City of Tualatin

TUALATIN CITY PLANNING COMMISSION MEETING

THURSDAY, DECEMBER 02, 2021

Join Zoom Meeting
https://us02web.zoom.us/j/83225444836?pwd=MTF4NzNzb1hJU2t4Z0FvTzNSVDhGUT09

Meeting ID: 832 2544 4836
Passcode: 935933
Dial in number: 1-669-990-9128

Bill Beers, Chair
Mona St. Clair, Vice Chair
Daniel Bachhuber Mitch Greene
Randall Hledik Janelle Thompson
Ursula Kuhn Zachary Wimer

CALL TO ORDER & ROLL CALL

ANNOUNCEMENTS & PLANNING COMMISSION COMMUNICATION

APPROVAL OF MINUTES

1. Approval of July Minutes.

COMMUNICATION FROM THE PUBLIC (NOT ON THE AGENDA)

Limited to 3 minutes

FUTURE ACTION ITEMS

ACTION ITEMS

COMMUNICATION FROM CITY STAFF

1. Consideration of a Conditional Use Permit to allow a "small lot" Subdivision and said Subdivision which includes 400-lots for residential development comprised of a mix of detached and attached single-family units plus two commercial lots known as "Autumn Sunrise."

ADJOURNMENT

CITY OF TUALATIN
Planning Division

UNOFFICAL

Tualatin Planning Commission

MINUTES OF July 15, 2021

TPC MEMBERS PRESENT:	**STAFF PRESENT:**
William Beers, Chair	Steve Koper
Mona St. Clair, Vice Chair	Johnathan Taylor
Alan Aplin, Commissioner	Lindsey Hagerman
Janelle Thompson, Commissioner	
	GUESTS:
TPC MEMBERS ABSENT:	Elaine Howard- Howard Consulting LLC
Daniel Bachhuber, Commissioner	
Ursula Kuhn, Commissioner	

CALL TO ORDER AND ROLL CALL:

Chair Beers called the meeting to order at 6:30pm. Roll call was taken.

ANNOUNCEMENTS AND PLANNING COMMISSION COMMUNICATION:

None.

APPROVAL OF MINUTES

Minutes were approved 3-0.

1. Review of February 18, 2020
2. Review of May 20, 2021

COMMUNICATION FROM THE PUBLIC (NOT ON THE AGENDA)

None.

ACTION ITEMS:

1. Proposed Southwest and Basalt Creek Development Area Presentation
2. Review the proposed Southwest and Basalt Creek Development Area and vote to find conformance with the Tualatin Comprehensive Plan.

Steve Koper, Assistant Community Development Director introduced Johnathan Taylor, Economic Development Manager.

Mr. Taylor introduced Elaine Howard with Elaine Howard Consulting Firm LLC. A firm the City of Tualatin has been working with since 2015 on various urban renewal projects.

Ms. Howard started her presentation and explained the role of the planning commission has in reviewing the draft of the SW Basalt Creek Area Plan and the report conformance of the comprehensive plan. She explained some common terminology used in urban renewal as well. She also discussed how property tax increases and how urban renewal works with this funding.

Ms. Howard described the public involvement for this project which included: past public input on the South Tualatin Concept Plan, Basalt Creek Concept Plan, Task Force, Online Open House, Agency, Planning Commission, City Council, and General Public Information.

She moved onto more details of the proposed urban renewal boundary and showed a map of the proposed implementation plan. She showed the funding projections for the area that corresponds with projects. Mr. Taylor added that there are a few current projects not on the list that would be included.

Mr. Taylor commented on the details of the proposed plan projections and explained they were based on existing plans. He went through the slides that showed current and past projects. He mentioned the storm water master plan and two other projects are currently being budgeted for 2021-2022 fiscal year.

Ms. Howard moved onto slide explaining the proposed maximum indebtedness action plan of $53,200,000. She explained this plan was developed with the city finance director being comfortable to do a 30-year plan calculated for a 6% growth scenario.

Ms. Howard moved on explaining the next steps for the project which included public input, briefing Washington County, Washington County consider vote, Tualatin City Council Hearing, Tualatin City Council Vote on Ordinance.

Commissioner Aaplin asked for clarification on what they are proposing specifically on for the Balsalt Creek. Ms. Howard let him know that the proposal is on the implementation tool used for the Balsalt Creek Concept Plan.

Commissioner Aaplin also asked if there was a specific timeframe that the implementation would need to be completed or deemed completed. Mr. Taylor explained the Balsalt Creek residents are in anticipation of 50 years of gravel extraction. Mr. Taylor also explained that if it is finished earlier and in 30 years they can go back and review but really it's based on the property owner and private entities.

Commissioner Aaplin asked about Washington County's unincorporated areas. Ms. Howard explained Washington County also has to agree with plans of development and property taxes will be evaluated based on the projection of growth. They also explained how property taxes will not increase property owner’s bill.

Mr. Koper, assistant director of community development was asked to go over page 74 of the agenda packet maps for zoned undesignated. He explained the concept plan was determined the area was an environmental constraint and wouldn't be developmental. He mentioned if a person found a way to work with environmental factors of land use they would have to work with the city to determine zoning.

Chair Beers asked Commissioner Thompson to give a quick overview of her participation in the task force. She mentioned it was a great representation of a variety of property owners and community members on the task force. She explained during the presentation they learned what urban growth is, and went over storm water, projects. She said everyone thought the plan flowed well and felt good about it all.

Mr. Taylor explained the next steps after approval would involve letting the public know by notice letter with their utility bill. He also said a notice letter will go out to residents in urban growth areas of Washington County as well for them to be aware.

Chair Beers moved to make a motion to approve the Southwest and Basalt Creek Development Area Plan and complies with Tualatin Development Code can comprehension plan. Commissioner Aaplin seconded the motion.

Commissioners moved onto the next action item: Review the proposed 11th Amendment to the Leveton Tax Increment Plan and vote to find
conformance with the Tualatin Development Code.

Mr. Taylor presented the next action item on the agenda asking for a substantial amendment. He explained how the tax increment is a current boundary not collecting taxes since 2010 due to not enough significant growth. He explained this requires a substantial amendment process with any type of growth after 30 acres and a percentage increase. He also noted that the Herman Road improvement concept plan would need a substantial amendment passed as well to move forward.

Mr. Taylor asked the commissioners if the proposed project meets in conformance to the comprehensive plan. Ms. Howard noted one finding that was put into the document included safety and transportation network.

Commissioner Aaplin asked if the proposal is to raise money to fulfill and complete Leveton. Mr. Taylor told him he is correct.
Commissioner Thompson asked if there was a timeline as well. Mr. Taylor responded that there is no timeline and once a project is complete the funding would no longer be collected.

Vice Chair St. Clair asked if the Herman road project would affect the mobile homes land. Mr. Koper let her know that it is the most constrained area of the project being close to homes but will have to possibly do retaining wall and right of way is already there.

Vice Chair St. Clair asked if tenants in the mobile homes will be displaced due to the Herman project. Mr. Koper let her know they should not be and the cities goal is to keep what is established there.

Chair Beers made motion that the Tualatin Commission finds the 11th Amendment to the Leveton Tax Increment Plan is in conformant to the Tualatin Development Code and Tualatin Comprehensive plan. Vice-Chair St. Clair seconded the motion.

COMMUNICATION FROM STAFF:
None.

FUTURE ACTION ITEMS
Mr. Koper let commissioner's know about Autumn Rise subdivision application was given to the city. He mentioned it's a bit unique in now needing a neighborhood meeting unlike the past ARII. He explained that this is new and all the pieces that involve with this land use application.

New applicants for Commissioners are being in process and being appointed with City Council.

ADJOURNMENT
MOTION by Commissioner Thompson adjourn the meeting at 8:00pm

City of Tualatin

CITY OF TUALATIN
Staff Report

TO:	Tualatin Planning Commissioners
THROUGH:	Steve Koper, Assistant Community Development Director
FROM:	Tony Doran, Engineering Associate
DATE:	December 2, 2021

SUBJECT:
Consideration of a Conditional Use Permit to allow a "small lot" Subdivision and said Subdivision which includes 400-lots for residential development comprised of a mix of detached and attached single-family units plus two commercial lots known as "Autumn Sunrise."

EXECUTIVE SUMMARY:
The Applicant, Lennar Northwest, Inc. requests Planning Commission approval of the “Autumn Sunrise” development, a 400-lot “Small Lot” Subdivision development (Conditional Use Permit CUP21-0001 and Subdivision SB21-0001) comprised of a mix of lots for single-family attached and detached homes. Approximately 3.1 acres (5% of gross site area) is proposed as open space and tree preservation. The project would also include two commercial lots reserved for future development.

The subject site is approximately 61.71 acres of property in the Basalt Creek planning area, located at 23620 & 23740 SW Boones Ferry Road; 9185, 9335, & 9415 SW Greenhill Lane. The site is south of SW Norwood Road, east of SW Boones Ferry Road, and north of SW Greenhill Lane. Tax Lots include 2S135D: 400, 401, 500, 501, 600, 800, and 900 and Tax Lot 1S35D 100. The lot’s zones include Medium-Low Density Residential (RML) and Neighborhood Commercial (CN).

The development is proposed to be constructed in four phases.

- The first phase would start in the northeast portion of the site adjacent to SW Norwood Road. Access to the site is proposed from SW Norwood Road opposite SW 89th Avenue and SW Vermillion Court.
- The second phase would have a secondary emergency access to Boones Ferry Road replaced by public streets constructed with the third phase.
- The third phase would include an intersection with SW Boones Ferry Road ultimately signalized with the fourth and final phase of the development. The third phase includes two commercial lots adjacent to SW Boones Ferry Road.
- The fourth phase completes the interior residential lots including a neighborhood park within Tract M. This also completes a public access route including a 6-foot wide sidewalk from SW Vermillion Drive to SW Boones Ferry Road via SW “M” Street. This connectivity enables regional connectivity to expected future parks facilities west of SW Boones Ferry Road.

The proposed development would construct an internal system of Local public streets. These streets would enable connectivity from SW Norwood Road to SW Boones Ferry Road and SW Greenhill Road. Additional connectivity enabling future development to the north and west of this subdivision includes:

- SW “C” Street north of Tualatin’s B-level reservoirs west north of Horizon Community Church,
- A public accessway extending from the west end of SW “E” Street south of Horizon Community Church,
- A public accessway extending north from the north end of SW “L” Street towards the Horizon Community Church’s lot,
- Private Tract L with public access and utility easements north of SW “M” Street. This will serve as a full access route to the signalized intersection of SW Boones Ferry Road and SW “H” Street. Lots to the north of Autumn Sunrise are expected to include access restrictions to SW Boones Ferry Road with future redevelopment.

Findings demonstrate approval criteria are met or are met with conditions of approval for: Tualatin Comprehensive Plan Chapters 3 and 10; Tualatin Development Code (TDC) Chapters 32, 33, 36, 41, 51, 73A, 73B, 73C, 73G, 74, and 75, and Title 3 of the Tualatin Municipal Code (TMC).

RECOMMENDATION:
Staff recommends approval of the Conditional Use Permit. Staff also recommends subsequent approval of the Subdivision application.

OUTCOMES OF DECISION:
If both the Conditional Use Permit and Subdivision applications are approved, the Autumn Sunrise Development would be able to move forward to construction of public utility improvements, private improvements, final plat approval, and ultimately release of lots within each Phase of the subdivision, which will allow for submittal of building permits to construct new dwelling units. Development on the commercial lots would require separate Architectural Review Approval.

ALTERNATIVES TO RECOMMENDATION:
-The Planning Commission may continue consideration of this matter to a date certain.
-The Planning Commission may deny either the Conditional Use Permit and/or Subdivision
-If the Conditional Use Permit is not approved, the Subdivision application cannot be approved because it relies on prior approval of the Conditional Use Permit.

ATTACHMENTS:
-Attachment 1 – Presentation
-Attachment 2 – Findings
-Exhibit A: Land Use Application
-Exhibit B: Narrative
-Exhibit C: Preliminary Plans
-Exhibit D: Traffic Impact Analysis and Supplement
-Exhibit E: Preliminary Stormwater Report
-Exhibit F: Evidence of Mailed Notice
-Exhibit G: CWS Service Provider Letter
-Exhibit H: Public Comments
-Exhibit I: Applicant “120 day” waiver
-Exhibit J: ODOT Case # 11988 Autumn Sunrise Subdivision
-Exhibit K: 11.15.2021 - Memorandum - Analysis of Legal Basis for ODOT Requested Condition of Approval
-Exhibit L: 21 11 11 Tim Neary RE_ CUP21-0001 & SB21-0001 Comments
-Exhibit M: Lancaster Response to Neary Email_211119
-Exhibit N: CWS Memorandum Tualatin - Autumn Sunrise Subdivision - CUP21-0011, SB21-0001
-Exhibit O: Washington County Autumn Comments
-Exhibit P: Draft Tualatin Water Master Plan
-Exhibit Q: Map 8-3 Local Streets Plan of the Tualatin Comprehensive Plan

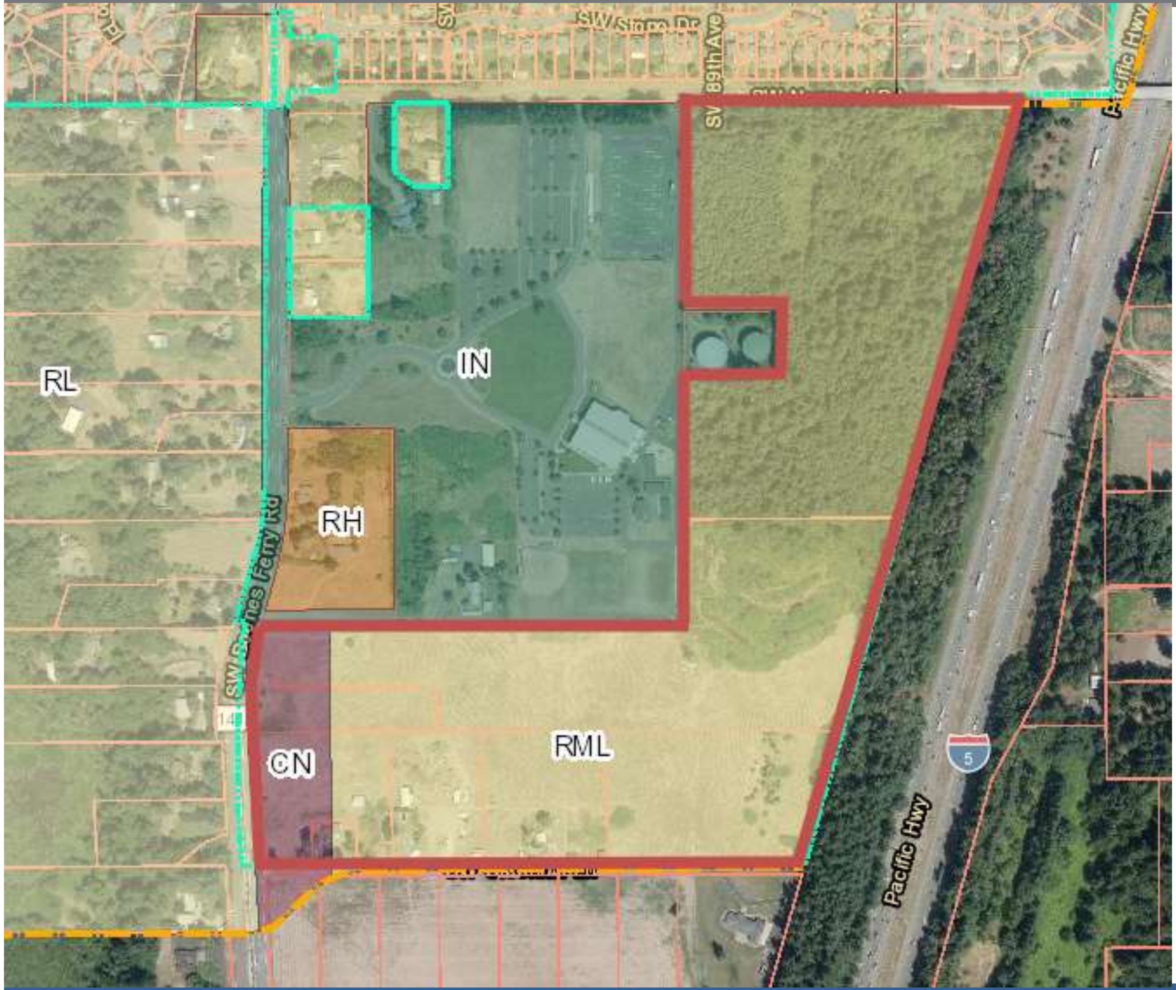
Autumn Sunrise Conditional Use Permit (CUP21-0001) and Subdivision (SB21-0001)

23620 & 23740 SW Boones Ferry Road; 9185, 9335, & 9415 SW Greenhill Lane

Autumn Sunrise CUP and Subdivision

TUALATIN PLANNING COMMISSION
December 2, 2021

SITE BACKGROUND



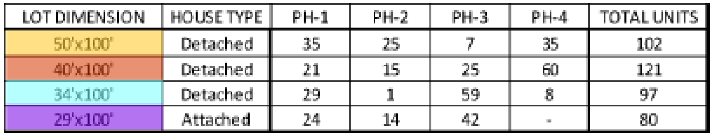
- 61.76+/- acres
- South of SW Norwood Road, east of SW Boones Ferry Road, and north of SW Greenhill Lane
- Zoned Medium-Low Density Residential (RML) and Neighborhood Commercial (CN)

ZONING

- Medium-Low Density Residential Zone (CN)
  - Townhomes are a Permitted Use
  - Single-family homes are a Conditional Use subject to “Small Lot” Conditional Use Permit and Subdivision
    - Maximum density for these uses is 10 dwelling units per acre
  - Development standards (e.g. setbacks) for townhomes are determined through Architectural Review process and subject to Table 41-3
  - Single-family homes in the Basalt Creek area are a Conditional Use subject to the development standards (e.g. setbacks) in Table 41-4

- Neighborhood Commercial Zone (CN)
  - No development is proposed as part of this application; future development requires approval through Architectural Review process
  - Community services are a Permitted use
  - Small retail uses are Permitted subject to TDC 51.210, which includes square footage limitations on certain uses and combinations of uses are allowed
  - Child care centers are Permitted subject to TDC 34.100.

PROPOSED DEVELOPMENT



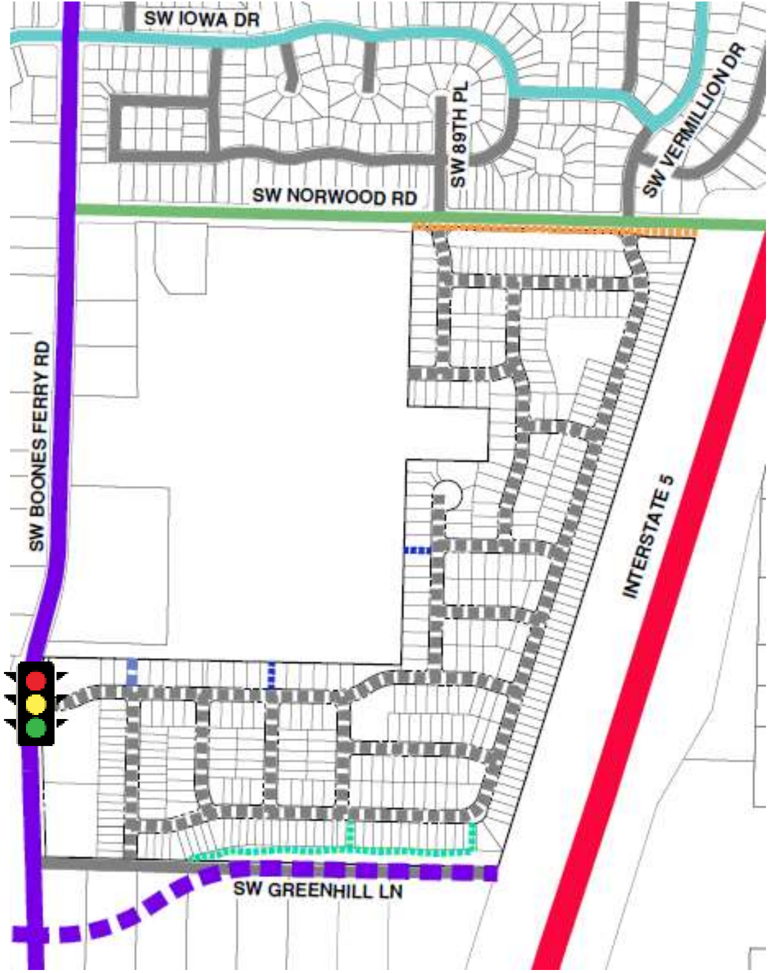
LOT DIMENSION	HOUSE TYPE	PH-1	PH-2	PH-3	PH-4	TOTAL UNITS
50'x100'	Detached	35	25	7	35	102
40'x100'	Detached	21	15	25	60	121
34'x100'	Detached	29	1	59	8	97
29'x100'	Attached	24	14	42	-	80

- 400 single-family attached and detached residential lots, and two commercial lots (for future development)
    - 320 detached single-family
    - 80 townhomes
- 5 percent of gross site area as open space (shown in green)
- 4 phases (102, 121, 97, and 80 units respectively).
- Maximum site density is 411 units

TRANSPORTATION ANALYSIS

- Traffic study required and provided (Exhibits D and M)
- City standards:
    - Ensure an acceptable level of service for roadways and a level of service of at least D and E for signalized and unsignalized intersections respectively, after the future traffic impacts are considered; and
    - Construct improvements that are necessary to meet this standard if existing infrastructure does not support
- Required improvements need to:
    - Be related to this specific development (i.e. development does not need to mitigate for unrelated system deficiencies)
    - Be approximately in proportion to impacts from this development (i.e. development is not responsible for fixing larger existing system deficiencies)

TRANSPORTATION PLAN



- Signalized intersection at Boones Ferry Road
- New system of local streets
- Sidewalks included along all streets
- Trail connections
- Frontage improvements
  - Boones Ferry Road
  - Norwood Road
- Dedication of right-of-way for future parkway extension in location of Greenhill Lane

UTILITY PLAN

- Construction and extension of gravity and pump sanitary sewer and potable water system loop to facilitate development in Basalt Creek area, including:
    - Construction of sanitary sewer pump station in collaboration with Clean Water Services (Red)
    - Connections to City's "B Level" reservoir (Blue) and "C Level reservoir (off-site)
- Construction of new public stormwater infrastructure located at low-points to capture new run-off (Green)

CONDITIONAL USE PERMIT (CUP)

TDC 33.040(5). - Conditional Use Permit approval criteria:

(a) The use is listed as a conditional use in the underlying zone;

(b) The characteristics of the site are suitable for the proposed use, considering size, shape, location, topography, existence of improvements and natural features;

(c) The proposed development is timely, considering the adequacy of transportation systems, public facilities, and services existing or planned for the area affected by the use;

(d) The proposed use will not alter the character of the surrounding area in any manner that substantially limits, impairs, or precludes the use of surrounding properties for the primary uses listed in the underlying zone; and

(e) The proposal satisfies those objectives and policies of the Tualatin Comprehensive Plan that are applicable to the proposed use.

SUBDIVISION (SB)

TDC 36.120(4). - Tentative Subdivision Plan approval criteria:

- Complies with lot and infrastructure standards.
- Does not impede the future use or development of the property or adjacent land.
- Street system complies with the Transportation System Plan and is designed for safe and orderly circulation for vehicles, bicycles and pedestrians
- Mitigates impacts to the transportation system.
- Takes into account the topography and vegetation of the site so the need for variances is minimized to the greatest extent practicable and such that the least disruption of the site, topography, and vegetation will result from the reasonable development of the lots.

TDC 36.130(4) . - Phased Tentative Subdivision Plan approval criteria

- Phasing plan meets connectivity standards between each phase and each phase is both self-sustaining and supports the overall infrastructure requirements of all phases.

RECOMMENDATION (CUP21-0001)

- Staff recommends the Planning Commission approve the Conditional Use Permit (CUP 21-0001) application, with recommended conditions of approval.
- The Planning Commission may alternatively:
  - Vote to approve CUP21-0001 with amended conditions of approval;
  - Vote to continue consideration of CUP21-0001 to a date certain; or
  - Deny CUP21-0001 based on a preponderance of evidence, supported by findings and analysis that show that one or more criterion in the TDC have not been met.

RECOMMENDATION (SB21-0001)

- If the Planning Commission has voted to approve or approve with amended conditions CUP21-0001, staff additionally recommends the Planning Commission approve the Subdivision (SB21-0001) application, with recommended conditions of approval.
- The Planning Commission may alternatively:
    - Vote to approve SB21-0001 with amended conditions of approval;
    - Vote to continue consideration of SB21-0001 to a date certain; or
    - Deny SB21-0001 based on a preponderance of evidence, supported by findings and analysis that show that one or more criterion in the TDC have not been met.

City of Tualatin
www.tualatinoregon.gov

December 2, 2021

Analysis and Findings for Autumn Sunrise Small Lot Subdivision

Case #: CUP21-0001 and SB21-0001
Project: Autumn Sunrise Subdivision
Location: 23620 & 23740 SW Boones Ferry Road; 9185, 9335, & 9415 SW Greenhill Lane; South of SW Norwood Road, east of SW Boones Ferry Road, and north of SW Greenhill Lane
Contact: Consultant: Mimi Doukas, AICP, RLA; AKS Engineering & Forestry, LLC
Applicant: Michael W. Anders, Lennar Northwest, Inc.
Owners: Autumn Sunrise, LLC (Tax Lots 2S135D: 400, 401, 500, 501, 600, 800, and 900)
P3 Properties, LLC (Tax Lot 1S35D 100)

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TUALATIN DEVELOPMENT CODE (TDC) AND TUALATIN MUNICIAL CODE (TMC)

I. INTRODUCTION

A. Project Description

The Applicant, Lennar Northwest, Inc. requests Planning Commission approval of the "Autumn Sunrise" development, a 400-lot "Small Lot" Subdivision development (Conditional Use Permit CUP21-0001 and Subdivision SB21-0001) comprised of a mix of lots for single-family attached and detached homes. Approximately 3.1 acres (5% of gross site area) is proposed as open space and tree preservation. The project would also include two commercial lots reserved for future development.

The subject site is approximately 61.71 acres of property in the Basalt Creek planning area, located at 23620 & 23740 SW Boones Ferry Road; 9185, 9335, & 9415 SW Greenhill Lane. The site is south of SW Norwood Road, east of SW Boones Ferry Road, and north of SW Greenhill Lane. Tax Lots include 2S135D: 400, 401, 500, 501, 600, 800, and 900 and Tax Lot 1S35D 100. The lot's zones include Medium-Low Density Residential (RML) and Neighborhood Commercial (CN).

The development is proposed to be constructed in four phases. The first phase would start in the northeast portion of the site along Norwood Road. Access to the site is proposed at two locations along Norwood Road, opposite SW 89th Avenue and SW Vermillion Court. The proposed development would construct an internal system of Local public streets. The proposed development would have a secondary emergency access to Boones Ferry Road in the interim, and ultimately construction of a new Local public signalized intersection with Boones Ferry Road concurrent with the fourth and final phase of the development

B. Applicable Criteria

The proposed Conditional Use Permit (CUP) for a "Small Lot" Subdivision is processed as a Type-III land use application. The applicant has elected to have the Planning Commission make a decision on the proposed Subdivision following a decision on the CUP. The applicable approval criteria for these applications include: Tualatin Comprehensive Plan Chapters 3 and 10; Tualatin Development Code (TDC) Chapters 32, 33, 36, 41, 51, 73A, 73B, 73C, 73G, 74, and 75, and Title 3 of the Tualatin Municipal Code (TMC).

C. Previous Land Use Actions

- ANN 19-0002
    - The City of Tualatin annexed Tax Lots 400, 401, 500, 501, 600, 800, and 900 of Washington County Assessor's Map 2S 1 35D into the City. These lots comprise the southern ±38 acres of the subject site adjacent to SW Boones Ferry Road and SW Greenhill Lane.
- ANN 20-003

  - The City of Tualatin annexed Tax Lot 100 of Washington County Assessor's Map 2S 1 35D, the northern ±25 acres of the subject site adjacent to SW Norwood Road.
- PTA 20-003
  - This Development Code Text Amendment approved modified development standards—smaller lot sizes, reduced setbacks, and increased structural lot coverage—for development of detached single-family dwellings in a "Small Lot Subdivision" under a Conditional Use Permit in the Basalt Creek Area. It also included requirements to build at least 20 percent of the units in a proposed development as attached single-family and a minimum of 5 percent of the gross site area as open space for the provision of recreational area and/or tree preservation. The maximum density of 10 units per acre remained unchanged.
- PMA 20-002 and PTA 20-005
  - This application adjusted the combined Comprehensive Plan and Zoning Map to shift the CN zoning district boundary on the subject site. The CN zoning district remains ±3.9 acres in area but is now an elongated rectangle fronting on SW Boones Ferry Road. The RML zoning district is now located further from SW Boones Ferry Road. This approval also included a text amendment to remove a provision that prohibited the CN zoning district within 300 feet of a school property and added the "basic utility" use category to the list of permitted uses within the CN zone.

D. Site Description and Surrounding Uses

The subject site is a total of ±61.96 acres located at the southernmost extent of the City's UGB and is comprised of eight tax lots. The site has frontage on SW Norwood Road, SW Boones Ferry Road, and SW Greenhill Road. A ±3.9-acre portion of the site adjacent to SW Boones Ferry Road is zoned CN. The remaining ±58 acres are zoned RML. The northern portion of the site is wooded while the southern area has three existing homes adjacent to SE Greenhill Lane and open agricultural fields.

Adjacent land uses include:

North: Medium Low Density Residential (RML); SW Norwood Road separates this site from residential subdivisions:

- Norwood Heights
- Tualatin Woods
- Tualatin Woods No. 2.

East: City Boundary and Urban Growth Boundary (UGB) are at the edge of this site. Interstate 5 right-of-way with unincorporated Washington County zoned Agriculture and Forest District (AF-5) and Future Development 20-Acre (FD-20) are beyond.

South: The City Boundary is at SW Greenhill Lane, beyond that are agricultural and low-density residential development in unincorporated Washington County zoned FD-20. The areas south of SW Greenhill Lane are within the City of Wilsonville Planning Area.

West: The City of Tualatin water towers and Horizon Christian Church and High School are zoned Institutional (IN). There is also a 5-acre unincorporated lot adjacent to SW Boones Ferry Road that will have the zoning designation of High Density Residential (RH) once it is annexed to the City. Unincorporated properties on the west side of SW Boones Ferry Road have low-density residential development (with County Zoning of FD-20) and will have the Low Density Residential (RL) zoning designation when annexed to the City.

Figure 1 and 2: Aerial views of subject site:

☐ Planning Districts

- Commercial Office (CO)
- Central Commercial (CC)
- General Commercial (CG)
- Recreational Commercial (CR)
- Medical Commercial (MC)
- Light Manufacturing (ML)
- General Manufacturing (MG)
- Manufacturing Park (MP)
- Manufacturing Business Park (MBP)
- Low Density Residential (RL)
- Medium Low Density Residential
- Medium High Density Residential (RMH)
- High Density Residential (RH)
- High Density/High Rise Residential (RH/HR)
- Institutional (IN)

(2 of 2)

Planning Districts

Planning District: RML

Planning District Name: Medium Low Density Residential

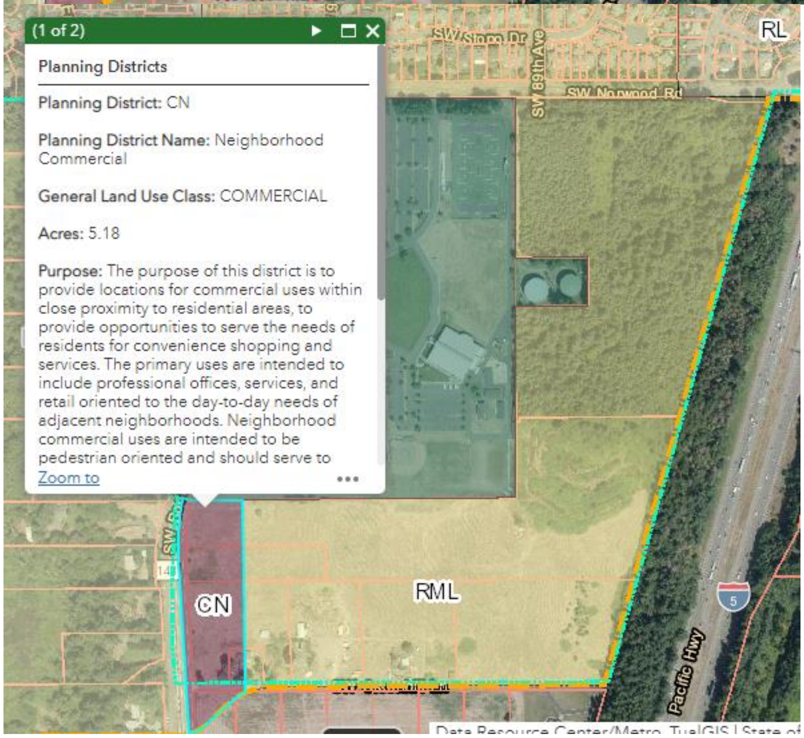
General Land Use Class: RESIDENTIAL

Acres: 110.18

Purpose: To provide areas of the City suitable for townhouses, condominiums, duplexes, triplexes and other multi-family dwellings, as well as areas for small-lot, small home subdivisions, and manufactured dwelling parks in designated areas, except as otherwise provided in TDC 41.320.

Tualatin Development Code: 41

Zoom to



(1 of 2)

Planning Districts

Planning District: CN

Planning District Name: Neighborhood Commercial

General Land Use Class: COMMERCIAL

Acres: 5.18

Purpose: The purpose of this district is to provide locations for commercial uses within close proximity to residential areas, to provide opportunities to serve the needs of residents for convenience shopping and services. The primary uses are intended to include professional offices, services, and retail oriented to the day-to-day needs of adjacent neighborhoods. Neighborhood commercial uses are intended to be pedestrian oriented and should serve to

Zoom to

E. Exhibit List

Exhibit A: Land Use Application
Exhibit B: Narrative
Exhibit C: Preliminary Plans
Exhibit D: Traffic Impact Analysis and Supplement
Exhibit E: Preliminary Stormwater Report
Exhibit F: Evidence of Mailed Notice
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Exhibit O: Washington County AutumnSunriseSUB-TUALCOMM
Exhibit P: Draft Tualatin Water Master Plan
Exhibit Q: Map 8-3 of the Tualatin Comprehensive Plan

F. Attachment List

Attachment A Presentation CUP21-0001 SB21-0001

II. PLANNING FINDINGS

TUALATIN COMPREHENSIVE PLAN

PART III GOALS AND POLICIES

[…]

CHAPTER 3: HOUSING & RESIDENTIAL GROWTH

GOAL 3.1 HOUSING SUPPLY. Ensure that a 20-year land supply is designated and has urban services planned to support the housing types and densities identified in the Housing Needs Analysis.

POLICY 3.1.1 DENSITY. Maintain a citywide residential density of at least eight (8) dwelling units per net acre.

Finding:

The proposed development includes a mix of single-family attached and detached units at a density of approximately 10 dwelling units per acre. Allowing detached units increases the diversity of housing provided while maintaining the housing density goals within the City as identified in the Housing Needs Analysis. These policies are met.

GOAL 3.2 HOUSING FOR ALL. Encourage development and preservation of housing that is affordable for all households in Tualatin.

POLICY 3.2.1 HOUSING TYPE DIVERSITY. Support development of townhomes, duplexes, triplexes, quadplexes, cottages, courtyard housing, accessory dwelling units, single story units, senior housing, and extended family and multi-generational housing in all residential zoning districts.

Finding:

The planned detached dwelling units on a variety of lot sizes, along with the planned attached townhomes, provide diversity in housing type while preserving the affordability that the targeted density provides. These policies are met.

CHAPTER 10 LAND USE DESIGNATIONS & ZONING

Purpose: The purpose of this chapter is to define a distinct range of land use designations that directly correspond with zones applied to lands within the City of Tualatin and its Urban Planning Area. This chapter explains the intention and distinguishing characteristics of each land use designation.

PLANNING DISTRICT OBJECTIVES

This section describes the purpose of each planning district.

Medium-Low Density Residential Planning District (RML) This district supports household living uses with a variety of housing types at moderately low densities. This district is primarily oriented toward middle housing types including attached dwellings, multi-family development, and manufactured dwelling parks.
[…]

Neighborhood Commercial Planning District (CN) To provide locations for commercial uses within close proximity to residential areas. It is to provide for opportunities to serve the needs of residents for convenience shopping and services. Such uses will be limited to professional offices, services, and retail trade that are oriented to the day-to-day commercial needs of the residential neighborhood. Neighborhood commercial uses are intended to be pedestrian oriented and should serve to reduce automobile trips and energy consumption. The purpose is also to assure that such development is of a scale and design so that it is compatible with the residential environment and is an enhancement to neighborhood areas. It is not the purpose of this district to create large scale commercial facilities that will compete with similar uses, such as large grocery or department stores, located in the downtown area.
[…]

Finding:
The proposed development is consistent with objectives of the RML zoning district in that it includes attached dwellings and a variety of housing types a at moderately low density. The application does not propose specific uses for the CN zoned portion of the property. Future uses would require approval through the Architectural Review land use process and would be limited to the uses allowed in that district, which are consistent with the above objectives. The location of the CN zoning relative to the RML zoning is consistent with the district objectives. These objectives are met.

TUALATIN DEVELOPMENT CODE
Chapter 32: Procedures
Section 32.010 – Purpose and Applicability.
[…]
(2) Applicability of Review Procedures. All land use and development permit applications and decisions, will be made by using the procedures contained in this Chapter. The procedure “type” assigned to each application governs the decision-making process for that permit or application. There are five types of permit/application procedures as described in subsections (a) through (e) below. Table 32-1 lists the City’s land use and development applications and corresponding review procedure(s).
[…]

(b)Type II Procedure (Administrative/Staff Review with Notice). A Type II procedure is used when the standards and criteria require limited discretion, interpretation, or policy or legal judgment. Type II decisions are made by the City Manager and require public notice and an opportunity for appeal to the Planning Commission, Architectural Review Board, or City Council as shown in Table 32-1. Those Type II decisions which are "limited land use decisions" as defined in ORS 197.015 are so noted in Table 32-1.

(c) Type III Procedure (Quasi-Judicial Review – Public Hearing). Type III procedure is used when the standards and criteria require discretion, interpretation, or policy or legal judgment. Quasi-Judicial decisions involve discretion but implement established policy. Type III decisions are made by the Planning Commission or Architectural Review Board and require public notice and a public hearing, with an opportunity for appeal to the City Council.
[…]
(3) Determination of Review Type. Unless specified in Table 32-1, the City Manager will determine whether a permit or application is processed as Type I, II, III, IV-A or IV-B based on the descriptions above. Questions regarding the appropriate procedure will be resolved in favor of the review type providing the widest notice and opportunity to participate. An applicant may choose to elevate a Type I or II application to a higher numbered review type, provided the applicant pays the appropriate fee for the selected review type.

Table 32-1 – Applications Types and Review Procedures

Application / Action	**Procedure Type**	**Decision Body***	**Appeal Body***	**Pre-Application Conference Required**	**Neighborhood/Developer Mtg Required**	**Applicable Code Chapter**
[…]						
Conditional Use Permit	III	PC	CC	Yes	Yes	TDC 33.040
[…]						
•Subdivisions (limited land use)	**II**	**CM**	**CC**	**Yes**	**Yes**	**TDC Ch 36**
[…]						
* City Council (CC); Planning Commission (PC); Architectural Review Board (ARB); City Manager or designee (CM); Land Use Board of Appeals (LUBA).						

Finding:

The proposed "Small Lot" Subdivision is identified as a Conditional Use in the RML zone. Per Table 32-1, a CUP is processed in accordance with the Type III procedures and a decision by the Planning Commission. The applicant has chosen to have the Planning Commission also make a decision on its Subdivision land use application, which would normally be processed as a Type II application. These criteria are met.

Section 32.020 – Procedures for Review of Multiple Applications.

Multiple applications processed individually require the filing of separate applications for each land use action. Each application will be separately reviewed according to the applicable procedure type and processed sequentially as follows:
(1) Applications with the highest numbered procedure type must be processed first;
(2) Applications specifically referenced elsewhere in the TDC as to the particular order must be processed in that order; and
(3) Where one land use application is dependent on the approval of another land use application, the land use application upon which the other is dependent must be processed first (e.g., a conditional use permit is subject to prior approval before architectural review).

Finding:

As discussed above, the applicant has asked the Planning Commission to make a decision on both its CUP and Subdivision applications. The Subdivision application is dependent on the prior approval of the CUP application, and therefore, the Planning Commission will need to first reach a decision on the CUP before it can make a decision on the Subdivision. These criteria can be met.

Section 32.030 – Time to Process Applications.

(1) Time Limit - 120-day Rule. The City must take final action on all Type II, Type III, and Type IV-A land use applications, as provided by ORS 227.178, including resolution of all local appeals, within 120 days after the application has been deemed complete under TDC 32.160, unless the applicant provides written request or consent to an extension in compliance with ORS 227.178. (Note: The 120-day rule does not apply to Type IV-B (Legislative Land Use) decisions.)
[…]

Finding:

The subject applications were submitted on July 1, 2021 and deemed complete on July 30, 2021. Under the 120-day rule, a final decision by the City must occur by November 27, 2021. The applicant has provided voluntary written extension of this deadline (Exhibit I), requiring a final decision by December 10, 2021. This criteria can be met.

<u>Section 32.110 – Pre-Application Conference.</u>

(1) Purpose of Pre-Application Conferences. Pre-application conferences are intended to familiarize applicants with the requirements of the TDC; to provide applicants with an opportunity discuss proposed projects in detail with City staff; and to identify approval criteria, standards, and procedures prior to filing a land use application. The pre-application conference is intended to be a tool to assist applicants in navigating the land use process, but is not intended to be an exhaustive review that identifies or resolves all potential issues, and does not bind or preclude the City from enforcing any applicable regulations or from applying regulations in a manner differently than may have been indicated at the time of the pre-application conference.

(2) When Mandatory. Pre-application conferences are mandatory for all land use actions identified as requiring a pre-application conference in Table 32-1. An applicant may voluntarily request a pre-application conference for any land use action even if it is not required.

(3) Timing of Pre-Application Conference. A pre-application conference must be held with City staff before an applicant submits an application and before an applicant conducts a Neighborhood/Developer meeting.

(4) Application Requirements for Pre-Application Conference.

(a) Application Form. Pre-application conference requests must be made on forms provided by the City Manager.

(b) Submittal Requirements. Pre-application conference requests must include:

(i) A completed application form;

(ii) Payment of the application fee;

(iii) The information required, if any, for the specific pre-application conference sought; and

(iv) Any additional information the applicant deems necessary to demonstrate the nature and scope of the proposal in sufficient detail to allow City staff to review and comment.

(5) Scheduling of Pre-Application Conference. Upon receipt of a complete application, the City Manager will schedule the pre-application conference. The City Manager will coordinate the involvement of city departments, as appropriate, in the pre-application conference. Pre-application conferences are not open to the general public.

(6) Validity Period for Mandatory Pre-Application Conferences; Follow-Up Conferences. A follow-up conference is required for those mandatory pre-application conferences that have previously been held when:

(a) An application relating to the proposed development that was the subject of the pre-application conference has not been submitted within six (6) months of the pre-application conference;

<u>Finding:</u>

A pre-application conference was held with City staff on February 17, 2021, which is within six months of the date of submittal of the application (July 1, 2021). These criteria are met.

<u>Section 32.120 – Neighborhood/Developer Meetings.</u>
(1) Purpose. The purpose of this meeting is to provide a means for the applicant and surrounding property owners to meet to review a development proposal and identify issues regarding the proposal so they can be considered prior to the application submittal. The meeting is intended to allow the developer and neighbors to share information and concerns regarding the project. The applicant may consider whether to incorporate solutions to these issues prior to application submittal.
(2) When Mandatory. Neighborhood/developer meetings are mandatory for all land use actions identified in Table 32-1 as requiring a neighborhood/developer meeting. An applicant may voluntarily conduct a neighborhood/developer meeting even if it is not required and may conduct more than one neighborhood/developer meeting at their election.
(3) Timing. A neighborhood/developer meeting must be held after a pre-application meeting with City staff, but before submittal of an application.
(4) Time and Location. Required neighborhood/developer meetings must be held within the city limits of the City of Tualatin at the following times:
(a) If scheduled on a weekday, the meeting must begin no earlier than 6:00 p.m.
(5) Notice Requirements.
(a) The applicant must provide notice of the meeting at least 14 calendar days and no more than 28 calendar days before the meeting. The notice must be by first class mail providing the date, time, and location of the meeting, as well as a brief description of the proposal and its location. The applicant must keep a copy of the notice to be submitted with their land use application.
(b) The applicant must mail notice of a neighborhood/developer meeting to the following persons:
(i) All property owners within 1,000 feet measured from the boundaries of the subject property;
(ii) All property owners within a platted residential subdivision that is located within 1,000 feet of the boundaries of the subject property. The notice area includes the entire subdivision and not just those lots within 1,000 feet. If the residential subdivision is one of two or more individually platted phases sharing a single subdivision name, the notice area need not include the additional phases; and
(iii) All designated representatives of recognized Citizen Involvement Organizations as established in TMC Chapter 11-9.
(6) Neighborhood/Developer Sign Posting Requirements. The applicant must provide and post on the subject property, at least 14 calendar days before the meeting. The sign must conform to the design and placement standards established by the City for signs notifying the public of land use actions in TDC 32.150.
(7) Neighborhood/Developer Meeting Requirements. The applicant must have a sign-in sheet for all attendees to provide their name, address, telephone number, and email address and keep a copy of the sign-in sheet to provide with their land use application. The applicant must

prepare meeting notes identifying the persons attending, those commenting and the substance of the comments expressed, and the major points that were discussed. The applicant must keep a copy of the meeting notes for submittal with their land use application.

Finding:

A Neighborhood/Developer Meeting was held on June 9, 2021 (Exhibit A) consistent with the above described requirements. These criteria are met.

Section 32.130 – Initiation of Applications.

(1) Type I, Type II, Type III, and Type IV-A Applications. Type I, Type II, Type III, and Type IV-A applications may be submitted by one or more of the following persons:
(a) The owner of the subject property;
(b)The contract purchaser of the subject property, when the application is accompanied by proof of the purchaser's status as such and by the seller's written consent;
[…]
(d) The agent of any of the foregoing, when the application is duly authorized in writing by a person authorized to submit an application by paragraphs (a), (b) or (c) of this subsection, and accompanied by proof of the agent's authority.
[…]

Finding:

This application has been submitted by the contract purchaser, Lennar Northwest, Inc., of the subject properties on behalf of the property owners, Autumn Sunrise, LLC and P3 Properties, LLC. These criteria are met.

Section 32.140 – Application Submittal.

(1) Submittal Requirements. Land use applications must be submitted on forms provided by the City. A land use application may not be accepted in partial submittals. All information supplied on the application form and accompanying the application must be complete and correct as to the applicable facts. Unless otherwise specified, all of the following must be submitted to initiate completeness review under TDC 32.160:
[…]
(2) Application Intake. Each application, when received, must be date-stamped with the date the application was received by the City, and designated with a receipt number and a notation of the staff person who received the application.
(3) Administrative Standards for Applications. The City Manager is authorized to establish administrative standards for application forms and submittals, including but not limited to plan details, information detail and specificity, number of copies, scale, and the form of submittal.

Finding:

The subject applications were submitted on July 1, 2021 and deemed to have met the submittal criteria on July 30, 2021. These criteria are met.

Section 32.150 - Sign Posting.

(1) When Signs Posted. Signs in conformance with these standards must be posted as follows:
[…]
(2) Sign Design Requirements. The applicant must provide and post a sign(s) that conforms to the following standards:
[…]
(3) On-site Placement. The applicant must place one sign on their property along each public street frontage of the subject property. (Example: If a property adjoins four public streets, the applicant must place a sign at each of those public street frontages for a total of four signs). The applicant cannot place the sign within public right of way.
(4) Removal. If a sign providing notice of a pending land use application disappears prior to the final decision date of the subject land use application, the applicant must replace the sign within forty-eight (48) hours of discovery of the disappearance or of receipt of notice from the City of its disappearance, whichever occurs first. The applicant must remove the sign no later than fourteen (14) days after:
[…]

Finding:

The applicant has provided evidence of compliance with these requirements (Exhibit A). These criteria are met.

Section 32.160 – Completeness Review.

(1) Duration. Except as otherwise provided under ORS 227.178, the City Manager must review an application for completeness within 30 days of its receipt.
(2) Considerations. Determination of completeness will be based upon receipt of the information required under TDC 32.140 and will not be based on opinions as to quality or accuracy. Applications that do not respond to relevant code requirements or standards can be deemed incomplete. A determination that an application is complete indicates only that the application is ready for review on its merits, not that the City will make a favorable decision on the application.
(3) Complete Applications. If an application is determined to be complete, review of the application will commence.
(4) Incomplete Applications. If an application is determined to be incomplete, the City Manager must provide written notice to the applicant identifying the specific information that is missing and allowing the applicant the opportunity to submit the missing information.

An application which has been determined to be incomplete must be deemed complete for purposes of this section upon receipt of:
[…]
(5) Vesting. If an application was complete at the time it was first submitted, or if the applicant submits additional required information within 180 days of the date the application was first submitted, approval or denial of the application must be based upon the standards and criteria that were in effect at the time the application was first submitted.
(6) Void Applications. An application is void if the application has been on file with the City for more than 180 days and the applicant has not provided the missing information or otherwise responded, as provided in subsection (4) of this section.
[…]

Finding:
These criteria are met.

Section 32.230 – Type III Procedure (Quasi-Judicial Review – Public Hearing).
Type III decisions involve the use of discretion and judgment and are made by the Planning Commission or Architectural Review Board after a public hearing with an opportunity for appeal to the City Council. The decision body for each application type is specified in Table 32-1. A hearing under these procedures provides a forum to apply standards to a specific set of facts to determine whether the facts conform to the applicable criteria and the resulting determination will directly affect only a small number of identifiable persons.
(1) Submittal Requirements. Type III applications must include the submittal information required by TDC 32.140(1).
(2) Determination of Completeness. After receiving an application for filing, the City Manager will review the application will for completeness in accordance with TDC 32.160.
(3) Written Notice of Public Hearing – Type III. Once the application has been deemed complete, the City must mail by regular first class mail Notice of a Public Hearing to the following individuals and agencies no fewer than 20 days before the hearing.
[…]
(4) Conduct of the Hearing - Type III. The person chairing the hearing must follow the order of proceedings set forth below. These procedures are intended to provide all interested persons a reasonable opportunity to participate in the hearing process and to provide for a full and impartial hearing on the application before the body. Questions concerning the propriety or the conduct of a hearing will be addressed to the chair with a request for a ruling. Rulings from the chair must, to the extent possible, carry out the stated intention of these procedures. A ruling given by the chair on such question may be modified or reversed by a majority of those members of the decision body present and eligible to vote on the application before the body. The procedures to be followed by the chair in the conduct of the hearing are as follows:

[…]
(5) Notice of Adoption of a Type III Decision. Notice of Adoption must be provided to the property owner, applicant, and any person who provided testimony at the hearing or in writing. The Type III Notice of Adoption must contain all of the following information:
[…]
(6) Appeal of a Type III Decision. Appeal of an Architectural Review Board or Planning Commission Type III Decision to the City Council may be made in accordance with TDC 32.310.
(7) Effective Date of a Type III Decision.
(a) The written order is the final decision on the application.
(b) The mailing date is the date of the order certifying its approval by the decision body.
(c) A decision of the Architectural Review Board or Planning Commission is final unless:
(i) a written appeal is received at the City offices within 14 calendar days of the date notice of the final decision is mailed; or
(ii) The City Manager or a member of the City Council requests a review of the decision within 14 calendar days of the date notice of the final decision is mailed.

Finding:
Processing of the proposed applications will follow the above described requirements. These criteria can be met.

Chapter 33: Applications and Approval Criteria
Section 33.040 Conditional Use Permit
[…]
(2) Applicability. A request for a conditional use, modification of an existing conditional use permit, or a review of an existing conditional use permit may be initiated by a property owner or the owner's authorized agent.

Finding:
The request for a new CUP has been made by the owner's authorized agent. This criterion is met.

[…]
(4) Specific Submittal Requirements. In addition to the general submittal requirements in TDC 32.140 (Application Submittal), the applicant must submit the following additional information and materials:
(a) Project title;
(b) The architect, landscape architect and engineer;
(c) A site plan, drawn to scale, showing the dimensions and arrangement of the proposed development;

(d) A Service Provider Letter from Clean Water Services (CWS) indicating that a "Stormwater Connection Permit Authorization Letter" will likely be issued; and
[…]

Finding:
The proposed CUP application submittal includes the above required materials. These criteria are met.

(5) Approval Criteria. The applicant must provide evidence substantiating that all the requirements of this Code relative to the proposed use are satisfied and demonstrate that the proposed use also satisfies the following criteria:
(a) The use is listed as a conditional use in the underlying zone;

Finding:
The applicant requests approval of a Small Lot Subdivision to include single-family dwellings which is listed as a Conditional Use in Table 40-1 for the RML zoning district. This criterion is met.

(b) The characteristics of the site are suitable for the proposed use, considering size, shape, location, topography, existence of improvements and natural features;

Finding:
The site characteristics are suitable for the proposed use. The site is zoned for residential development, the proposed residential density does not exceed that allowed by the RML zoning district (10 dwelling units per acre). The site is located in the Basalt Creek planning area, and approval of the site would include construction and improvement of public utility facilities from their existing boundaries, helping to facilitate the orderly development of the Basalt Creek area. The site topography is relatively flat and contains no areas of steep slopes and therefore suitable for medium low density residential development. A treed area is located in the northerly portion of the site, adjacent to Norwood Road. As part of the CUP application, the applicant has proposed to preserve a portion of this area to serve as a buffer between existing development and the new development. This would not be required but for the CUP application requirements. A small wetland is located on the southwest corner of the site (Exhibit A), which is at the low point of the development within the CN zoned portion of the site, and will be filled, subject to Oregon DSL permitting and approval, to accommodate a stormwater detention facility. Overall, the Small Lot Subdivision standards in the Basalt Creek Area allow more flexibility for a diverse mix of housing types while maintaining the desired density for the area. This criterion is met.

(c) The proposed development is timely, considering the adequacy of transportation systems, public facilities, and services existing or planned for the area affected by the use;

Finding:

As noted above, the proposed development is located within the Basalt Creek planning area and is on the edge of the existing development within Tualatin in this location. Construction of the proposed development includes a significant extension of public facilities, construction of a sanitary sewer pump station, water system improvements, and Local roadway construction, including the addition of a signalized intersection at the intersection at Boones Ferry Road, and dedication of a portion of the future right-of-way for the extension of Basalt Creek Parkway. Without extension of the aforementioned public facilities, other developable properties within the Basalt Creek planning area in this immediate vicinity will be challenged, if not impossible. Approval of the proposed development is timely given that the Basalt Creek planning area has been in the Urban Growth Boundary since 2004, Concept Planning and Comprehensive Planning for this area has been complete since 2018. Services planned for the area are non-existent and will likely remain as such absent construction of this development. This criterion is met.

(d) The proposed use will not alter the character of the surrounding area in any manner that substantially limits, impairs, or precludes the use of surrounding properties for the primary uses listed in the underlying zone; and

Finding:

The proposed development is required to obtain CUP approval due to the inclusion of detached single-family dwellings. Single family dwellings are the most prevalent use within the surrounding area. The surrounding zoning is a mix of residential, institutional, and unincorporated Washington County lands which are identified with a "future urban" zoning designation. While the development as a whole may have more impact on the surrounding area than the existing vacant lot, it is important to make the distinction that the proposed conditional use, which is detached single-family homes, will not substantially limit, impair or preclude the use of surrounding properties for uses listed in the underlying zone, which are primarily residential in nature (with the exception of the adjacent Horizon campus, which is a use that is commonly located within or next to a residential area) as compared to a development of a similar number of townhomes or multi-family dwellings, which would be considered an outright permitted use at this location. This criterion is met.

(e) The proposal satisfies those objectives and policies of the Tualatin Community Plan that are applicable to the proposed use.

Finding:

Findings addressing the applicable Comprehensive Plan goals, policies, and objectives are found above. This criterion is met.

(6) Conditions of Approval. The Hearing Body may impose, in addition to the regulations and standards expressly specified in this chapter, other conditions found necessary to protect the best interests of the surrounding property or neighborhood or the City as a whole. In no event will this Chapter be used as a means to exclude multi-family housing from the City.

Finding:

The applicant has requested up to six model homes at a time to be permitted prior to full completion of public improvements for each phase. Necessary public infrastructure providing safe access and utilities would be constructed to serve the model homes. Condition of Approval Number C1 would allow for no more than six model homes within the proposed development at any time, subject to final approval by the City Engineer. Within Condition of Approval C1, this criterion is met.

TDC 33.110. - Tree Removal Permit/Review.

(1) Purpose. To regulate the removal of trees within the City limits other than trees within the public right-of-way which are subject to TDC Chapter 74.

(2) Applicability. No person may remove a tree on private property within the City limits, unless the City grants a tree removal permit, consistent with the provisions of this Section.

(3) Exemptions. The following actions are exempt from the requirements of a tree removal permit.

- **(a) General Exemption. Four or fewer trees may be removed within a single calendar year from a single parcel of property or contiguous parcels of property under the same ownership without a permit, if the tree is:**
  - **(i) Not located in the Natural Resource Protection Overlay District (NRPO);**
  - **(ii) Not located in the Wetlands Protection Area (WPA) of the Wetlands Protection District (WPD);**
  - **(iii) Not a Heritage Tree; and**
  - **(iv) Not previously required to be retained or planted under an approved Architectural Review decision.**
- **(b) Forest Harvesting Exemption. Forest Harvesting Uses, as provided by Agricultural Uses in TDC 39.300 are exempt.**
- **(c) Orchard Exemption. Orchards Uses, as provided by Agricultural Uses in TDC 39.300, are exempt.**
- **(d) Public Property Exemption. Tree removal on federal, state, county, or City property is exempt from the requirements of a tree removal permit. This exemption includes, but is not limited to road, improvements and maintenance to City parks, rights-of-way, water,**

sanitary sewer, and stormwater facilities. (Removal of trees from public right-of-way are governed by TDC Chapter 74.)

(3) Procedure Type. Tree Removal Permit applications are subject to Type II Review in accordance with TDC Chapter 32. Tree Removal Permit applications submitted with an Architectural Review, Subdivision, or Partition application will be processed in conjunction with the Architectural Review, Subdivision, or Partition decision.

(4) Specific Submittal Requirements. In addition to the general submittal requirements in TDC 32.140 (Application Submittal), an applicant must submit the following:

- **(a) Tree Preservation Plan. A tree preservation plan drawn to scale must include:**
  - **(i) The location, size, species, and tag identification number of all trees on-site eight inches or more in diameter;**
  - **(ii) All trees proposed for removal and all trees proposed to be preserved;**
  - **(iii) All existing and proposed structures;**
  - **(iv) All existing and proposed public and private improvements; and**
  - **(v) All existing public and private easements.**
- **(b) Tree Assessment Report. A tree assessment prepared by a certified arborist must include:**
  - **(i) An analysis as to whether trees proposed for preservation may be preserved in light of the development proposed, are healthy specimens, and do not pose an imminent hazard to persons or property if preserved;**
  - **(ii) An analysis as to whether any trees proposed for removal could reasonably be preserved in light of the development proposed and health of the tree;**
  - **(iii) a statement addressing the approval criteria set forth in TDC 33.110(5);**
  - **(iv) the name, contact information, and signature of the arborist preparing the report; and**
  - **(v) The tree assessment report must have been prepared and dated no more than one calendar year preceding the date the development or Tree Removal Permit application is deemed complete by the City.**
- **(c) Tree Tags. All trees on-site must be physically identified and numbered in the field with an arborist-approved tagging system that corresponds to the Tree Preservation Plan and Tree Assessment Report.**

(5) Approval Criteria.

- **(a) An applicant must satisfactorily demonstrate that at least one of the following criteria are met:**
  - **(i) The tree is diseased and:**
    - **(A) The disease threatens the structural integrity of the tree; or**
    - **(B) The disease permanently and severely diminishes the esthetic value of the tree; or**
    - **(C) The continued retention of the tree could result in other trees being infected with a disease that threatens either their structural integrity or esthetic value.**
  - **(ii) The tree represents a hazard which may include but not be limited to:**

(A) The tree is in danger of falling; or

(B) Substantial portions of the tree are in danger of falling.

(iii) It is necessary to remove the tree to construct proposed improvements based on Architectural Review approval, building permit, or approval of a Subdivision or Partition Review.

(b) If none of the conditions in TDC 33.110(5)(a) are met, the certified arborist must evaluate the condition of each tree.

(i) Evergreen Trees. An evergreen tree which meets any of the following criteria as determined by a certified arborist will not be required to be retained:

(A) Trunk Condition—extensive decay and hollow; or

(B) Crown Development—unbalanced and lacking a full crown;

(ii) Deciduous Trees. A deciduous tree which meets any of the following criteria as determined by a certified arborist will not be required to be retained:

(A) Trunk Condition—extensive decay and hollow;

(B) Crown Development—unbalanced and lacking a full crown; or

(C) Structure—Two or more dead limbs.

[…]

(7) Conditions of Approval. Any tree required to be retained must be protected in accordance with the TDC 73B and 73C.

Finding:

The Preliminary Tree Assessment Report and Tree Inventory indicate tree removal is necessary to construct project improvements, infrastructure, and to accommodate future dwellings on the planned lots. Tree Preservation and Removal Plans included with the Preliminary Tree Assessment Report and Tree Inventory show Tracts D and E adjacent to SW Norwood Road with an area of preserved trees. The elimination of a planter strip between the curb and multi-use path along the site's Norwood Road frontage, typically required as a standard cross-section, allowed further preservation of trees. Condition of Approval Number 1 and 2 will require the applicant to submit final plans that show removal of trees as shown in the Preliminary Tree Assessment Report and Tree Inventory along with protection of trees as shown within Tracts D and E consistent with the requirements of TDC 73B and 73C. With Condition of Approval Number 1 and 2, these criteria are met.

CHAPTER 36 – SUBDIVIDING, PARTITIONS, AND PROPERTY LINE ADJUSTMENTS

(1) Applications subject to this Chapter must follow the procedures specified in TDC Chapter 32; however, in case of conflict the procedures specified in TDC Chapter 36 prevail.

(2) Additional Submittal Requirements. In addition to the application materials required by TDC 32.140 (Application Submittal), the following application materials are also required to subdivide, partition, or replat land:

(a) Subdivision or partition plan map;

(b) Proposed plat name, approved by the County Surveyor;
(c) The names, addresses, and contact information of the design engineer and surveyor;
(d) The date the plan was prepared;
(e) North arrow;
(f) Scale of drawing;
(g) Location of the subdivision or partition by 1-4 Section, Township and Range;
(h) Preliminary utility plans for existing and proposed water, sanitary sewer and storm drainage, including the size and grade;
(i) Existing and proposed streets (public and private), including location, centerline, right-of-way and pavement width, approximate radius of curves and approximate grades of proposed streets on the subject property and within three hundred feet of the site;
(j) An outline plan demonstrating that the adjacent property can be divided in the future in a manner that is consistent with the subdivision plan, and illustrating the connections to transit routes, pedestrian and bike facilities, and accessways to adjacent properties;
(k) Easements, including location, width and purpose of all recorded and proposed easements in or abutting the site;
(l) Flood areas, including the location of any flood plain, drainage hazard areas and other areas subject to flooding or ponding;
(m) Natural resources, including the location of natural features, such as rock outcroppings, wetlands, water courses, creeks, wooded areas and trees having a trunk diameter of eight inches or greater, as measured at a point four feet above ground level, proposed to be removed and to be retained on site;
(n) Approximate lot dimensions, including all existing property lines and their lengths and the approximate location and dimensions of all proposed lots;
(o) Approximate area of each lot;
(p) Proposed lot numbers;
(q) Existing structures, including the location and present use of all structures, wells and septic tanks on the site and an indication of which structures, wells and septic tanks are to remain after platting; indicate all City-designated historic landmarks;
(r) All lots intended to be dedicated or reserved for public use;
(s) A vicinity map showing a minimum one-mile radius;
(t) Contour lines with intervals at a minimum of two feet for slopes up to five percent and five feet for slopes over five percent;
(u) For subdivisions and phased subdivisions, a completed trip generation estimate on forms provided by the City and a Traffic Impact Analysis;
(v) If a variance or minor variance is requested to the dimensional standards of the lots, or the minimum lot size, adequate information to show compliance with the approval criteria in TDC 33.120(5) for a minor variance or TDC 33.120(6) for a variance;
(w) A "Service Provider Letter" from Clean Water Services;

(x) If a railroad-highway grade crossing provides or will provide the only access to the subject property, the applicant must indicate that fact in the application, and the City must notify the ODOT Rail Division and the railroad company that the application has been received;

(y) A completed City fact sheet;

(z) A title report for the property(ies) subject to the application;

(aa) Other supplementary material as may be required, such as deed restrictions, a statement of ownership, use, covenants, conditions, limitations, and responsibility for maintenance; and

(bb) Other information required by the City Manager.

[…]

Finding:

The proposed Subdivision application meets the above submittal requirements. These criteria are met.

TDC 36.120. - Tentative Subdivision Plan.

(1) Applicability. Tentative Subdivision Plan approval is required before land is divided into four or more lots within a calendar year. For Phased Subdivisions, see TDC 36.130 (Phased Tentative Subdivision Plan). For Manufactured Dwelling Park Subdivisions, see TDC 36.140 (Manufactured Dwelling Park Tentative Subdivision Plan).

(2) Procedure Type. A Tentative Subdivision Plan is processed as a Type II procedure under 32.220.

(3) Submittal Requirements.

(a) Prior to submitting an application for a Tentative Subdivision Plan, the applicant must comply with the pre-application conference requirements in TDC 32.110 (Pre-Application Conference) and Neighborhood/Developer Meeting requirements in TDC 32.120 (Neighborhood/Developer Meetings).

(b) In addition to the submittal requirements for a Type II application under TDC 32.140 (Application Submittal), an application for subdivision tentative plan must include the information required in TDC 36.040(2) (Additional Submittal Requirements).

Finding:

The applicant has proposed a 400-lot subdivision and therefore the requirements of TDC 36.120 are applicable. As discussed above, the applicant has requested the application be processed pursuant to the Type III procedures and decided by the Planning Commission. As discussed above, the applicant has satisfied the pre-application conference and neighborhood/developer meeting requirements and the additional submittal criteria of TDC 36.040(2). These criteria are met.

(4) Approval Criteria. A Tentative Subdivision Plan must be approved if all of the following criteria are met:

- **(a) The Tentative Subdivision Plan complies with the standards of this Chapter and with all applicable provisions of the TDC, including, but not limited to, the following:**
  - **(i) Lot standards, including, but not limited to, standards for lot area, lot width and depth, lot frontage and designation of front and rear lot lines.**
  - **(ii) City infrastructure standards; and**
  - **(iii) Any special development standards, including, but not limited to, floodplain development, special setbacks, geological or geotechnical analysis, and vision clearance.**
- **(b) The Tentative Subdivision Plan does not impede the future use or development of the property or adjacent land.**
- **(c) Development within the Tentative Subdivision Plan can be adequately served by City infrastructure.**
- **(d) The street system in and adjacent to the Tentative Subdivision Plan conforms to the Tualatin Transportation System Plan.**
- **(e) The street system in and adjacent to the Tentative Subdivision Plan is designed so as to provide for the safe, orderly, and efficient circulation of traffic into, through, and out of the subdivision.**
- **(f) The Tentative Subdivision Plan provides safe and convenient bicycle and pedestrian access from within the subdivision to adjacent residential areas and transit stops, existing or planned schools, parks, shopping areas, transit stops, employment centers, and other neighborhood amenities.**
- **(g) The Tentative Subdivision Plan mitigates impacts to the transportation system consistent with the approved Traffic Impact Analysis, where applicable.**
- **(h) The Tentative Subdivision Plan takes into account the topography and vegetation of the site so the need for variances is minimized to the greatest extent practicable.**
- **(i) The Tentative Subdivision Plan takes into account the topography and vegetation of the site, such that the least disruption of the site, topography, and vegetation will result from the reasonable development of the lots.**

Finding:

As identified in the Plan Set (Exhibit C) and the application materials (Exhibits A and B) as well as responses within the staff report and by agency comments (Exhibits J, N, and O), the proposed tentative subdivision plan complies with the standards of Chapter 36 and other applicable chapters of the TDC and TMC as well as the above listed requirements, subject to conditions of approval. As conditioned, these criterion are met.

TDC 36.130. - Phased Tentative Subdivision Plan.

(1) Applicability. Phased Tentative Subdivision Plan approval is required before land is divided as a phased subdivision. When the subdivision of land is phased, one tentative plan is approved for the entire phased subdivision, and each individual phase receives separate final plat approval.

(2) Procedure Type. A Phased Tentative Subdivision Plan is processed as a Type II procedure under TDC 32.220 (Type II Procedure).

(3) Submittal Requirements.

- **(a) Prior to submitting an application for a Phased Tentative Subdivision Plan, the applicant must comply with the pre-application conference requirements in TDC 32.110 (Pre-Application Conference) and Neighborhood/Developer Meeting requirements in TDC 32.120 (Neighborhood/Developer Meetings).**
- **(b) In addition to the submittal requirements for a Type II application under TDC 32.140 (Application Submittal), an application for a Phased Tentative Subdivision Plan must include the information required in TDC 36.040(2) (Additional Submittal Requirements).**
- **(c) An application for a Phased Tentative Subdivision Plan must also include:**
  - **(i) A phasing plan that indicates the tentative boundaries of each phase;**
  - **(ii) The sequencing of the phases;**
  - **(iii) The tentative configuration of lots in each phase; and**
  - **(iv) A plan for the construction of all required city infrastructure in each phase.**

Finding:

The applicant has proposed a phased subdivision and therefore the requirements of TDC 36.130 are applicable. As discussed above, the applicant has requested the application be processed pursuant to the Type III procedures and decided by the Planning Commission. As discussed above, the applicant has satisfied the pre-application conference and neighborhood/developer meeting requirements and the additional submittal criteria of TDC 36.040(2). The applicant has also included a tentative phasing plan (Exhibit C). These criteria are met.

(4) Approval Criteria. A Phased Tentative Subdivision Plan must be approved if all of the following criteria are met:

- **(a) The Phased Tentative Subdivision Plan meets all of the criteria for Tentative Subdivision Plan approval in TDC 36.110 (Tentative Subdivision);**
- **(b) Connectivity for streets and City utilities between each phase ensures the orderly and efficient construction of required public improvements among all phases;**
- **(c) Each phase is substantially and functionally self-contained and self-sustaining with regard to required public improvements; and**
- **(d) Each phase is designed in such a manner that all phases support the infrastructure requirements for the phased subdivision as a whole.**

Finding:

The proposed phased subdivision plan has been reviewed for compliance with the above requirements and has been deemed to be satisfactory by the City Engineering, subject to appropriate conditions of approval. As conditioned, these criteria are met.

[…]

TDC 36.160. Final Plat.

(1) Applicability. Final plat approval is required before a final plat of a partition, subdivision, phased subdivision, and manufactured dwelling park subdivision is recorded.

(2) Procedure. Final plats are exempt from the procedures TDC 32.220 (Type II Procedure), and instead follow the procedures set forth in this section. Final plats must be reviewed by the City prior to recording with county.

(3) Submittal Requirements. Applications for final plat must be submitted prior to expiration of tentative plan approval.

(4) Approval Criteria. A final plat must be approved if all of the following criteria are met:

- **(a) The final plat is in substantial conformance with the approved tentative plan or tentative replat plan.**
  […]
- **(c) If the approval of a final plat for a specific phase requires the change of a boundary of a subsequent phase, or a change to the conditions of approval, the tentative plan must be modified first to reflect the changes.**
- **(d) The final plat complies with all applicable provisions of ORS Chapter 92.**
- **(e) Conditions of approval imposed on the tentative plan or tentative replat have been met;**
- **(f) The final plat dedicates, free and clear of all liens and encumbrances and without any reservation or restriction other than reversionary rights upon vacation, all City infrastructure, if such dedication is required by the Tualatin Development Code or as a condition of approval;**
- **(g) The City Manager has certified that:**
  - **(i) All required public improvements and private improvements are completed and approved; or**
  - **(ii) The owner of the property subject to the final plat has executed and filed with the City an Improvement Agreement under TDC 36.320 (Improvement Agreement for Public Improvements), requiring all City infrastructure and private improvements to be completed within 24 months of the final plat approval.**

(5) Approval or Rejection of Final Plat.

- **(a) If the City Manager finds that the final plat does not meet the approval criteria set forth in subsection (3) of this section, the City Manager must notify the applicant of the deficiencies and afford the applicant opportunity to comply. Rejection of a final plat does not affect tentative plan or tentative replat approval.**

(b) If the City Manager finds that the final plat meets the approval criteria set forth in subsection (3) of this section, the City Manager must endorse approval on the final plat, and the applicant may process and record the final plat.

(6) Recording of Final Plat. The approved final plat must be recorded within ten years of the effective date of the tentative plan or tentative replat approval. No building permits for development of lots or parcels will be issued until the final plat is recorded.

(7) Operation and Maintenance of Facilities and Common Property. Where facilities and common property, including, but not limited to, private streets, parking areas, privately owned pedestrian walkways and bikeways, and landscape strips, are included within the development, the recorded covenants, conditions, and restrictions for the development must include a provision that such facilities and common property be perpetually operated and maintained by a property owners' association. Each property owner must be a member of the property owners' association. The association must have the power to levy and assess against privately owned property in the development all necessary costs for operation and maintenance of such facilities and common property. The documents creating such association must be approved by the City Manager.

TDC 36.310. - Approval of Streets and Rights of Way.

(1) The plat of a partition, subdivision, phased subdivision, manufactured dwelling park subdivision, or replat must provide for the dedication of all public rights-of-way, reserve strips, easements, tracts and accessways, together with public improvements therein approved and accepted for public use.

(a) The applicant must comply with the requirements of TDC Chapter 74, Public Improvement Requirements.

(b) The applicant must comply with the design and construction standards set forth in the Public Works Construction Code.

(c) The applicant must provide evidence to the City that property intended to be dedicated to the public is free of all liens, encumbrances, claims and encroachments.

(2) The plat of a partition, subdivision, phased subdivision, manufactured dwelling park subdivision, or replat must indicate the ownership and location of private easements and tracts, and the ownership and location of private improvements within public rights-of-way and easements.

(3) Approval of the final plat of a partition, subdivision, phased subdivision, manufactured dwelling park subdivision, or replat by the City constitutes acceptance of all public rights-of-way, reserve strips, easements, tracts and accessways shown thereon, as well as public facilities located therein.

Finding:

Condition of Approval Number 3 will require the final plat to meet the above listed criteria. With Condition of Approval Number 3, these criteria are met.

[…]

TDC 36.320. - Improvement Agreement for Public Improvements.

(1) An applicant may submit the subdivision plat for City acceptance prior to installing all required public improvements if the applicant submits a signed Improvement Agreement and written assurances, to City Manager.

(2) The Improvement Agreement must be in a form approved by the City and contain the following provisions:

- **(a) A promise by the owner to complete the required public improvements within 24 months of final plat approval.**
- **(b) Monetary assurance for the full value of all required public improvements in one of the following forms:**
  - **(i) A Corporate Surety Bond issued by a surety company authorized to transact business in the State of Oregon; or**
  - **(ii) A cash deposit; or**
  - **(iii) Cash in escrow.**
- **(c) A statement that if the owner fails to perform all of the conditions of the Improvement Agreement that the City may collect on the assurance and pursue any and all remedies available to it at law and in equity to enforce the Improvement Agreement.**

(3) The value of the monetary assurance must be based upon of the costs of the City completing the public improvements and include, but are not limited to:

- **(a) Related engineering;**
- **(b) Right-of-way acquisition;**
- **(c) Easement acquisition and public contracting costs;**
- **(d) Labor and materials; and**
- **(e) Incidental expenses.**

(4) In the event the applicant fails to perform all provisions of the Improvement Agreement, the City is authorized, but not required, to complete unfinished or improperly constructed portions of the required public improvements and to use the assurance for reimbursement to cover the City's costs, including bringing any necessary action to collect such funds.

- **(a) If the amount of the assurance exceeds the actual cost and expense incurred by the City to satisfy the provisions of the Compliance Agreement upon the applicant's failure to do so, the City will release the balance.**
- **(b) If the amount of the assurance is less than the actual costs incurred by the City, the owner is liable to the City for such additional costs. A City lien must be placed on the subdivision still owned by the owner in an amount which represents the difference between the City costs and the amount received by the City pursuant to the applicant's assurance.**

(5) If the applicant fails to perform under the provisions of the Improvement Agreement the City may, as an additional but not exclusive remedy, refuse to issue building permits for properties subject to the Improvement Agreement.

(6) The remedies provided by this section for violation of an Improvement Agreement are in addition to any other remedies available to the City at law and in equity.

Finding:

Condition of Approval Number 4 will require that a public improvement agreement, if used, to meet the above listed requirements. With Condition of Approval Number 4, these criteria are met.

TDC 36.330. - Issuance of Building Permits.

(1) Except as provided in subsection (2) of this section, the City must not issue a building permit or permits to connect to City utility services for lots within a subdivision or partition plat until the City Manager has determined that the corresponding public improvements are substantially complete to assure that the health and safety of the citizens will not be endangered from inadequate public facilities.

(2) Subject to submittal and approval of, and compliance with, the subdivision plan, as well as sufficient security to assure completion of the public portions of the subdivision, the applicant or individual lot owners within the subdivision may receive a building permit or utility service for not more than 50 percent of the platted lots within the subdivision prior to:

- **(a)The completion of all required public improvements in accordance with the Public Works Construction Code; and**
- **(b)The acceptance of the public improvements by resolution of the City Council.**

(3) The City must not issue building permits or utility service approval for any lot which together with previously approved lots would exceed 50 percent of the platted lots within the subdivision until:

- **(a)All required public improvements have been completed in accordance with the Public Works Construction Code; and**
- **(b)The public improvements have been accepted by resolution of the City Council.**

(4) City approval for use of a public improvement prior to the final approval and acceptance by the City of the subdivision plat does not constitute a release or waiver of any security which has been filed to assure compliance with the subdivision plan approval or any related agreements.

(5) For a subdivision or partition in commercial, institutional, or manufacturing zones (planning districts) or multi-family residential developments which require Architectural Review approval, the City Manager may authorize building permits to be issued prior to the public improvements being substantially complete provided the following conditions are satisfied:

- **(a)A Public Works Permit for the public improvements has been issued;**
- **(b)An Architectural Review for the development has been approved;**
- **(c)The subdivision or partition plat is recorded;**

(d)All easements and dedications required of any development approval have been recorded; and

(e)Building permits are conditioned to deny occupancy until the public improvements in the subdivision are complete and are accepted by resolution of the City Council.

Finding:

Condition of Approval Number 5 will limit building permit issuance subject to the above described requirements. As noted above, Condition of Approval Number C1 will allow for the construction of model homes that cannot be occupied or sold until these criteria are met for the phase in which they are located. With Condition of Approval Number C1 and 5, these criteria are met.

TDC 36.340. - Existing Structures and Appurtenances.

(1) Any existing structures proposed to be demolished must be removed prior to the City approval of the subdivision or partition plat. Any structures determined to be a historic City landmark must be reviewed in accordance with TDC Chapter 68.

(2)Any existing wells must be abandoned in the manner prescribed by State and County regulations prior to the City approval of the subdivision or partition plat.

(3)Any existing underground fuel or oil tanks, septic tanks and similar underground storage tanks must be removed or filled as required by the Department of Environmental Quality prior to the City's approval of the subdivision or partition plat.

Finding:

The Existing Conditions Overview show structures including two wells on lot 501 and septic tanks on lots 600 and 800. These existing structures are not shown on the final plans. Condition of Approval Number 6 will require the wells must be abandoned and septic tanks removed or filled prior to final plat approval. With Condition of Approval Number 6, these criteria are met.

TDC 36.400. - Lot Dimensions.

(1) Double Frontage and Reverse Frontage.

(a) Double frontage and reversed frontage lots must be avoided except where essential to provide separation of residential development from railroad tracks or crossings, traffic arterials or collectors, adjacent nonresidential uses, or to overcome specific disadvantages of topography and orientation.

(b) Residences on double frontage lots must be oriented towards the lower classification street adjacent to the lot:

(i) Local street instead of collector or arterial; and

(ii) Collector street instead of arterial.

(c) If two local streets are adjacent to a series of adjacent double frontage lots, then residences on all such lots must be oriented towards the same local street.

(2) Large Lots. When subdividing, partitioning or adjusting land into large lots which at some future time are possible to be resubdivided, repartitioned, or readjusted to a size which more closely conforms to the other lots in the subdivision or area, the applicant must submit a future streets plan. The future streets plan must indicate that proposed large lots be of such size and shape and contain such building site restrictions as will provide for the extension and opening of streets at such intervals and the subsequent division of any such large lot into smaller size lots which meet the requirements of the TDC.

(3) Side Lot Lines. The side lines of lots, as far as practicable, must run at right angles to the street upon which the lots face.

(4) Lot Size and Shape. The lot size, width, shape and orientation must be appropriate for the location of the lot and comply with the zone (planning district) standards for the type of development and use contemplated.

(5) Frontage on Public Streets. All lots created after September 1, 1979 must abut a public street, except for the following:

- **(a) Secondary condominium lots, which must conform to TDC 73C and TDC 75;**
- **(b) Lots and tracts created to preserve wetlands, greenways, Natural Areas and Stormwater Quality Control Facilities identified by TDC Chapters 71, 72, and the Surface Water Management Ordinance, TMC Chapter 3-5 respectively, or for the purpose of preserving park lands in accordance with the Parks and Recreation Master Plan;**
- **(c) Residential lots where frontage along a public street is impractical due to physical site restraints. Access to lots must occur via a shared driveway within a tract. The tract must have no adverse impacts to surrounding properties or roads and may only be approved if it meets the following criteria:**
  - **(i) Does not exceed 250 feet in length;**
  - **(ii) If the tract exceeds 150 feet in length, it has a turnaround facility as approved by the Fire Marshal for fire and life safety;**
  - **(iii) The tract does not serve more than six lots;**
  - **(iv) A public street is not needed to provide access to other adjacent properties as required by TDC Chapter 74;**
  - **(v) A recorded document providing for the ownership, use rights, and allocation for liability for construction and maintenance has been submitted to the City Manager prior to issuance of a building permit; and**

Finding:

All planned lots abut public streets and do not include double frontage or reversed frontage lots. Planned open space Tracts A, D, and E and future Clean Water Services' Norwood sanitary sewer pump station Tract F separate lots from SW Norwood Road on the north. Open space Tract J separates the future Basalt Creek Parkway extension on the south. A large buffer of trees separates the eastern lots from the Interstate 5 improvements. Neighborhood Commercial lots and a public stormwater facility in Tract K provide separation from SW Boones Ferry Road. To *the extent practicable, side lot lines have been oriented at right angles to the front of the planned lots. The size and dimensions of the planned lots are appropriate for the planned residential and commercial uses and comply with the standards of the applicable zones. Condition of Approval Number 3 will require compliance with the applicable lot dimension standards for the RML zone, which will be reviewed for compliance* prior to final plat approval. With Condition of Approval Number 3, these *criteria are met.*

TDC 36.410. - Small Lot Subdivisions for RL and RML Zones.

(1) Conditional Use Permit Required.

(a) A conditional use permit is required before lots smaller than 6,500 square feet are permitted in RL and RML zones. An applicant must comply with the provisions of TDC 33.040 (Condition Use Permit).

(b) In addition to the submittal requirements for a Conditional Use Permit in TDC 33.040, a Tree Survey is required. The purpose of the tree survey is to show that, by utilizing the small lot subdivision provisions, a greater number of trees can be preserved than would be possible without use of the small lot subdivision provisions.

(2) Small Lot Standards. In addition to the general subdivision requirement in TDC 36.120, a subdivision that includes the small lots must also meet the following standards:

(b) RML Zone. In the RML zone, small lot subdivisions must comply with the following:

(i) Small lots must be no less than 4,500 square feet;

(ii) Maximum building coverage must not exceed 45 percent;

(iii) Minimum lot width must be at least 30 feet. Lots that have frontage on a public street must have a minimum lot width of 50 feet or 30 feet for lots on a cul-de-sac bulb. For flag lots, the minimum lot width at the street must be sufficient to comply with at least the minimum access requirements contained in TDC 73C;

(iv) Front yard setback must be a minimum of 20 feet to the garage and 12 feet to the house;

(v) Side yard setback must be a minimum of five feet;

(vi) On corner lots, the setback for yards adjacent to streets must be a minimum of 20 feet to the garage and 12 feet to the house in the yard where a driveway provides access to a street other than an alley and must be a minimum of 12 feet in the yard where no driveway access exists; and

(vii) Rear yard setback must be a minimum of 15 feet.

Finding:

The applicant has proposed a CUP for the proposed Small Lot Subdivision, which will be located within the RML zone. As noted in TDC 41.330, the Small Lot Subdivision standards of that section apply to the subject property rather than those in TDC 36.410(2) due to its location within the Basalt Creek area. These criteria are met.

[…]

CHAPTER 41 – MEDIUM LOW DENSITY RESIDENTIAL ZONE (RML)

[…]

TDC 41.200. - Use Categories.

(1) Use Categories. Table 41-1 lists use categories Permitted Outright (P) or Conditionally Permitted (C) in the RML zone. Use categories may also be designated as Limited (L) and subject to the limitations listed in Table 41-1 and restrictions identified in TDC 41.210. Limitations may restrict the specific type of use, location, size, or other characteristics of the use category. Use categories which are not listed are prohibited within the zone, except for uses which are found by the City Manager or appointee to be of a similar character and to meet the purpose of this zone, as provided in TDC 31.070.

(2) Overlay Zones. Additional uses may be allowed in a particular overlay zone. See the overlay zone Chapters for additional uses

Excerpt of Table 41-1
Use Categories in the RML Zone

USE CATEGORY	STATUS	LIMITATIONS AND CODE REFERENCES
RESIDENTIAL USE CATEGORIES		
Household Living	P/C	Permitted housing types subject to TDC 41.220.
[…]		

[…]

TDC 41.220. - Housing Types.

Table 41-2 lists Housing Types permitted in the RML zone. Housing types may be Permitted Outright (P), Conditionally Permitted (C), or Not Permitted (N) in the RML zone.

Table 41-2
Housing Types in the RML Zone

HOUSING TYPE	STATUS	LIMITATIONS AND CODE REFERENCES
Single-Family Dwelling	C	• Limited to single-family dwellings in a small lot subdivision, with conditional use permit, subject to TDC 36.410. • Limited to single-family dwellings in a small lot subdivision, with conditional use permit, and if the development is located south of Norwood Road and east of Boones Ferry Road (Basalt Creek Area), subject to TDC 36.410(1) and TDC 41.330
[…]		

TDC 41.300. - Development Standards.

Development standards in the RML zone are listed in Table 41-3. Additional standards may apply to some uses and situations, see TDC 41.310 and TDC 41.330. The standards in Table 41-3 may be modified for greenway and natural area dedications as provided in TDC 36.420. The standards for lot size, lot width, building coverage, and setbacks that apply to single-family dwellings in small lot subdivisions are provided in TDC 36.410(2)(b).

Table 41-3
Development Standards in the RML Zone

STANDARD	REQUIREMENT	LIMITATIONS AND CODE REFERENCES
MAXIMUM DENSITY		
Household Living Uses	Maximum: 10 units per acre Minimum: 7 units per acre	
[…]		
MINIMUM LOT SIZE		
Townhouse (or Rowhouse)	1,400 square feet	
[…]		
MINIMUM AVERAGE LOT WIDTH		
Townhouse(or Rowhouse)	14 feet	
All Other Permitted Uses		
Flag Lots	—	Must be sufficient to comply with minimum access requirements of TDC 73C.
MINIMUM SETBACKS		
Front Setback		Minimum setback to a garage door must be 20 feet.
• 1 story structure	20 feet	
• 1.5 story structure	25 feet	
• 2 story structure	30 feet	
• 2.5 story structure	35 feet	
• Townhouse (or Rowhouse)	0-20 feet	As determined through Architectural Review process.
Side and Rear Setback		Where living spaces face a side yard, the minimum setback must be ten feet
• 1 story structure	5 feet	
• 1.5 story structure	7 feet	
• 2 story structure	10 feet	
• 2.5 story structure	12 feet	

Table 41-3 Development Standards in the RML Zone		
STANDARD	REQUIREMENT	LIMITATIONS AND CODE REFERENCES
Corner Lots	—	On corner lots, the setback is the same as the front yard setback on any side facing a street other than an alley.
Minimum Distance Between Buildings within One Development	10 feet	For Townhouses, determined through the Architectural Review process
Parking and Vehicle Circulation Areas	10 feet	For Townhouses, determined through the Architectural Review process
Conditional Uses	—	As determined through Architectural Review process. No minimum setback must be greater than 50 feet
Any Yard Area Adjacent to Basalt Creek Parkway	50 feet	
MAXIMUM STRUCTURE HEIGHT		
All Uses	35 feet	May be increased to a maximum of 50 feet with a conditional use permit, if all setbacks are not less than 1½ times the height of the building.
MAXIMUM LOT COVERAGE		
Townhouse (or Rowhouse)	90%	
All Other Permitted Uses	40%	
Conditional Uses	45%	

[…]

TDC 41.330. - Development Standards for Single-Family Dwellings in a Small Lot Subdivision for Certain Basalt Creek Area Properties.

This section applies only to small lot subdivisions, with a conditional use permit as provided in TDC 36.410(1), in RML zoned properties located south of Norwood Road and east of Boones Ferry Road (Basalt Creek Area). Development standards for Single-Family Dwellings in a small lot subdivision, with conditional use permit are listed in Table 41-4. Additional

conditions may be placed on the small lot subdivision through the conditional use process. The small lot subdivision standards in TDC 36.410(2) do not apply to small lot subdivisions subject to this section.

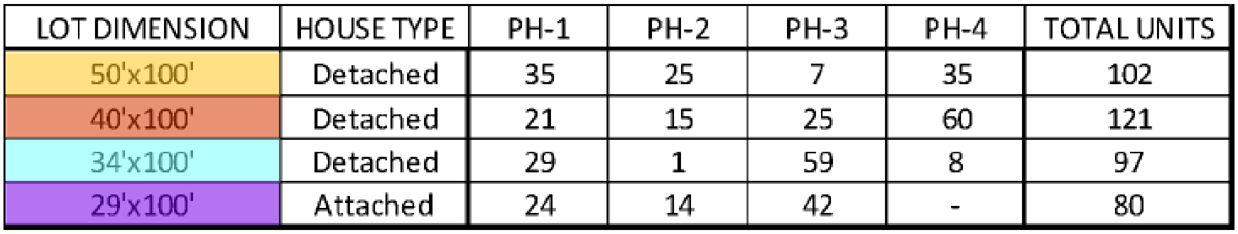
Table 41-4 Development Standards in the RML Zone subject to TDC 41.330		
STANDARD	**REQUIREMENT**	**LIMITATIONS AND CODE REFERENCES**
		MAXIMUM DENSITY
Single-Family Dwelling	**10 units per acre**	**• Limited subject to the requirement that a minimum of 20% of the dwelling units in the small lot subdivision must include attached housing types, as provided in TDC 41.300 and Table 41-3.** **• A phasing plan for the timing of construction will be approved through the small lot subdivision process, with conditional use permit, but provided no more than 70% of the approved Single-Family Dwellings may be issued Building Permits prior to the construction and issuance of Certificates of Occupancy for all approved attached housing types (i.e., non-single-family dwellings), or as otherwise determined through the conditional use process.**
		Minimum Open Space
	5% of gross site acreage	**• Proposed open space shall be for tree preservation or active and passive open space, as approved through the conditional use process for small lot subdivisions. Stormwater and drainage facilities are not counted toward percentage of open space requirement.** **• Compliance with this section satisfied TDC 36.410(1)(b).**
		MINIMUM AVERAGE LOT SIZE
Single Family Lot	**3,000 square feet**	
		MINIMUM AVERAGE LOT WIDTH
Single Family Detached Lot	**26 feet**	**Must be sufficient to comply with minimum access requirements of TDC 73C.**
Single Family Flag Lots		**Must be sufficient to comply with minimum access requirements of TDC 73C.**
		MINIMUM SETBACKS
Single Family Front Setback		
• building	**10 feet**	
• garage	**20 feet**	

Table 41-4 Development Standards in the RML Zone subject to TDC 41.330		
STANDARD	REQUIREMENT	LIMITATIONS AND CODE REFERENCES
Single Family Side Setback	5 feet	
Single Family Rear Setback	10 feet	
Single Family Street side setback	10 feet	
Any Yard Area Adjacent to Basalt Creek Parkway	50 feet	
MAXIMUM STRUCTURE HEIGHT		
Single Family Uses	35 feet	May be increased to a maximum of 50 feet with a conditional use permit, if all setbacks are not less than 1% times the height of the building.
MAXIMUM LOT COVERAGE		
Single Family Detached Lot	55%	

Finding:

The subject site is located in the Basalt Creek Area as defined above and this application is for a Small Lot Subdivision, subject to CUP and Subdivision approval. Townhomes/attached single-family dwellings are a Permitted use subject to the development standards in Table 41-3. Detached single-family dwellings are a Conditional use subject to the development standards in Table 41-4. Condition of Approval Number C2 will require future development to be compliant with these standards. Table 41-4 also requires that a minimum of 20% of units within a Small Lot Subdivision in the Basalt Creek area be developed as townhomes/attached single-family dwellings, subject to a phasing plan for the timing of construction will be approved through the small lot subdivision process, with conditional use permit, but provided no more than 70% of the approved Single-Family Dwellings may be issued Building Permits prior to the construction and issuance of Certificates of Occupancy for all approved attached housing types.

The applicant has proposed that rather than tying the issuance of building permits in Phase 4 to the Certificates of Occupancy for all the townhomes, the Applicant would prefer that a condition of approval be written that requires no more than 70 percent of the single-family *detached lots be platted prior to the platting of all the townhome lots. Staff notes that the purpose the phasing provision was prevent a scenario in which the townhome lots were left unbuilt in favor of the detached single-family lots. Accordingly, staff recommends Condition of Approval Number C2 that would require issuance of a Certificate of Occupancy for at least 50% of the attached homes in a given Phase prior to issuance of Building Permits for more than 70% of the detached single-family units in that Phase. With Conditions of Approval Number C2, these criteria are met.*



LOT DIMENSION	HOUSE TYPE	PH-1	PH-2	PH-3	PH-4	TOTAL UNITS
50'x100'	Detached	35	25	7	35	102
40'x100'	Detached	21	15	25	60	121
34'x100'	Detached	29	1	59	8	97
29'x100'	Attached	24	14	42	-	80

CHAPTER 51 – NEIGHBORHOOD COMMERCIAL ZONE (CN)

[…]

<u>TDC 51.200. - Use Categories.</u>

(1)Use Categories. Table 51-1 lists use categories Permitted Outright (P) or Conditionally Permitted (C) in the CN zone. Use categories may also be designated as Limited (L) and subject to the limitations listed in Table 51-1 and restrictions identified in TDC 51.210. Limitations may restrict the specific type of use, location, size, or other characteristics of the use category. Use categories which are not listed are prohibited within the zone, except for uses which are found by the City Manager or appointee to be of a similar character and to meet the purpose of this zone, as provided in TDC 31.070.

(2)Overlay Zones. Additional uses may be allowed in a particular overlay zone. See the overlay zone Chapters for additional uses.

Table 51-1
Use Categories in the CN Zone

USE CATEGORY	STATUS	LIMITATIONS AND CODE REFERENCES
RESIDENTIAL USE CATEGORIES		
Household Living	P (L)	Permitted uses limited to one (1) dwelling unit for each business located on the lot.

Table 51-1
Use Categories in the CN Zone

USE CATEGORY	STATUS	LIMITATIONS AND CODE REFERENCES
COMMERCIAL USE CATEGORIES		
Retail Sales and Services	P (L)	Permitted uses limited to: General merchandise or variety stores; • Food stores, subject to TDC 51.210(1); • Drug store and pharmacy; • Laundry and dry cleaning, subject to TDC 51.210(2); • Beauty and barber shops; Shoe repair; and • Child day care center, subject to TDC 34.100. All commercial uses subject to floor area limitation, see TDC 51.210(3).
INSTITUTIONAL USE CATEGORIES		
Community Services	P(L)	Permitted uses limited to a community center, community recreation facility, or community aquatic center, when open to the general public and operated by a non-profit community organization.
INFRASTRUCTURE AND UTILITIES USE CATEGORIES		
Basic Utilities	P/C (L)	Permitted uses limited to sewer and water pump stations, pressure reading stations, water quality and flow control facilities. Conditional uses limited to utility substations.
Greenways and Natural Areas	P	—
Transportation Facilities	P	—

Finding:

This application includes the creation of two lots and one tract within the CN Zone. Future commercial development is planned for Lots 251 and 252; however, no uses or improvements to these two lots are included in this application. The Preliminary Plans show a stormwater facility that serves the residential subdivision within Tract K. The stormwater facility is considered a "Basic Utility" as described in Table 51-1 above and is a permitted use. The criteria are met.

[…]

TDC 51.300. - Development Standards.

Development standards in the CN zone are listed in Table 51-2. Additional standards may apply to some uses and situations, see TDC 51.310.

Table 51-2
Development Standards in the CN Zone

STANDARD	REQUIREMENT	LIMITATIONS AND CODE REFERENCES
MINIMUM LOT SIZE		
All Uses	20,000 square feet	—
MINIMUM LOT WIDTH		
Minimum Average Lot Width	100 feet	When lot has frontage on public street, minimum lot width is 100 feet.
Minimum Lot Width at the Building Line	100 feet	—
Infrastructure and Utilities Uses	—	As determined through the Subdivision, Partition, or Lot Line Adjustment process
MINIMUM SETBACKS		
Front	20 feet	
Side and Rear	0— 15 feet	As determined through Architectural Review Process.
Corner Lots	0—10 feet along each frontage	Must be a sufficient distance to provide adequate sight distance for vehicular and pedestrian traffic at an intersection, as determined through the Architectural Review process.
Parking and Vehicle Circulation Areas	5 feet	Except as approved through Architectural Review process.
Fences	5 feet	From public right-of-way.
MAXIMUM LOT COVERAGE		
All Uses	75 percent	Includes both building and parking areas. All land not covered by buildings or parking must be landscaped.
MAXIMUM STRUCTURE HEIGHT		
All Uses	25 feet	In addition to meeting the maximum height limit, where a property line or alley separates CN land from land in a residential district, a building must not be greater than 20 feet in height at the setback line; and a building or structure must not extend above a plane beginning at 20 feet in height above that setback line and extending inward and upward at a slope of 45 degrees.

Finding:

The Preliminary Plat shows Lot 251 and Lot 252 exceed the minimum lot size and lot width requirements. Setbacks, lot coverage, and building height will be reviewed with future land use applications. The criteria are met.

[…]

CHAPTER 73A – DESIGN STANDARDS

RESIDENTIAL DESIGN STANDARDS

TDC 73A.100. - Single-Family Design Standards Applicability; Exceptions.

(1) *Applicability.* The single-family design standards apply to:

(a) New single-family dwelling; or

[…]

(2) *Exceptions.* The single-family design standards in subsection (1) do not apply to a side wall plane that abuts the side yard of an adjacent dwelling.

- **TDC 73A.110. - Clear and Objective (Type I) Single Family Design Standards.**
  Single-Family uses using the Clear and Objective (Type I) standards must comply with the following:
  […]

TDC 73A.140. - Discretionary (Type II) Single Family Design Standards.

Single Family uses using Type II discretionary standards, and not using the clear and objective standards, must demonstrate compliance the following discretionary standards:

[…]

Finding:

Future development of single-family attached and detached dwellings will be required to comply with the applicable requirements of Chapter 73A at the time of building permit approval. These criteria are met.

CHAPTER 73B - LANDSCAPING STANDARDS

TDC 73B.080. - Minimum Landscaping Standards for All Zones.

The following are minimum standards for landscaping for all zones.

(1) Required Landscape Areas	• Must be designed, constructed, installed, and maintained so that within three years the ground must be covered by living grass or other plant materials. • The foliage crown of trees cannot be used to meet this requirement. • A maximum of ten percent of the landscaped area may be covered with unvegetated areas of bark chips, rock or stone. • Must be installed in accordance with the provisions of the American National Standards Institute ANSI A300 (Part 1) (Latest Edition). • Must be controlled by pruning, trimming, or otherwise so that: • It will not interfere with designated pedestrian or vehicular access; and • It will not constitute a traffic hazard because of reduced visibility.
(2) Fences	• Landscape plans that include fences must integrate any fencing into the plan to guide wild animals toward animal crossings under, over, or around transportation corridors.
(3) Tree Preservation	• Trees and other plant materials to be retained must be identified on the landscape plan and grading plan. • During construction: ○ Must provide above and below ground protection for existing trees and plant materials identified to remain; ○ Trees and plant materials identified for preservation must be protected by chain link or other sturdy fencing placed around the tree at the drip line; ○ If it is necessary to fence within the drip line, such fencing must be specified by a qualified arborist; ○ Top soil storage and construction material storage must not be located within the drip line of trees designated to be preserved; ○ Where site conditions make necessary a grading, building, paving, trenching, boring, digging, or other similar encroachment upon a preserved tree's drip-line area, such grading, paving, trenching, boring, digging, or similar encroachment must only be permitted under the direction of a qualified arborist. Such direction must assure that the

	health needs of trees within the preserved area can be met; and ○ Tree root ends must not remain exposed. • Landscaping under preserved trees must be compatible with the retention and health of the preserved tree. • When it is necessary for a preserved tree to be removed in accordance with TDC 33.110 (Tree Removal Permit) the landscaped area surrounding the tree or trees must be maintained and replanted with trees that relate to the present landscape plan, or if there is no landscape plan, then trees that are complementary with existing, landscape materials. Native trees are encouraged • 100 percent of the area preserved under any tree or group of trees (Except for impervious surface areas) retained in the landscape plan must apply directly to the percentage of landscaping required for a development
(4) Grading	• After completion of site grading, top-soil is to be restored to exposed cut and fill areas to provide a suitable base for seeding and planting. • All planting areas must be graded to provide positive drainage. • Soil, water, plant materials, mulch, or other materials must not be allowed to wash across roadways or walkways. • Impervious surface drainage must be directed away from pedestrian walkways, dwelling units, buildings, outdoor private and shared areas and landscape areas except where the landscape area is a water quality facility.
(5) Irrigation	• Landscaped areas must be irrigated with an automatic underground or drip irrigation system • Exceptions: ○ Irrigation requirement does not apply to duplexes and townhouses.
(6) Re-vegetation in Un-landscaped Areas	• Vegetation must be replanted in all areas where vegetation has been removed or damaged in areas not affected by the landscaping requirements and that are not to be occupied by structures or other improvements.

	• Plant materials must be watered at intervals sufficient to ensure survival and growth for a minimum of two growing seasons. • The use of native plant materials is encouraged to reduce irrigation and maintenance demands. • Disturbed soils should be amended to an original or higher level of porosity to regain infiltration and stormwater storage capacity.

TDC 73B.090. - Minimum Standards Trees and Plants.

The following minimum standards apply to the types of landscaping required to be installed for all zones.

(1) Deciduous Shade Trees	• One and on-half inch caliper measured six inches above ground; • Balled and burlapped; bare root trees will be acceptable to plant during their dormant season; • Reach a mature height of 30 feet or more; • Cast moderate to dense shade in summer; • Live over 60 years; • Do well in urban environments, tolerant of pollution and heat, and resistant to drought; • Require little maintenance and mechanically strong; • Insect- and disease-resistant; • Require little pruning; and • Barren of fruit production.
(2) Deciduous Ornamental Trees	• One and on-half inch caliper measured six inches above ground; • balled and burlapped; bare root trees will be acceptable to plant during their dormant season; and • Healthy, disease-free, damage-free, well-branched stock, characteristic of the species
(3) Coniferous Trees	• Five feet in height above ground; • Balled and burlapped; bare root trees will be acceptable to plant during their dormant season; and • Healthy, disease-free, damage-free, well-branched stock, characteristic of the species.

(4) Evergreen and Deciduous Shrubs	• **One to five gallon size;** • **Healthy, disease-free, damage-free, well-branched stock, characteristic of the species; and** • **Side of shrub with best foliage must be oriented to public view.**
(5) Groundcovers	• **Fully rooted;** • **Well branched or leafed;** • **Healthy, disease-free, damage-free, well-branched stock, characteristic of the species; and** • **English ivy (Hedera helix) is prohibited.**
(6) Lawns	• **Consist of grasses, including sod, or seeds of acceptable mix within the local landscape industry;** • **100 percent coverage and weed free; and** • **Healthy, disease-free, damage-free, characteristic of the species.**

Finding:
The planned landscape areas shown on the Preliminary Plans meet the applicable landscaping standards above. Condition of Approval Number 1 will require the applicant to submit a Final Landscape plan consistent with the requirements of Chapter 73B With Condition of Approval Number 1, these criteria are met.
[…]

CHAPTER 73C - PARKING STANDARDS
[…]
TDC 73C.010. - Off-Street Parking and Loading Applicability and General Requirements.
(1) ***Applicability.*** **Off-street parking and loading is required to be provided by the owner and/or developer, in all zones, whenever the following occurs:**
(a) Establishment of a new structure or use;
(b) Change in use; or
(c) Change in use of an existing structure.
[…]

TDC 73C.100. - Off-Street Parking Minimum/Maximum Requirements.
(1) The following are the minimum and maximum requirements for off-street motor vehicle parking in the City, except these standards do not apply in the Core Area Parking District. The Core Area Parking District standards are in TDC 73C.110.

USE	**MINIMUM MOTOR VEHICLE PARKING**	**MAXIMUM MOTOR VEHICLE PARKING**	**BICYCLE PARKING**	**PERCENTAGE OF BICYCLE PARKING TO BE COVERED**
(a) Residential Uses				
(i) Detached single-family dwelling, residential home, residential facilities (located in low density (RL) zones) Townhouse and Duplexes	2.00 vehicle parking spaces per dwelling unit, residential home or residential facility (stalls or spaces within a residential garage not included, except as approved in Architectural Review).	None	None Required	N/A
[…]				

(2)

Finding:

The applicant has proposed to develop a combination of detached single-family dwellings and townhomes within the Autumn Sunrise development. Condition of Approval Number 7 will require that each unit provide a minimum of 2 vehicle parking spaces, not inclusive of a garage per TDC 73C.100. With Condition of Approval 7, these criteria are met.

CHAPTER 73G – MASONRY WALL STANDARDS

[…]

TDC 73G.010. - Purpose.

The purpose of masonry wall design standards is to implement the community design goals and policies of the Comprehensive Plan to require a masonry wall in the RL and RML zones for access-restricted lot lines and property lines abutting major collectors, minor collectors, major arterials, minor arterials, expressway right-of-way, and interstate highways.

TDC 73G.020. - Applicability

[…]

(2) Subdivisions and Partitions of Access-Restricted Lot Lines in the RL and RML Zones. A masonry wall is required to be installed for all subdivisions and partitions in the RL and RML

zones that have access-restricted lot lines abutting the following streets for a distance greater than 60 feet:

(a) Major collectors;
(b) Minor collectors;
(c) Major arterials;
(d) Minor arterials,
(e) Expressway right-of-way; or
(f) Interstate highway.

[…]

Finding:

The subject site includes access restricted lot lines to several roadways, with a functional classification of minor collector or higher (SW Norwood Road, SW Boones Ferry Road, SW Basalt Creek Parkway, and Interstate 5). Along SW Norwood Road and SW Basalt Creek Parkway, the lot lines of the lots do not abut the streets and therefore a masonry wall is not required. Along SW Boones Ferry Road, the lots that have frontage are zoned CN, not RML. However, the lots along the easterly edge of do have frontage along the Interstate 5 highway right-of-way. Given that the purpose of the masonry wall design standards are to implement community design goals, and masonry walls that are not visible from a public right-of-way, in this case, due to the large existing tree buffer between the highway and the subject property, that requiring a masonry wall would not further the purpose of the requirement and therefore staff recommends that the Planning Commission adopt its findings that these criteria are not applicable.

Chapter 74: Public Improvement Requirements

[…]

TDC 74.120 Public Improvements.

(1) Except as specially provided, all public improvements must be installed at the expense of the applicant. All public improvements installed by the applicant must be constructed and guaranteed as to workmanship and material as required by the Public Works Construction Code prior to acceptance by the City. Work must not be undertaken on any public improvement until after the construction plans have been approved by the City Manager and a Public Works Permit issued and the required fees paid.

Finding:

Condition of Approval 5 will require that all public improvements be installed by the applicant at their expense and will require prior approval of plans and a Public Works Permit. With Condition of Approval 5, this criterion is met.

TDC 74.130 Private Improvements.

All private improvements must be installed at the expense of the applicant. The property owner must retain maintenance responsibilities over all private improvements.

Finding:

Condition of Approval 5will require that all private improvements be installed prior to building permit issuance for the phase in which the improvement is located. Conditional of Approval Number 8 will require that the property owner, their successor or a Homeowners' Association retain maintenance responsibility over all private improvements. With Condition of Approval 5 and 8, this criterion is met.

TDC 74.140 Construction Timing.

(1) All the public improvements required under this chapter must be completed and accepted by the City prior to the issuance of a Certificate of Occupancy; or, for subdivision and partition applications, in accordance with the requirements of the Subdivision regulations.
(2) All private improvements required under this Chapter must be approved by the City prior to the issuance of a Certificate of Occupancy; or for subdivision and partition applications, in accordance with the requirements of the Subdivision regulations.

Finding:

This Subdivision application is planned in four phases. Public improvements are planned to follow this phasing plan as illustrated on the Preliminary Plans. Public and private improvements must be installed and maintained at the expense of the applicant. All public and private improvements proposed and modified by conditions of approval must be completed prior to building permit issuance for homes in the phase in which these improvements are located. These criteria are met with conditions of approval.

[…]

TDC 74.210 Minimum Street Right-of-Way Widths.

The width of streets in feet shall not be less than the width required to accommodate a street improvement needed to mitigate the impact of a proposed development. In cases where a street is required to be improved according to the standards of the TDC, the width of the right-of-way shall not be less than the minimums indicated in TDC Chapter 74, Public Improvement Requirements, Figures 74-2A through 74-2G.
(1)For subdivision and partition applications, wherever existing or future streets adjacent to property proposed for development are of inadequate right-of-way width the additional right-of-way necessary to comply with TDC Chapter 74, Public Improvement Requirements, Figures 74-2A through 74-2G must be shown on the final subdivision or partition plat prior to approval of the plat by the City. This right-of-way dedication must be for the full width of the

property abutting the roadway and, if required by the City Manager, additional dedications must be provided for slope and utility easements if deemed necessary.
(3)For development applications that will impact existing streets not adjacent to the applicant's property, and to construct necessary street improvements to mitigate those impacts would require additional right-of-way, the applicant must be responsible for obtaining the necessary right-of-way from the property owner. A right-of-way dedication deed form must be obtained from the City Manager and upon completion returned to the City Manager for acceptance by the City. On subdivision and partition plats the right-of-way dedication must be accepted by the City prior to acceptance of the final plat by the City. On other development applications the right-of-way dedication must be accepted by the City prior to issuance of building permits. The City may elect to exercise eminent domain and condemn necessary off-site right-of-way at the applicant's request and expense. The City Council must determine when condemnation proceedings are to be used.
(4)If the City Manager deems that it is impractical to acquire the additional right-of-way as required in subsections (1)—(3) of this section from both sides of the center-line in equal amounts, the City Manager may require that the right-of-way be dedicated in a manner that would result in unequal dedication from each side of the road. This requirement will also apply to slope and utility easements as discussed in TDC 74.320 and 74.330. The City Manager's recommendation must be presented to the City Council in the preliminary plat approval for subdivisions and partitions, and in the recommended decision on all other development applications, prior to finalization of the right-of-way dedication requirements.
(5)Whenever a proposed development is bisected by an existing or future road or street that is of inadequate right-of-way width according to TDC Chapter 74, Public Improvement Requirements, Figures 74-2A through 74-2G, additional right-of-way must be dedicated from both sides or from one side only as determined by the City Manager to bring the road right-of-way in compliance with this section.(6)When a proposed development is adjacent to or bisected by a street proposed in the Transportation System Plan and no street right-of-way exists at the time the development is proposed, the entire right-of-way as shown in TDC Chapter 74, Public Improvement Requirements, Figures 74-2A through 74-2G must be dedicated by the applicant. The dedication of right-of-way required in this subsection must be along the route of the road as determined by the City.

Finding:
The City Engineer has reviewed the proposed Subdivision against the above requirements and has deemed it to be in compliance. These criteria are met.

TDC 74.310. - Greenway, Natural Area, Bike, and Pedestrian Path Dedications and Easements.

(1)Areas dedicated to the City for Greenway or Natural Area purposes or easements or dedications for bike and pedestrian facilities during the development application process

must be surveyed, staked and marked with a City approved boundary marker prior to acceptance by the City.

(2)For subdivision and partition applications, the Greenway, Natural Area, bike, and pedestrian path dedication and easement areas must be shown to be dedicated to the City on the final subdivision or partition plat prior to approval of the plat by the City; …

TDC 74.320. - Slope Easements.

(1)The applicant must obtain and convey to the City any slope easements determined by the City Manager to be necessary adjacent to the proposed development site to support the street improvements in the public right-of-way or accessway or utility improvements required to be constructed by the applicant.

(2)For subdivision and partition applications, the slope easement dedication area must be shown to be dedicated to the City on the final subdivision or partition plat prior to approval of the plat by the City; …

TDC 74.330. - Utility Easements.

(1) Utility easements for water, sanitary sewer and storm drainage facilities, telephone, television cable, gas, electric lines and other public utilities must be granted to the City.

(2)For subdivision and partition applications, the on-site public utility easement dedication area must be shown to be dedicated to the City on the final subdivision or partition plat prior to approval of the plat by the City; and

(3)For subdivision and partition applications which require off-site public utility easements to serve the proposed development, a utility easement must be granted to the City prior to approval of the final plat by the City. The City may elect to exercise eminent domain and condemn necessary off-site public utility easements at the applicant's request and expense. The City Council must determine when condemnation proceedings are to be used.

[…]

(5) The width of the public utility easement must meet the requirements of the Public Works Construction Code. All subdivisions and partitions must have a 6-foot public utility easement adjacent to the street and a 5-foot public utility easement adjacent to all side and rear lot lines. Other easements may be required as determined by the City Manager.

[…]

Finding:

Condition of Approval Number 3 will require all easements and dedications to be shown on the final plat consistent with the above requirements. With Condition of Approval Number 3, these criteria are satisfied.

TDC 74.350. - Maintenance Easement or Lots.

A dedicated lot or easement will be required when access to public improvements for operation and maintenance is required, as determined by the City Manager. Access for maintenance vehicles must be constructed of an all-weather driving surface capable of carrying a 50,000-pound vehicle. The width of the lot or easement must be at least 15-feet in order to accommodate City maintenance vehicles. In subdivisions and partitions, the easement or lot must be dedicated to the City on the final plat. In any other development, the easement or lot must be granted to the City and recorded prior to issuance of a building permit.

<u>Finding:</u>
Utility easements are included in the application as illustrated on the Preliminary Plat and Preliminary Composite Utility Plans. Public utility easements (PUEs) 8 feet wide are provided along the public street frontages. No sides and rear public utility easements are identified. The City Engineer has determined that no sides are rear public utility easements are required; only the 8-foot wide public utility easement adjacent to all street frontages as shown.
The Preliminary Grading and ESC Plans show retaining walls within the public utility easement such as between lots 145/146 and 297/298. The Preliminary Street Tree and Planting Plan show masonry columns street adjacent corners of tracts A, D, and E. No obstructions are allowed with the public utility easement that would conflict with construction and maintained of franchise utilities. All walls must be located outside these easements. Condition of Approval Number 5 will require that all access to public improvements be improved consistent with the above standards where applicable. With Condition of Approval Number 5, these criteria are met.

<u>TDC 74.410. - Future Street Extensions.</u>
(1) Streets must be extended to the proposed development site boundary where necessary to do any one of the following:

- **(a) Give access to, or permit future development of adjoining land;**
- **(b) Provide additional access for emergency vehicles;**
- **(c) Provide for additional direct and convenient pedestrian, bicycle and vehicle circulation;**
- **(d) Eliminate the use of culs-de-sac except where topography, barriers such as railroads or freeways, existing development, or environmental constraints such as major streams and rivers prevent street extension; and**
- **(e) Eliminate circuitous routes. The resulting dead end streets may be approved without a turnaround. A reserve strip may be required to preserve the objectives of future street extensions.**
- **(2) Proposed streets must comply with the general location, orientation and spacing identified in the Functional Classification Plan (Comprehensive Plan Map 8-1), Local**

Streets Plan (Comprehensive Plan Map 8-3) and the Street Design Standards (Figures 74-2A through 74-2G).

(a) Streets and major driveways, as defined in TDC 31.060, proposed as part of new residential or mixed residential/commercial developments must comply with the following standards:

- **(i) Full street connections with spacing of no more than 530 feet between connections, except where prevented by barriers;**
- **(ii) Bicycle and pedestrian accessway easements where full street connections are not possible, with spacing of no more than 330 feet, except where prevented by barriers;**
- **(iii) Limiting culs-de-sac and other closed-end street systems to situations where barriers prevent full street extensions; and**
- **(iv) Allowing culs-de-sac and closed-end streets to be no longer than 200 feet or with more than 25 dwelling units, except for streets stubbed to future developable areas.**

(b) Streets proposed as part of new industrial or commercial development must comply with Comprehensive Plan Map 8-1.

(3) During the development application process, the location, width, and grade of streets must be considered in relation to existing and planned streets, to topographical conditions, to public convenience and safety, and to the proposed use of the land to be served by the streets. The arrangement of streets in a subdivision must either:

(a) Provide for the continuation or appropriate projection of existing streets into surrounding areas; or

(b) Conform to a street plan approved or adopted by the City to meet a particular situation where topographical or other conditions make continuance of or conformance to existing streets impractical.

(4) The City Manager may require the applicant to submit a street plan showing all existing, proposed, and future streets in the area of the proposed development.

(5) The City Manager may require the applicant to participate in the funding of future off-site street extensions when the traffic impacts of the applicant's development warrant such a condition.

Finding:

The City Engineer has reviewed the proposed Subdivision against the above requirements and has deemed it to be in compliance. The public street configuration shows through connectivity, except for one street terminating in a cul-de-sac bulb due to the City's water reservoirs. These criteria are met.

TDC 74.420 Street Improvements.

When an applicant proposes to develop land adjacent to an existing or proposed street, including land which has been excluded under TDC 74.220, the applicant should be responsible for the improvements to the adjacent existing or proposed street that will bring the improvement of the street into conformance with the Transportation Plan (TDC Chapter 11), TDC 74.425 (Street Design Standards), and the City' s Public Works Construction Code, subject to the following provisions:

(1) For any development proposed within the City, roadway facilities within the right-of-way described in TDC 74.210 must be improved to standards as set out in the Public Works Construction Code.

(2) The required improvements may include the rebuilding or the reconstruction of any existing facilities located within the right-of-way adjacent to the proposed development to bring the facilities into compliance with the Public Works Construction Code.

(3) The required improvements may include the construction or rebuilding of off-site improvements which are identified to mitigate the impact of the development.

(4) Where development abuts an existing street, the improvement required must apply only to that portion of the street right-of-way located between the property line of the parcel proposed for development and the centerline of the right-of-way, plus any additional pavement beyond the centerline deemed necessary by the City Manager to ensure a smooth transition between a new improvement and the existing roadway (half-street improvement). Additional right-of-way and street improvements and off-site right-of-way and street improvements may be required by the City to mitigate the impact of the development. The new pavement must connect to the existing pavement at the ends of the section being improved by tapering in accordance with the Public Works Construction Code.

(5) If additional improvements are required as part of the Access Management Plan of the City, TDC Chapter 75, the improvements must be required in the same manner as the half-street improvement requirements.

(6) All required street improvements must include curbs, sidewalks with appropriate buffering, storm drainage, street lights, street signs, street trees, and, where designated, bikeways and transit facilities.

(7) For subdivision and partition applications, the street improvements required by TDC Chapter 74 must be completed and accepted by the City prior to signing the final subdivision or partition plat, or prior to releasing the security provided by the applicant to assure completion of such improvements or as otherwise specified in the development application approval.

[…]

(10) Streets within, or partially within, a proposed development site must be graded for the entire right-of-way width and constructed and surfaced in accordance with the Public Works Construction Code.
(11) Existing streets which abut the proposed development site must be graded, constructed, reconstructed, surfaced or repaired as necessary in accordance with the Public Works Construction Code and TDC Chapter 11, Transportation Plan, and TDC 74.425 (Street Design Standards).
(12) Sidewalks with appropriate buffering must be constructed along both sides of each internal street and at a minimum along the development side of each external street in accordance with the Public Works Construction Code.
(13) The applicant must comply with the requirements of the Oregon Department of Transportation (ODOT), Tri-Met, Washington County and Clackamas County when a proposed development site is adjacent to a roadway under any of their jurisdictions, in addition to the requirements of this chapter.
(14) The applicant must construct any required street improvements adjacent to parcels excluded from development, as set forth in TDC 74.220 of this chapter.
(15) Except as provided in TDC 74.430, whenever an applicant proposes to develop land with frontage on certain arterial streets and, due to the access management provisions of TDC Chapter 75, is not allowed direct access onto the arterial, but instead must take access from another existing or future public street thereby providing an alternate to direct arterial access, the applicant must be required to construct and place at a minimum street signage, a sidewalk, street trees and street lights along that portion of the arterial street adjacent to the applicant's property. The three certain arterial streets are S.W. Tualatin-Sherwood Road, S.W. Pacific Highway (99W) and S.W. 124th Avenue. In addition, the applicant may be required to construct and place on the arterial at the intersection of the arterial and an existing or future public non-arterial street warranted traffic control devices (in accordance with the Manual on Uniform Traffic Control Devices, latest edition), pavement markings, street tapers and turning lanes, in accordance with the Public Works Construction Code.
(16) The City Manager may determine that, although concurrent construction and placement of the improvements in (14) and (15) of this section, either individually or collectively, are impractical at the time of development, the improvements will be necessary at some future date. In such a case, the applicant must sign a written agreement guaranteeing future performance by the applicant and any successors in interest of the property being developed. The agreement must be subject to the City's approval.
(17) Intersections should be improved to operate at a level of service of at least D and E for signalized and unsignalized intersections, respectively.

(18) Pursuant to requirements for off-site improvements as conditions of development approval, proposed multi-family residential, commercial, or institutional uses that are adjacent to a major transit stop will be required to comply with the City's Mid-Block Crossing Policy.

Finding:
The City Engineer has reviewed the proposed Subdivision against the above requirements and has deemed it to be in compliance. Washington County and ODOT have additionally reviewed the proposed development, and have recommended applicable conditions of approval. Within Conditions of Approval 8, 9, 10 and 12, these criteria are met.

TDC 74.425 Street Design Standards.
[…]
(4) All streets must be designed and constructed according to the preferred standard. The City Manager may reduce the requirements of the preferred standard based on specific site conditions, but in no event will the requirement be less than the minimum standard. The City Manager must take into consideration the following factors when deciding whether the site conditions warrant a reduction of the preferred standard:

(a) Arterials:
  (i) Whether adequate right-of-way exists;
  (ii) Impacts to properties adjacent to right-of-way;
  (iii) Current and future vehicle traffic at the location; and
  (iv) Amount of heavy vehicles (buses and trucks).

(b) Collectors:
  (i) Whether adequate right-of-way exists;
  (ii) Impacts to properties adjacent to right-of-way;
  (iii) Amount of heavy vehicles (buses and trucks); and
  (iv) Proximity to property zoned manufacturing or industrial.

(c) Local Streets:
  (i) Local streets proposed within areas which have environmental constraints and/or sensitive areas and will not have direct residential access may utilize the minimum design standard.
  (ii) When the minimum design standard is allowed, the City Manager may determine that no parking signs are required on one or both sides of the street.

Finding:
The City Engineer has reviewed the proposed Subdivision against the above requirements and has deemed it to be in compliance. These criteria are met.

TDC 74.430. - Streets, Modifications of Requirements in Cases of Unusual Conditions.

(1) When, in the opinion of the City Manager, the construction of street improvements in accordance with TDC 74.420 would result in the creation of a hazard, or would be impractical, or would be detrimental to the City, the City Manager may modify the scope of the required improvement to eliminate such hazardous, impractical, or detrimental results. Examples of conditions requiring modifications to improvement requirements include but are not limited to horizontal alignment, vertical alignment, significant stands of trees, fish and wildlife habitat areas, the amount of traffic generated by the proposed development, timing of the development or other conditions creating hazards for pedestrian, bicycle or motor vehicle traffic. The City Manager may determine that, although an improvement may be impractical at the time of development, it will be necessary at some future date. In such cases, a written agreement guaranteeing future performance by the applicant in installing the required improvements must be signed by the applicant and approved by the City.

(2) When the City Manager determines that modification of the street improvement requirements in TDC 74.420 is warranted pursuant to subsection (1) of this section, the City Manager must prepare written findings of modification. The City Manager must forward a copy of said findings and description of modification to the applicant, or his authorized agent, as part of the Utility Facilities Review for the proposed development, as provided by TDC Chapter 32 (Procedures). The decision of the City Manager may be appealed to the City Council in accordance with TDC Chapter 32 (Procedures).

(3) To accommodate bicyclists on streets prior to those streets being upgraded to the full standards, an interim standard may be implemented by the City. These interim standards include reduction in motor vehicle lane width to ten feet (the minimum specified in AASHTO's A Policy on Geo-metric Design of Highways and Streets (1990)), a reduction of bike lane width to 4-feet (as measured from the longitudinal gutter joint to the centerline of the bike lane stripe), and a paint-striped separation two to four feet wide in lieu of a center turn lane. Where available roadway width does not provide for these minimums, the roadway can be signed for shared use by bicycle and motor vehicle travel. When width constraints occur at an intersection, bike lanes should terminate 50 feet from the intersection with appropriate signing.

Finding:

The City Engineer has reviewed the proposed Subdivision against the above requirements and has deemed it to be in compliance. These criteria are met.

TDC 74.440 Streets, Traffic Study Required.

(1) The City Manager may require a traffic study to be provided by the applicant and furnished to the City as part of the development approval process as provided by this Code, when the City Manager determines that such a study is necessary in connection with a proposed development project in order to:

- **(a) Assure that the existing or proposed transportation facilities in the vicinity of the proposed development are capable of accommodating the amount of traffic that is expected to be generated by the proposed development, and/or**
- **(b) Assure that the internal traffic circulation of the proposed development will not result in conflicts between on-site parking movements and/or on-site loading movements and/or on-site traffic movements, or impact traffic on the adjacent streets.**

(2) The required traffic study must be completed prior to the approval of the development application.

(3) The traffic study must include, at a minimum:

- **(a) an analysis of the existing situation, including the level of service on adjacent and impacted facilities.**
- **(b) an analysis of any existing safety deficiencies.**
- **(c) proposed trip generation and distribution for the proposed development.**
- **(d) projected levels of service on adjacent and impacted facilities.**
- **(e) recommendation of necessary improvements to ensure an acceptable level of service for roadways and a level of service of at least D and E for signalized and unsignalized intersections respectively, after the future traffic impacts are considered.**
- **(f) The City Manager will determine which facilities are impacted and need to be included in the study.**
- **(g) The study must be conducted by a registered engineer.**
- **(4) The applicant must implement all or a portion of the improvements called for in the traffic study as determined by the City Manager.**

Finding:

The applicant has submitted a Traffic Impact Analysis and Supplemental Memorandums (Exhibit C). City staff has reviewed the subject analysis and has determined that it meets the above requirements. These criteria are met.

TDC 74.450. - Bikeways and Pedestrian Paths.

(1) Where proposed development abuts or contains an existing or proposed bikeway, pedestrian path, or multi-use path, as set forth in TDC Chapter 11, Transportation Figure 11-4, the City may require that a bikeway, pedestrian path, or multi-use path be constructed, and an easement or dedication provided to the City.

(2) Where required, bikeways and pedestrian paths must be provided as follows:

(a) Bike and pedestrian paths must be constructed and surfaced in accordance with the Public Works Construction Code.

(b) The applicant must install the striping and signing of the bike lanes and shared roadway facilities, where designated.

Finding:

The City Engineer has reviewed the proposed Subdivision against the above requirements and has deemed it to be in compliance. These criteria are met.

TDC 74.460. - Accessways in Residential, Commercial and Industrial Subdivisions and Partitions.

(1) Accessways must be constructed by the applicant, dedicated to the City on the final residential, commercial or industrial subdivision or partition plat, and accepted by the City.

(2) Accessways must be located between the proposed subdivision or partition and all of the following locations that apply:

(a) Adjoining publicly-owned land intended for public use, including schools and parks. Where a bridge or culvert would be necessary to span a designated greenway or wetland to provide a connection, the City may limit the number and location of accessways to reduce the impact on the greenway or wetland;

(b) Adjoining arterial or collector streets upon which transit stops or bike lanes are provided or designated;

(c) Adjoining undeveloped residential, commercial or industrial properties;

(d) Adjoining developed sites where an accessway is planned or provided.

(3) In designing residential, commercial and industrial subdivisions and partitions, the applicant is expected to design and locate accessways in a manner which does not restrict or inhibit opportunities for developers of adjacent property to connect with an accessway. The applicant is to have reasonable flexibility to locate the required accessways. When developing a parcel which adjoins parcels where accessways have been constructed or approved for construction, the applicant must connect at the same points to provide system continuity and enhance opportunities for pedestrians and bicyclists to use the completed accessway.

(4) Accessways must be as short as possible, but in no case more than 600 feet in length.

(5) Accessways must be as straight as possible to provide visibility from one end to the other.

(6) Accessways must be located and improved within a right-of-way or tract of no less than eight feet.

(7) Where possible, accessways must be combined with utility easements.

(8) Accessways must be constructed in accordance with the Public Works Construction Code.

(9) Curb ramps must be provided wherever the accessway crosses a curb and must be constructed in accordance with the Public Works Construction Code.

(10) The Federal Americans With Disabilities Act (ADA) applies to development in the City of Tualatin. Accessways must comply with the Oregon Structural Specialty Code's (OSSC) accessibility standards.

(11) Fences and gates which prevent pedestrian and bike access must not be allowed at the entrance to or exit from any accessway.

(12) Final design and location of accessways must be approved by the City.

(13) Outdoor Recreation Access Routes must be provided between a subdivision or partition and parks, bikeways and greenways where a bike or pedestrian path is designated.

[…]

Finding:

The City Engineer has reviewed the proposed Subdivision against the above requirements and has deemed it to be in compliance. These criteria are met.

TDC 74.765. - Street Tree Species and Planting Locations.

All trees, plants or shrubs planted in the right-of-way of the City must conform in species and location and in accordance with the street tree plan and City standards, including Table 74-1. If the City Manager determines that none of the species in City standards, including Table 74-1 is appropriate or finds appropriate a species not listed, the City Manager may substitute an unlisted species.

Table 74-1
Street Tree Species

Species Common Names	Planting Strip Width (feet)			Power line compatible	Spacing on center (feet)
	4	5	6+		
Amur Maackia	•	•	•	•	30
Amur Maple	•	•	•	•	30
Armstrong Maple	•	•	•		30
Autumn Applause Ash		•	•		30
Black Tupelo	•	•	•		30
Capital Flowering Pear	•	•	•		30
Cascara	•	•	•	•	30
Crimson King Maple		•	•		30
Crimson Sentry Maple	•	•	•	•	30
Eastern Redbud	•	•	•		30
European Hornbeam	•	•	•	•	30
Frontier Elm			•		60

Table 74-1 Street Tree Species					
Ginko		●	●		30
Globe Sugar Maple			●		60
Golden Desert Ash	●	●	●	●	30
Goldenrain	●	●	●		30
Greenspire Linden		●	●		30
Ivory Japanese Lilac	●	●	●	●	30
Leprechaun Ash	●	●	●		30
Persain Parrotia	●	●	●		30
Purple Beech	●	●	●		30
Raywood Ash		●	●	●	30
Katsura	●	●	●		30
Red Oak			●		60
Red Sunset Maple			●		60
Scanlon/Bowhall Maple	●	●	●		30
Scarlet Oak			●		60
Shademaster Honey Locust		●	●		30
Skyrocket English Oak	●	●	●		30
Japanese snowbell	●	●	●	●	30
Sourwood	●	●	●	●	30
Tall Stewartia	●	●	●	●	30
Chinese Fringetree	●	●	●	●	30
Tri-Color Beech			●		60
Trident Maple	●	●	●	●	30
Urbanite Ash		●	●		30
Yellowwood	●	●	●		30
Zelkova Musashino	●	●	●		30

[…]

Finding:

The Preliminary Street Tree and Planting Plans shows the planned street tree species and spacing. The species and spacing generally meet requirements. Final plans must show approvable street tree species and spacing. The applicant must purchase and install approved street trees. These criteria are met with condition of approval 13.

TDC 74.470 Street Lights.

(1) Street light poles and luminaries must be installed in accordance with the Public Works Construction Code.

(2) The applicant must submit a street lighting plan for all interior and exterior streets on the proposed development site prior to issuance of a Public Works Permit.

<u>TDC 74.475. - Street Names.</u>

(1) A street name must not be used which will duplicate or be confused with the names of existing streets in the Counties of Washington or Clackamas, except for extensions of existing streets. Street names and numbers must conform to the established pattern in the surrounding area.

(2) The City Manager must maintain the approved list of street names from which the applicant may choose. Prior to the creation of any street, the street name must be approved by the City Manager.

<u>TDC 74.480. - Street Signs.</u>

(1) Street name signs must be installed at all street intersections in accordance with standards adopted by the City.

(2) Stop signs and other traffic control signs (speed limit, dead-end, etc.) may be required by the City.

(3) Prior to approval of the final subdivision or partition plat, the applicant must pay the City a non-refundable fee equal to the cost of the purchase and installation of street signs, traffic control signs and street name signs. The location, placement, and cost of the signs must be determined by the City.

<u>TDC 74.485. - Street Trees.</u>

(1) Prior to approval of a residential subdivision or partition final plat, the applicant must pay the City a non-refundable fee equal to the cost of the purchase and installation of street trees. The location, placement, and cost of the trees must be determined by the City. This sum must be calculated on the interior and exterior streets as indicated on the final subdivision or partition plat.

(2) In nonresidential subdivisions and partitions street trees must be planted by the owners of the individual lots as development occurs.

(3) The Street Tree Ordinance specifies the species of tree which is to be planted and the spacing between trees.

<u>Finding:</u>

The Preliminary Street Lighting Plans show street light fixtures for the applicable streets. Condition of Approval Number 14 will require final street lighting plans must be submitted with the construction drawings. Condition of Approval Number 15 will require final street names must be proposed by the applicant and accepted by the City Engineer prior to construction plan approval. Condition of Approval 15 will require street name signs, stop signs, and other traffic control signs to be purchased and installed in accordance with City standards. With Conditions of Approval 14 and 15, these criteria are met.

[…]

TDC 74.620 Sanitary Sewer Service.

(1) Sanitary sewer lines must be installed to serve each property in accordance with the Public Works Construction Code. Sanitary sewer construction plans and calculations must be submitted to the City Manager for review and approval prior to construction.

(2) If there are undeveloped properties adjacent to the proposed development site which can be served by the gravity sewer system on the proposed development site, the applicant must extend public sanitary sewer lines to the common boundary line with these properties. The lines must be sized to convey flows to include all future development from all up stream areas that can be expected to drain through the lines on the site, in accordance with the City's Sanitary Sewer System Master Plan, TDC Chapter 13.

Finding:

The applicant has proposed sanitary sewer lines (Exhibit C) to serve each property, which per Condition of Approval Number 16 will be required to be in accordance with the Public Works Construction Code (PWCC 205). As shown in the Preliminary Composite Utility Plan (Exhibit C), and subject to Condition of Approval Number 16, the applicant has provided extension of the gravity sanitary sewer system to the common boundary line with all undeveloped properties adjacent to the proposed development site, sized to convey flows to include all future development from upstream areas. With Conditions of Approval 16, these criteria are met.

Preliminary Composite Utility Plans show the intent for individual sanitary sewer lines to serve each property in accordance with the Public Works Construction Code. Public sanitary sewer lines are extended from a future Clean Water Services' "Norwood" sanitary sewer pump station near I-5 and SW Norwood Road through public streets to the southern boundary of the site at SW "M" Street near SW Boones Ferry Road to provide service to future development.

Clean Water Services submitted an Architectural Review (AR21-0014) for the Norwood pump station, but has not yet obtained an issued decision, construction permits, or completed construction. This pump stations is required for the Autumn Sunrise subdivision to extend public sanitary sewer mains to serve all lots within their subdivision. The applicant must coordinate with Clean Water Services to obtain permission to connect to the Norwood pump station or obtain associated approvals and complete construction of this facility. Permission from Clean Water Services must be obtained to connect Autumn Sunrise lines to Clean Water Services pump station lines prior to completion of the Clean Water Services project.

The public lines are shown to extend north of SW "H" street within Tract L with a public access and utility easement. This extension is to enable future development of the lots to the north of this vicinity with a gravity line. The public line in SW "H" street ends prior to reaching SW Boones Ferry Road as the previously mentioned extension is the shortest route providing the lowest main to assist future development to obtain gravity service as possible. The public line in SW "H" street extends to the east side of both commercial zoned lots to allow a connection.

Developments to the west of the commercial zoned lots. SW Boones Ferry Road cannot be served by a gravity extension of this line; therefore it is not extended further than the east property line of the commercial lots.

Separate sanitary sewer service laterals are stated to connect to each residential and commercial lot within the subdivision. The applicant must submit final plans showing separate service laterals for each residential and commercial lot with a cleanout at the right-of-way and gravity mains to flow to a future Clean Water Services' Norwood pump station on Tract F.

The entire subdivision must be part of a single permit set or each permit must have sufficient infrastructure to be self-supporting to meet all applicable code requirements.

The criteria are met with condition of approval 16.

[…]

TDC 74.610 Water Service.

(1) Water lines must be installed to serve each property in accordance with the Public Works Construction Code. Water line construction plans must be submitted to the City Manager for review and approval prior to construction.

(2) If there are undeveloped properties adjacent to the subject site, public water lines must be extended by the applicant to the common boundary line of these properties. The lines must be sized to provide service to future development, in accordance with the City's Water System Master Plan, TDC Chapter 12.

(3) As set forth is TDC Chapter 12, Water Service, the City has three water service levels. All development applicants must be required to connect the proposed development site to the service level in which the development site is located. If the development site is located on a boundary line between two service levels the applicant must be required to connect to the service level with the higher reservoir elevation. The applicant may also be required to install or provide pressure reducing valves to supply appropriate water pressure to the properties in the proposed development site.

Finding:

Preliminary Composite Utility Plans show public water lines extended throughout the public rights-of-way and show most lots with individual water laterals. A 12-inch main is shown from SW Norwood Road within SW Vermillion Drive to SW "H" Street to SW Boones Ferry Road. The remainder of the public mains are 8-inches in diameter. Conditions of Approval Number 9 will require submittal of final water plans and approval of a Public Works Permit which will require construction of water lines consistent with the requirements of PWCC Section 204 including backflow prevention devices and cross-connections, to be demonstrated at the time of building and construction permit applications. As shown in the Preliminary Composite Utility Plan (Exhibit C), and subject to Condition of Approval Number 9, the applicant has provided extension of the public water system to the common boundary line with all undeveloped properties *adjacent to the proposed development site, sized to serve all future development. With Conditions of Approval 9, these criteria are met*

The development site is located within the "Pressure Zone C". Condition of Approval Number 9 will require the development to connect the development site to Zone C, consistent with the applicable "Pressure Zone C" City standards. Specific to the Basalt Creek area, the draft Tualatin Water Master Plan (Exhibit P) identifies the need for the proposed development to construct 18" public mains from the B-Level reservoirs in order to provide adequate service to the C-Level reservoirs to serve this development. Condition of Approval 9 will require final plans showing 18" public water lines from Tualatin's B-level water reservoir site to SW Norwood Road from SW "C" Street, to SW "A" Street, to SW Vermillion Drive, to SW Norwood Road, to the east border of this subdivision; relocation of existing 12-inch public water lines from Tualatin's B-level water reservoir site to SW Norwood Road to be relocated east to within SW "C" Street and SW 89th Avenue and upsized to 18-inch diameters; and p*rior to disconnecting and removing the existing public water lines from the B-Level reservoir to the existing mains within SW Norwood Road the proposed water lines reconnecting Tualatin's B-Level reservoir site to lines within SW Norwood Road must be constructed and approved by the City. Condition of Approval 17 will also limit the number of homes for which building permits can be issued prior to construction of the aforementioned infrastructure to 50 lots. Condition of Approval Number 9 will require* public *water lines to extend to SW Boones Ferry Road within SW "H" Street*, and *continue to extend to the north property line within SW Boones Ferry Road as a 12" diameter main ending with a blow-off assembly. Within Conditions of Approval 9 and 17, these criteria are met.*

[…]

TDC 74.630 Storm Drainage System.

(1)Storm drainage lines must be installed to serve each property in accordance with City standards and Clean Water Services standards. Storm drainage construction plans and calculations must be submitted to the City Manager for review and approval prior to construction.

(2)The storm drainage calculations must confirm that adequate capacity exists to serve the site. The discharge from the development must be analyzed in accordance with the City's Storm and Surface Water Regulations and Clean Water Services standards.

(3)If there are undeveloped properties adjacent to the proposed development site which can be served by the storm drainage system on the proposed development site, the applicant must extend storm drainage lines to the common boundary line with these properties. The lines must be sized to convey expected flows to include all future development from all up stream areas that will drain through the lines on the site, in accordance with the adopted Stormwater Master Plan.

[…]

Finding:

Conditions of Approval Number 9 will require a storm drainage system to serve all properties within the proposed development constructed consistent with the requirements of PWCC Section 206. With Conditions of Approval Number 9, these criteria are met.

TDC 74.640 Grading.

(1) Development sites must be graded to minimize the impact of storm water runoff onto adjacent properties and to allow adjacent properties to drain as they did before the new development.

(2) A development applicant must submit a grading plan showing that all lots in all portions of the development will be served by gravity drainage from the building crawl spaces; and that this development will not affect the drainage on adjacent properties. The City Manager may require the applicant to remove all excess material from the development site.

Finding:

The Preliminary Grading and ESC Plans and the Preliminary Stormwater Report demonstrate that project grading will not cause stormwater runoff to be conveyed to adjoining properties nor affect existing drainage patterns of adjoining properties. Condition of Approval Number 28 will require that prior to issuance of permits for construction activities, the applicant must submit final plans demonstrating offsite stormwater impact and drainage for adjacent properties is no greater than the pre-developed conditions and gravity drainage can be provided from this development to an approved public system.

The plans indicate disturbance of approximately 61.96 acres. Erosion and sediment control plans and permit applications conforming to the requirements of the City of Tualatin, CWS, and Oregon Department of Environmental Quality must be provided with the construction permit submittal documents. The applicant must obtain an erosion control permit from the City of Tualatin for disturbance greater than 500 square feet and a National Pollution Discharge Elimination System (NPDES) 1200-C Construction Erosion Control permit from Oregon DEQ for over 5 acres. With Conditions of Approval 18, these criteria are met.

TDC 74.650 Water Quality, Storm Water Detention and Erosion Control.

(1) All Applications. The applicant must comply with the water quality, stormwater detention, and erosion control requirements in Tualatin Municipal Code Chapter 3-5 (Soil Erosion, Surface Water Management, Water Quality Facilities, and Building and Sewers) and Clean Water Services standards.

(2) Subdivisions and Partitions. Prior to approval of the final plat, an application for subdivision and partition development must:

(a) Submit a stormwater facilities design with calculations to satisfy the requirements of the Tualatin Municipal Code Chapter 3-5 (Soil Erosion, Surface Water Management, Water Quality Facilities, and Building And Sewers) and applicable Clean Water Services standards;

(b) Obtain a Stormwater Connection Permit from Clean Water Services; and

(c) Either construct a permanent on-site water quality facility and stormwater detention facility; or enter into an agreement with the City, as provided in TDC 36.320 and TMC 3-5-390, recorded against the property, to guarantee construction of a permanent on-site water quality facility and stormwater detention facility.

(4) On-Site Private and Regional Non-Residential Facilities. For on-site private and regional non-residential public facilities, the applicant must:

(a) Enter into a stormwater facility agreement, as provided in TMC 3-5-390, recorded against the property. The stormwater facility agreement will include an operation and maintenance plan, provided by the City and consistent with Clean Water Services requirements, for the water quality facility.

(b) Submit an erosion control plan prior to issuance of a Public Works Permit consistent with TMC 3-5 and Clean Water Services standards. No construction or disturbing of the site must occur until the erosion control plan is approved by the City and the required measures are in place and approved by the City.

Finding:

The applicant has demonstrated compliance with the water quality, stormwater detention, including hydromodification and erosion control requirements in Tualatin Municipal Code Chapter 3-5 (Soil Erosion, Surface Water Management, Water Quality Facilities, and Building and Sewers) and Clean Water Services standards through its Plan Set (Exhibit C) and Preliminary Stormwater Report (Exhibit E). CWS and ODOT have provided comments (Exhibit J and O) on the proposed stormwater system and have recommended approval of the proposal subject to conditions of approval.

Condition of Approval Number 9 will require the final stormwater system to comply with the requirements of Subsections (2) and (4) as well as ODOT and CWS requirements.
The Preliminary Stormwater Report includes a review of the existing storm drainage system and includes a downstream analysis with the above information as applicable. Downstream deficiencies are not identified. The detention facilities are stated to match or reduce the predevelopment flows and will have no adverse impacts on the downstream system.
With Conditions of Approval 9 etc., these criteria are met.

TDC 74.660 Underground.

(1) All utility lines including, but not limited to, those required for gas, electric, communication, lighting and cable television services and related facilities must be placed underground. Surface-mounted transformers, surface-mounted connection boxes and meter cabinets may be placed above ground. Temporary utility service facilities, high capacity electric and communication feeder lines, and utility transmission lines operating at 50,000 volts or above may be placed above ground. The applicant must make all necessary arrangements with all utility companies to provide the underground services. The City reserves the right to approve the location of all surface-mounted transformers.
(2)Any existing overhead utilities may not be upgraded to serve any proposed development. If existing overhead utilities are not adequate to serve the proposed development, the applicant must, at their own expense, provide an underground system. The applicant must be responsible for obtaining any off-site deeds and/or easements necessary to provide utility service to this site; the deeds and/or easements must be submitted to the City Manager for acceptance by the City prior to issuance of the Public Works Permit.
[…]
Findings:
New utility lines associated with the project are correctly indicated to be placed underground. There are existing overhead utility lines along the frontage of SW Norwood Road. These overhead utilities are shown to be undergrounded on the Preliminary Composite Utility Plans. Existing overhead lines within the Greenhill Lane right-of-way will not be altered with this application because improvements are not being made within the SW Greenhill Lane right-of-way. Future utility placement is must be coordinated with the appropriate utility provider as required. These criteria are met.

Chapter 75 Access Management
[…]
TDC 75.020. - Permit for New Driveway Approach

1. **Applicability. A driveway approach permit must be obtained prior to constructing, relocating, reconstructing, enlarging, or altering any driveway approach.**
3. **Procedure Type. A Driveway Approach Permit is processed as a Type II procedure under TDC 32.220 (Type II).**
4. **Submittal Requirements. In addition to the application materials required by TDC 32.140 (Application Submittal), the following application materials are also required:**
   a. **A site plan, of a size and form and in the number of copies meeting the standards established by the City Manager, containing the following information:(i)The location and dimensions of the proposed driveway approach;(ii)The relationship to nearest street intersection and adjacent driveway approaches;(iii)Topographic conditions;(iv)The location of all utilities;(v)The location of any existing or proposed buildings, structures, or**

vehicular use areas;(vi)The location of any trees and vegetation adjacent to the location of the proposed driveway approach that are required to be protected pursuant to TDC Chapter 73B or 73C; and(vii)The location of any street trees adjacent to the location of the proposed driveway approach.

- b. **Identification of the uses or activities served, or proposed to be served, by the driveway approach; and**
- c. **Any other information, as determined by the City Manager, which may be required to adequately review and analyze the proposed driveway approach for conformance with the applicable criteria.**

(5) **Criteria. A Driveway Approach Permit must be granted if:**

- a. **The proposed driveway approach meets the standards of this Chapter and the Public Works Construction Code;**
- b. **No site conditions prevent placing the driveway approach in the required location;**
- c. **The number of driveway approaches onto an arterial are minimized;**
- d. **The proposed driveway approach, where possible:(i)Is shared with an adjacent property; or(ii)Takes access from the lowest classification of street abutting the property;**
- e. **The proposed driveway approach meets vision clearance standards;**
- f. **The proposed driveway approach does not create traffic hazards and provides for safe turning movements and access;**
- g. **The proposed driveway approach does not result in significant adverse impacts to the vicinity;**
- h. **The proposed driveway approach minimizes impact to the functionality of adjacent streets and intersections; and (i)The proposed driveway approach balances the adverse impacts to residentially zoned property and the functionality of adjacent streets.**

[…]

TDC 75.040. - Driveway Approach Requirements

(2) Owners of two or more uses, structures, or parcels of land may agree to utilize jointly the same driveway approach when the combined driveway approach of both uses, structures, or parcels of land satisfies their combined requirements as designated in this code; provided that satisfactory legal evidence is presented to the City Attorney in the form of deeds, easements, leases or contracts to establish joint use. Copies of said deeds, easements, leases or contracts must be placed on permanent file with the City Recorder.

(3) Joint and Cross Access.

(a)Adjacent commercial uses may be required to provide cross access drive and pedestrian access to allow circulation between sites.

(b)A system of joint use driveways and cross access easements may be required and may incorporate the following:

(i)A continuous service drive or cross access corridor extending the entire length of each block served to provide for driveway separation consistent with the access management classification system and standards;

(ii)A design speed of ten mph and a maximum width of 24 feet to accommodate two-way travel aisles designated to accommodate automobiles, service vehicles, and loading vehicles;

(iii)Stub-outs and other design features to make it visually obvious that the abutting properties may be tied in to provide cross access via a service drive; and

(iv)An unified access and circulation system plan for coordinated or shared parking areas.

(c)Pursuant to this section, property owners may be required to:

(i)Record an easement with the deed allowing cross access to and from other properties served by the joint use driveways and cross access or service drive;

(ii)Record an agreement with the deed that remaining access rights along the roadway will be dedicated to the city and pre-existing driveways will be closed and eliminated after construction of the joint-use driveway;

(iii)Record a joint maintenance agreement with the deed defining maintenance responsibilities of property owners; and(iv)If subsection(i) through (iii) above involve access to the state highway system or county road system, ODOT or the county must be contacted and must approve changes to subsection(i) through (iii) above prior to any changes.

(4) Requirements for Development on Less than the Entire Site.

(a)To promote unified access and circulation systems, lots and parcels under the same ownership or consolidated for the purposes of development and comprised of more than one building site must be reviewed as one unit in relation to the access standards. The number of access points permitted must be the minimum number necessary to provide reasonable access to these properties, not the maximum available for that frontage. All necessary easements, agreements, and stipulations must be met. This must also apply to phased development plans. The owner and all lessees within the affected area must comply with the access requirements.

(b)All access must be internalized using the shared circulation system of the principal commercial development or retail center. Driveways should be designed to avoid queuing across surrounding parking and driving aisles.

(5) Lots that front on more than one street may be required to locate motor vehicle accesses on the street with the lower functional classification as determined by the City Manager.

(6) Except as provided in TDC 53.100, all driveway approach must connect directly with public streets.

(7) To afford safe pedestrian access and egress for properties within the City, a sidewalk must be constructed along all street frontage, prior to use or occupancy of the building or structure proposed for said property. The sidewalks required by this section must be constructed to City standards, except in the case of streets with inadequate right-of-way width or where the final street design and grade have not been established, in which case the sidewalks must be constructed to a design and in a manner approved by the City Manager. Sidewalks approved by the City Manager may include temporary sidewalks and sidewalks constructed on private property; provided, however, that such sidewalks must provide continuity with sidewalks of adjoining commercial developments existing or proposed. When a sidewalk is to adjoin a future street improvement, the sidewalk construction must include construction of the curb and gutter section to grades and alignment established by the City Manager.

(8) The standards set forth in this Code are minimum standards for driveway approaches, and may be increased through the Architectural Review process in any particular instance where the standards provided herein are deemed insufficient to protect the public health, safety, and general welfare.

(9) Minimum driveway approach width for uses are as provided in Table 75-1 (Driveway Approach Width):

TABLE 75-1
Driveway Approach Width

Use	Minimum Driveway Approach Width	Maximum Driveway Approach Width
Single-Family Residential, townhouses, and duplexes	10 feet	26 feet for one or two care garages 37 feet for three or more garages
Multi-family	2 Units = 16 feet 3-49 Units = 24 feet 50-499 = 32 feet Over 500 = as required by the City Manager	May provide two 16 foot one-way driveways instead of one 24-foot driveway May provide two 24-foot one-way driveways instead of one 32-foot driveway

TABLE 75-1
Driveway Approach Width

Use	Minimum Driveway Approach Width	Maximum Driveway Approach Width
Commercial	1-99 Parking Spaces = 32 feet 100-249 Parking Spaces = two approaches each 32 feet	Over 250 Parking Spaces = As Required by the City Manager, but not exceeding 40 feet
Industrial	36 feet	Over 250 Parking Spaces = As Required by the City Manager, but not exceeding 40 feet
Institutional	1-99 Parking Spaces = 32 feet 100-249 Parking Spaces = two approaches each 32 feet	Over 250 Parking Spaces = As Required by the City Manager, but not exceeding 40 feet

[…]

(11) Distance between Driveways and Intersections. Except for single-family dwellings, the minimum distance between driveways and intersections must be as provided below. Distances listed must be measured from the stop bar at the intersection.

(a) At the intersection of collector or arterial streets, driveways must be located a minimum of 150 feet from the intersection.

(b) At the intersection of two local streets, driveways must be located a minimum of 30 feet from the intersection.

(c) If the subject property is not of sufficient width to allow for the separation between driveway and intersection as provided, the driveway must be constructed as far from the intersection as possible, while still maintaining the 5-foot setback between the driveway and property line.

(d) When considering a driveway approach permit, the City Manager may approve the location of a driveway closer than 150 feet from the intersection of collector or arterial streets, based on written findings of fact in support of the decision.

(12) Vision Clearance Area.

(a) Local Streets. A vision clearance area for all local street intersections, local street and driveway intersections, and local street or driveway and railroad intersections must be that triangular area formed by the right-of-way lines along such lots and a straight line joining the right-of-way lines at points which are ten feet from the

intersection point of the right-of-way lines, as measured along such lines (see Figure 73-2 for illustration).

(b) Collector Streets. A vision clearance area for all collector/arterial street intersections, collector/arterial street and local street intersections, and collector/arterial street and railroad intersections must be that triangular area formed by the right-of-way lines along such lots and a straight line joining the right-of-way lines at points which are 25 feet from the intersection point of the right-of-way lines, as measured along such lines. Where a driveway intersects with a collector/arterial street, the distance measured along the driveway line for the triangular area must be ten feet (see Figure 73-2 for illustration).

(c) Vertical Height Restriction. Except for items associated with utilities or publicly owned structures such as poles and signs and existing street trees, no vehicular parking, hedge, planting, fence, wall structure, or temporary or permanent physical obstruction must be permitted between 30 inches and eight feet above the established height of the curb in the clear vision area (see Figure 73-2 for illustration).

Finding:

As shown on their Preliminary Plans (Exhibit C), the applicant has proposed driveway approaches consistent with the above requirements. The single-family home lots are shown with widths approximately 20 feet wide and the attached townhome lots are planned to have shared driveways and approaches up to 37 feet wide. The maintenance and use of the shared driveways are stated to be addressed in the Covenants, Conditions & Restrictions (CC&Rs) of the townhome units. Condition of Approval Number 7 will require the applicant to submit final construction plans that show driveway approaches consistent with the above criteria. Condition of Approval Number 19 will require CC&Rs to be recorded with the final plat that include shared access and maintenance responsibilities for the shared driveway approaches. With Condition of Approval Number 7and 19, these criteria are met.

TDC 75.050. - Access Limited Roadways

(1) This section applies to all developments, permit approvals, land use approvals, partitions, subdivisions, or any other actions taken by the City pertaining to property abutting any road or street listed in TDC 75.050(2). In addition, any property not abutted by a road or street listed in subsection (2), but having access to an arterial by any easement or prescriptive right, must be treated as if the property did abut the arterial and this Chapter applies.

(2) The following Freeways and Arterials are access limited roadways: …

(h)Boones Ferry Road at all points located within the City of Tualatin Planning Area; …

(t)Basalt Creek Parkway.

Finding:

The proposed development has frontage on SW Boones Ferry Road and the future SW Basalt Creek Parkway. A single access point to SW Boones Ferry Road has been proposed and is subject to the below listed spacing standards. With Condition of Approval Number 11, these criteria are met.

[…]

TDC 75.070. - Existing Driveways and Street Intersections.

(1) Existing driveways with access onto arterials on the date this chapter was originally adopted are allowed to remain. If additional development occurs on properties with existing driveways with access onto arterials then this Chapter applies and the entire site must be made to conform with the requirements of this chapter.

(2)The City Manager may restrict existing driveways and street intersections to right-in and right-out by construction of raised median barriers or other means.

[…]

TDC 75.100. - Spacing Standards for New Intersections.

Except as shown in TDC Chapter 11, Transportation, (Figures 11-1 and 11-3), all new intersections with arterials must have a minimum spacing of one-half mile between intersections.

TDC 75.110. - Joint Access Standards.

When the City Manager determines that joint accesses are required by properties undergoing development or redevelopment, an overall access plan shall be prescribed by the City Manager and all properties shall adhere to this. Interim accesses may be allowed in accordance with TDC 75.060 of this chapter to provide for the eventual implementation of the overall access plan.

TDC 75.120. - Collector Streets Access Standards.

(1) Major Collectors. Direct access from newly constructed single family homes, duplexes or triplexes are not permitted. As major collectors in residential areas are fully improved, or adjacent land redevelops, direct access should be relocated to the nearest local street where feasible.

(2) Minor Collectors. Residential, commercial and industrial driveways where the frontage is greater or equal to 70 feet are permitted. Minimum spacing at 100 feet. Uses with less than 50 feet of frontage shall use a common (joint) access where available.

(3) If access is not able to be relocated to the nearest local street, the City Manager may allow interim access in accordance with 75.060 of this chapter to provide for the eventual implementation of the overall access plan.

TDC 75.130. - New Streets Access Standards.

(1) New streets designed to serve as alternatives to direct, parcel by parcel, access onto arterials are shown in TDC Chapter 11, Transportation, (Figures 11-1 and 11-3). These streets are shown as corridors with the exact location determined through the partition, subdivision, public works permit or Architectural Review process. Unless modified by the City Council by the procedure set out below, these streets will be the only new intersections with arterials in the City. See map for changes.
(2) Specific alignment of a new street may be altered by the City Manager upon finding that the street, in the proposed alignment, will carry out the objectives of this chapter to the same, or a greater degree as the described alignment, that access to adjacent and nearby properties is as adequately maintained and that the revised alignment will result in a segment of the Tualatin road system which is reasonable and logical.
(3) The City Council may include additional streets in TDC Chapter 11, Transportation, (Figures 11-1 and 11-3), through the plan amendment procedure. In addition to other required findings, the City Council must find that the addition is necessary to implement the objectives of this chapter.
[…]
Findings:
The City's TSP classifies SW Norwood Road as a Major Collector and SW Boones Ferry Road as a Major Arterial. The future SW Basalt Creek Parkway is planned to run along a portion of the southern boundary of the site. These streets are all under Washington County's roadway jurisdiction. The planned access to SW Boones Ferry Road and SW Norwood Road *and the associated frontage improvements have been coordinated with Washington County Land Use & Transportation and City staff. Washington County Code dictates that the minimum spacing standard along SW Boones Ferry Road is 600 feet and the planned spacing from the new intersection to the future SW Basalt Creek Parkway intersection is approximately 800 feet.*

The applicant has proposed a system of new Local streets, consistent with Map 8-3 of the Tualatin Comprehensive Plan (Exhibit Q) and the Transportation System Plan (TSP) that will be under City of Tualatin roadway jurisdiction. Condition of Approval Number 11will require all frontage improvements to existing streets as well as new streets and intersections to be designed and constructed in accordance with Tualatin and Washington County requirements and includes the specific requirements for these facilities. These proposed improvements have been reviewed and approved by the City Engineer. With Condition of Approval Number 11, these criteria have been met.

III. RECOMMENDATION

Based on the application materials and analysis and findings presented above, staff recommends approval of the Conditional Use Permit (CUP21-0001) and Subdivision (SB21-0001) and therefore recommends approval of the applications with the following Conditions of Approval:

CUP GENERAL CONDITIONS:

C1) Building permits for up to 6 model home units within each phase may be issued prior to completion of public improvements identified in SB21-0001, subject to prior City Engineer approval. These units may not be sold, inhabited, or issued Certificates of Occupancy until such time as the public improvements for the phase in which they are located are fully completed, inspected and accepted by the City.

C2) SB21-0001 shall not allow for the platting of more than 70 percent of the single-family detached lots prior to the platting of 100% of the total townhome lots.

C3) Any modification to Conditions of Approval associated with the Conditional Use Permit (CUP21-0001) will be subject to additional Conditional Use Permit application review.

SUBDIVISON GENERAL CONDITIONS:

1) All open spaces and common landscaped areas shall comply with the requirements of Chapter 73B.
2) The applicant must submit with their final plans a tree removal, protection and preservation plan consistent with their preliminary tree removal plan that demonstrates compliance with TDC 33.110, 73B.080 and 73.090.
3) The final plat for each phase must consistent with the requirements of TDC 36.160:
   a) Be in substantial conformance with the approved tentative plan or tentative replat plan,
   b) If the approval of a final plat for a specific phase requires the change of a boundary of a subsequent phase, or a change to the conditions of approval, the tentative plan must be modified first to reflect the changes,
   c) Comply with all applicable provisions of ORS Chapter 92,
   d) Comply will all conditions of approval of CUP21-0001 and SB21-0001,
   e) Dedicate, free and clear of all liens and encumbrances and without any reservation or restriction other than reversionary rights upon vacation, all City infrastructure, if such dedication is required by the Tualatin Development Code or as a condition of approval.
4) The applicant shall construct all approved public improvements and private improvements with approval from the City of Tualatin, ODOT, and Washington County; or the owner of

the property subject to the final plat must have executed and filed with the City an Improvement Agreement under TDC 36.320 (Improvement Agreement for Public Improvements), requiring all City infrastructure and private improvements to be completed within 24 months of the final plat approval.

5) The applicant must submit a copy of the recorded plat for each phase of the subdivision where Building Permits are requested in accordance with code section TDC 36.330.
6) The applicant shall submit final plans that show wells to be abandoned and septic tanks removed in accordance with TDC 36.340.
7) Each dwelling unit shall be accessed from a driveway approach meeting applicable TDC requirements and provide a minimum of 2 parking spaces, in addition to garages per TDC 73C.100.
8) Where facilities and common property, including, but not limited to, private streets, parking areas, privately owned pedestrian walkways and bikeways, and landscape strips, are included within the development, the recorded covenants, conditions, and restrictions for the development must include a provision that such facilities and common property be perpetually operated and maintained by a property owners' association. Each property owner must be a member of the property owners' association. The association must have the power to levy and assess against privately owned property in the development all necessary costs for operation and maintenance of such facilities and common property. The documents creating such association must be approved by the City Manager.
9) The applicant must submit final stormwater plans and calculations in accordance with PWCC 206:
   a) Certified by an Oregon registered, professional engineer that in accordance with TMC 3-5-390(1):
      i) Demonstrates runoff from all new and modified private and public impervious areas meet the standards of Clean Water Services.
      ii) Treats new and modified impervious areas in accordance with CWS D&CS 4.08.1.d meeting phosphorous removal in accordance with TMC 3-5-350 per the design storm in accordance with TMC 3-5-360 and CWS D&CS 4.08.2.
      iii) Demonstrates the public stormwater facility within Tract C can detain up to the 50 year storm event to discharge to the ODOT system (ODOT Hydraulics Manual
      iv) Demonstrates the public stormwater system in Tract K is constructed in accordance with TMC 3-5-220(1), TMC 3-5-230, and CWS D&CS 4.08
      v) Demonstrates the project site meets CWS hydromodification and detention standards, as applicable.
      vi) Includes conveyance calculations that all public stormwater facilities can accommodate up to a 25-year storm event in accordance with TDC 74.640 and CWS D&CS 5.05.2.d.
      vii) Demonstrate compliance with the submitted Clean Water Services' Service Provider Letter CWS File Number 21-001425 conditions (Exhibit G) to obtain a Stormwater

Connection Permit Authorization Letter in accordance with TDC 74.650(2) and CWS D&CS 3.01.2(d).

viii) Demonstrates compliance with all requirements stated within the Service Provider Letter and CWS Memo dated October 29, 2021 (Exhibit O).

10) The applicant must provide the City with a copy of an approved ODOT Miscellaneous Permit for stormwater connection to I-5's stormwater system.

11) The applicant must submit final plans showing street improvements consistent with TDC 74 and 75 that show:

a) Frontage improvements along the site's frontage with SW Norwood Road that includes:
   - i) 38.5 feet of right-of-way dedication,
   - ii) Pavement, curbs and gutters,
   - iii) A 12-foot wide curb-tight sidewalk on the south side,
   - iv) Street lights and street signs,
   - v) An 8-foot wide public utility easement adjacent to right-of-way, which may be reduced to preserve trees at the discretion of the City Engineer,
   - vi) The portion of the street cost above local standard is Transportation Development Tax creditable.

b) Improvements for the internal Local streets SW 89th Avenue, SW Vermillion Drive, SW "A" Street, SW "B" Street, SW "C" Street, SW "D" Street, SW "E" Street, SW "F" Street, SW "G" Street, SW "H" Street, SW "I" Street, SW "J" Street, SW "K" Street, SW "L" Street, and SW "M" Street that include:
   - i) 50 feet of right-of-way dedication,
   - ii) 32 feet of pavement,
   - iii) Curbs and gutters,
   - iv) 4-foot wide planter strips,
   - v) Street lights,
   - vi) Street signs with local street names approved by the City Engineer,
   - vii) Street trees and planting locations with irrigation consistent with the requirements of TDC 74.765,
   - viii) 5-foot wide sidewalks except for streets with one side 6-foot wide sidewalk per condition 25c,
   - ix) 8-foot wide public utility easements adjacent to right-of-way.

c) A 6-foot sidewalk, one foot which may be located within the PUE, will be constructed:
   - i) West side of SW Vermillion Drive, from SW Norwood Road to SW "H" Street intersection,
   - ii) North side of SW "H" Street, from SW Vermillion Drive intersection to SW Boones Ferry Road intersection.

d) Street H, between Boones Ferry and M Street, will be constructed as 36 feet wide to accommodate three lanes of traffic. A left and right turn lane storage length of 125 feet shall be provided with appropriate street tapers, per City of Tualatin Public Works construction Code standards. Street H right of way shall be widened, per additional pavement width.

e) Street H and Boones Ferry Road intersection shall be constructed to accommodate truck turning movements, as directed by City Engineer.

f) Frontage improvements along the property's SW Boones Ferry Road frontage that include:
   i) 53 feet of right-of-way dedication,
   ii) Striping,
   iii) A traffic signal,
   iv) Crosswalks and receiving ramp on the west side of SW Boones Ferry Road,
   v) Curbs and gutters,
   vi) One 6-foot wide planter strip on the east side,
   vii) Street signs with local street name for SW "H" Street approved by the City Engineer,
   viii) Approvable street trees and planting locations with irrigation,
   ix) A 12-foot wide multi-use path on the east side with Parks System Development Credits for the additional 6 feet greater than a standard sidewalk,
   x) An 8-foot wide public utility easement adjacent to right-of-way,
   xi) Subject to the addition of a project consisting of a transit stop pull-out along SW Boones Ferry Road to the City's Transportation Development Tax (TDT) approved project list, TriMet approval, and Washington County approval, the applicant must design, permit, and construct a transit stop pull-out along SW Boones Ferry Road adjacent to the project site. All costs are Transportation Development Tax creditable.

g) For the future SW Basalt Creek Parkway as shown on Exhibit C, Sheets SB-03 and SB-04
   i) Dedication of adequate right-of-way.
   ii) An 8-foot wide public utility easement,
   iii) A slope easement sufficient for rough grading of the right-of-way.

h) A Private Tract L to provide access to adjacent properties to the north and east built to the following standards:
   i) A 5-foot wide sidewalk on the west side,
   ii) Curbs and gutters on both sides,
   iii) A minimum of 24 feet paved travel surface to accommodate two-way traffic,
   iv) A concrete approach to SW "H" Street matching the travel surface width,

   v) With a blanket public access and utility easement.

12) The applicant must obtain construction permit approval in accordance with TDC 36.160 ODOT, Washington County, and the City of Tualatin including provision of associated financial assurance.

13) The applicant must purchase and install approved street trees.

14) The applicant must purchase and install approved street lights.

15) The applicant must purchase and install street signs and traffic control signs.

16) The applicant shall submit final sanitary sewer plans in accordance with PWCC 205 that show:
    a) Location of the sanitary sewer lines, grade, materials, and other details.
    b) A separate lateral serving each lot.
    c) c) Cleanouts for all laterals, as directed by City Engineer..
    d) The applicant must extend 8-inch public sanitary sewer mains within SW Norwood Road and local public streets within each subdivision phase as shown in the Preliminary Plans.
    e) The public lines in SW “M” Street shall extend to the south boundary of the development.

17) The applicant shall submit final water plans in accordance with PWCC 204 that show,
    a) The existing 12-inch water mains from the B-Level reservoir site that connect to the existing line near the northwest corner of the development upsized to 18-inch diameter and routed within SW “C“ Street and SW 89th Avenue. The portion of the pipe material cost above 8” water main is System Development Charge creditable.
    b) At developer’s discretion, and with coordination with City Engineer, developer may construct additional Norwood Road water main improvements as outlined by City Norwood Road water main improvements project. All associated costs are System Development Charge creditable.
    c) A 12-inch diameter main line from SW Norwood Road within SW Vermillion Drive to SW “H” Street to SW Boones Ferry Road and the remainder of the public mains lines within the subdivision 8-inches in diameter. The portion of the pipe material cost above 8” water main is System Development Charge creditable.
    d) A 12-inch diameter main line within SW “J” Street from SW “H” Street extended south past SW Vermillion Drive through Tract J between lots 207 and 208 a minimum 10 feet south of the south residential lot lines for a future C Level connection. Tract J must include a public water line easement over its entirety. A 15-foot wide public water line easement must be centered on the water main from SW Vermillion Drive adjacent to

lots 207 and 208 or as approved by City Engineer. The portion of the pipe material cost above 8” water main is System Development Charge creditable.

e) A 12-inch diameter main line ending with a blow off assembly to the north property line within SW Boones Ferry Road. The portion of the pipe material cost above 8” water main is System Development Charge creditable.

f) A separate lateral for each lot and tract in accordance with PWCC 204.

18) The applicant must submit financial assurance for construction performance of the approved stormwater system in accordance with TMC 3-390(c), PWCC 102.14.00, and amount per CWS D&CS 2.07 Table 2-1.

19) The applicant must show all easements, tracts, and dedications on the Final Plat consistent with these conditions of approval. All easements shall be dedicated to the public as specified. Except as specified, all Tracts shall be owned and maintained by the applicant or a Homeowners’ Association.

20) SB21-0001 shall be subject to all conditions in CUP21-0001, except as modified through future Conditional Use Permit application(s).

21) The applicant shall be responsible for construction and acceptance of all improvements shown within the Preliminary Plans (Exhibit C), except as modified by condition of approval. In the event of a conflict, conditions of approval shall supersede improvements shown in the plans.

22) All future structural development shall be subject to the Site Design Standards requirements of TDC 73A.

PRIOR TO EROSION CONTROL, PUBLIC WORKS, AND WATER QUALITY PERMIT ISSUANCE FOR EACH SEQUENTIAL PHASE:

Submit to the Engineering Division via eTrakit for review and approval:

23) The applicant shall comply with the contractor insurance and bond requirements of the City of Tualatin.

24) The applicant shall submit final erosion control plans in accordance with PWCC 200.

25) The applicant must submit a copy of the National Pollution Discharge Elimination System (NPDES) 1200-C Construction Erosion Control permit from Oregon DEQ

26) The applicant must submit final plans demonstrating easement access to public improvements for operation and maintenance is accordance with TDC 74.350 as follows:
    a) A 15-foot wide public maintenance access easement over lot 251 from the public right-of-way to the public stormwater facility on Tract K with a turn-around.
    b) Construction of a 12-foot wide Portland Cement concrete all-weather driving surface capable of carrying a 60,000-pound vehicle from public right-of-way to surround manholes by five feet:
        i) Within the easement over Lot 251 and Tract K with a turn-around.
        ii) Within Tract C adjacent to Vermillion at least 20-feet past the back of sidewalk.
    c) 15-foot wide public stormwater easements:
        i) Between lots 91 and 92 or as approved by City Engineer.
        ii) Between lots 239 and 240 or as approved by City Engineer.

27) The applicant must submit final plans showing Tracts A, D, E, G, J, M, and O as open space, owned and maintained by the applicant or a Homeowners' Association. The improvements shown in the Preliminary Plans in Tract M shall be completed prior to issuance of building permits for phase 4.

28) The applicant must submit final plans showing Tract B as dedicated to the City of Tualatin and construction of a 12-foot wide Portland Cement asphalt or concrete all-weather driving surface capable of carrying a 60,000-pound vehicle. .

29) The applicant must submit final plans showing Tract H as dedicated to the City of Tualatin. Water System Development Charge credits shall be provided to developer based on fair market value of developed land. All trees must be removed from Tract H and site graded per the approval of the City Engineer.

30) The applicant must submit final plans showing Tract C and K as dedicated to the City of Tualatin for public stormwater facilities.

31) The applicant must coordinate conveyance of Tract F to Clean Water Services.

32) The applicant must submit final plans showing Tract I and N as 8-foot wide concrete public accessways in compliance with TDC 74.460.

33) The applicant must submit final plans showing Tract L as owned as maintained by the applicant or Homeowners' Association with an easement for public utilities, public pedestrian and vehicular access over the entire Tract.

34) The applicant must submit final plans showing public pedestrian access easements as shown on plans for Tracts A, D, and E sufficient for meandering sidewalk.

35) All retaining walls, fences, support structures, and walls must be constructed outside of public utility easements.

36) A gated emergency vehicle access from the south end of SW “G” Street to SW Boones Ferry Road to be constructed to TVF&R’s requirements that will be constructed prior plat approval for Phase 2. Emergency vehicle gate must be installed and the end of the constructed SW “G” Street and the access intersection with Boones Ferry Road which will be removed prior to acceptance of the public improvements in Phase 3.

37) The applicant must obtain City of Tualatin Public Works, Water Quality, and Erosion Control Permits and provide copies of the ODOT Miscellaneous Permit and the Washington County Facilities Permit.

PRIOR TO APPROVAL OF THE FINAL PLAT OF EACH SEQUENTIAL PHASE:

Submit to the Engineering Division via eTrakit for review and approval:

38) The first phase expires two years of from the effective date of this decision, unless an application for final plat is submitted or an extension is granted under TDC 36.210. All subsequent phases expire ten years from the effective date of this decision, and an extension under TDC 36.210 is not available. No building permits for development of lots or parcels will be issued until the final plat for applicable phase is recorded.

PRIOR TO BUILDING PERMIT ISSUANCE FOR LOTS WITHIN EACH PHASE:

Submit to the Engineering Division via eTrakit for review and approval:

39) The applicant must substantially construct improvements required of each phase as permitted by issued Erosion Control, Public Works, and Water Quality Permits from the City of Tualatin in accordance with TDC 36.330, the obtained ODOT Miscellaneous Permit for stormwater, and Washington County Facility Permits.

40) The applicant must submit paper and electronic as-builts of the Engineering permits along with maintenance bonds and any final fees for public and water quality improvements.

41) Prior to the 51st building permit issuance the City of Tualatin Water Main upsizing project to the existing reservoirs must be completed and operational.

PRIOR TO OCCUPANCY:

42) An approved public sanitary sewer system (pump station or approved alternative approach) must be available prior to occupancy of any home, including model homes.

Prior to occupancy of the 298th home (the first home of the fourth subdivision phase) the SW Boones Ferry Road and SW "H" Street signal must be operational and all public improvements completed.

CITY OF TUALATIN
18880 SW Martinazzi Ave
Tualatin, OR 97062-7092
Phone: (503) 692-2000
Fax: (503) 692-0147

DEVELOPMENT APPLICATION:
SUBDIVISION/PARTITION/ PROPERTY LINE ADJUSTMENT

Application for: ☑ Subdivision ☐ Partition ☐ Property Line Adjustment

Project Address: South of SW Norwood Road, east of SW Boones Ferry Road, and north of SW Greenhill Lane Planning District: RML and CN

Project Tax Map Number: 2S 1 35D Tax Lot Number(s): 100, 400, 401, 500, 501, 600, 800, and 900

Property Owner(s): Autumn Sunrise, LLC (Tax Lots 400, 401, 500, 501, 600, 800, and 900)

Property Owner's Address: 485 S. State Street

Owner's Phone Number: Contact Applicant's Consultant Fax Number:

Owner's Email Address: Contact Applicant's Consultant

Owner's Signature: ● COT, MANAGER Date: 06/21/2021

Owner's Signature: Date:

Owner's Signature:

Applicant's Name: Lennar Northwest, Inc.

Applicant's Address: 11807 NE 99th Street, Suite 1170

Applicant's Phone Number: Contact Applicant's Consultant Fax Number:

Applicant's Email Address: Contact Applicant's Consultant

Applicant's Signature: Michael W. Anders Date: 6/21/21

Consultant's Name: Mimi Doukas, AICP, RLA

Consultant's Company: AKS Engineering & Forestry, LLC

Consultant's Address: 12965 SW Herman Road, Suite 100

Consultant's Phone Number: (503) 563-6151 Fax Number:

Consultant's Email Address: mimid@aks-eng.com

Direct Communication to: ☐ Owner ☐ Applicant ☑ Consultant

Existing Use: Agricultural field and forest Proposed Use: Single-family residential subdivision

Total Acreage: ±61.96 acres No. of Lots/Parcels: 402 (400 single-family)

Average Lot/Parcel Width: ±39 feet Average Lot/Parcel Area: ±4150 square feet

Subdivision Name (if applicable): Autumn Sunrise

Receipt Number: Fee: $ Job Number:

By: Date:

CITY OF TUALATIN
18880 SW Martinazzi Ave
Tualatin, OR 97062-7092
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DEVELOPMENT APPLICATION:
SUBDIVISION/PARTITION/ PROPERTY LINE ADJUSTMENT

ADDITIONAL OWNERS

Project Address: South of SW Norwood Road, east of SW Boones Ferry Road, and north of SW Greenhill Lane
Project Tax Map Number: 1S 1 35D Tax Lot Number(s): 100
Property Owner's Name: P3 Properties LLC
Property Owner's Address: PO Box 691, White Salmon, WA 98672
Owner's Phone Number: Contact Applicant's Consultant Fax Number: ____
Owner's Email Address: Contact Applicant's Consultant
Owner's Signature: DocuSigned by: Paul Pennington DCA9D73FC66B4AD... Date: 6/22/2021
Owner's Signature: ____ Date: ____

Project Address: ____
Project Tax Map Number: ____ Tax Lot Number(s): ____
Property Owner's Name: ____
Property Owner's Address: ____
Owner's Phone Number: ____ Fax Number: ____
Owner's Email Address: ____
Owner's Signature: ____ Date: ____
Owner's Signature: ____ Date: ____

Project Address: ____
Project Tax Map Number: ____ Tax Lot Number(s): ____
Property Owner's Name: ____
Property Owner's Address: ____
Owner's Phone Number: ____ Fax Number: ____
Owner's Email Address: ____
Owner's Signature: ____ Date: ____
Owner's Signature: ____ Date: ____

FIRST AMERICAN TITLE

Property Research Report

SUBJECT PROPERTY

Ns
R560164
2S135D000100
Washington

OWNER

P3 Properties LLC

DATE PREPARED

06/14/2021

PREPARED BY

khaight@firstam.com

First American Title

Customer Service 503.219.8746
cs.oregon@firstam.com

First American Title

Customer Service Department
Phone: 503.219.TRIO (8746)
Fax: 503.790.7872
Email: cs.oregon@firstam.com

Date: 6/14/2021

OWNERSHIP INFORMATION

Owner: P3 Properties LLC
CoOwner:
Site: Ns Tualatin OR 97062
Mail: PO Box 691 White Salmon WA 98672

Parcel #: R560164
Ref Parcel #: 2S135D000100
TRS: 02S / 01W / 35 / SE
County: Washington

PROPERTY DESCRIPTION

Map Grid: 715-E1
Census Tract: 032110 Block: 1004
Neighborhood: Cio 6 Byrom
School Dist: 88J Sherwood
Impr Type:
Subdiv/Plat:
Land Use: 6404 - Designated Forestland - Vacant - Rural Residential
Std Land Use: OTHR - Other
Zoning: Tualatin-RML - Medium-Low Density Residential
Lat/Lon: 45.35184254 / -122.76762239
Watershed: Fanno Creek-Tualatin River
Legal: ACRES 25.18, POTENTIAL ADD'L TAX LIABILITY

ASSESSMENT AND TAXATION

Market Land: $0.00
Market Impr: $0.00
Market Special: $4,598,630.00
Market Total: $4,598,630.00 (2020)
% Improved: 0.00%
Assessed Total: $12,430.00 (2021)
Levy Code: 88.13
Tax: $190.12 (2020)
Millage Rate: 15.2952
Exemption:
Exemption Type:

PROPERTY CHARACTERISTICS

Bedrooms:
Baths, Total:
Baths, Full:
Baths, Half:
Total Units: 1
Stories:
Fireplaces:
Cooling:
Heating:
Building Style:

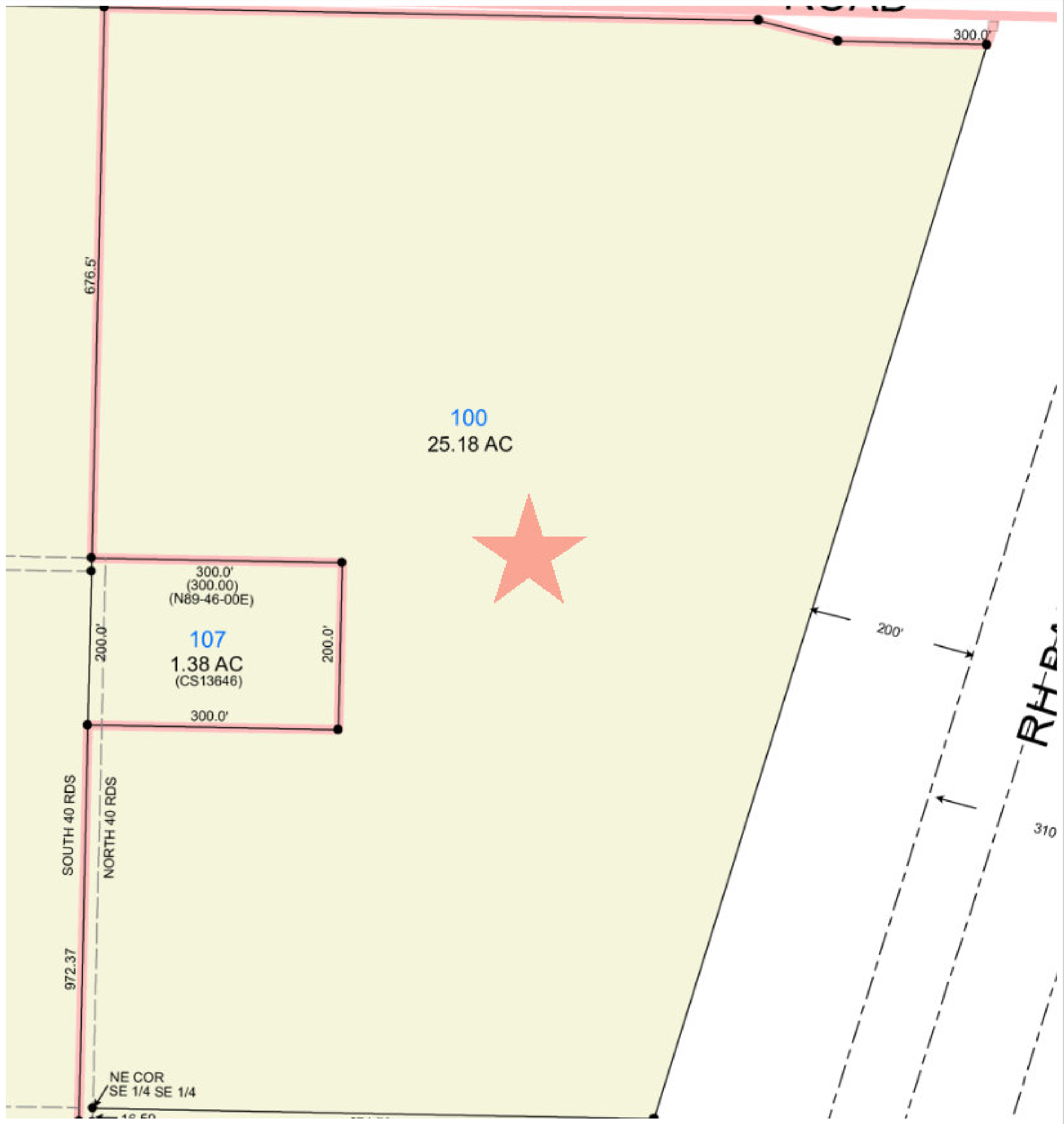
Total SqFt:
First Floor:
Second Floor:
Basement Fin:
Basement Unfin:
Basement Total:
Attic Fin:
Attic Unfin:
Attic Total:
Garage:

Year Built:
Eff Year Built:
Lot Size Ac: 25.18 Acres
Lot Size SF: 1,096,841 SqFt
Lot Width:
Lot Depth:
Roof Material:
Roof Shape:
Ext Walls:
Const Type:

SALES AND LOAN INFORMATION

Owner	Date	Doc #	Sale Price	Deed Type	Loan Amt	Loan Type
P3 PROPERTIES LLC	02/25/2015	12686		Deed		Conv/Unk
PAUL PENNINGTON	08/19/2013	75740		Deed		Conv/Unk
PAUL PENNINGTON	07/11/2013	63209		Deed		Conv/Unk

Assessor Map

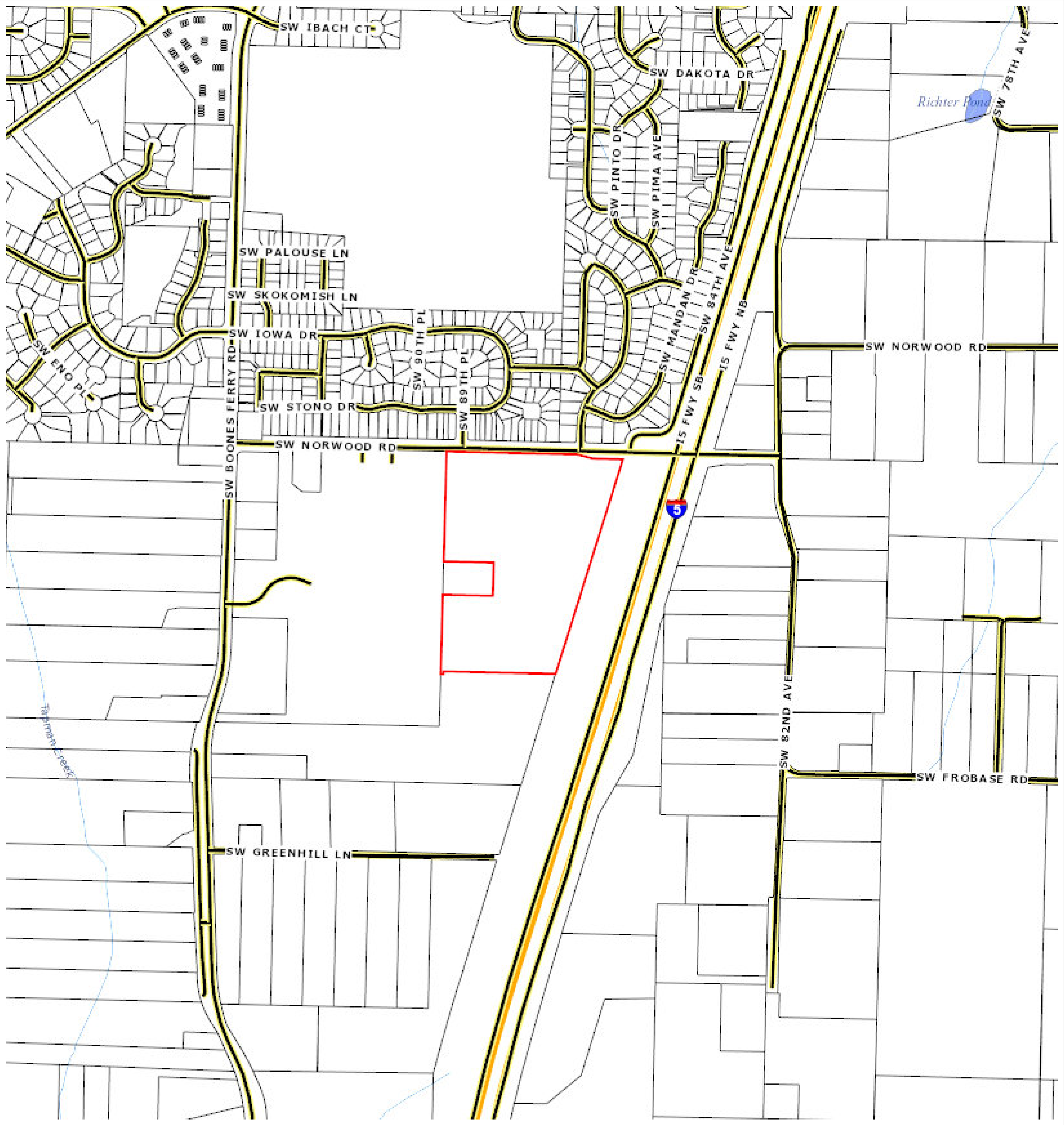


First American Title

Parcel ID: R560164

Site Address: Ns

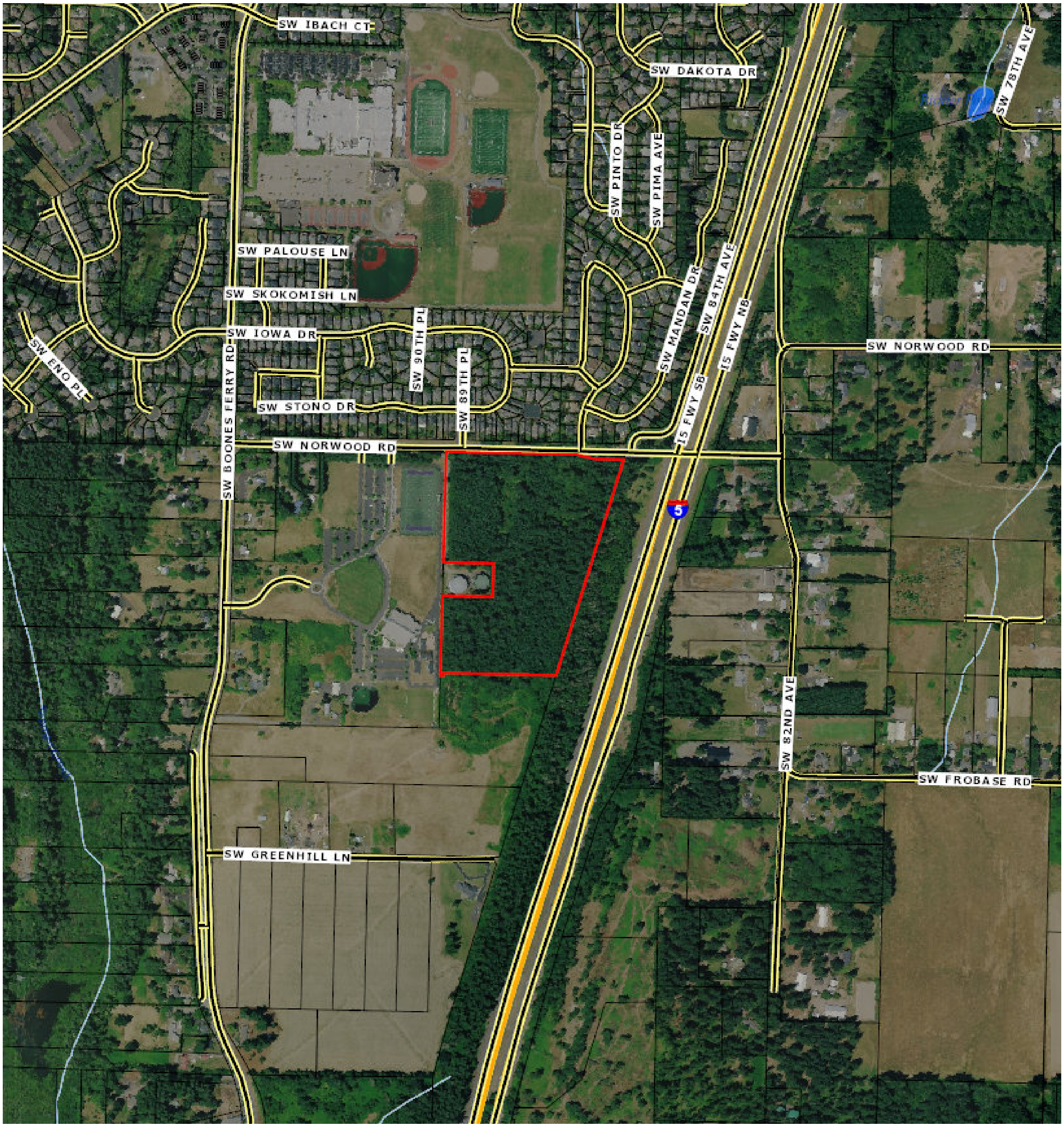
Street Map



First American Title

Parcel ID: R560164

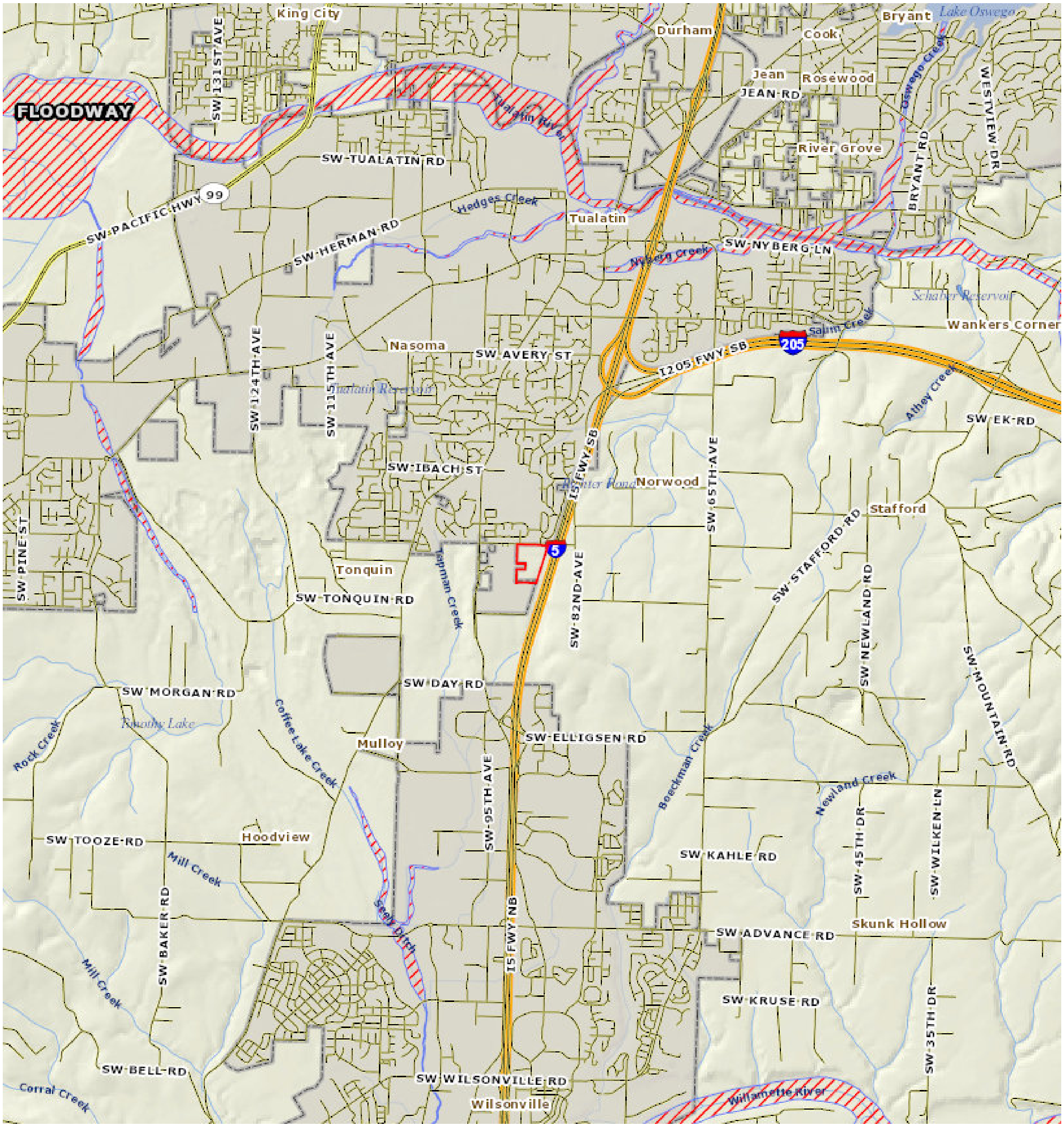
Aerial Map



First American Title

Parcel ID: R560164

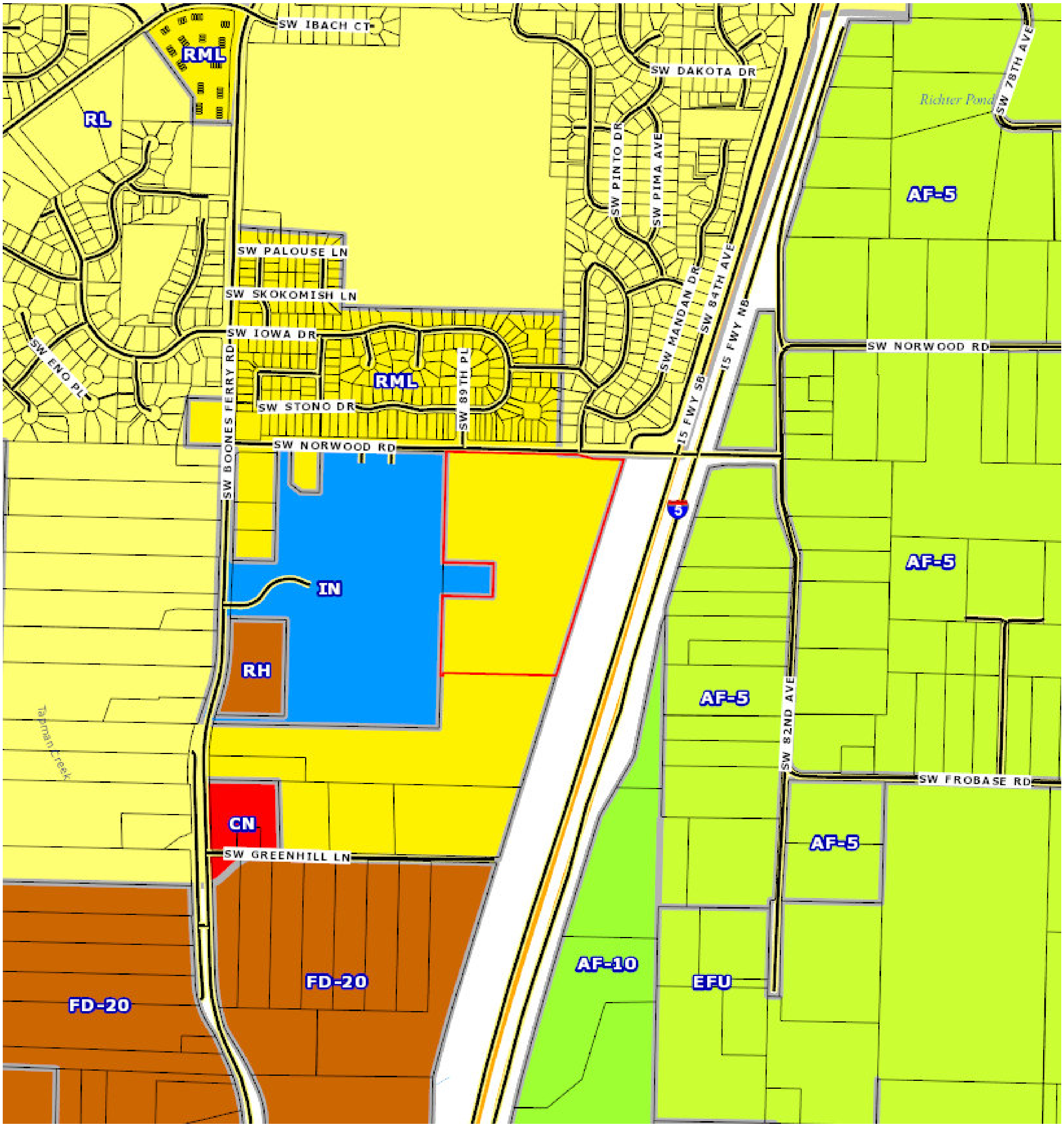
Flood Map - 100 Year



First American Title

Parcel ID: R560164

Zoning Map



First American Title

Parcel ID: R560164

15
36

Washington County, Oregon
02/25/2015 11:18:23 AM
D-DBS Cnt=1 Stn=12 S PFEIFER
$15.00 $5.00 $11.00 $20.00 - Total =$51.00

2015-012686

02016302201500126860030038

I, Richard Hobernicht, Director of Assessment and Taxation and Ex-Officio County Clerk for Washington County, Oregon, do hereby certify that the within instrument of writing was received and recorded in the book of records of said county.

Richard Hobernicht

Richard Hobernicht, Director of Assessment and Taxation, Ex-Officio County Clerk

After recording return to:
P3 Properties, LLC
c/o Paul Pennington
P.O. Box 691
White Salmon, WA 98672

Until further notice, all tax statements
should be sent to:
P3 Properties, LLC
c/o Paul Pennington
P.O. Box 691
White Salmon, WA 98672

Tax Account No. 2S135D0 00100
Ref No. R0560164

True actual consideration paid is $ 0

BARGAIN AND SALE DEED

Paul Pennington, Janet Pennington Peterson, and Gay Pennington Paschoal, as equal tenants in common, Grantors, do hereby convey unto P3 Properties, LLC, an Oregon limited liability company, Grantee, all of their right, title, and interest in that certain real property, with the tenements, hereditaments and appurtenances thereunto belonging or in any way appertaining, situated in Washington County, State of Oregon, described as follows, to-wit:

SEE ATTACHED EXHIBIT "A"

To have and to hold the same unto the said grantee and grantee's successors and assigns forever.

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSON'S RIGHTS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010. THIS INSTRUMENT DOES NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY THAT THE UNIT OF LAND BEING TRANSFERRED IS A LAWFULLY ESTABLISHED LOT OR PARCEL, AS DEFINED IN ORS 92.010 OR 215.010, TO VERIFY THE APPROVED USES OF THE LOT OR PARCEL, TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES, AS DEFINED IN ORS 30.930, AND TO INQUIRE ABOUT THE RIGHTS OF NEIGHBORING PROPERTY OWNERS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424,

OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010.

DATED: 2/12/2015 ,

Paul Pennington 2/9/2015
Paul Pennington

Janet Pennington Peterson
Janet Pennington Peterson

Gay Pennington Paschoal
Gay Pennington Paschoal

STATE OF Washington)
) §
County of Klickitat)

This instrument was acknowledged before me on 2.9.2015, 2014, by Paul Pennington.

DIANE MURPHY
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXPIRES
JUNE 16, 2015

Diane Murphy
Notary Public for ~~Oregon~~ Washington
mm

STATE OF OREGON)
) §
County of Benton)

This instrument was acknowledged before me on 2/12/2015 , by Janet Pennington Peterson.

OFFICIAL STAMP
MIRANDA ASHLEY HOWARD
NOTARY PUBLIC-OREGON
COMMISSION NO. 933427
MY COMMISSION EXPIRES OCTOBER 28, 2018

Notary Public for Oregon

STATE OF OREGON)
) §
County of Washington)

This instrument was acknowledged before me on Feb 5, 2015 ~~, 2014,~~ 4L by Gay Penington Paschoal.

OFFICIAL STAMP
THERESA WEAVER
NOTARY PUBLIC - OREGON
COMMISSION NO. 934162
MY COMMISSION EXPIRES DECEMBER 18, 2018

Notary Public for Oregon

EXHIBIT "A"

All interest in 25.18 acres of land, located at S.W. Norwood Ave., Tualatin, Oregon 97062, more particularly described as:

The North half of the Northwest quarter of the Southeast quarter and the Northeast quarter of the Southeast quarter of Section 35, Township 2 South, Range 1 West of the Willamette Meridian, in Washington County, Oregon,
EXCEPTING tract conveyed to the State of Oregon, by and through its State Highway Commission, in deed book 325, page 183, as follows: A parcel of land lying in the Northeast quarter of the Southeast quarter of Section 35, T2S, R1W, W.M.; the said parcel being that portion of said Northeast quarter of the Southeast quarter lying Easterly of a line parallel to and 100 feet Westerly of the centerline of the West Portland-Hubbard Highway as said highway has been relocated, which centerline is described as follows:
Beginning at Engineer's centerline Station 349/00, said Station being 115.27 feet North and 78.52 feet East of the East quarter corner of said section 35; thence South 15°49'15" West 1600 feet to Station 365/00; said centerline crossing the East and South lines of said Northeast quarter of the Southeast quarter approximately at Section 351/83 and Station 363/91 respectively;

ALSO EXCEPTING that tract conveyed to the State of Oregon, by and through its State Highway Commission, by deed in book 341, page 233;
ALSO EXCEPTING the following described premises: Beginning at an iron bar marking the center of Section 35, T2S, R1W, W.M., Washington County, Oregon; thence South along the West line of the Southeast quarter of said Section 35 to the Southwest corner of tract conveyed to Merle Pennington and Dorthea Pennington by deed of record in book 417 at page 314, Deed Records of Washington County; thence East along the South line of said tract so conveyed 16 rods and 30 feet to a point; thence North parallel to the West line of said Southeast quarter of said Section 35 to the North line of said Southeast quarter of Section 35; thence West along the North line of said Southeast quarter 16 rods and 30 feet to the point of beginning;
ALSO EXCEPTING the following parcels: Parcel conveyed to Shope, described in instrument of record in book 575, page 110, October 13, 1965, Washington County Records; parcel conveyed to School District 88J, described in instrument of record in Book 767, page 495, December 17, 1969, Washington County Records; and parcel conveyed to City of Tualatin described in instrument of record in Book 825, Page 873, 1971, Washington County Records.

Also identified as Washington County Tax Lot 100 on Tax Map 2S135D

FIRST AMERICAN TITLE

Property Research Report

SUBJECT PROPERTY

23740 SW Boones Ferry Rd
R560253
2S135D000400
Washington

OWNER

Autumn Sunrise LLC

DATE PREPARED

06/14/2021

PREPARED BY

khaight@firstam.com

First American Title

Customer Service 503.219.8746
cs.oregon@firstam.com

IMPORTANT – READ CAREFULLY: THIS REPORT IS NOT AN INSURED PRODUCT OR SERVICE OR A REPRESENTATION OF THE CONDITION OF TITLE TO REAL PROPERTY. IT IS NOT AN ABSTRACT, LEGAL OPINION, OPINION OF TITLE, TITLE INSURANCE COMMITMENT OR PRELIMINARY REPORT, OR ANY FORM OF TITLE INSURANCE OR GUARANTY. THIS REPORT IS ISSUED EXCLUSIVELY FOR THE BENEFIT OF THE APPLICANT THEREFOR, AND MAY NOT BE USED OR RELIED UPON BY ANY OTHER PERSON. THIS REPORT MAY NOT BE REPRODUCED IN ANY MANNER WITHOUT FIRST AMERICAN'S PRIOR WRITTEN CONSENT. FIRST AMERICAN DOES NOT REPRESENT OR WARRANT THAT THE INFORMATION HEREIN IS COMPLETE OR FREE FROM ERROR, AND THE INFORMATION HEREIN IS PROVIDED WITHOUT ANY WARRANTIES OF ANY KIND, AS-IS, AND WITH ALL FAULTS. AS A MATERIAL PART OF THE CONSIDERATION GIVEN IN EXCHANGE FOR THE ISSUANCE OF THIS REPORT, RECIPIENT AGREES THAT FIRST AMERICAN'S SOLE LIABILITY FOR ANY LOSS OR DAMAGE CAUSED BY AN ERROR OR OMISSION DUE TO INACCURATE INFORMATION OR NEGLIGENCE IN PREPARING THIS REPORT SHALL BE LIMITED TO THE FEE CHARGED FOR THE REPORT, IF ANY. RECIPIENT ACCEPTS THIS REPORT WITH THIS LIMITATION AND AGREES THAT FIRST AMERICAN WOULD NOT HAVE ISSUED THIS REPORT BUT FOR THE LIMITATION OF LIABILITY DESCRIBED ABOVE. FIRST AMERICAN MAKES NO REPRESENTATION OR WARRANTY AS TO THE LEGALITY OR PROPRIETY OF RECIPIENT'S USE OF THE INFORMATION HEREIN.

First American Title

Customer Service Department
Phone: 503.219.TRIO (8746)
Fax: 503.790.7872
Email: cs.oregon@firstam.com
Date: 6/14/2021

OWNERSHIP INFORMATION

Owner:	Autumn Sunrise LLC	Parcel #:	R560253
CoOwner:		Ref Parcel #:	2S135D000400
Site:	23740 SW Boones Ferry Rd Tualatin OR 97062	TRS:	02S / 01W / 35 / SE
Mail:	485 S State St Lake Oswego OR 97034	County:	Washington

PROPERTY DESCRIPTION

Map Grid:	715-E1
Census Tract:	032110 Block: 1004
Neighborhood:	Cio 6 Byrom
School Dist:	88J Sherwood
Impr Type:	
Subdiv/Plat:	
Land Use:	1900 - Urban Developable Tract - Vacant
Std Land Use:	RCON - Condominium, Pud
Zoning:	Tualatin-RML - Medium-Low Density Residential
Lat/Lon:	45.34837945 / -122.77384747
Watershed:	Abernethy Creek-Willamette River
Legal:	ACRES 1.88

ASSESSMENT AND TAXATION

Market Land:	$343,350.00
Market Impr:	$0.00
Market Special:	$0.00
Market Total:	$343,350.00 (2020)
% Improved:	0.00%
Assessed Total:	$146,730.00 (2021)
Levy Code:	88.15
Tax:	$2,663.62 (2020)
Millage Rate:	18.1531
Exemption:	
Exemption Type:	

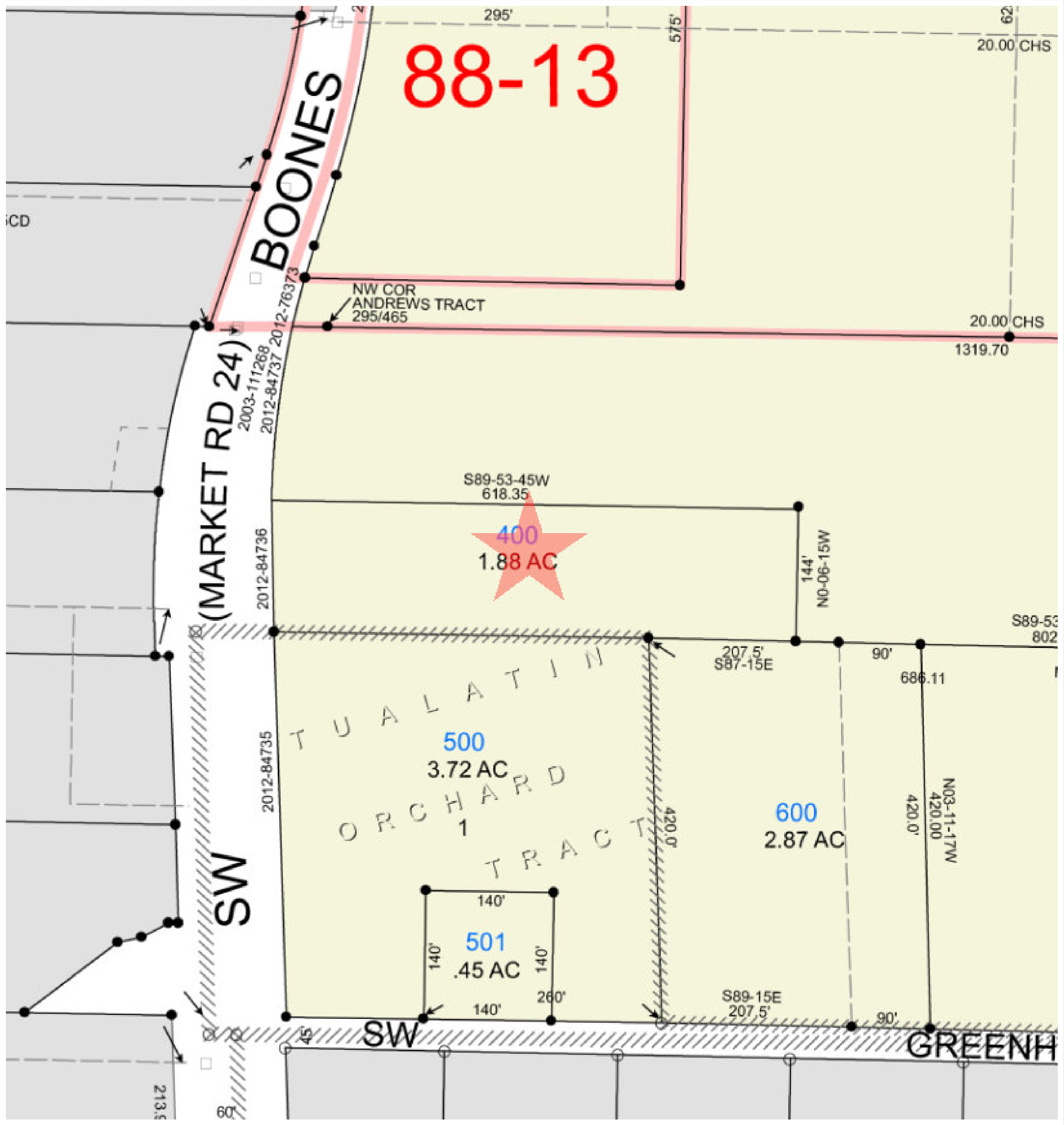
PROPERTY CHARACTERISTICS

Bedrooms:		Total SqFt:		Year Built:	
Baths, Total:		First Floor:		Eff Year Built:	
Baths, Full:		Second Floor:		Lot Size Ac:	1.88 Acres
Baths, Half:		Basement Fin:		Lot Size SF:	81,893 SqFt
Total Units:	1	Basement Unfin:		Lot Width:	
# Stories:		Basement Total:		Lot Depth:	
# Fireplaces:		Attic Fin:		Roof Material:	
Cooling:		Attic Unfin:		Roof Shape:	
Heating:		Attic Total:		Ext Walls:	
Building Style:		Garage:		Const Type:	

SALES AND LOAN INFORMATION

Owner	Date	Doc #	Sale Price	Deed Type	Loan Amt	Loan Type
AUTUMN SUNRISE LLC	02/04/2021	14624		Deed Of Trust	$2,500,000.00	Conventional
AUTUMN SUNRISE LLC	09/28/2007	0000105096	$7,143,000.00	Deed	$1,039,000.00	Conventional
KIMBALL HILL HOMES OREGON INC	10/03/2005	0000121808	$15,000,000.00	Mortgage	$9,800,000.00	Conv/Unk
ROOT HOLDINGS LLC	06/17/2005	0000069068	$200,000.00	Deed		Conv/Unk

Assessor Map

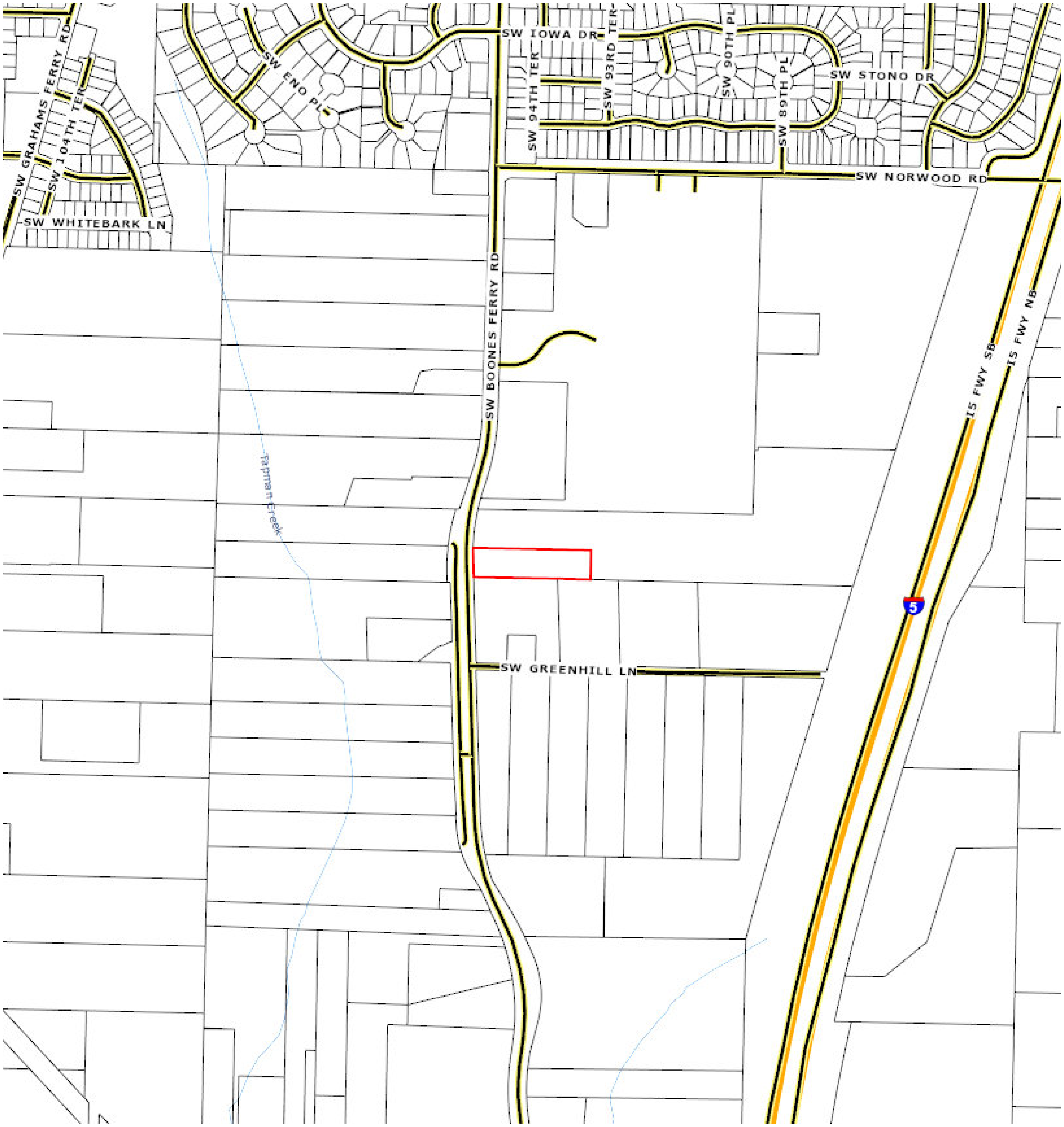


First American Title

Parcel ID: R560253

Site Address: 23740 SW Boones Ferry Rd

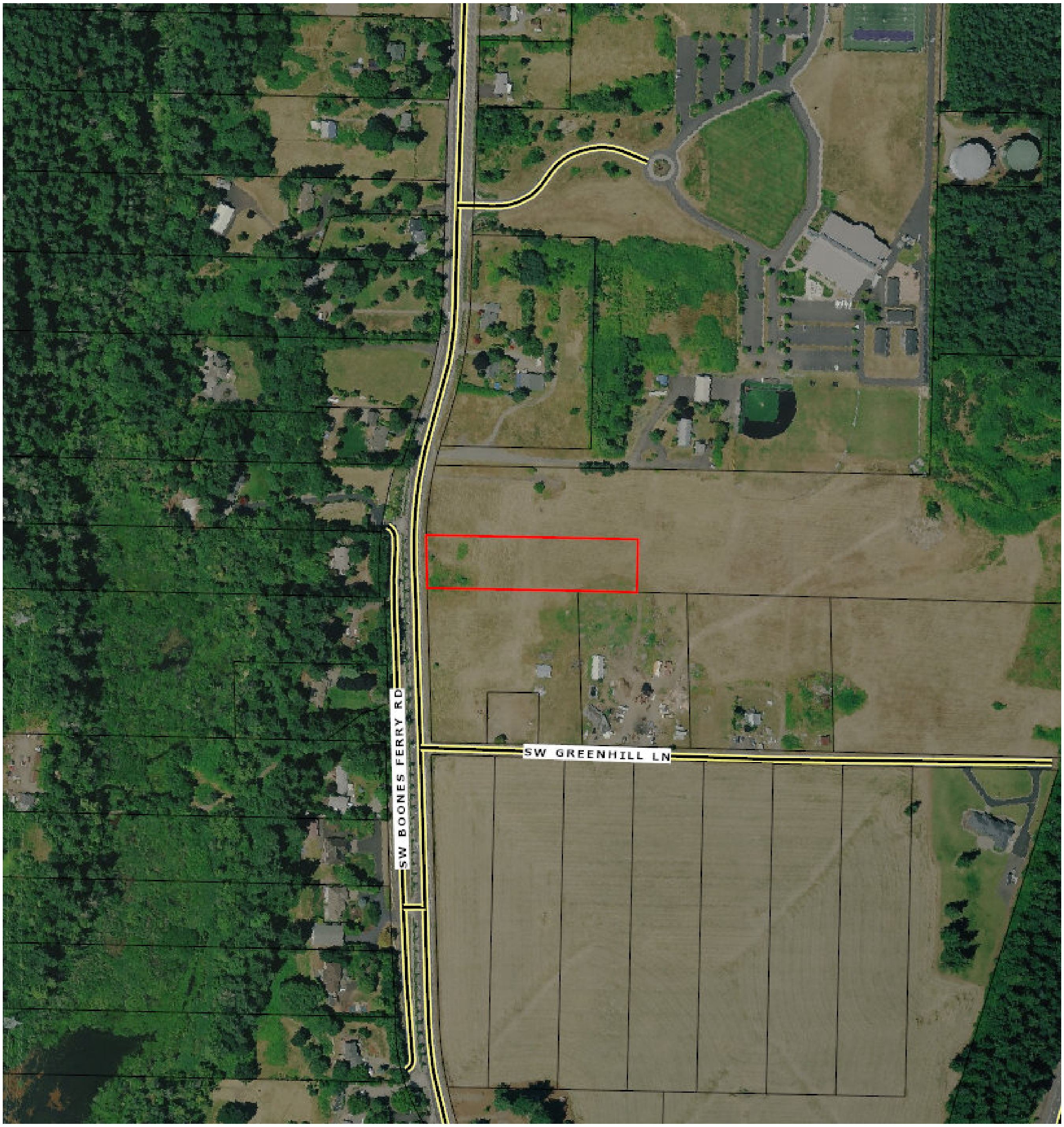
Street Map



First American Title

Parcel ID: R560253

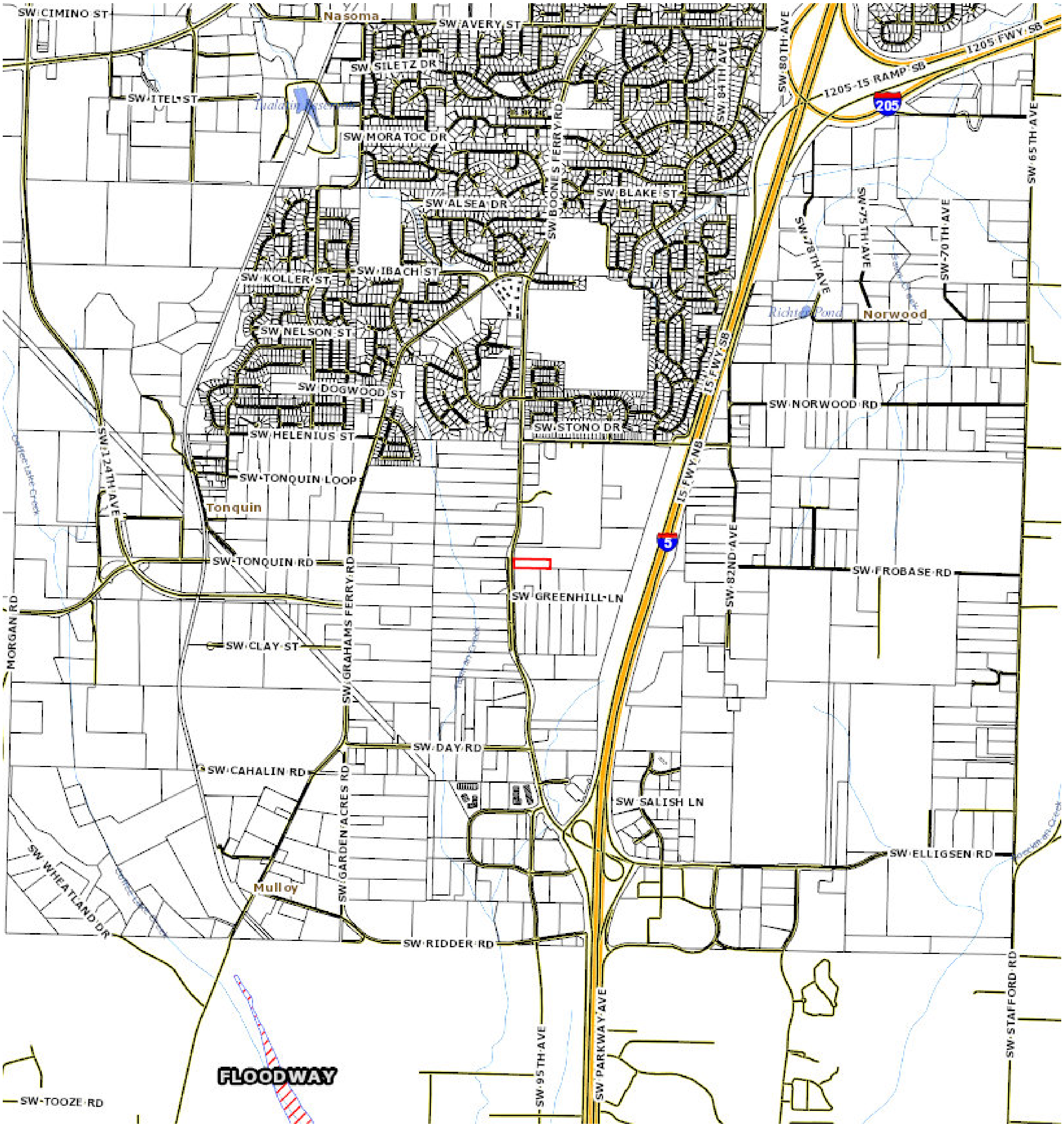
Aerial Map



First American Title

Parcel ID: R560253

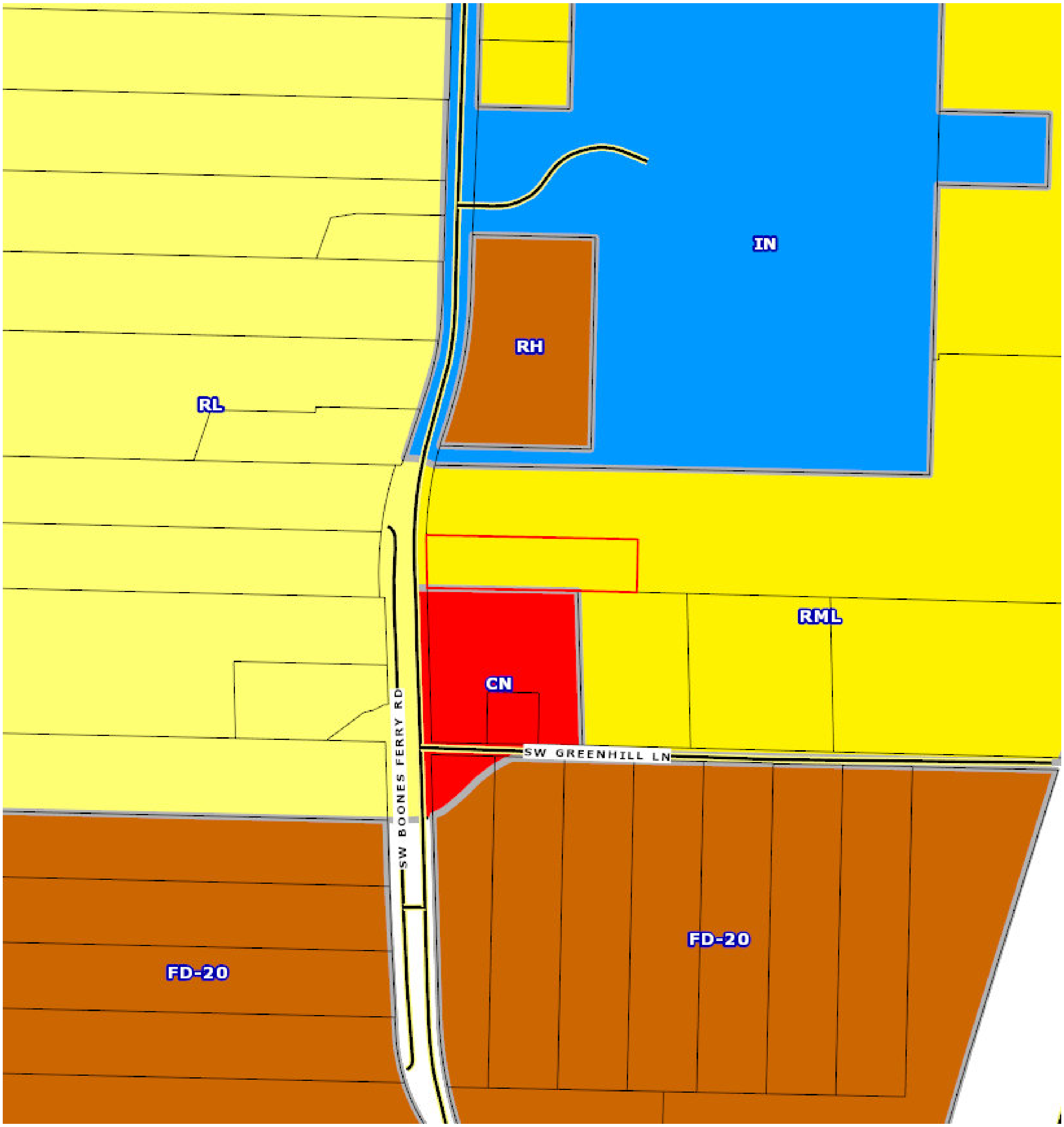
Flood Map - 100 Year



First American Title

Parcel ID: R560253

Zoning Map



First American Title

Parcel ID: R560253

2S
11
41

7,143

Washington County, Oregon 2007-105096
09/28/2007 03:29:27 PM
D-DW Cnt=1 Stn=16 D HOFFMAN
$25.00 $5.00 $11.00 $7,143.00 - Total = $7,184.00

01171368200701050960050056

I, Richard Hobernicht, Director of Assessment and Taxation and Ex-Officio County Clerk for Washington County, Oregon, do hereby certify that the within instrument of writing was received and recorded in the book of records of said county.

Richard Hobernicht
Richard Hobernicht, Director of Assessment and Taxation, Ex-Officio County Clerk

THIS SPACE RESERVE

After recording return to:
Autumn Sunrise LLC
1400 SW Schaeffer Road
West Linn, OR 97068

Until a change is requested all tax statements shall be sent to the following address:
Autumn Sunrise LLC
1400 SW Schaeffer Road
West Linn, OR 97068

File No.: 7073-1087491 (LSH)
Date: September 14, 2007

FATCO. NO. 1087491-LO

STATUTORY SPECIAL WARRANTY DEED

Kimball Hill Homes Oregon, Inc., an Oregon Corporation, Grantor, conveys and specially warrants to **Autumn Sunrise LLC, an Oregon limited liability company**, Grantee, the following described real property free of liens and encumbrances created or suffered by the Grantor, except as specifically set forth herein:

This property is free from liens and encumbrances, EXCEPT:

1. The **2007/08** Taxes, a lien not yet payable.
2. Covenants, conditions, restrictions and/or easements, if any, affecting title, which may appear in the public record, including those shown on any recorded plat or survey.

See Legal Description attached hereto as Exhibit A and by this reference incorporated herein.

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSON'S RIGHTS, IF ANY, UNDER ORS 197.352. THIS INSTRUMENT DOES NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY APPROVED USES, TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES AS DEFINED IN ORS 30.930 AND TO INQUIRE ABOUT THE RIGHTS OF NEIGHBORING PROPERTY OWNERS, IF ANY, UNDER ORS 197.352.

The true consideration for this conveyance is **$7,143,000.00**.

WASHINGTON COUNTY
REAL PROPERTY TRANSFER TAX
$ 7143.00 9-28-07
FEE PAID DATE

Dated this 26TH day of SEPTEMBER, 2007.

Kimball Hill Homes Oregon, Inc., an Oregon corporation

Dudley McGee

By: Dudley McGee, Vice President

STATE OF California)
)ss.
County of SACRAMENTO)

This instrument was acknowledged before me on this 26TH day of SEPTEMBER, 2007 by Dudley McGee as Vice President of Kimball Hill Homes Oregon, Inc., on behalf of the corporation.

SHARON K. BALL
Commission # 1484422
Notary Public - California
Sacramento County
My Comm. Expires Apr 20, 2008

Sharon K. Ball

Notary Public for California
My commission expires: APRIL 20, 2008

EXHIBIT A

LEGAL DESCRIPTION:

PARCEL I:

BEGINNING AT A POINT WHICH POINT IS 5 CHAINS SOUTH OF THE NORTHEAST CORNER OF THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, AND RUNNING THENCE SOUTH 5 CHAINS TO A POINT; THENCE WEST 20 CHAINS, MORE OR LESS, TO THE CENTER OF THE COUNTY ROAD; THENCE NORTHERLY ALONG THE CENTER OF SAID COUNTY ROAD TO THE SOUTHWEST CORNER OF THAT CERTAIN TRACT OF LAND CONVEYED BY ANNIE C. VOGET IN FEE SIMPLE REMAINDER TO BEN D. ANDREWS AND HARRIET K. ANDREWS AS DESCRIBED IN BOOK 294 PAGE 587, DEED RECORDS OF WASHINGTON COUNTY; THENCE EAST ALONG THE SOUTH LINE OF SAID TRACT SO CONVEYED TO BEN D. ANDREWS AND HARRIET K. ANDREWS AS DESCRIBED IN BOOK 294 PAGE 587, DEED RECORDS OF SAID COUNTY, TO THE POINT OF BEGINNING, EXCEPT THAT PORTION DESCRIBED IN CONTRACT OF SALE IN FAVOR OF ROBERT K. COLE, AND WIFE, RECORDED MARCH 25, 1968 IN BOOK 686, PAGE 495, RECORDS OF WASHINGTON COUNTY.

PARCEL II:

A TRACT OF LAND SITUATED IN THE SOUTH ONE-HALF OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST OF THE WILLAMETTE MERIDIAN, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON, AND BEING A PART OF THAT CERTAIN TRACT OF LAND DESCRIBED IN BOOK 294, PAGE 585, DEED OF RECORDS, WASHINGTON COUNTY, OREGON, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS, TO-WIT:

BEGINNING AT THE INTERSECTION OF THE WESTERLY LINE OF THE SOUTHEAST ONE-QUARTER OF SAID SECTION 35, WITH THE NORTHERLY LINE OF SAID TRACT OF LAND DESCRIBED IN BOOK 294, PAGE 585, DEED RECORDS. FROM SAID PLACE OF BEGINNING THENCE NORTH 89°53'45" EAST ALONG SAID NORTHERLY LINE OF SAID TRACT DESCRIBED IN BOOK 294, PAGE 585, 1319.70 FEET TO THE NORTHEAST CORNER OF SAID TRACT OF LAND; THENCE SOUTH 0°14' WEST 330.00 FEET TO THE NORTHERLY LINE OF TUALATIN ORCHARD TRACT; THENCE SOUTH 89°53'45" WEST ALONG SAID NORTHERLY LINE OF TUALATIN ORCHARD TRACT, 802.80 FEET; THENCE LEAVING SAID NORTHERLY LINE OF TUALATIN ORCHARD TRACT, NORTH 0°06'15" WEST 144 FEET; THENCE SOUTH 89°53'45" WEST PARALLEL WITH SAID NORTHERLY LINE OF TUALATIN ORCHARD TRACT, 618.35 FEET TO THE INTERSECTION OF EASTERLY RIGHT OF WAY LINE OF STATE HIGHWAY NO. 217; THENCE NORTHEASTERLY ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 883.87 FEET THROUGH A CENTRAL ANGLE OF 10°55'20" A DISTANCE OF 169.44 FEET TO A POINT OF TANGENT; THENCE NORTH 17°16' EAST 251.58 FEET; THENCE LEAVING SAID EASTERLY RIGHT OF WAY LINE OF STATE HIGHWAY NO. 217, NORTH 89°53'45" EAST 60.42 FEET TO THE PLACE OF BEGINNING.

TOGETHER WITH A PORTION OF PARCEL 1 OF THOSE CERTAIN TRACTS OF LAND IN THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON CONVEYED TO GRACE COMMUNITY CHURCH OF THE ASSEMBLIES OF GOD, INC., BY DEED RECORDED AS DOCUMENT NUMBER 200155727 WASHINGTON COUNTY, OREGON DEED RECORDS, SAID PORTION BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF THAT CERTAIN TRACT OF LAND CONVEYED TO GRACE COMMUNITY CHURCH BY DEED RECORDED AS DOCUMENT NUMBER 2002004397 SAID DEED RECORDS AND RUNNING THENCE ALONG THE BOUNDARY OF SAID PARCEL 1, NORTH 89°34'48" EAST 485.62 FEET, NORTH 15°44'54" EAST 690.21 FEET, SOUTH 89°35'49" WEST 674.70 FEET SOUTH 00°09'07" EAST 16.50 FEET AND SOUTH 89°38'49" WEST 16.50 FEET; THENCE SOUTH 00°09'07" EAST 313.47 FEET TO A POINT ON THE NORTH LINE OF SAID DOCUMENT NUMBER 2002004397; THENCE ALONG THE BOUNDARY THEREOF NORTH 89°36'05" EAST 16.50 FEET AND SOUTH 00°08'37" EAST 313.16 FEET TO THE POINT OF BEGINNING.

PARCEL III:

LOT 1, TUALATIN ORCHARDS TRACT, EXCEPTING THE WEST 140 FEET OF THE EAST 260 FEET OF THE SOUTH 140 FEET, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON.

PARCEL IV:

THE WEST 140 FEET OF THE EAST 260 FEET OF THE SOUTH 140 FEET OF LOT 1, TUALATIN ORCHARD TRACTS, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON.

PARCEL V:

THE WESTERLY MOST 207.5 FEET, BEING A PORTION OF THAT CERTAIN TRACT OF LAND LOCATED IN SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST OF THE WILLAMETTE MERIDIAN, CONVEYED BY GRACE SCHUSTER TO JOHN DAY AND JESSIE DAY, UNDER DATE OF APRIL 20, 1949, AS SET FORTH IN DEED RECORDED IN BOOK 294 AT PAGE 446, DEED RECORDS, SAID TRACT SO CONVEYED, OF WHICH THE LAND HEREBY CONVEYED FORMS A PART, BEING DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN; THENCE NORTH 233 FEET; THENCE NORTH 87°15' WEST 1255.52 FEET TO THE SOUTHEAST CORNER OF THE TRACT HEREBY CONVEYED; THENCE NORTH 420 FEET ALONG THE WEST LINE OF LOT 4, TUALATIN ORCHARD TRACTS, TO THE SOUTH LINE OF TRACT CONVEYED BY DEED TO GEORGE ANDREWS, ET AL, IN BOOK 70, PAGE 374, RECORDED DECEMBER 27, 1905; THENCE NORTH 87°15' WEST 990.32 FEET ALONG THE SOUTH LINE OF SAID ANDREWS TRACT; THENCE SOUTH 420 FEET ALONG THE EAST LINE OF LOT 1, TUALATIN ORCHARDS TRACTS; THENCE SOUTH 87°15' EAST 990.32 FEET TO THE SOUTHEAST CORNER OF PROPERTY HEREBY CONVEYED.

PARCEL VI:

BEGINNING AT THE NORTHEAST CORNER OF TRACT 1, TUALATIN ORCHARD TRACTS, A DULY RECORDED SUBDIVISION IN SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON; THENCE SOUTH 87°15' EAST 207.5 FEET TO THE POINT OF TRUE BEGINNING OF THIS DIRECTION; THENCE SOUTH PARALLEL TO THE EAST LINE OF SAID TRACT 1, TUALATIN ORCHARD TRACTS, AND 207.5 FEET EASTERLY THEREFROM 420.0 FEET TO A POINT; THENCE SOUTH 87°15' EAST 90 FEET TO A POINT; THENCE NORTH PARALLEL TO THE EAST LINE OF SAID TRACT 1, 420.0 FEET; THENCE NORTH 87°15' WEST 90 FEET TO THE POINT OF TRUE BEGINNING OF THIS DESCRIPTION.

PARCEL VII:

A TRACT OF LAND IN THE SOUTHEAST 1/4 OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF LOT 12, TUALATIN ORCHARD TRACTS; THENCE NORTH 89°44'43" EAST 1159.47 FEET; THENCE NORTH 3°00'17" WEST 880.00 FEET TO A POINT ON A LINE EXTENDED FROM THE NORTHEAST CORNER OF LOT 1, TUALATIN ORCHARD TRACTS TO THE NORTHWEST CORNER OF LOT 4, TUALATIN ORCHARD TRACTS, SAID POINT FALLING NORTH 89°44'43" EAST 686.11 FEET FROM THE NORTHEAST CORNER OF SAID LOT 1 AND BEING THE TRUE POINT OF BEGINNING; THENCE SOUTH 3°00'17" EAST 420.00 FEET TO A POINT ON THE NORTH RIGHT OF WAY LINE OF GREENHILL LANE; THENCE WESTERLY ALONG SAID RIGHT OF WAY LINE SOUTH 89°44'43" WEST 389.06 FEET; THENCE NORTH 3°00'17" WEST 420.00 FEET; THENCE NORTH 89°44'43" EAST 389.06 FEET TO THE TRUE POINT OF BEGINNING.

PARCEL VIII:

A TRACT OF LAND IN THE SOUTHEAST 1/4 OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF LOT 12, TUALATIN ORCHARD TRACTS; THENCE NORTH 89°44'43" EAST 1159.47 FEET; THENCE NORTH 3°00'17" WEST 880.00 FEET TO A POINT ON A LINE EXTENDED FROM THE NORTHEAST CORNER OF LOT 1, TUALATIN ORCHARD TRACTS TO THE NORTHWEST CORNER OF LOT 4, TUALATIN ORCHARDS TRACTS, SAID POINT FALLING NORTH 89°44'43" EAST 686.11 FEET FROM THE NORTHEAST CORNER OF SAID LOT 1 AND BEING THE TRUE POINT OF BEGINNING; THENCE NORTH 89°44'43" EAST 763.79 FEET TO A POINT ON THE WESTERLY RIGHT OF WAY OF THE BALDOCK FREEWAY; THENCE SOUTH 15°49'15" WEST 436.59 FEET ALONG SAID RIGHT OF WAY TO THE NORTH RIGHT OF WAY LINE OF GREENHILL LANE; THENCE WESTERLY ALONG SAID RIGHT OF WAY SOUTH 89°44'43' WEST 622.75 FEET; THENCE NORTH 3°00'17" WEST 420.00 FEET TO THE TRUE POINT OF BEGINNING.

FIRST AMERICAN TITLE

Property Research Report

SUBJECT PROPERTY
23620 SW Boones Ferry Rd
R560262
2S135D000401
Washington

OWNER
Autumn Sunrise LLC

DATE PREPARED
06/14/2021

PREPARED BY
khaight@firstam.com

First American Title

Customer Service 503.219.8746
cs.oregon@firstam.com

First American Title

Customer Service Department
Phone: 503.219.TRIO (8746)
Fax: 503.790.7872
Email: cs.oregon@firstam.com

Date: 6/14/2021

OWNERSHIP INFORMATION

Owner: Autumn Sunrise LLC
CoOwner:
Site: 23620 SW Boones Ferry Rd Tualatin OR 97062
Mail: 485 S State St Lake Oswego OR 97034

Parcel #: R560262
Ref Parcel #: 2S135D000401
TRS: 02S / 01W / 35 / SE
County: Washington

PROPERTY DESCRIPTION

Map Grid: 715-E1
Census Tract: 032110 Block: 1004
Neighborhood: Cio 6 Byrom
School Dist: 88J Sherwood
Impr Type:
Subdiv/Plat:
Land Use: 1910 - Urban Developable Tract Improved
Std Land Use: RSFR - Single Family Residence
Zoning: Tualatin-RML - Medium-Low Density Residential
Lat/Lon: 45.3486529 / -122.77095718
Watershed: Abernethy Creek-Willamette River
Legal: ACRES 17.55

ASSESSMENT AND TAXATION

Market Land: $3,205,160.00
Market Impr: $0.00
Market Special: $0.00
Market Total: $3,205,160.00 (2020)
% Improved: 0.00%
Assessed Total: $663,540.00 (2021)
Levy Code: 88.15
Tax: $12,045.30 (2020)
Millage Rate: 18.1531
Exemption:
Exemption Type:

PROPERTY CHARACTERISTICS

Bedrooms: 3
Baths, Total: 2
Baths, Full: 2
Baths, Half:
Total Units:
Stories:
Fireplaces: 1
Cooling:
Heating: Forced Air
Building Style: RS0 - Single Family

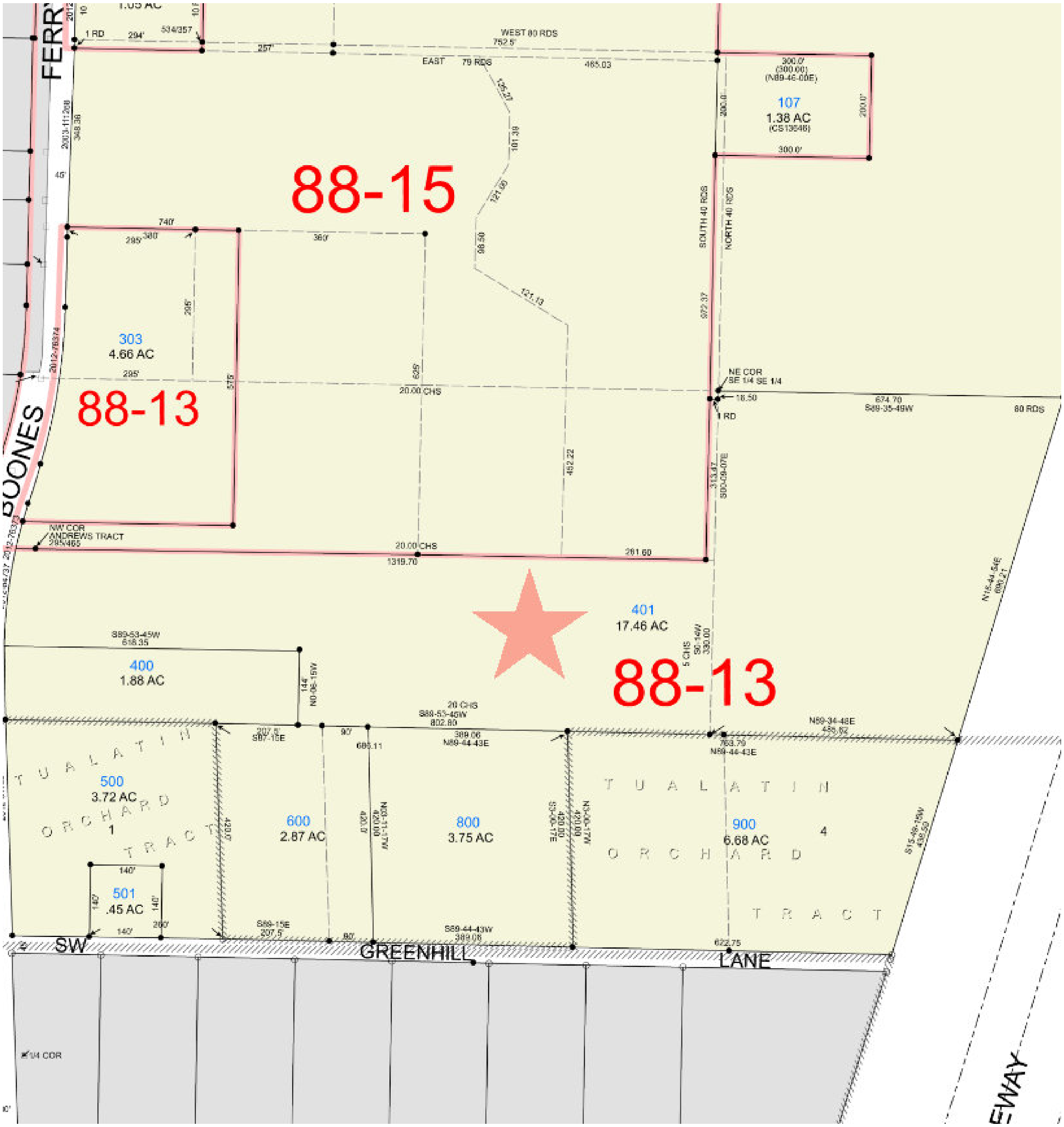
Total SqFt: 1,414 SqFt
First Floor: 1,414 SqFt
Second Floor:
Basement Fin:
Basement Unfin:
Basement Total:
Attic Fin:
Attic Unfin:
Attic Total:
Garage: Finished Garage 420 SqFt

Year Built: 1970
Eff Year Built: 1999
Lot Size Ac: 17.55 Acres
Lot Size SF: 764,478 SqFt
Lot Width:
Lot Depth:
Roof Material: Compostion Shingle
Roof Shape: Gable
Ext Walls: Wood
Const Type: Wood

SALES AND LOAN INFORMATION

Owner	Date	Doc #	Sale Price	Deed Type	Loan Amt	Loan Type
OWNER NAME UNAVAILABLE	09/28/2007	0000105096		Quit Claim	$1,039,000.00	Conventional
AUTUMN SUNRISE LLC	09/28/2007	2007105096	$7,143,000.00	DW		
GRACE COMMUNITY CHURCH	06/17/2005	0000069065		Deed Of Trust	$4,500,000.00	Conv/Unk
GRACE COMMUNITY CHURCH	01/11/2002	4397	$537,890.00	Deed		Conv/Unk

Assessor Map

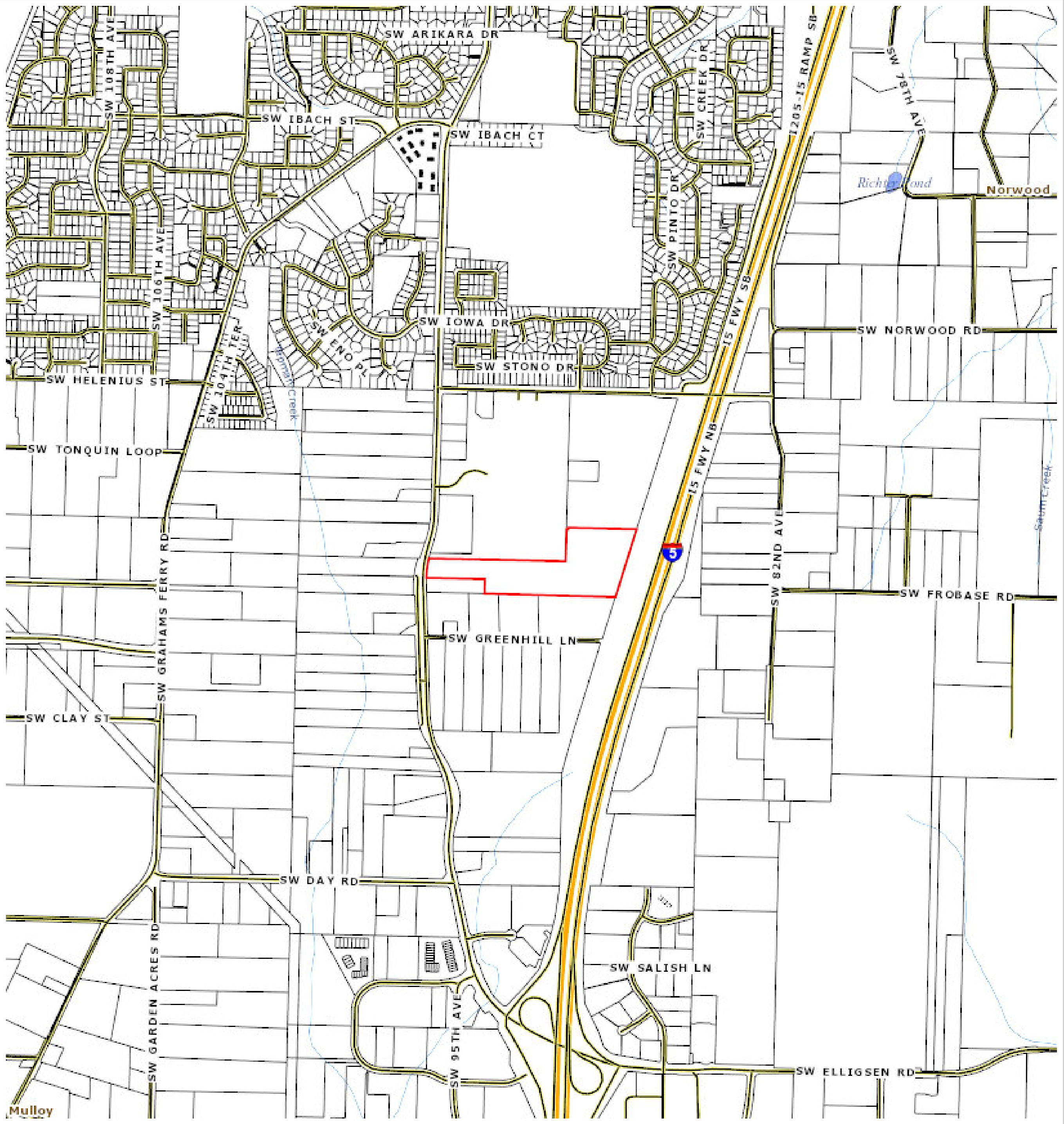


First American Title

Parcel ID: R560262

Site Address: 23620 SW Boones Ferry Rd

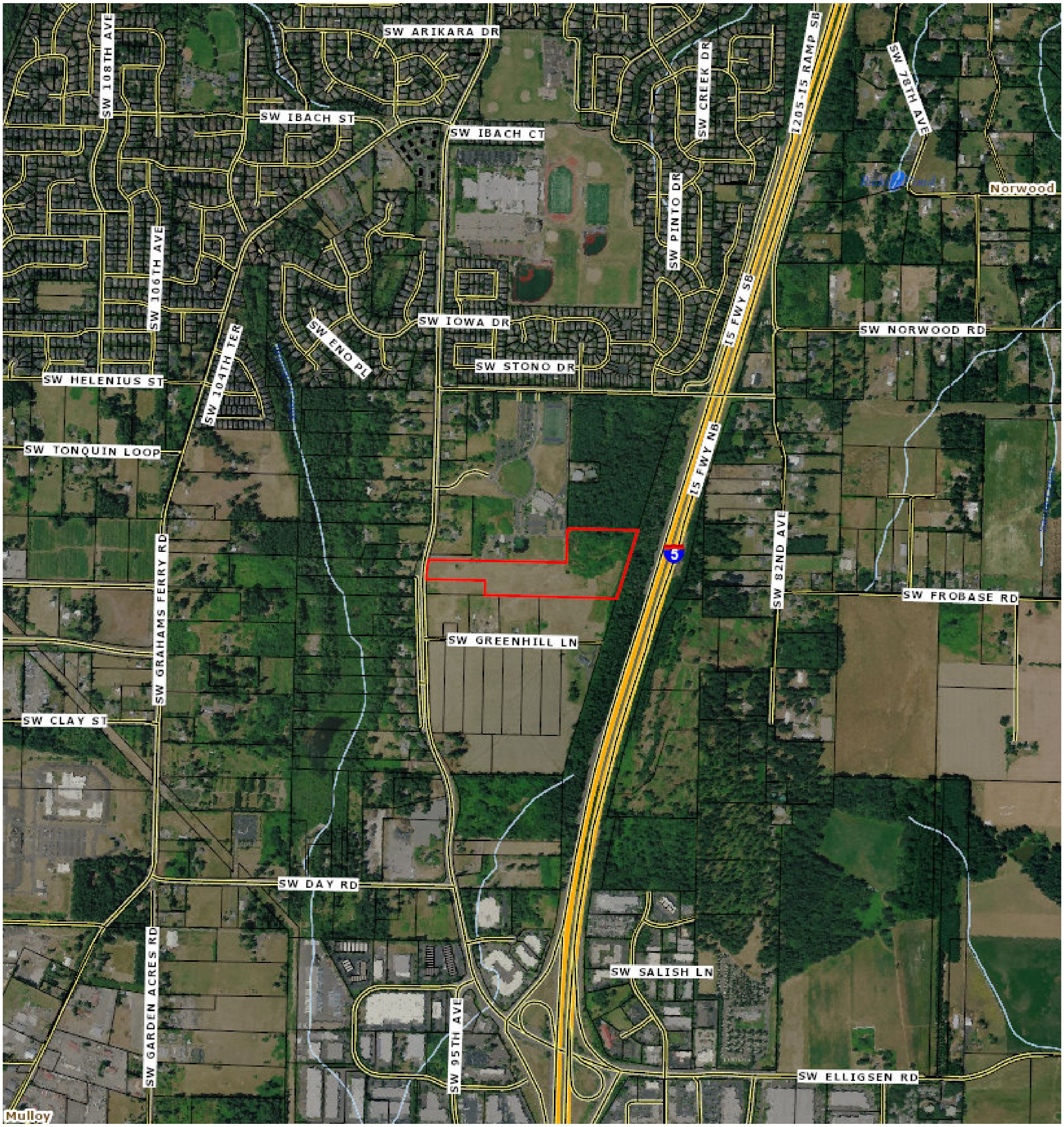
Street Map



First American Title

Parcel ID: R560262

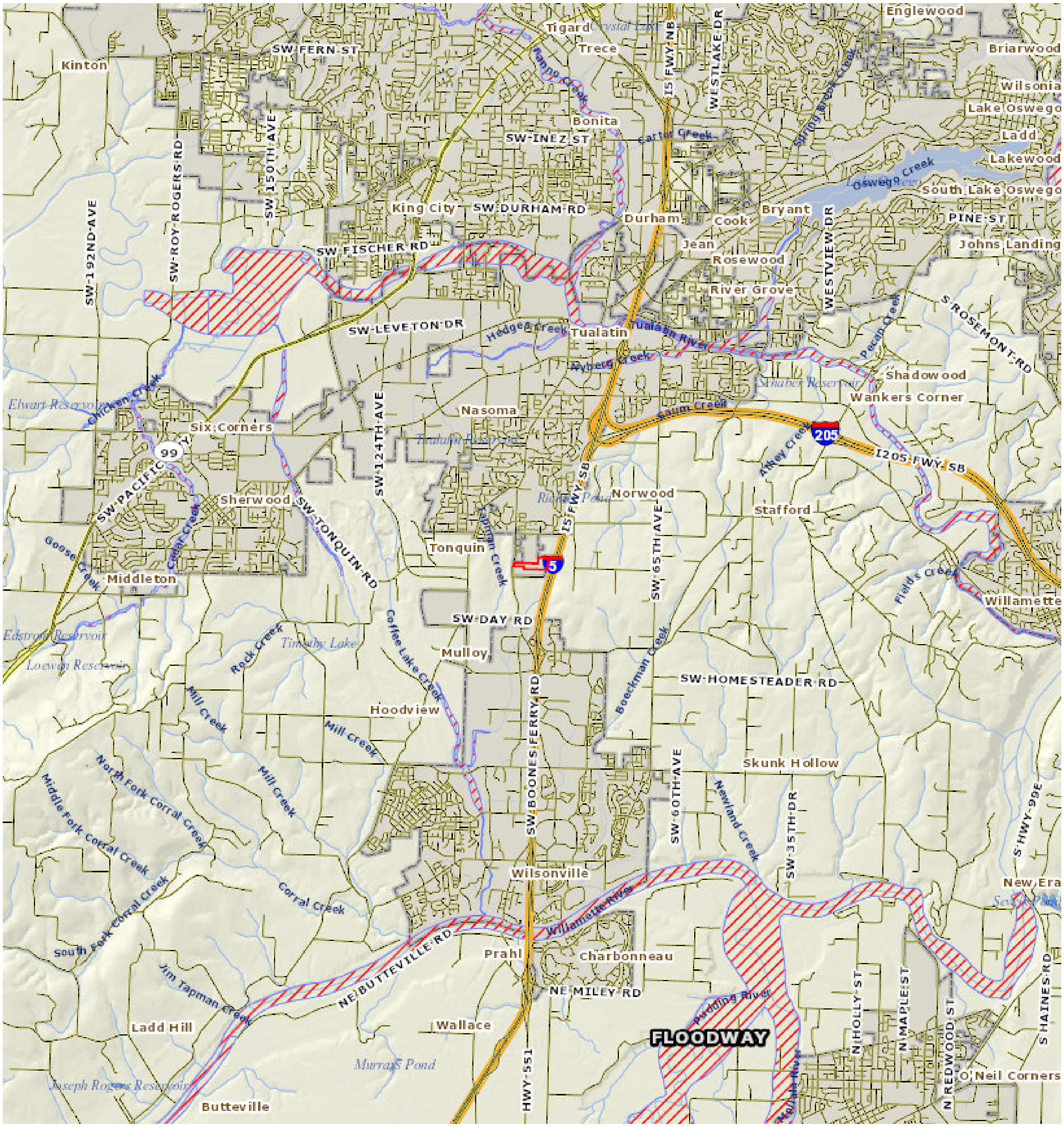
Aerial Map



First American Title

Parcel ID: R560262

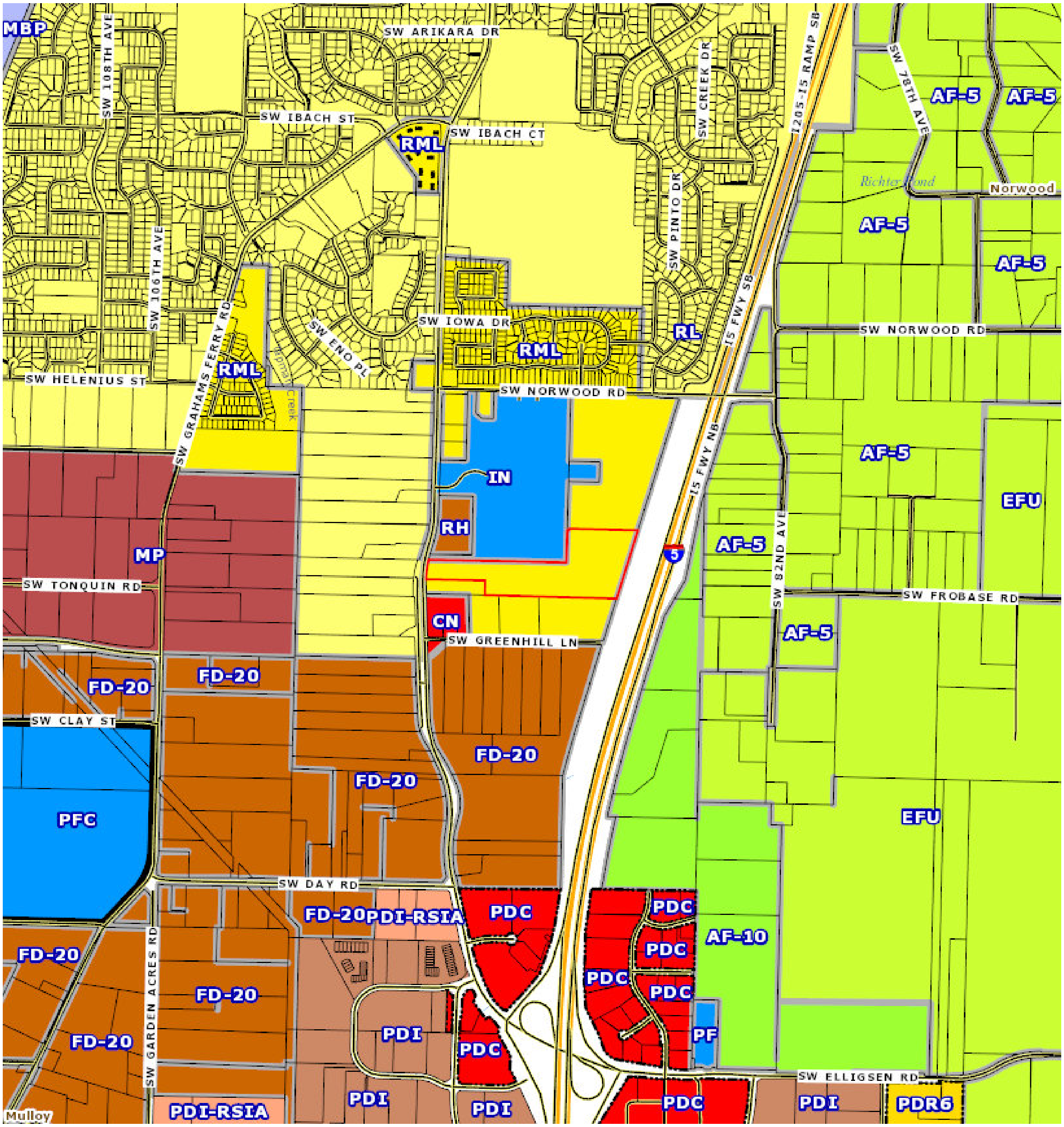
Flood Map - 100 Year



First American Title

Parcel ID: R560262

Zoning Map



First American Title

Parcel ID: R560262

2S
11
41

7,143

FIRST AMERICAN

Washington County, Oregon
09/28/2007 03:29:27 PM
D-DW Cnt=1 Stn=16 D HOFFMAN
$25.00 $5.00 $11.00 $7,143.00 - Total = $7,184.00

2007-105096

01171368200701050960050056

I, Richard Hobernicht, Director of Assessment and Taxation and Ex-Officio County Clerk for Washington County, Oregon, do hereby certify that the within instrument of writing was received and recorded in the book of records of said county.

Richard Hobernicht

Richard Hobernicht, Director of Assessment and Taxation, Ex-Officio County Clerk

THIS SPACE RESERVE

After recording return to:
Autumn Sunrise LLC
1400 SW Schaeffer Road
West Linn, OR 97068

Until a change is requested all tax statements shall be sent to the following address:
Autumn Sunrise LLC
1400 SW Schaeffer Road
West Linn, OR 97068

File No.: 7073-1087491 (LSH)
Date: September 14, 2007

FATCO. NO. 1087491-LO

STATUTORY SPECIAL WARRANTY DEED

Kimball Hill Homes Oregon, Inc., an Oregon Corporation, Grantor, conveys and specially warrants to **Autumn Sunrise LLC, an Oregon limited liability company**, Grantee, the following described real property free of liens and encumbrances created or suffered by the Grantor, except as specifically set forth herein:

This property is free from liens and encumbrances, EXCEPT:

1. The **2007/08** Taxes, a lien not yet payable.
2. Covenants, conditions, restrictions and/or easements, if any, affecting title, which may appear in the public record, including those shown on any recorded plat or survey.

See Legal Description attached hereto as Exhibit A and by this reference incorporated herein.

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSON'S RIGHTS, IF ANY, UNDER ORS 197.352. THIS INSTRUMENT DOES NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY APPROVED USES, TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES AS DEFINED IN ORS 30.930 AND TO INQUIRE ABOUT THE RIGHTS OF NEIGHBORING PROPERTY OWNERS, IF ANY, UNDER ORS 197.352.

The true consideration for this conveyance is **$7,143,000.00**.

WASHINGTON COUNTY
REAL PROPERTY TRANSFER TAX
$ 7143.00 9-28-07
FEE PAID DATE

Dated this 26TH day of SEPTEMBER, 2007.

Kimball Hill Homes Oregon, Inc., an Oregon corporation

Dudley McGee

By: Dudley McGee, Vice President

STATE OF California)
)ss.
County of SACRAMENTO)

This instrument was acknowledged before me on this 26TH day of SEPTEMBER, 2007 by Dudley McGee as Vice President of Kimball Hill Homes Oregon, Inc., on behalf of the corporation.

SHARON K. BALL
Commission # 1484422
Notary Public - California
Sacramento County
My Comm. Expires Apr 20, 2008

Sharon K. Ball

Notary Public for California
My commission expires: APRIL 20, 2008

EXHIBIT A

LEGAL DESCRIPTION:

PARCEL I:

BEGINNING AT A POINT WHICH POINT IS 5 CHAINS SOUTH OF THE NORTHEAST CORNER OF THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, AND RUNNING THENCE SOUTH 5 CHAINS TO A POINT; THENCE WEST 20 CHAINS, MORE OR LESS, TO THE CENTER OF THE COUNTY ROAD; THENCE NORTHERLY ALONG THE CENTER OF SAID COUNTY ROAD TO THE SOUTHWEST CORNER OF THAT CERTAIN TRACT OF LAND CONVEYED BY ANNIE C. VOGET IN FEE SIMPLE REMAINDER TO BEN D. ANDREWS AND HARRIET K. ANDREWS AS DESCRIBED IN BOOK 294 PAGE 587, DEED RECORDS OF WASHINGTON COUNTY; THENCE EAST ALONG THE SOUTH LINE OF SAID TRACT SO CONVEYED TO BEN D. ANDREWS AND HARRIET K. ANDREWS AS DESCRIBED IN BOOK 294 PAGE 587, DEED RECORDS OF SAID COUNTY, TO THE POINT OF BEGINNING, EXCEPT THAT PORTION DESCRIBED IN CONTRACT OF SALE IN FAVOR OF ROBERT K. COLE, AND WIFE, RECORDED MARCH 25, 1968 IN BOOK 686, PAGE 495, RECORDS OF WASHINGTON COUNTY.

PARCEL II:

A TRACT OF LAND SITUATED IN THE SOUTH ONE-HALF OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST OF THE WILLAMETTE MERIDIAN, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON, AND BEING A PART OF THAT CERTAIN TRACT OF LAND DESCRIBED IN BOOK 294, PAGE 585, DEED OF RECORDS, WASHINGTON COUNTY, OREGON, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS, TO-WIT:

BEGINNING AT THE INTERSECTION OF THE WESTERLY LINE OF THE SOUTHEAST ONE-QUARTER OF SAID SECTION 35, WITH THE NORTHERLY LINE OF SAID TRACT OF LAND DESCRIBED IN BOOK 294, PAGE 585, DEED RECORDS. FROM SAID PLACE OF BEGINNING THENCE NORTH 89°53'45" EAST ALONG SAID NORTHERLY LINE OF SAID TRACT DESCRIBED IN BOOK 294, PAGE 585, 1319.70 FEET TO THE NORTHEAST CORNER OF SAID TRACT OF LAND; THENCE SOUTH 0°14' WEST 330.00 FEET TO THE NORTHERLY LINE OF TUALATIN ORCHARD TRACT; THENCE SOUTH 89°53'45" WEST ALONG SAID NORTHERLY LINE OF TUALATIN ORCHARD TRACT, 802.80 FEET; THENCE LEAVING SAID NORTHERLY LINE OF TUALATIN ORCHARD TRACT, NORTH 0°06'15" WEST 144 FEET; THENCE SOUTH 89°53'45" WEST PARALLEL WITH SAID NORTHERLY LINE OF TUALATIN ORCHARD TRACT, 618.35 FEET TO THE INTERSECTION OF EASTERLY RIGHT OF WAY LINE OF STATE HIGHWAY NO. 217; THENCE NORTHEASTERLY ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 883.87 FEET THROUGH A CENTRAL ANGLE OF 10°55'20" A DISTANCE OF 169.44 FEET TO A POINT OF TANGENT; THENCE NORTH 17°16' EAST 251.58 FEET; THENCE LEAVING SAID EASTERLY RIGHT OF WAY LINE OF STATE HIGHWAY NO. 217, NORTH 89°53'45" EAST 60.42 FEET TO THE PLACE OF BEGINNING.

TOGETHER WITH A PORTION OF PARCEL 1 OF THOSE CERTAIN TRACTS OF LAND IN THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON CONVEYED TO GRACE COMMUNITY CHURCH OF THE ASSEMBLIES OF GOD, INC., BY DEED RECORDED AS DOCUMENT NUMBER 200155727 WASHINGTON COUNTY, OREGON DEED RECORDS, SAID PORTION BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF THAT CERTAIN TRACT OF LAND CONVEYED TO GRACE COMMUNITY CHURCH BY DEED RECORDED AS DOCUMENT NUMBER 2002004397 SAID DEED RECORDS AND RUNNING THENCE ALONG THE BOUNDARY OF SAID PARCEL 1, NORTH 89°34'48" EAST 485.62 FEET, NORTH 15°44'54" EAST 690.21 FEET, SOUTH 89°35'49" WEST 674.70 FEET SOUTH 00°09'07" EAST 16.50 FEET AND SOUTH 89°38'49" WEST 16.50 FEET; THENCE SOUTH 00°09'07" EAST 313.47 FEET TO A POINT ON THE NORTH LINE OF SAID DOCUMENT NUMBER 2002004397; THENCE ALONG THE BOUNDARY THEREOF NORTH 89°36'05" EAST 16.50 FEET AND SOUTH 00°08'37" EAST 313.16 FEET TO THE POINT OF BEGINNING.

PARCEL III:

LOT 1, TUALATIN ORCHARDS TRACT, EXCEPTING THE WEST 140 FEET OF THE EAST 260 FEET OF THE SOUTH 140 FEET, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON.

PARCEL IV:

THE WEST 140 FEET OF THE EAST 260 FEET OF THE SOUTH 140 FEET OF LOT 1, TUALATIN ORCHARD TRACTS, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON.

PARCEL V:

THE WESTERLY MOST 207.5 FEET, BEING A PORTION OF THAT CERTAIN TRACT OF LAND LOCATED IN SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST OF THE WILLAMETTE MERIDIAN, CONVEYED BY GRACE SCHUSTER TO JOHN DAY AND JESSIE DAY, UNDER DATE OF APRIL 20, 1949, AS SET FORTH IN DEED RECORDED IN BOOK 294 AT PAGE 446, DEED RECORDS, SAID TRACT SO CONVEYED, OF WHICH THE LAND HEREBY CONVEYED FORMS A PART, BEING DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN; THENCE NORTH 233 FEET; THENCE NORTH 87°15' WEST 1255.52 FEET TO THE SOUTHEAST CORNER OF THE TRACT HEREBY CONVEYED; THENCE NORTH 420 FEET ALONG THE WEST LINE OF LOT 4, TUALATIN ORCHARD TRACTS, TO THE SOUTH LINE OF TRACT CONVEYED BY DEED TO GEORGE ANDREWS, ET AL, IN BOOK 70, PAGE 374, RECORDED DECEMBER 27, 1905; THENCE NORTH 87°15' WEST 990.32 FEET ALONG THE SOUTH LINE OF SAID ANDREWS TRACT; THENCE SOUTH 420 FEET ALONG THE EAST LINE OF LOT 1, TUALATIN ORCHARDS TRACTS; THENCE SOUTH 87°15' EAST 990.32 FEET TO THE SOUTHEAST CORNER OF PROPERTY HEREBY CONVEYED.

PARCEL VI:

BEGINNING AT THE NORTHEAST CORNER OF TRACT 1, TUALATIN ORCHARD TRACTS, A DULY RECORDED SUBDIVISION IN SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON; THENCE SOUTH 87°15' EAST 207.5 FEET TO THE POINT OF TRUE BEGINNING OF THIS DIRECTION; THENCE SOUTH PARALLEL TO THE EAST LINE OF SAID TRACT 1, TUALATIN ORCHARD TRACTS, AND 207.5 FEET EASTERLY THEREFROM 420.0 FEET TO A POINT; THENCE SOUTH 87°15' EAST 90 FEET TO A POINT; THENCE NORTH PARALLEL TO THE EAST LINE OF SAID TRACT 1, 420.0 FEET; THENCE NORTH 87°15' WEST 90 FEET TO THE POINT OF TRUE BEGINNING OF THIS DESCRIPTION.

PARCEL VII:

A TRACT OF LAND IN THE SOUTHEAST 1/4 OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF LOT 12, TUALATIN ORCHARD TRACTS; THENCE NORTH 89°44'43" EAST 1159.47 FEET; THENCE NORTH 3°00'17" WEST 880.00 FEET TO A POINT ON A LINE EXTENDED FROM THE NORTHEAST CORNER OF LOT 1, TUALATIN ORCHARD TRACTS TO THE NORTHWEST CORNER OF LOT 4, TUALATIN ORCHARD TRACTS, SAID POINT FALLING NORTH 89°44'43" EAST 686.11 FEET FROM THE NORTHEAST CORNER OF SAID LOT 1 AND BEING THE TRUE POINT OF BEGINNING; THENCE SOUTH 3°00'17" EAST 420.00 FEET TO A POINT ON THE NORTH RIGHT OF WAY LINE OF GREENHILL LANE; THENCE WESTERLY ALONG SAID RIGHT OF WAY LINE SOUTH 89°44'43" WEST 389.06 FEET; THENCE NORTH 3°00'17" WEST 420.00 FEET; THENCE NORTH 89°44'43" EAST 389.06 FEET TO THE TRUE POINT OF BEGINNING.

PARCEL VIII:

A TRACT OF LAND IN THE SOUTHEAST 1/4 OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF LOT 12, TUALATIN ORCHARD TRACTS; THENCE NORTH 89°44'43" EAST 1159.47 FEET; THENCE NORTH 3°00'17" WEST 880.00 FEET TO A POINT ON A LINE EXTENDED FROM THE NORTHEAST CORNER OF LOT 1, TUALATIN ORCHARD TRACTS TO THE NORTHWEST CORNER OF LOT 4, TUALATIN ORCHARDS TRACTS, SAID POINT FALLING NORTH 89°44'43" EAST 686.11 FEET FROM THE NORTHEAST CORNER OF SAID LOT 1 AND BEING THE TRUE POINT OF BEGINNING; THENCE NORTH 89°44'43" EAST 763.79 FEET TO A POINT ON THE WESTERLY RIGHT OF WAY OF THE BALDOCK FREEWAY; THENCE SOUTH 15°49'15" WEST 436.59 FEET ALONG SAID RIGHT OF WAY TO THE NORTH RIGHT OF WAY LINE OF GREENHILL LANE; THENCE WESTERLY ALONG SAID RIGHT OF WAY SOUTH 89°44'43' WEST 622.75 FEET; THENCE NORTH 3°00'17" WEST 420.00 FEET TO THE TRUE POINT OF BEGINNING.

FIRST AMERICAN TITLE

Property Research Report

SUBJECT PROPERTY
Ns
R560271
2S135D000500
Washington

OWNER
Autumn Sunrise LLC

DATE PREPARED
06/14/2021

PREPARED BY
khaight@firstam.com

First American Title

Customer Service 503.219.8746
cs.oregon@firstam.com

First American Title

Customer Service Department
Phone: 503.219.TRIO (8746)
Fax: 503.790.7872
Email: cs.oregon@firstam.com
Date: 6/14/2021

OWNERSHIP INFORMATION

Owner: Autumn Sunrise LLC
CoOwner:
Site: Ns Tualatin OR 97062
Mail: 485 S State St Lake Oswego OR 97034

Parcel #: R560271
Ref Parcel #: 2S135D000500
TRS: 02S / 01W / 35 / SE
County: Washington

PROPERTY DESCRIPTION

Map Grid: 715-E1
Census Tract: 032110 Block: 1004
Neighborhood: Cpo 5 Sherwood-Tualatin S1
School Dist: 88J Sherwood
Impr Type: G - General Improvements
Subdiv/Plat: Tualatin Orchard Tract
Land Use: 1900 - Urban Developable Tract - Vacant
Std Land Use: RCON - Condominium, Pud
Zoning: Tualatin-CN - Neighborhood Commercial
Lat/Lon: 45.34779775 / -122.77411217
Watershed: Abernethy Creek-Willamette River
Legal: TUALATIN ORCHARD TRACT, LOT PT 1, ACRES 3.72

ASSESSMENT AND TAXATION

Market Land: $776,760.00
Market Impr: $1,610.00
Market Special: $0.00
Market Total: $778,370.00 (2020)
% Improved: 0.00%
Assessed Total: $87,240.00 (2021)
Levy Code: 88.15
Tax: $1,583.68 (2020)
Millage Rate: 18.1531
Exemption:
Exemption Type:

PROPERTY CHARACTERISTICS

Bedrooms:
Baths, Total:
Baths, Full:
Baths, Half:
Total Units: 1
Stories:
Fireplaces:
Cooling:
Heating:
Building Style:

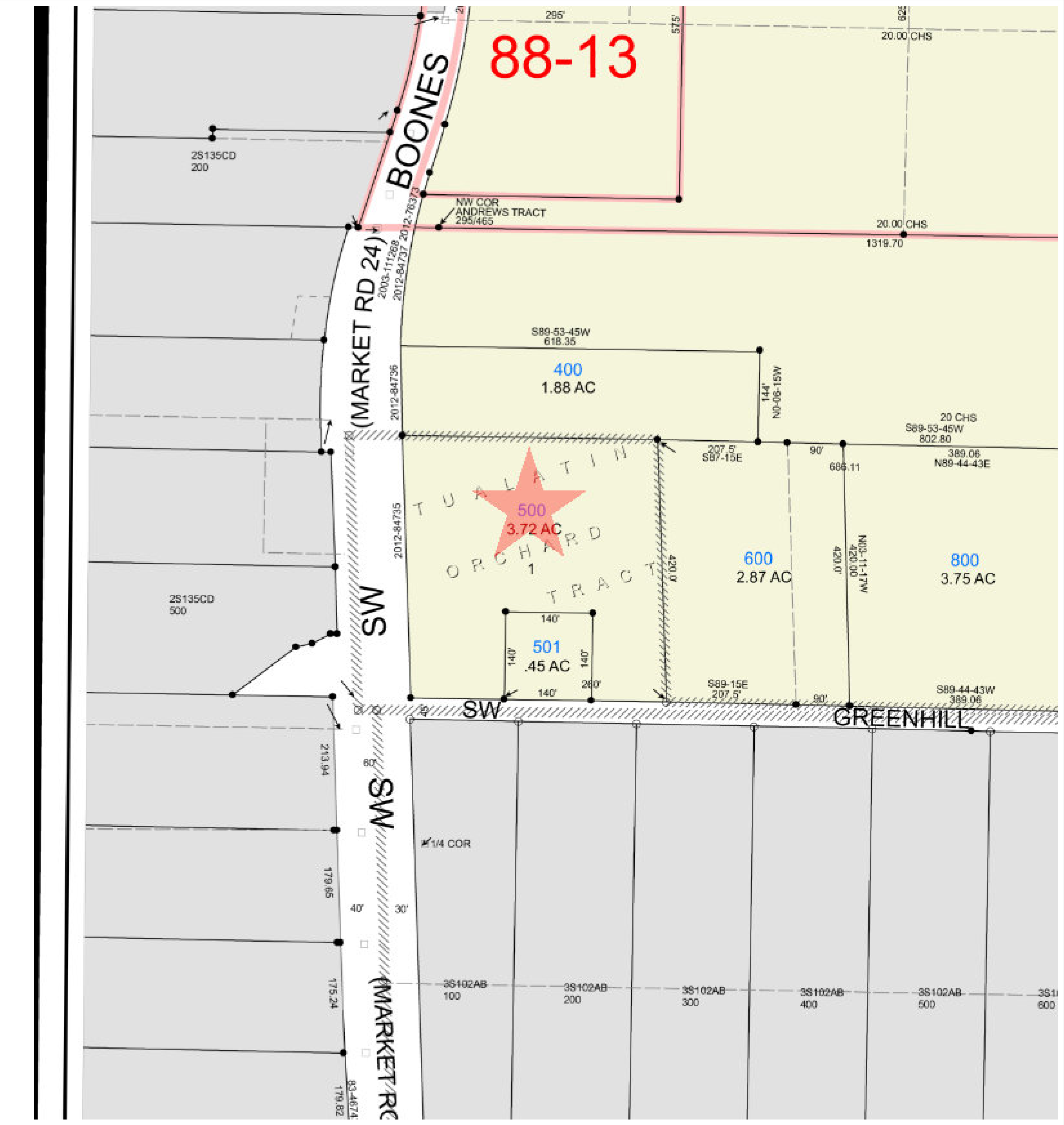
Total SqFt:
First Floor:
Second Floor:
Basement Fin:
Basement Unfin:
Basement Total:
Attic Fin:
Attic Unfin:
Attic Total:
Garage:

Year Built: 1970
Eff Year Built: 1970
Lot Size Ac: 3.72 Acres
Lot Size SF: 162,043 SqFt
Lot Width:
Lot Depth:
Roof Material:
Roof Shape:
Ext Walls:
Const Type:

SALES AND LOAN INFORMATION

Owner	Date	Doc #	Sale Price	Deed Type	Loan Amt	Loan Type
RECORD OWNER	09/28/2007	105096		Deed	$1,039,000.00	Conv/Unk
MARY L MUIR	09/25/1991	53277	$160,000.00	Deed		Conv/Unk
RECORD OWNER	01/04/1991	520		Deed		Conv/Unk
RECORD OWNER	09/29/1989	47096		Deed		Conv/Unk

Assessor Map

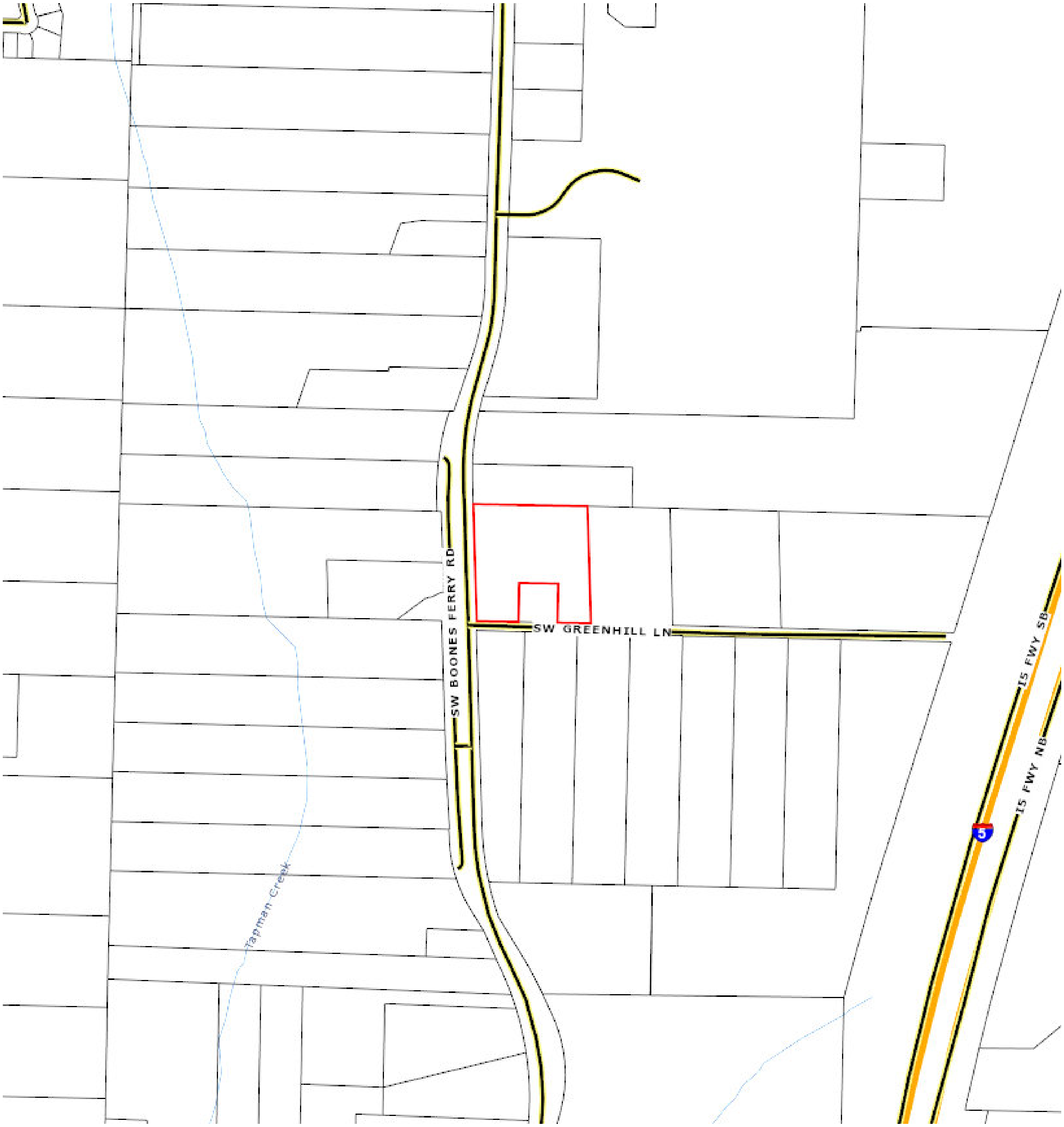


First American Title

Parcel ID: R560271

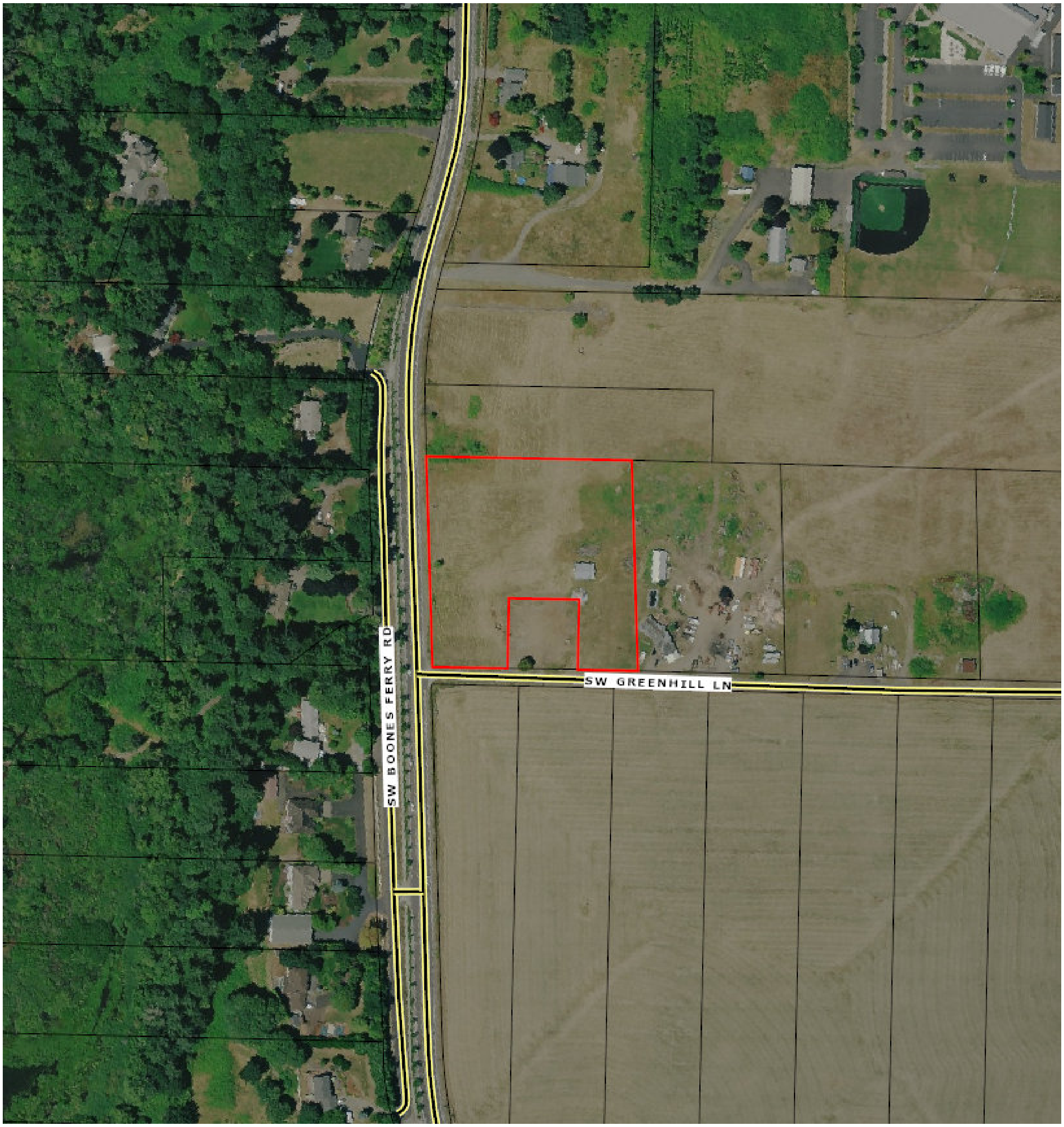
Site Address: Ns

Street Map



Parcel ID: R560271

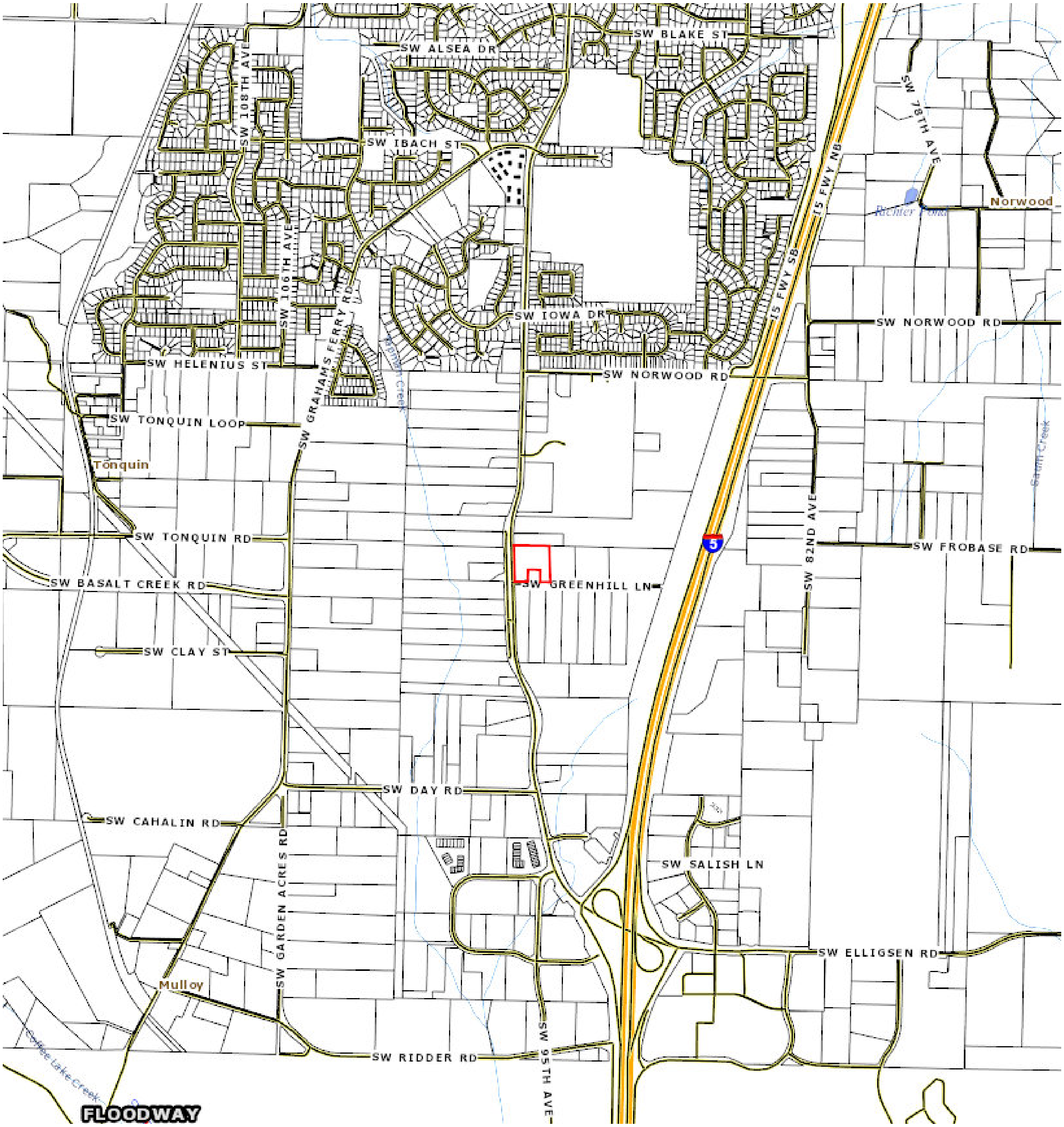
Aerial Map



First American Title

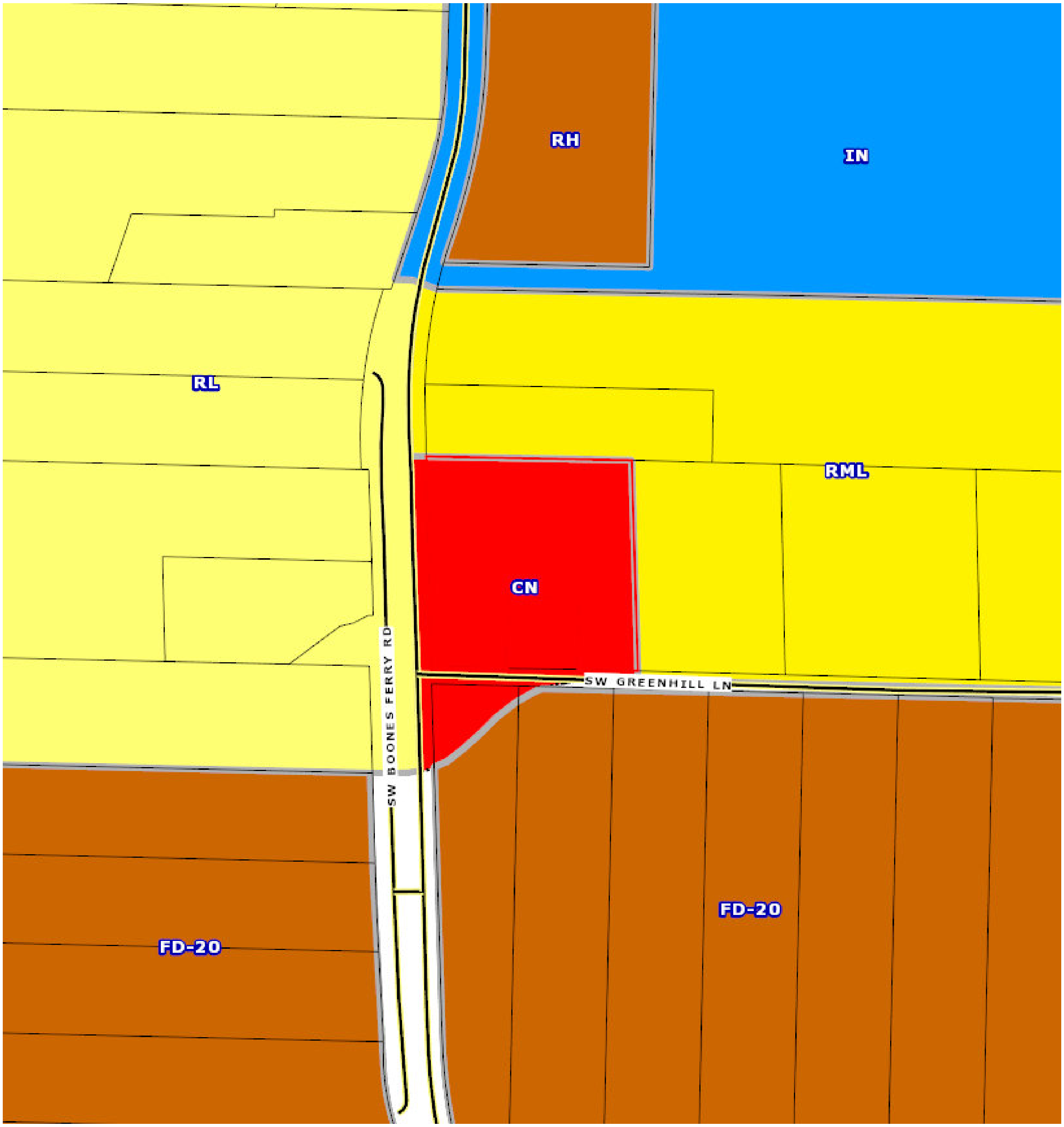
Parcel ID: R560271

Flood Map - 100 Year



Parcel ID: R560271

Zoning Map



First American Title

Parcel ID: R560271

2S5
11
41

7,143

Washington County, Oregon 2007-105096
09/28/2007 03:29:27 PM
D-DW Cnt=1 Stn=16 D HOFFMAN
$25.00 $5.00 $11.00 $7,143.00 - Total = $7,184.00

01171368200701050960050056

I, Richard Hobernicht, Director of Assessment and Taxation and Ex-Officio County Clerk for Washington County, Oregon, do hereby certify that the within instrument of writing was received and recorded in the book of records of said county.

Richard Hobernicht

Richard Hobernicht, Director of Assessment and Taxation, Ex-Officio County Clerk

THIS SPACE RESERVE

After recording return to:
Autumn Sunrise LLC
1400 SW Schaeffer Road
West Linn, OR 97068

Until a change is requested all tax statements shall be sent to the following address:
Autumn Sunrise LLC
1400 SW Schaeffer Road
West Linn, OR 97068

File No.: 7073-1087491 (LSH)
Date: September 14, 2007

FATCO. NO. 1087491-LO

STATUTORY SPECIAL WARRANTY DEED

Kimball Hill Homes Oregon, Inc., an Oregon Corporation, Grantor, conveys and specially warrants to **Autumn Sunrise LLC, an Oregon limited liability company**, Grantee, the following described real property free of liens and encumbrances created or suffered by the Grantor, except as specifically set forth herein:

This property is free from liens and encumbrances, EXCEPT:

1. The **2007/08** Taxes, a lien not yet payable.
2. Covenants, conditions, restrictions and/or easements, if any, affecting title, which may appear in the public record, including those shown on any recorded plat or survey.

See Legal Description attached hereto as Exhibit A and by this reference incorporated herein.

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSON'S RIGHTS, IF ANY, UNDER ORS 197.352. THIS INSTRUMENT DOES NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY APPROVED USES, TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES AS DEFINED IN ORS 30.930 AND TO INQUIRE ABOUT THE RIGHTS OF NEIGHBORING PROPERTY OWNERS, IF ANY, UNDER ORS 197.352.

The true consideration for this conveyance is **$7,143,000.00**.

WASHINGTON COUNTY
REAL PROPERTY TRANSFER TAX
$ 7143.00 9-28-07
FEE PAID DATE

Dated this 26TH day of SEPTEMBER, 2007.

Kimball Hill Homes Oregon, Inc., an Oregon corporation

By: Dudley McGee, Vice President

STATE OF California)
)ss.
County of SACRAMENTO)

This instrument was acknowledged before me on this 26TH day of SEPTEMBER, 2007 by Dudley McGee as Vice President of Kimball Hill Homes Oregon, Inc., on behalf of the corporation.

Sharon K. Ball

SHARON K. BALL
Commission # 1484422
Notary Public - California
Sacramento County
My Comm. Expires Apr 20, 2008

Notary Public for California
My commission expires: APRIL 20, 2008

EXHIBIT A

LEGAL DESCRIPTION:

PARCEL I:

BEGINNING AT A POINT WHICH POINT IS 5 CHAINS SOUTH OF THE NORTHEAST CORNER OF THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, AND RUNNING THENCE SOUTH 5 CHAINS TO A POINT; THENCE WEST 20 CHAINS, MORE OR LESS, TO THE CENTER OF THE COUNTY ROAD; THENCE NORTHERLY ALONG THE CENTER OF SAID COUNTY ROAD TO THE SOUTHWEST CORNER OF THAT CERTAIN TRACT OF LAND CONVEYED BY ANNIE C. VOGET IN FEE SIMPLE REMAINDER TO BEN D. ANDREWS AND HARRIET K. ANDREWS AS DESCRIBED IN BOOK 294 PAGE 587, DEED RECORDS OF WASHINGTON COUNTY; THENCE EAST ALONG THE SOUTH LINE OF SAID TRACT SO CONVEYED TO BEN D. ANDREWS AND HARRIET K. ANDREWS AS DESCRIBED IN BOOK 294 PAGE 587, DEED RECORDS OF SAID COUNTY, TO THE POINT OF BEGINNING, EXCEPT THAT PORTION DESCRIBED IN CONTRACT OF SALE IN FAVOR OF ROBERT K. COLE, AND WIFE, RECORDED MARCH 25, 1968 IN BOOK 686, PAGE 495, RECORDS OF WASHINGTON COUNTY.

PARCEL II:

A TRACT OF LAND SITUATED IN THE SOUTH ONE-HALF OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST OF THE WILLAMETTE MERIDIAN, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON, AND BEING A PART OF THAT CERTAIN TRACT OF LAND DESCRIBED IN BOOK 294, PAGE 585, DEED OF RECORDS, WASHINGTON COUNTY, OREGON, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS, TO-WIT:

BEGINNING AT THE INTERSECTION OF THE WESTERLY LINE OF THE SOUTHEAST ONE-QUARTER OF SAID SECTION 35, WITH THE NORTHERLY LINE OF SAID TRACT OF LAND DESCRIBED IN BOOK 294, PAGE 585, DEED RECORDS. FROM SAID PLACE OF BEGINNING THENCE NORTH 89°53'45" EAST ALONG SAID NORTHERLY LINE OF SAID TRACT DESCRIBED IN BOOK 294, PAGE 585, 1319.70 FEET TO THE NORTHEAST CORNER OF SAID TRACT OF LAND; THENCE SOUTH 0°14' WEST 330.00 FEET TO THE NORTHERLY LINE OF TUALATIN ORCHARD TRACT; THENCE SOUTH 89°53'45" WEST ALONG SAID NORTHERLY LINE OF TUALATIN ORCHARD TRACT, 802.80 FEET; THENCE LEAVING SAID NORTHERLY LINE OF TUALATIN ORCHARD TRACT, NORTH 0°06'15" WEST 144 FEET; THENCE SOUTH 89°53'45" WEST PARALLEL WITH SAID NORTHERLY LINE OF TUALATIN ORCHARD TRACT, 618.35 FEET TO THE INTERSECTION OF EASTERLY RIGHT OF WAY LINE OF STATE HIGHWAY NO. 217; THENCE NORTHEASTERLY ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 883.87 FEET THROUGH A CENTRAL ANGLE OF 10°55'20" A DISTANCE OF 169.44 FEET TO A POINT OF TANGENT; THENCE NORTH 17°16' EAST 251.58 FEET; THENCE LEAVING SAID EASTERLY RIGHT OF WAY LINE OF STATE HIGHWAY NO. 217, NORTH 89°53'45" EAST 60.42 FEET TO THE PLACE OF BEGINNING.

TOGETHER WITH A PORTION OF PARCEL 1 OF THOSE CERTAIN TRACTS OF LAND IN THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON CONVEYED TO GRACE COMMUNITY CHURCH OF THE ASSEMBLIES OF GOD, INC., BY DEED RECORDED AS DOCUMENT NUMBER 200155727 WASHINGTON COUNTY, OREGON DEED RECORDS, SAID PORTION BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF THAT CERTAIN TRACT OF LAND CONVEYED TO GRACE COMMUNITY CHURCH BY DEED RECORDED AS DOCUMENT NUMBER 2002004397 SAID DEED RECORDS AND RUNNING THENCE ALONG THE BOUNDARY OF SAID PARCEL 1, NORTH 89°34'48" EAST 485.62 FEET, NORTH 15°44'54" EAST 690.21 FEET, SOUTH 89°35'49" WEST 674.70 FEET SOUTH 00°09'07" EAST 16.50 FEET AND SOUTH 89°38'49" WEST 16.50 FEET; THENCE SOUTH 00°09'07" EAST 313.47 FEET TO A POINT ON THE NORTH LINE OF SAID DOCUMENT NUMBER 2002004397; THENCE ALONG THE BOUNDARY THEREOF NORTH 89°36'05" EAST 16.50 FEET AND SOUTH 00°08'37" EAST 313.16 FEET TO THE POINT OF BEGINNING.

PARCEL III:

LOT 1, TUALATIN ORCHARDS TRACT, EXCEPTING THE WEST 140 FEET OF THE EAST 260 FEET OF THE SOUTH 140 FEET, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON.

PARCEL IV:

THE WEST 140 FEET OF THE EAST 260 FEET OF THE SOUTH 140 FEET OF LOT 1, TUALATIN ORCHARD TRACTS, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON.

PARCEL V:

THE WESTERLY MOST 207.5 FEET, BEING A PORTION OF THAT CERTAIN TRACT OF LAND LOCATED IN SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST OF THE WILLAMETTE MERIDIAN, CONVEYED BY GRACE SCHUSTER TO JOHN DAY AND JESSIE DAY, UNDER DATE OF APRIL 20, 1949, AS SET FORTH IN DEED RECORDED IN BOOK 294 AT PAGE 446, DEED RECORDS, SAID TRACT SO CONVEYED, OF WHICH THE LAND HEREBY CONVEYED FORMS A PART, BEING DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN; THENCE NORTH 233 FEET; THENCE NORTH 87°15' WEST 1255.52 FEET TO THE SOUTHEAST CORNER OF THE TRACT HEREBY CONVEYED; THENCE NORTH 420 FEET ALONG THE WEST LINE OF LOT 4, TUALATIN ORCHARD TRACTS, TO THE SOUTH LINE OF TRACT CONVEYED BY DEED TO GEORGE ANDREWS, ET AL, IN BOOK 70, PAGE 374, RECORDED DECEMBER 27, 1905; THENCE NORTH 87°15' WEST 990.32 FEET ALONG THE SOUTH LINE OF SAID ANDREWS TRACT; THENCE SOUTH 420 FEET ALONG THE EAST LINE OF LOT 1, TUALATIN ORCHARDS TRACTS; THENCE SOUTH 87°15' EAST 990.32 FEET TO THE SOUTHEAST CORNER OF PROPERTY HEREBY CONVEYED.

PARCEL VI:

BEGINNING AT THE NORTHEAST CORNER OF TRACT 1, TUALATIN ORCHARD TRACTS, A DULY RECORDED SUBDIVISION IN SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON; THENCE SOUTH 87°15' EAST 207.5 FEET TO THE POINT OF TRUE BEGINNING OF THIS DIRECTION; THENCE SOUTH PARALLEL TO THE EAST LINE OF SAID TRACT 1, TUALATIN ORCHARD TRACTS, AND 207.5 FEET EASTERLY THEREFROM 420.0 FEET TO A POINT; THENCE SOUTH 87°15' EAST 90 FEET TO A POINT; THENCE NORTH PARALLEL TO THE EAST LINE OF SAID TRACT 1, 420.0 FEET; THENCE NORTH 87°15' WEST 90 FEET TO THE POINT OF TRUE BEGINNING OF THIS DESCRIPTION.

PARCEL VII:

A TRACT OF LAND IN THE SOUTHEAST 1/4 OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF LOT 12, TUALATIN ORCHARD TRACTS; THENCE NORTH 89°44'43" EAST 1159.47 FEET; THENCE NORTH 3°00'17" WEST 880.00 FEET TO A POINT ON A LINE EXTENDED FROM THE NORTHEAST CORNER OF LOT 1, TUALATIN ORCHARD TRACTS TO THE NORTHWEST CORNER OF LOT 4, TUALATIN ORCHARD TRACTS, SAID POINT FALLING NORTH 89°44'43" EAST 686.11 FEET FROM THE NORTHEAST CORNER OF SAID LOT 1 AND BEING THE TRUE POINT OF BEGINNING; THENCE SOUTH 3°00'17" EAST 420.00 FEET TO A POINT ON THE NORTH RIGHT OF WAY LINE OF GREENHILL LANE; THENCE WESTERLY ALONG SAID RIGHT OF WAY LINE SOUTH 89°44'43" WEST 389.06 FEET; THENCE NORTH 3°00'17" WEST 420.00 FEET; THENCE NORTH 89°44'43" EAST 389.06 FEET TO THE TRUE POINT OF BEGINNING.

PARCEL VIII:

A TRACT OF LAND IN THE SOUTHEAST 1/4 OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF LOT 12, TUALATIN ORCHARD TRACTS; THENCE NORTH 89°44'43" EAST 1159.47 FEET; THENCE NORTH 3°00'17" WEST 880.00 FEET TO A POINT ON A LINE EXTENDED FROM THE NORTHEAST CORNER OF LOT 1, TUALATIN ORCHARD TRACTS TO THE NORTHWEST CORNER OF LOT 4, TUALATIN ORCHARDS TRACTS, SAID POINT FALLING NORTH 89°44'43" EAST 686.11 FEET FROM THE NORTHEAST CORNER OF SAID LOT 1 AND BEING THE TRUE POINT OF BEGINNING; THENCE NORTH 89°44'43" EAST 763.79 FEET TO A POINT ON THE WESTERLY RIGHT OF WAY OF THE BALDOCK FREEWAY; THENCE SOUTH 15°49'15" WEST 436.59 FEET ALONG SAID RIGHT OF WAY TO THE NORTH RIGHT OF WAY LINE OF GREENHILL LANE; THENCE WESTERLY ALONG SAID RIGHT OF WAY SOUTH 89°44'43' WEST 622.75 FEET; THENCE NORTH 3°00'17" WEST 420.00 FEET TO THE TRUE POINT OF BEGINNING.

FIRST AMERICAN TITLE

Property Research Report

SUBJECT PROPERTY
9415 SW Greenhill Ln
R560280
2S135D000501
Washington

OWNER
Autumn Sunrise LLC

DATE PREPARED
06/14/2021

PREPARED BY
khaight@firstam.com

First American Title

Customer Service 503.219.8746
cs.oregon@firstam.com

First American Title

Customer Service Department
Phone: 503.219.TRIO (8746)
Fax: 503.790.7872
Email: cs.oregon@firstam.com
Date: 6/14/2021

OWNERSHIP INFORMATION

Owner: Autumn Sunrise LLC
CoOwner:
Site: 9415 SW Greenhill Ln Tualatin OR 97062
Mail: 485 S State St Lake Oswego OR 97034

Parcel #: R560280
Ref Parcel #: 2S135D000501
TRS: 02S / 01W / 35 / SE
County: Washington

PROPERTY DESCRIPTION

Map Grid: 715-E1
Census Tract: 032110 Block: 1004
Neighborhood: Cpo 5 Sherwood-Tualatin S1
School Dist: 88J Sherwood
Impr Type: R1 - Residence Single Family
Subdiv/Plat: Tualatin Orchard Tract
Land Use: 1910 - Urban Developable Tract Improved
Std Land Use: RSFR - Single Family Residence
Zoning: Tualatin-CN - Neighborhood Commercial
Lat/Lon: 45.34722316 / -122.77400242
Watershed: Abernethy Creek-Willamette River
Legal: TUALATIN ORCHARD TRACT, LOT PT 1, ACRES 0.45

ASSESSMENT AND TAXATION

Market Land: $190,490.00
Market Impr: $1,000.00
Market Special: $0.00
Market Total: $191,490.00 (2020)
% Improved: 1.00%
Assessed Total: $191,490.00 (2021)
Levy Code: 88.15
Tax: $3,428.48 (2020)
Millage Rate: 18.1531
Exemption:
Exemption Type:

PROPERTY CHARACTERISTICS

Bedrooms: 4
Baths, Total: 3
Baths, Full:
Baths, Half:
Total Units: 1
Stories:
Fireplaces:
Cooling:
Heating: Baseboard Electric
Building Style: RS0 - Single Family

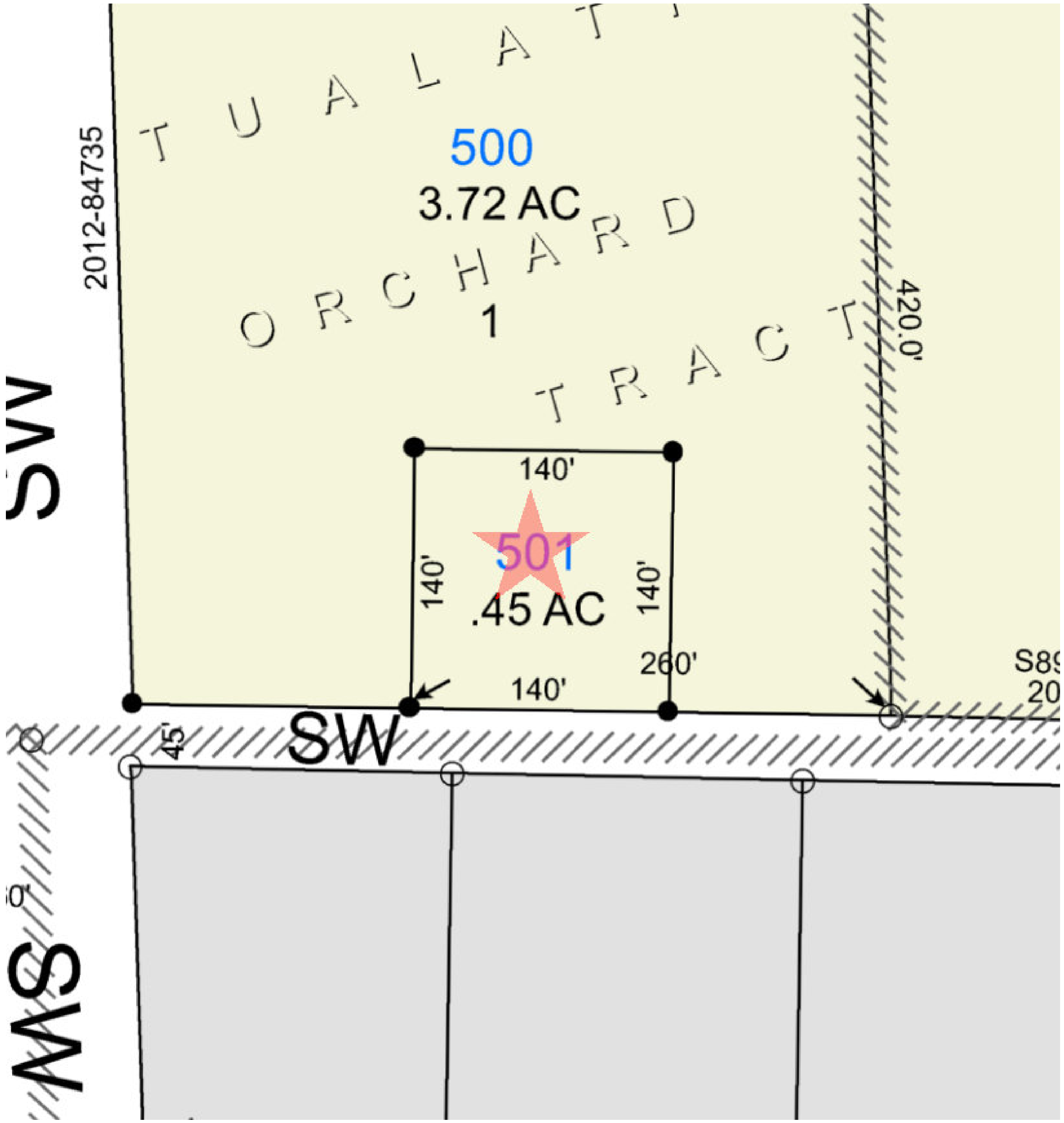
Total SqFt: 2,313 SqFt
First Floor: 1,753 SqFt
Second Floor: 560 SqFt
Basement Fin:
Basement Unfin:
Basement Total:
Attic Fin:
Attic Unfin:
Attic Total:
Garage: Finished Garage 716 SqFt

Year Built: 1952
Eff Year Built: 1970
Lot Size Ac: 0.45 Acres
Lot Size SF: 19,602 SqFt
Lot Width:
Lot Depth:
Roof Material: Shake
Roof Shape: Hip
Ext Walls: Wood Sheathing
Const Type: Wood

SALES AND LOAN INFORMATION

Owner	Date	Doc #	Sale Price	Deed Type	Loan Amt	Loan Type
OWNER NAME UNAVAILABLE	09/28/2007	0000105096		Quit Claim	$1,039,000.00	Conventional
AUTUMN SUNRISE LLC	09/28/2007	2007105096	$7,143,000.00	DW		
KIMBALL HILL HOMES OREGON INC	10/03/2005	121808	$15,000,000.00	Deed	$9,800,000.00	Conventional
ROOT HOLDINGS LLC	06/17/2005	69070	$950,000.00	Deed	$4,500,000.00	Private Party Lender

Assessor Map



Parcel ID: R560280

Site Address: 9415 SW Greenhill Ln

Street Map

First American Title

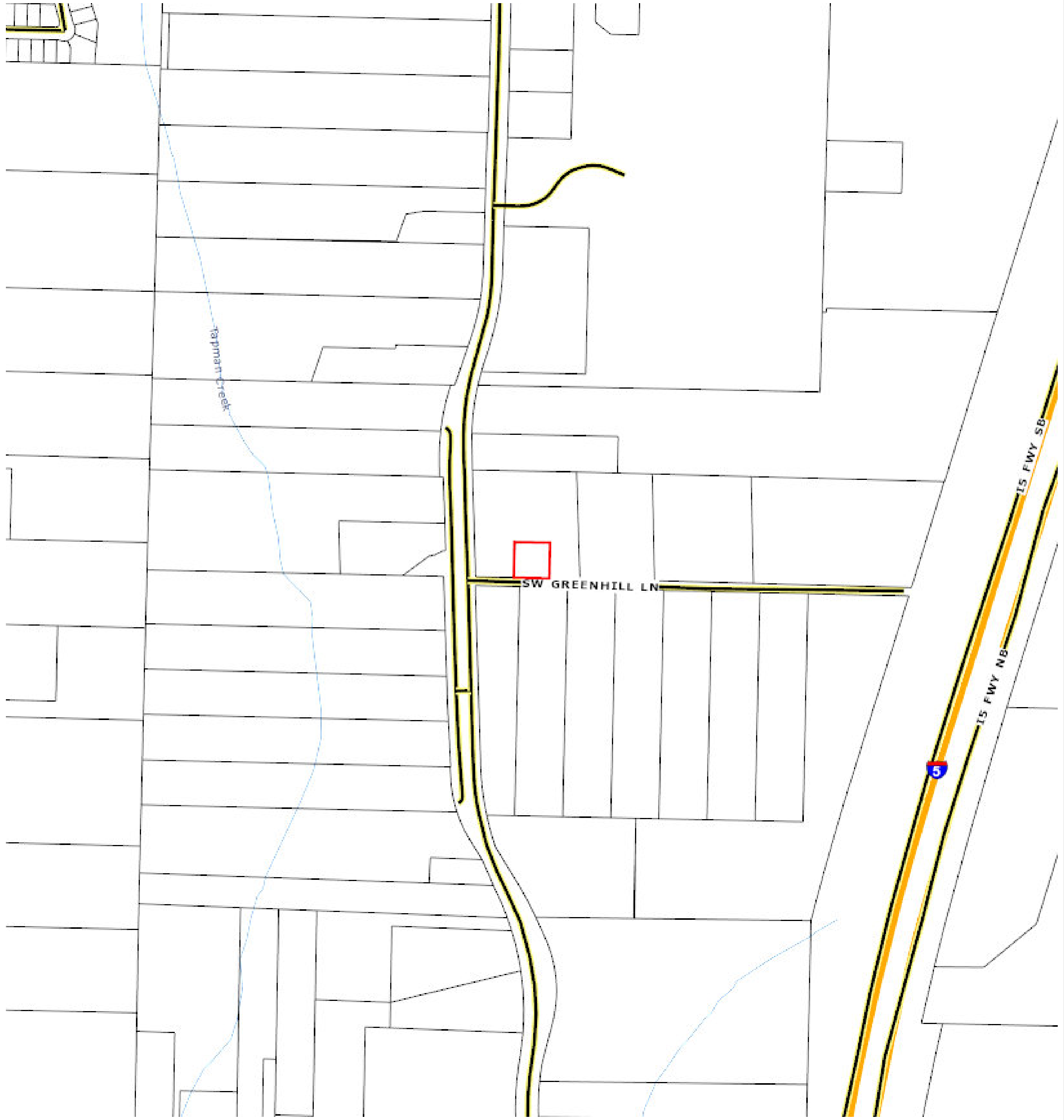
Parcel ID: R560280

Aerial Map

First American Title

Parcel ID: R560280

Flood Map - 100 Year



First American Title

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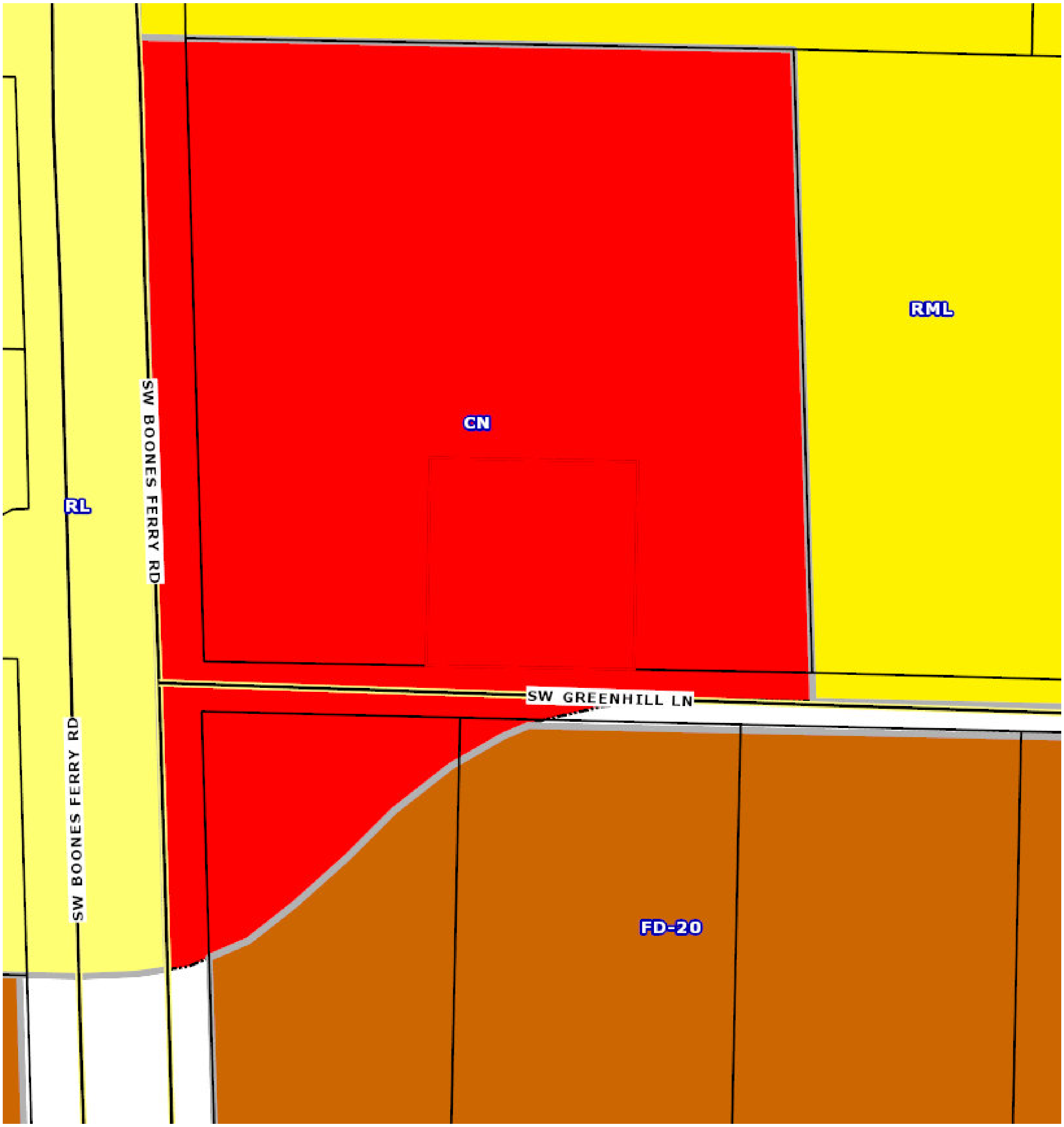
Zoning Map



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Washington County, Oregon 2007-105096
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$25.00 $5.00 $11.00 $7,143.00 - Total = $7,184.00

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Richard Hobernicht

Richard Hobernicht, Director of Assessment and Taxation, Ex-Officio County Clerk

THIS SPACE RESERVE

FATCO. NO. 1087491-LO

After recording return to:
Autumn Sunrise LLC
1400 SW Schaeffer Road
West Linn, OR 97068

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File No.: 7073-1087491 (LSH)
Date: September 14, 2007

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WASHINGTON COUNTY
REAL PROPERTY TRANSFER TAX
$ 7143.00 9-28-07
FEE PAID DATE

Dated this 26TH day of SEPTEMBER, 2007.

Kimball Hill Homes Oregon, Inc., an Oregon corporation

Dudley McGee

By: Dudley McGee, Vice President

STATE OF California)
)ss.
County of SACRAMENTO)

This instrument was acknowledged before me on this 26TH day of SEPTEMBER, 2007 by Dudley McGee as Vice President of Kimball Hill Homes Oregon, Inc., on behalf of the corporation.

Sharon K. Ball

SHARON K. BALL
Commission # 1484422
Notary Public - California
Sacramento County
My Comm. Expires Apr 20, 2008

Notary Public for California
My commission expires: APRIL 20, 2008

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PARCEL III:

LOT 1, TUALATIN ORCHARDS TRACT, EXCEPTING THE WEST 140 FEET OF THE EAST 260 FEET OF THE SOUTH 140 FEET, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON.

PARCEL IV:

THE WEST 140 FEET OF THE EAST 260 FEET OF THE SOUTH 140 FEET OF LOT 1, TUALATIN ORCHARD TRACTS, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON.

PARCEL V:

THE WESTERLY MOST 207.5 FEET, BEING A PORTION OF THAT CERTAIN TRACT OF LAND LOCATED IN SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST OF THE WILLAMETTE MERIDIAN, CONVEYED BY GRACE SCHUSTER TO JOHN DAY AND JESSIE DAY, UNDER DATE OF APRIL 20, 1949, AS SET FORTH IN DEED RECORDED IN BOOK 294 AT PAGE 446, DEED RECORDS, SAID TRACT SO CONVEYED, OF WHICH THE LAND HEREBY CONVEYED FORMS A PART, BEING DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN; THENCE NORTH 233 FEET; THENCE NORTH 87°15' WEST 1255.52 FEET TO THE SOUTHEAST CORNER OF THE TRACT HEREBY CONVEYED; THENCE NORTH 420 FEET ALONG THE WEST LINE OF LOT 4, TUALATIN ORCHARD TRACTS, TO THE SOUTH LINE OF TRACT CONVEYED BY DEED TO GEORGE ANDREWS, ET AL, IN BOOK 70, PAGE 374, RECORDED DECEMBER 27, 1905; THENCE NORTH 87°15' WEST 990.32 FEET ALONG THE SOUTH LINE OF SAID ANDREWS TRACT; THENCE SOUTH 420 FEET ALONG THE EAST LINE OF LOT 1, TUALATIN ORCHARDS TRACTS; THENCE SOUTH 87°15' EAST 990.32 FEET TO THE SOUTHEAST CORNER OF PROPERTY HEREBY CONVEYED.

PARCEL VI:

BEGINNING AT THE NORTHEAST CORNER OF TRACT 1, TUALATIN ORCHARD TRACTS, A DULY RECORDED SUBDIVISION IN SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON; THENCE SOUTH 87°15' EAST 207.5 FEET TO THE POINT OF TRUE BEGINNING OF THIS DIRECTION; THENCE SOUTH PARALLEL TO THE EAST LINE OF SAID TRACT 1, TUALATIN ORCHARD TRACTS, AND 207.5 FEET EASTERLY THEREFROM 420.0 FEET TO A POINT; THENCE SOUTH 87°15' EAST 90 FEET TO A POINT; THENCE NORTH PARALLEL TO THE EAST LINE OF SAID TRACT 1, 420.0 FEET; THENCE NORTH 87°15' WEST 90 FEET TO THE POINT OF TRUE BEGINNING OF THIS DESCRIPTION.

PARCEL VII:

A TRACT OF LAND IN THE SOUTHEAST 1/4 OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF LOT 12, TUALATIN ORCHARD TRACTS; THENCE NORTH 89°44'43" EAST 1159.47 FEET; THENCE NORTH 3°00'17" WEST 880.00 FEET TO A POINT ON A LINE EXTENDED FROM THE NORTHEAST CORNER OF LOT 1, TUALATIN ORCHARD TRACTS TO THE NORTHWEST CORNER OF LOT 4, TUALATIN ORCHARD TRACTS, SAID POINT FALLING NORTH 89°44'43" EAST 686.11 FEET FROM THE NORTHEAST CORNER OF SAID LOT 1 AND BEING THE TRUE POINT OF BEGINNING; THENCE SOUTH 3°00'17" EAST 420.00 FEET TO A POINT ON THE NORTH RIGHT OF WAY LINE OF GREENHILL LANE; THENCE WESTERLY ALONG SAID RIGHT OF WAY LINE SOUTH 89°44'43" WEST 389.06 FEET; THENCE NORTH 3°00'17" WEST 420.00 FEET; THENCE NORTH 89°44'43" EAST 389.06 FEET TO THE TRUE POINT OF BEGINNING.

PARCEL VIII:

A TRACT OF LAND IN THE SOUTHEAST 1/4 OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF LOT 12, TUALATIN ORCHARD TRACTS; THENCE NORTH 89°44'43" EAST 1159.47 FEET; THENCE NORTH 3°00'17" WEST 880.00 FEET TO A POINT ON A LINE EXTENDED FROM THE NORTHEAST CORNER OF LOT 1, TUALATIN ORCHARD TRACTS TO THE NORTHWEST CORNER OF LOT 4, TUALATIN ORCHARDS TRACTS, SAID POINT FALLING NORTH 89°44'43" EAST 686.11 FEET FROM THE NORTHEAST CORNER OF SAID LOT 1 AND BEING THE TRUE POINT OF BEGINNING; THENCE NORTH 89°44'43" EAST 763.79 FEET TO A POINT ON THE WESTERLY RIGHT OF WAY OF THE BALDOCK FREEWAY; THENCE SOUTH 15°49'15" WEST 436.59 FEET ALONG SAID RIGHT OF WAY TO THE NORTH RIGHT OF WAY LINE OF GREENHILL LANE; THENCE WESTERLY ALONG SAID RIGHT OF WAY SOUTH 89°44'43' WEST 622.75 FEET; THENCE NORTH 3°00'17" WEST 420.00 FEET TO THE TRUE POINT OF BEGINNING.

FIRST AMERICAN TITLE

Property Research Report

SUBJECT PROPERTY
9335 SW Greenhill Ln
R560299
2S135D000600
Washington

OWNER
Autumn Sunrise LLC

DATE PREPARED
06/14/2021

PREPARED BY
khaight@firstam.com

First American Title

Customer Service 503.219.8746
cs.oregon@firstam.com

First American Title

Customer Service Department
Phone: 503.219.TRIO (8746)
Fax: 503.790.7872
Email: cs.oregon@firstam.com
Date: 6/14/2021

OWNERSHIP INFORMATION

Owner: Autumn Sunrise LLC
CoOwner:
Site: 9335 SW Greenhill Ln Tualatin OR 97062
Mail: 485 S State St Lake Oswego OR 97034

Parcel #: R560299
Ref Parcel #: 2S135D000600
TRS: 02S / 01W / 35 / SE
County: Washington

PROPERTY DESCRIPTION

Map Grid: 715-E1
Census Tract: 032110 Block: 1004
Neighborhood: Cio 6 Byrom
School Dist: 88J Sherwood
Impr Type: R1 - Residence Single Family
Subdiv/Plat:
Land Use: 1910 - Urban Developable Tract Improved
Std Land Use: RSFR - Single Family Residence
Zoning: Tualatin-RML - Medium-Low Density Residential
Lat/Lon: 45.34761295 / -122.77273339
Watershed: Abernethy Creek-Willamette River
Legal: ACRES 2.87

ASSESSMENT AND TAXATION

Market Land: $873,770.00
Market Impr: $1,000.00
Market Special: $0.00
Market Total: $874,770.00 (2020)
% Improved: 0.00%
Assessed Total: $306,640.00 (2021)
Levy Code: 88.15
Tax: $5,566.49 (2020)
Millage Rate: 18.1531
Exemption:
Exemption Type:

PROPERTY CHARACTERISTICS

Bedrooms: 2
Baths, Total: 2
Baths, Full:
Baths, Half:
Total Units:
Stories:
Fireplaces: 1
Cooling:
Heating: Baseboard Electric
Building Style: RS0 - Single Family

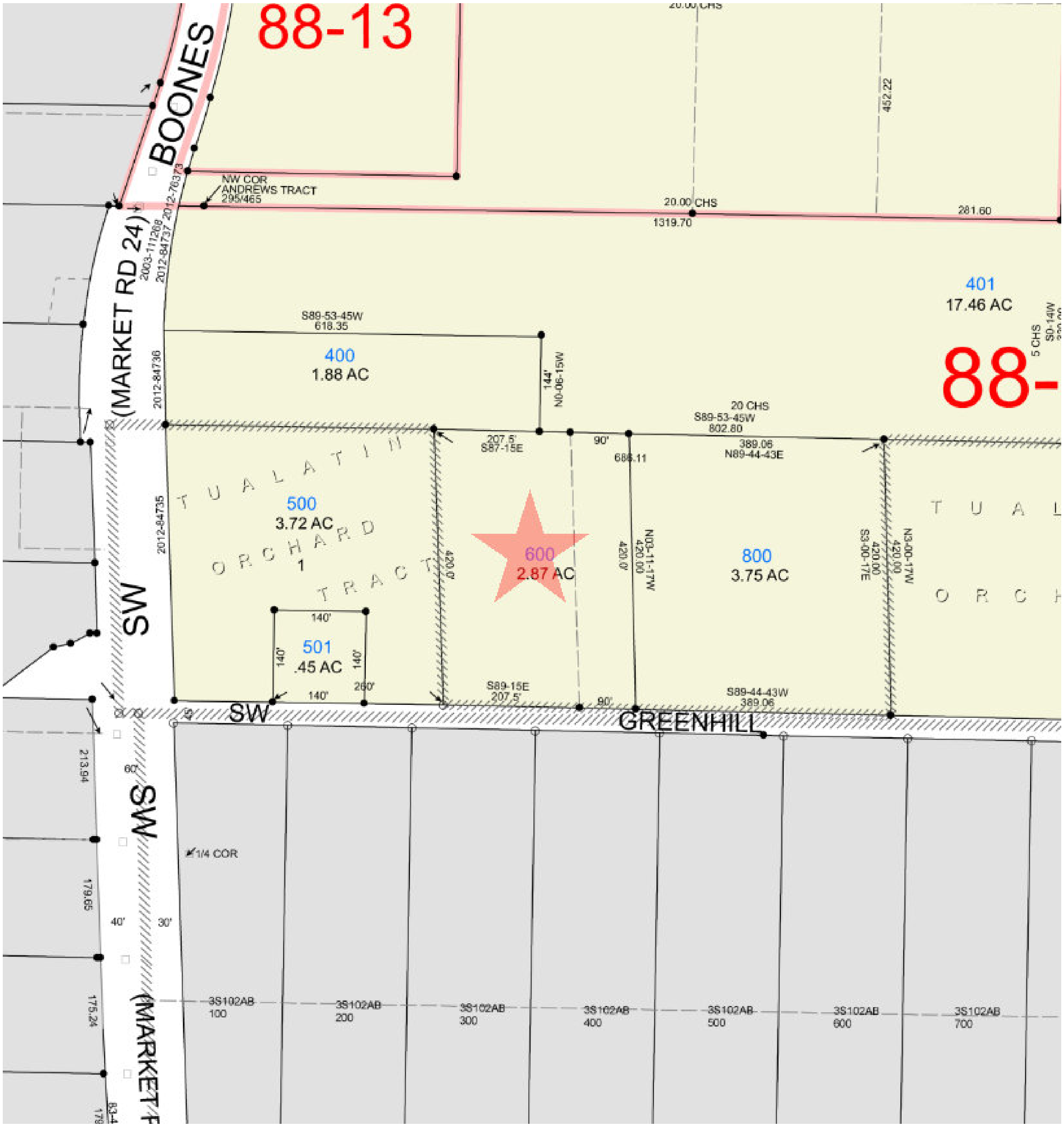
Total SqFt: 1,548 SqFt
First Floor: 1,548 SqFt
Second Floor:
Basement Fin:
Basement Unfin:
Basement Total:
Attic Fin:
Attic Unfin:
Attic Total:
Garage: Finished Garage 480 SqFt

Year Built: 1975
Eff Year Built: 1975
Lot Size Ac: 2.87 Acres
Lot Size SF: 125,017 SqFt
Lot Width:
Lot Depth:
Roof Material: Compostion Shingle
Roof Shape: Gable
Ext Walls: Wood Sheathing
Const Type: Wood

SALES AND LOAN INFORMATION

Owner	Date	Doc #	Sale Price	Deed Type	Loan Amt	Loan Type
OWNER NAME UNAVAILABLE	09/28/2007	0000105096		Quit Claim	$1,039,000.00	Conventional
AUTUMN SUNRISE LLC	09/28/2007	2007105096	$7,143,000.00	DW		
ROOT HOLDINGS LLC	06/17/2005	69069	$1,600,000.00	Deed		Conv/Unk

Assessor Map

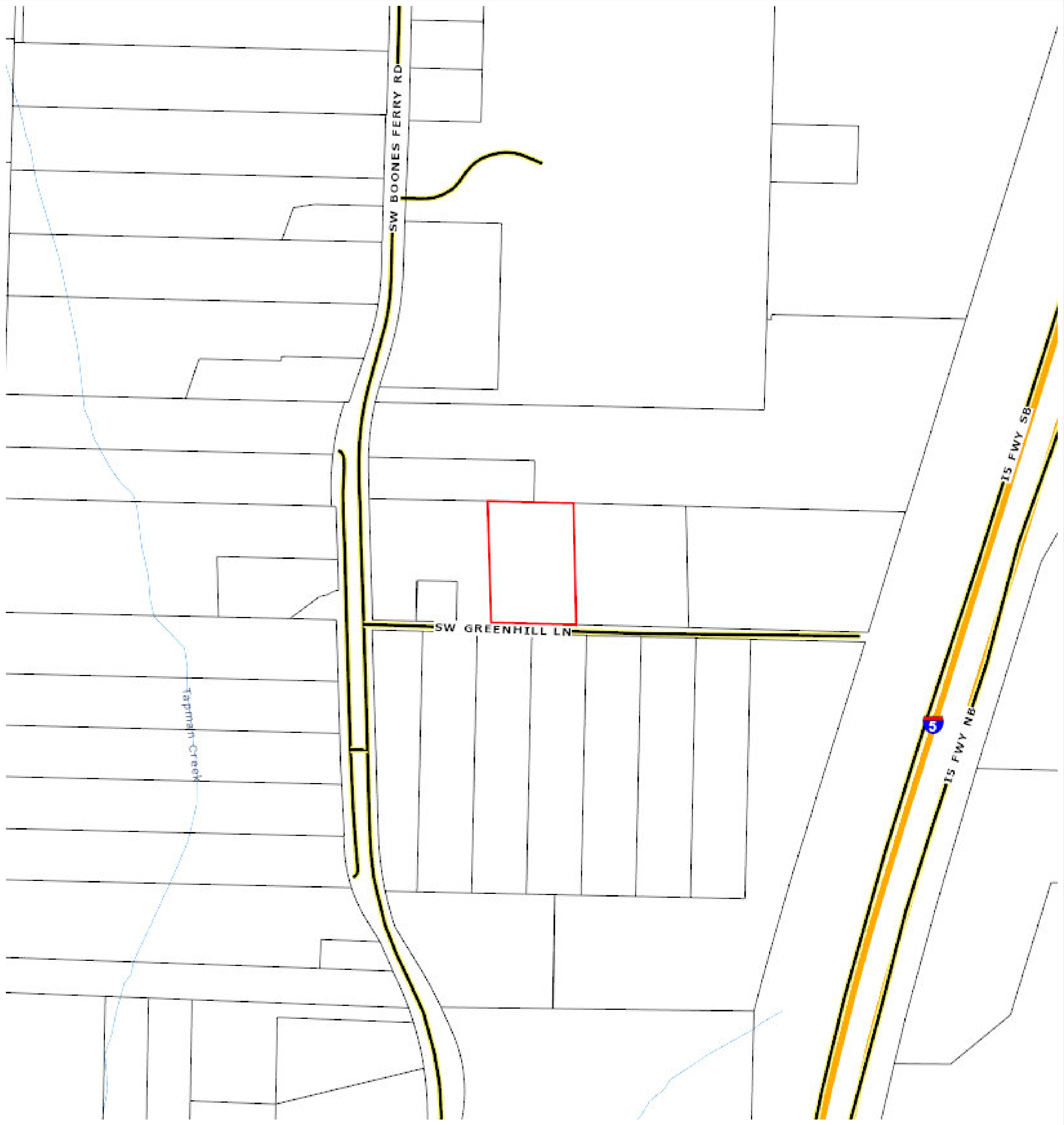


First American Title

Parcel ID: R560299

Site Address: 9335 SW Greenhill Ln

Street Map



First American Title

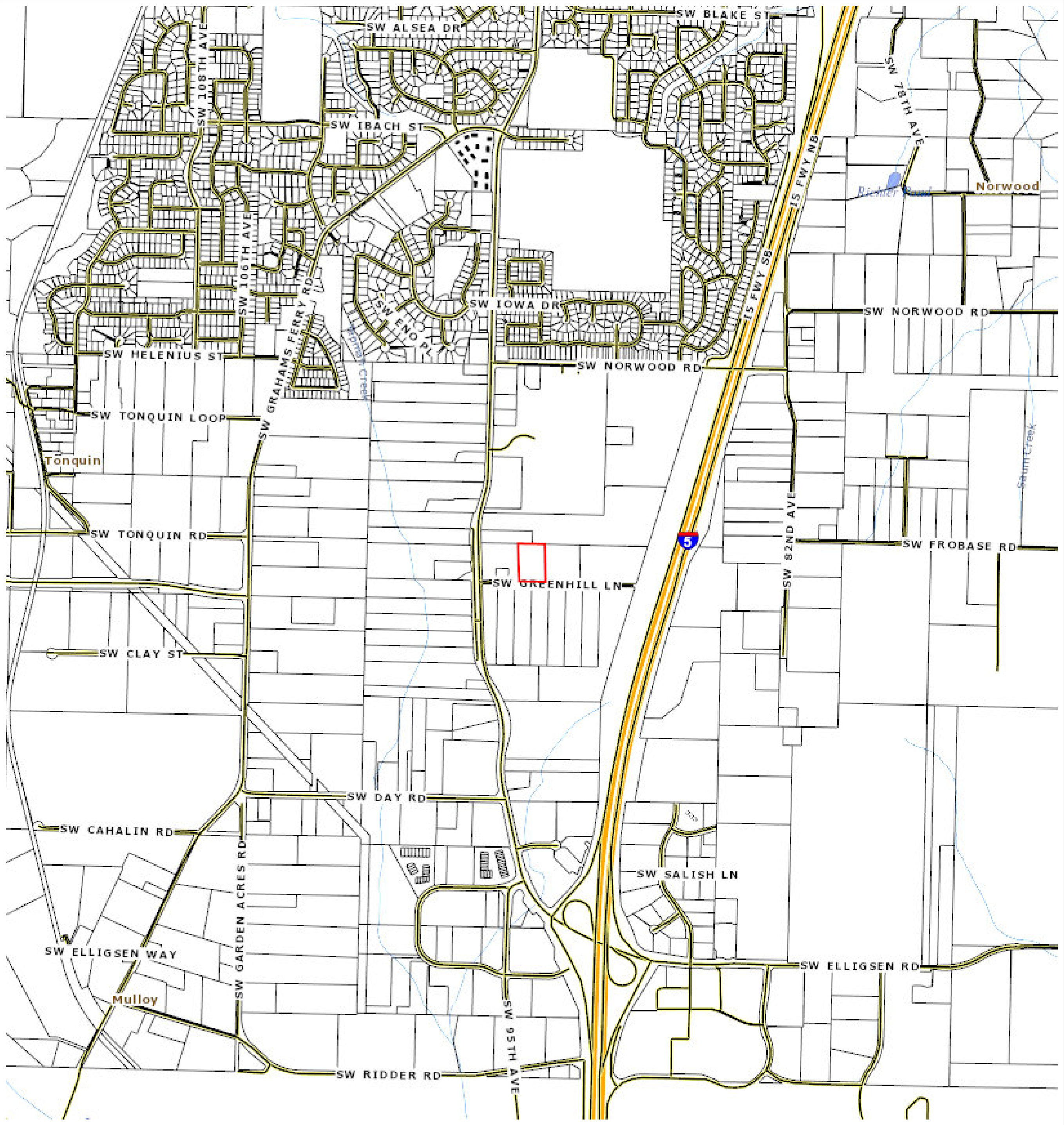
Parcel ID: R560299

Aerial Map

First American Title

Parcel ID: R560299

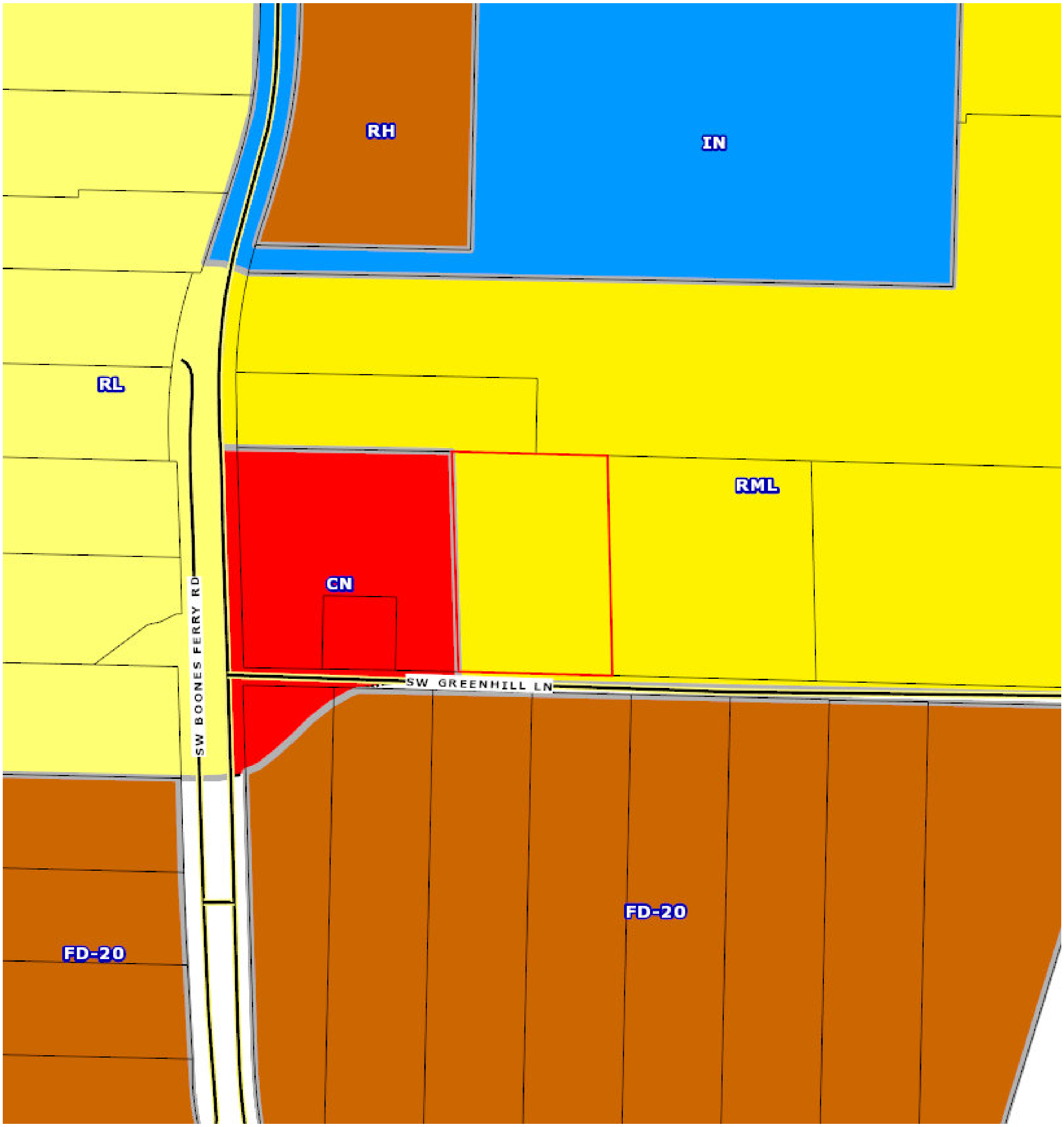
Flood Map - 100 Year



Parcel ID: R560299

First American Title

Zoning Map



FIRST AMERICAN | First American Title

Parcel ID: R560299

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7,143

FIRST AMERICAN

Washington County, Oregon
09/28/2007 03:29:27 PM
D-DW Cnt=1 Stn=16 D HOFFMAN
$25.00 $5.00 $11.00 $7,143.00 - Total = $7,184.00

2007-105096

01171368200701050960050056

I, Richard Hobernicht, Director of Assessment and Taxation and Ex-Officio County Clerk for Washington County, Oregon, do hereby certify that the within instrument of writing was received and recorded in the book of records of said county.

Richard Hobernicht

Richard Hobernicht, Director of Assessment and Taxation, Ex-Officio County Clerk

THIS SPACE RESERVE

FATCO. NO. 1087491-LO

After recording return to:
Autumn Sunrise LLC
1400 SW Schaeffer Road
West Linn, OR 97068

Until a change is requested all tax statements shall be sent to the following address:
Autumn Sunrise LLC
1400 SW Schaeffer Road
West Linn, OR 97068

File No.: 7073-1087491 (LSH)
Date: September 14, 2007

STATUTORY SPECIAL WARRANTY DEED

Kimball Hill Homes Oregon, Inc., an Oregon Corporation, Grantor, conveys and specially warrants to **Autumn Sunrise LLC, an Oregon limited liability company**, Grantee, the following described real property free of liens and encumbrances created or suffered by the Grantor, except as specifically set forth herein:

This property is free from liens and encumbrances, EXCEPT:

1. The **2007/08** Taxes, a lien not yet payable.
2. Covenants, conditions, restrictions and/or easements, if any, affecting title, which may appear in the public record, including those shown on any recorded plat or survey.

See Legal Description attached hereto as Exhibit A and by this reference incorporated herein.

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSON'S RIGHTS, IF ANY, UNDER ORS 197.352. THIS INSTRUMENT DOES NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY APPROVED USES, TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES AS DEFINED IN ORS 30.930 AND TO INQUIRE ABOUT THE RIGHTS OF NEIGHBORING PROPERTY OWNERS, IF ANY, UNDER ORS 197.352.

The true consideration for this conveyance is **$7,143,000.00**.

WASHINGTON COUNTY
REAL PROPERTY TRANSFER TAX
$ 7143.00 9-28-07
FEE PAID DATE

Dated this 26TH day of SEPTEMBER, 2007.

Kimball Hill Homes Oregon, Inc., an Oregon corporation

Dudley McGee
By: Dudley McGee, Vice President

STATE OF California)
)ss.
County of SACRAMENTO)

This instrument was acknowledged before me on this 26TH day of SEPTEMBER, 2007 by Dudley McGee as Vice President of Kimball Hill Homes Oregon, Inc., on behalf of the corporation.

SHARON K. BALL
Commission # 1484422
Notary Public - California
Sacramento County
My Comm. Expires Apr 20, 2008

Sharon K. Ball
Notary Public for California
My commission expires: APRIL 20, 2008

EXHIBIT A

LEGAL DESCRIPTION:

PARCEL I:

BEGINNING AT A POINT WHICH POINT IS 5 CHAINS SOUTH OF THE NORTHEAST CORNER OF THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, AND RUNNING THENCE SOUTH 5 CHAINS TO A POINT; THENCE WEST 20 CHAINS, MORE OR LESS, TO THE CENTER OF THE COUNTY ROAD; THENCE NORTHERLY ALONG THE CENTER OF SAID COUNTY ROAD TO THE SOUTHWEST CORNER OF THAT CERTAIN TRACT OF LAND CONVEYED BY ANNIE C. VOGET IN FEE SIMPLE REMAINDER TO BEN D. ANDREWS AND HARRIET K. ANDREWS AS DESCRIBED IN BOOK 294 PAGE 587, DEED RECORDS OF WASHINGTON COUNTY; THENCE EAST ALONG THE SOUTH LINE OF SAID TRACT SO CONVEYED TO BEN D. ANDREWS AND HARRIET K. ANDREWS AS DESCRIBED IN BOOK 294 PAGE 587, DEED RECORDS OF SAID COUNTY, TO THE POINT OF BEGINNING, EXCEPT THAT PORTION DESCRIBED IN CONTRACT OF SALE IN FAVOR OF ROBERT K. COLE, AND WIFE, RECORDED MARCH 25, 1968 IN BOOK 686, PAGE 495, RECORDS OF WASHINGTON COUNTY.

PARCEL II:

A TRACT OF LAND SITUATED IN THE SOUTH ONE-HALF OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST OF THE WILLAMETTE MERIDIAN, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON, AND BEING A PART OF THAT CERTAIN TRACT OF LAND DESCRIBED IN BOOK 294, PAGE 585, DEED OF RECORDS, WASHINGTON COUNTY, OREGON, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS, TO-WIT:

BEGINNING AT THE INTERSECTION OF THE WESTERLY LINE OF THE SOUTHEAST ONE-QUARTER OF SAID SECTION 35, WITH THE NORTHERLY LINE OF SAID TRACT OF LAND DESCRIBED IN BOOK 294, PAGE 585, DEED RECORDS. FROM SAID PLACE OF BEGINNING THENCE NORTH 89°53'45" EAST ALONG SAID NORTHERLY LINE OF SAID TRACT DESCRIBED IN BOOK 294, PAGE 585, 1319.70 FEET TO THE NORTHEAST CORNER OF SAID TRACT OF LAND; THENCE SOUTH 0°14' WEST 330.00 FEET TO THE NORTHERLY LINE OF TUALATIN ORCHARD TRACT; THENCE SOUTH 89°53'45" WEST ALONG SAID NORTHERLY LINE OF TUALATIN ORCHARD TRACT, 802.80 FEET; THENCE LEAVING SAID NORTHERLY LINE OF TUALATIN ORCHARD TRACT, NORTH 0°06'15" WEST 144 FEET; THENCE SOUTH 89°53'45" WEST PARALLEL WITH SAID NORTHERLY LINE OF TUALATIN ORCHARD TRACT, 618.35 FEET TO THE INTERSECTION OF EASTERLY RIGHT OF WAY LINE OF STATE HIGHWAY NO. 217; THENCE NORTHEASTERLY ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 883.87 FEET THROUGH A CENTRAL ANGLE OF 10°55'20" A DISTANCE OF 169.44 FEET TO A POINT OF TANGENT; THENCE NORTH 17°16' EAST 251.58 FEET; THENCE LEAVING SAID EASTERLY RIGHT OF WAY LINE OF STATE HIGHWAY NO. 217, NORTH 89°53'45" EAST 60.42 FEET TO THE PLACE OF BEGINNING.

TOGETHER WITH A PORTION OF PARCEL 1 OF THOSE CERTAIN TRACTS OF LAND IN THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON CONVEYED TO GRACE COMMUNITY CHURCH OF THE ASSEMBLIES OF GOD, INC., BY DEED RECORDED AS DOCUMENT NUMBER 200155727 WASHINGTON COUNTY, OREGON DEED RECORDS, SAID PORTION BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF THAT CERTAIN TRACT OF LAND CONVEYED TO GRACE COMMUNITY CHURCH BY DEED RECORDED AS DOCUMENT NUMBER 2002004397 SAID DEED RECORDS AND RUNNING THENCE ALONG THE BOUNDARY OF SAID PARCEL 1, NORTH 89°34'48" EAST 485.62 FEET, NORTH 15°44'54" EAST 690.21 FEET, SOUTH 89°35'49" WEST 674.70 FEET SOUTH 00°09'07" EAST 16.50 FEET AND SOUTH 89°38'49" WEST 16.50 FEET; THENCE SOUTH 00°09'07" EAST 313.47 FEET TO A POINT ON THE NORTH LINE OF SAID DOCUMENT NUMBER 2002004397; THENCE ALONG THE BOUNDARY THEREOF NORTH 89°36'05" EAST 16.50 FEET AND SOUTH 00°08'37" EAST 313.16 FEET TO THE POINT OF BEGINNING.

PARCEL III:

LOT 1, TUALATIN ORCHARDS TRACT, EXCEPTING THE WEST 140 FEET OF THE EAST 260 FEET OF THE SOUTH 140 FEET, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON.

PARCEL IV:

THE WEST 140 FEET OF THE EAST 260 FEET OF THE SOUTH 140 FEET OF LOT 1, TUALATIN ORCHARD TRACTS, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON.

PARCEL V:

THE WESTERLY MOST 207.5 FEET, BEING A PORTION OF THAT CERTAIN TRACT OF LAND LOCATED IN SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST OF THE WILLAMETTE MERIDIAN, CONVEYED BY GRACE SCHUSTER TO JOHN DAY AND JESSIE DAY, UNDER DATE OF APRIL 20, 1949, AS SET FORTH IN DEED RECORDED IN BOOK 294 AT PAGE 446, DEED RECORDS, SAID TRACT SO CONVEYED, OF WHICH THE LAND HEREBY CONVEYED FORMS A PART, BEING DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN; THENCE NORTH 233 FEET; THENCE NORTH 87°15' WEST 1255.52 FEET TO THE SOUTHEAST CORNER OF THE TRACT HEREBY CONVEYED; THENCE NORTH 420 FEET ALONG THE WEST LINE OF LOT 4, TUALATIN ORCHARD TRACTS, TO THE SOUTH LINE OF TRACT CONVEYED BY DEED TO GEORGE ANDREWS, ET AL, IN BOOK 70, PAGE 374, RECORDED DECEMBER 27, 1905; THENCE NORTH 87°15' WEST 990.32 FEET ALONG THE SOUTH LINE OF SAID ANDREWS TRACT; THENCE SOUTH 420 FEET ALONG THE EAST LINE OF LOT 1, TUALATIN ORCHARDS TRACTS; THENCE SOUTH 87°15' EAST 990.32 FEET TO THE SOUTHEAST CORNER OF PROPERTY HEREBY CONVEYED.

PARCEL VI:

BEGINNING AT THE NORTHEAST CORNER OF TRACT 1, TUALATIN ORCHARD TRACTS, A DULY RECORDED SUBDIVISION IN SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON; THENCE SOUTH 87°15' EAST 207.5 FEET TO THE POINT OF TRUE BEGINNING OF THIS DIRECTION; THENCE SOUTH PARALLEL TO THE EAST LINE OF SAID TRACT 1, TUALATIN ORCHARD TRACTS, AND 207.5 FEET EASTERLY THEREFROM 420.0 FEET TO A POINT; THENCE SOUTH 87°15' EAST 90 FEET TO A POINT; THENCE NORTH PARALLEL TO THE EAST LINE OF SAID TRACT 1, 420.0 FEET; THENCE NORTH 87°15' WEST 90 FEET TO THE POINT OF TRUE BEGINNING OF THIS DESCRIPTION.

PARCEL VII:

A TRACT OF LAND IN THE SOUTHEAST 1/4 OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF LOT 12, TUALATIN ORCHARD TRACTS; THENCE NORTH 89°44'43" EAST 1159.47 FEET; THENCE NORTH 3°00'17" WEST 880.00 FEET TO A POINT ON A LINE EXTENDED FROM THE NORTHEAST CORNER OF LOT 1, TUALATIN ORCHARD TRACTS TO THE NORTHWEST CORNER OF LOT 4, TUALATIN ORCHARD TRACTS, SAID POINT FALLING NORTH 89°44'43" EAST 686.11 FEET FROM THE NORTHEAST CORNER OF SAID LOT 1 AND BEING THE TRUE POINT OF BEGINNING; THENCE SOUTH 3°00'17" EAST 420.00 FEET TO A POINT ON THE NORTH RIGHT OF WAY LINE OF GREENHILL LANE; THENCE WESTERLY ALONG SAID RIGHT OF WAY LINE SOUTH 89°44'43" WEST 389.06 FEET; THENCE NORTH 3°00'17" WEST 420.00 FEET; THENCE NORTH 89°44'43" EAST 389.06 FEET TO THE TRUE POINT OF BEGINNING.

PARCEL VIII:

A TRACT OF LAND IN THE SOUTHEAST 1/4 OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF LOT 12, TUALATIN ORCHARD TRACTS; THENCE NORTH 89°44'43" EAST 1159.47 FEET; THENCE NORTH 3°00'17" WEST 880.00 FEET TO A POINT ON A LINE EXTENDED FROM THE NORTHEAST CORNER OF LOT 1, TUALATIN ORCHARD TRACTS TO THE NORTHWEST CORNER OF LOT 4, TUALATIN ORCHARDS TRACTS, SAID POINT FALLING NORTH 89°44'43" EAST 686.11 FEET FROM THE NORTHEAST CORNER OF SAID LOT 1 AND BEING THE TRUE POINT OF BEGINNING; THENCE NORTH 89°44'43" EAST 763.79 FEET TO A POINT ON THE WESTERLY RIGHT OF WAY OF THE BALDOCK FREEWAY; THENCE SOUTH 15°49'15" WEST 436.59 FEET ALONG SAID RIGHT OF WAY TO THE NORTH RIGHT OF WAY LINE OF GREENHILL LANE; THENCE WESTERLY ALONG SAID RIGHT OF WAY SOUTH 89°44'43' WEST 622.75 FEET; THENCE NORTH 3°00'17" WEST 420.00 FEET TO THE TRUE POINT OF BEGINNING.

FIRST AMERICAN TITLE

Property Research Report

SUBJECT PROPERTY

9185 SW Greenhill Ln
R560306
2S135D000800
Washington

OWNER

Autumn Sunrise LLC

DATE PREPARED

06/14/2021

PREPARED BY

khaight@firstam.com

First American Title

Customer Service 503.219.8746
cs.oregon@firstam.com

First American Title

Customer Service Department
Phone: 503.219.TRIO (8746)
Fax: 503.790.7872
Email: cs.oregon@firstam.com
Date: 6/14/2021

OWNERSHIP INFORMATION

Owner: Autumn Sunrise LLC
CoOwner:
Site: 9185 SW Greenhill Ln Tualatin OR 97062
Mail: 485 S State St Lake Oswego OR 97034

Parcel #: R560306
Ref Parcel #: 2S135D000800
TRS: 02S / 01W / 35 / SE
County: Washington

PROPERTY DESCRIPTION

Map Grid: 715-E1
Census Tract: 032110 Block: 1004
Neighborhood: Cio 6 Byrom
School Dist: 88J Sherwood
Impr Type: R1 - Residence Single Family
Subdiv/Plat:
Land Use: 1910 - Urban Developable Tract Improved
Std Land Use: RSFR - Single Family Residence
Zoning: Tualatin-RML - Medium-Low Density Residential
Lat/Lon: 45.34761356 / -122.77140214
Watershed: Abernethy Creek-Willamette River
Legal: ACRES 3.75

ASSESSMENT AND TAXATION

Market Land: $842,940.00
Market Impr: $47,080.00
Market Special: $0.00
Market Total: $890,020.00 (2020)
% Improved: 5.00%
Assessed Total: $262,380.00 (2021)
Levy Code: 88.15
Tax: $4,763.00 (2020)
Millage Rate: 18.1531
Exemption:
Exemption Type:

PROPERTY CHARACTERISTICS

Bedrooms: 3
Baths, Total: 1
Baths, Full:
Baths, Half:
Total Units:
Stories:
Fireplaces:
Cooling:
Heating: Forced Air
Building Style: RS0 - Single Family

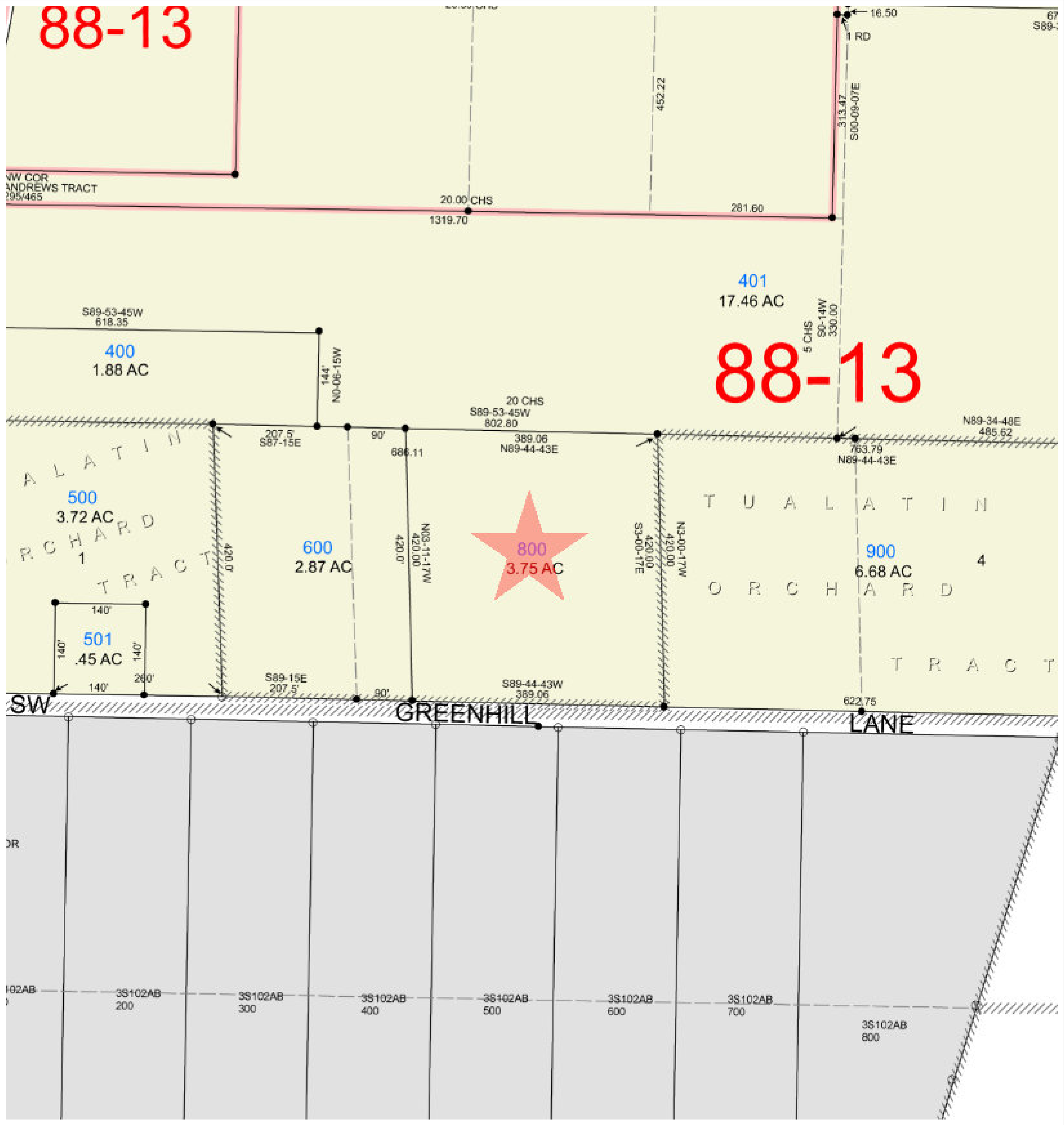
Total SqFt: 1,178 SqFt
First Floor: 954 SqFt
Second Floor: 224 SqFt
Basement Fin:
Basement Unfin:
Basement Total:
Attic Fin: 224 SqFt
Attic Unfin:
Attic Total: 224 SqFt
Garage:

Year Built: 1980
Eff Year Built: 1980
Lot Size Ac: 3.75 Acres
Lot Size SF: 163,350 SqFt
Lot Width:
Lot Depth:
Roof Material: Compostion Shingle
Roof Shape: Gable
Ext Walls: Wood Sheathing
Const Type: Wood

SALES AND LOAN INFORMATION

Owner	Date	Doc #	Sale Price	Deed Type	Loan Amt	Loan Type
OWNER NAME UNAVAILABLE	09/28/2007	0000105096		Quit Claim	$1,039,000.00	Conventional
AUTUMN SUNRISE LLC	09/28/2007	2007105096	$7,143,000.00	DW		

Assessor Map

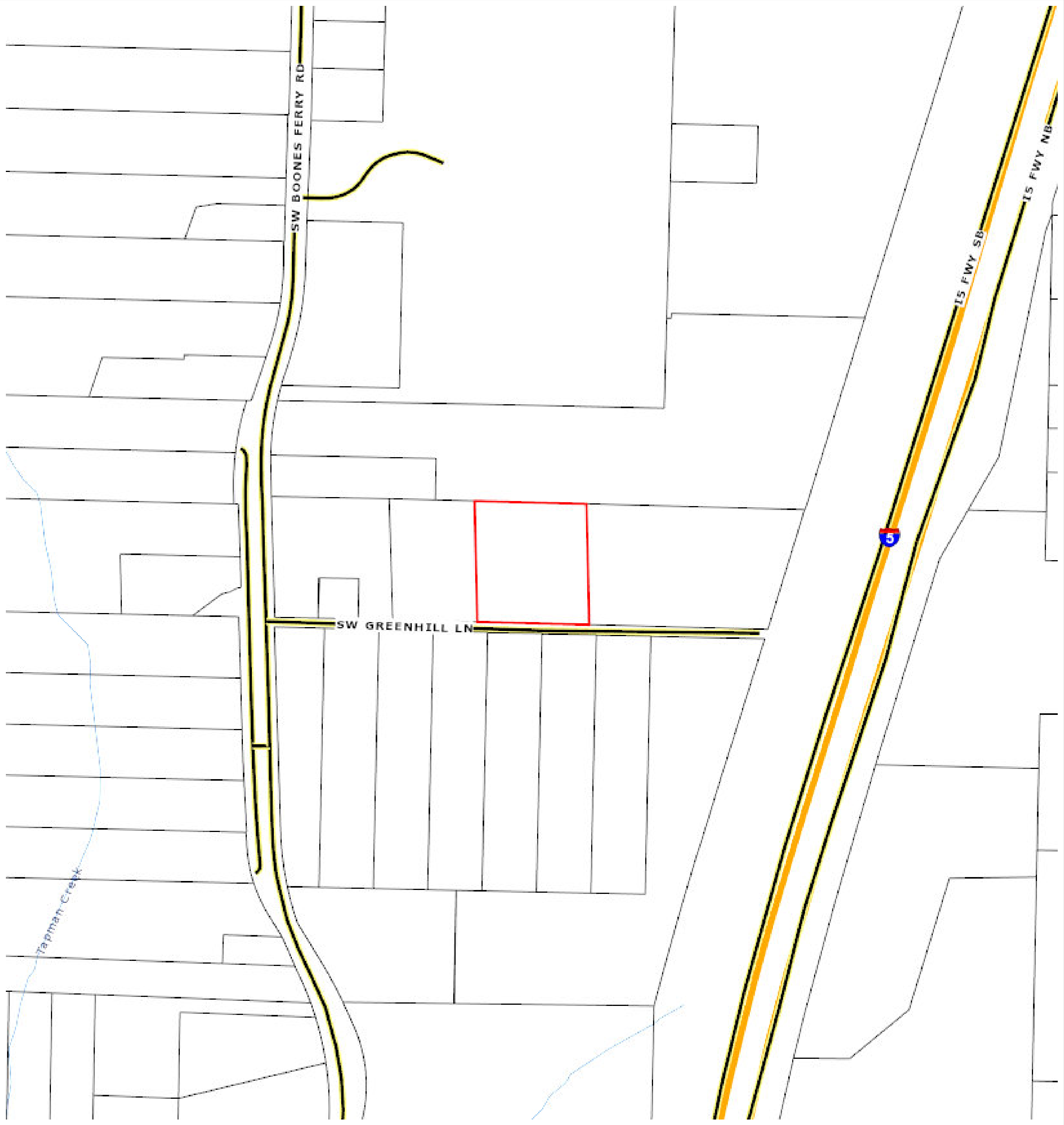


First American Title

Parcel ID: R560306

Site Address: 9185 SW Greenhill Ln

Street Map



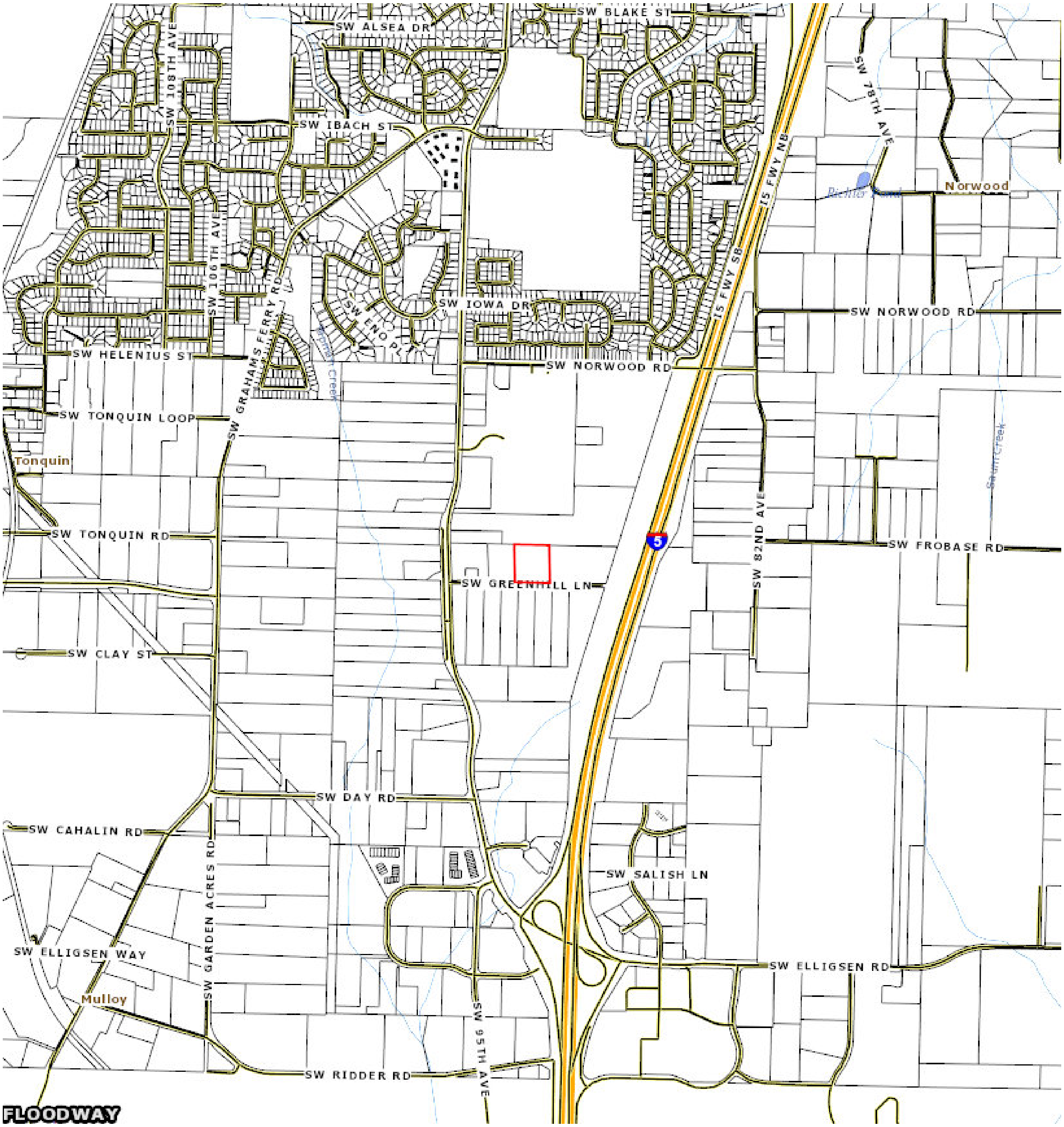
First American Title

Parcel ID: R560306

Aerial Map

Parcel ID: R560306

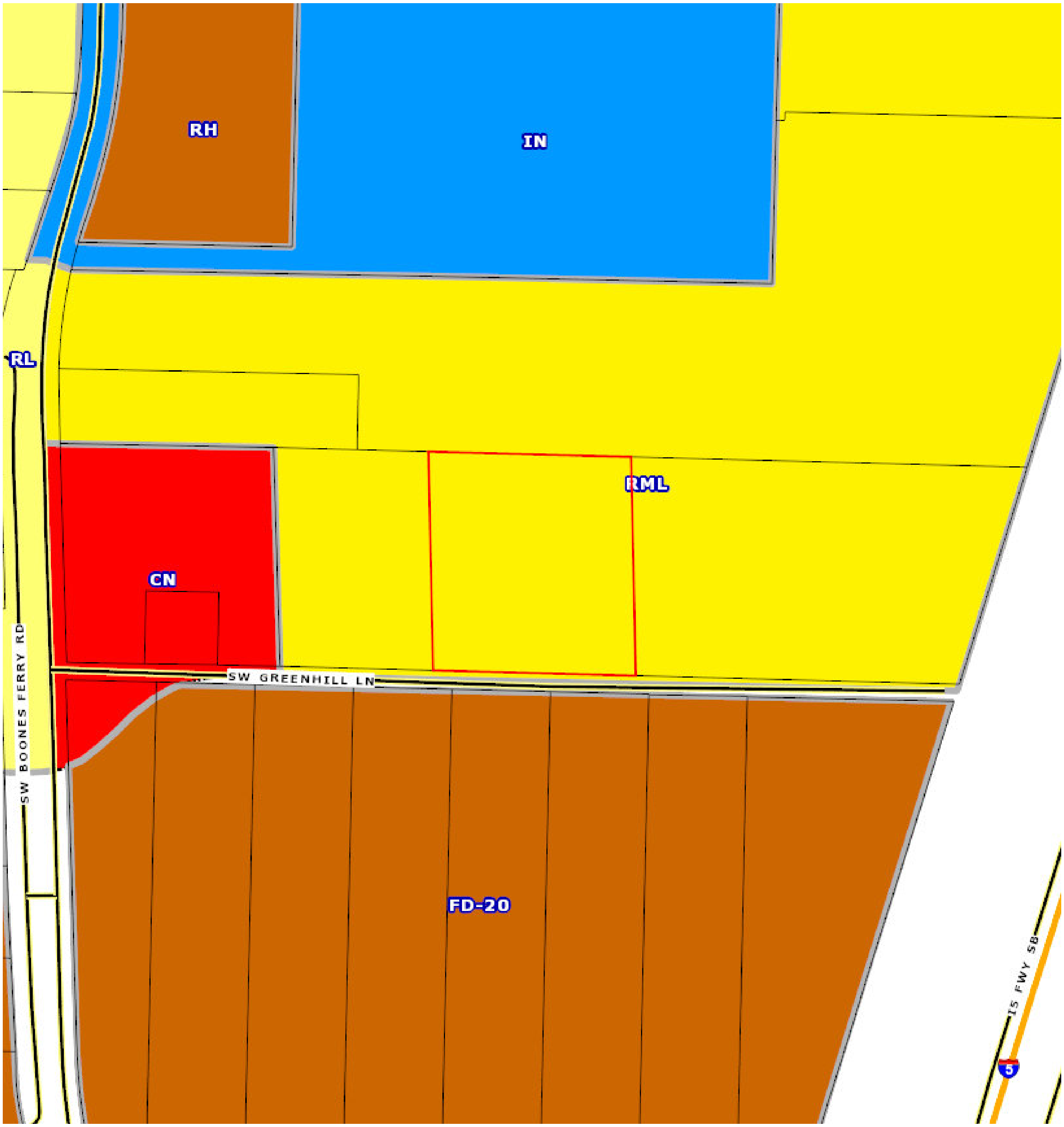
Flood Map - 100 Year



First American Title

Parcel ID: R560306

Zoning Map



First American Title

Parcel ID: R560306

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7,143

Washington County, Oregon
09/28/2007 03:29:27 PM
D-DW Cnt=1 Stn=16 D HOFFMAN
$25.00 $5.00 $11.00 $7,143.00 - Total = $7,184.00

2007-105096

01171368200701050960050056

I, Richard Hobernicht, Director of Assessment and Taxation and Ex-Officio County Clerk for Washington County, Oregon, do hereby certify that the within instrument of writing was received and recorded in the book of records of said county.

Richard Hobernicht

Richard Hobernicht, Director of Assessment and Taxation, Ex-Officio County Clerk

FIRST AMERICAN

After recording return to:
Autumn Sunrise LLC
1400 SW Schaeffer Road
West Linn, OR 97068

Until a change is requested all tax statements shall be sent to the following address:
Autumn Sunrise LLC
1400 SW Schaeffer Road
West Linn, OR 97068

File No.: 7073-1087491 (LSH)
Date: September 14, 2007

THIS SPACE RESERVE

FATCO. NO. 1087491-LO

STATUTORY SPECIAL WARRANTY DEED

Kimball Hill Homes Oregon, Inc., an Oregon Corporation, Grantor, conveys and specially warrants to **Autumn Sunrise LLC, an Oregon limited liability company**, Grantee, the following described real property free of liens and encumbrances created or suffered by the Grantor, except as specifically set forth herein:

This property is free from liens and encumbrances, EXCEPT:

1. The **2007/08** Taxes, a lien not yet payable.
2. Covenants, conditions, restrictions and/or easements, if any, affecting title, which may appear in the public record, including those shown on any recorded plat or survey.

See Legal Description attached hereto as Exhibit A and by this reference incorporated herein.

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSON'S RIGHTS, IF ANY, UNDER ORS 197.352. THIS INSTRUMENT DOES NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY APPROVED USES, TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES AS DEFINED IN ORS 30.930 AND TO INQUIRE ABOUT THE RIGHTS OF NEIGHBORING PROPERTY OWNERS, IF ANY, UNDER ORS 197.352.

The true consideration for this conveyance is **$7,143,000.00**.

WASHINGTON COUNTY
REAL PROPERTY TRANSFER TAX
$ 7143.00 9-28-07
FEE PAID DATE

Dated this 26TH day of SEPTEMBER, 2007.

Kimball Hill Homes Oregon, Inc., an Oregon corporation

Dudley McGee

By: Dudley McGee, Vice President

STATE OF California)
)ss.
County of SACRAMENTO)

This instrument was acknowledged before me on this 26TH day of SEPTEMBER, 2007 by Dudley McGee as Vice President of Kimball Hill Homes Oregon, Inc., on behalf of the corporation.

Sharon K. Ball

SHARON K. BALL
Commission # 1484422
Notary Public - California
Sacramento County
My Comm. Expires Apr 20, 2008

Notary Public for California
My commission expires: APRIL 20, 2008

EXHIBIT A

LEGAL DESCRIPTION:

PARCEL I:

BEGINNING AT A POINT WHICH POINT IS 5 CHAINS SOUTH OF THE NORTHEAST CORNER OF THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, AND RUNNING THENCE SOUTH 5 CHAINS TO A POINT; THENCE WEST 20 CHAINS, MORE OR LESS, TO THE CENTER OF THE COUNTY ROAD; THENCE NORTHERLY ALONG THE CENTER OF SAID COUNTY ROAD TO THE SOUTHWEST CORNER OF THAT CERTAIN TRACT OF LAND CONVEYED BY ANNIE C. VOGET IN FEE SIMPLE REMAINDER TO BEN D. ANDREWS AND HARRIET K. ANDREWS AS DESCRIBED IN BOOK 294 PAGE 587, DEED RECORDS OF WASHINGTON COUNTY; THENCE EAST ALONG THE SOUTH LINE OF SAID TRACT SO CONVEYED TO BEN D. ANDREWS AND HARRIET K. ANDREWS AS DESCRIBED IN BOOK 294 PAGE 587, DEED RECORDS OF SAID COUNTY, TO THE POINT OF BEGINNING, EXCEPT THAT PORTION DESCRIBED IN CONTRACT OF SALE IN FAVOR OF ROBERT K. COLE, AND WIFE, RECORDED MARCH 25, 1968 IN BOOK 686, PAGE 495, RECORDS OF WASHINGTON COUNTY.

PARCEL II:

A TRACT OF LAND SITUATED IN THE SOUTH ONE-HALF OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST OF THE WILLAMETTE MERIDIAN, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON, AND BEING A PART OF THAT CERTAIN TRACT OF LAND DESCRIBED IN BOOK 294, PAGE 585, DEED OF RECORDS, WASHINGTON COUNTY, OREGON, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS, TO-WIT:

BEGINNING AT THE INTERSECTION OF THE WESTERLY LINE OF THE SOUTHEAST ONE-QUARTER OF SAID SECTION 35, WITH THE NORTHERLY LINE OF SAID TRACT OF LAND DESCRIBED IN BOOK 294, PAGE 585, DEED RECORDS. FROM SAID PLACE OF BEGINNING THENCE NORTH 89°53'45" EAST ALONG SAID NORTHERLY LINE OF SAID TRACT DESCRIBED IN BOOK 294, PAGE 585, 1319.70 FEET TO THE NORTHEAST CORNER OF SAID TRACT OF LAND; THENCE SOUTH 0°14' WEST 330.00 FEET TO THE NORTHERLY LINE OF TUALATIN ORCHARD TRACT; THENCE SOUTH 89°53'45" WEST ALONG SAID NORTHERLY LINE OF TUALATIN ORCHARD TRACT, 802.80 FEET; THENCE LEAVING SAID NORTHERLY LINE OF TUALATIN ORCHARD TRACT, NORTH 0°06'15" WEST 144 FEET; THENCE SOUTH 89°53'45" WEST PARALLEL WITH SAID NORTHERLY LINE OF TUALATIN ORCHARD TRACT, 618.35 FEET TO THE INTERSECTION OF EASTERLY RIGHT OF WAY LINE OF STATE HIGHWAY NO. 217; THENCE NORTHEASTERLY ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 883.87 FEET THROUGH A CENTRAL ANGLE OF 10°55'20" A DISTANCE OF 169.44 FEET TO A POINT OF TANGENT; THENCE NORTH 17°16' EAST 251.58 FEET; THENCE LEAVING SAID EASTERLY RIGHT OF WAY LINE OF STATE HIGHWAY NO. 217, NORTH 89°53'45" EAST 60.42 FEET TO THE PLACE OF BEGINNING.

TOGETHER WITH A PORTION OF PARCEL 1 OF THOSE CERTAIN TRACTS OF LAND IN THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON CONVEYED TO GRACE COMMUNITY CHURCH OF THE ASSEMBLIES OF GOD, INC., BY DEED RECORDED AS DOCUMENT NUMBER 200155727 WASHINGTON COUNTY, OREGON DEED RECORDS, SAID PORTION BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF THAT CERTAIN TRACT OF LAND CONVEYED TO GRACE COMMUNITY CHURCH BY DEED RECORDED AS DOCUMENT NUMBER 2002004397 SAID DEED RECORDS AND RUNNING THENCE ALONG THE BOUNDARY OF SAID PARCEL 1, NORTH 89°34'48" EAST 485.62 FEET, NORTH 15°44'54" EAST 690.21 FEET, SOUTH 89°35'49" WEST 674.70 FEET SOUTH 00°09'07" EAST 16.50 FEET AND SOUTH 89°38'49" WEST 16.50 FEET; THENCE SOUTH 00°09'07" EAST 313.47 FEET TO A POINT ON THE NORTH LINE OF SAID DOCUMENT NUMBER 2002004397; THENCE ALONG THE BOUNDARY THEREOF NORTH 89°36'05" EAST 16.50 FEET AND SOUTH 00°08'37" EAST 313.16 FEET TO THE POINT OF BEGINNING.

PARCEL III:

LOT 1, TUALATIN ORCHARDS TRACT, EXCEPTING THE WEST 140 FEET OF THE EAST 260 FEET OF THE SOUTH 140 FEET, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON.

PARCEL IV:

THE WEST 140 FEET OF THE EAST 260 FEET OF THE SOUTH 140 FEET OF LOT 1, TUALATIN ORCHARD TRACTS, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON.

PARCEL V:

THE WESTERLY MOST 207.5 FEET, BEING A PORTION OF THAT CERTAIN TRACT OF LAND LOCATED IN SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST OF THE WILLAMETTE MERIDIAN, CONVEYED BY GRACE SCHUSTER TO JOHN DAY AND JESSIE DAY, UNDER DATE OF APRIL 20, 1949, AS SET FORTH IN DEED RECORDED IN BOOK 294 AT PAGE 446, DEED RECORDS, SAID TRACT SO CONVEYED, OF WHICH THE LAND HEREBY CONVEYED FORMS A PART, BEING DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN; THENCE NORTH 233 FEET; THENCE NORTH 87°15' WEST 1255.52 FEET TO THE SOUTHEAST CORNER OF THE TRACT HEREBY CONVEYED; THENCE NORTH 420 FEET ALONG THE WEST LINE OF LOT 4, TUALATIN ORCHARD TRACTS, TO THE SOUTH LINE OF TRACT CONVEYED BY DEED TO GEORGE ANDREWS, ET AL, IN BOOK 70, PAGE 374, RECORDED DECEMBER 27, 1905; THENCE NORTH 87°15' WEST 990.32 FEET ALONG THE SOUTH LINE OF SAID ANDREWS TRACT; THENCE SOUTH 420 FEET ALONG THE EAST LINE OF LOT 1, TUALATIN ORCHARDS TRACTS; THENCE SOUTH 87°15' EAST 990.32 FEET TO THE SOUTHEAST CORNER OF PROPERTY HEREBY CONVEYED.

PARCEL VI:

BEGINNING AT THE NORTHEAST CORNER OF TRACT 1, TUALATIN ORCHARD TRACTS, A DULY RECORDED SUBDIVISION IN SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON; THENCE SOUTH 87°15' EAST 207.5 FEET TO THE POINT OF TRUE BEGINNING OF THIS DIRECTION; THENCE SOUTH PARALLEL TO THE EAST LINE OF SAID TRACT 1, TUALATIN ORCHARD TRACTS, AND 207.5 FEET EASTERLY THEREFROM 420.0 FEET TO A POINT; THENCE SOUTH 87°15' EAST 90 FEET TO A POINT; THENCE NORTH PARALLEL TO THE EAST LINE OF SAID TRACT 1, 420.0 FEET; THENCE NORTH 87°15' WEST 90 FEET TO THE POINT OF TRUE BEGINNING OF THIS DESCRIPTION.

PARCEL VII:

A TRACT OF LAND IN THE SOUTHEAST 1/4 OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF LOT 12, TUALATIN ORCHARD TRACTS; THENCE NORTH 89°44'43" EAST 1159.47 FEET; THENCE NORTH 3°00'17" WEST 880.00 FEET TO A POINT ON A LINE EXTENDED FROM THE NORTHEAST CORNER OF LOT 1, TUALATIN ORCHARD TRACTS TO THE NORTHWEST CORNER OF LOT 4, TUALATIN ORCHARD TRACTS, SAID POINT FALLING NORTH 89°44'43" EAST 686.11 FEET FROM THE NORTHEAST CORNER OF SAID LOT 1 AND BEING THE TRUE POINT OF BEGINNING; THENCE SOUTH 3°00'17" EAST 420.00 FEET TO A POINT ON THE NORTH RIGHT OF WAY LINE OF GREENHILL LANE; THENCE WESTERLY ALONG SAID RIGHT OF WAY LINE SOUTH 89°44'43" WEST 389.06 FEET; THENCE NORTH 3°00'17" WEST 420.00 FEET; THENCE NORTH 89°44'43" EAST 389.06 FEET TO THE TRUE POINT OF BEGINNING.

PARCEL VIII:

A TRACT OF LAND IN THE SOUTHEAST 1/4 OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF LOT 12, TUALATIN ORCHARD TRACTS; THENCE NORTH 89°44'43" EAST 1159.47 FEET; THENCE NORTH 3°00'17" WEST 880.00 FEET TO A POINT ON A LINE EXTENDED FROM THE NORTHEAST CORNER OF LOT 1, TUALATIN ORCHARD TRACTS TO THE NORTHWEST CORNER OF LOT 4, TUALATIN ORCHARDS TRACTS, SAID POINT FALLING NORTH 89°44'43" EAST 686.11 FEET FROM THE NORTHEAST CORNER OF SAID LOT 1 AND BEING THE TRUE POINT OF BEGINNING; THENCE NORTH 89°44'43" EAST 763.79 FEET TO A POINT ON THE WESTERLY RIGHT OF WAY OF THE BALDOCK FREEWAY; THENCE SOUTH 15°49'15" WEST 436.59 FEET ALONG SAID RIGHT OF WAY TO THE NORTH RIGHT OF WAY LINE OF GREENHILL LANE; THENCE WESTERLY ALONG SAID RIGHT OF WAY SOUTH 89°44'43' WEST 622.75 FEET; THENCE NORTH 3°00'17" WEST 420.00 FEET TO THE TRUE POINT OF BEGINNING.

FIRST AMERICAN TITLE

Property Research Report

SUBJECT PROPERTY
Ns
R560315
2S135D000900
Washington

OWNER
Autumn Sunrise LLC

DATE PREPARED
06/14/2021

PREPARED BY
khaight@firstam.com

First American Title

Customer Service 503.219.8746
cs.oregon@firstam.com

First American Title

Customer Service Department
Phone: 503.219.TRIO (8746)
Fax: 503.790.7872
Email: cs.oregon@firstam.com
Date: 6/14/2021

OWNERSHIP INFORMATION

Owner: Autumn Sunrise LLC
CoOwner:
Site: Ns Tualatin OR 97062
Mail: 485 S State St Lake Oswego OR 97034

Parcel #: R560315
Ref Parcel #: 2S135D000900
TRS: 02S / 01W / 35 / SE
County: Washington

PROPERTY DESCRIPTION

Map Grid: 715-E1
Census Tract: 032110 Block: 1004
Neighborhood: Cio 6 Byrom
School Dist: 88J Sherwood
Impr Type:
Subdiv/Plat: Tualatin Orchard Tract
Land Use: 1900 - Urban Developable Tract - Vacant
Std Land Use: RCON - Condominium, Pud
Zoning: Tualatin-RML - Medium-Low Density Residential
Lat/Lon: 45.34763568 / -122.7692987
Watershed: Abernethy Creek-Willamette River
Legal: TUALATIN ORCHARD TRACT, LOT PT 4, ACRES 6.68

ASSESSMENT AND TAXATION

Market Land: $1,033,910.00
Market Impr: $0.00
Market Special: $0.00
Market Total: $1,033,910.00 (2020)
% Improved: 0.00%
Assessed Total: $813,100.00 (2021)
Levy Code: 88.15
Tax: $14,760.28 (2020)
Millage Rate: 18.1531
Exemption:
Exemption Type:

PROPERTY CHARACTERISTICS

Bedrooms:
Baths, Total:
Baths, Full:
Baths, Half:
Total Units:
Stories:
Fireplaces:
Cooling:
Heating:
Building Style:

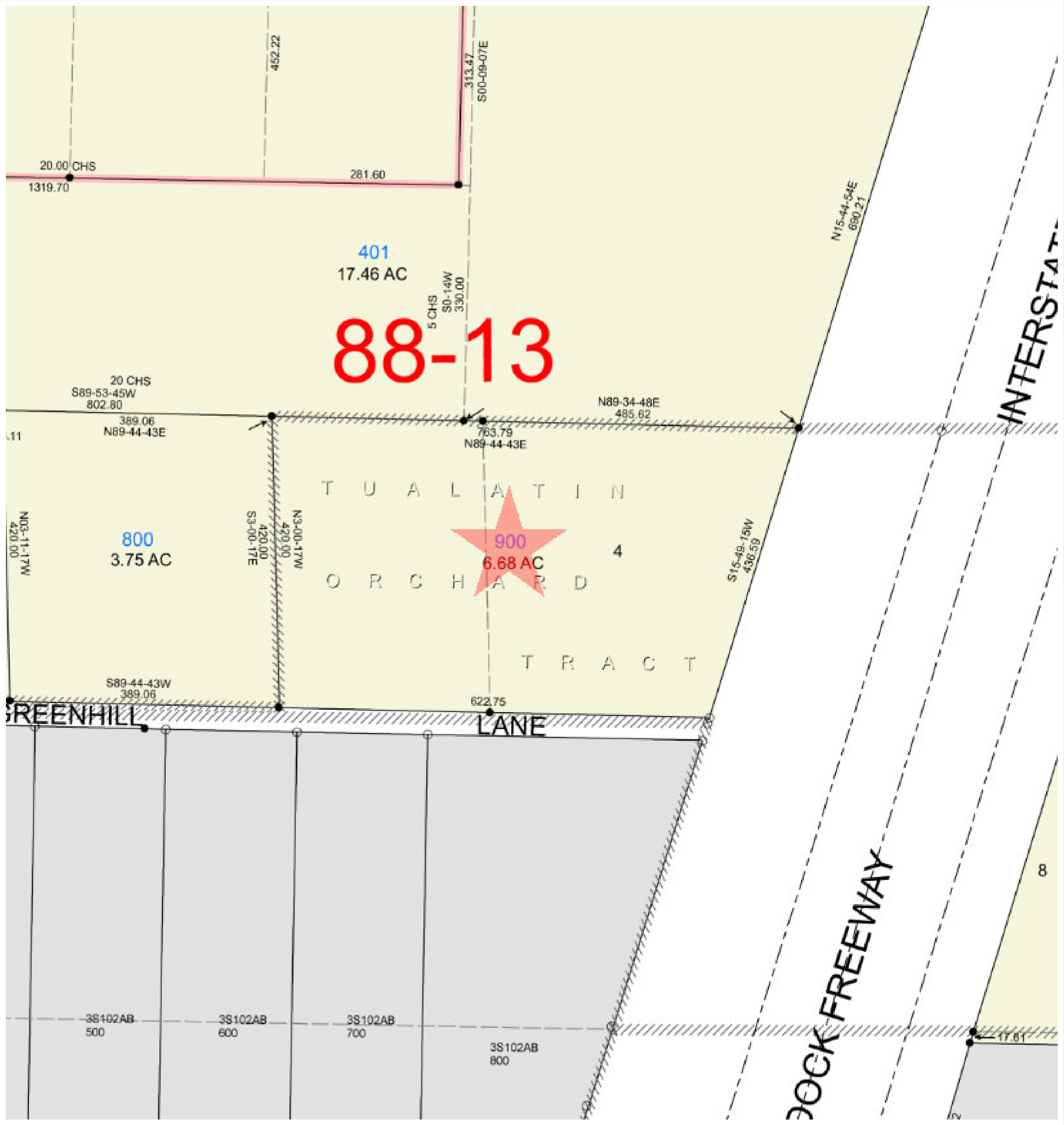
Total SqFt:
First Floor:
Second Floor:
Basement Fin:
Basement Unfin:
Basement Total:
Attic Fin:
Attic Unfin:
Attic Total:
Garage:

Year Built:
Eff Year Built:
Lot Size Ac: 6.68 Acres
Lot Size SF: 290,981 SqFt
Lot Width:
Lot Depth:
Roof Material:
Roof Shape:
Ext Walls:
Const Type:

SALES AND LOAN INFORMATION

Owner	Date	Doc #	Sale Price	Deed Type	Loan Amt	Loan Type
AUTUMN SUNRISE LLC	09/28/2007	2007105096	$7,143,000.00	DW		
ROOT HOLDINGS LLC	09/19/2005	114105	$1,640,000.00	Deed	$4,500,000.00	Private Party Lender
ANNIE M WILLEY	10/07/2004	116501		Deed		Conv/Unk

Assessor Map

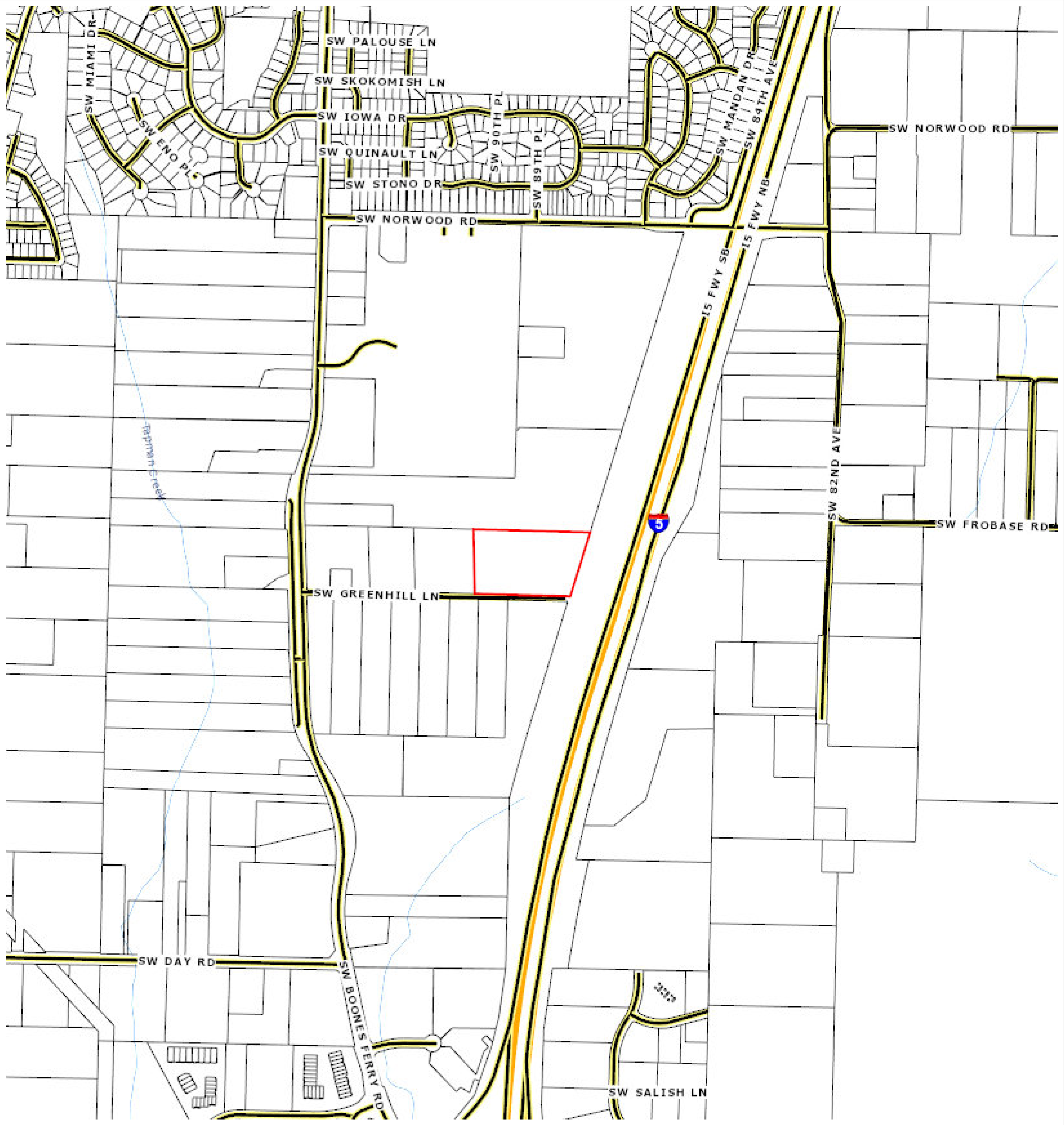


First American Title

Parcel ID: R560315

Site Address: Ns

Street Map



First American Title

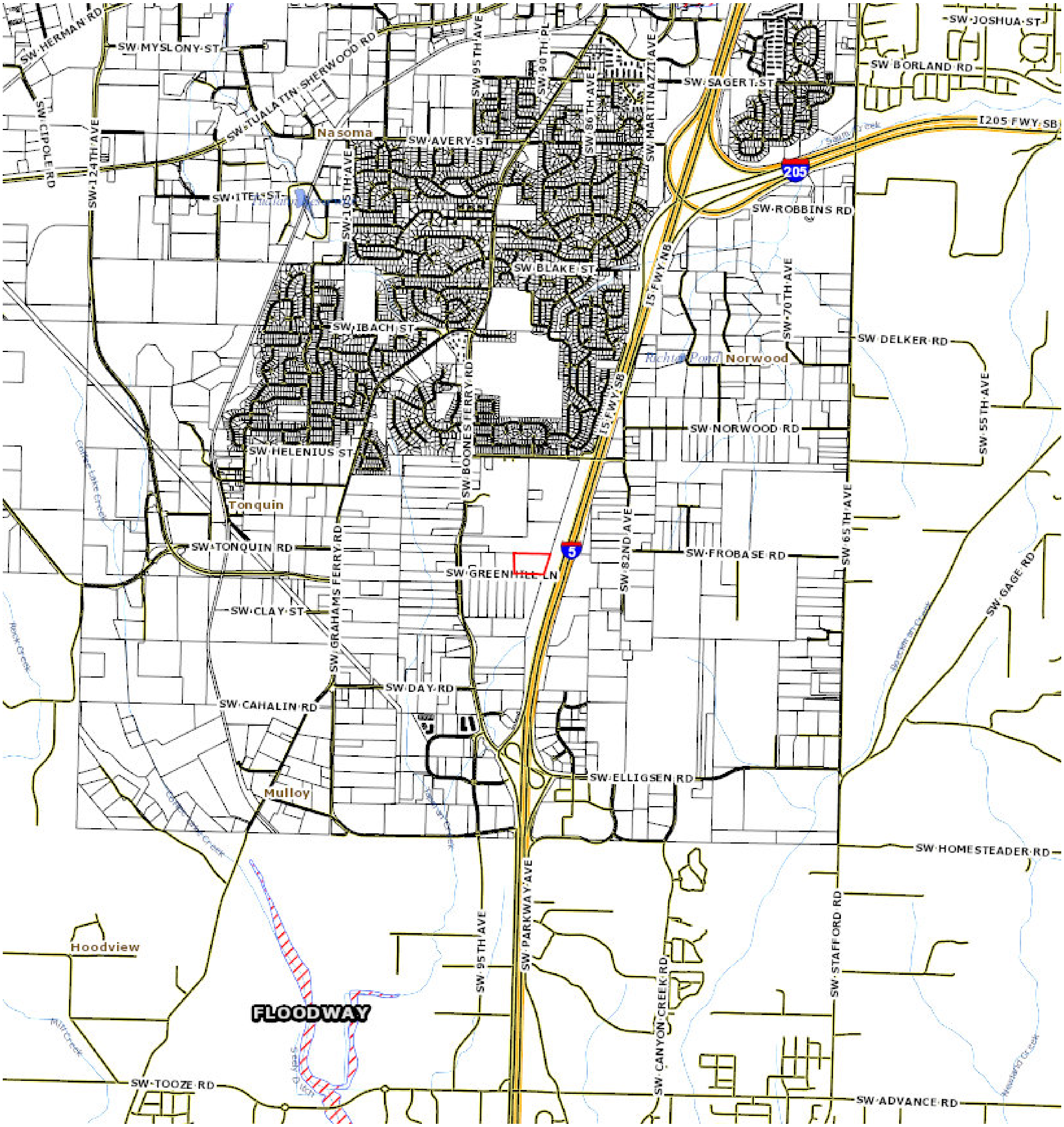
Parcel ID: R560315

Aerial Map

First American Title

Parcel ID: R560315

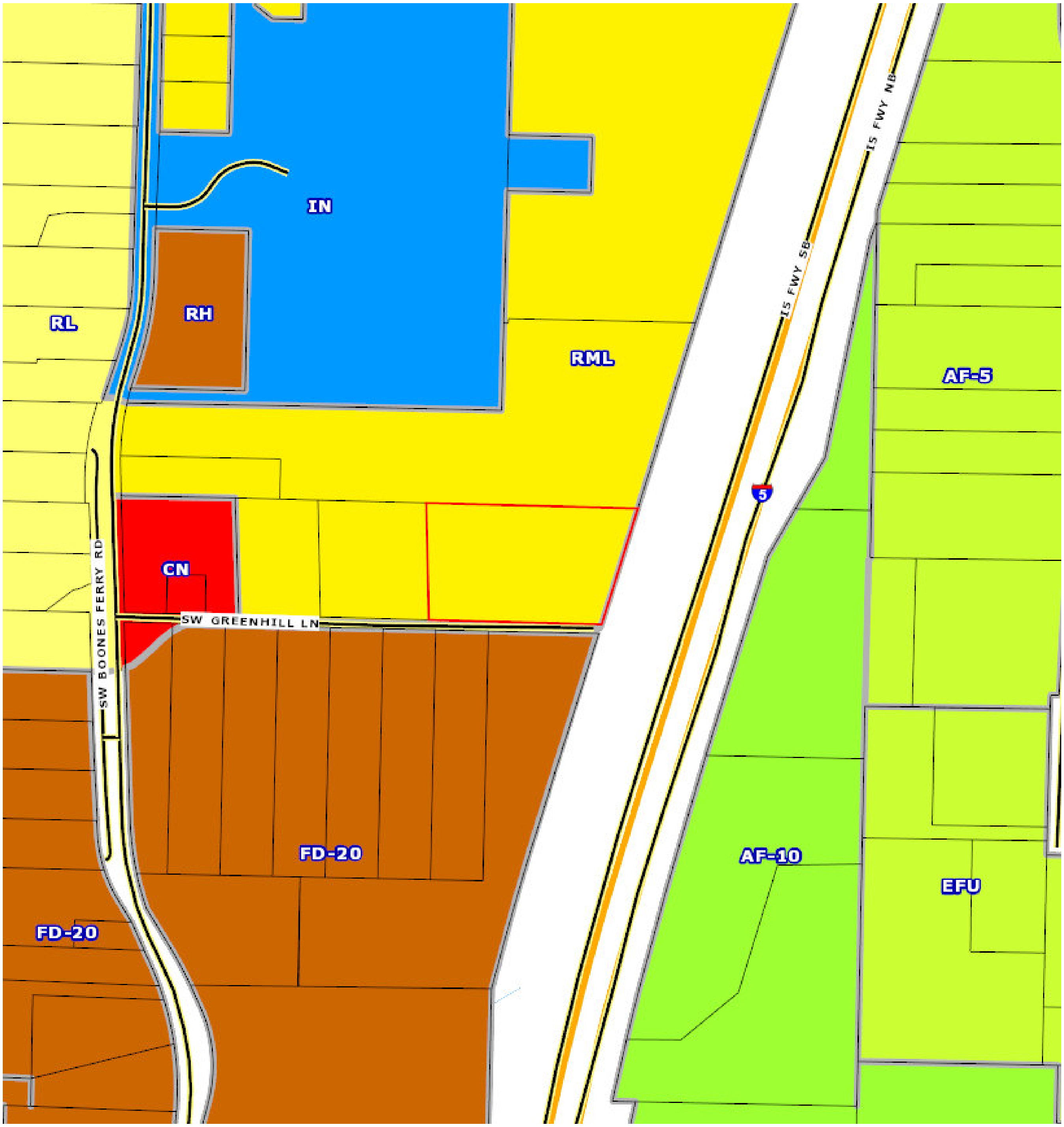
Flood Map - 100 Year



First American Title

Parcel ID: R560315

Zoning Map



First American Title

Parcel ID: R560315

2S
1
41

7,143

FIRST AMERICAN

Washington County, Oregon 2007-105096
09/28/2007 03:29:27 PM
D-DW Cnt=1 Stn=16 D HOFFMAN
$25.00 $5.00 $11.00 $7,143.00 - Total = $7,184.00

01171368200701050960050056

I, Richard Hobernicht, Director of Assessment and Taxation and Ex-Officio County Clerk for Washington County, Oregon, do hereby certify that the within instrument of writing was received and recorded in the book of records of said county.

Richard Hobernicht

Richard Hobernicht, Director of Assessment and Taxation, Ex-Officio County Clerk

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FATCO. NO. 1087491-LO

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The true consideration for this conveyance is **$7,143,000.00**.

WASHINGTON COUNTY
REAL PROPERTY TRANSFER TAX
$ 7143.00 9-28-07
FEE PAID DATE

Dated this 26TH day of SEPTEMBER, 2007.

Kimball Hill Homes Oregon, Inc., an Oregon corporation

Dudley McGee
By: Dudley McGee, Vice President

STATE OF California)
)ss.
County of SACRAMENTO)

This instrument was acknowledged before me on this 26TH day of SEPTEMBER, 2007 by Dudley McGee as Vice President of Kimball Hill Homes Oregon, Inc., on behalf of the corporation.

Sharon K. Ball

SHARON K. BALL
Commission # 1484422
Notary Public - California
Sacramento County
My Comm. Expires Apr 20, 2008

Notary Public for California
My commission expires: APRIL 20, 2008

EXHIBIT A

LEGAL DESCRIPTION:

PARCEL I:

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TOGETHER WITH A PORTION OF PARCEL 1 OF THOSE CERTAIN TRACTS OF LAND IN THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON CONVEYED TO GRACE COMMUNITY CHURCH OF THE ASSEMBLIES OF GOD, INC., BY DEED RECORDED AS DOCUMENT NUMBER 200155727 WASHINGTON COUNTY, OREGON DEED RECORDS, SAID PORTION BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

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PARCEL III:

LOT 1, TUALATIN ORCHARDS TRACT, EXCEPTING THE WEST 140 FEET OF THE EAST 260 FEET OF THE SOUTH 140 FEET, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON.

PARCEL IV:

THE WEST 140 FEET OF THE EAST 260 FEET OF THE SOUTH 140 FEET OF LOT 1, TUALATIN ORCHARD TRACTS, IN THE COUNTY OF WASHINGTON AND STATE OF OREGON.

PARCEL V:

THE WESTERLY MOST 207.5 FEET, BEING A PORTION OF THAT CERTAIN TRACT OF LAND LOCATED IN SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST OF THE WILLAMETTE MERIDIAN, CONVEYED BY GRACE SCHUSTER TO JOHN DAY AND JESSIE DAY, UNDER DATE OF APRIL 20, 1949, AS SET FORTH IN DEED RECORDED IN BOOK 294 AT PAGE 446, DEED RECORDS, SAID TRACT SO CONVEYED, OF WHICH THE LAND HEREBY CONVEYED FORMS A PART, BEING DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN; THENCE NORTH 233 FEET; THENCE NORTH 87°15' WEST 1255.52 FEET TO THE SOUTHEAST CORNER OF THE TRACT HEREBY CONVEYED; THENCE NORTH 420 FEET ALONG THE WEST LINE OF LOT 4, TUALATIN ORCHARD TRACTS, TO THE SOUTH LINE OF TRACT CONVEYED BY DEED TO GEORGE ANDREWS, ET AL, IN BOOK 70, PAGE 374, RECORDED DECEMBER 27, 1905; THENCE NORTH 87°15' WEST 990.32 FEET ALONG THE SOUTH LINE OF SAID ANDREWS TRACT; THENCE SOUTH 420 FEET ALONG THE EAST LINE OF LOT 1, TUALATIN ORCHARDS TRACTS; THENCE SOUTH 87°15' EAST 990.32 FEET TO THE SOUTHEAST CORNER OF PROPERTY HEREBY CONVEYED.

PARCEL VI:

BEGINNING AT THE NORTHEAST CORNER OF TRACT 1, TUALATIN ORCHARD TRACTS, A DULY RECORDED SUBDIVISION IN SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON; THENCE SOUTH 87°15' EAST 207.5 FEET TO THE POINT OF TRUE BEGINNING OF THIS DIRECTION; THENCE SOUTH PARALLEL TO THE EAST LINE OF SAID TRACT 1, TUALATIN ORCHARD TRACTS, AND 207.5 FEET EASTERLY THEREFROM 420.0 FEET TO A POINT; THENCE SOUTH 87°15' EAST 90 FEET TO A POINT; THENCE NORTH PARALLEL TO THE EAST LINE OF SAID TRACT 1, 420.0 FEET; THENCE NORTH 87°15' WEST 90 FEET TO THE POINT OF TRUE BEGINNING OF THIS DESCRIPTION.

PARCEL VII:

A TRACT OF LAND IN THE SOUTHEAST 1/4 OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF LOT 12, TUALATIN ORCHARD TRACTS; THENCE NORTH 89°44'43" EAST 1159.47 FEET; THENCE NORTH 3°00'17" WEST 880.00 FEET TO A POINT ON A LINE EXTENDED FROM THE NORTHEAST CORNER OF LOT 1, TUALATIN ORCHARD TRACTS TO THE NORTHWEST CORNER OF LOT 4, TUALATIN ORCHARD TRACTS, SAID POINT FALLING NORTH 89°44'43" EAST 686.11 FEET FROM THE NORTHEAST CORNER OF SAID LOT 1 AND BEING THE TRUE POINT OF BEGINNING; THENCE SOUTH 3°00'17" EAST 420.00 FEET TO A POINT ON THE NORTH RIGHT OF WAY LINE OF GREENHILL LANE; THENCE WESTERLY ALONG SAID RIGHT OF WAY LINE SOUTH 89°44'43" WEST 389.06 FEET; THENCE NORTH 3°00'17" WEST 420.00 FEET; THENCE NORTH 89°44'43" EAST 389.06 FEET TO THE TRUE POINT OF BEGINNING.

PARCEL VIII:

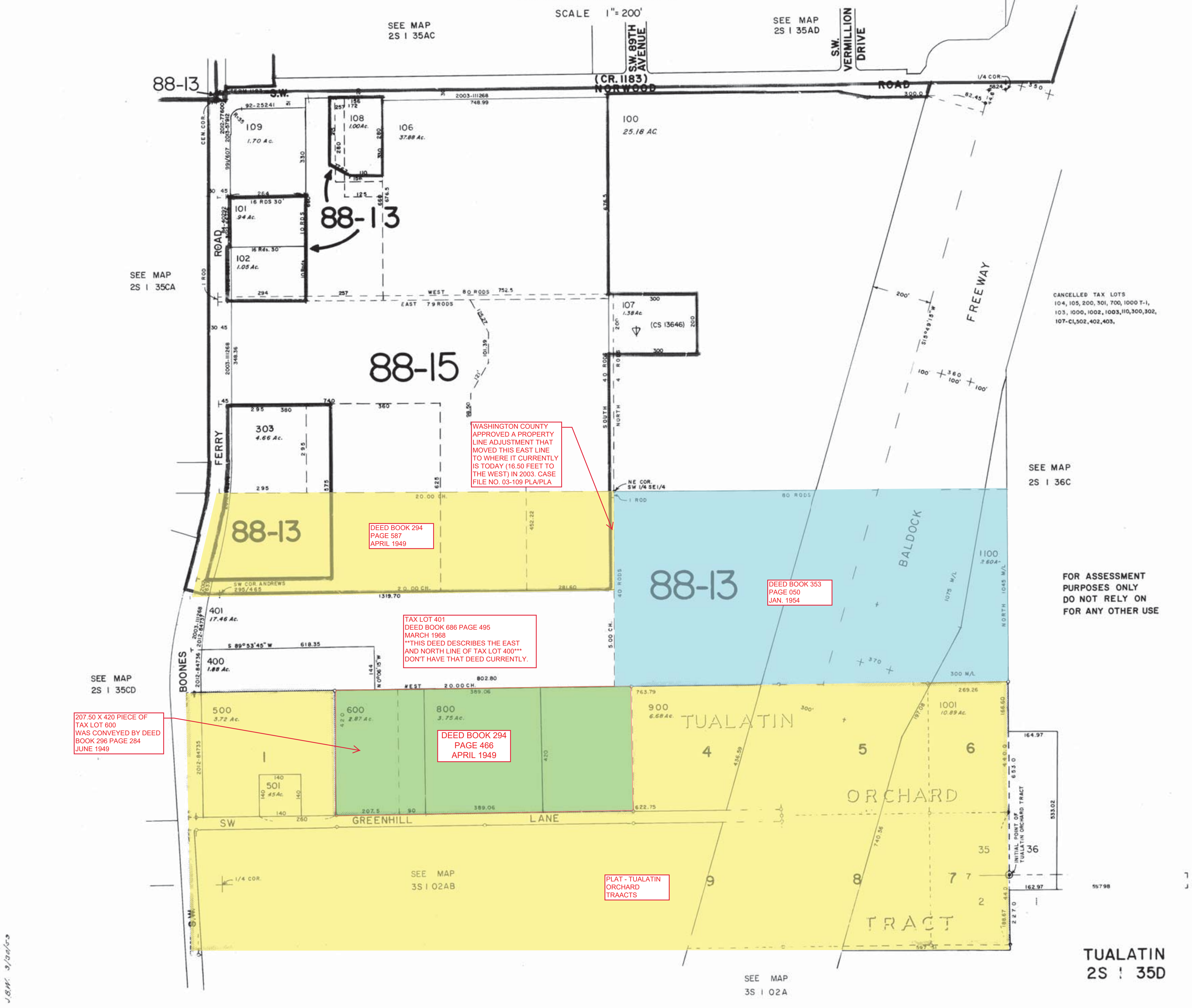
A TRACT OF LAND IN THE SOUTHEAST 1/4 OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF LOT 12, TUALATIN ORCHARD TRACTS; THENCE NORTH 89°44'43" EAST 1159.47 FEET; THENCE NORTH 3°00'17" WEST 880.00 FEET TO A POINT ON A LINE EXTENDED FROM THE NORTHEAST CORNER OF LOT 1, TUALATIN ORCHARD TRACTS TO THE NORTHWEST CORNER OF LOT 4, TUALATIN ORCHARDS TRACTS, SAID POINT FALLING NORTH 89°44'43" EAST 686.11 FEET FROM THE NORTHEAST CORNER OF SAID LOT 1 AND BEING THE TRUE POINT OF BEGINNING; THENCE NORTH 89°44'43" EAST 763.79 FEET TO A POINT ON THE WESTERLY RIGHT OF WAY OF THE BALDOCK FREEWAY; THENCE SOUTH 15°49'15" WEST 436.59 FEET ALONG SAID RIGHT OF WAY TO THE NORTH RIGHT OF WAY LINE OF GREENHILL LANE; THENCE WESTERLY ALONG SAID RIGHT OF WAY SOUTH 89°44'43' WEST 622.75 FEET; THENCE NORTH 3°00'17" WEST 420.00 FEET TO THE TRUE POINT OF BEGINNING.

SE 1/4 SECTION 35 T2S R1W W.M.

WASHINGTON COUNTY OREGON

2S 1 35D
TUALATIN



WASHINGTON COUNTY
APPROVED A PROPERTY
LINE ADJUSTMENT THAT
MOVED THIS EAST LINE
TO WHERE IT CURRENTLY
IS TODAY (16.50 FEET TO
THE WEST) IN 2003. CASE
FILE NO. 03-109 PLA/PLA

DEED BOOK 294
PAGE 587
APRIL 1949

DEED BOOK 353
PAGE 050
JAN. 1954

TAX LOT 401
DEED BOOK 686 PAGE 495
MARCH 1968
**THIS DEED DESCRIBES THE EAST
AND NORTH LINE OF TAX LOT 400***
DON'T HAVE THAT DEED CURRENTLY.

207.50 X 420 PIECE OF
TAX LOT 600
WAS CONVEYED BY DEED
BOOK 296 PAGE 284
JUNE 1949

DEED BOOK 294
PAGE 466
APRIL 1949

PLAT - TUALATIN
ORCHARD
TRAACTS

TUALATIN
2S 1 35D

RECORD OF SURVEY

29,313

FOR GRACE COMMUNITY CHURCH
IN THE S.E. 1/4, SECTION 35, T2S, R1W, W.M.
WASHINGTON COUNTY, OREGON

SCALE 1" = 200'

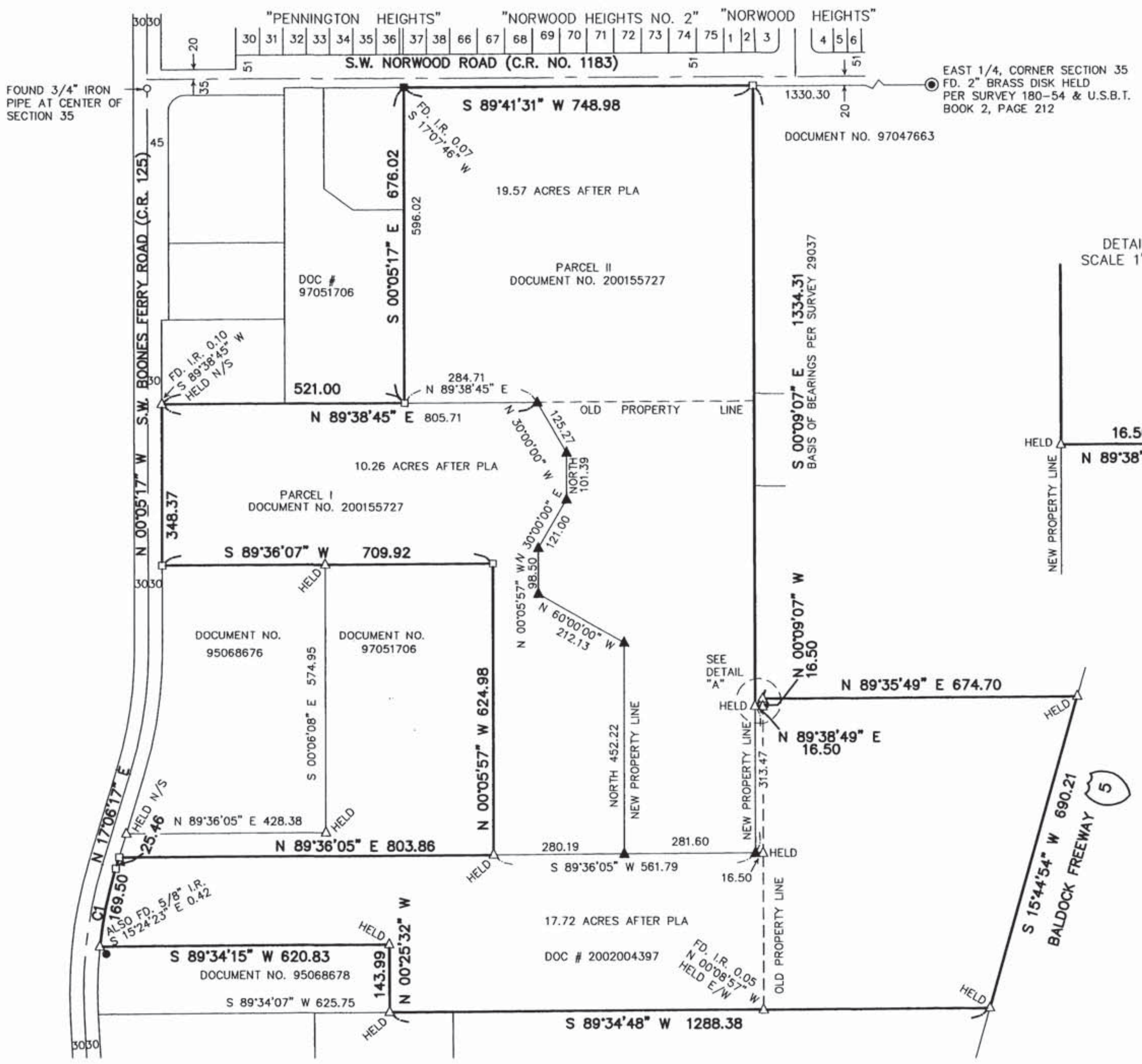
APRIL 30, 2003

200 160 120 80 40 0 100 200 400

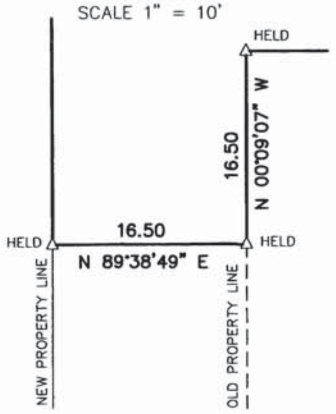
LEGEND

- ○ = FOUND IRON PIPE AS NOTED
- △ = FOUND 5/8" IRON ROD WITH YELLOW PLASTIC CAP STAMPED "REPPETO LS 657" PER SURVEY 26269
- □ = FOUND 5/8" IRON ROD WITH YELLOW PLASTIC CAP STAMPED "D.C.S. INC LS. 1856" PER SURVEY 29037
- ■ = FOUND 5/8" IRON ROD WITH YELLOW PLASTIC CAP STAMPED "CORLILE 921" PER SURVEY 18645
- ● = FOUND 5/8" IRON ROD
- ▲ = SET 5/8" X 30" IRON ROD WITH YELLOW PLASTIC CAP STAMPED "D.C.S INC. LS 1856"
- ◉ = FOUND WASHINGTON COUNTY MONUMENT AS NOTED

PLA = PROPERTY LINE ADJUSTMENT



DETAIL "A"
SCALE 1" = 10'



REFERENCES

SURVEYS: 6271 13646 18054 18645 24477 26269 29037

COUNTY ROAD NOTES ROAD NO. 1183

U.S.B.T. BOOK 2, PAGE 212

DEEDS: DOCUMENT NO. 95068676 DOCUMENT NO. 9506878
DOCUMENT NO. 97051706 DOCUMENT NO. 98100606
DOCUMENT NO. 2001055727 DOCUMENT NO. 2002004397

NARRATIVE

1 – THE PURPOSE OF THIS SURVEY IS TO MONUMENT TWO PROPERTY LINE ADJUSTMENTS PER WASHINGTON COUNTY CASE FILE NUMBER 03–109 PLA/PLA.

2 – ACCEPTED THE OVERALL BOUNDARY AS ESTABLISHED AND MONUMENTED IN OUR SURVEY 29037.

3 – MONUMENTED PROPERTY LINE ADJUSTMENTS IN ACCORDANCE WITH APPROVED CASE FILE NUMBER 03–109 PLA/PLA.

4 – BASIS OF BEARINGS IS PER SURVEY NUMBER 29037.

CURVE TABLE

CURVE	DELTA	RADIUS	ARC	CHORD	CHORD BEARING
C1	10°55'33"	888.87	169.50	169.24	S 11°38'31" W

I HEREBY CERTIFY THAT THIS SURVEY WAS PREPARED USING HP PRODUCT # 51645A ON AZON 13–0444 POLYESTER FILM.

REGISTERED
PROFESSIONAL
LAND SURVEYOR

John M. Peterson

OREGON
JULY 13, 1979
JOHN M. PETERSON
1856

RENEWAL 12/31/04

DEVELOPMENT & CONSTRUCTION SERVICES, INC.

339 W. MAIN STREET
HILLSBORO, OREGON 97123
(503) 648–4959

JOB # 0108022

WASHINGTON COUNTY
SURVEYOR'S OFFICE
ACCEPTED FOR FILING
8 - 6 - 03

AFFIDAVIT OF MAILING NOTICE

STATE OF OREGON)
) SS
COUNTY OF WASHINGTON)

I, Mitchell Goodwin being first duly sworn, depose and say:

That on the 17 day of May, 20 21, I served upon the persons shown on Exhibit "A" (Mailing Area List), attached hereto and by this reference incorporated herein, a copy of the Notice of Neighborhood/Developer Meeting marked Exhibit "B," attached hereto and by this reference incorporated herein, by mailing to them a true and correct copy of the original hereof. I further certify that the addresses shown on said Exhibit "A" are their regular addresses as determined from the books and records of the Washington County and/or Clackamas County Departments of Assessment and Taxation Tax Rolls, and that said envelopes were placed in the United States Mail with postage fully prepared thereon.

Mitchell

Signature

SUBSCRIBED AND SWORN to before me this 19th day of May, 2021.

OFFICIAL STAMP
GOLDIE MARIE HAMILTON
NOTARY PUBLIC - OREGON
COMMISSION NO. 999054
MY COMMISSION EXPIRES APRIL 20, 2024

Goldie Hamilton
Notary Public for Oregon
My commission expires: 4/20/2024

RE: Autumn Sunrise Subdivision and Conditional Use Permit

AKS
ENGINEERING & FORESTRY

May 17, 2021

RE: Neighborhood/Developer Virtual Meeting – Autumn Sunrise Subdivision and Conditional Use Permit

Dear Property Owner/Neighbor:

AKS Engineering & Forestry, LLC is holding a neighborhood meeting regarding Autumn Sunrise, a ±62-acre site located in the Basalt Creek Planning Area that is generally located south of SW Norwood Road and east of SW Lower Boones Ferry Road in Tualatin, Oregon. The site is comprised of Tax Lots 100, 400, 401, 500, 501, 600, 800, and 900 of Washington County Assessor's Map 2S 1 35D and is zoned Medium-Low Density Residential (RML) and Neighborhood Commercial (CN). A map of the location is shown on the back of this letter. The project involves a Conditional Use Permit to allow detached single-family homes in the RML zone, and a Subdivision for 400 single-family attached and detached lots and two commercial lots. Improvements to the commercial lots will be addressed in future land use applications. Prior to submitting a land use application to the City of Tualatin, we would like to discuss the project with you in more detail.

The purpose of this meeting is to provide a forum for surrounding property owners/residents to review and discuss the project before the application is submitted to the City. Due to social distancing measures and the inability to meet in person, this meeting will be held via telephone and online Zoom webinar. The City of Tualatin Planning Division approves of this means of holding the required neighborhood meeting. The meeting is scheduled for:

Wednesday, June 9, 2021 AT 6:00 PM
SEE ATTACHED INSTRUCTIONS TO LEARN HOW TO JOIN THE MEETING

This meeting gives you the opportunity to share any special information you know about the property involved. We will try to answer questions related to how the project meets relevant development standards and is consistent with Tualatin's land use regulations. Please note that this meeting will be an informational meeting on preliminary plans. These plans may be altered prior to submittal of the application to the City. Depending upon the type of land use action required, you may receive official notice from the City of Tualatin requesting that you participate with written comments and/or you may have the opportunity to attend a public hearing.

I look forward to discussing this project with you. If you have questions but will be unable to attend, please feel free to contact me at 503-563-6151 or by email at slotemakerm@aks-eng.com.

Sincerely,

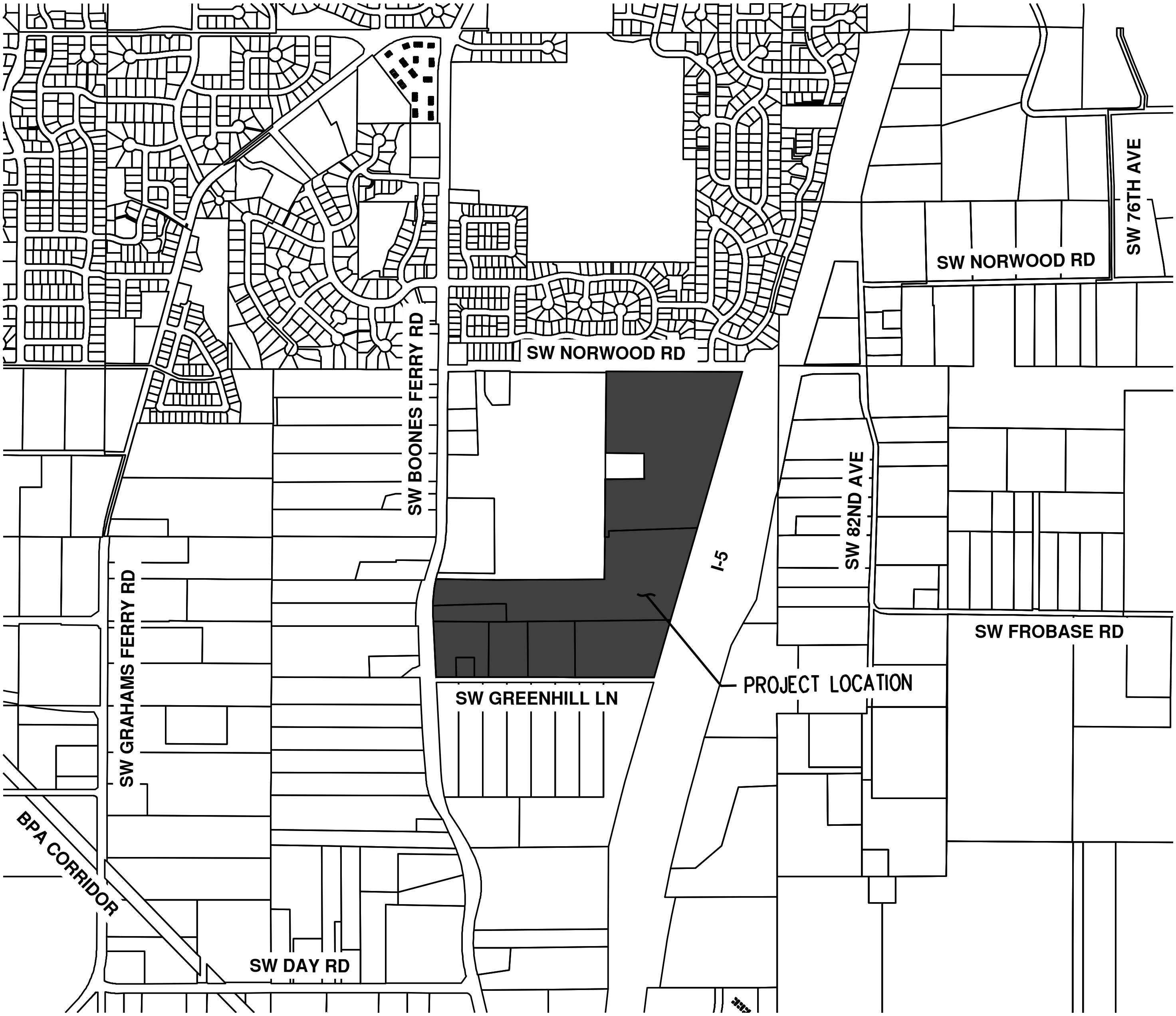
AKS ENGINEERING & FORESTRY, LLC

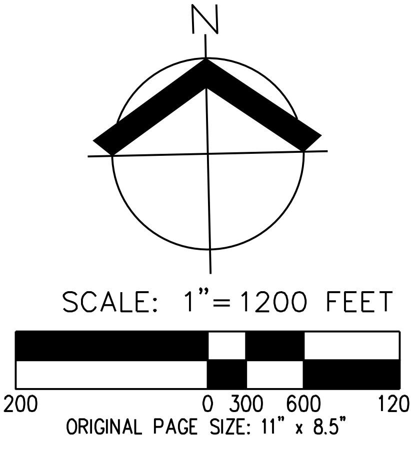
M Slotemaker

Melissa Slotemaker, AICP
12965 SW Herman Road, Suite 100 | Tualatin, OR 97062
P: 503.563.6151 | www.aks-eng.com | SlotemakerM@aks-eng.com

Enclosures: Vicinity Map
Instructions for Joining & Participating in the Public Neighborhood Meeting

Cc: Tabitha Boschetti, City of Tualatin Community Development Department by email
Byrom CIO representatives by email





DATE: 05/13/2021

AUTUMN SUNRISE SITE VICINITY MAP

EXHIBIT
A

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
503.563.6151 WWW.AKS-ENG.COM

DRWN: JSM
CHKD: DS
AKS JOB:
7454

DWG: VICINITY MAP | LAYOUT1

Instructions for Joining & Participating in the Public Neighborhood Meeting for the Autumn Sunrise Subdivision and Conditional Use Permit

Virtual Meeting provided via Zoom Webinar

Wednesday June 9, 2021 at 6:00 PM

Please Register in Advance (a list of attendees must be submitted to the City):

- Go to **www.aks-eng.com/autumn-sunrise** and follow the link to register.
- Complete the online registration form.
- You will receive a confirmation email containing a link to join the Zoom webinar at the scheduled time as well as additional instructions.
- Meeting materials will be available on **www.aks-eng.com/autumn-sunrise** two days prior to the meeting and at least 10 days after the meeting concludes.

How to Join the Meeting:

Join by computer, tablet, or smartphone

- **This is the preferred method as it allows you to see the Presenter's materials on screen.**
- Click on the "Click Here to Join" link provided in your registration confirmation email.
- (If you registered at **www.aks-eng.com/autumn-sunrise** but did not receive a confirmation email, please check your junk/spam folder before contacting the Meeting Administrator.)
- You may be prompted to "download and run Zoom" or to install the App (ZOOM cloud meetings). Follow the prompts or bypass this process by clicking "join from your browser".
- You should automatically be connected to the virtual neighborhood meeting.

Join by telephone

- Dial any of the toll-free Zoom numbers below to connect to the neighborhood meeting:

+1-669-900-6833	+1-346-248-7799
+1-929-205-6099	+1-253-215-8782
+1-301-715-8592	+1-312-626-6799

- If you experience trouble connecting, please pick another number and try again.
- After dialing in, enter this Zoom ID when prompted: **861 3179 8813**
- The Password if needed is: **6161**

MEETING ADMINISTRATOR:

For technical assistance or to submit a question for the meeting:

Email slotemakerm@aks-eng.com

During the Meeting

Audio Help

- Meeting attendees will be muted throughout the presentation. This will allow everyone to hear the presentation clearly without added distractions.
- Make sure that the speakers on your device are turned on and not muted.
- If you do not have speakers on your computer, you can join by phone (using the "Join by telephone" instructions) to hear the presentation while watching the presentation on your computer monitor.

Questions & Answers

Your questions are important to us. There will be time reserved during the meeting to take questions, using one of the submission options below. Our presentation team will make their best effort to answer all question(s) during the meeting.

Prior to the Meeting:

- You can Email your question(s) in advance to: **slotemakerm@aks-eng.com**

During the Meeting:

- ***Preferred Method:*** Use the "Q&A" button on the bottom of the presentation screen to submit a question in real time.
- Email your question to: **slotemakerm@aks-eng.com**

After the Meeting:

- We will continue to take questions after the meeting has ended. Please submit your question(s) to: **slotemakerm@aks-eng.com**
- All questions received after the meeting and prior to midnight will be answered in an email to all registered meeting participants by end of business the following day.

Helpful Hints/Troubleshooting

We want to start on time! Please join the meeting 5-10 minutes prior to the 6:00 PM start time to ensure successful connection.

- You do not need a Zoom account to join the meeting.
- You will need a valid email address at the time of registration to receive the confirmation email and link to join the webinar or receive answers to any questions submitted after the meeting.
- For first-time Zoom users, we recommend downloading and installing the Zoom App well in advance, by clicking on the "Click Here to Join" link in your confirmation email.
- For technical assistance, please contact the Meeting Administrator (contact above).
- If you have difficulties connecting by computer, tablet, or smartphone, we suggest disconnecting and instead use the "Join by telephone" instructions to listen in.

ZIMMERMAN STEPHEN A & MATHYS JACKIE L
24305 SW BOONES FERRY RD
TUALATIN, OR, 97062

ZACHER BRIAN M & ZACHER MICHAELA F
9325 SW QUINAULT LN
TUALATIN, OR, 97062

YOUNG DOUGLAS A & YOUNG TERESA S
987 SOLANA CT
MOUNTAIN VIEW, CA, 94040

YEE DONALD M & YEE PAMELA E
9105 SW STONO DR
TUALATIN, OR, 97062

YARNELL AARON
22620 SW 87TH PL
TUALATIN, OR, 97062

YAMAMOTO MICHAEL
22930 SW MANDAN DR
TUALATIN, OR, 97062

YACKLEY DIANE M & GANNETT TOD C
23240 SW BOONES FERRY RD
TUALATIN, OR, 97062

WYBENGA DOUGLAS
1510 WOODLAND DR
CORVALLIS, OR, 97330

WORKMAN STEPHEN G & WORKMAN MARY B
8810 SW STONO DR
TUALATIN, OR, 97062

WOOLSEY RANDY M & WOOLSEY DONNA J
8775 SW STONO DR
TUALATIN, OR, 97062

WOODRUFF VIRGINIA C
22740 SW 93RD TER
TUALATIN, OR, 97062

WONG JONATHAN D & WONG BETH J
9345 SW STONO DR
TUALATIN, OR, 97062

WISER BRIAN R & LIRA MARIA ALEJANDRA
22845 SW 89TH PL
TUALATIN, OR, 97062

WILSON DAVID L & WILSON KAREN A
22750 SW 92ND PL
TUALATIN, OR, 97062

WILLIAMS TOM K
9300 SW NORWOOD RD
TUALATIN, OR, 97062

WESSON MICHAEL SANDER
9385 SW IOWA DR
TUALATIN, OR, 97062

WELCH RAYMOND P & WELCH PAMELA K
8575 SW MARICOPA DR
TUALATIN, OR, 97062

WELBORN RANDALL J & JULIE ANN WELBORN LIV TRUST
22885 SW VERMILLION DR
TUALATIN, OR, 97062

WEINSTEIN MARC A & WEINSTEIN EILEEN
8830 SW STONO DR
TUALATIN, OR, 97062

WEBB BRIAN & ROBERTS KIRA
22850 SW MANDAN DR
TUALATIN, OR, 97062

WASHINGTON COUNTY FACILITIES MGMT
169 N 1ST AVE #42
HILLSBORO, OR, 97124

WADSWORTH ERIC & WADSWORTH WENDY
9265 SW STONO DR
TUALATIN, OR, 97062

VETETO MARK E & VETETO NANCY
9220 SW STONO DR
TUALATIN, OR, 97062

VELAZQUEZ BRIAN A & VELAZQUEZ CHRISTINA RALSTON
9325 SW PALOUSE LN
TUALATIN, OR, 97062

VANDERBURG SUSAN B, JOHN TIMOTHY, & JACQUELIN
21715 SW HEDGES DR
TUALATIN, OR, 97062

TYGART DONALD G & MERCADO LORELEI
22920 SW MANDAN DR
TUALATIN, OR, 97062

TURNBULL BRENT D
9340 SW IOWA DR
TUALATIN, OR, 97062

CITY OF TUALATIN
18880 SW MARTINAZZI AVE
TUALATIN, OR, 97062

TRIKUR MARTA LUIZA & TRIKUR SERGEY F
22775 SW 90TH PL
TUALATIN, OR, 97062

TRICKETT AARON & TRICKETT HEATHER
22580 SW VERMILLION DR
TUALATIN, OR, 97062

TRAN NICHOLAS
8983 SW STONO DR
TUALATIN, OR, 97062

TOMPKINS TIMOTHY L & TOMPKINS RACHEL N
22570 SW VERMILLION DR
TUALATIN, OR, 97062

TOLER E TRENT & TOLER ROSEANN T
22595 SW 87TH PL
TUALATIN, OR, 97062

TIGARD-TUALATIN SCHOOL DISTRICT #23J
6960 SW SANDBURG ST
TIGARD, OR, 97223

THURLEY CHRISTOPHER
9135 SW STONO DR
TUALATIN, OR, 97062

THOMPSON WAYNE & THOMPSON JOYCE
9120 SW STONO DR
TUALATIN, OR, 97062

TENLY PROPERTIES CORP
PO BOX 6839
BEND, OR, 97708

TAYLOR BRENDA & TAYLOR JOE N
22885 SW 94TH TER
TUALATIN, OR, 97062

TAYLOR ARTHUR R & MANANDIL MYLYN
22675 SW VERMILLION DR
TUALATIN, OR, 97062

TAPASA HEIDI L & TAPASA TUUMAMAO
22605 SW 94TH TER
TUALATIN, OR, 97062

TAM AARON L M & TAM AMY
9250 SW IOWA DR
TUALATIN, OR, 97062

SYVERSON FAMILY LIV TRUST
8895 SW IOWA DR
TUALATIN, OR, 97062

SWANK ERICA & SWANK TRAVIS
22715 SW MANDAN DR
TUALATIN, OR, 97062

SUTHERLAND STUART P & SUTHERLAND LEEANN N FAM TRUST
22805 SW 92ND PL
TUALATIN, OR, 97062

Suppressed Ownership
9375 SW STONO DR
TUALATIN, OR, 97062

STUART JAMES W & STUART HOLLY V
9235 SW IOWA DR
TUALATIN, OR, 97062

STRATTON GILLIAN M
9195 SW IOWA DR
TUALATIN, OR, 97062

STONE LEAH & STONE SHERRY
8755 SW STONO DR
TUALATIN, OR, 97062

STIMSON TOM P & GUTIERREZ-STIMSON ERINN M
8894 SW STONO DR
TUALATIN, OR, 97062

STILLS DANNY T & STILLS DEBRA J
3498 CHAPARREL LOOP
WEST LINN, OR, 97068

ST CLAIR DEBORAH J
9375 SW QUINAULT LN
TUALATIN, OR, 97062

SPH PROPERTY ONE LLC
1301 2ND AVE FL 31
SEATTLE, WA, 98101

SPECHT-SMITH DANA LYNN & SPECHT DAVID LEE
9380 SW QUINAULT LN
TUALATIN, OR, 97062

SOMERTON RITA G & SOMERTON MARVIN
9375 SW IOWA DR
TUALATIN, OR, 97062

SNODDY ROBERT B
9430 SW IOWA DR
TUALATIN, OR, 97062

SMITH SCOTT M & SMITH ALLYN B
22750 SW VERMILLION DR
TUALATIN, OR, 97062

SMITH WILLIAM R & SMITH BARBARA J
22865 SW 89TH PL
TUALATIN, OR, 97062

SMITH ROBERT D & SMITH JANIS K
13547 SW HILLSHIRE DR
TIGARD, OR, 97223

SLAWIK JON V & SLAWIK VAN MY
23445 SW 82ND AVE
TUALATIN, OR, 97062

SIROIS TYSON & JARRARD LINDSEY
22500 SW PINTO DR
TUALATIN, OR, 97062

SINGLETERRY ELNORA & SEITLINGER LEO FRANCIS JR & SEITLINGER LAURA RENE
23535 SW 82ND AVE
TUALATIN, OR, 97062

SHOBAKEN THOMAS R
8795 SW STONO CT
TUALATIN, OR, 97062

SHMULEVSKY MICHAEL & BALANETSKAYA NATALIA
25935 NE NORTH VALLEY RD
NEWBERG, OR, 97132

SHIPLEY HEATHER
9355 SW IOWA DR
TUALATIN, OR, 97062

SHIMADA HIROSHI & SHIMADA ANGELIQUE
22645 SW 94TH TER
TUALATIN, OR, 97062

SHEETZ DONALD K & MARY M SHEETZ REV LIV TRUST
9155 SW IOWA DR
TUALATIN, OR, 97062

SHAMBURG SCOTT A & SHAMBURG LISA G
PO BOX 829
TUALATIN, OR, 97062

SEPP JULIE & SEPP ROBERT
9150 SW STONO DR
TUALATIN, OR, 97062

SELIVONCHICK GREGORY A & SELIVONCHICK GEORGANNE
8945 SW IOWA DR
TUALATIN, OR, 97062

SEKI KATSUMICHI & SEKI MIYUKI
22625 SW 87TH PL
TUALATIN, OR, 97062

SCOTT JERRY MICHAEL & STAMBAUGH DEBRA R
9080 SW IOWA DR
TUALATIN, OR, 97062

SCOTT JOAN D
PO BOX 2594
TUALATIN, OR, 97062

SCHWEITZ ERIC J & SCHWEITZ KAREN M
9390 SW SKOKOMISH LN
TUALATIN, OR, 97062

SCHULTZ LARRY & JOANN REV LIV TRUST
8890 SW IOWA DR
TUALATIN, OR, 97062

SCHOTT DAVID M & SCHOTT COURTNEY A
22690 SW VERMILLION DR
TUALATIN, OR, 97062

SCHAFROTH J F & SCHAFROTH KATE R
8838 SW STONO DR
TUALATIN, OR, 97062

SAYLOR ERIC M & SAYLOR BRITTA M
22835 SW 90TH PL
TUALATIN, OR, 97062

SAWAI STUART T & SAWAI MARY JANE
8891 SW IOWA DR
TUALATIN, OR, 97062

SANDSTROM GLENN M
9405 SW PALOUSE LN
TUALATIN, OR, 97062

SANCHEZ SALVADOR & VARGAS YOANA A
22570 SW MANDAN DR
TUALATIN, OR, 97062

SALISBURY VERONICA PIPER & PAROSA JOSHUA DAVID
9360 SW IOWA DR
TUALATIN, OR, 97062

SALDIVAR CASIMIRO & SALDIVAR MARIA CONCEPCION
22755 SW MANDAN DR
TUALATIN, OR, 97062

SACKETT ANTHONY
22635 SW MANDAN DR
TUALATIN, OR, 97062

RUDISEL A TRUST
PO BOX 1667
LAKE OSWEGO, OR, 97035

RONALD TY & RONALD JENNIFER
8870 SW STONO DR
TUALATIN, OR, 97062

ROMINE CLAUDIA
22980 SW VERMILLION
TUALATIN, OR, 97062

ROMEIKE ROGER W & ROMEIKE SHERREL
22665 SW MANDAN DR
TUALATIN, OR, 97062

ROLISON MIKEL J
23685 SW 82ND AVE
TUALATIN, OR, 97062

ROGERS JOHN & AGUILAR-NELSON LIZI
15309 NW DECATUR WAY
PORTLAND, OR, 97229

ROBLES MARCELINO
22880 SW MANDAN DR
TUALATIN, OR, 97062

ROBERTS LISA A
22535 SW 94TH TER
TUALATIN, OR, 97062

RILEY SHAWN O
23365 SW BOONES FERRY RD
TUALATIN, OR, 97062

RHONDES ERIK & RHODES MEGAN
9360 SW SKOKOMISH LN
TUALATIN, OR, 97062

REYNHOLDS GLENN A & REYNHOLDS NANCY J
22795 SW 92ND PL
TUALATIN, OR, 97062

REPCAK ROMAN & PARK-REPCAK ROBIN
22810 SW 93RD TER
TUALATIN, OR, 97062

RAZ DOUGLAS JOHN
22685 SW 94TH TER
TUALATIN, OR, 97062

RAY CYNTHIA P
8878 SW STONO DR
TUALATIN, OR, 97062

RAMKU FAMILY TRUST
14193 NW MEADOWRIDGE DR
PORTLAND, OR, 97229

RAMIREZ JOSE ANTONIO
22560 SW 94TH TER
TUALATIN, OR, 97062

RAMIREZ DANIEL LOPEZ & TOVAR LAURA BRAMBILLA
23100 SW 82ND AVE
TUALATIN, OR, 97062

QIAN LIDONG & YANG YUYUAN
8815 SW STONO DR
TUALATIN, OR, 97062

POTTER DYLAN D & POTTER MICHELLE P
23405 SW BOONES FERRY RD
TUALATIN, OR, 97062

PORTIS DAVID B & PORTIS PHYLLIS A
24195 SW 82ND
TUALATIN, OR, 97062

PITT CHARLES R
8883 SW IOWA DR
TUALATIN, OR, 97062

PIRTLE JAMES L JR & PIRTLE LINDA L
22780 SW 93RD TER
TUALATIN, OR, 97062

PIERCE KELLY JOANNE & PIERCE BRIAN LAWRENCE
8675 SW STONO DR
TUALATIN, OR, 97062

PFEIFER STEPHANIE B
22530 SW 93RD TER
TUALATIN, OR, 97062

PETTY NEIL & HIBBITTS JOANN
22985 SW 82ND
TUALATIN, OR, 97062

PERRY JANETTE & PERRY KENNETH
8885 SW STONO DR
TUALATIN, OR, 97062

PEEBLES CRAIG M & PEEBLES TANYA A
22840 SW 90TH PL
TUALATIN, OR, 97062

PATTON ANDREW M & PATTON LINDSEY M
9270 SW STONO DR
TUALATIN, OR, 97062

PANOCH RICHARD S & CHAVEZ CARISA L
22530 SW MANDAN DR
TUALATIN, OR, 97062

PADE VIRGIL DEAN & PADE DEBORAH LYNN
PO BOX 1310
SHERWOOD, OR, 97140

P3 PROPERTIES LLC
PO BOX 691
WHITE SALMON, WA, 98672

OSTROWSKI MICHAEL J & OSTROWSKI SHERIE M
9370 SW STONO DR
TUALATIN, OR, 97062

ORLANDINI ANTHONY J & ORLANDINI JUDY R
8555 SW MARICOPA DR
TUALATIN, OR, 97062

O'NEAL DANNY F & O'NEAL JONI L
22625 SW 94TH TER
TUALATIN, OR, 97062

OLIVERA APOLINAR & OLIVERA DEBBIE & WHITWORTH DAVID ET AL
22640 SW VERMILLION DR
TUALATIN, OR, 97062

ODOMS LIVING TRUST
PO BOX 2446
TUALATIN, OR, 97062

NOYES PATRICK A & THOMPSON CAMILLIA
22810 SW 92ND PL
TUALATIN, OR, 97062

NORTH DAVID P & NORTH BARBARA
8818 SW STONO DR
TUALATIN, OR, 97062

NEWBERRY GARY B & THOMPSON DONNA
9295 SW IOWA DR
TUALATIN, OR, 97062

NELSON KIRIN H
8826 SW STONO DR
TUALATIN, OR, 97062

NEARY TIMOTHY & NEARY LUCY
22780 SW 92ND PL
TUALATIN, OR, 97062

MUD ROOM LLC
1320 SW TURNER RD
WEST LINN, OR, 97068

MOSHOFSKY JOHN & MOSHOFSKY GINGER
9310 SW SKOKOMISH LN
TUALATIN, OR, 97062

MOLLER THERESA
22825 SW 93RD TER
TUALATIN, OR, 97062

MIKULA KATERINA
9330 SW PALOUSE LN
TUALATIN, OR, 97062

MENES MARK A
9280 SW STONO DR
TUALATIN, OR, 97062

MCNUTT SCOTT M JR & MCNUTT KATRIN
22565 SW MANDAN DR
TUALATIN, OR, 97062

NGUYEN KHANH T & FONG TODD P
23605 SW 82ND AVE
TUALATIN, OR, 97062

NEULEIB TAMI R
9395 SW SKOKOMISH LN
TUALATIN, OR, 97062

NELL ZACHARY D & NELL KENDRA
8842 SW STONO DR
TUALATIN, OR, 97062

MUSIAL LUKE & MUNSEY VICTORIA
22825 SW 94TH TER
TUALATIN, OR, 97062

MOYES DUSTIN R & MOYES CAROL L
8765 SW STONO DR
TUALATIN, OR, 97062

MORELAND BEVERLY H & MORELAND BEVERLY H LIV TRUST
753 KOTZY AVE S
SALEM, OR, 97302

MILLER BARBRA C
9315 SW IOWA DR
TUALATIN, OR, 97062

MICHELS ELIZABETH A
22590 SW 93RD TER
TUALATIN, OR, 97062

MENESES VIRGINIA & VALENCIA DIEGO
22915 SW MANDAN DR
TUALATIN, OR, 97062

MCMANUS HEIDI
22820 SW 90TH PL
TUALATIN, OR, 97062

NEWTON KYLE C & NEWTON HAILEY R
8814 SW STONO DR
TUALATIN, OR, 97062

NELSON MICHAEL D & NELSON ASHLEY K
22590 SW VERMILLION DR
TUALATIN, OR, 97062

NEILL RACHEL & HUSUM BRENT
9350 SW STONO DR
TUALATIN, OR, 97062

MURPHY MICHAEL F & OLSON-MURPHY ANTONETTE K
8870 SW IOWA DR
TUALATIN, OR, 97062

MOTT LINDA L LIV TRUST
22525 SW MANDAN DR
TUALATIN, OR, 97062

MOORE DAVID C & MOORE TAMMY
8990 SW STONO DR
TUALATIN, OR, 97062

MILLER CAROLE D LIV TRUST
8834 SW STONO DR
TUALATIN, OR, 97062

MICHAEL SCOTT CURTIS & MICHAEL TINA FRANCINE
8580 SW MARICOPA DR
TUALATIN, OR, 97062

MCREYNOLDS CHRIS & MCREYNOLDS AUDREY
22720 SW 87TH PL
TUALATIN, OR, 97062

MCLEOD TRUST
23465 SW BOONES FERRY RD
TUALATIN, OR, 97062

MCLAUGHLIN NATHANIEL ANDREW & MCLAUGHLIN AREENA DEVI
8960 SW IOWA DR
TUALATIN, OR, 97062

MCKEAN AMY & MCKEAN RAYMOND
22685 SW VERMILLION DR
TUALATIN, OR, 97062

MCKEAN JOHN R & MCKEAN LINDA L
21370 MAKAH CT
TUALATIN, OR, 97062

MCGRADY ANDREA M
9260 SW SKOKOMISH LN
TUALATIN, OR, 97062

MCGILCHRIST STEPHEN R & NYSTROM-GERDES ELIZABETH R
22720 SW 93RD TER
TUALATIN, OR, 97062

MCDONOUGH JOHN MICHAEL & MCDONOUGH MAUREEN CLARE
8750 SW STONO DR
TUALATIN, OR, 97062

MCCORMIC KIMBERLEY A
8882 SW STONO DR
TUALATIN, OR, 97062

MCCALEB KEVIN L
8950 SW IOWA DR
TUALATIN, OR, 97062

MCALLISTER DENNIS C & MCALLISTER RAGNHILD
8805 SW STONO DR
TUALATIN, OR, 97062

MATHERS LES D & MATHERS CHRIS A
23050 SW 82ND AVE
TUALATIN, OR, 97062

MAST MARVIN R & JELI CARLENE M
23845 SW BOONES FERRY RD
TUALATIN, OR, 97062

MARTIN FAMILY TRUST
8986 SW STONO DR
TUALATIN, OR, 97062

MARTIN GARY D & LUMLEY-MARTIN MEGAN B
22785 SW MANDAN DR
TUALATIN, OR, 97062

MARLEAU ALLISON P
22615 SW VERMILLION DR
TUALATIN, OR, 97062

MARK HENRY & MARK CHRISTINE
22725 SW 90TH PL
TUALATIN, OR, 97062

MARBLE AMANDA L
8989 SW STONO DR
TUALATIN, OR, 97062

MALONEY CHERYL L
22820 SW VERMILLION DR
TUALATIN, OR, 97062

MALONSON GARY D & MALONSON MARSHA L
22955 SW VERMILLION DR
TUALATIN, OR, 97062

MAIER DARLA & MAIER THOMAS
9340 SW PALOUSE LN
TUALATIN, OR, 97062

MADONDO JEFFRET & JOHNSON MORGAN IRENE
22795 SW 94TH TER
TUALATIN, OR, 97062

MACCLANATHAN MELANIE & MACCLANATHAN MICHAEL
22575 SW 94TH TER
TUALATIN, OR, 97062

LYNCH LARRY L & LYNCH SUZANNE M
23185 SW 82ND AVE
TUALATIN, OR, 97062

LUSCOMBE BRUCE C TRUST
22605 SW 87TH PL
TUALATIN, OR, 97062

LUCINI JOHN W & GRACE N FAM TRUST
23677 SW BOONES FERRY RD
TUALATIN, OR, 97062

LIMING JEANNE E
9380 SW SKOKOMISH LN
TUALATIN, OR, 97062

LEMON CHASE ANTHONY & LEMON HEIDI
8940 SW IOWA DR
TUALATIN, OR, 97062

LEE WILLIAM
9335 SW PALOUSE LN
TUALATIN, OR, 97062

LEE FLORENCE & YAM WAI LUN
8822 SW STONO DR
TUALATIN, OR, 97062

LEE DAVID O & RAPISARDA DEIDRE
24245 SW BOONES FERRY RD
TUALATIN, OR, 97062

LATHROP JEFFREY A & LATHROP MARIA M
9265 SW IOWA DR
TUALATIN, OR, 97062

LARSON ANDREW & WISEMAN LEAH DANIELLE
22845 SW 94TH TER
TUALATIN, OR, 97062

LARA SALVADOR
22845 SW 93RD TER
TUALATIN, OR, 97062

LANDCASTER DEVELOPMENT CORPORATION
6770 SW CANYON DR
PORTLAND, OR, 97225

LANDCASTER DEVELOPMENT CORPORATION
6770 SW CANYON DR
PORTLAND, OR, 97225

LAM DAVID & NGUYEN BETH NGOC BICH
8700 SW STONO DR
TUALATIN, OR, 97062

LACEY LONNIE D & LACEY LORI A
22665 SW 94TH TER
TUALATIN, OR, 97062

KNUDSON THOMAS & KNUDSON LINDA SALYERS
8725 SW STONO DR
TUALATIN, OR, 97062

KLOSSNER ANDREW J
8854 SW STONO DR
TUALATIN, OR, 97062

KLEPICH DAVID & KLEPICH BRITTANI
22545 SW MANDAN DR
TUALATIN, OR, 97062

KLAUSS CYDNI M
22635 SW 87TH PL
TUALATIN, OR, 97062

KIS JUAN ANTONIO & KIS CLAUDIA
22615 SW 93RD TER
TUALATIN, OR, 97062

KINNAMAN JEFFREY B & KINNAMAN JENNIFER D
8780 SW STONO DR
TUALATIN, OR, 97062

KIMMEL RONALD A & KIMMEL REBECCA A
23605 SW BOONES FERRY RD
TUALATIN, OR, 97062

KERNER ROBERT
8850 SW STONO DR
TUALATIN, OR, 97062

KERN KEVIN
9450 SW IOWA DR
TUALATIN, OR, 97062

KENNEDY MICHAEL C & KENNEDY LINDA
22735 SW 87TH PL
TUALATIN, OR, 97062

KALATEH EBRAHIM SHIRDOOST & DOOST NOOSHIN NEZAM
22585 SW 87TH PL
TUALATIN, OR, 97062

JOHNSON FLETCHER & JOHNSON CHRISTINA
9365 SW STONO DR
TUALATIN, OR, 97062

JENKINS PHILIP D & JENKINS KRISTEN K
9240 SW STONO DR
TUALATIN, OR, 97062

JASTRAM WILLIAM E & JASTRAM CHRISTINE A
9015 SW IOWA DR
TUALATIN, OR, 97062

JACOBS JEFFREY W
9360 SW PALOUSE LN
TUALATIN, OR, 97062

INGRAM CLIFFORD KEITH & INGRAM ELISABETH JOY
22785 SW 87TH PL
TUALATIN, OR, 97062

HYRE TIMOTHY R & HYRE ANNILEE D
22840 SW VERMILLION DR
TUALATIN, OR, 97062

HUMPHREY MARGIE LIV TRUST
22820 SW 92ND PL
TUALATIN, OR, 97062

HUMPHREY SUSAN E
8801 SW STONO DR
TUALATIN, OR, 97062

HUALA ROBIN PATRICK
14607 NE 57TH ST
BELLEVUE, WA, 98007

HORIZON COMMUNITY CHURCH
PO BOX 2690
TUALATIN, OR, 97062

HOOVER DAN M
8993 SW STONO DR
TUALATIN, OR, 97062

HOLDBROOK-DADSON DENISE
9330 SW SKOKOMISH LN
TUALATIN, OR, 97062

HODGE KENNETH M
9235 SW STONO DR
TUALATIN, OR, 97062

HILDRETH TYRONE MACGREGOR & HILDRETH SHANA LYNNE
9355 SW QUINAULT LN
TUALATIN, OR, 97062

HIGASHI DUSTIN L & SANTORO ANGELA C
22895 SW MANDAN DR
TUALATIN, OR, 97062

HICKOK TODD J & HICKOK MOLLY J
23855 SW BOONES FERRY RD
TUALATIN, OR, 97062

HEYER TRUST
22775 SW VERMILLION DR
TUALATIN, OR, 97062

HERTZ PAULA D
22900 SW MANDAN DR
TUALATIN, OR, 97062

HERRERA FERNANDO & HERRERA MARIA
9360 SW STONO DR
TUALATIN, OR, 97062

HERNANDEZ KIMBERLY A
22500 SW MANDAN DR
TUALATIN, OR, 97062

HEIRONIMUS JULIE A & VALLECK GEORGE
22710 SW 90TH PL
TUALATIN, OR, 97062

HEINZE JOINT TRUST
8070 SW LAUREL ST
PORTLAND, OR, 97225

HAUDBINE PATRICK E & HAUDBINE DELEE
9215 SW STONO DR
TUALATIN, OR, 97062

HATCHER THOMAS W & HATCHER ELIZABETH A
22645 SW VERMILLION DR
TUALATIN, OR, 97062

HARRISON LIV TRUST
8976 SW STONO DR
TUALATIN, OR, 97062

HANAWA IWAO & HANAWA LAURIE
3528 CHEROKEE CT
WEST LINN, OR, 97068

HAMM STEVEN & HAMM SANDRA
22725 SW VERMILLION DR
TUALATIN, OR, 97062

HAMILTON JAMES & HAMILTON KRISTIN
9400 IOWA DR
TUALATIN, OR, 97062

HAMILTON GEORGE & ALICE TRUST
22740 SW 87TH PL
TUALATIN, OR, 97062

HALL SCOTT & HALL BETH
9065 SW STONO DR
TUALATIN, OR, 97062

GUERRA FILEMON M JR & QUIRANTE MALINDA
8899 SW IOWA DR
TUALATIN, OR, 97062

GRIFFITH DWIGHT A & GRIFFITH H KAY
22905 SW VERMILLION DR
TUALATIN, OR, 97062

GREEN JUSTIN J
8560 SW MARICOPA DR
TUALATIN, OR, 97062

GORGER MOLLY J TRUST
PO BOX 230725
TIGARD, OR, 97281

GOFORTH NATHAN L & TAAFFE JULIA C
22755 SW 90TH PL
TUALATIN, OR, 97062

GLASS BRIAN D & GLASS LEAH M
8900 SW SWEEK DR #537
TUALATIN, OR, 97062

GLAESER CHARLES W & GLAESER CHRISTA
8955 SW IOWA DR
TUALATIN, OR, 97062

GILCHRIST BEVERLY & GILCHRIST ROLAND
9310 SW IOWA ST
TUALATIN, OR, 97062

GILBERT CHRISTOPHER S & GILBERT TAYLOR A
22680 SW 87TH PL
TUALATIN, OR, 97062

GIACCHI ROBYN M
8900 SW IOWA DR
TUALATIN, OR, 97062

GHODS SHAWN M & GHODS JENNA N
22815 SW 89TH PL
TUALATIN, OR, 97062

GEORGE TIMOTHY P & GEORGE BETHANY
9335 SW IOWA DR
TUALATIN, OR, 97062

GENSLER KRISTOPHER & GENSLER MARIAH
8540 SW MARICOPA DR
TUALATIN, OR, 97062

GARIBAY JAIME
22555 SW 94TH TER
TUALATIN, OR, 97062

GAMACHE ROBERT R & GAMACHE CHERI
22770 SW VERMILLION DR
TUALATIN, OR, 97062

GALVER ROBERTO & GALVER PATRICIA BYRNE
22995 SW VERMILLION DR
TUALATIN, OR, 97062

FULLER ERIC M & FULLER XIAOYAN
9365 SW QUINAULT LN
TUALATIN, OR, 97062

FRY ALBERTA A TRUST
9175 SW STONO DR
TUALATIN, OR, 97062

FRONIUS JOHN A & FRONIUS SUSAN A
22650 SW 87TH PL
TUALATIN, OR, 97062

FRIBLEY SARAH E & FRIBLEY CHAD C
9005 SW STONO DR
TUALATIN, OR, 97062

FRENCH RODERICK LEE & FRENCH THERESE LYNN
9080 SW STONO DR
TUALATIN, OR, 97062

FRAZIER FAMILY LLC
22830 SW 89TH PL
TUALATIN, OR, 97062

FRAZIER JOHN D IV & FRAZIER WANDA R
22830 SW 89TH PL
TUALATIN, OR, 97062

FRAVEL LINDA S
9365 SW SKOKOMISH
TUALATIN, OR, 97062

FRANKS TERRENCE D
22730 SW 90TH PL
TUALATIN, OR, 97062

FRANCIS FRANK J & FRANCIS HELEN MARIE
9130 SW IOWA DR
TUALATIN, OR, 97062

FRANCIS KATHLEEN & FRANCIS DAN
9345 SW SKOKOMISH LN
TUALATIN, OR, 97062

FOSSE PATRICIA J & FOSSE RANDY C
22925 SW MANDAN DR
TUALATIN, OR, 97062

FORCE ROBERT B & FORCE JEANETTE M
9365 SW PALOUSE LN
TUALATIN, OR, 97062

FINDERS DEBRA P
9355 SW PALOUSE LN
TUALATIN, OR, 97062

FEUCHT DANIEL & BEVERLY LIV TRUST
22715 SW 87TH PL
TUALATIN, OR, 97062

FAST JEFFREY & FAST TIFFANY
22800 SW MANDAN DR
TUALATIN, OR, 97062

FADLING JULIE H
22630 SW VERMILLION DR
TUALATIN, OR, 97062

ESZLINGER ERIC & ESZLINGER NATASHA
9395 SW QUINAULT LN
TUALATIN, OR, 97062

ESAU EVAN & ESAU MICHELLE
18315 CAPISTRANO WAY
MORGAN HILL, CA, 95037

ERWERT EMILY
22915 SW 94TH TER
TUALATIN, OR, 97062

ERDMAN PAUL & ERDMAN PAMALA B
8862 SW STONO DR
TUALATIN, OR, 97062

ENNIS MARK & ENNIS BARBARA
9380 SW STONO DR
TUALATIN, OR, 97062

EDWARDS DANIELLE
22585 SW 93RD TER
TUALATIN, OR, 97062

EDELINE JENNIFER A & EDELINE SEAN M
9350 SW QUINAULT LN
TUALATIN, OR, 97062

EAKINS EILEEN G
22760 SW 93RD TERR
TUALATIN, OR, 97062

DUNN PATRICK P & DUNN CLARA I RUSINQUE
9380 SW PALOUSE LN
TUALATIN, OR, 97062

DUFFIELD RICHARD & DUFFIELD KATIE ANN
22865 SW MANDAN DR
TUALATIN, OR, 97062

DOW PETER J REV TRUST & SHERFY JENNIFER L REV TRUST
9360 SW QUINAULT LN
TUALATIN, OR, 97062

DERIENZO NICHOLAS C & DERIENZO COURTNEY LEIGH
22755 SW 87TH PL
TUALATIN, OR, 97062

DAVIS JASON WAYNE
9180 SW STONO DR
TUALATIN, OR, 97062

CURTHOYS CAROL ANN REV LIV TRUST
8879 SW IOWA DR
TUALATIN, OR, 97062

CRISP TONI K
9380 SW IOWA DR
TUALATIN, OR, 97062

COOK DAVID C & COOK DAYNA L
22660 SW 93RD TER
TUALATIN, OR, 97062

COBB DANIEL Z & COBB ROSA
22770 SW 89TH PL
TUALATIN, OR, 97062

CHRISTENSEN MICHAEL A & CHRISTENSEN JAMIE L
23725 SW 82ND AVE
TUALATIN, OR, 97062

CHEN RICHARD & CHEN LENA
PO BOX 1551
LAKE OSWEGO, OR, 97035

CHAND PARBIN
22600 SW MANDAN DR
TUALATIN, OR, 97062

DOSS ANDREA & DOSS BRANDON
22580 SW 94TH TER
TUALATIN, OR, 97062

DEMPSTER MICHAEL M
22830 SW MANDAN DR
TUALATIN, OR, 97062

DAVIS JAMES HAYES & BRANSON-DAVIS NESHIA
23395 SW 82ND AVE
TUALATIN, OR, 97062

CRUZ ALEJANDRO FRANCISCO
9270 SW SKOKOMISH LN
TUALATIN, OR, 97062

CRANSTON MICHAEL S
8845 SW STONO DR
TUALATIN, OR, 97062

CONFER ANDREW B
22575 SW 87TH PL
TUALATIN, OR, 97062

CLARK ROY H
9295 SW PALOUSE LN
TUALATIN, OR, 97062

CHILDS ROBERT M & CHILDS MARY J
22705 SW VERMILLION DR
TUALATIN, OR, 97062

CHAUSSE PETER L & CHAUSSE PAULINA
22920 SW 82ND AVE
TUALATIN, OR, 97062

CHAN JOSEPH L
23156 BLAND CIR
WEST LINN, OR, 97068

DITTMAN ADAM H & DITTMAN ELIZABETH
22785 SW 89TH PL
TUALATIN, OR, 97062

DEARDORFF CRAIG S & DEARDORFF ALBERTA
22595 SW 93RD TER
TUALATIN, OR, 97062

DARLING LANCE F
22865 SW 94TH TER
TUALATIN, OR, 97062

CRONKRITE ERIK
9315 SW PALOUSE LN
TUALATIN, OR, 97062

COOPER JULIE ANN LIV TRUST
9390 SW IOWA DR
TUALATIN, OR, 97062

COMMUNITY PARTNERS FOR AFFORDABLE HOUSING
PO BOX 23206
TIGARD, OR, 97281

CHRISTENSEN STANFORD DEE & CAROL MAE REV INTERVIVOS TRUST
8980 SW STONO DR
TUALATIN, OR, 97062

CHEN RICHARD & CHEN LENA
PO BOX 1551
LAKE OSWEGO, OR, 97035

CHASE HARRY M & CHASE CATHY LEE
8799 SW STONO DR
TUALATIN, OR, 97062

CHAN CHEUK YEE CHAN REVOC LIV TRUST
11531 SE FLAVEL ST
PORTLAND, OR, 97266

CHAMPAGNE PATRICK & ROY CELINE
8880 SW IOWA DR
TUALATIN, OR, 97062

CHAMBERLAND MATHEW & CHAMBERLAND JAMES W
8975 SW IOWA DR
TUALATIN, OR, 97062

CHAMBERLAIN JOHN & CHAMBERLAIN DEBRA
9000 SW GREENHILL LN
TUALATIN, OR, 97062

CHAMBERLAIN PARTNERS LLC
10340 SW TUALATIN RD
TUALATIN, OR, 97062

CHADWICK SCOTT A
6650 MAPLE AVE
OAK HILLS, CA, 92344

CARNS STEVEN C
9335 SW QUINAULT LN
TUALATIN, OR, 97062

CARLSON RICHARD
11105 BERRY RD
VALLEY CENTER, CA, 92082

CARDENAS FERNANDO
9340 SW QUINAULT LN
TUALATIN, OR, 97062

CARBAJAL PEDRO & CARBAJAL REGINA
8925 SW IOWA DR
TUALATIN, OR, 97062

CAMPBELL ANGELA R & CAMPBELL CHRISTOPHER A
22910 SW MANDAN DR
TUALATIN, OR, 97062

CALVANO FAMILY TRUST
22760 SW 90TH PL
TUALATIN, OR, 97062

CALKINS MICHAEL & CALKINS DIANE
8890 SW STONO DR
TUALATIN, OR, 97062

CALDERON CAMIE M
22735 SW 92ND PL
TUALATIN, OR, 97062

CAIS CARLY J
9340 SW STONO DR
TUALATIN, OR, 97062

BURNS DANIEL D & KRILL DEANN R
9345 SW QUINAULT LN
TUALATIN, OR, 97062

BURCHFIEL LARRY & BURCHFIEL DEBORAH
8858 SW STONO DR
TUALATIN, OR, 97062

BUNCE MICHAEL R REVOC LIV TRUST & BUNCE DEBORAH J REVOC LIV TRUST
9150 SW IOWA DR
TUALATIN, OR, 97062

BUHAY JASON & BUHAY MICHELLE
9300 SW STONO DR
TUALATIN, OR, 97062

BRASHEAR GREGORY A
22935 SW MANDAN DR
TUALATIN, OR, 97062

BRACKNEY CHRIS
23355 SW 82ND AVE
TUALATIN, OR, 97062

BOX MICHAEL L & BOX KATIE M
9370 SW PALOUSE LN
TUALATIN, OR, 97062

BOSKET JOHN A & BOSKET JULIE L
9355 SW STONO DR
TUALATIN, OR, 97062

BOELL DONALD B & BOELL PATRICIA J
22675 SW 87TH
TUALATIN, OR, 97062

BOCCI JAMES A & BOCCI JULIA A
23205 SW BOONES FERRY RD
TUALATIN, OR, 97062

BLACK JENNIFER O & BLACK DAVID O JR
9040 SW STONO DR
TUALATIN, OR, 97062

BIEBERDORF JENNIFER E & BIEBERDORF JEREMY
22695 SW MANDAN DR
TUALATIN, OR, 97062

BENNETT JASON M & MCALEER MARGUERITE T
22730 SW VERMILLION DR
TUALATIN, OR, 97062

BEMROSE HEATHER LYNN
9320 SW IOWA DR
TUALATIN, OR, 97062

BELL JAMES M & BELL EVA J
22710 SW VERMILLION DR
TUALATIN, OR, 97062

BELL REV TRUST
8930 SW IOWA DR
TUALATIN, OR, 97062

BELDING ROBERT E LIV TRUST
22745 SW VERMILLION DR
TUALATIN, OR, 97062

BEIKMAN STEPHEN & BEIKMAN MONIQUE
22760 SW 87TH PL
TUALATIN, OR, 97062

BEEBE BRENT E & BEEBE SANDRA L
8895 SW STONO DR
TUALATIN, OR, 97062

BEDIENT SONYA & GOUY PHIL
8995 SW IOWA DR
TUALATIN, OR, 97062

BECKER SUSAN
9405 SW QUINAULT LN
TUALATIN, OR, 97062

BEAR ALISA ANN TRUST
8525 SW MARICOPA DR
TUALATIN, OR, 97062

BAZANT CHRISTINE LEE & BAZANT JOHN JOSEPH
36449 HWY 34
LEBANON, OR, 97355

BAVARO EMILY EVELYN & BAVARO JOSHUA
22940 SW VERMILLION DR
TUALATIN, OR, 97062

BANKS LANDON & BANKS MIRANDA
22850 SW 93RD TER
TUALATIN, OR, 97062

BADARACCO ERIN
8456 SW MOHAWK ST
TUALATIN, OR, 97062

BACA GREGORY R & BACA ELIZABETH R
16869 SW 65TH AVE #387
LAKE OSWEGO, OR, 97035

BABCOCK GAYLON
8680 SW STONO DR
TUALATIN, OR, 97062

AUTUMN SUNRISE LLC
485 S STATE ST
LAKE OSWEGO, OR, 97034

AUSTIN MICHAEL P & AUSTIN ALLISON M
9325 SW IOWA DR
TUALATIN, OR, 97062

AUST JOSEPHINE A
8846 SW STONO DR
TUALATIN, OR, 97062

AUGEE JOEL L & AUGEE HEIDI M S
8905 SW IOWA DR
TUALATIN, OR, 97062

ATKINS DANIEL J & ATKINS DAWNITA G
22570 SW 93RD TER
TUALATIN, OR, 97062

AROZA EMMANUEL E
17084 SW LYNNLY WAY
SHERWOOD, OR, 97140

ARCIGA MARCO A & ARCIGA VIRGINIA L
22550 SW 93RD TER
TUALATIN, OR, 97062

ARCHULETA JOHN L & ARCHULETA ELISHA J
9385 SW SKOKOMISH LN
TUALATIN, OR, 97062

ANTHIMIADES GEORGE T & ANTHIMIADES STEPHANIE J
8735 SW STONO DR
TUALATIN, OR, 97062

ANGIN JONATHAN & BRIDGET TRUST
PO BOX 2413
TUALATIN, OR, 97062

ANDERSON SCOTT A & ANDERSON ANDREA N
22825 SW 92ND PL
TUALATIN, OR, 97062

ANDERSON RICHARD J JR
22630 SW 93RD TER
TUALATIN, OR, 97062

ALVSTAD RANDALL & ALVSTAD KAREN
23515 SW BOONES FERRY RD
TUALATIN, OR, 97062

ALSOP RICHARD F
22800 SW 89TH PL
TUALATIN, OR, 97062

ALLISON VICKI R
8994 SW STONO DR
TUALATIN, OR, 97062

ALLARD JOHN A & ALLARD KELCIE L
8885 SW IOWA DR
TUALATIN, OR, 97062

AGORIO DIANA
22790 SW 87TH PL
TUALATIN, OR, 97062

AGHAZADEH-SANAEI MEHDI & ASIAEE NAHID
23745 SW BOONES FERRY RD
TUALATIN, OR, 97062

From:	Melissa Slotemaker
To:	pdxalex@icloud.com; robikelly@earthlink.net; mwestenhaver@hotmail.com; deb.fant@gmail.com
Cc:	Mimi Doukas; Tabitha Boschetti; Lindsey Hagerman
Subject:	Autumn Sunrise Subdivision and Conditional Use Permit Neighborhood Meeting
Date:	Tuesday, May 18, 2021 8:55:00 AM
Attachments:	image001.png 7454 20210513 N"hd Mtg Mailing-FINAL.pdf

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Hello Byrom CIO Representatives,

I am pleased to invite you to participate in a virtual Neighborhood/Developer Meeting on **June 9, 2021 at 6:00 pm** to discuss a planned Subdivision and Conditional Use Permit (for detached single-family homes) at the ±62-acre site south of SW Norwood Road and east of SW Boones Ferry Road. This meeting provides an opportunity for us to discuss the planned application with surrounding property owners and the Byrom CIO before the application is submitted to the City.

The property was the subject of recent land use applications for Annexation, Development Code Text Amendment, and Plan and Map Amendments. This application is for a 400-lot Residential Subdivision and a Conditional Use Permit to allow detached single-family homes. Two commercially zoned lots along SW Boones Ferry Road are planned to be created with this Subdivision, but commercial improvements and uses will be addressed in future land use applications.

You can find information about the project, how to join the virtual meeting via Zoom or telephone, and how to submit comments or questions on the attached document.

Please let me know if you have any questions.

Sincerely,
Melissa Slotemaker

Melissa Slotemaker, AICP
AKS ENGINEERING & FORESTRY, LLC
12965 SW Herman Road, Suite 100 | Tualatin, OR 97062
P: 503.563.6151 Ext. 141 | www.aks-eng.com | slotemakerm@aks-eng.com
Offices in: Bend, OR | Keizer, OR | Tualatin, OR | Vancouver, WA

NOTICE

NEIGHBORHOOD / DEVELOPER MEETING

06/09/2021 6:00 p.m.
aks-eng.com/autumn-sunrise
503-563-6151.

In addition to the requirements of TDC 32.150, the 18" x 24" sign must display the meeting date, time, and address as well as a contact phone number. The block around the word "NOTICE" must remain **orange** composed of the **RGB color values Red 254, Green 127, and Blue 0**. A PowerPoint template of this sign is available at: https://www.tualatinoregon.gov/planning/land-use-application-sign-templates.

As the ~~applicant~~ applicant's consultant for the Autumn Sunrise Subdivision and Conditional Use Permit project, I hereby certify that on this day, 9 sign(s) was/were posted on the subject property in accordance with the requirements of the Tualatin Development Code and the Community Development Division.

~~Applicant's~~ Applicant's consultant Name: Mitchell Godwin
(Please Print)

~~Applicant's~~ Applicant's consultant Signature:

Date: 5/18/2021

AKS
ENGINEERING & FORESTRY

June 18, 2021

Neighborhood Meeting Summary: Autumn Sunrise Subdivision, Conditional Use, and Architectural Review

Meeting Date: June 9, 2021
Time: 6:00 PM
Location: Virtual Meeting via Zoom Webinar

The following serves as a summary of the Neighborhood Meeting process. On May 17, 2021, property owners within 1000 feet of the proposed development site were sent notification of the planned Autumn Sunrise applications. This notification included the project location, project details, and the neighborhood meeting date and time. Information on how to join the meeting remotely was provided in the notification letter. Signs were posted on the subject property on May 18, 2021 to notify the public of the proposed project and upcoming meeting. The Byrom CIO representatives were also emailed the meeting information on May 18, 2021.

On June 9, 2021, Mimi Doukas, Melissa Slotemaker, and Darko Simic from AKS Engineering & Forestry, LLC were the meeting presenters. Michael Anders from Lennar Northwest attended the meeting and was available to answer questions. The meeting began with Melissa Slotemaker providing an overview of the Autumn Sunrise site and the planned land use applications. She then provided details on the City's review process and opportunities for public input.

Following the presentation, attendees were given the opportunity to ask questions live or write questions in the Q&A dialog box. The following topics were discussed:

- Anticipated roadway improvements along SW Norwood Road and SW Boones Ferry Road
- Tree preservation area on the site adjacent to SW Norwood Road
- Concerns about increase in traffic, especially on SW Norwood Road and north on SW Vermillion Drive
- Discussion of Transportation Impact Analysis requirements and how traffic counts are determined
- Requirement for new homes to pay Transportation Development Tax
- Average cost of System Development Charges per new home
- Disrepair of the existing pathway along SW Norwood Road
- Whether a wall will be built along I-5
- Whether a signal will be warranted at the SW Norwood Road/SW Boones Ferry intersection
- When the application, and specifically the transportation study, will be available for review by the public
- Suggestion to include roundabouts in the design of SW Norwood Road
- Anticipated timeline of residential and commercial construction
- Size of the residential lots and quality of the construction

The meeting concluded at approximately 7:00 pm.

Sincerely,

AKS ENGINEERING & FORESTRY, LLC

M Slotemaker

Melissa Slotemaker, AICP
12965 SW Herman Road, Suite 100 | Tualatin, OR 97062
P: 503.563.6151 | www.aks-eng.com | SlotemakerM@aks-eng.com

Zoom Neighborhood Meeting Attendee Report

Attendee Report

Report Generated: 6/15/2021 13:49

Topic	Webinar ID	Actual Start Time	Actual Duration (minutes)	# Registered	# Cancelled	Unique Viewers	Total Users	Max Concurrent Views
Autumn Sunrise Neighborhood Meeting	861 3179 8813	6/9/2021 17:43	78	27	0	16	21	16

Host Details

Attended	User Name (Original Name)	Email	Join Time	Leave Time	Time in Session (minutes)	Country/Region Name
Yes	Mimi Doukas	mimid@aks-eng.com	6/9/2021 17:43	6/9/2021 19:01	78	United States

Panelist Details

Attended	User Name (Original Name)	Email	Join Time	Leave Time	Time in Session (minutes)	Country/Region Name
Yes	Michael Anders	Mike.Anders@lennar.com	6/9/2021 17:44	6/9/2021 19:01	78	United States
Yes	Melissa Slotemaker	slotemakerm@aks-eng.com	6/9/2021 17:46	6/9/2021 19:01	76	United States
Yes	Darko Simic	Simicd@aks-eng.com	6/9/2021 17:53	6/9/2021 19:01	68	United States

Attendee Details

Attended	User Name (Original Name)	First Name	Last Name	Email	Registration Time	Approval Status	Join Time	Leave Time	Time in Session (minutes)
Yes	Cynthia Ray	Cynthia	Ray	cynthiaray201@gmail.com	6/9/2021 16:34	approved	6/9/2021 18:02	6/9/2021 19:01	60
Yes	Julie Welborn	Julie	Welborn	randyjw@juno.com	6/9/2021 16:35	approved	6/9/2021 18:07	6/9/2021 19:01	54
No	Kurt	Kurt	Clark	Clark0351@gmail.com	5/24/2021 8:36	approved	--	--	--
No	Beth	Beth	Dittman	beth.dittman@gmail.com	5/26/2021 11:21	approved	--	--	--
Yes	Dave Tully	Dave	Tully	davidallentully@hotmail.com	5/20/2021 18:47	approved	6/9/2021 18:00	6/9/2021 19:01	62
Yes	Justin McArthur	Justin	McArthur	mcarthurj@aks-eng.com	6/9/2021 9:36	approved	6/9/2021 18:00	6/9/2021 19:01	61
Yes	Delee Haudbine	Delee	Haudbine	dhaudbine@frontier.com	6/7/2021 19:51	approved	6/9/2021 18:00	6/9/2021 19:01	61
Yes	Eric Hawkinson	Eric	Hawkinson	erichawk22@gmail.com	6/9/2021 17:19	approved	6/9/2021 18:00	6/9/2021 19:01	61
Yes	Paula Hertz	Paula	Hertz	Paula.Hertz@izeinnovation.com	5/26/2021 10:04	approved	6/9/2021 18:00	6/9/2021 19:01	61
Yes	Matt Huxley	Matt	Huxley	matt.huxley@outlook.com	6/9/2021 18:05	approved	6/9/2021 18:06	6/9/2021 19:01	56
No	Marguerite Mcaleer-Bennett	Marguerite	Mcaleer-Bennett	mmcaleer@intlschool.org	6/9/2021 17:32	approved	--	--	--
Yes	Autumn Hickman	Autumn	Hickman	autumn.hickman@northwest-bank.com	5/21/2021 20:18	approved	6/9/2021 18:00	6/9/2021 19:01	62
Yes	Brent Beebe	Brent	Beebe	brent.beebe@gmail.com	5/21/2021 12:08	approved	6/9/2021 18:00	6/9/2021 18:50	51
Yes	Rebecca Kimmel	Rebecca	Kimmel	rkimmel77@gmail.com	6/9/2021 17:59	approved	6/9/2021 18:00	6/9/2021 19:01	62

Zoom Neighborhood Meeting Attendee Report

Yes	Joshua Bavaro	Joshua	Bavaro	jbavaroguitar@gmail.com	6/9/2021 15:03	approved	6/9/2021 18:00	6/9/2021 18:13	14
Yes	Joshua Bavaro	Joshua	Bavaro	jbavaroguitar@gmail.com			6/9/2021 18:13	6/9/2021 19:01	48
No	Tom	Tom	Knudson	tgk692003@gmail.com	5/26/2021 12:52	approved	--	--	--
No	John	John	Lucini	JwLuci@gmail.com	5/20/2021 17:26	approved	--	--	--
Yes	Grace Lucini	Grace	Lucini	GrLuci@gmail.com	5/20/2021 17:21	approved	6/9/2021 18:00	6/9/2021 19:01	61
No	Danny	Danny	O'Neal	dtcme99@comcast.net	6/9/2021 16:05	approved	--	--	--
No	Kim	Kim	Chadwick	k-chadwick@comcast.net	6/7/2021 18:52	approved	--	--	--
No	joan	joan	neumann	jessyleeme3@yahoo.com	5/20/2021 22:06	approved	--	--	--
No	Julie	Julie	Popma	julie.popma@gmail.com	5/21/2021 7:06	approved	--	--	--
Yes	Marguerite McAleer	Marguerite	McAleer	Margueritemcaleer@gmail.com	6/9/2021 17:27	approved	6/9/2021 18:00	6/9/2021 19:01	61
Yes	Chris Brune	Chris	Brune	csbrune@yahoo.com	6/2/2021 14:54	approved	6/9/2021 18:00	6/9/2021 19:01	61
No	Junior	Junior	Carbajal	jrcarbajal06@gmail.com	5/27/2021 10:04	approved	--	--	--
Yes	Andy Self	Andy	Self	Andy@anglework.com	6/9/2021 17:30	approved	6/9/2021 18:00	6/9/2021 19:01	62
No	Roderick	Roderick	French	rick.french@comcast.net	6/9/2021 10:16	approved	--	--	--

The meeting will start shortly…

Visit

If you haven’t already, please visit

www.aks-eng.com/autumn-sunrise

to register for this event.

Call

If you are having audio difficulties, please call

+1-253-215-8782

Zoom ID **861 3179 8813**, Password **6161**

OR one of the telephone numbers listed on the Virtual Meeting Instructions sheet at the above website.

Submit

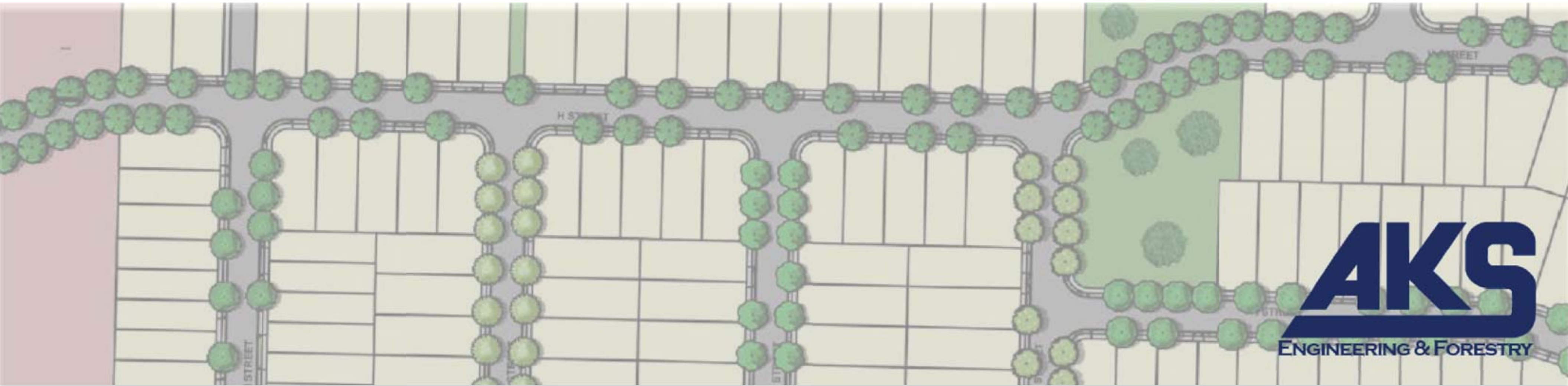
You can submit questions by typing them into the **Group Chat Box** – they will go directly to the Meeting Moderator. Questions will be answered after the presentation.

During the Question/Answer period, you can also **“Raise Your Hand”** to be called on to provide your questions and comments.

AKS
ENGINEERING & FORESTRY

Autumn Sunrise
Subdivision and Conditional Use Permit

Neighborhood Meeting
June 9, 2021



AKS
ENGINEERING & FORESTRY

Introductions

Applicant

- Lennar Northwest, Inc.
  - Michael Anders, Director of Land Acquisition
  - David Force, Forward Planning Manager

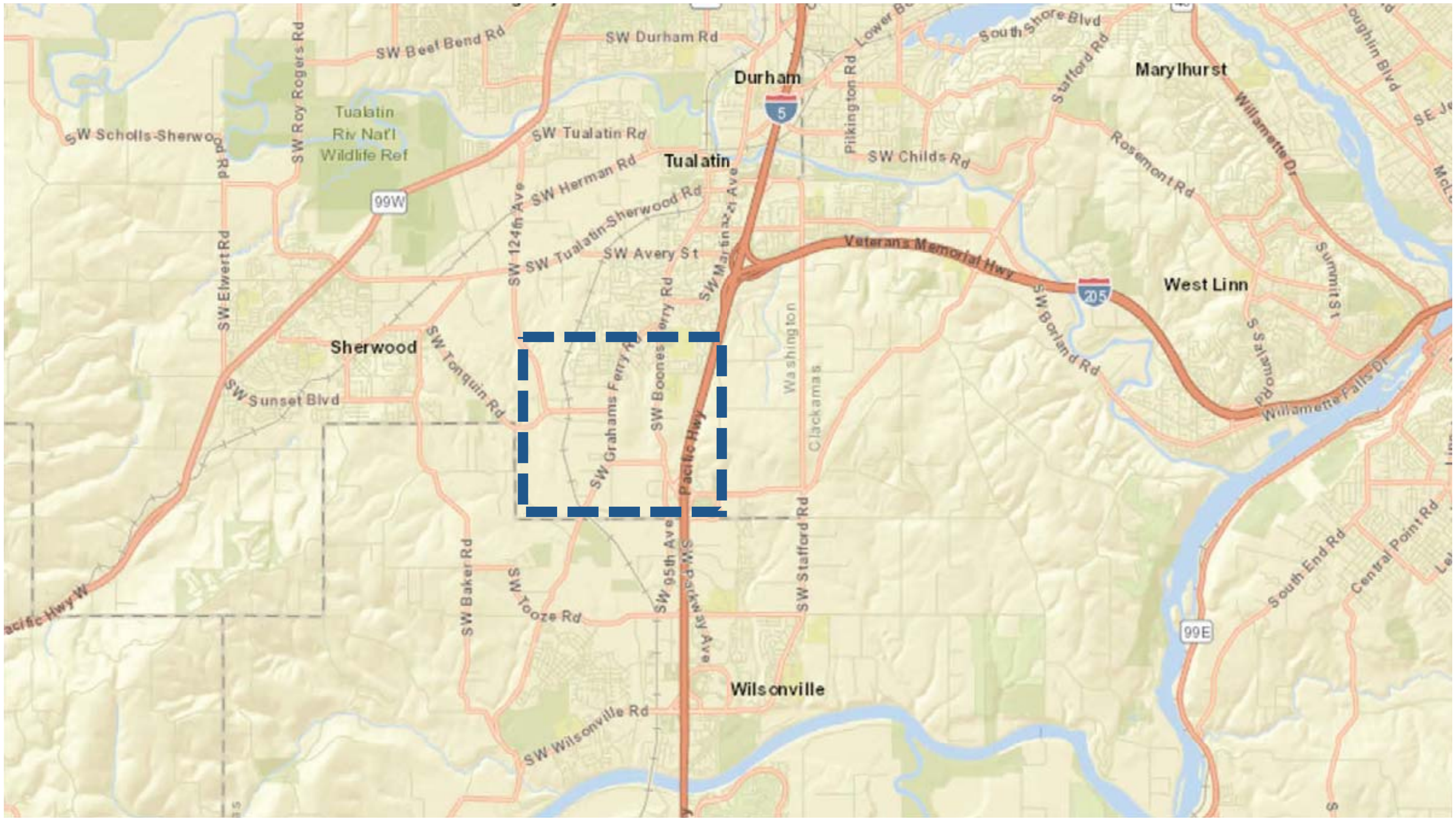
Property Owners

- Autumn Sunrise, LLC
- P3 Properties, LLC

Land Use Planning and Civil Engineering

- AKS Engineering & Forestry, LLC
  - Mimi Doukas, AICP, RLA
  - Darko Simic, PE
  - Melissa Slotemaker, AICP

Location


Durham
Tualatin
Marylhurst
West Linn
Sherwood
Wilsonville
Tualatin Riv Nat'l Wildlife Ref
SW Beef Bend Rd
SW Durham Rd
SW Scholls-Sherwood Rd
SW Roy Rogers Rd
SW Tualatin Rd
SW Herman Rd
SW Tualatin-Sherwood Rd
SW Avery St
SW 124th Ave
SW Elwert Rd
SW Sunset Blvd
SW Tonquin Rd
SW Grahams Ferry Rd
SW Boones Ferry Rd
Pacific Hwy
Pacific Hwy W
SW Martinazzi Ave
Veterans Memorial Hwy
SW Childs Rd
Pilkington Rd
Stafford Rd
Rosemont Rd
Willamette Dr
SW Borland Rd
Salamo Rd
Summit St
Willamette Falls Dr
Washington
Clackamas
SW Stafford Rd
SW Baker Rd
SW Tooze Rd
SW 95th Ave
SW Parkway Ave
SW Wilsonville Rd
South End Rd
Central Point Rd
South Shore Blvd
99W
99E
5
205

Location

- In the Basalt Creek Planning Area
- Recently annexed to City of Tualatin

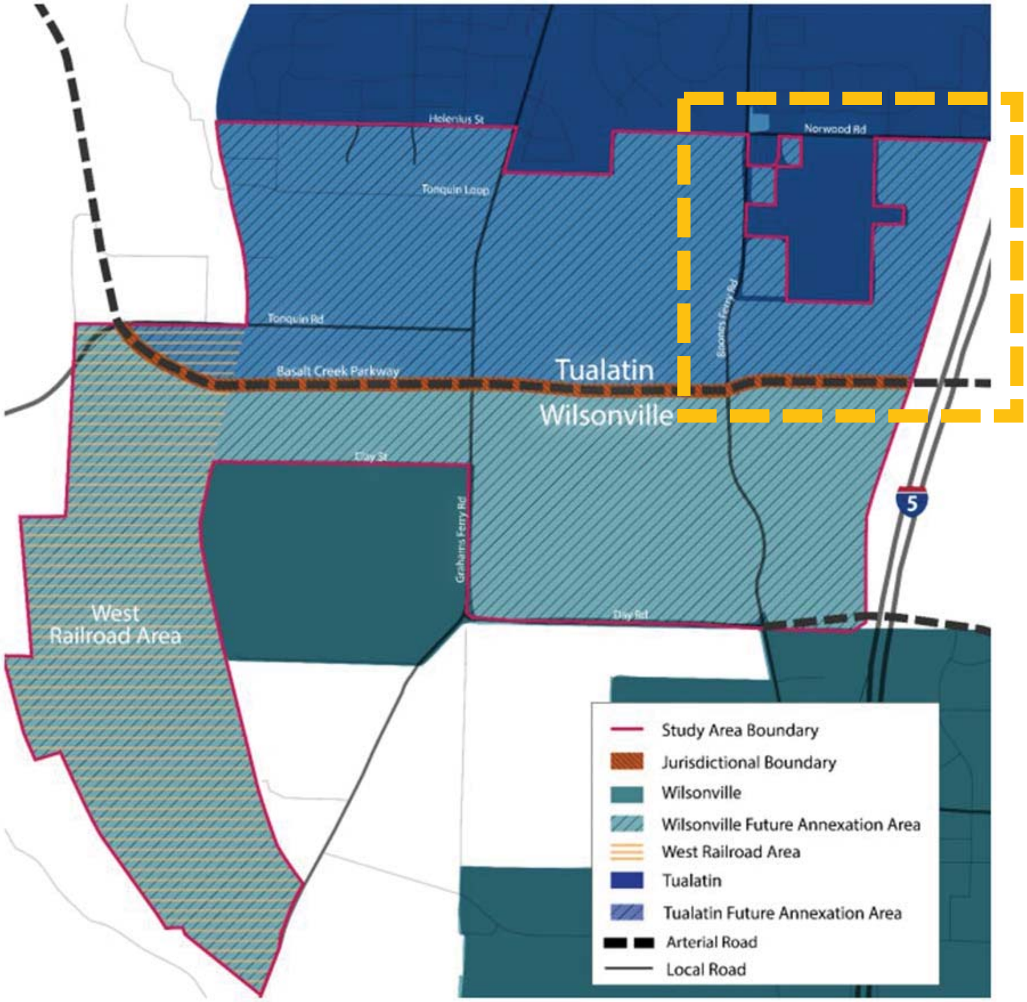


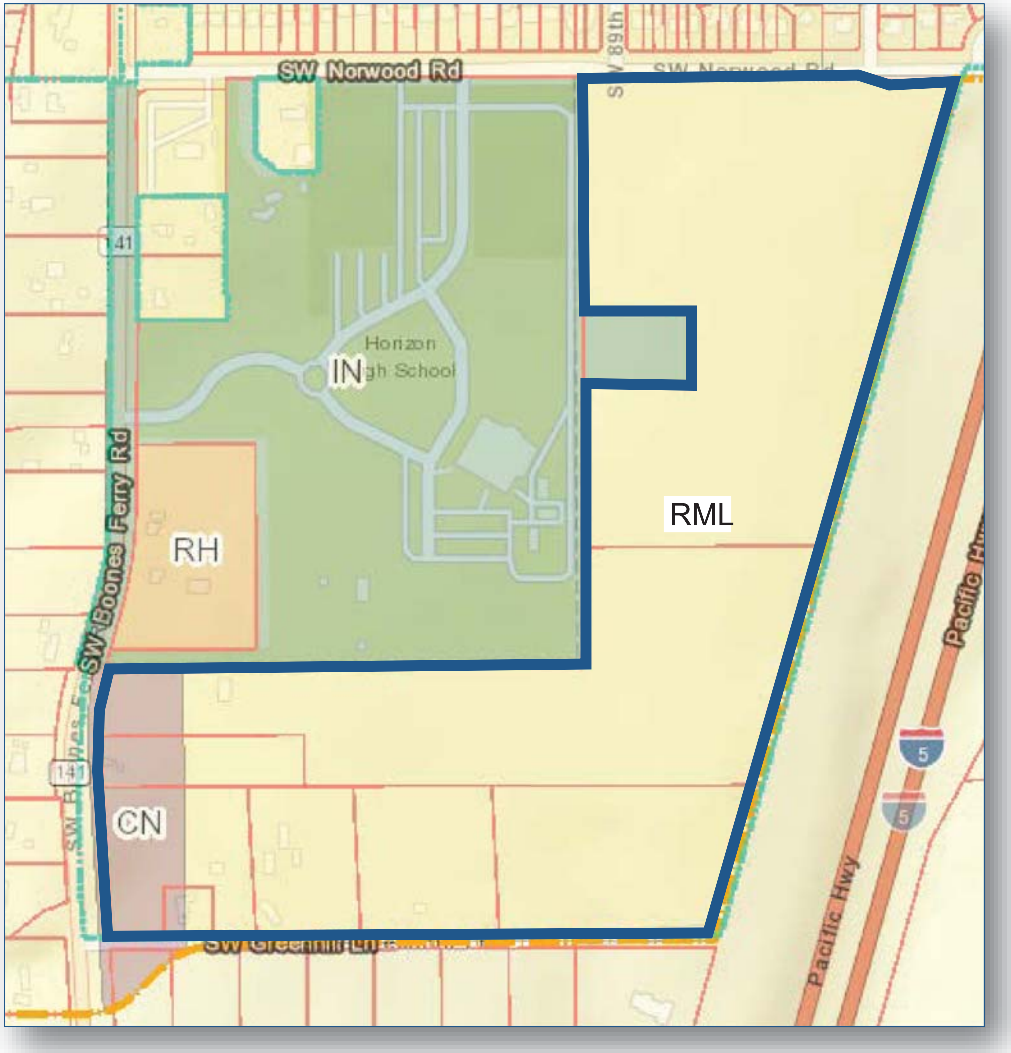
Figure 1 Basalt Creek Planning Area and jurisdictional boundaries.

Location

- ±62-acre site
- East of SW Boones Ferry Road
- South of SW Norwood Road
- West of I-5
- North of SW Greenhill Lane

Location

- ±58 acres Medium Low Density Residential (RML) Zoning
- ±3.9 acres Neighborhood Commercial (CN) Zoning - adjacent to SW Boones Ferry Road
- Neighboring Uses:
  - Horizon High School (IN)
  - High Density Residential (RH) site
  - Residential neighborhood (RML) north of SW Norwood Road
  - Unincorporated Low density residential (RL) to the west
  - Unincorporated Washington County Zoning in the Wilsonville Planning area to the south



Project Features

- Single-family residential lots for detached and attached dwellings
- 60-foot tree preservation buffer on north
- Open spaces
- Pedestrian pathways
- Northern stormwater facility
- Site for potential new City water reservoir

Project Features

- Neighborhood park
- Open spaces
- Pedestrian pathways
- Southern stormwater facility
- Future commercial lots adjacent to SW Boones Ferry Road

OPEN SPACE
PICNIC BENCH & TREES

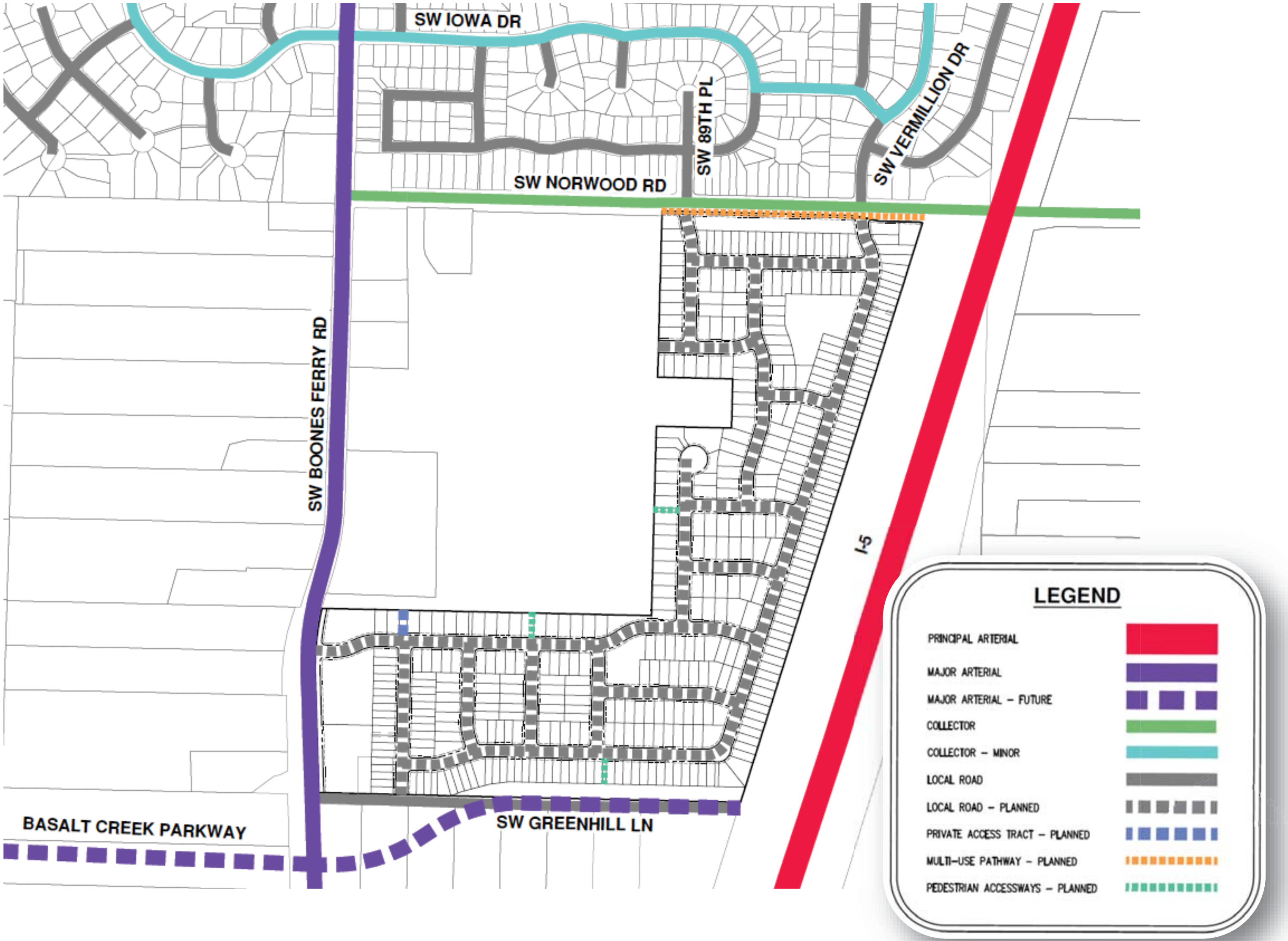
NEIGHBORHOOD PARK
PICKLEBALL COURT & SHELTER

STORMWATER FACILITY
NATIVE TREES & SHRUBS

BUFFER AREA
5' PEDESTRIAN PATH

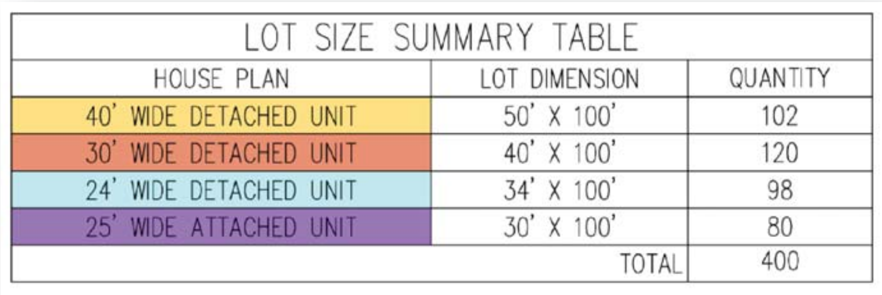
Circulation

- Two access points to SW Norwood Road
- One access point to SW Boones Ferry Road - aligns with frontage road access on the west
- Private shared access to RH site to the north is provided through the site
- Pedestrian accessways provided to adjacent sites where full street connections not feasible
- Multi-use path along SW Norwood Road



Housing Types

- 400 single-family residential lots
  - 320 detached homes
  - 80 attached townhomes
- 4 phases



LOT SIZE SUMMARY TABLE

HOUSE PLAN	LOT DIMENSION	QUANTITY
40' WIDE DETACHED UNIT	50' X 100'	102
30' WIDE DETACHED UNIT	40' X 100'	120
24' WIDE DETACHED UNIT	34' X 100'	98
25' WIDE ATTACHED UNIT	30' X 100'	80
	TOTAL	400

The Process

The combined application will include Subdivision, Conditional Use for detached single-family homes and Architectural Review for wall/fence design along SW Norwood Road.

Application

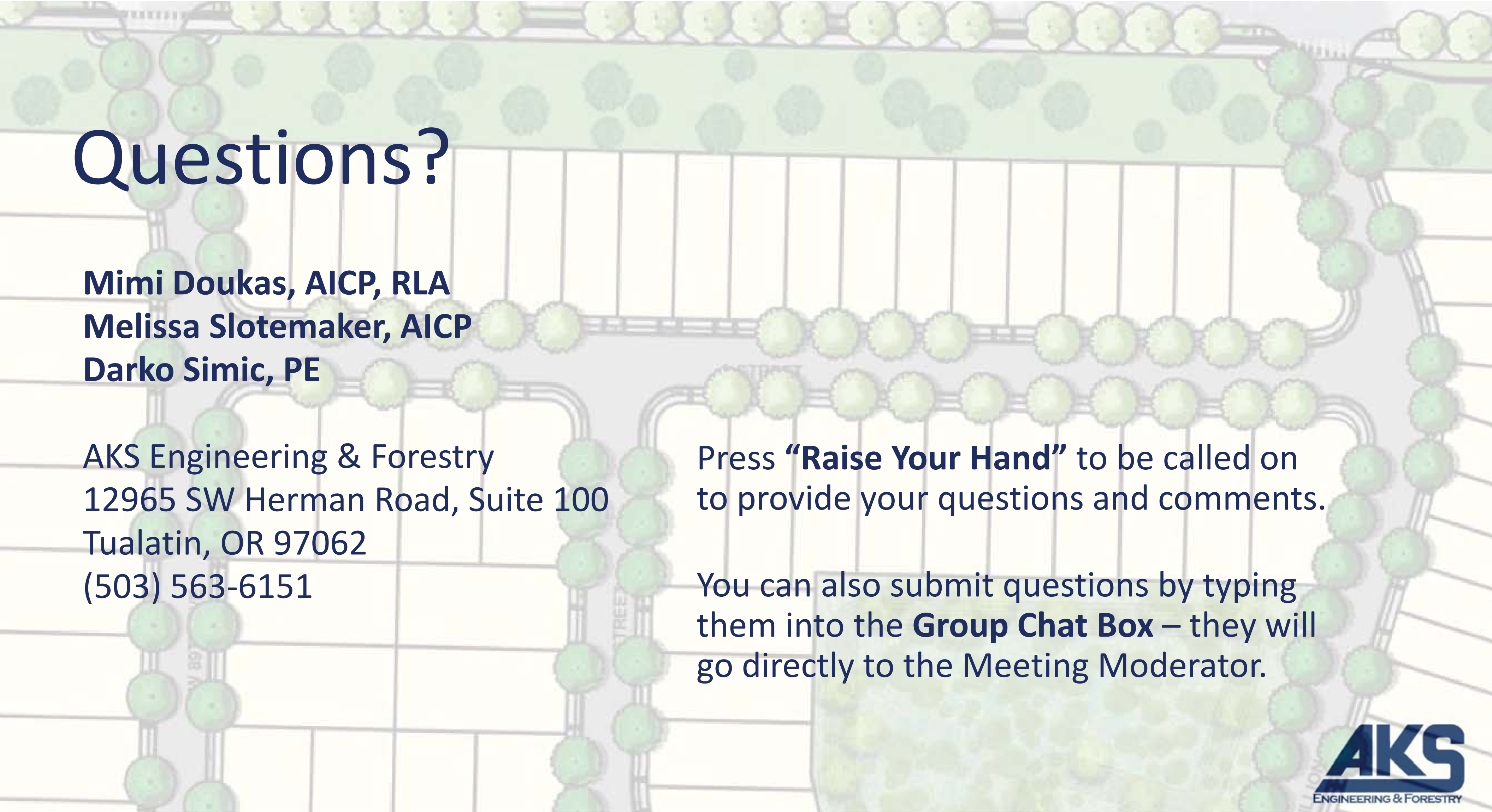
- Pre-application Conference
- Neighborhood Meeting

City Review

- Notice/Site Posting
- Staff Report

Planning Commission

- Hearing
- Decision



Questions?

Mimi Doukas, AICP, RLA
Melissa Slotemaker, AICP
Darko Simic, PE

AKS Engineering & Forestry
12965 SW Herman Road, Suite 100
Tualatin, OR 97062
(503) 563-6151

Press **“Raise Your Hand”** to be called on to provide your questions and comments.

You can also submit questions by typing them into the **Group Chat Box** – they will go directly to the Meeting Moderator.

Clean Water Services
Our commitment is clear.

CWS File Number
21-001425

Service Provider Letter

This form and the attached conditions will serve as your Service Provider Letter in accordance with Clean Water Services Design and Construction Standards (R&O 19-5, as amended by R&O 19-22).

Jurisdiction:	City of Tualatin	**Review Type:**	Tier 2 Analysis
Site Address / Location:	SW Boones Ferry/SW Norwood Rd Tualatin, OR 97062	**SPL Issue Date:**	June 23, 2021
		SPL Expiration Date:	June 23, 2023

Applicant Information:		**Owner Information:**	
Name	SONYA TEMPLETON	Name	DAVID FORCE
Company	AKS ENGINEERING & FORESTRY LLC	Company	LENNAR NORTHWEST INC
Address	12965 SW HERMAN RD SUITE 100 TUALATIN OR 97062	Address	11807 NE 99TH STREET, SUITE 1170 VANCOUVER WA 98682
Phone/Fax	(503) 867-2613	Phone/Fax	(360) 258-7879
E-mail:	templetons@aks-eng.com	E-mail:	David.force@lennar.com

Tax lot ID		**Development Activity**
2S135D000100, 400, 401, 500, 501, 600, 800, 900		Autumn Sunrise Residential Subdivision

Pre-Development Site Conditions:		**Post Development Site Conditions:**	
Sensitive Area Present:	☒ On-Site ☒ Off-Site	Sensitive Area Present:	☐ On-Site ☒ Off-Site
Vegetated Corridor Width:	50	Vegetated Corridor Width:	
Vegetated Corridor Condition:	Degraded		

Enhancement of Remaining Vegetated Corridor Required: ☐ **Square Footage to be enhanced:**

Encroachments into Pre-Development Vegetated Corridor:

Type and location of Encroachment:	Square Footage:
Stormwater Facility (Permanent Encroachment; Mitigation Required)	11,011

Mitigation Requirements:

Type/Location	Sq. Ft./Ratio/Cost
Per R&O 13-12 VC Encroachment Mitigation Requirement Met Through Wetland Mitigation Bank Credit Purchase	

☒ Conditions Attached ☒ Development Figures Attached (2) ☐ Planting Plan Attached ☐ Geotech Report Required

This Service Provider Letter does NOT eliminate the need to evaluate and protect water quality sensitive areas if they are subsequently discovered on your property.

CWS File Number 21-001425

In order to comply with Clean Water Services water quality protection requirements the project must comply with the following conditions:

1. No structures, development, construction activities, gardens, lawns, application of chemicals, uncontained areas of hazardous materials as defined by Oregon Department of Environmental Quality, pet wastes, dumping of materials of any kind, or other activities shall be permitted within the sensitive area or Vegetated Corridor which may negatively impact water quality, except those allowed in R&O 19-5, Chapter 3, as amended by R&O 19-22.
2. Prior to any site clearing, grading or construction the Vegetated Corridor and water quality sensitive areas shall be surveyed, staked, and temporarily fenced per approved plan. During construction the Vegetated Corridor shall remain fenced and undisturbed except as allowed by R&O 19-5, Section 3.06.1, as amended by R&O 19-22 and per approved plans.
3. **Prior to any activity within the sensitive area, the applicant shall gain authorization for the project from the Oregon Department of State Lands (DSL) and US Army Corps of Engineers (USACE). The applicant shall provide Clean Water Services or its designee (appropriate city) with copies of all DSL and USACE project authorization permits.**
4. An approved Oregon Department of Forestry Notification is required for one or more trees harvested for sale, trade, or barter, on any non-federal lands within the State of Oregon.
5. Prior to any ground disturbing activities, an erosion control permit is required. Appropriate Best Management Practices (BMP's) for Erosion Control, in accordance with Clean Water Services' Erosion Prevention and Sediment Control Planning and Design Manual, shall be used prior to, during, and following earth disturbing activities.
6. Prior to construction, a Stormwater Connection Permit from Clean Water Services or its designee is required pursuant to Ordinance 27, Section 4.B.
7. The water quality swale and detention pond shall be planted with Clean Water Services approved native species, and designed to blend into the natural surroundings.
8. **Should final development plans differ significantly from those submitted for review by Clean Water Services, the applicant shall provide updated drawings, and if necessary, obtain a revised Service Provider Letter.**

<u>This Service Provider Letter is not valid unless CWS-approved site plan is attached.</u>

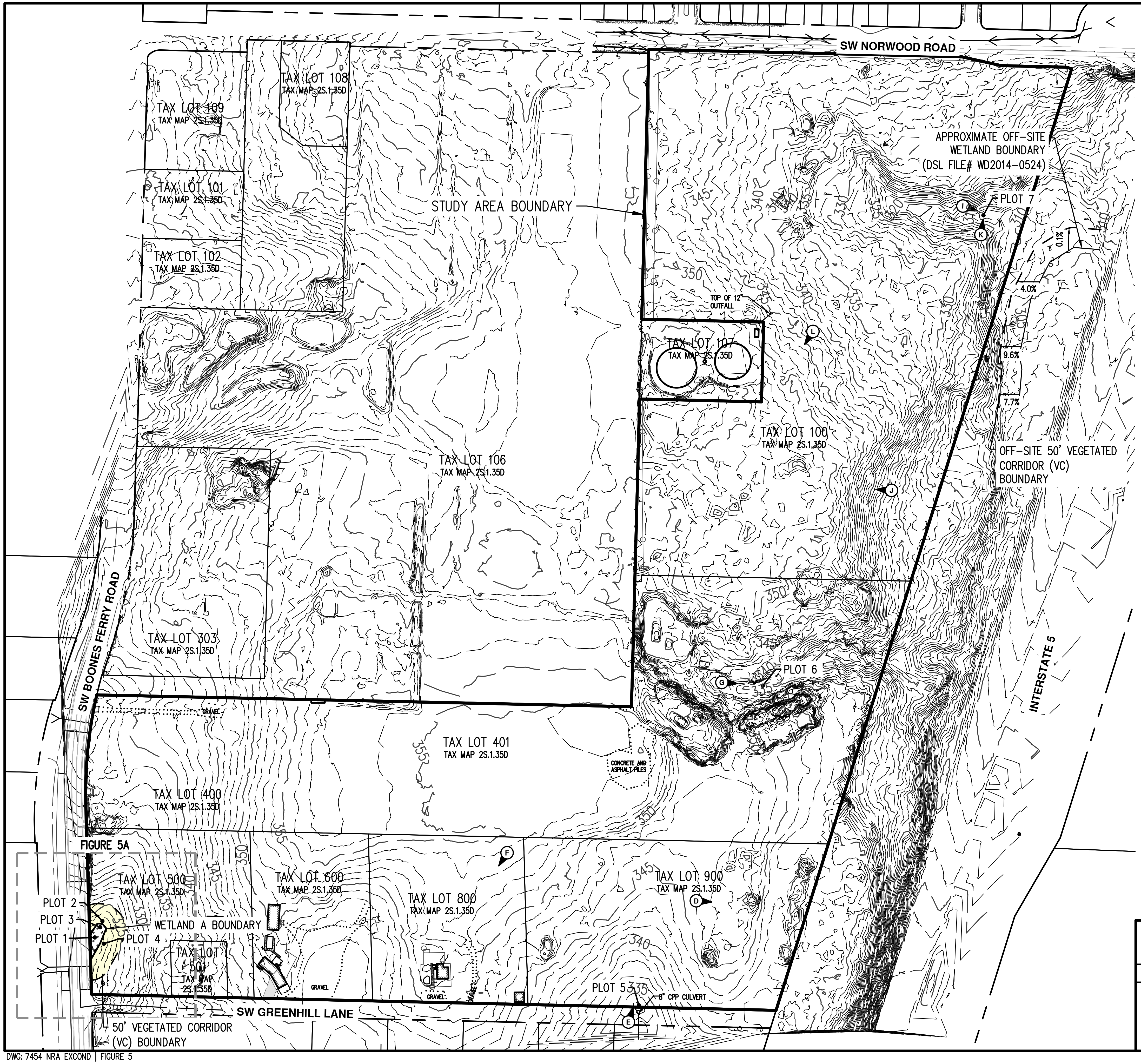
Please call (503) 681-3667 with any questions.

Stacy Benjamin

Stacy Benjamin
Environmental Plan Review

Attachments (2)

CWS FILE NO. 21-001425
Approved
Clean Water Services
FOR ENVIRONMENTAL REVIEW
By SNB Date 6/23/2021
SPL ATTACHMENT 1 OF 2

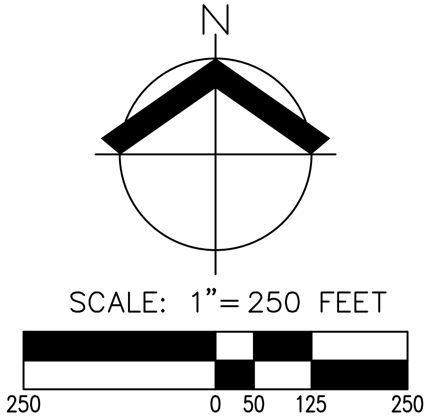


LEGEND (COLOR COPY):

▨	ON-SITE PEM/SLOPE WETLAND A: 1,930 SF± (0.04 ACRES±)
▭	ON-SITE DEGRADED CONDITION VEGETATED CORRIDOR: 11,011 SF± (0.25 ACRES±)
Ⓐ►	PHOTO LOCATION & ORIENTATION

WETLAND BOUNDARY SHOWN WAS DELINEATED BY AKS ENGINEERING & FORESTRY, LLC ON 02/24/2020 AND WAS LOCATED USING A TRIMBLE GEO 7X HANDHELD GPS RECEIVER WITH SUB-METER ACCURACY.

1-FOOT INTERVAL CONTOURS DERIVED FROM NOAA LIDAR EXISTING CONDITIONS, AND STUDY AREA ARE DERIVED FROM AKS LAND SURVEY WITH SUB-METER ACCURACY.



SCALE: 1"=250 FEET

ORIGINAL PAGE SIZE: 11" x 17"

DATE: 05/24/2021

NATURAL RESOURCES EXISTING CONDITIONS OVERVIEW

AUTUMN SUNRISE NATURAL RESOURCE ASSESSMENT

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
503.563.6151 WWW.AKS-ENG.COM

FIGURE	5
DRWN:	SKT
CHKD:	SAR
AKS JOB:	7454

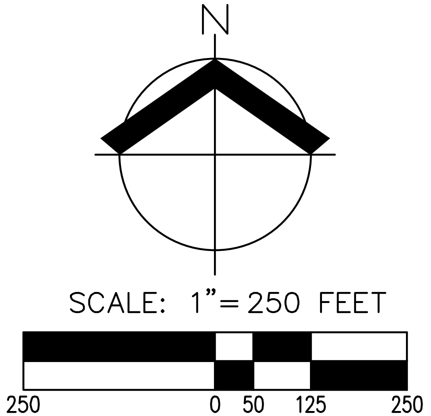
DWG: 7454 NRA EXCOND | FIGURE 5

CWS FILE NO. 21-001425
Approved
Clean Water Services
FOR ENVIRONMENTAL REVIEW
By SNB Date 6/23/2021
SPL ATTACHMENT 2 OF 2

LEGEND (COLOR COPY):

▨	ON-SITE WETLAND A AREA: 1,930 SF± (0.04 ACRES±)
🟪	PERMANENT ON-SITE WETLAND A IMPACT AREA: 1,930 SF± (0.04 ACRES±)
▨	PERMANENT VEGETATED CORRIDOR IMPACT AREA: 11,011 SF± (0.25 ACRES±)

WETLAND BOUNDARY SHOWN WAS DELINEATED BY AKS ENGINEERING AND FORESTRY, LLC ON 02/24/2020 AND WAS LOCATED USING A TRIMBLE GEO 7X HANDHELD GPS RECEIVER WITH SUB-METER ACCURACY.



ORIGINAL PAGE SIZE: 11" x 17"

DATE: 5/26/2021

SUBDIVISION SITE PLAN OVERVIEW

AUTUMN SUNRISE NATURAL RESOURCE ASSESSMENT

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
503.563.6151 WWW.AKS-ENG.COM

EXHIBIT
6

DRWN: JSM
CHKD: ST
AKS JOB:
7454

DWG: 7454 NRA SITE PLAN | FIGURE 6

Autumn Sunrise
Subdivision Application

Date: July 2021

Submitted to:
City of Tualatin
18800 SW Martinazzi Avenue
Tualatin, OR 97062

Applicant:
Lennar Northwest, Inc.
11807 NE 99th Street, Suite 1170
Vancouver, WA 98682

AKS Job Number: 7454

AKS ENGINEERING & FORESTRY
12965 SW Herman Road, Suite 100
Tualatin, OR 97062
(503) 563-6151

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Exhibits

Exhibit A: Preliminary Plans

Exhibit B: Application Forms and Checklists

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Exhibit E: Neighborhood Meeting Documentation

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Exhibit G: Preliminary Tree Assessment Report and Tree Inventory

Exhibit H: Traffic Impact Analysis

Exhibit I: Preliminary Stormwater Report

Exhibit J: Subdivision Plat Naming Confirmation

Autumn Sunrise
Subdivision Application

Submitted to:
City of Tualatin – Planning Division
18800 SW Martinazzi Avenue
Tualatin, OR 97062

Applicant:
Lennar Northwest, Inc.
11807 NE 99th Street, Suite 1170
Vancouver, WA 98682

Property Owners:
Tax Lots 400, 401, 500, 501, 600, 800, and 900:
Autumn Sunrise, LLC
485 S State Street
Lake Oswego, OR 97034

Tax Lot 100:
P3 Properties LLC
PO Box 691
White Salmon, WA 98672

Applicant's Consultant:
AKS Engineering & Forestry, LLC
12965 SW Herman Road, Suite 100
Tualatin, OR 97062

Contact: Mimi Doukas, AICP, RLA
Email: mimid@aks-eng.com
Phone: (503) 563-6151

Site Location:
23620 & 23740 SW Boones Ferry Road; 9185, 9335, & 9415 SW Greenhill Lane
South of SW Norwood Road, east of SW Boones Ferry Road, and north of SW Greenhill Lane; Tualatin, OR

Washington County Assessor's Map:
Map 2S 1 35D, Tax Lots 100, 400, 401, 500, 501, 600, 800, and 900

Site Size:
Total of ±61.71 acres

Land Use Districts:
Medium-Low Density Residential (RML)
Neighborhood Commercial (CN)

I. Executive Summary

Consistent with State and Metro guidelines and in order to address the identified regional and local need for urban land for housing, the City of Tualatin adopted the Housing Element of the Tualatin Comprehensive Plan and Housing Needs Analysis in 2020. The Housing Needs Analysis identifies the main area for residential growth to occur in the southern area of the City, in the Basalt Creek Concept Plan Area. This Subdivision application is for a project known as Autumn Sunrise within the Basalt Creek Area. The project will provide a diverse mix of small lot and attached housing units and help meet the City's housing needs as identified in the City's Comprehensive Plan and implemented in the Tualatin Development Code.

The subject ±62-acre site is located in the Medium Low Density Residential (RML) and Neighborhood Commercial (CN) zones and has received previous land use approvals, which are described below.

1. ANN 19-0002
   The City of Tualatin annexed Tax Lots 400, 401, 500, 501, 600, 800, and 900 of Washington County Assessor's Map 2S 1 35D into the City. These lots comprise the southern ±38 acres of the subject site adjacent to SW Boones Ferry Road and SW Greenhill Lane.

2. ANN 20-003
   The City of Tualatin annexed Tax Lot 100 of Washington County Assessor's Map 2S 1 35D, the northern ±25 acres of the subject site adjacent to SW Norwood Road.

2. PTA 20-003
   This Development Code Text Amendment approved modified development standards—smaller lot sizes, reduced setbacks, and increased structural lot coverage—for development of detached single-family dwellings in a "Small Lot Subdivision" under a Conditional Use Permit in the Basalt Creek Area. It also included requirements to build at least 20 percent of the units in a proposed development as attached single-family and a minimum of 5 percent of the gross site area as open space for the provision of recreational area and/or tree preservation. The maximum density of 10 units per acre remained unchanged.

3. PMA 20-002 and PTA 20-005
   This application adjusted the combined Comprehensive Plan and Zoning Map to shift the CN zoning district boundary on the subject site. The CN zoning district remains ±3.9 acres in area but is now an elongated rectangle fronting on SW Boones Ferry Road. The RML zoning district is now located further from SW Boones Ferry Road. This approval also included a text amendment to remove a provision that prohibited the CN zoning district within 300 feet of a school property and added the "basic utility" use category to the list of permitted uses within the CN zone.

This application package includes a detailed Subdivision submittal for 400 single-family attached and detached residential lots, and two commercial lots. Key issues for consideration are described below.

Phasing

The Autumn Sunrise residential subdivision is planned to be constructed in 4 phases, starting at the northern end of the site. Small lot subdivisions within the Basalt Creek Area (per TDC 41.330) are required to provide a phasing plan demonstrating that the required attached townhome units will not be left to the last phase to be constructed. As illustrated on the Product Distribution Plan included in Exhibit A, 24 townhomes are planned in Phase 1, 14 townhomes are planned in Phase 2, and 42 townhomes are planned in Phase 3. No townhomes are planned in Phase 4. Therefore, all 80 of the townhome lots will be created prior to the final phase of the project. Rather than tying the issuance of building permits in Phase 4 to the Certificates of Occupancy for all the townhomes, the Applicant would prefer that a condition of approval be written that requires no more than 70 percent of the single-family detached lots be platted prior to the platting of all the townhome lots. Please see the response to TDC 41.330 below for additional detail.

Future Architectural Review Applications

Future single-family detached residential units are required to obtain an Architectural Review Single Family (ARSF) approval prior to building permit submittal. ARSF is a Type I staff-level decision that ensures the applicable architectural design elements required by code are provided. The future attached townhome units are also required to obtain Architectural Review (AR) approval. The AR process for the attached units will be a Type II staff-level decision with public notice.

Open Space and Pedestrian Connections

The planned open spaces within Autumn Sunrise include three tracts along SW Norwood Road that serve as a visual and acoustic buffer. Over 70 existing trees are planned to be preserved within these tracts. In addition, a neighborhood park and green spaces that will be owned and maintained by the Homeowners' Association are planned. Pedestrian connections are provided on the planned sidewalks along both sides of the new streets. Instead of the standard 5-foot sidewalk, a 12-foot multi-use pathway is included in the SW Norwood Road frontage improvements as required by the City Transportation System Plan (TSP). Additional pedestrian pathways provide connectivity to the open space to the south and tracts are provided for future connections to the Horizon Community Church and Christian School (Horizon School) campus to the northwest.

Stormwater Drainage and Intersection Location along SW Boones Ferry Road

As mentioned above, PMA 20-002 and PTA 20-005 were a Plan Map and Text Amendment that modified the CN zoning boundary and modified language for the CN zoning district. During the review of the application, two concerns were expressed by neighbors along SW Boones Ferry Road. First, a concern was raised about the amount of stormwater runoff currently being collected from the east side of SW Boones Ferry Road and routed under the street, causing flooding on properties west of the right-of-way. The second concern was the location of the Autumn Sunrise subdivision local street access on SW Boones Ferry Road and wanting to make sure Washington County and the City took the location of the frontage road west of SW Boones Ferry Road into consideration.

Both of the above concerns have been addressed in the design of the street and stormwater systems in this application. The planned Autumn Sunrise stormwater facilities have been designed to provide both stormwater quality treatment and quantity detention in accordance with the current Clean Water Services (CWS) requirements. In addition, the stormwater improvements include re-routing the stormwater runoff from the two existing ditch inlets on the east side of SW Boones Ferry Road to the new stormwater facility. Upon approval by Washington County, the existing storm pipe under SW Boones Ferry Road is planned to be capped to end the flow of stormwater from the east side to the west side of the roadway. Also, as illustrated on the Aerial Photo Site Map included in Exhibit A, after coordination with adjacent property owners, Washington County, and the City, the location of the new local street intersection at SW Boones

Ferry Road is planned to be directly opposite the existing emergency access point of the frontage road on the west side of SW Boones Ferry Road.

Model Homes

This application includes two model home areas (in Phases 1 and 3). The Applicant would like the provision to allow building permits to be obtained for the model homes prior to completion of the public improvements of the applicable phase to be included with the Subdivision approval.

Concurrent Conditional Use Permit Application

While the RML zoning district allows a variety of attached dwellings as well as detached, small-lot subdivisions, Conditional Use Permit approval is required for detached single-family dwellings. Within the Basalt Creek Area, small lot subdivisions are required to meet the standards in TDC 36.410 as well as those standards specific to the Basalt Creek Area (TDC 41.330). The standards allow a maximum of 80 percent of the units to be detached dwellings and require a minimum of 5 percent of the site to be open space. The Conditional Use Permit application package has been submitted separately but will be reviewed concurrently by the City.

This application includes the City application forms, written materials, and preliminary plans necessary for the Planning Commission to review and determine compliance with the applicable approval criteria. The evidence is substantial and supports the City's approval of the application.

II. Site Description/Setting

The subject site is a total of ±61.96 acres located at the southernmost extent of the City's UGB and is comprised of eight tax lots. The site has frontage on SW Norwood Road, SW Boones Ferry Road, and SW Greenhill Road. Please refer to the Vicinity Map on the first page of the Preliminary Plans (Exhibit A) for the location of the site. A ±3.9-acre portion of the site adjacent to SW Boones Ferry Road is zoned CN. The remaining ±58 acres are zoned RML. The northern portion of the site is wooded while the southern area has three existing homes adjacent to SE Greenhill Lane and open agricultural fields.

North:	SW Norwood Road and Norwood Heights residential subdivision. Zoned RML.
East:	City Boundary and Urban Growth Boundary (UGB) at edge of site. Interstate 5 right-of-way with unincorporated Washington County zoned Agriculture and Forest District (AF-5) and Future Development 20-Acre (FD-20) beyond.
South:	The City Boundary is at SW Greenhill Lane, beyond which are agricultural and low-density residential development in unincorporated Washington County zoned FD-20. The areas south of SW Greenhill Lane are within the City of Wilsonville Planning Area.
West:	The City of Tualatin water towers and Horizon School are zoned Institutional (IN). There is also a 5-acre unincorporated lot adjacent to SW Boones Ferry Road that will have the zoning designation of High Density Residential (RH) once it is annexed to the City. Unincorporated properties on the west side of SW Boones Ferry Road have low-density residential development (with County Zoning of FD-20) and will have the Low Density Residential (RL) zoning designation when annexed to the City.

III. Applicable Review Criteria

This application involves the development of land for housing. Oregon Revised Statues (ORS) 197.307(4) states that a local government may apply only clear and objective standards, conditions, and procedures regulating the provision of housing, and that such standards, conditions, and procedures cannot have the effect, either in themselves or cumulatively, of discouraging housing through unreasonable cost or delay. In addition, this application involves a "limited land use decision" as that term is defined in ORS 197.015(12). The significance of this statutory provision is also discussed below.

Oregon Courts and the Land Use Board of Appeals (LUBA) have generally held that an approval standard is not clear and objective if it imposes on an applicant "subjective, value-laden analyses that are designed to balance or mitigate impacts of the development" (Rogue Valley Association of Realtors v. City of Ashland, 35 Or LUBA 139, 158 [1998] aff'd, 158 Or App 1 [1999]). ORS 197.831 places the burden on local governments to demonstrate that the standards and conditions placed on housing applications can be imposed only in a clear and objective manner. While this application addresses all standards and conditions, the Applicant reserves the right to object to the enforcement of standards or conditions that are not clear and objective and does not waive its right to assert that the housing statutes apply to this application. The exceptions in ORS 197.307(5) do not apply to this application.

ORS 197.195(1) describes how certain standards can be applied as part of a limited land use application. The applicable land use regulations are found in this application. Pursuant to ORS 197.195(1), Comprehensive Plan provisions (as well as goals, policies, etc. from within the adopted elements of the Comprehensive Plan) may not be used as a basis for a decision or an appeal of a decision unless they are specifically incorporated into the land use regulations. While this application may respond to Comprehensive Plan and/or related documents, such a response does not imply or concede that said provisions are applicable approval criteria. Similarly, the Applicant does not waive its right to object to the attempted implementation of these provisions unless they are specifically listed in the applicable land use regulations, as is required by ORS 197.195(1).

Pursuant to ORS 197.522, if this application is found to be inconsistent with the applicable land use regulations, the Applicant may offer an amendment or propose conditions of approval to make the application consistent with applicable regulations. The jurisdiction is not obligated to take the initiative to develop such conditions on its own or develop the evidentiary record that might be needed to impose such conditions.

City of Tualatin Development Code

CHAPTER 32 – PROCEDURES

TDC 32.010. Purpose and Applicability.

…

(2) Applicability of Review Procedures. All land use and development permit applications and decisions, will be made by using the procedures contained in this Chapter. The procedure "type" assigned to each application governs the decision-making process for that permit or application. There are five types of permit/application procedures as described in subsections (a) through (e) below. Table 32-1 lists the City's land use and development applications and corresponding review procedure(s).

…

(b) **Type II Procedure (Administrative/Staff Review with Notice).** A Type II procedure is used when the standards and criteria require limited discretion, interpretation, or policy or legal judgment. Type II decisions are made by the City Manager and require public notice and an opportunity for appeal to the Planning Commission, Architectural Review Board, or City Council as shown in Table 32-1. Those Type II decisions which are "limited land use decisions" as defined in ORS 197.015 are so noted in Table 32-1.

(c) **Type III Procedure (Quasi-Judicial Review—Public Hearing).** Type III procedure is used when the standards and criteria require discretion, interpretation, or policy or legal judgment. Quasi-Judicial decisions involve discretion but implement established policy. Type III decisions are made by the Planning Commission or Architectural Review Board and require public notice and a public hearing, with an opportunity for appeal to the City Council.

…

(3) **Determination of Review Type.** Unless specified in Table 32-1, the City Manager will determine whether a permit or application is processed as Type I, II, III, IV-A or IV-B based on the descriptions above. Questions regarding the appropriate procedure will be resolved in favor of the review type providing the widest notice and opportunity to participate. An applicant may choose to elevate a Type I or II application to a higher numbered review type, provided the applicant pays the appropriate fee for the selected review type.

Excerpt of Table 32-1—Applications Types and Review Procedures

Application/Action	Procedure Type	Decision Body*	Appeal Body*	Pre-Application Conference Required	Neighborhood / Developer Mtg Required	Applicable Code Chapter
Architectural Review	II	CM	ARB/CC	Yes	Yes	TDC 33.020
Conditional Use Permit	III	PC	CC	Yes	Yes	TDC 33.040
Subdivisions (limited land use)	II	CM	CC	Yes	Yes	TDC Ch 36

** City Council (CC); Planning Commission (PC); Architectural Review Board (ARB); City Manager or designee (CM); Land Use Board of Appeals (LUBA).*

Response: As described in Table 32-1, a Subdivision application is subject to a Type II procedure and the City Manager is the decision body. However, as described under TDC 32.010(3) above, an applicant may choose to elevate a Type II application to a higher level of review. The associated Conditional Use Permit for the Autumn Sunrise site is being reviewed through the Type III procedure; therefore, to simplify and streamline the review process, the Applicant is choosing to elevate this Subdivision application to the Type III level of review. Therefore, this application will follow the Type III review procedure with a public hearing before the Planning Commission.

TDC 32.020. - Procedures for Review of Multiple Applications.

Multiple applications processed individually require the filing of separate applications for each land use action. Each application will be separately reviewed according to the applicable procedure type and processed sequentially as follows:

(1) Applications with the highest numbered procedure type must be processed first;

(2) Applications specifically referenced elsewhere in the TDC as to the particular order must be processed in that order; and

(3) Where one land use application is dependent on the approval of another land use application, the land use application upon which the other is dependent must be processed first (e.g., a conditional use permit is subject to prior approval before architectural review).

Response: City staff confirmed at the Pre-application conference that the applications can be processed concurrently and do not need to be submitted sequentially.

TDC 32.110. – Pre-Application Conference.

(1) *Purpose of Pre-Application Conferences.* Pre-application conferences are intended to familiarize applicants with the requirements of the TDC; to provide applicants with an opportunity discuss proposed projects in detail with City staff; and to identify approval criteria, standards, and procedures prior to filing a land use application. The pre-application conference is intended to be a tool to assist applicants in navigating the land use process, but is not intended to be an exhaustive review that identifies or resolves all potential issues, and does not bind or preclude the City from enforcing any applicable regulations or from applying regulations in a manner differently than may have been indicated at the time of the pre-application conference.

(2) *When Mandatory.* Pre-application conferences are mandatory for all land use actions identified as requiring a pre-application conference in Table 32-1. An applicant may voluntarily request a pre-application conference for any land use action even if it is not required.

(3) *Timing of Pre-Application Conference.* A pre-application conference must be held with City staff before an applicant submits an application and before an applicant conducts a Neighborhood/Developer meeting.

(4) *Application Requirements for Pre-Application Conference.*

(a) *Application Form.* Pre-application conference requests must be made on forms provided by the City Manager.

(b) *Submittal Requirements.* Pre-application conference requests must include:

(i) A completed application form;

(ii) Payment of the application fee;

(iii) The information required, if any, for the specific pre-application conference sought; and

(iv) Any additional information the applicant deems necessary to demonstrate the nature and scope of the proposal in sufficient detail to allow City staff to review and comment.

(5) *Scheduling of Pre-Application Conference.* Upon receipt of a complete application, the City Manager will schedule the pre-application conference. The City Manager will coordinate the involvement of city departments, as appropriate, in the pre-application conference. Pre-application conferences are not open to the general public.

(6) *Validity Period for Mandatory Pre-Application Conferences; Follow-Up Conferences.* A follow-up conference is required for those mandatory pre-application conferences that have previously been held when:

(a) An application relating to the proposed development that was the subject of the pre-application conference has not been submitted within six months of the pre-application conference;

(b) The proposed use, layout, and/or design of the proposal have significantly changed; or

(c) The owner and/or developer of a project changes after the pre-application conference and prior to application submittal.

Response: A pre-application conference was held with City staff on February 17, 2021. The pre-application conference followed the above procedures and is valid for six months (until August 17, 2021). The standards are met.

TDC 32.120. - Neighborhood/Developer Meetings.

(1) *Purpose.* The purpose of this meeting is to provide a means for the applicant and surrounding property owners to meet to review a development proposal and identify issues regarding the proposal so they can be considered prior to the application submittal. The meeting is intended to allow the developer and neighbors to share information and concerns regarding the project. The applicant may consider whether to incorporate solutions to these issues prior to application submittal.

(2) *When Mandatory.* Neighborhood/developer meetings are mandatory for all land use actions identified in Table 32-1 as requiring a neighborhood/developer meeting. An applicant may voluntarily conduct a neighborhood/developer meeting even if it is not required and may conduct more than one neighborhood/developer meeting at their election.

(3) *Timing.* A neighborhood/developer meeting must be held after a pre-application meeting with City staff, but before submittal of an application.

(4) *Time and Location.* Required neighborhood/developer meetings must be held within the city limits of the City of Tualatin at the following times:

(a) If scheduled on a weekday, the meeting must begin no earlier than 6:00 p.m.

(b) If scheduled on a weekend, the meeting must begin between 10:00 a.m. and 6:00 p.m.

(5) *Notice Requirements.*

(a) The applicant must provide notice of the meeting at least 14 calendar days and no more than 28 calendar days before the meeting. The notice must be by first class mail providing the date, time, and location of the meeting, as well as a brief description of the proposal and its location. The applicant must keep a copy of the notice to be submitted with their land use application.

(b) The applicant must mail notice of a neighborhood/developer meeting to the following persons:

(i) All property owners within 1,000 feet measured from the boundaries of the subject property;

(ii) All property owners within a platted residential subdivision that is located within 1,000 feet of the boundaries of the subject property. The notice area includes the entire subdivision and not just those lots within 1,000 feet. If the residential subdivision is one of two or more individually platted phases sharing a single subdivision name, the notice area need not include the additional phases; and

(iii) All designated representatives of recognized Citizen Involvement Organizations as established in TMC Chapter 11-9.

(c) The City will provide the applicant with labels for mailing for a fee.

(d) Failure of a property owner to receive notice does not invalidate the neighborhood/developer meeting proceedings.

(6) *Neighborhood/Developer Sign Posting Requirements.* The applicant must provide and post on the subject property, at least 14 calendar days before the meeting. The sign must conform to the design and placement standards established by the City for signs notifying the public of land use actions in TDC 32.150.

(7) *Neighborhood/Developer Meeting Requirements.* The applicant must have a sign-in sheet for all attendees to provide their name, address, telephone number, and email address and keep a copy of the sign-in sheet to provide with their land use application. The applicant must prepare meeting notes identifying the persons attending, those commenting and the substance of the comments expressed, and the major points that were discussed. The applicant must keep a copy of the meeting notes for submittal with their land use application.

Response: A Neighborhood/Developer Meeting is required for the subject application and was held on June 9, 2021. The meeting was held for the Subdivision and Conditional Use applications, following the City of Tualatin's Temporary Guidance for Neighborhood/Developer Meeting. The applicable meeting documentation is provided in Exhibit E and the above requirements are met.

TDC 32.130. - Initiation of Applications.

(1) *Type I, Type II, Type III, and Type IV-A Applications.* Type I, Type II, Type III, and Type IV-A applications may be submitted by one or more of the following persons:

(a) The owner of the subject property;

(b) The contract purchaser of the subject property, when the application is accompanied by proof of the purchaser's status as such and by the seller's written consent;

(c) A lessee in possession of the property, when the application is accompanied by the owners' written consent; or

(d) The agent of any of the foregoing, when the application is duly authorized in writing by a person authorized to submit an application by paragraphs (a), (b) or (c) of this subsection, and accompanied by proof of the agent's authority.

(2) *Type IV-A or B Applications.* Type IV-A or B applications may be initiated by the City.

Response: This application has been submitted by the contract purchaser of the subject properties. The above standards are met.

TDC 32.140. - Application Submittal.

(1) *Submittal Requirements.* Land use applications must be submitted on forms provided by the City. A land use application may not be accepted in partial submittals. All information supplied on the application form and accompanying the application must be complete and correct as to the applicable facts. Unless otherwise specified, all of the following must be submitted to initiate completeness review under TDC 32.160:

(a) *A completed application form.* The application form must contain, at a minimum, the following information:

(i) The names and addresses of the applicant(s), the owner(s) of the subject property, and any authorized representative(s) thereof;

(ii) The address or location of the subject property and its assessor's map and tax lot number;

(iii) The size of the subject property;

(iv) The comprehensive plan designation and zoning of the subject property;

(v) The type of application(s);

(vi) A brief description of the proposal; and

(vii) Signatures of the applicant(s), owner(s) of the subject property, and/or the duly authorized representative(s) thereof authorizing the filing of the application(s).

(b) A written statement addressing each applicable approval criterion and standard;

(c) Any additional information required under the TDC for the specific land use action sought;

(d) Payment of the applicable application fee(s) pursuant to the most recently adopted fee schedule;

(e) Recorded deed/land sales contract with legal description.

(f) A preliminary title report or other proof of ownership.

(g) For those applications requiring a neighborhood/developer meeting:

(i) The mailing list for the notice;

(ii) A copy of the notice;

(iii) An affidavit of the mailing and posting;

(iv) The original sign-in sheet of participants; and

(v) The meeting notes described in TDC 32.120(7).

(h) A statement as to whether any City-recognized Citizen Involvement Organizations (CIOs) whose boundaries include, or are adjacent to, the subject property were contacted in advance of filing the application and, if so, a summary of the contact. The summary must include the date when contact was made, the form of the contact and who it was with (e.g. phone conversation with neighborhood association chairperson, meeting with land use committee, presentation at neighborhood association meeting), and the result;

(i) Any additional information, as determined by the City Manager, that may be required by another provision, or for any other permit elsewhere, in the TDC, and any other information that may be required to adequately review and analyze the proposed development plan as to its conformance to the applicable criteria;

…

Response: This application submittal includes the applicable information required above, including the application form, fee, narrative, property ownership information, and neighborhood/developer meeting documentation. An email with the neighborhood/developer meeting information was sent to City staff and the applicable City-recognized Citizen Involvement Organization (CIOs) contacts. The neighborhood/developer meeting documentation is provided in Exhibit E. The above submittal requirements are met.

…

CHAPTER 33 – APPLICATIONS AND APPROVAL CRITERIA

…

TDC 33.110. - Tree Removal Permit/Review.

…

(2) *Applicability.* No person may remove a tree on private property within the City limits, unless the City grants a tree removal permit, consistent with the provisions of this Section.

Response: This application includes tree removal on private property; therefore, the standards of this section apply.

(3) *Exemptions.* The following actions are exempt from the requirements of a tree removal permit.

(a) *General Exemption.* Four or fewer trees may be removed within a single calendar year from a single parcel of property or contiguous parcels of property under the same ownership without a permit, if the tree is:

(i) Not located in the Natural Resource Protection Overlay District (NRPO);

(ii) Not located in the Wetlands Protection Area (WPA) of the Wetlands Protection District (WPD);

(iii) Not a Heritage Tree; and

(iv) Not previously required to be retained or planted under an approved Architectural Review decision.

(b) *Forest Harvesting Exemption.* Forest Harvesting Uses, as provided by Agricultural Uses in TDC 39.300 are exempt.

(c) *Orchard Exemption.* Orchards Uses, as provided by Agricultural Uses in TDC 39.300, are exempt.

(d) *Public Property Exemption.* Tree removal on federal, state, county, or City property is exempt from the requirements of a tree removal permit. This exemption includes, but is not limited to road, improvements and maintenance to City parks, rights-of-way, water, sanitary sewer, and stormwater facilities. (Removal of trees from public right-of-way are governed by TDC Chapter 74.)

Response: The on-site trees planned for removal do not meet the exemption criteria above. The exemptions do not apply.

(3) *Procedure Type.* Tree Removal Permit applications are subject to Type II Review in accordance with TDC Chapter 32. Tree Removal Permit applications submitted with an Architectural Review, Subdivision, or Partition application will be processed in conjunction with the Architectural Review, Subdivision, or Partition decision.

Response: The Tree Removal Permit is being processed in conjunction with the Subdivision application through a Type III review procedure as discussed above.

(4) *Specific Submittal Requirements.* In addition to the general submittal requirements in TDC 32.140 (Application Submittal), an applicant must submit the following:

(a) *Tree Preservation Plan.* A tree preservation plan drawn to scale must include:

(i) The location, size, species, and tag identification number of all trees on-site eight inches or more in diameter;

(ii) All trees proposed for removal and all trees proposed to be preserved;

(iii) All existing and proposed structures;

(iv) All existing and proposed public and private improvements; and

(v) All existing public and private easements.

(b) *Tree Assessment Report.* A tree assessment prepared by a certified arborist must include:

(i) An analysis as to whether trees proposed for preservation may be preserved in light of the development proposed, are healthy specimens, and do not pose an imminent hazard to persons or property if preserved;

(ii) An analysis as to whether any trees proposed for removal could reasonably be preserved in light of the development proposed and health of the tree;

(iii) a statement addressing the approval criteria set forth in TDC 33.110(5);

(iv) the name, contact information, and signature of the arborist preparing the report; and

(v) The tree assessment report must have been prepared and dated no more than one calendar year preceding the date the development or Tree Removal Permit application is deemed complete by the City.

(c) *Tree Tags.* All trees on-site must be physically identified and numbered in the field with an arborist-approved tagging system that corresponds to the Tree Preservation Plan and Tree Assessment Report.

Response: The above submittal requirements are included in the application. Please see the Tree Preservation and Removal Plans included with the Preliminary Tree Assessment Report and Tree Inventory (Exhibit G), and the approval criteria below.

(5) *Approval Criteria.*

(a) An applicant must satisfactorily demonstrate that at least one of the following criteria are met:

(i) The tree is diseased and:

(A) The disease threatens the structural integrity of the tree; or

(B) The disease permanently and severely diminishes the esthetic value of the tree; or

(C) The continued retention of the tree could result in other trees being infected with a disease that threatens either their structural integrity or esthetic value.

(ii) The tree represents a hazard which may include but not be limited to:

(A) The tree is in danger of falling; or

(B) Substantial portions of the tree are in danger of falling.

(iii) It is necessary to remove the tree to construct proposed improvements based on Architectural Review approval, building permit, or approval of a Subdivision or Partition Review.

(b) If none of the conditions in TDC 33.110(5)(a) are met, the certified arborist must evaluate the condition of each tree.

(i) *Evergreen Trees.* An evergreen tree which meets any of the following criteria as determined by a certified arborist will not be required to be retained:

(A) Trunk Condition—extensive decay and hollow; or

(B) Crown Development—unbalanced and lacking a full crown;

(ii) *Deciduous Trees.* A deciduous tree which meets any of the following criteria as determined by a certified arborist will not be required to be retained:

(A) Trunk Condition—extensive decay and hollow;

(B) Crown Development—unbalanced and lacking a full crown; or

(C) Structure—Two or more dead limbs.

Response: As illustrated in the Preliminary Tree Assessment Report and Tree Inventory (Exhibit G), tree removal is necessary to construct project improvements, infrastructure, and to accommodate future dwellings on the planned lots. Therefore criterion (5)(a)(iii) is met.

(6) *Emergencies.* If emergency conditions occur requiring the immediate cutting or removal of trees to avoid danger or hazard to persons or property, an emergency permit must be issued by the City Manager without payment of a fee and without formal application, provided the owner provides enough information to the City Manager to document that an emergency exists. If an emergency exists and the City Offices are closed, the emergency condition may be abated provided the person files information documenting the emergency and necessity of immediate removal of the tree as soon as practical after the City Offices reopen. An "emergency condition" for purposes of this section is when a tree presents an immediate danger of collapse, and represents a clear and present hazard to persons or property. For the purposes of this section, "immediate danger of collapse" means that the tree is already leaning, and there is a significant likelihood that the tree will topple or otherwise fail and cause damage before a tree cutting permit could be obtained through the nonemergency process. "Immediate danger of collapse" does not include hazardous conditions that can be alleviated by pruning or treatment. Examples of emergency conditions include:

(a) A tree leaning on a structure;

(b) A tree leaning on another tree and there is a significant likelihood that the tree will topple or otherwise fail; or

(c) If a utility service has been interrupted and repairs cannot be completed without the removal of a tree.

Response: Emergency conditions as described above are not anticipated. The above criteria do not apply with this application.

(7) *Conditions of Approval.* Any tree required to be retained must be protected in accordance with the TDC 73B and 73C.

Response: See the responses to TDC 73B.080 for additional tree preservation standards. TDC 73C relates to parking lot standards and landscaping and does not apply to this application.

…

CHAPTER 36 – SUBDIVIDING, PARTITIONS, AND PROPERTY LINE ADJUSTMENTS

…

TDC 36.040. - Applications and Submittal Requirements.

(1) Applications subject to this Chapter must follow the procedures specified in TDC Chapter 32; however, in case of conflict the procedures specified in TDC Chapter 36 prevail.

(2) Additional Submittal Requirements. In addition to the application materials required by TDC 32.140 (Application Submittal), the following application materials are also required to subdivide, partition, or replat land:

(a) Subdivision or partition plan map;

(b) Proposed plat name, approved by the County Surveyor;

(c) The names, addresses, and contact information of the design engineer and surveyor;

(d) The date the plan was prepared;

(e) North arrow;

(f) Scale of drawing;

(g) Location of the subdivision or partition by 1-4 Section, Township and Range;

(h) Preliminary utility plans for existing and proposed water, sanitary sewer and storm drainage, including the size and grade;

(i) Existing and proposed streets (public and private), including location, centerline, right-of-way and pavement width, approximate radius of curves and approximate grades of proposed streets on the subject property and within three hundred feet of the site;

(j) An outline plan demonstrating that the adjacent property can be divided in the future in a manner that is consistent with the subdivision plan, and illustrating the connections to transit routes, pedestrian and bike facilities, and accessways to adjacent properties;

(k) Easements, including location, width and purpose of all recorded and proposed easements in or abutting the site;

(l) Flood areas, including the location of any flood plain, drainage hazard areas and other areas subject to flooding or ponding;

(m) Natural resources, including the location of natural features, such as rock outcroppings, wetlands, water courses, creeks, wooded areas and trees having a trunk diameter of eight inches or greater, as measured at a point four feet above ground level, proposed to be removed and to be retained on site;

(n) Approximate lot dimensions, including all existing property lines and their lengths and the approximate location and dimensions of all proposed lots;

(o) Approximate area of each lot;

(p) Proposed lot numbers;

(q) Existing structures, including the location and present use of all structures, wells and septic tanks on the site and an indication of which structures, wells and septic tanks are to remain after platting; indicate all City-designated historic landmarks;

(r) All lots intended to be dedicated or reserved for public use;

(s) A vicinity map showing a minimum one-mile radius;

(t) Contour lines with intervals at a minimum of two feet for slopes up to five percent and five feet for slopes over five percent;

(u) For subdivisions and phased subdivisions, a completed trip generation estimate on forms provided by the City and a Traffic Impact Analysis;

(v) If a variance or minor variance is requested to the dimensional standards of the lots, or the minimum lot size, adequate information to show compliance with the approval criteria in TDC 33.120(5) for a minor variance or TDC 33.120(6) for a variance;

(w) A "Service Provider Letter" from Clean Water Services;

(x) If a railroad-highway grade crossing provides or will provide the only access to the subject property, the applicant must indicate that fact in the application, and the City must notify the ODOT Rail Division and the railroad company that the application has been received;

(y) A completed City fact sheet;

(z) A title report for the property(ies) subject to the application;

(aa) Other supplementary material as may be required, such as deed restrictions, a statement of ownership, use, covenants, conditions, limitations, and responsibility for maintenance; and

(bb) Other information required by the City Manager.

Response: The above additional Subdivision submittal materials are included in this application as applicable. Please also see TDC 32.140 for additional submittal requirements.

TDC 36.120. - Tentative Subdivision Plan.

(1) Applicability. Tentative Subdivision Plan approval is required before land is divided into four or more lots within a calendar year. For Phased Subdivisions, see TDC 36.130 (Phased Tentative Subdivision Plan). For Manufactured Dwelling Park Subdivisions, see TDC 36.140 (Manufactured Dwelling Park Tentative Subdivision Plan).

Response: This application includes a Tentative Subdivision Plan for a phased Subdivision. Therefore, the standards of this chapter and of TDC 36.130 below apply.

(2) Procedure Type. A Tentative Subdivision Plan is processed as a Type II procedure under 32.220.

Response: This phased Subdivision application is being elevated to the Type III review procedure and will be reviewed concurrently with the associated Conditional Use Permit application.

(3) Submittal Requirements.

(a) Prior to submitting an application for a Tentative Subdivision Plan, the applicant must comply with the pre-application conference requirements in TDC 32.110 (Pre-Application Conference) and Neighborhood/Developer Meeting requirements in TDC 32.120 (Neighborhood/Developer Meetings).

(b) In addition to the submittal requirements for a Type II application under TDC 32.140 (Application Submittal), an application for subdivision tentative plan must include the information required in TDC 36.040(2) (Additional Submittal Requirements).

Response: The Applicant has complied with the above submittal requirements, including a pre-application conference and neighborhood/developer meeting. In addition, the applicable application materials described under TDC 32.140 and TDC 36.040(2) and listed above have been provided.

(4) *Approval Criteria.* A Tentative Subdivision Plan must be approved if all of the following criteria are met:

(a) The Tentative Subdivision Plan complies with the standards of this Chapter and with all applicable provisions of the TDC, including, but not limited to, the following:

(i) Lot standards, including, but not limited to, standards for lot area, lot width and depth, lot frontage and designation of front and rear lot lines.

(ii) City infrastructure standards; and

(iii) Any special development standards, including, but not limited to, floodplain development, special setbacks, geological or geotechnical analysis, and vision clearance.

Response: Please see the responses to the applicable lot standard requirements in TDC 41.300, 41.330, and TDC 51.300, the infrastructure standards in Chapter 74 and Title 3 of the Municipal Code, and other applicable special development standards in this narrative. This criterion is met.

(b) The Tentative Subdivision Plan does not impede the future use or development of the property or adjacent land.

Response: As illustrated on the Preliminary Plans (Exhibit A), the planned Subdivision allows future development on the created lots with permitted or conditionally permitted uses on the site. This criterion is met.

(c) Development within the Tentative Subdivision Plan can be adequately served by City infrastructure.

Response: As illustrated on the Preliminary Plans (Exhibit A), the planned Subdivision will be adequately served by the expansion of City infrastructure onto and through the site. This criterion is met.

(d) The street system in and adjacent to the Tentative Subdivision Plan conforms to the Tualatin Transportation System Plan.

Response: As illustrated on the Preliminary Circulation Plan (in Exhibit A), the planned street improvements conform to the Tualatin Transportation System Plan (TSP). This criterion is met.

(e) The street system in and adjacent to the Tentative Subdivision Plan is designed so as to provide for the safe, orderly, and efficient circulation of traffic into, through, and out of the subdivision.

Response: As illustrated on the Preliminary Circulation Plan (in Exhibit A), the planned street system is designed to provide safe, orderly, and efficient circulation for vehicles, bicycles, and pedestrians throughout the site. This criterion is met.

(f) The Tentative Subdivision Plan provides safe and convenient bicycle and pedestrian access from within the subdivision to adjacent residential areas and transit stops, existing or planned schools, parks, shopping areas, transit stops, employment centers, and other neighborhood amenities.

Response: As illustrated on the Preliminary Circulation Plan (in Exhibit A), the planned street system is designed to provide safe and convenient bicycle and pedestrian access to adjacent streets and neighborhoods, including to the existing transit stop just south of the site on SW Boones Ferry Road. This criterion is met.

(g) **The Tentative Subdivision Plan mitigates impacts to the transportation system consistent with the approved Traffic Impact Analysis, where applicable.**

Response: The planned street improvements provide mitigation of impacts to the transportation system that will result from the future uses. Please see the Traffic Impact Analysis included as Exhibit H. This criterion is met.

(h) **The Tentative Subdivision Plan takes into account the topography and vegetation of the site so the need for variances is minimized to the greatest extent practicable.**

Response: The street and lot pattern take the existing topography and vegetation into consideration so that variances are not needed with this application. This criterion is met.

(i) **The Tentative Subdivision Plan takes into account the topography and vegetation of the site, such that the least disruption of the site, topography, and vegetation will result from the reasonable development of the lots.**

Response: The planned street and lot pattern take the existing topography and vegetation into consideration, allowing development of the site at the required density while utilizing the existing trees as a buffer along the northern property line of the site. The planned grading works with the existing topography and steps down toward the northeast corner of the site. Areas with steeper topography are designed to have lots with deck-living homes that sit on the slope. This criterion is met.

…

TDC 36.130. - Phased Tentative Subdivision Plan.

(1) ***Applicability.*** **Phased Tentative Subdivision Plan approval is required before land is divided as a phased subdivision. When the subdivision of land is phased, one tentative plan is approved for the entire phased subdivision, and each individual phase receives separate final plat approval.**

Response: This application includes a phased Subdivision. Each phase is planned to be submitted for separate final plat approval as described above. Please see the Preliminary Plat included in Exhibit A for details on the planned phasing.

(2) ***Procedure Type.*** **A Phased Tentative Subdivision Plan is processed as a Type II procedure under TDC 32.220 (Type II Procedure).**

Response: This phased Subdivision application is being elevated to the Type III review procedure and will be reviewed concurrently with the associated Conditional Use Permit application.

(3) ***Submittal Requirements.***

(a) **Prior to submitting an application for a Phased Tentative Subdivision Plan, the applicant must comply with the pre-application conference requirements in TDC 32.110 (Pre-Application Conference) and Neighborhood/Developer Meeting requirements in TDC 32.120 (Neighborhood/Developer Meetings).**

(b) In addition to the submittal requirements for a Type II application under TDC 32.140 (Application Submittal), an application for a Phased Tentative Subdivision Plan must include the information required in TDC 36.040(2) (Additional Submittal Requirements).

(c) An application for a Phased Tentative Subdivision Plan must also include:

(i) A phasing plan that indicates the tentative boundaries of each phase;

(ii) The sequencing of the phases;

(iii) The tentative configuration of lots in each phase; and

(iv) A plan for the construction of all required city infrastructure in each phase.

Response: The Applicant has complied with the above submittal requirements, including a pre-application conference and neighborhood/developer meeting. In addition, the applicable application materials described under TDC 32.140, TDC 36.040(2), and listed above have been provided.

(4) *Approval Criteria.* A Phased Tentative Subdivision Plan must be approved if all of the following criteria are met:

(a) The Phased Tentative Subdivision Plan meets all of the criteria for Tentative Subdivision Plan approval in TDC 36.110 (Tentative Subdivision);

Response: Please see the responses to TDC 36.120 above for the applicable Tentative Subdivision criteria. This criterion is met.

(b) Connectivity for streets and City utilities between each phase ensures the orderly and efficient construction of required public improvements among all phases;

Response: Please see the Preliminary Street Plans and Preliminary Composite Utility Plans in Exhibit A for details on the planned street and utility connections and how the planned phasing allows for orderly and efficient construction of public improvements. This criterion is met.

(c) Each phase is substantially and functionally self-contained and self-sustaining with regard to required public improvements; and

Response: Each phase of the Subdivision includes the necessary public improvements for a functioning neighborhood without reliance on future phases. Please see the Preliminary Street Plans and Preliminary Composite Utility Plans in Exhibit A for details on the planned street and utility improvements. This criterion is met.

(d) Each phase is designed in such a manner that all phases support the infrastructure requirements for the phased subdivision as a whole.

Response: As illustrated on the Preliminary Plans (Exhibit A), the planned phasing of improvements allows orderly development with each phase building on the previous phase and supporting the subdivision as a whole. This criterion is met.

…

TDC 36.310. - Approval of Streets and Rights of Way.

(1) The plat of a partition, subdivision, phased subdivision, manufactured dwelling park subdivision, or replat must provide for the dedication of all public rights-of-way,

reserve strips, easements, tracts and accessways, together with public improvements therein approved and accepted for public use.

(a) The applicant must comply with the requirements of TDC Chapter 74, Public Improvement Requirements.

(b) The applicant must comply with the design and construction standards set forth in the Public Works Construction Code.

(c) The applicant must provide evidence to the City that property intended to be dedicated to the public is free of all liens, encumbrances, claims and encroachments.

Response: This phased subdivision application includes the dedication of public rights-of-way, easements, and tracts, as well as the associated public improvements, as applicable. The public improvements are designed to comply with TDC Chapter 74, Public Improvement Requirements and the applicable standards of the Public Works Construction code. Copies of the property deeds are included in the application materials and indicate the property intended to be dedicated is free of liens, encumbrances, claims, and encroachments. The criteria are met.

(2) The plat of a partition, subdivision, phased subdivision, manufactured dwelling park subdivision, or replat must indicate the ownership and location of private easements and tracts, and the ownership and location of private improvements within public rights-of-way and easements.

Response: Information mentioned in this standard is planned to be shown on the final subdivision plats. This standard is met as applicable.

(3) Approval of the final plat of a partition, subdivision, phased subdivision, manufactured dwelling park subdivision, or replat by the City constitutes acceptance of all public rights-of-way, reserve strips, easements, tracts and accessways shown thereon, as well as public facilities located therein.

Response: This application is for preliminary plat approval. Dedication of public right-of-way and utility and street improvements are planned to be completed in conjunction with the final subdivision plat process. This standard is understood.

…

TDC 36.400. - Lot Dimensions.

(1) Double Frontage and Reverse Frontage.

(a) Double frontage and reversed frontage lots must be avoided except where essential to provide separation of residential development from railroad tracks or crossings, traffic arterials or collectors, adjacent nonresidential uses, or to overcome specific disadvantages of topography and orientation.

(b) Residences on double frontage lots must be oriented towards the lower classification street adjacent to the lot:

(i) Local street instead of collector or arterial; and

(ii) Collector street instead of arterial.

(c) If two local streets are adjacent to a series of adjacent double frontage lots, then residences on all such lots must be oriented towards the same local street.

Response: This application does not include double frontage or reversed frontage lots as described above. Planned open space tracts separate lots from SW Norwood Road on the north and the future Basalt Creek Parkway extension on the south. A large buffer of trees separates the eastern lots from the Interstate 5 improvements. The standards do not apply.

(2) *Large Lots.* When subdividing, partitioning or adjusting land into large lots which at some future time are possible to be resubdivided, repartitioned, or readjusted to a size which more closely conforms to the other lots in the subdivision or area, the applicant must submit a future streets plan. The future streets plan must indicate that proposed large lots be of such size and shape and contain such building site restrictions as will provide for the extension and opening of streets at such intervals and the subsequent division of any such large lot into smaller size lots which meet the requirements of the TDC.

Response: This application does not create large lot. This standard does not apply.

(3) *Side Lot Lines.* The side lines of lots, as far as practicable, must run at right angles to the street upon which the lots face.

Response: As much as possible, side lot lines are oriented at right angles to the front of the planned lots. Please see the Preliminary Plans (Exhibit A) for details. This standard is met.

(4) *Lot Size and Shape.* The lot size, width, shape and orientation must be appropriate for the location of the lot and comply with the zone (planning district) standards for the type of development and use contemplated.

Response: The size and dimensions of the planned lots are appropriate for the planned residential and commercial uses and comply with the standards of the applicable zones. See the responses to the standards in Chapters 41 and 51 below. This standard is met.

(5) *Frontage on Public Streets.* All lots created after September 1, 1979 must abut a public street, except for the following:

- (a) Secondary condominium lots, which must conform to TDC 73C and TDC 75;
- (b) Lots and tracts created to preserve wetlands, greenways, Natural Areas and Stormwater Quality Control Facilities identified by TDC Chapters 71, 72, and the Surface Water Management Ordinance, TMC Chapter 3-5 respectively, or for the purpose of preserving park lands in accordance with the Parks and Recreation Master Plan;
- (c) Residential lots where frontage along a public street is impractical due to physical site restraints. Access to lots must occur via a shared driveway within a tract. The tract must have no adverse impacts to surrounding properties or roads and may only be approved if it meets the following criteria:
  - (i) Does not exceed 250 feet in length;
  - (ii) If the tract exceeds 150 feet in length, it has a turnaround facility as approved by the Fire Marshal for fire and life safety;
  - (iii) The tract does not serve more than six lots;
  - (iv) A public street is not needed to provide access to other adjacent properties as required by TDC Chapter 74;
  - (v) A recorded document providing for the ownership, use rights, and allocation for liability for construction and maintenance has been submitted to the City Manager prior to issuance of a building permit; and

(vi) Access easements have been provided to all properties needing access to the driveway.

(d) Lots in the Manufacturing Park Zone Planning District which have access to the public right-of-way in accordance with TDC 73C and TDC Chapter 75 via permanent access easement over one or more adjoining properties, creating uninterrupted vehicle and pedestrian access between the subject lot and the public right-of-way.

Response: The planned lots abut public streets as required above. The above exceptions do not apply.

TDC 36.410. - Small Lot Subdivisions for RL and RML Zones.

(1) **Conditional Use Permit Required.**

(a) A conditional use permit is required before lots smaller than 6,500 square feet are permitted in RL and RML zones. An applicant must comply with the provisions of TDC 33.040 (Condition Use Permit).

(b) In addition to the submittal requirements for a Conditional Use Permit in TDC 33.040, a Tree Survey is required. The purpose of the tree survey is to show that, by utilizing the small lot subdivision provisions, a greater number of trees can be preserved than would be possible without use of the small lot subdivision provisions.

Response: Conditional Use Permit approval is required for lots smaller than 6,500 square feet in the RML zone. See the associated Conditional Use Permit application that has been concurrently submitted to the City for review. A tree survey is included in this application in accordance with the above requirement. (See the Preliminary Tree Assessment Report and Tree Inventory in Exhibit G.) The smaller lots allow the targeted density of 7-10 units per acre while preserving the existing trees adjacent to SW Norwood Road. The applicable criteria are met.

(2) *Small Lot Standards.* In addition to the general subdivision requirement in TDC 36.120, a subdivision that includes the small lots must also meet the following standards:

…

Response: This application includes a small lot subdivision in the RML Zone. However, as stated in TDC 41.330, the small lot subdivision standards of this subsection do not apply to small lot subdivisions in the Basalt Creek Area. Please see the responses to TDC 41.330 below for the applicable standards.

…

CHAPTER 41 – MEDIUM LOW DENSITY RESIDENTIAL ZONE (RML)

…

TDC 41.200. - Use Categories.

(1) *Use Categories.* Table 41-1 lists use categories Permitted Outright (P) or Conditionally Permitted (C) in the RML zone. Use categories may also be designated as Limited (L) and subject to the limitations listed in Table 41-1 and restrictions identified in TDC 41.210. Limitations may restrict the specific type of use, location, size, or other characteristics of the use category. Use categories which are not listed are prohibited within the zone, except for uses which are found by the City Manager or appointee to

be of a similar character and to meet the purpose of this zone, as provided in TDC 31.070.

(2) *Overlay Zones.* Additional uses may be allowed in a particular overlay zone. See the overlay zone Chapters for additional uses.

Response: As further described in Table 41-2, the planned townhouse (attached residential) use is a permitted use in the RML zone, while the planned single-family dwelling (detached) use is a conditionally permitted use. Overlay zones do not apply to the site. Please also see the associated Conditional Use Permit application that has been concurrently submitted to the City for review.

Excerpt of Table 41-1 Use Categories in the RML Zone		
USE CATEGORY	STATUS	LIMITATIONS AND CODE REFERENCES
RESIDENTIAL USE CATEGORIES		
Household Living	P/C	Permitted housing types subject to TDC 41.220.
Residential Accessory Uses	P (L)	Permitted uses limited to Family Child Care Home subject to ORS 329A.440.
Group Living	P/C (L)	Permitted uses limited to • Residential Facility; and, • Nursing Facility. Conditional uses limited to Congregate Care Facility subject to TDC 34.020 and TDC 34.030.

…

TDC 41.220. - Housing Types.

Table 41-2 lists Housing Types permitted in the RML zone. Housing types may be Permitted Outright (P), Conditionally Permitted (C), or Not Permitted (N) in the RML zone.

Table 41-2 Housing Types in the RML Zone		
HOUSING TYPE	STATUS	LIMITATIONS AND CODE REFERENCES
Single-Family Dwelling	C	• Limited to single-family dwellings in a small lot subdivision, with conditional use permit, subject to TDC 36.410. • Limited to single-family dwellings in a small lot subdivision, with conditional use permit, and if the development is located south of Norwood Road and east of Boones Ferry Road (Basalt Creek Area), subject to TDC 36.410(1) and TDC 41.330
Accessory Dwelling Unit	P	Subject to TDC 34.600.
Duplex Townhouse (or Rowhouse)	P	See TDC definition in 31.060.
Multi-Family Structure	P	See TDC definition in 31.060.
Manufacturing Dwelling	N	See TDC definition in 31.060.
Manufactured Dwelling Park	P	Limited to locations designated by the Tualatin Community Plan Map and subject to TDC 34.190.
Retirement Housing Facility	C	Subject to TDC 34.400.
Residential Home	P	See TDC definition in 31.060.

Response: The planned townhomes (attached units) are permitted in the RML zone, while the planned single-family dwellings (detached units) are limited to small lot subdivisions with a Conditional Use Permit. The site is also located within the Basalt Creek Area and therefore TDC 36.410(1) applies. Please see the responses to TDC 36.410 and TDC 41.330 for the other applicable standards. The standards are met.

TDC 41.300. - Development Standards.

Development standards in the RML zone are listed in Table 41-3. Additional standards may apply to some uses and situations, see TDC 41.310 and TDC 41.330. The standards in Table 41-3 may be modified for greenway and natural area dedications as provided in TDC 36.420. The standards for lot size, lot width, building coverage, and setbacks that apply to single-family dwellings in small lot subdivisions are provided in TDC 36.410(2)(b).

Table 41-3
Development Standards in the RML Zone

STANDARD	REQUIREMENT	LIMITATIONS AND CODE REFERENCES
MAXIMUM DENSITY		
Household Living Uses	Maximum: 10 units per acre Minimum: 7 units per acre	
Manufactured Dwelling Parks	12 units per acre	Limited to single-wide dwelling parks or any part of a single-wide dwelling park.
Retirement Housing Facility, or Congregate Care Facility	15 units per acre	
Nursing Facility	15 units per acre	
Group Living Uses	15 units per acre	
MINIMUM LOT SIZE		
Townhouse (or Rowhouse)	1,400 square feet	
Multi-Family Structure and Duplex		
• Development on Less than One Acre	10,000 square feet	For up to two units, plus an additional 4,195 square feet for each unit exceeding two.
• Development on More than One Acre	4,356 square feet per unit	
Multi-Family Structure under Condominium Ownership	20,000 square feet	Limited to the primary condominium lot.
All Other Permitted Uses	10,000 square feet	
Conditional Uses	20,000 square feet	
Infrastructure and Utilities Uses	—	As determined through the Subdivision, Partition, or Lot Line Adjustment process
MINIMUM AVERAGE LOT WIDTH		
Townhouse(or Rowhouse)	14 feet	
Multi-Family Structure	75 feet	May be 40 feet on a cul-de-sac street.
Multi-Family Structure under Condominium Ownership	100 feet	Limited to the primary condominium lot. Minimum lot width at street is 40 feet.
All Other Permitted Uses	75 feet	
Conditional Uses	100 feet	Minimum lot width at street is 40 feet.
Flag Lots	—	Must be sufficient to comply with minimum access requirements of TDC 73C.

Table 41-3 Development Standards in the RML Zone		
STANDARD	**REQUIREMENT**	**LIMITATIONS AND CODE REFERENCES**
MINIMUM SETBACKS		
Front Setback		Minimum setback to a garage door must be 20 feet.
• 1 story structure	20 feet	
• 1.5 story structure	25 feet	
• 2 story structure	30 feet	
• 2.5 story structure	35 feet	
• Townhouse (or Rowhouse)	0-20 feet	As determined through Architectural Review process.
Side and Rear Setback		Where living spaces face a side yard, the minimum setback must be ten feet
• 1 story structure	5 feet	
• 1.5 story structure	7 feet	
• 2 story structure	10 feet	
• 2.5 story structure	12 feet	
Corner Lots	—	On corner lots, the setback is the same as the front yard setback on any side facing a street other than an alley.
Minimum Distance Between Buildings within One Development	10 feet	For Townhouses, determined through the Architectural Review process
Parking and Vehicle Circulation Areas	10 feet	For Townhouses, determined through the Architectural Review process
Conditional Uses	—	As determined through Architectural Review process. No minimum setback must be greater than 50 feet
Any Yard Area Adjacent to Basalt Creek Parkway	50 feet	
MAXIMUM STRUCTURE HEIGHT		
All Uses	35 feet	May be increased to a maximum of 50 feet with a conditional use permit, if all setbacks are not less than 1½ times the height of the building.
MAXIMUM LOT COVERAGE		
Townhouse (or Rowhouse)	90%	
All Other Permitted Uses	40%	
Conditional Uses	45%	

Response: The above development standards apply to the planned townhomes (attached units). Please see the responses to TDC 41.330 for the applicable development standards for the detached single-family residential units. As illustrated on the Preliminary Plans (Exhibit A), the townhome lots meet the above density, lot size, and lot width standards. Setbacks, height, and lot coverage will be reviewed with the subsequent Architectural Review process. The applicable standards are met.

TDC 41.310. - Projections Into Required Yards.

The following architectural features may project into a required front or rear yard setback area not more than three feet, and into a required side yard not more than two feet: cornices, eaves, canopies, decks, sun-shades, gutters, chimneys, flues, belt courses, leaders, sills, pilasters, lintels, ornamental features, and other similar architectural features.

Response: Specific architectural features and projections into required yards for the specific lots will be reviewed with the subsequent Architectural Review applications. This standard does not apply with this application.

TDC 41.320. - Density Bonus or Setback Reduction for Developments Adjacent to Greenways and Natural Areas.

To preserve natural areas and habitat for fish and wildlife, the decision-making authority may provide a density bonus or setback reduction for developments that are adjacent to Greenways or Natural Areas that dedicate land for conservation or public recreational purposes, in accordance with the following standards:

Response: This application does not include greenways or natural areas as described above. Therefore, this section does not apply.

…

TDC 41.330. - Development Standards for Single-Family Dwellings in a Small Lot Subdivision for Certain Basalt Creek Area Properties.

This section applies only to small lot subdivisions, with a conditional use permit as provided in TDC 36.410(1), in RML zoned properties located south of Norwood Road and east of Boones Ferry Road (Basalt Creek Area). Development standards for Single-Family Dwellings in a small lot subdivision, with conditional use permit are listed in Table 41-4. Additional conditions may be placed on the small lot subdivision through the conditional use process. The small lot subdivision standards in TDC 36.410(2) do not apply to small lot subdivisions subject to this section.

Response: The subject site is located in the Basalt Creek Area as defined above and this application is for a Small Lot Subdivision. Therefore, the development standards in this section apply to the detached single-family lots. Please also see the separate Conditional Use Permit application submittal for the responses to the applicable Conditional Use criteria.

Table 41-4
Development Standards in the RML Zone subject to TDC 41.330

STANDARD	REQUIREMENT	LIMITATIONS AND CODE REFERENCES
MAXIMUM DENSITY		
Single-Family Dwelling	10 units per acre	• Limited subject to the requirement that a minimum of 20% of the dwelling units in the small lot subdivision must include attached housing types, as provided in TDC 41.300 and Table 41-3. • A phasing plan for the timing of construction will be approved through the small lot subdivision process, with conditional use permit, but provided no more than 70% of the approved Single-Family Dwellings may be issued Building Permits prior to the construction and issuance of Certificates of Occupancy for all approved attached housing types (i.e., non-single-family dwellings), or as otherwise determined through the conditional use process.

Table 41-4
Development Standards in the RML Zone subject to TDC 41.330

STANDARD	REQUIREMENT	LIMITATIONS AND CODE REFERENCES
Minimum Open Space		
	5% of gross site acreage	• Proposed open space shall be for tree preservation or active and passive open space, as approved through the conditional use process for small lot subdivisions. Stormwater and drainage facilities are not counted toward percentage of open space requirement. • Compliance with this section satisfied TDC 36.410(1)(b).
MINIMUM AVERAGE LOT SIZE		
Single Family Lot	3,000 square feet	
MINIMUM AVERAGE LOT WIDTH		
Single Family Detached Lot	26 feet	Must be sufficient to comply with minimum access requirements of TDC 73C.
Single Family Flag Lots		Must be sufficient to comply with minimum access requirements of TDC 73C.
MINIMUM SETBACKS		
Single Family Front Setback		
• building	10 feet	
• garage	20 feet	
Single Family Side Setback	5 feet	
Single Family Rear Setback	10 feet	
Single Family Street side setback	10 feet	
Any Yard Area Adjacent to Basalt Creek Parkway	50 feet	
MAXIMUM STRUCTURE HEIGHT		
Single Family Uses	35 feet	May be increased to a maximum of 50 feet with a conditional use permit, if all setbacks are not less than 1% times the height of the building.
MAXIMUM LOT COVERAGE		
Single Family Detached Lot	55%	

Response: As illustrated on the Preliminary Plans (Exhibit A), the above standards are met for the detached single-family lots. A phasing plan is included in this application (see TDC 36.130 and the discussion in the Executive Summary) that ensures a maximum of 70 percent of the single-family detached lots will be created before all the attached townhouse lots have been platted. Please see the Density Calculations on the Product Distribution Plan in Exhibit A for details on how the density, open space, and lot size standards are met. The Preliminary Setback Plans (in Exhibit A) demonstrate that future homes can meet the minimum setback requirements at the time of Architectural Review and Building Permit submittals. The planned setback to the future Basalt Creek Parkway is also illustrated on the Preliminary Setback Plans (in Exhibit A). Maximum height and maximum lot coverage will also be reviewed with future Architectural Review and Building Permit submittals. The applicable standards are met.

…

CHAPTER 51 – NEIGHBORHOOD COMMERCIAL ZONE (CN)

…

TDC 51.110. - District Location Standards.

(1) District Location. The boundaries of a CN District must be separated from all other CN, CC, and CG districts by at least 1,320 feet.

(2) Street Frontage. At least one-fourth of the total street frontage of the CN District area must be on an Arterial or Major Collector street.

Response: The above district location standards were reviewed with the Plan Map Amendment application (PMA 20-0002). This application does not alter the location of the CN District; therefore, this section does not apply.

TDC 51.200. - Use Categories.

(1) Use Categories. Table 51-1 lists use categories Permitted Outright (P) or Conditionally Permitted (C) in the CN zone. Use categories may also be designated as Limited (L) and subject to the limitations listed in Table 51-1 and restrictions identified in TDC 51.210. Limitations may restrict the specific type of use, location, size, or other characteristics of the use category. Use categories which are not listed are prohibited within the zone, except for uses which are found by the City Manager or appointee to be of a similar character and to meet the purpose of this zone, as provided in TDC 31.070.

(2) Overlay Zones. Additional uses may be allowed in a particular overlay zone. See the overlay zone Chapters for additional uses.

Table 51-1
Use Categories in the CN Zone

USE CATEGORY	STATUS	LIMITATIONS AND CODE REFERENCES
RESIDENTIAL USE CATEGORIES		
Household Living	P (L)	Permitted uses limited to one (1) dwelling unit for each business located on the lot.

Table 51-1
Use Categories in the CN Zone

USE CATEGORY	STATUS	LIMITATIONS AND CODE REFERENCES
COMMERCIAL USE CATEGORIES		
Retail Sales and Services	P (L)	Permitted uses limited to: General merchandise or variety stores; • Food stores, subject to TDC 51.210(1); • Drug store and pharmacy; • Laundry and dry cleaning, subject to TDC 51.210(2); • Beauty and barber shops; Shoe repair; and • Child day care center, subject to TDC 34.100. All commercial uses subject to floor area limitation, see TDC 51.210(3).
INSTITUTIONAL USE CATEGORIES		
Community Services	P(L)	Permitted uses limited to a community center, community recreation facility, or community aquatic center, when open to the general public and operated by a non-profit community organization.
INFRASTRUCTURE AND UTILITIES USE CATEGORIES		
Basic Utilities	P/C (L)	Permitted uses limited to sewer and water pump stations, pressure reading stations, water quality and flow control facilities. Conditional uses limited to utility substations.
Greenways and Natural Areas	P	—
Transportation Facilities	P	—

Response: This application includes the creation of two lots and one tract within the CN Zone. Future commercial development is planned for Lots 251 and 252; however, no uses or improvements to these two lots are included in this application. As illustrated on the Preliminary Plans (Exhibit A), a stormwater facility that serves the residential subdivision is planned for Tract K. The stormwater facility is considered a "Basic Utility" as described in Table 51-1 above and is a permitted use. The applicable use standards are met.

TDC 51.210. - Additional Limitations on Uses.

(1) Food Stores. Food stores must not exceed 4,000 square feet of gross floor area.

(2) Laundry and Dry Cleaning. Laundry and dry cleaning establishments must be exclusively for the cleaning of clothing and materials of the resident population and must not involve laundry or cleaning of commercial, industrial, or institutional clothing and materials.

(3) Commercial Floor Area Limit. A nonresidential occupant must not occupy more than 10,000 square feet of any building or combination of buildings within a single CN District area.

Response: The above limitations on uses do not apply to the stormwater facility use. Therefore, the above standards do not apply.

TDC 51.300. - Development Standards.

Development standards in the CN zone are listed in Table 51-2. Additional standards may apply to some uses and situations, see TDC 51.310.

Table 51-2 Development Standards in the CN Zone		
STANDARD	**REQUIREMENT**	**LIMITATIONS AND CODE REFERENCES**
MINIMUM LOT SIZE		
All Uses	20,000 square feet	—
MINIMUM LOT WIDTH		
Minimum Average Lot Width	100 feet	When lot has frontage on public street, minimum lot width is 100 feet.
Minimum Lot Width at the Building Line	100 feet	—
Infrastructure and Utilities Uses	—	As determined through the Subdivision, Partition, or Lot Line Adjustment process
MINIMUM SETBACKS		
Front	20 feet	
Side and Rear	0— 15 feet	As determined through Architectural Review Process.
Corner Lots	0—10 feet along each frontage	Must be a sufficient distance to provide adequate sight distance for vehicular and pedestrian traffic at an intersection, as determined through the Architectural Review process.
Parking and Vehicle Circulation Areas	5 feet	Except as approved through Architectural Review process.
Fences	5 feet	From public right-of-way.
MAXIMUM LOT COVERAGE		
All Uses	75 percent	Includes both building and parking areas. All land not covered by buildings or parking must be landscaped.
MAXIMUM STRUCTURE HEIGHT		
All Uses	25 feet	In addition to meeting the maximum height limit, where a property line or alley separates CN land from land in a residential district, a building must not be greater than 20 feet in height at the setback line; and a building or structure must not extend above a plane beginning at 20 feet in height above that setback line and extending inward and upward at a slope of 45 degrees.

Response: As illustrated on the Preliminary Plat in Exhibit A, Lot 251 and Lot 252 meet the above lot size and lot width requirements. Setbacks, lot coverage, and building height will be reviewed with subsequent land use applications. The applicable standards are met.

TDC 51.310. - Additional Development Standards.

(1) Building and Driveway Orientation. All commercial uses in CN District must be oriented and have primary driveway access to an Arterial or Major Collector street. No more than one driveway may access Minor Collector, Local Residential, or Cul-De-Sac street.

(2) Building Design. All commercial buildings must be of a general residential character, including the following design elements:

(a) Facade Design. All building facades must be of wood or brick and, if painted, must be in muted, earth tone colors.

(b) Roof Forms. All roofs must be compatible with the surrounding residential area as determined through the Architectural Review process.

(3) **Setback Reduction for Developments Adjacent to Greenways and Natural Areas. To preserve natural areas and habitat for fish and wildlife, the decision-making authority may provide a front yard setback reduction for developments that are adjacent to Greenways or Natural Areas that dedicate land for conservation or public recreational purposes, in accordance with the following standards.**

…

Response: Commercial uses or improvements are not included in this application and the site does not include greenways or natural areas; therefore, the above standards do not apply.

CHAPTER 73B - LANDSCAPING STANDARDS

…

TDC 73B.020. - Landscape Area Standards Minimum Areas by Use and Zone.

The following are the minimum areas required to be landscaped for each use and zone:

Zone	Minimum Area Requirement*	Minimum Area Requirement with dedication for a fish and wildlife habitat*
1. RL, RML, RMH, RH and RH/HR zones—Permitted Uses	None	None
2. RL, RML, RMH, RH and RH/HR zones—Conditional Uses, except Small Lot Subdivisions	25 percent of the total area to be developed	20 percent of the total area to be developed
3. CO, CR, CC, CG, ML and MG zones except within the Core Area Parking District—All uses	15 percent of the total area to be developed	12.5 percent of the total area to be developed
4. CO, CR, CC, CG, MUC, ML and MG zones within the Core Area Parking District—All uses	10 percent of the total area to be developed	7.5 percent of the total area to be developed
5. IN, CN, CO/MR, MC and MP zones—All uses	25 percent of the total area to be developed	22.5 percent of the total area to be developed
6. Industrial Business Park Overlay District and MBP—must be approved through Industrial Master Plans	20 percent of the total area to be developed	Not applicable
* For properties within the Hedges Creek Wetland Protection District which have signed the "Wetlands Mitigation Agreement," the improved or unimproved wetland buffer area may reduce the required landscaping to 12.5 percent as long as all other landscape requirements are met.		

Response: As stated in the table above, a minimum landscape area requirement does not apply within the RML zone for permitted uses or small lot subdivisions. However, open space landscaped areas are included in the project and the applicable landscape standards are met as described in the responses below.

…

TDC 73B.080. - Minimum Landscaping Standards for All Zones.

The following are minimum standards for landscaping for all zones.

(1) Required Landscape Areas	• Must be designed, constructed, installed, and maintained so that within three years the ground must be covered by living grass or other plant materials. • The foliage crown of trees cannot be used to meet this requirement. • A maximum of ten percent of the landscaped area may be covered with unvegetated areas of bark chips, rock or stone. • Must be installed in accordance with the provisions of the American National Standards Institute ANSI A300 (Part 1) (Latest Edition). • Must be controlled by pruning, trimming, or otherwise so that: • It will not interfere with designated pedestrian or vehicular access; and • It will not constitute a traffic hazard because of reduced visibility.
(2) Fences	• Landscape plans that include fences must integrate any fencing into the plan to guide wild animals toward animal crossings under, over, or around transportation corridors.
(3) Tree Preservation	• Trees and other plant materials to be retained must be identified on the landscape plan and grading plan. • During construction: o Must provide above and below ground protection for existing trees and plant materials identified to remain; o Trees and plant materials identified for preservation must be protected by chain link or other sturdy fencing placed around the tree at the drip line; o If it is necessary to fence within the drip line, such fencing must be specified by a qualified arborist; o Top soil storage and construction material storage must not be located within the drip line of trees designated to be preserved; o Where site conditions make necessary a grading, building, paving, trenching, boring, digging, or other similar encroachment upon a preserved tree's drip-line area, such grading, paving, trenching, boring, digging, or similar encroachment must only be permitted under the direction of a qualified arborist. Such direction must assure that the health needs of trees within the preserved area can be met; and o Tree root ends must not remain exposed. • Landscaping under preserved trees must be compatible with the retention and health of the preserved tree. • When it is necessary for a preserved tree to be removed in accordance with TDC 33.110 (Tree Removal Permit) the landscaped area surrounding the tree or trees must be maintained and replanted with trees that relate to the present landscape plan, or if there is no landscape plan, then trees that are complementary with existing, landscape materials. Native trees are encouraged • 100 percent of the area preserved under any tree or group of trees (Except for impervious surface areas) retained in the landscape plan must apply directly to the percentage of landscaping required for a development

(4) Grading	• After completion of site grading, top-soil is to be restored to exposed cut and fill areas to provide a suitable base for seeding and planting. • All planting areas must be graded to provide positive drainage. • Soil, water, plant materials, mulch, or other materials must not be allowed to wash across roadways or walkways. • Impervious surface drainage must be directed away from pedestrian walkways, dwelling units, buildings, outdoor private and shared areas and landscape areas except where the landscape area is a water quality facility.
(5) Irrigation	• Landscaped areas must be irrigated with an automatic underground or drip irrigation system • Exceptions: o Irrigation requirement does not apply to duplexes and townhouses.
(6) Re-vegetation in Un-landscaped Areas	• Vegetation must be replanted in all areas where vegetation has been removed or damaged in areas not affected by the landscaping requirements and that are not to be occupied by structures or other improvements. • Plant materials must be watered at intervals sufficient to ensure survival and growth for a minimum of two growing seasons. • The use of native plant materials is encouraged to reduce irrigation and maintenance demands. • Disturbed soils should be amended to an original or higher level of porosity to regain infiltration and stormwater storage capacity.

Response: The planned landscape areas, as illustrated on the Preliminary Plans (Exhibit A), are designed to meet the applicable landscaping standards above. Final details of the landscape areas will be provided with the construction plans for review and approval by the City prior to construction. The standards are met as applicable.

TDC 73B.090. - Minimum Standards Trees and Plants.

The following minimum standards apply to the types of landscaping required to be installed for all zones.

(1) Deciduous Shade Trees	• One and on-half inch caliper measured six inches above ground; • Balled and burlapped; bare root trees will be acceptable to plant during their dormant season; • Reach a mature height of 30 feet or more; • Cast moderate to dense shade in summer; • Live over 60 years; • Do well in urban environments, tolerant of pollution and heat, and resistant to drought; • Require little maintenance and mechanically strong; • Insect- and disease-resistant; • Require little pruning; and • Barren of fruit production.
(2) Deciduous Ornamental Trees	• One and on-half inch caliper measured six inches above ground;

	• balled and burlapped; bare root trees will be acceptable to plant during their dormant season; and • Healthy, disease-free, damage-free, well-branched stock, characteristic of the species
(3) Coniferous Trees	• Five feet in height above ground; • Balled and burlapped; bare root trees will be acceptable to plant during their dormant season; and • Healthy, disease-free, damage-free, well-branched stock, characteristic of the species.
(4) Evergreen and Deciduous Shrubs	• One to five gallon size; • Healthy, disease-free, damage-free, well-branched stock, characteristic of the species; and • Side of shrub with best foliage must be oriented to public view.
(5) Groundcovers	• Fully rooted; • Well branched or leafed; • Healthy, disease-free, damage-free, well-branched stock, characteristic of the species; and • English ivy (Hedera helix) is prohibited.
(6) Lawns	• Consist of grasses, including sod, or seeds of acceptable mix within the local landscape industry; • 100 percent coverage and weed free; and • Healthy, disease-free, damage-free, characteristic of the species.

Response: The planned landscape areas, as illustrated on the Preliminary Plans (Exhibit A), are designed to meet the above minimum tree and plant standards. Final details of the landscape areas will be provided with the construction plans for review and approval by the City prior to construction. The standards are met as applicable.

…

CHAPTER 73G – MASONRY WALL STANDARDS

…

TDC 73G.020. - Applicability.

(1) New Construction of Access-Restricted Lot Lines in the RL and RML Zones. A masonry wall is required to be installed for all properties in the RL and RML zones that meet either of the following:

(a) The property has access-restricted lot lines abutting the following streets for a distance greater than 60 feet:

(i) Major collectors;

(ii) Minor collectors;

(iii) Major arterials;

(iv) Minor arterials;

(v) Expressway right-of-way; or

(vi) Interstate highway.

(b) No existing masonry wall is located along an access restricted lot line and more than 50 percent of masonry walls are constructed along the abutting access restricted street to the nearest intersecting streets, or hypothetical extensions thereof on both sides of the subject property (See Figure 73-5 for illustration), meet the masonry wall standard, then any new masonry wall must be in conformance with the required design standards.

(2) Subdivisions and Partitions of Access-Restricted Lot Lines in the RL and RML Zones. A masonry wall is required to be installed for all subdivisions and partitions in the RL and RML zones that have access-restricted lot lines abutting the following streets for a distance greater than 60 feet:

(a) Major collectors;

(b) Minor collectors;

(c) Major arterials;

(d) Minor arterials,

(e) Expressway right-of-way; or

(f) Interstate highway.

Response: The subject site of this Subdivision application includes access-restricted lot lines in the RML Zone. As discussed below under (4)(e), the eastern property line adjacent to the Interstate 5 corridor is exempt from the masonry wall standard since there is more than a 200-foot vegetated buffer between the planned lots and the Interstate 5 highway improvements. The masonry wall standards do not apply along SW Boones Ferry Road because that portion of the site has CN zoning. Additionally, there are 60-foot open space tracts provided along the SW Norwood Street right-of-way for the purpose of tree preservation and a visual buffer. Therefore, the residential lots do not abut the SW Norwood Road right-of-way and the masonry wall standards do not apply. (Please note that fencing and landscaping is provided on the south side of the open space tracts. See the Preliminary Street Tree and Planting Plans included in Exhibit A for details.) Finally, while the future Basalt Creek Parkway will be access restricted, the right-of-way does not yet exist and will not be created with this application; therefore, the masonry wall standards do not apply along the southern SW Greenhill Road right-of-way. Therefore, the masonry wall standards are not applicable.

…

(4) Exceptions to Masonry Wall Location or Configuration. The following exceptions apply to the masonry wall location or configuration requirements:

(a) Where the City Manager determines that vehicular access is to be provided from the arterial/collector/expressway to a parcel or lot abutting the arterial/collector/expressway, the masonry wall is not required along the arterial/collector/expressway frontage of that particular parcel or lot.

(b) For public streets classified as an arterial/collector/expressway, where the City Manager determines that an opening or passage through the masonry wall must be provided, the masonry wall must include such required opening. The same must be provided in masonry walls along state-owned interstate highways when required by the state or Tualatin Valley Fire & Rescue or the City Manager.

(c) **All vision clearance requirements must be met.**

(d) **The City Manager, in the case of public streets classified as an arterial/collector/expressway, or the state in the case of state-owned interstate highways, may require an alternate location or configuration of the masonry wall alignment to accommodate stormwater facilities, easements, or other requirements, such as, but not limited to, bicycle paths, multi-use paths, or for maintenance purposes.**

(e) **For state-owned interstate highways, where an area of vegetation at least 200 linear feet in width runs parallel to the interstate highway and forms a visual, esthetic or acoustic barrier, or land in a Natural Resource Protection Overlay (NRPO) district or other protected area as defined in TDC Chapter 72 runs parallel to the interstate highway, and such land is located between the interstate highway property line and the developable area of a property being developed in the RL or RML Planning District, a masonry wall is not required. Where the area of vegetation is less than 200 linear feet in width, the required masonry wall must be located entirely outside the vegetated, NRPO or other protected area and as close as physically possible to, approximately parallel with, the edge of said vegetated, NRPO or other protected area on the developable portion of the property being developed.**

Response: As best illustrated on the Aerial Photo Site Map in Exhibit A, there is an existing vegetated buffer along the Interstate 5 corridor that is over 200 linear feet in width. This vegetated buffer runs along the entire eastern property line of the subject site. Therefore, a masonry wall is not required along the eastern perimeter of the site in accordance with (4)(e) above. In addition, vision clearance requirements are met adjacent to the planned fence south of SW Norwood Road.

…

CHAPTER 74 – PUBLIC IMPROVEMENT REQUIREMENTS

TDC 74.110. - Phasing of Improvements.

The applicant may build the development in phases. If the development is to be phased the applicant must submit a phasing plan to the City Manager for approval with the development application. The timing and extent or scope of public improvements and the conditions of development must be determined by the City Council on subdivision applications and by the City Manager on other development applications.

Response: As discussed above in the responses to TDC 36.130, this Subdivision application is planned in four phases. Public improvements are planned to follow this phasing plan as illustrated on the Preliminary Plans (Exhibit A). This standard is met.

TDC 74.120. - Public Improvements.

(1) **Except as specially provided, all public improvements must be installed at the expense of the applicant. All public improvements installed by the applicant must be constructed and guaranteed as to workmanship and material as required by the Public Works Construction Code prior to acceptance by the City. Work must not be undertaken on any public improvement until after the construction plans have been approved by the City Manager and a Public Works Permit issued and the required fees paid.**

Response: This standard is understood.

(2) **In accordance with the Tualatin Basin Program for fish and wildlife habitat the City intends to minimize or eliminate the negative impacts of public streets by modifying right-of-way widths and street improvements when appropriate. The City Manager is**

authorized to modify right-of-way widths and street improvements to address the negative impacts on fish and wildlife habitat.

Response: City staff have not indicated that the planned improvements along the project's public street frontages are planned to have a negative effect on fish and/or wildlife habitat. Therefore, no modification to right-of-way widths or improvements for fish and wildlife are included with this project. Please refer to the Preliminary Plans (Exhibit A) for additional information regarding right-of-way dedication and planned street improvements. This standard is met.

TDC 74.130. - Private Improvements.

All private improvements must be installed at the expense of the applicant. The property owner must retain maintenance responsibilities over all private improvements.

Response: This standard is understood.

TDC 74.140. - Construction Timing.

(1) All the public improvements required under this chapter must be completed and accepted by the City prior to the issuance of a Certificate of Occupancy; or, for subdivision and partition applications, in accordance with the requirements of the Subdivision regulations.

(2) All private improvements required under this Chapter must be approved by the City prior to the issuance of a Certificate of Occupancy; or for subdivision and partition applications, in accordance with the requirements of the Subdivision regulations.

Response: These standards are understood.

TDC 74.210. - Minimum Street Right-of-Way Widths.

The width of streets in feet must not be less than the width required to accommodate a street improvement needed to mitigate the impact of a proposed development. In cases where a street is required to be improved according to the standards of the TDC, the width of the right-of-way must not be less than the minimums indicated in TDC Chapter 74, Public Improvement Requirements, Figures 74-2A through 74-2G.

(1) For subdivision and partition applications, wherever existing or future streets adjacent to property proposed for development are of inadequate right-of-way width the additional right-of-way necessary to comply with TDC Chapter 74, Public Improvement Requirements, Figures 74-2A through 74-2G must be shown on the final subdivision or partition plat prior to approval of the plat by the City. This right-of-way dedication must be for the full width of the property abutting the roadway and, if required by the City Manager, additional dedications must be provided for slope and utility easements if deemed necessary.

Response: The City's TSP classifies SW Norwood Road as a Major Collector and SW Boones Ferry Road as a Major Arterial. Please see the Preliminary Street Plans in Exhibit A for details on the planned dedications and improvements along these existing rights-of-way in accordance with the applicable City standards. The future Basalt Creek Parkway is planned to run along a portion of the southern boundary of the site, as illustrated on the Preliminary Circulation Plan in Exhibit A. However, details on the design have not been determined and the portion of the future parkway abutting the site is anticipated to be constructed after 2040 (according to the Basalt Creek Concept Plan) and is not included in the City TSP. The standards are met.

…

(3) **For development applications that will impact existing streets not adjacent to the applicant's property, and to construct necessary street improvements to mitigate those impacts would require additional right-of-way, the applicant must be responsible for obtaining the necessary right-of-way from the property owner. A right-of-way dedication deed form must be obtained from the City Manager and upon completion returned to the City Manager for acceptance by the City. On subdivision and partition plats the right-of-way dedication must be accepted by the City prior to acceptance of the final plat by the City. On other development applications the right-of-way dedication must be accepted by the City prior to issuance of building permits. The City may elect to exercise eminent domain and condemn necessary off-site right-of-way at the applicant's request and expense. The City Council must determine when condemnation proceedings are to be used.**

Response: This application does not include off-site improvements that require additional right-of-way. The above standards do not apply.

(4) **If the City Manager deems that it is impractical to acquire the additional right-of-way as required in subsections (1)—(3) of this section from both sides of the center-line in equal amounts, the City Manager may require that the right-of-way be dedicated in a manner that would result in unequal dedication from each side of the road. This requirement will also apply to slope and utility easements as discussed in TDC 74.320 and 74.330. The City Manager's recommendation must be presented to the City Council in the preliminary plat approval for subdivisions and partitions, and in the recommended decision on all other development applications, prior to finalization of the right-of-way dedication requirements.**

Response: As illustrated on the Preliminary Plat and Preliminary Street Plans (in Exhibit A), the existing right-of-way widths vary in size and equal dedications on both sides of the streets are not feasible. The planned dedications and improvements allow the roadways to be built to the applicable City and County standards and are illustrated on the Preliminary Plans (Exhibit A) in accordance with the above standard. This standard is met.

(5) **Whenever a proposed development is bisected by an existing or future road or street that is of inadequate right-of-way width according to TDC Chapter 74, Public Improvement Requirements, Figures 74-2A through 74-2G, additional right-of-way must be dedicated from both sides or from one side only as determined by the City Manager to bring the road right-of-way in compliance with this section.**

Response: The project site is not bisected by an existing or future road with inadequate right-of-way width. Therefore, this standard does not apply.

(6) **When a proposed development is adjacent to or bisected by a street proposed in the Transportation System Plan and no street right-of-way exists at the time the development is proposed, the entire right-of-way as shown in TDC Chapter 74, Public Improvement Requirements, Figures 74-2A through 74-2G must be dedicated by the applicant. The dedication of right-of-way required in this subsection must be along the route of the road as determined by the City.**

Response: The project site is not bisected by an existing or future road with inadequate right-of-way width. The layout takes the general location of the future Basalt Creek Parkway into consideration, but the final right-of-way design and location have not been determined and dedication is not required with this application. Therefore, this standard does not apply.

…

TDC 74.310. - Greenway, Natural Area, Bike, and Pedestrian Path Dedications and Easements.

(1) **Areas dedicated to the City for Greenway or Natural Area purposes or easements or dedications for bike and pedestrian facilities during the development application process must be surveyed, staked and marked with a City approved boundary marker prior to acceptance by the City.**

(2) **For subdivision and partition applications, the Greenway, Natural Area, bike, and pedestrian path dedication and easement areas must be shown to be dedicated to the City on the final subdivision or partition plat prior to approval of the plat by the City; or**

(3) **For all other development applications, Greenway, Natural Area, bike, and pedestrian path dedications and easements must be submitted to the City Manager ; building permits must not be issued for the development prior to acceptance of the dedication or easement by the City.**

Response: Easements for public pedestrian access are included in this application and will meet the applicable standards above prior to approval of the plat or acceptance by the City.

TDC 74.320. - Slope Easements.

(1) **The applicant must obtain and convey to the City any slope easements determined by the City Manager to be necessary adjacent to the proposed development site to support the street improvements in the public right-of-way or accessway or utility improvements required to be constructed by the applicant.**

(2) **For subdivision and partition applications, the slope easement dedication area must be shown to be dedicated to the City on the final subdivision or partition plat prior to approval of the plat by the City; or**

(3) **For all other development applications, a slope easement dedication must be submitted to the City Manager; building permits must not be issued for the development prior to acceptance of the easement by the City.**

Response: Slope easements are not included in this application. The above standards do not apply.

TDC 74.330. - Utility Easements.

(1) **Utility easements for water, sanitary sewer and storm drainage facilities, telephone, television cable, gas, electric lines and other public utilities must be granted to the City.**

(2) **For subdivision and partition applications, the on-site public utility easement dedication area must be shown to be dedicated to the City on the final subdivision or partition plat prior to approval of the plat by the City; and**

(3) **For subdivision and partition applications which require off-site public utility easements to serve the proposed development, a utility easement must be granted to the City prior to approval of the final plat by the City. The City may elect to exercise eminent domain and condemn necessary off-site public utility easements at the applicant's request and expense. The City Council must determine when condemnation proceedings are to be used.**

(4) **For development applications other than subdivisions and partitions, and for both on-site and off-site easement areas, a utility easement must be granted to the City; building permits must not be issued for the development prior to acceptance of the easement by the City. The City may elect to exercise eminent domain and condemn necessary off-site public utility easements at the applicant's request and expense. The City Council must determine when condemnation proceedings are to be used.**

(5) **The width of the public utility easement must meet the requirements of the Public Works Construction Code. All subdivisions and partitions must have a 6-foot public**

utility easement adjacent to the street and a 5-foot public utility easement adjacent to all side and rear lot lines. Other easements may be required as determined by the City Manager.

Response: Utility easements are included in the application as illustrated on the Preliminary Plat and Preliminary Composite Utility Plans included in Exhibit A. Off-site public utility easements are not necessary. Public utility easements (PUEs) eight feet wide are provided along the public street frontages. The applicable requirements of the Public Works Construction Code can be met. The applicable standards are met.

…

TDC 74.350. - Maintenance Easement or Lots.

A dedicated lot or easement will be required when access to public improvements for operation and maintenance is required, as determined by the City Manager. Access for maintenance vehicles must be constructed of an all-weather driving surface capable of carrying a 50,000-pound vehicle. The width of the lot or easement must be at least 15-feet in order to accommodate City maintenance vehicles. In subdivisions and partitions, the easement or lot must be dedicated to the City on the final plat. In any other development, the easement or lot must be granted to the City and recorded prior to issuance of a building permit.

Response: The stormwater facilities are planned to be owned and maintained by the City; however because each facility abuts public right-of-way, maintenance or access easements are not needed to access the facilities. Access to the existing City water reservoirs will be provided at the west end of "C" Street (final street names have not been determined) via Tract B. Additionally, it is anticipated that Tract H will be acquired by the City to site an additional reservoir. Access will then be available to the water reservoir site from the north and the south. The standard is met as applicable.

TDC 74.410. - Future Street Extensions.

(1) Streets must be extended to the proposed development site boundary where necessary to do any one of the following:

- **(a) Give access to, or permit future development of adjoining land;**
- **(b) Provide additional access for emergency vehicles;**
- **(c) Provide for additional direct and convenient pedestrian, bicycle and vehicle circulation;**
- **(d) Eliminate the use of culs-de-sac except where topography, barriers such as railroads or freeways, existing development, or environmental constraints such as major streams and rivers prevent street extension; and**
- **(e) Eliminate circuitous routes. The resulting dead end streets may be approved without a turnaround. A reserve strip may be required to preserve the objectives of future street extensions.**

Response: As illustrated on the Preliminary Plans (Exhibit A) and in coordination with City and County staff, streets or private access points are extended to the site boundaries where connections are feasible and encouraged. One full street extension is planned to the Horizon School site just north of the existing water reservoirs. In addition, there is a private access tract (Tract L) provided off of "H" Street, ±315 feet east of SW Boones Ferry Road. This tract will be used as the primary access to the Community Partners for Affordable Housing property and secondary access for Horizon School. "M" Street extends to SW Greenhill Lane to allow for future connectivity to the remnant piece of land that will be created when the Basalt Creek Parkway extension is constructed. Connections to the east are not planned due to the existing Interstate-5 right-of-way. The standards are met.

(2) Proposed streets must comply with the general location, orientation and spacing identified in the Functional Classification Plan (Comprehensive Plan Map 8-1), Local Streets Plan (Comprehensive Plan Map 8-3) and the Street Design Standards (Figures 74-2A through 74-2G).

(a) Streets and major driveways, as defined in TDC 31.060, proposed as part of new residential or mixed residential/commercial developments must comply with the following standards:

(i) Full street connections with spacing of no more than 530 feet between connections, except where prevented by barriers;

(ii) Bicycle and pedestrian accessway easements where full street connections are not possible, with spacing of no more than 330 feet, except where prevented by barriers;

(iii) Limiting culs-de-sac and other closed-end street systems to situations where barriers prevent full street extensions; and

(iv) Allowing culs-de-sac and closed-end streets to be no longer than 200 feet or with more than 25 dwelling units, except for streets stubbed to future developable areas.

Response: The planned circulation network is consistent with the Functional Classification Plan and the Local Street Plan in the Comprehensive Plan. As illustrated on the Preliminary Street Plans included in Exhibit A, the majority of full street connections are spaced no more than 530 feet apart. Barriers to providing further street connections include access restricted roads such as Interstate 5 to the east, the future Basalt Creek Parkway to the south, SW Boones Ferry Road to the west, and SW Norwood Road to the north. In addition, two interior blocks exceed 530 feet on one block frontage due to the placement of the stormwater facility in the northeast area of the site and the neighborhood park in the southcentral area of the site.

The Horizon School has recently completed a master plan which is included on the Preliminary Circulation Plan in Exhibit A. In order to maintain security and flexibility for the school, full street connections are not desired at the southeastern corner of the school site. Two tracts for bicycle and pedestrian accessways have been reserved between the two sites to allow for future non-vehicular connectivity. Pedestrian accessways are also provided to the south to create a looped trail through the open space adjacent to SW Greenhill Lane. One cul-de-sac (that does not exceed the maximum 200-foot length) is included in the application and is necessary due to the location of the existing and future water reservoirs. The applicable standards are met.

(b) Streets proposed as part of new industrial or commercial development must comply with Comprehensive Plan Map 8-1 and Figures 74-2A through 74-2G.

Response: This application does not include streets that are part of industrial or commercial development; therefore, this standard does not apply.

(3) **During the development application process, the location, width, and grade of streets must be considered in relation to existing and planned streets, to topographical conditions, to public convenience and safety, and to the proposed use of the land to be served by the streets. The arrangement of streets in a subdivision must either:**

(a) **Provide for the continuation or appropriate projection of existing streets into surrounding areas; or**

(b) **Conform to a street plan approved or adopted by the City to meet a particular situation where topographical or other conditions make continuance of or conformance to existing streets impractical.**

Response: Existing and planned streets, topographical conditions, public convenience and safety, and the planned residential and commercial uses were considered in the process to determine the location, width, and grade of the planned streets. The layout of the streets provides for the future continuation of circulation beyond the site and conforms to the street plans adopted by the City in the TSP. The standards are met.

(4) **The City Manager may require the applicant to submit a street plan showing all existing, proposed, and future streets in the area of the proposed development.**

Response: The Product Distribution Plan in Exhibit A includes the planned layout for the future development of the adjacent Horizon School and the Community Partners for Affordable Housing sites as well as the location of the future Basalt Creek Parkway right-of-way. This standard is met as applicable.

(5) **The City Manager may require the applicant to participate in the funding of future off-site street extensions when the traffic impacts of the applicant's development warrant such a condition.**

Response: The traffic impacts of the planned Subdivision and the necessary mitigation are discussed in the Traffic Impact Analysis provided as Exhibit H. Funding of future off-street extensions are not included in the required mitigation. This standard does not apply.

TDC 74.420. - Street Improvements.

When an applicant proposes to develop land adjacent to an existing or proposed street, including land which has been excluded under TDC 74.220, the applicant should be responsible for the improvements to the adjacent existing or proposed street that will bring the improvement of the street into conformance with the Transportation Plan (TDC Chapter 11), TDC 74.425 (Street Design Standards), and the City's Public Works Construction Code, subject to the following provisions:

(1) **For any development proposed within the City, roadway facilities within the right-of-way described in TDC 74.210 must be improved to standards as set out in the Public Works Construction Code.**

Response: As shown on the Preliminary Plans (Exhibit A), planned improvements within the public rights-of-way have been designed and are planned to be constructed in accordance with the City's Public Works Construction Code. This standard is met.

(2) **The required improvements may include the rebuilding or the reconstruction of any existing facilities located within the right-of-way adjacent to the proposed development to bring the facilities into compliance with the Public Works Construction Code.**

Response: This project includes improvements to the existing frontages along SW Norwood Road and SW Boones Ferry Road. These existing roadways will be brought into compliance with the Public Works Construction Code. This standard is met.

(3) The required improvements may include the construction or rebuilding of off-site improvements which are identified to mitigate the impact of the development.

Response: Off-site improvements are not planned and have not been identified in the Traffic Impact Analysis or by City staff as being required for this project. This standard does not apply.

(4) Where development abuts an existing street, the improvement required must apply only to that portion of the street right-of-way located between the property line of the parcel proposed for development and the centerline of the right-of-way, plus any additional pavement beyond the centerline deemed necessary by the City Manager to ensure a smooth transition between a new improvement and the existing roadway (half-street improvement). Additional right-of-way and street improvements and off-site right-of-way and street improvements may be required by the City to mitigate the impact of the development. The new pavement must connect to the existing pavement at the ends of the section being improved by tapering in accordance with the Public Works Construction Code.

Response: As shown on the Preliminary Plans (Exhibit A), new improvements to the existing SW Norwood Road and SW Boones Ferry Road frontages are designed with transitions to the existing paved areas. The design of the frontage improvements includes tapering as needed in accordance with the Public Works Construction Code. This standard is met.

(5) If additional improvements are required as part of the Access Management Plan of the City, TDC Chapter 75, the improvements must be required in the same manner as the half-street improvement requirements.

Response: Additional street improvements beyond those planned for SW Norwood Road and SW Boones Ferry Road as shown on the Preliminary Plans (Exhibit A), have not been identified in the TIA, by City staff, or TDC Chapter 75. This standard does not apply.

(6) All required street improvements must include curbs, sidewalks with appropriate buffering, storm drainage, street lights, street signs, street trees, and, where designated, bikeways and transit facilities.

Response: As shown on the Preliminary Plans (Exhibit A), planned street improvements have been designed and are planned to be constructed consistent with the applicable minimum cross sections, as shown in the City's TSP and Figures 74-2A through 74-2G of the City's TDC. The improvements include the applicable features and facilities listed in this standard. This standard is met.

(7) For subdivision and partition applications, the street improvements required by TDC Chapter 74 must be completed and accepted by the City prior to signing the final subdivision or partition plat, or prior to releasing the security provided by the applicant to assure completion of such improvements or as otherwise specified in the development application approval.

Response: This standard is understood.

(8) For development applications other than subdivisions and partitions, all street improvements required by this section must be completed and accepted by the City prior to the issuance of a Certificate of Occupancy.

Response: This application involves a subdivision. Therefore, this standard does not apply.

(9) **In addition to land adjacent to an existing or proposed street, the requirements of this section must apply to land separated from such a street only by a railroad right-of-way.**

Response: This project does not include land separated from a street by a railroad right-of-way. This standard does not apply.

(10) **Streets within, or partially within, a proposed development site must be graded for the entire right-of-way width and constructed and surfaced in accordance with the Public Works Construction Code.**

Response: As illustrated on the Preliminary Plans (Exhibit A), the planned streets are designed to be graded for the entire right-of-way width and constructed and surfaced in accordance with the Public Works Construction Code. This standard is met.

(11) **Existing streets which abut the proposed development site must be graded, constructed, reconstructed, surfaced or repaired as necessary in accordance with the Public Works Construction Code and TDC Chapter 11, Transportation Plan, and TDC 74.425 (Street Design Standards).**

Response: As shown on the Preliminary Plans (Exhibit A), and as discussed previously, improvements to SW Norwood Road and SW Boones Ferry Road have been designed in accordance with the City's Public Works Construction Code, the TSP, and TDC 74.425 (Street Design Standards). This standard is met.

(12) **Sidewalks with appropriate buffering must be constructed along both sides of each internal street and at a minimum along the development side of each external street in accordance with the Public Works Construction Code.**

Response: As shown on the Preliminary Plans (Exhibit A), sidewalks are planned to be constructed along both sides of the internal streets and along the project's frontages on SW Norwood Road and SW Boones Ferry Road in accordance with the City's Public Works Construction Code. This standard is met.

(13) **The applicant must comply with the requirements of the Oregon Department of Transportation (ODOT), Tri-Met, Washington County and Clackamas County when a proposed development site is adjacent to a roadway under any of their jurisdictions, in addition to the requirements of this chapter.**

Response: The project site has frontage on existing roadways under City of Tualatin (SW Norwood Road), Washington County (SW Boones Ferry Road), and ODOT (Interstate 5) jurisdiction. The planned improvements have been coordinated with the City and County. Alterations and access to the ODOT right-of-way are not included in this application. This standard is met as applicable.

(14) **The applicant must construct any required street improvements adjacent to parcels excluded from development, as set forth in TDC 74.220 of this chapter.**

Response: This project does not include parcels excluded from development as described in TDC 74.220. This standard does not apply.

(15) **Except as provided in TDC 74.430, whenever an applicant proposes to develop land with frontage on certain arterial streets and, due to the access management provisions of TDC Chapter 75, is not allowed direct access onto the arterial, but instead must take access from another existing or future public street thereby providing an alternate to direct arterial access, the applicant must be required to construct and place at a minimum street signage, a sidewalk, street trees and street lights along that portion of**

the arterial street adjacent to the applicant's property. The three certain arterial streets are S.W. Tualatin-Sherwood Road, S.W. Pacific Highway (99W) and S.W. 124th Avenue. In addition, the applicant may be required to construct and place on the arterial at the intersection of the arterial and an existing or future public non-arterial street warranted traffic control devices (in accordance with the Manual on Uniform Traffic Control Devices, latest edition), pavement markings, street tapers and turning lanes, in accordance with the Public Works Construction Code.

Response: The planned access to SW Boones Ferry Road and the associated frontage improvements have been coordinated with Washington County Land Use & Transportation and City staff and are designed in accordance with the Public Works Construction Code. This standard is met.

(16) The City Manager may determine that, although concurrent construction and placement of the improvements in (14) and (15) of this section, either individually or collectively, are impractical at the time of development, the improvements will be necessary at some future date. In such a case, the applicant must sign a written agreement guaranteeing future performance by the applicant and any successors in interest of the property being developed. The agreement must be subject to the City's approval.

Response: This project does not include delayed improvements as described above. This standard does not apply.

(17) Intersections should be improved to operate at a level of service of at least D and E for signalized and unsignalized intersections, respectively.

Response: As demonstrated in the Traffic Impact Analysis (Exhibit H), intersections adjacent to the site as described in TDC 74.420 above will be improved to operate at a Level of Service of D or better. This standard is met.

(18) Pursuant to requirements for off-site improvements as conditions of development approval, proposed multi-family residential, commercial, or institutional uses that are adjacent to a major transit stop will be required to comply with the City's Mid-Block Crossing Policy.

Response: This project does not include multi-family residential, commercial, or institutional uses. The transit stop along SW Boones Ferry Road is not considered a major transit stop as defined under TDC 31.060. Therefore, this standard does not apply.

TDC 74.425. - Street Design Standards.

(1) Street design standards are based on the functional and operational characteristics of streets such as travel volume, capacity, operating speed, and safety. They are necessary to ensure that the system of streets, as it develops, will be capable of safely and efficiently serving the traveling public while also accommodating the orderly development of adjacent lands.

(2) The proposed street design standards are shown in Figures 72A through 72G. The typical roadway cross sections comprise the following elements: right-of-way, number of travel lanes, bicycle and pedestrian facilities, and other amenities such as landscape strips. These figures are intended for planning purposes for new road construction, as well as for those locations where it is physically and economically feasible to improve existing streets.

(3) In accordance with the Tualatin Basin Program for fish and wildlife habitat it is the intent of Figures 74-2A through 74-2G to allow for modifications to the standards when deemed appropriate by the City Manager to address fish and wildlife habitat.

(4) All streets must be designed and constructed according to the preferred standard. The City Manager may reduce the requirements of the preferred standard based on specific site conditions, but in no event will the requirement be less than the minimum standard. The City Manager must take into consideration the following factors when deciding whether the site conditions warrant a reduction of the preferred standard:

(a) Arterials:

(i) Whether adequate right-of-way exists;

(ii) Impacts to properties adjacent to right-of-way;

(iii) Current and future vehicle traffic at the location; and

(iv) Amount of heavy vehicles (buses and trucks).

(b) Collectors:

(i) Whether adequate right-of-way exists;

(ii) Impacts to properties adjacent to right-of-way;

(iii) Amount of heavy vehicles (buses and trucks); and

(iv) Proximity to property zoned manufacturing or industrial.

(c) Local Streets:

(i) Local streets proposed within areas which have environmental constraints and/or sensitive areas and will not have direct residential access may utilize the minimum design standard.

(ii) When the minimum design standard is allowed, the City Manager may determine that no parking signs are required on one or both sides of the street.

Response: As shown on the Preliminary Plans (Exhibit A), public street improvements have been designed and are planned to be constructed consistent with the preferred cross-section or greater. Reductions to the street standards are not included in the planned designs. The applicable standards are met.

…

TDC 74.440. - Streets, Traffic Study Required.

(1) The City Manager may require a traffic study to be provided by the applicant and furnished to the City as part of the development approval process as provided by this Code, when the City Manager determines that such a study is necessary in connection with a proposed development project in order to:

(a) Assure that the existing or proposed transportation facilities in the vicinity of the proposed development are capable of accommodating the amount of traffic that is expected to be generated by the proposed development; and/or

(b) Assure that the internal traffic circulation of the proposed development will not result in conflicts between on-site parking movements and/or on-site loading movements and/or on-site traffic movements, or impact traffic on the adjacent streets.

(2) The required traffic study must be completed prior to the approval of the development application.

(3) The traffic study must include, at a minimum:

(a) An analysis of the existing situation, including the level of service on adjacent and impacted facilities.

(b) An analysis of any existing safety deficiencies.

(c) Proposed trip generation and distribution for the proposed development.

(d) Projected levels of service on adjacent and impacted facilities.

(e) Recommendation of necessary improvements to ensure an acceptable level of service for roadways and a level of service of at least D and E for signalized and unsignalized intersections respectively, after the future traffic impacts are considered.

(f) The City Manager will determine which facilities are impacted and need to be included in the study.

(g) The study must be conducted by a registered engineer.

(4) The applicant must implement all or a portion of the improvements called for in the traffic study as determined by the City Manager.

Response: A Traffic Impact Analysis analyzing the existing and planned transportation facilities is included as Exhibit H. The Traffic Impact Analysis includes the elements as outlined under (3) above and recommends improvements that have been incorporated into the Preliminary Plans (Exhibit A). The applicable standards are met.

TDC 74.450. - Bikeways and Pedestrian Paths.

(1) Where proposed development abuts or contains an existing or proposed bikeway, pedestrian path, or multi-use path, as set forth in TDC Chapter 11, Transportation Figure 11-4, the City may require that a bikeway, pedestrian path, or multi-use path be constructed, and an easement or dedication provided to the City.

(2) Where required, bikeways and pedestrian paths must be provided as follows:

(a) Bike and pedestrian paths must be constructed and surfaced in accordance with the Public Works Construction Code.

(b) The applicant must install the striping and signing of the bike lanes and shared roadway facilities, where designated.

Response: Bicycle facilities are identified on the City TSP along SW Norwood Road and SW Boones Ferry Road. As illustrated on the Preliminary Street Plans in Exhibit A, frontage improvements along SW Norwood Road include a 12-foot multi-use path and a future bicycle lane; and the frontage improvements along SW Boones Ferry Road include a bicycle lane. These facilities will be constructed and designed in accordance with the applicable City standards. The standards are met.

TDC 74.460. - Accessways in Residential, Commercial and Industrial Subdivisions and Partitions.

(1) Accessways must be constructed by the applicant, dedicated to the City on the final residential, commercial or industrial subdivision or partition plat, and accepted by the City.

Response: Accessways are planned within the project boundary as illustrated on the Preliminary Plans (Exhibit A). The accessways will be constructed by the Applicant and dedicated to the City. The standard is met.

(2) Accessways must be located between the proposed subdivision or partition and all of the following locations that apply:

(a) Adjoining publicly-owned land intended for public use, including schools and parks. Where a bridge or culvert would be necessary to span a designated

greenway or wetland to provide a connection, the City may limit the number and location of accessways to reduce the impact on the greenway or wetland;

Response: Publicly-owned land is not located adjacent to the project site; therefore, this standard does not apply.

(b) Adjoining arterial or collector streets upon which transit stops or bike lanes are provided or designated;

Response: SW Boones Ferry Road is designed with bike lanes and has an existing transit stop just south of SW Greenhill Lane. However, this project includes full roadway connections to SW Boones Ferry Road and to SW Greenhill Lane; therefore, accessways are not needed. This standard does not apply.

(c) Adjoining undeveloped residential, commercial or industrial properties;

Response: The SW Greenhill Lane intersection with SW Boones Ferry Road will ultimately be closed when Basalt Creek Parkway is extended south of the site. Therefore, access to the adjoining undeveloped properties to the south will be provided via "M" Street. Because a full street connection is provided, accessways are not needed. This standard does not apply.

(d) Adjoining developed sites where an accessway is planned or provided.

Response: Horizon School has a master plan for future development of their site. In addition to a street stub and shared access, two tracts for future pedestrian accessways are provided from the Autumn Sunrise boundary to the school site. This standard is met.

(3) In designing residential, commercial and industrial subdivisions and partitions, the applicant is expected to design and locate accessways in a manner which does not restrict or inhibit opportunities for developers of adjacent property to connect with an accessway. The applicant is to have reasonable flexibility to locate the required accessways. When developing a parcel which adjoins parcels where accessways have been constructed or approved for construction, the applicant must connect at the same points to provide system continuity and enhance opportunities for pedestrians and bicyclists to use the completed accessway.

Response: As discussed above, two tracts for future pedestrian accessways are provided from the Autumn Sunrise boundary to the Horizon School site. Existing accessways are not stubbed to the subject site. This standard is met as applicable.

(4) Accessways must be as short as possible, but in no case more than 600 feet in length.

Response: As illustrated on the Preliminary Plans (Exhibit A), the planned accessways are approximately 100 feet long. This standard is met.

(5) Accessways must be as straight as possible to provide visibility from one end to the other.

Response: As illustrated on the Preliminary Plans (Exhibit A), the planned accessways are straight and visibility is provided from one end to the other. This standard is met.

(6) Accessways must be located and improved within a right-of-way or tract of no less than eight feet.

Response: As illustrated on the Preliminary Plans (Exhibit A), the planned accessways are located in 15-foot-wide tracts. This standard is met.

(7) **Where possible, accessways must be combined with utility easements.**

Response: As illustrated on the Preliminary Composite Utility Plans included in Exhibit A, utilities are provided within planned rights-of-way and easements within the planned accessways are not needed. This standard does not apply.

(8) **Accessways must be constructed in accordance with the Public Works Construction Code.**

Response: The planned accessways are designed and will be constructed in accordance with the Public Works Construction Code. This standard is met.

(9) **Curb ramps must be provided wherever the accessway crosses a curb and must be constructed in accordance with the Public Works Construction Code.**

Response: Curb ramps are provided at the intersections of the accessways and sidewalk crossings in accordance with the standards of the Public Works Construction Code. This standard is met.

(10) **The Federal Americans With Disabilities Act (ADA) applies to development in the City of Tualatin. Accessways must comply with the Oregon Structural Specialty Code's (OSSC) accessibility standards.**

Response: The planned accessways are designed and will be constructed in accordance with the applicable ADA and OSSC accessibility standards. This standard is met.

(11) **Fences and gates which prevent pedestrian and bike access must not be allowed at the entrance to or exit from any accessway.**

Response: As illustrated on the Preliminary Plans (Exhibit A), fences and gates are not planned at the entrances or exits of accessways. This standard is met.

(12) **Final design and location of accessways must be approved by the City.**

Response: The final design and location of the accessways will be reviewed and approved by the City with the construction drawings. This standard can be met.

(13) **Outdoor Recreation Access Routes must be provided between a subdivision or partition and parks, bikeways and greenways where a bike or pedestrian path is designated.**

Response: An Outdoor Recreation Access Route, as defined under TDC 31.060, is a pedestrian path that provides access to a recreation trail. Designated trails are not located adjacent to the site. This standard does not apply.

TDC 74.470. - Street Lights.

(1) **Street light poles and luminaries must be installed in accordance with the Public Works Construction Code.**

(2) **The applicant must submit a street lighting plan for all interior and exterior streets on the proposed development site prior to issuance of a Public Works Permit.**

Response: Please see the Preliminary Street Lighting Plans in Exhibit A for details on the planned street light fixtures for the applicable streets. Final street lighting plans will be reviewed with the construction drawings. The standards are met as applicable.

TDC 74.475. - Street Names.

(1) A street name must not be used which will duplicate or be confused with the names of existing streets in the Counties of Washington or Clackamas, except for extensions of existing streets. Street names and numbers must conform to the established pattern in the surrounding area.

(2) The City Manager must maintain the approved list of street names from which the applicant may choose. Prior to the creation of any street, the street name must be approved by the City Manager.

Response: As illustrated on the Preliminary Plans (Exhibit A), placeholder names are being used. Final street names will be determined in coordination with the City Engineer prior to construction plan approval. The future street names can meet the applicable standards as described above.

TDC 74.480. - Street Signs.

(1) Street name signs must be installed at all street intersections in accordance with standards adopted by the City.

(2) Stop signs and other traffic control signs (speed limit, dead-end, etc.) may be required by the City.

(3) Prior to approval of the final subdivision or partition plat, the applicant must pay the City a non-refundable fee equal to the cost of the purchase and installation of street signs, traffic control signs and street name signs. The location, placement, and cost of the signs must be determined by the City.

Response: Street name signs, stop signs, and other traffic control signs are planned to be installed in accordance with City standards and the applicable fees will be paid. The standards can be met.

TDC 74.485. - Street Trees.

(1) Prior to approval of a residential subdivision or partition final plat, the applicant must pay the City a non-refundable fee equal to the cost of the purchase and installation of street trees. The location, placement, and cost of the trees must be determined by the City. This sum must be calculated on the interior and exterior streets as indicated on the final subdivision or partition plat.

(2) In nonresidential subdivisions and partitions street trees must be planted by the owners of the individual lots as development occurs.

(3) The Street Tree Ordinance specifies the species of tree which is to be planted and the spacing between trees.

Response: The Preliminary Street Tree and Planting Plans included in Exhibit A illustrates the planned street tree species and spacing. Appropriate funding for street trees in accordance with this section is planned to be paid by the Applicant based on the City's determination. The applicable standards are met.

TDC 74.610. - Water Service.

(1) Water lines must be installed to serve each property in accordance with the Public Works Construction Code. Water line construction plans must be submitted to the City Manager for review and approval prior to construction.

(2) If there are undeveloped properties adjacent to the subject site, public water lines must be extended by the applicant to the common boundary line of these properties. The lines must be sized to provide service to future development, in accordance with the City's Water System Master Plan, TDC Chapter 12.

(3) As set forth is TDC Chapter 12, Water Service, the City has three water service levels. All development applicants must be required to connect the proposed development site to the service level in which the development site is located. If the development site is located on a boundary line between two service levels the applicant must be required to connect to the service level with the higher reservoir elevation. The applicant may also be required to install or provide pressure reducing valves to supply appropriate water pressure to the properties in the proposed development site.

Response: As shown on the Preliminary Composite Utility Plans in Exhibit A, water lines are planned to be extended throughout the public rights-of-way and individual water laterals extended to each of the planned lots. A public water line is extended to the southern boundary of the site at SW "M" Street to provide service to future development. The water system has been designed as appropriate for the applicable "Pressure Zone C" City standards. The standards are met.

TDC 74.620. - Sanitary Sewer Service.

(1) Sanitary sewer lines must be installed to serve each property in accordance with the Public Works Construction Code. Sanitary sewer construction plans and calculations must be submitted to the City Manager for review and approval prior to construction.

(2) If there are undeveloped properties adjacent to the proposed development site which can be served by the gravity sewer system on the proposed development site, the applicant must extend public sanitary sewer lines to the common boundary line with these properties. The lines must be sized to convey flows to include all future development from all up stream areas that can be expected to drain through the lines on the site, in accordance with the City's Sanitary Sewer System Master Plan, TDC Chapter 13.

Response: As shown on the Preliminary Composite Utility Plans in Exhibit A, individual sanitary sewer lines are planned to serve each property in accordance with the Public Works Construction Code. A public sanitary sewer line is extended to the southern boundary of the site at SW "M" Street to provide service to future development. The standards are met.

TDC 74.630. - Storm Drainage System.

(1) Storm drainage lines must be installed to serve each property in accordance with City standards and Clean Water Services standards. Storm drainage construction plans and calculations must be submitted to the City Manager for review and approval prior to construction.

(2) The storm drainage calculations must confirm that adequate capacity exists to serve the site. The discharge from the development must be analyzed in accordance with the City's Storm and Surface Water Regulations and Clean Water Services standards.

(3) If there are undeveloped properties adjacent to the proposed development site which can be served by the storm drainage system on the proposed development site, the

applicant must extend storm drainage lines to the common boundary line with these properties. The lines must be sized to convey expected flows to include all future development from all up stream areas that will drain through the lines on the site, in accordance with the adopted Stormwater Master Plan.

Response: As illustrated on the Preliminary Composite Utility Plans in Exhibit A, storm drainage lines are planned within the rights-of-way to serve each lot. Please also see the Preliminary Stormwater Report (Exhibit I) for details on the planned storm drainage system and the applicable calculations. A public storm drainage line is extended to the southern boundary of the site at SW "M" Street to provide service to future development. The standards are met.

TDC 74.640. - Grading.

(1) Development sites must be graded to minimize the impact of storm water runoff onto adjacent properties and to allow adjacent properties to drain as they did before the new development.

(2) A development applicant must submit a grading plan showing that all lots in all portions of the development will be served by gravity drainage from the building crawl spaces; and that this development will not affect the drainage on adjacent properties. The City Manager may require the applicant to remove all excess material from the development site.

Response: The Preliminary Grading and ESC Plans in Exhibit A and the Preliminary Stormwater Report (Exhibit I) demonstrate that project grading will not cause stormwater runoff to be conveyed to adjoining properties nor affect existing drainage patterns of adjoining properties. The standards are met.

TDC 74.650. - Water Quality, Storm Water Detention and Erosion Control.

(1) All Applications. The applicant must comply with the water quality, stormwater detention, and erosion control requirements in Tualatin Municipal Code Chapter 3-5 (Soil Erosion, Surface Water Management, Water Quality Facilities, and Building and Sewers) and Clean Water Services standards.

(2) Subdivisions and Partitions. Prior to approval of the final plat, an application for subdivision and partition development must:

  (a) Submit a stormwater facilities design with calculations to satisfy the requirements of the Tualatin Municipal Code Chapter 3-5 (Soil Erosion, Surface Water Management, Water Quality Facilities, and Building And Sewers) and applicable Clean Water Services standards;

  (b) Obtain a Stormwater Connection Permit from Clean Water Services; and

  (c) Either construct a permanent on-site water quality facility and stormwater detention facility; or enter into an agreement with the City, as provided in TDC 36.320 and TMC 3-5-390, recorded against the property, to guarantee construction of a permanent on-site water quality facility and stormwater detention facility.

…

Response: Water quality, stormwater detention, and erosion control are shown on the Preliminary Plans (Exhibit A) and addressed in the Preliminary Stormwater Report (Exhibit I) in accordance with applicable City and Clean Water Services standards. Final construction plans and a Final Stormwater Report are planned to be submitted to the City for review and approval prior to site disturbance. Please also see the responses to the applicable

Tualatin Municipal Code chapters below under TMC Chapters 3 through 5. The applicable standards are met.

TDC 74.660. - Underground.

(1) All utility lines including, but not limited to, those required for gas, electric, communication, lighting and cable television services and related facilities must be placed underground. Surface-mounted transformers, surface-mounted connection boxes and meter cabinets may be placed above ground. Temporary utility service facilities, high capacity electric and communication feeder lines, and utility transmission lines operating at 50,000 volts or above may be placed above ground. The applicant must make all necessary arrangements with all utility companies to provide the underground services. The City reserves the right to approve the location of all surface-mounted transformers.

Response: New utility lines associated with the project are planned to be placed underground. Future utility placement is planned to be coordinated with the appropriate utility provider as required. The standards are met.

(2) Any existing overhead utilities may not be upgraded to serve any proposed development. If existing overhead utilities are not adequate to serve the proposed development, the applicant must, at their own expense, provide an underground system. The applicant must be responsible for obtaining any off-site deeds and/or easements necessary to provide utility service to this site; the deeds and/or easements must be submitted to the City Manager for acceptance by the City prior to issuance of the Public Works Permit.

Response: There are existing overhead utility lines along the frontage of SW Norwood Road. These overhead utilities will be undergrounded with the planned improvements, as illustrated on the Preliminary Composite Utility Plans included in Exhibit A. There are also existing overhead lines within the Greenhill Lane right-of-way. These overhead lines will not be altered with this application because improvements are not being made within the SW Greenhill Lane right-of-way. This standard is met as applicable.

…

TDC 74.765. - Street Tree Species and Planting Locations.

All trees, plants or shrubs planted in the right-of-way of the City must conform in species and location and in accordance with the street tree plan and City standards, including Table 74-1. If the City Manager determines that none of the species in City standards, including Table 74-1 is appropriate or finds appropriate a species not listed, the City Manager may substitute an unlisted species.

Table 74-1
Street Tree Species

Species Common Names	Planting Strip Width (feet)			Power line compatible	Spacing on center (feet)
	4	5	6+		
Amur Maackia	•	•	•	•	30
Amur Maple	•	•	•	•	30
Armstrong Maple	•	•	•		30
Autumn Applause Ash		•	•		30
Black Tupelo	•	•	•		30
Capital Flowering Pear	•	•	•		30
Cascara	•	•	•	•	30
Crimson King Maple		•	•		30
Crimson Sentry Maple	•	•	•	•	30

Table 74-1 Street Tree Species					
Eastern Redbud	•	•	•		30
European Hornbeam	•	•	•	•	30
Frontier Elm			•		60
Ginko		•	•		30
Globe Sugar Maple			•		60
Golden Desert Ash	•	•	•	•	30
Goldenrain	•	•	•		30
Greenspire Linden		•	•		30
Ivory Japanese Lilac	•	•	•	•	30
Leprechaun Ash	•	•	•		30
Persain Parrotia	•	•	•		30
Purple Beech	•	•	•		30
Raywood Ash		•	•	•	30
Katsura	•	•	•		30
Red Oak			•		60
Red Sunset Maple			•		60
Scanlon/Bowhall Maple	•	•	•		30
Scarlet Oak			•		60
Shademaster Honey Locust		•	•		30
Skyrocket English Oak	•	•	•		30
Japanese snowbell	•	•	•	•	30
Sourwood	•	•	•	•	30
Tall Stewartia	•	•	•	•	30
Chinese Fringetree	•	•	•	•	30
Tri-Color Beech			•		60
Trident Maple	•	•	•	•	30
Urbanite Ash		•	•		30
Yellowwood	•	•	•		30
Zelkova Musashino	•	•	•		30

Response: As illustrated on the Preliminary Street Tree and Planting Plans in Exhibit A, the planned street trees are listed on the above table and will be planted in accordance with City standards. This standard is met.

CHAPTER 75 – ACCESS MANAGEMENT

…

TDC 75.040. - Driveway Approach Requirements.

(1) The provision and maintenance of driveway approaches from private property to the public streets as stipulated in this Code are continuing requirements for the use of any structure or parcel of real property in the City of Tualatin. No building or other permit may be issued until scale plans are presented that show how the driveway approach requirement is to be fulfilled. If the owner or occupant of a lot or building changes the use to which the lot or building is put, thereby increasing driveway approach requirements, it is unlawful and a violation of this code to begin or maintain such altered use until the required increase in driveway approach is authorized by the City.

Response: Driveway approaches are provided to each residential lot, as illustrated on the Preliminary Street Plans of Exhibit A. Final driveway approach design will be included in subsequent construction drawing in accordance with City standards. This standard is met.

(2) Owners of two or more uses, structures, or parcels of land may agree to utilize jointly the same driveway approach when the combined driveway approach of both uses,

structures, or parcels of land satisfies their combined requirements as designated in this code; provided that satisfactory legal evidence is presented to the City Attorney in the form of deeds, easements, leases or contracts to establish joint use. Copies of said deeds, easements, leases or contracts must be placed on permanent file with the City Recorder.

Response: The attached townhomes are planned to have shared driveways and approaches. The maintenance and use of the shared driveways will be addressed in the Covenants, Conditions & Restrictions (CC&Rs) of the townhome units. The CC&Rs will be recorded with the final plat in accordance with City and County requirements. This standard is met.

(3) Joint and Cross Access.

- **(a) Adjacent commercial uses may be required to provide cross access drive and pedestrian access to allow circulation between sites.**
- **(b) A system of joint use driveways and cross access easements may be required and may incorporate the following:**
  - **(i) A continuous service drive or cross access corridor extending the entire length of each block served to provide for driveway separation consistent with the access management classification system and standards;**
  - **(ii) A design speed of ten mph and a maximum width of 24 feet to accommodate two-way travel aisles designated to accommodate automobiles, service vehicles, and loading vehicles;**
  - **(iii) Stub-outs and other design features to make it visually obvious that the abutting properties may be tied in to provide cross access via a service drive; and**
  - **(iv) An unified access and circulation system plan for coordinated or shared parking areas.**
- **(c) Pursuant to this section, property owners may be required to:**
  - **(i) Record an easement with the deed allowing cross access to and from other properties served by the joint use driveways and cross access or service drive;**
  - **(ii) Record an agreement with the deed that remaining access rights along the roadway will be dedicated to the city and pre-existing driveways will be closed and eliminated after construction of the joint-use driveway;**
  - **(iii) Record a joint maintenance agreement with the deed defining maintenance responsibilities of property owners; and**
  - **(iv) If subsection(i) through (iii) above involve access to the state highway system or county road system, ODOT or the county must be contacted and must approve changes to subsection (i) through (iii) above prior to any changes.**

Response: The attached townhomes are planned to have shared driveways and approaches. The maintenance and use of the shared driveways will be addressed in the CC&Rs of the townhome units. The CC&Rs will be recorded with the final plat in accordance with City and County requirements. The applicable standards are met.

(4) **Requirements for Development on Less than the Entire Site.**

(a) **To promote unified access and circulation systems, lots and parcels under the same ownership or consolidated for the purposes of development and comprised of more than one building site must be reviewed as one unit in relation to the access standards. The number of access points permitted must be the minimum number necessary to provide reasonable access to these properties, not the maximum available for that frontage. All necessary easements, agreements, and stipulations must be met. This must also apply to phased development plans. The owner and all lessees within the affected area must comply with the access requirements.**

(b) **All access must be internalized using the shared circulation system of the principal commercial development or retail center. Driveways should be designed to avoid queuing across surrounding parking and driving aisles.**

Response: As illustrated on the Preliminary Plans (Exhibit A), the planned access and circulation system is designed for the entire site. The standards are met as applicable.

(5) **Lots that front on more than one street may be required to locate motor vehicle accesses on the street with the lower functional classification as determined by the City Manager.**

Response: As illustrated on the Preliminary Plans (Exhibit A), all interior streets are classified as Local streets. Therefore, a "lower classification" does not apply to lots that are located on more than one street. This standard does not apply.

(6) **Except as provided in TDC 53.100, all driveway approach must connect directly with public streets.**

Response: As illustrated on the Preliminary Plans (Exhibit A), residential driveway approaches are planned to connect directly with public streets. This standard is met.

(7) **To afford safe pedestrian access and egress for properties within the City, a sidewalk must be constructed along all street frontage, prior to use or occupancy of the building or structure proposed for said property. The sidewalks required by this section must be constructed to City standards, except in the case of streets with inadequate right-of-way width or where the final street design and grade have not been established, in which case the sidewalks must be constructed to a design and in a manner approved by the City Manager. Sidewalks approved by the City Manager may include temporary sidewalks and sidewalks constructed on private property; provided, however, that such sidewalks must provide continuity with sidewalks of adjoining commercial developments existing or proposed. When a sidewalk is to adjoin a future street improvement, the sidewalk construction must include construction of the curb and gutter section to grades and alignment established by the City Manager.**

Response: As illustrated on the Preliminary Plans (Exhibit A), public sidewalks constructed to applicable City standards are planned on all street frontages within the project area. This standard is met.

(8) **The standards set forth in this Code are minimum standards for driveway approaches, and may be increased through the Architectural Review process in any particular instance where the standards provided herein are deemed insufficient to protect the public health, safety, and general welfare.**

Response: Subsequent Architectural Review applications will be submitted for the attached and detached single-family homes. This standard is understood.

(9) Minimum driveway approach width for uses are as provided in Table 75-1 (Driveway Approach Width):

TABLE 75-1 Driveway Approach Width		
Use	Minimum Driveway Approach Width	Maximum Driveway Approach Width
Single-Family Residential, townhouses, and duplexes	10 feet	26 feet for one or two care garages 37 feet for three or more garages
Multi-family	2 Units = 16 feet 3-49 Units = 24 feet 50-499 = 32 feet Over 500 = as required by the City Manager	May provide two 16 foot one-way driveways instead of one 24-foot driveway May provide two 24-foot one-way driveways instead of one 32-foot driveway
Commercial	1-99 Parking Spaces = 32 feet 100-249 Parking Spaces = two approaches each 32 feet	Over 250 Parking Spaces = As Required by the City Manager, but not exceeding 40 feet
Industrial	36 feet	Over 250 Parking Spaces = As Required by the City Manager, but not exceeding 40 feet
Institutional	1-99 Parking Spaces = 32 feet 100-249 Parking Spaces = two approaches each 32 feet	Over 250 Parking Spaces = As Required by the City Manager, but not exceeding 40 feet

Response: As illustrated on the Preliminary Street Plans included in Exhibit A, each detached single-family lot is planned to have a ±20-foot-wide driveway approach. The attached townhome lots are planned to have shared ±37-foot-wide driveway approaches. The applicable standards are met.

(10) *Driveway Approach Separation.* There must be a minimum distance of 40 feet between any two adjacent driveways on a single property unless a lesser distance is approved by the City Manager.

Response: This application does not include lots with more than one driveway. This standard does not apply.

(11) *Distance between Driveways and Intersections.* Except for single-family dwellings, the minimum distance between driveways and intersections must be as provided below. Distances listed must be measured from the stop bar at the intersection.

…

Response: The planned project is for single-family dwellings; therefore, the standards in this subsection do not apply.

(12) Vision Clearance Area.

(a) *Local Streets.* A vision clearance area for all local street intersections, local street and driveway intersections, and local street or driveway and railroad intersections must be that triangular area formed by the right-of-way lines along such lots and a straight line joining the right-of-way lines at points which are ten feet from the intersection point of the right-of-way lines, as measured along such lines (see Figure 73-2 for illustration).

(b) *Collector Streets.* A vision clearance area for all collector/arterial street intersections, collector/arterial street and local street intersections, and collector/arterial street and railroad intersections must be that triangular area formed by the right-of-way lines along such lots and a straight line joining the right-of-way lines at points which are 25 feet from the intersection point of the right-of-way lines, as measured along such lines. Where a driveway intersects with a collector/arterial street, the distance measured along the driveway line for the triangular area must be ten feet (see Figure 73-2 for illustration).

(c) *Vertical Height Restriction.* Except for items associated with utilities or publicly owned structures such as poles and signs and existing street trees, no vehicular parking, hedge, planting, fence, wall structure, or temporary or permanent physical obstruction must be permitted between 30 inches and eight feet above the established height of the curb in the clear vision area (see Figure 73-2 for illustration).

Response: The applicable vision clearance areas described above are noted on the Preliminary Street Plans of Exhibit A and the vertical height restriction is understood. The standards are met.

TDC 75.050. - Access Limited Roadways.

(1) This section applies to all developments, permit approvals, land use approvals, partitions, subdivisions, or any other actions taken by the City pertaining to property abutting any road or street listed in TDC 75.050(2). In addition, any property not abutted by a road or street listed in subsection (2), but having access to an arterial by any easement or prescriptive right, must be treated as if the property did abut the arterial and this Chapter applies.

(2) The following Freeways and Arterials are access limited roadways:

(a) Interstate 5 Freeway;

(b) Interstate 205 Freeway;

(c) Pacific Highway 99W;

(d) Tualatin-Sherwood Road at all points located within the City of Tualatin Planning Area;

(e) Nyberg Street, from its intersection with Tualatin-Sherwood Road east to 65th Avenue, including the I-5 Interchange;

(f) 124th Avenue from Pacific Highway 99W south to Tonquin to Basalt Creek Parkway;

(g) Lower Boones Ferry Road, from Boones Ferry Road to the Bridgeport/72nd intersection and from the Bridgeport/72nd intersection to the east City limits;

(h) Boones Ferry Road at all points located within the City of Tualatin Planning Area;

(i) 65th Avenue from its intersection with Nyberg Street south to City limits;

(j) Borland Road from 65th Avenue east to Saum Creek;

(k) Bridgeport Road from Lower Boones Ferry Road to the west City limits;

(l) Martinazzi Avenue from Boones Ferry Road south to Sagert Street;

(m) Sagert Street from Martinazzi Avenue to 65th Avenue;

(n) Leveton Drive from 108th Avenue to 124th Avenue;

(o) 108th Avenue from Leveton Drive to Herman Road;

(p) Herman Road from Teton Avenue to 124th Avenue;

(q) 90th Avenue;

(r) Avery Street;

(s) Teton Avenue;

(t) Basalt Creek Parkway.

If the Council finds that any other road or street is in need of access control for any reason, it may direct that the street or road be added to this section through a Plan Text Amendment.

Response: This application includes a subdivision that abuts the Interstate 5 Freeway, SW Boones Ferry Road, and the future Basalt Creek Parkway extension, which are all listed above. Therefore, this section applies.

(3) This Chapter takes precedence over any other TDC chapter and over any other ordinance of the City when considering any development, land use approval or other proposal for property abutting an arterial or any property having an access right to an arterial.

(4) The City may act on its own initiative to protect the public safety and control access on arterials or any street to be included by TDC 75.030, consistent with its authority as the City Road Authority.

Response: The above standards are understood.

TDC 75.060. - Interim Access Agreement.

(1) When a property abuts a freeway or arterial and a future street shown in TDC Chapter 11, Transportation, (Figures 11-1 and 11-3), or abuts or bisects the property, the City Manager may approve an interim access on the arterial through an agreement with the property owner if:

(1) The City Manager finds that at the current time the construction of the new street shown in TDC Chapter 11, Transportation, (Figures 11-1 and 11-3), is impractical due to costs of right-of-way acquisition.

Response: The access to SW Boones Ferry Road is planned to be constructed at the time of the adjacent site improvements. Therefore, an Interim Access Agreement is not needed and this section does not apply.

…

TDC 75.070. - Existing Driveways and Street Intersections.

(1) Existing driveways with access onto arterials on the date this chapter was originally adopted are allowed to remain. If additional development occurs on properties with existing driveways with access onto arterials then this Chapter applies and the entire site must be made to conform with the requirements of this chapter.

(2) The City Manager may restrict existing driveways and street intersections to right-in and right-out by construction of raised median barriers or other means.

Response: The existing residential driveway onto SW Boones Ferry Road, an Arterial, is planned to be removed and the planned site improvements will conform to the requirements of this chapter. The standards are met as applicable.

…

TDC 75.100. - Spacing Standards for New Intersections.

Except as shown in TDC Chapter 11, Transportation, (Figures 11-1 and 11-3), all new intersections with arterials must have a minimum spacing of one-half mile between intersections.

Response: The Washington County minimum spacing standard along SW Boones Ferry Road is 600 feet and the planned spacing from the new intersection to the future Basalt Creek Parkway intersection is ±800 feet. Therefore, the County arterial intersection spacing is met.

TDC 75.110. - Joint Access Standards.

When the City Manager determines that joint accesses are required by properties undergoing development or redevelopment, an overall access plan shall be prescribed by the City Manager and all properties shall adhere to this. Interim accesses may be allowed in accordance with TDC 75.060 of this chapter to provide for the eventual implementation of the overall access plan.

Response: Access to the new lots is provided off of the new local street network and joint access is not planned. The standards do not apply.

TDC 75.120. - Collector Streets Access Standards.

(1) *Major Collectors.* Direct access from newly constructed single family homes, duplexes or triplexes are not permitted. As major collectors in residential areas are fully improved, or adjacent land redevelops, direct access should be relocated to the nearest local street where feasible.

(2) *Minor Collectors.* Residential, commercial and industrial driveways where the frontage is greater or equal to 70 feet are permitted. Minimum spacing at 100 feet. Uses with less than 50 feet of frontage shall use a common (joint) access where available.

(3) If access is not able to be relocated to the nearest local street, the City Manager may allow interim access in accordance with 75.060 of this chapter to provide for the eventual implementation of the overall access plan.

Response: SW Norwood Road is classified as a Major Collector. Direct access to the residential lots is planned off of the new local street network. The above standards are met as applicable.

TDC 75.130. - New Streets Access Standards.

(1) New streets designed to serve as alternatives to direct, parcel by parcel, access onto arterials are shown in TDC Chapter 11, Transportation, (Figures 11-1 and 11-3). These streets are shown as corridors with the exact location determined through the partition, subdivision, public works permit or Architectural Review process. Unless modified by the City Council by the procedure set out below, these streets will be the only new intersections with arterials in the City. See map for changes.

(2) Specific alignment of a new street may be altered by the City Manager upon finding that the street, in the proposed alignment, will carry out the objectives of this chapter to the same, or a greater degree as the described alignment, that access to adjacent and nearby properties is as adequately maintained and that the revised alignment will result in a segment of the Tualatin road system which is reasonable and logical.

(3) The City Council may include additional streets in TDC Chapter 11, Transportation, (Figures 11-1 and 11-3), through the plan amendment procedure. In addition to other required findings, the City Council must find that the addition is necessary to implement the objectives of this chapter.

Response: TDC Chapter 11 has been removed from the Development Code and replaced by a separate Comprehensive Plan document. Map 8-3 of the Comprehensive Plan provides a local street plan for the subject site area. A clip of Map 8-3: Local Street Plan is provided here:

A note on Map 8-3 states, "future roadway alignments are approximate and subject to additional engineering and design." The planned circulation plan substantially implements this conceptual local street plan, providing one street connection to SW Boones Ferry Road and two connections to SW Norwood Street. See the Preliminary Plans (Exhibit A) for details. The standards are met, as applicable.

TDC 75.140. - Existing Streets Access Standards.

The following list describes in detail the freeways and arterials as defined in TDC 75.050 with respect to access. Recommendations are made for future changes in accesses and location of future accesses. These recommendations are examples of possible solutions and shall not be construed as limiting the City' s authority to change or impose different conditions if additional studies result in different recommendations from those listed below.

…

(8) ***BOONES FERRY ROAD.***

…

Response: While SW Boones Ferry Road is listed in this section, no details are provided for access south of SW Norwood Road along the frontage of the subject site. Therefore, the standards in this section do not apply.

…

TMC 3-2-020 Application, Permit and Inspection Procedure.

(1) No person shall connect to any part of the sanitary sewer system without first making an application and securing a permit from the City for such connection, nor may any person substantially increase the flow, or alter the character of sewage, without first obtaining an additional permit and paying such charges therefore as may be fixed by the City, including such charges as inspection charges, connection charges and monthly service charges.

(2) Upon approval of the application and payment of all charges, the City will issue a sewer connection permit for the premises covered in the application. The application and permit shall be on forms provided by the City.

(3) After approval of the application, evidenced by the issuance of a permit, no change shall be made in the location of the sewer, the grade, materials, or other details from those described in the permit or as shown on the plans and specifications for which the permit was issued except with written permission from the City. The applicant's signature on an application for any permit as set forth shall constitute an agreement to comply with all of the provisions, terms and requirements of this and other City of Tualatin ordinances, rules and regulations, laws of the State of Oregon, and with the plans and specifications filed with the application, if any, together with such corrections or modifications as may be made or permitted by the City, if any. Such agreement shall be binding upon the applicant and may be altered only by the City upon the written request for the alteration from the applicant.

(4) It shall be the duty of the person doing the work authorized by permit to notify the City that said work is ready for inspection.

(5) All sewer construction work shall be inspected by an inspector acting for the City to insure compliance with all requirements of the City. No sewer shall be covered at any point until it has been inspected and passed for acceptance. No sewer shall be connected to the City's public sewer until the work covered by the permit has been completed, inspected, and approved by the inspector. All sewers shall be tested for leakage in the presence of the inspector and shall be cleaned of all debris accumulated from construction operations.

(6) When any work has been inspected and the test results are not satisfactory, a written notice to that effect shall be given instructing the owner of the premises, or the agent of such owner, to repair the sewer or other work authorized by the permit in accordance with the ordinances, rules and regulations of the City.

(7) All costs and expenses incident to the installation and connection of any sewer or other work for which a permit has been issued shall be borne by the owner. The owner shall indemnify the City from any loss or damage that may directly or indirectly be occasioned by the work.

TMC 3-2-030 Materials and Manner of Construction.

(1) All building sewers, side sewers and connections to the main sewer shall be so constructed as to conform to the requirements of the Oregon State Plumbing Laws and rules and regulations and specifications for sewerage construction of the City.

(2) Old building sewers may be used in connection with new buildings only when they are found, upon examination and test by the City Inspector, to meet all requirements of the City.

(3) A public works permit must be secured from the City and other agency having jurisdiction by owners or contractors intending to excavate in a public street for the purpose of installing sewers or making sewer connections.

(4) The City and its officers, agents or employees shall not be answerable for any liability or injury or death to any person or damage to any property arising during or growing out of the performance of any work by any such applicant. The applicant shall be answerable for and shall save the City and its officers, agents and employees harmless from any liability imposed by law upon the City or its officers, agents or employees, including all costs, expenses, fees and interest incurred in defending same.

Response: Separate sanitary sewer services are planned to each lot within the subdivision. See the Preliminary Composite Utility Plans in Exhibit A for details. Compliance with the applicable City standards will be demonstrated at the time of building and construction permit applications. The applicable standards are met.

CHAPTER 3-03 – WATER SERVICE

TMC 3-3-040 Separate Services Required.

(1) Except as authorized by the City Engineer, a separate service and meter to supply regular water service or fire protection service shall be required for each building, residential unit or structure served. For the purposes of this section, trailer parks and multi-family residences of more than four dwelling units shall constitute a single unit unless the City Engineer determines that separate services are required.

(2) For nonresidential uses, separate meters shall be provided for each structure. Separate meters shall also be provided to each buildable lot or parcel on which water service is or will be provided.

TMC 3-3-110 Construction Standards.

All water line construction and installation of services and equipment shall be in conformance with the City of Tualatin Public Works Construction Code. In addition, whenever a property owner extends a water line, which upon completion, is intended to be dedicated to the City as part of the public water system, said extension shall be carried to the opposite property line or to such other point as determined by the City Engineer. Water line size shall be determined by the City Engineer in accordance with the City's Development Code or implementing ordinances and the Public Works Construction Code.

TMC 3-3-120 Backflow Prevention Devices and Cross Connections.

(1) Except where this ordinance provides more stringent requirements, the definitions, standards, requirements and regulations set forth in the Oregon Administrative Rules pertaining to public water supply systems and specifically OAR 333 Division 61 in effect on the date this ordinance becomes effective are hereby adopted and incorporated by reference.

(2) The owner of property to which City water is furnished for human consumption shall install in accordance with City standards an appropriate backflow prevention device on the premises where any of the following circumstances exist:

(a) Those circumstances identified in regulations adopted under subsection (1) of this section;

(b) Where there is a fire protection service, an irrigation service or a nonresidential service connection which is two inches or larger in size;

(c) Where the potable water supply provided inside a structure is 32 feet or more, higher than the elevation of the water main at the point of service connection;

(3) All double check detector assemblies used for system containment on fire protection services shall be approved by the Oregon State Health Division. The meter register on all double check detector assemblies shall be indicated in cubic feet measurement.

(4) Except as otherwise provided in this subsection, all irrigation systems shall be installed with a double check valve assembly. Irrigation system backflow prevention device assemblies installed before the effective date of this ordinance, which were approved at the time they were installed but are not on the current list of approved device assemblies maintained by the Oregon State Health Division, shall be permitted to remain in service provided they are properly maintained, are commensurate with the degree of hazard, are tested at least annually, and perform satisfactorily. When devices of this type are moved, or require more than minimum maintenance, they shall be replaced by device assemblies which are on the Health Division list of approved device assemblies.

(5) Any installation, corrective measure, disconnection or other change to a backflow prevention device shall be performed at the sole expense of the owner of the property. All costs or expenses for any correction or modification to the City's system caused by or resulting from a cross connection shall be the responsibility of the owner and/or the user of the cross connection.

(6) Any backflow prevention device which is installed on property for the protection of the City water supply shall be tested at the time of installation and immediately after the device is moved or relocated. The property owner shall forward the results of such testing to the Operations Director within ten days of the date of installation or relocation.

TMC 3-3-130 Control Valves.

The customer shall install a suitable valve, as close to the meter location as practical, the operation of which will control the entire water supply from the service. The operation by the customer of the curb stop in the meter box is prohibited.

Response: Separate water services are planned to each lot within the subdivision. See the Preliminary Composite Utility Plans in Exhibit A for details. Compliance with the applicable City standards, including backflow prevention devices and cross-connections, will be demonstrated at the time of building and construction permit applications. The applicable standards are met.

…

CHAPTER 3-05 – SOIL EROSION, SURFACE WATER MANAGEMENT, WATER QUALITY FACILITIES, AND BUILDING AND SEWERS

EROSION CONTROL

TMC 3-5-010 Policy.

It is the policy of the City to require temporary and permanent measures for all construction projects to lessen the adverse effects of construction on the environment. The contractor shall properly install, operate and maintain both temporary and permanent works as provided in this chapter or in an approved plan, to protect the environment during the term of the project. In addition, these erosion control rules apply to all properties within the City, regardless of whether that property is involved in a construction or development activity. Nothing in this chapter shall relieve any person from the obligation to comply with the regulations or permits of any federal, state, or local authority.

…

TMC 3-5-050 Erosion Control Permits.

(1) Except as noted in subsection (3) of this section, no person shall cause any change to improved or unimproved real property that causes, will cause, or is likely to cause a temporary or permanent increase in the rate of soil erosion from the site without first obtaining a permit from the City and paying prescribed fees. Such changes to land shall include, but are not limited to, grading, excavating, filling, working of land, or stripping of soil or vegetation from land.

(2) No construction, land development, grading, excavation, fill, or the clearing of land is allowed until the City has issued an Erosion Control Permit covering such work, or the City has determined that no such permit is required. No public agency or body shall undertake any public works project without first obtaining from the City an Erosion Control Permit covering such work, or receiving a determination from the City that none is required.

(3) No Erosion Control Permit from City is required for the following:

(a) For work of a minor nature provided all the following criteria are met:

(A) The development does not require a development permit or approval from the City;

(B) No development activity or disturbance of land surface occurs within 100 feet of a sensitive area defined in TMC 3-5.270;

(C) The slope of the site is less than 20 percent;

(D) The work on the site involves the disturbance of less than 500 square feet of land surface; and

(E) The excavation, fill or combination thereof involves less than 20 cubic yards of material.

(b) Permits and approvals of land division, interior improvements to an existing structure, and other activities for which there is no physical disturbance to the surface of the land.

(c) A permit shall not be required for activities within the City which constitute accepted farming practices as defined in ORS 215.203, provided any erosion does not cause sedimentation in waters of the Tualatin River basin.

(4) An exception from the permit requirement shall not relieve the property or its owner from the prohibition of TMC 3-5.040.

Response: The Applicant will obtain the necessary City erosion control permit approvals prior to site improvements. The standards are met as applicable.

TMC 3-5-060 Permit Process.

(1) *Applications for an Erosion Control Permit.* Application for an Erosion Control Permit shall include an Erosion Control Plan which contains methods and interim facilities to be constructed or used concurrently and to be operated during construction to control erosion. The plan shall include either:

(a) A site specific plan outlining the protection techniques to control soil erosion and sediment transport from the site to less than one ton per acre per year as calculated using the Soil Conservation Service Universal Soil Loss Equation or other equivalent method approved by the City Engineer, or

(b) Techniques and methods contained and prescribed in the Soil Erosion Control Matrix and Methods, outlined in TMC 3-5.190 or the Erosion Control Plans - Technical Guidance Handbook, City of Portland and Unified Sewerage Agency, January, 1991.

(2) *Site Plan.* A site specific plan, prepared by an Oregon registered professional engineer, shall be required when the site meets any of the following criteria:

  (a) Greater than five acres;

  (b) Greater than one acre and has slopes greater than 20 percent;

  (c) Contains or is within 100 feet of a City-identified wetland or a waterway identified on FEMA floodplain maps; or

  (d) Greater than one acre and contains highly erodible soils.

Response: The above erosion control permit requirements can be submitted as applicable. The applicable standards can be met.

ADDITIONAL SURFACE WATER MANAGEMENT STANDARDS

TMC 3-5-200 Downstream Protection Requirement.

Each new development is responsible for mitigating the impacts of that development upon the public storm water quantity system. The development may satisfy this requirement through the use of any of the following techniques, subject to the limitations and requirements in TMC 3-5-210:

(1) Construction of permanent on-site stormwater quantity detention facilities designed in accordance with this title;

(2) Enlargement of the downstream conveyance system in accordance with this title and the Public Works Construction Code;

(3) The payment of a Storm and Surface Water Management System Development Charge, which includes a water quantity component designated to meet these requirements.

Response: The project includes new stormwater management facilities to treat and detain stormwater to meet CWS and City of Tualatin standards. (See the Preliminary Stormwater Report in Exhibit I for details.) The applicable standards are met.

TMC 3-5-210 Review of Downstream System.

For new development other than the construction of a single family house or duplex, plans shall document review by the design engineer of the downstream capacity of any existing storm drainage facilities impacted by the proposed development. That review shall extend downstream to a point where the impacts to the water surface elevation from the development will be insignificant, or to a point where the conveyance system has adequate capacity, as determined by the City Engineer.

To determine the point at which the downstream impacts are insignificant or the drainage system has adequate capacity, the design engineer shall submit an analysis using the following guidelines:

(1) Evaluate the downstream drainage system for at least ¼ mile;

(2) Evaluate the downstream drainage system to a point at which the runoff from the development in a build out condition is less than ten percent of the total runoff of the basin in its current development status. Developments in the basin that have been approved may be considered in place and their conditions of approval to exist if the work has started on those projects;

(3) Evaluate the downstream drainage system throughout the following range of storms: Two-, five-, ten-, 25-year;

(4) The City Engineer may modify items (1), (2), (3) to require additional information to determine the impacts of the development or to delete the provision of unnecessary information.

If the increase in surface waters leaving a development will cause or contribute to damage from flooding, then the identified capacity deficiency shall be corrected prior to development or the development must construct onsite detention. To determine if the runoff from the development will cause or contribute to damage from flooding the City Engineer will consider the following factors:

(1) The potential for or extent of flooding or other adverse impacts from the run-off of the development on downstream properties;

(2) The potential for or extent of possibility of inverse condemnation claims;

(3) Incremental impacts of runoff from the subject and other developments in the basin; and

(4) Other factors that may be relevant to the particular situation.

The purpose of the City Engineer's review is to protect the City and its inhabitants from the impacts or damage caused by runoff from development while recognizing all appropriate limitations on exactions from the development.

Response: The Preliminary Stormwater Report included as Exhibit I includes a review of the existing storm drainage system and includes a downstream analysis with the above information as applicable. Please see the Preliminary Stormwater Report for details.

TMC 3-5-220 Criteria for Requiring On-Site Detention to be Constructed.

The City shall determine whether the onsite facility shall be constructed. If the onsite facility is constructed, the development shall be eligible for a credit against Storm and Surface Water System Development Charges, as provided in City ordinance.

On-site facilities shall be constructed when any of the following conditions exist:

(1) There is an identified downstream deficiency, as defined in TMC 3-5-210, and detention rather than conveyance system enlargement is determined to be the more effective solution.

(2) There is an identified regional detention site within the boundary of the development.

(3) There is a site within the boundary of the development which would qualify as a regional detention site under criteria or capital plan adopted by the Unified Sewerage Agency.

(4) The site is located in the Hedges Creek Subbasin as identified in the Tualatin Drainage Plan and surface water runoff from the site flows directly or indirectly into the Wetland Protected Area (WPA) as defined in TDC 71.020. Properties located within the Wetland Protection District as described in TDC 71.010, or within the portion of the subbasin east of SW Tualatin Road are excepted from the on-site detention facility requirement.

Response: As described in the Preliminary Stormwater Report (Exhibit I), new facilities are planned to detain stormwater to meet CWS standards. Although downstream deficiencies are not anticipated, detention is required to meet hydromodification standards and is therefore provided. Furthermore, the construction of the detention facilities will match or reduce the predevelopment flows and will have no adverse impacts on the downstream system. The criteria are met as applicable.

TMC 3-5-230 On-Site Detention Design Criteria.

(1) Unless designed to meet the requirements of an identified downstream deficiency as defined in TMC 3-5.210, stormwater quantity onsite detention facilities shall be designed to capture run-off so the run-off rates from the site after development do not exceed predevelopment conditions, based upon a 25-year, 24-hour return storm.

(2) When designed to meet the requirements of an identified downstream deficiency as defined in TMC 3-5.210, stormwater quantity on-site detention facilities shall be designed such that the peak runoff rates will not exceed predevelopment rates for the two through 100 year storms, as required by the determined downstream deficiency.

(3) Construction of on-site detention shall not be allowed as an option if such a detention facility would have an adverse effect upon receiving waters in the basin or subbasin in the event of flooding, or would increase the likelihood or severity of flooding problems downstream of the site.

TMC 3-5-240 On-Site Detention Design Method.

(1) The procedure for determining the detention quantities is set forth in Section 4.4 Retention/Detention Facility Analysis and Design, King County, Washington, Surface Water Design Manual, January, 1990, except subchapters 4.4.5 Tanks, 4.4.6 Vaults and Figure 4.4.4G Permanent Surface Water Control Pond Sign. This reference shall be used for procedure only. The design criteria shall be as noted herein. Engineers desiring to utilize a procedure other than that set forth herein shall obtain City approval prior to submitting calculations utilizing the proposed procedure.

(2) For single family and duplex residential subdivisions, stormwater quantity detention facilities shall be sized for the impervious areas to be created by the subdivision, including all residences on individual lots at a rate of 2,640 square feet of impervious surface area per dwelling unit, plus all roads which are assessed a surface water management monthly fee under Unified Sewerage Agency rules. Such facilities shall be constructed as a part of the subdivision public improvements. Construction of a single family or duplex residence on an existing lot of record is not required to construct stormwater quantity detention facilities.

(3) All developments other than single family and duplex, whether residential, multi-family, commercial, industrial, or other uses, the sizing of stormwater quantity detention facilities shall be based on the impervious area to be created by the development, including structures and all roads and impervious areas which are assessed a surface water management monthly fee under Unified Sewerage Agency rules. Impervious surfaces shall be determined based upon building permits, construction plans, site visits or other appropriate methods deemed reliable by City.

Response: As described in the Preliminary Stormwater Report (Exhibit I), the new stormwater facilities are designed to detain stormwater to meet CWS hydromodification standards and City of Tualatin standards. The standards are met as applicable.

…

PERMANENT ON-SITE WATER QUALITY FACILITIES

TMC 3-5-280 Placement of Water Quality Facilities.

Title III specifies that certain properties shall install water quality facilities for the purpose of removing phosphorous. No such water quality facilities shall be constructed within the defined area of existing or created wetlands unless a mitigation action, approved by the City, is constructed to replace the area used for the water quality facility.

TMC 3-5-290 Purpose of Title.

The purpose of this title is to require new development and other activities which create impervious surfaces to construct or fund on-site or off-site permanent water quality facilities to reduce the amount of phosphorous entering the storm and surface water system.

TMC 3-5-300 Application of Title.

Title III of this Chapter shall apply to all activities which create new or additional impervious surfaces, except as provided in TMC 3-5.310.

TMC 3-5-310 Exceptions.

(1) Those developments with application dates prior to July 1, 1990, are exempt from the requirements of Title III. The application date shall be defined as the date on which a complete application for development approval is accepted by the City in accordance with City regulations.

(2) Construction of one and two family (duplex) dwellings are exempt from the requirements of Title III.

(3) Sewer lines, water lines, utilities or other land development that will not directly increase the amount of storm water run-off or pollution leaving the site once construction has been completed and the site is either restored to or not altered from its approximate original condition are exempt from the requirements of Title III.

TMC 3-5-320 Definitions.

Stormwater Quality Control Facility refers to any structure or drainage way that is designed, constructed and maintained to collect and filter, retain, or detain surface water run-off during and after a storm event for the purpose of water quality improvement. It may also include, but is not limited to, existing features such as constructed wetlands, water quality swales, low impact development approaches ("LIDA"), and ponds which are maintained as stormwater quality control facilities.

Low Impact Development Approaches or *LIDA* means stormwater facilities constructed utilizing low impact development approaches used to temporarily store, route or filter run-off for the purpose of improving water quality. Examples include; but are not limited to, Porous Pavement, Green Roofs, Infiltration Planters/Rain Gardens, Flow-Through Planters, LIDA Swales, Vegetated Filter Strips, Vegetated Swales, Extended Dry Basins, Constructed Water Quality Wetland, Conveyance and Stormwater Art, and Planting Design and Habitats.

Water Quality Swale means a vegetated natural depression, wide shallow ditch, or constructed facility used to temporarily store, route or filter run-off for the purpose of improving water quality.

Existing Wetlands means those areas identified and delineated as set forth in the Federal Manual for Identifying the Delineating Jurisdictional Wetlands, January, 1989, or as amended, by a qualified wetlands specialist.

Created Wetlands means those wetlands developed in an area previously identified as a non-wetland to replace, or mitigate wetland destruction or displacement.

Constructed Wetlands means those wetlands developed as a water quality or quantity facility, subject to change and maintenance as such. These areas must be clearly defined and/or separated from existing or created wetlands. This separation shall preclude a free and open connection to such other wetlands.

TMC 3-5-330 Permit Required.

Except as provided in TMC 3-5-310, no person shall cause any change to improved or unimproved real property that will, or is likely to, increase the rate or quantity of run-off or pollution from the site without first obtaining a permit from the City and following the conditions of the permit.

TMC 3-5-340 Facilities Required.

For new development, subject to the exemptions of TMC 3-5-310, no permit for construction, or land development, or plat or site plan shall be approved unless the conditions of the plat, plan or permit approval require permanent stormwater quality control facilities in accordance with this Title III.

Response: As described in the Preliminary Stormwater Report (Exhibit I), the planned stormwater facilities will mitigate the increase in run-off and provide water quality controls for the planned site improvements. The applicable approvals can be obtained from the City and the above criteria are met.

TMC 3-5-345 Inspection Reports.

The property owner or person in control of the property shall submit inspection reports annually to the City for the purpose of ensuring maintenance activities occur according to the operation and maintenance plan submitted for an approved permit or architectural review.

TMC 3-5-350 Phosphorous Removal Standard.

The stormwater quality control facilities shall be designed to remove 65 percent of the phosphorous from the runoff from 100 percent of the newly constructed impervious surfaces. Impervious surfaces shall include pavement, buildings, public and private roadways, and all other surfaces with similar runoff characteristics.

TMC 3-5-360 Design Storm.

The stormwater quality control facilities shall be designed to meet the removal efficiency of TMC 3-5-350 for a mean summertime storm event totaling 0.36 inches of precipitation falling in four hours with an average return period of 96 hours.

Response: As described in the Preliminary Stormwater Report (Exhibit I), the planned stormwater facilities are designed to treat stormwater to meet CWS and City of Tualatin standards. The above standards are met as applicable.

TMC 3-5-370 Design Requirements.

The removal efficiency in TDC Chapter 35 specifies only the design requirements and are not intended as a basis for performance evaluation or compliance determination of the stormwater quality control facility installed or constructed pursuant to this Title III.

TMC 3-5-390 Facility Permit Approval.

A stormwater quality control facility permit shall be approved only if the following are met:

(1) The plat, site plan, or permit application includes plans and a certification prepared by an Oregon registered, professional engineer that the proposed stormwater quality control facilities have been designed in accordance with criteria expected to achieve removal efficiencies for total phosphorous required by this Title III. Clean Water Services Design and Construction Standards shall be used in preparing the plan for the water quality facility; and

(2) The plat, site plan, or permit application shall be consistent with the areas used to determine the removal required in TMC 3-5-350; and

(3) A financial assurance, or equivalent security acceptable to the City, is provided by the applicant which assures that the stormwater quality control facilities are constructed according to the plans established in the plat, site plan, or permit approval. The financial assurance may be combined with our financial assurance requirements imposed by the City; and

(4) A stormwater facility agreement identifies who will be responsible for assuring the long term compliance with the operation and maintenance plan.

Response: As described in the Preliminary Stormwater Report (Exhibit I), the planned stormwater improvements will meet the applicable CWS and City of Tualatin standards. The above standards are met as applicable.

…

TMC 3-5-420 Residential Developments.

The permanent stormwater quality control facilities for the construction of any single family and duplex subdivision shall be adequately sized for the public improvements of the subdivision and for the future construction of single family and duplex houses on the individual lots at a rate of 2,640 square feet of impervious surface per dwelling unit.

Response: As described in the Preliminary Stormwater Report (Exhibit I) and on the Preliminary Plans (Exhibit A), the planned stormwater improvements are adequately sized for the planned subdivision improvements and future construction of single-family homes. The standard is met.

TMC 3-5-430 Placement of Water Quality Facilities.

No water quality facilities shall be constructed within the defined area of existing or created wetlands unless a mitigation action is approved by the City, and is constructed to replace the area used for water quality.

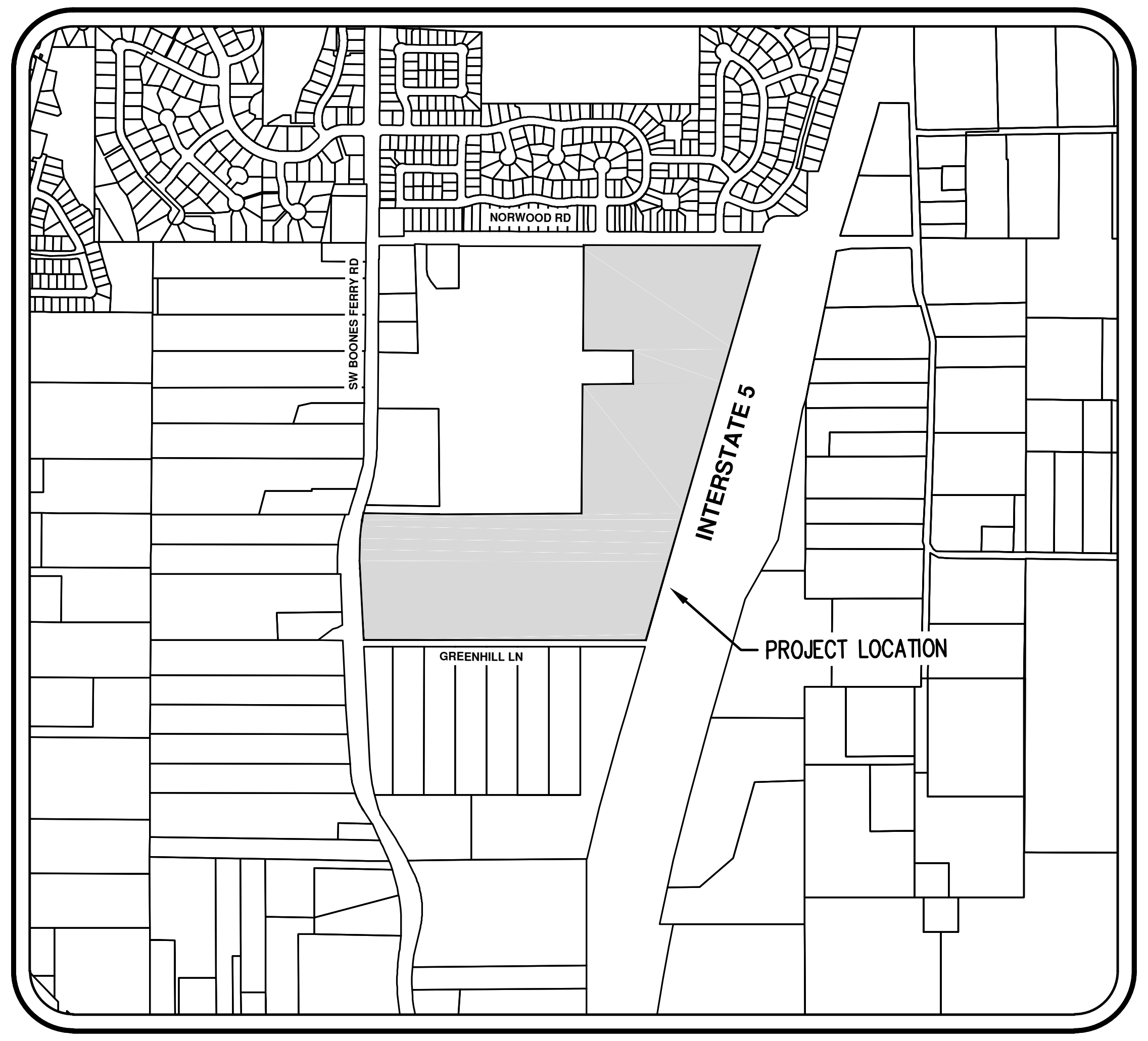
Response: As illustrated on the site plans included in the CWS Service Provider Letter (Exhibit F), an existing wetland adjacent to SW Boones Ferry Road is planned to be removed with the planned roadway and stormwater facility improvements. The CWS Service Provider Letter outlines the planned encroachment areas and the mitigation required. The standard is met.

IV. Conclusion

The required findings have been made and this written narrative and accompanying documentation demonstrate that the application is consistent with the applicable provisions of the Tualatin Development Code and Tualatin Municipal Code. The evidence in the record is substantial and supports approval of the application.

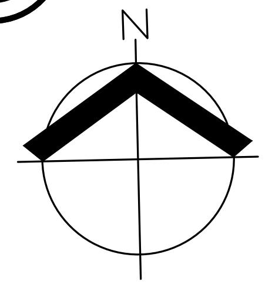
AUTUMN SUNRISE SUBDIVISION

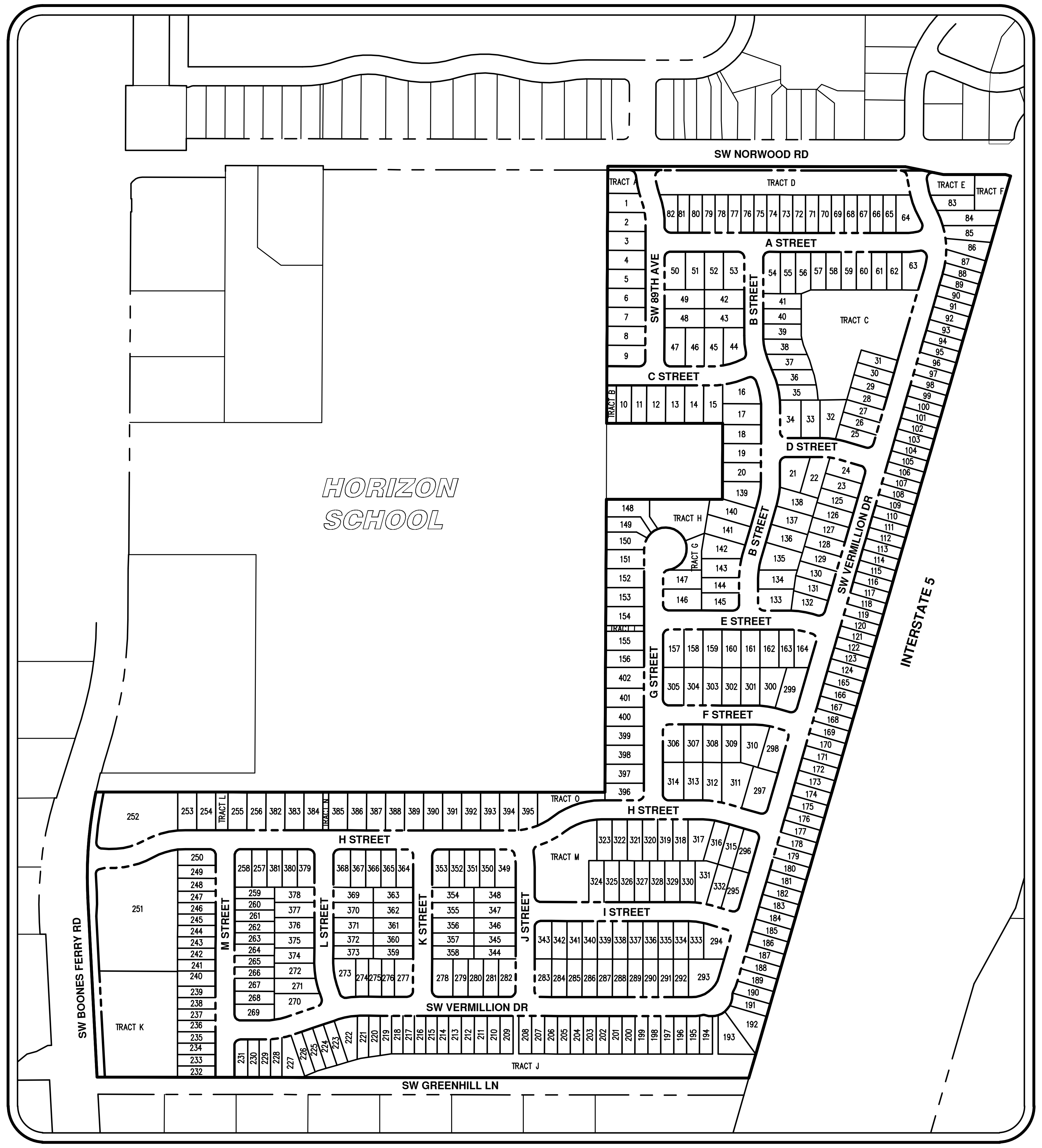
LAND USE APPLICATION PLANS



VICINITY MAP

1"=1000'





SITE MAP

1"=250'

APPLICANT/DEVELOPER	LENNAR NORTHWEST, INC. 11807 NE 99TH ST., SUITE 1170 VANCOUVER, WA 98682
PLANNING/CIVIL ENGINEERING/SURVEYING/ NATURAL RESOURCE/ ARBORIST/LANDSCAPE ARCHITECTURE FIRM	AKS ENGINEERING & FORESTRY, LLC CONTACT: MIMI DOUKAS, AICP 12965 SW HERMAN ROAD, SUITE 100 TUALATIN, OR 97062 PH: 503-563-6151 EMAIL: MIMID@AKS-ENG.COM
PROJECT LOCATION	LOCATED SOUTH OF SW NORWOOD ROAD AND EAST OF SW BOONES FERRY ROAD IN THE CITY OF TUALATIN, WASHINGTON COUNTY, OREGON
PROPERTY DESCRIPTION	TAX LOTS 100, 400, 401, 500, 501, 600, 800, AND 900 (WASHINGTON COUNTY ASSESSOR'S MAP 2S 1 35D) LOCATED IN THE CENTRAL PORTION OF SECTION 35, TOWNSHIP 2 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON
EXISTING LAND USE	SINGLE FAMILY RESIDENTIAL WITH ASSOCIATED AGRICULTURAL FIELD AND VACANT LAND
PROJECT PURPOSE	SINGLE-FAMILY ATTACHED AND DETACHED RESIDENTIAL, 400 LOT RESIDENTIAL SUBDIVISION WITH 2 COMMERCIAL LOTS IN THE RML ZONE DISTRICT
VERTICAL DATUM	VERTICAL DATUM: ELEVATIONS ARE BASED ON WASHINGTON COUNTY BENCHMARK NO. 452, LOCATED AT THE NORTHWEST CORNER OF THE BRIDGE ON NORWOOD ROAD OVER INTERSTATE 5 FREEWAY. ELEVATION = 342.76 FEET (NGVD 29).

AKS DRAWING FILE: 7454 COVER.DWG | LAYOUT: PO-00

AKS

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12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
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WWW.AKS-ENG.COM

ENGINEERING · SURVEYING · NATURAL RESOURCES
FORESTRY · PLANNING · LANDSCAPE ARCHITECTURE

LENNAR

COVER SHEET WITH VICINITY MAP
AUTUMN SUNRISE SUBDIVISON
LENNAR NORTHWEST, INC.
TUALATIN, OREGON

84800PE
JULY 12, 2016
MARKO SIMIC
PRELIMINARY
RENEWAL DATE: 6/30/22

JOB NUMBER:	7454
DATE:	7/1/2021
DESIGNED BY:	JSM
DRAWN BY:	JSM
CHECKED BY:	DS

PO-00

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LEGEND

	EXISTING	PROPOSED
DECIDUOUS TREE	◌	●
CONIFEROUS TREE	✧	✶
FIRE HYDRANT	♀	●
WATER BLOWOFF	♀	⫯
WATER METER	▭	▬
WATER VALVE	⋈	⧓
DOUBLE CHECK VALVE	⊠	▣
AIR RELEASE VALVE	♂	♂
SANITARY SEWER CLEAN OUT	○	●
SANITARY SEWER MANHOLE	○	●
SIGN	─o─	─●─
STREET LIGHT	☼	✹
MAILBOX	MB	MB

	EXISTING	PROPOSED
STORM DRAIN CLEAN OUT	○	●
STORM DRAIN CATCH BASIN	□	■
STORM DRAIN AREA DRAIN	□	■
STORM DRAIN MANHOLE	◎	◉
GAS METER	◘	◙
GAS VALVE	◐	◐
GUY WIRE ANCHOR	←	←
UTILITY POLE	─o─	─●─
POWER VAULT	P	P
POWER JUNCTION BOX	△	▲
POWER PEDESTAL	□	■
COMMUNICATIONS VAULT	C	C
COMMUNICATIONS JUNCTION BOX	△	▲
COMMUNICATIONS RISER	⬠	⬟

	EXISTING	PROPOSED
RIGHT-OF-WAY LINE	—— – – —— – – ——	━━ ━ ━ ━━ ━ ━ ━━
BOUNDARY LINE	━━━━━━	━━━━━━
PROPERTY LINE	──────	──────
CENTERLINE	—— – —— – ——	—— – —— – ——
DITCH	— — — > — — — > —	——— > ——— > ——— > ———
CURB	══════	══════
EDGE OF PAVEMENT	- - - - - - - -	— — — — — — —
EASEMENT	- - - - - - - -	- - - - - - - -
FENCE LINE	── XXX ── XXX ── XXX ──	─o──o──o──o──o─
GRAVEL EDGE	....	. . . .
POWER LINE	— — — — PWR — — — — PWR —	── PWR ── PWR ──
OVERHEAD WIRE	──── — — — OHW ────	── OHW ── OHW ──
COMMUNICATIONS LINE	— — — — COM — — — — COM —	── COM ── COM ──
FIBER OPTIC LINE	— — — — CFO — — — — CFO —	— — — — CFO — — — — CFO —
GAS LINE	— — — — GAS — — — — GAS —	── GAS ── GAS ── GAS ──
STORM DRAIN LINE	— — — — STM — — — — STM —	── STM ── STM ──
SANITARY SEWER LINE	— — — — SAN — — — — SAN —	── SAN ── SAN ──
WATER LINE	— — — — WAT — — — — WAT —	── WAT ── WAT ──

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SHEET INDEX AND LEGEND
AUTUMN SUNRISE SUBDIVISON
LENNAR NORTHWEST, INC.
TUALATIN, OREGON

PRELIMINARY
MARKO SIMIC
RENEWAL DATE: 6/30/22

JOB NUMBER: 7454
DATE: 7/1/2021
DESIGNED BY: JSM
DRAWN BY: JSM
CHECKED BY: DS

PO-01

LEGEND

🟨 RESIDENTIAL LOTS

🟥 COMMERCIAL LOTS

🟩 OPEN SPACE

▨ STORMWATER FACILITY

POTENTIAL PLAN ELEMENTS, LOCATIONS, AND DETAILS AS SHOWN ARE CONCEPTUAL AND SUBJECT TO CHANGE

MULTI-USE PATHWAY

WIDENED EASY WALK SURFACE AND VEGETATION PROVIDE A LOW-STRESS ROUTE THAT CONNECTS THE COMMUNITY AND ENHANCES ACCESS

TREE PRESERVATION AREA

EXISTING TREES TO BE RETAINED

BUFFER PLANTINGS AND FENCE

CWS SANITARY SEWER PUMP STATION

STORMWATER FACILITY

NATIVE TREES & SHRUBS

EXISTING WATER RESERVOIR

COMMERCIAL

OPEN SPACE

PICNIC BENCH & TREES

NEIGHBORHOOD PARK

PICKLEBALL COURT & PICNIC SHELTER

STORMWATER FACILITY

NATIVE TREES & SHRUBS

OPEN SPACE

5' PEDESTRIAN PATH

AKS DRAWING FILE: 7454LMPL-MP.DWG | LAYOUT: TB

CONCEPTUAL MASTER PLAN
AUTUMN SUNRISE SUBDIVISON
LENNAR NORTHWEST, INC.
TUALATIN, OREGON

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REGISTERED LANDSCAPE ARCHITECT
KIRSTI OSWALD
797
OREGON
06/06/13
PRELIMINARY

JOB NUMBER:	7454
DATE:	7/1/2021
DESIGNED BY:	NKP
DRAWN BY:	NKP
CHECKED BY:	KAH

PO-02

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AERIAL PHOTO SITE MAP
AUTUMN SUNRISE SUBDIVISON
LENNAR NORTHWEST, INC.
TUALATIN, OREGON

84806PE
OREGON
JULY 12, 2016
DARKO SIMIC

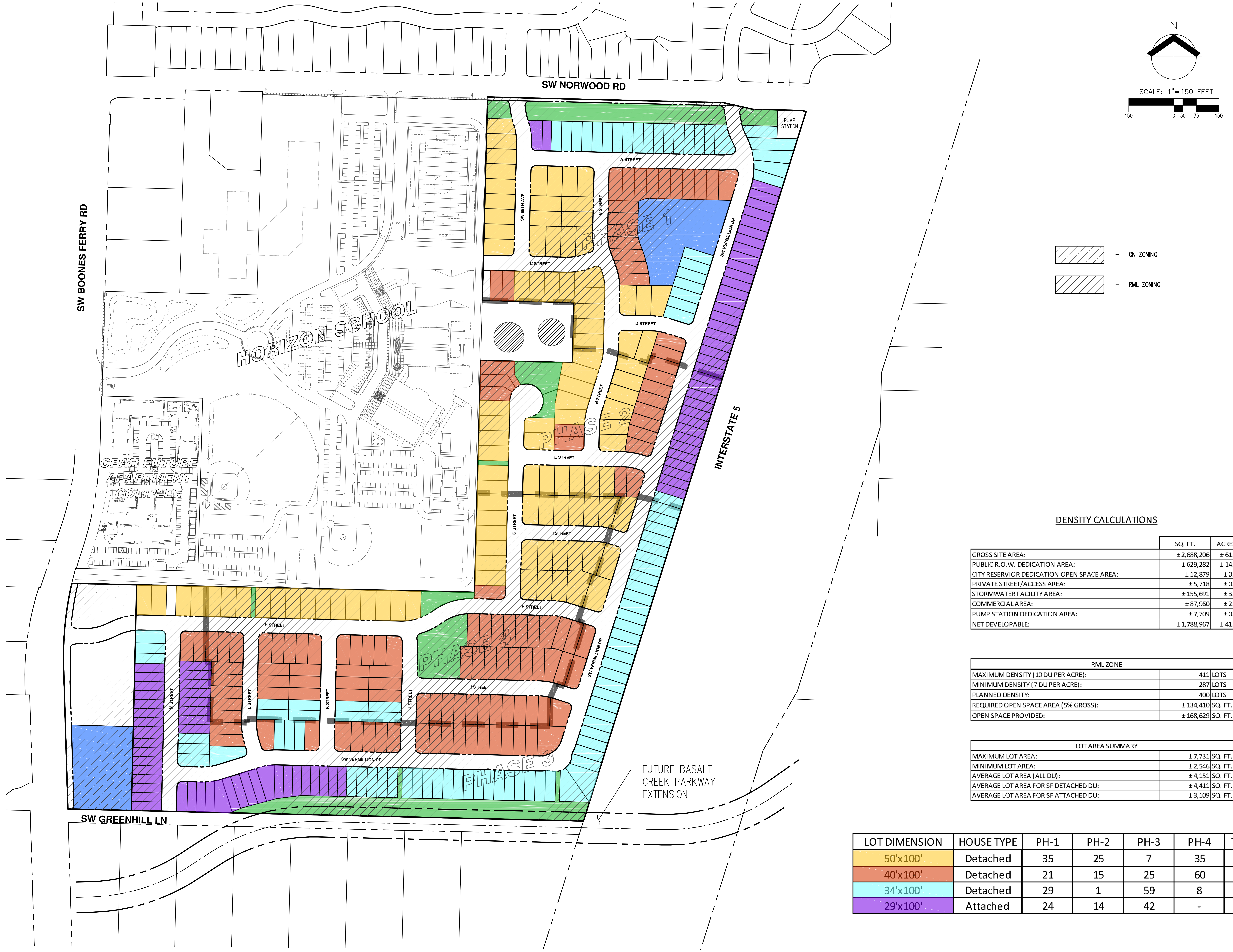
PRELIMINARY

RENEWAL DATE: 6/30/22

JOB NUMBER: 7454
DATE: 7/1/2021
DESIGNED BY: JSM
DRAWN BY: JSM
CHECKED BY: DS

PO-03

AKS DRAWING FILE: 7454 SITE AERIAL.DWG | LAYOUT: LAYOUT1



DENSITY CALCULATIONS

	SQ. FT.	ACRES
GROSS SITE AREA:	± 2,688,206	± 61.71
PUBLIC R.O.W. DEDICATION AREA:	± 629,282	± 14.45
CITY RESERVIOR DEDICATION OPEN SPACE AREA:	± 12,879	± 0.30
PRIVATE STREET/ACCESS AREA:	± 5,718	± 0.13
STORMWATER FACILITY AREA:	± 155,691	± 3.57
COMMERCIAL AREA:	± 87,960	± 2.02
PUMP STATION DEDICATION AREA:	± 7,709	± 0.18
NET DEVELOPABLE:	± 1,788,967	± 41.07

RML ZONE		
MAXIMUM DENSITY (10 DU PER ACRE):	411	LOTS
MINIMUM DENSITY (7 DU PER ACRE):	287	LOTS
PLANNED DENSITY:	400	LOTS
REQUIRED OPEN SPACE AREA (5% GROSS):	± 134,410	SQ. FT.
OPEN SPACE PROVIDED:	± 168,629	SQ. FT.

LOT AREA SUMMARY		
MAXIMUM LOT AREA:	± 7,731	SQ. FT.
MINIMUM LOT AREA:	± 2,546	SQ. FT.
AVERAGE LOT AREA (ALL DU):	± 4,151	SQ. FT.
AVERAGE LOT AREA FOR SF DETACHED DU:	± 4,411	SQ. FT.
AVERAGE LOT AREA FOR SF ATTACHED DU:	± 3,109	SQ. FT.

LOT DIMENSION	HOUSE TYPE	PH-1	PH-2	PH-3	PH-4	TOTAL UNITS
🟨 50'x100'	Detached	35	25	7	35	102
🟧 40'x100'	Detached	21	15	25	60	121
🟦 34'x100'	Detached	29	1	59	8	97
🟪 29'x100'	Attached	24	14	42	-	80

AKS DRAWING FILE: 7454 PRODUCT DIST.DWG | LAYOUT: PP-00

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PRODUCT DISTRIBUTION PLAN
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LENNAR NORTHWEST, INC.
TUALATIN, OREGON

REGISTERED PROFESSIONAL ENGINEER
84806PE
OREGON
JULY 12, 2016
DARKO SIMIC
PRELIMINARY
RENEWAL DATE: 6/30/22

JOB NUMBER:	7454
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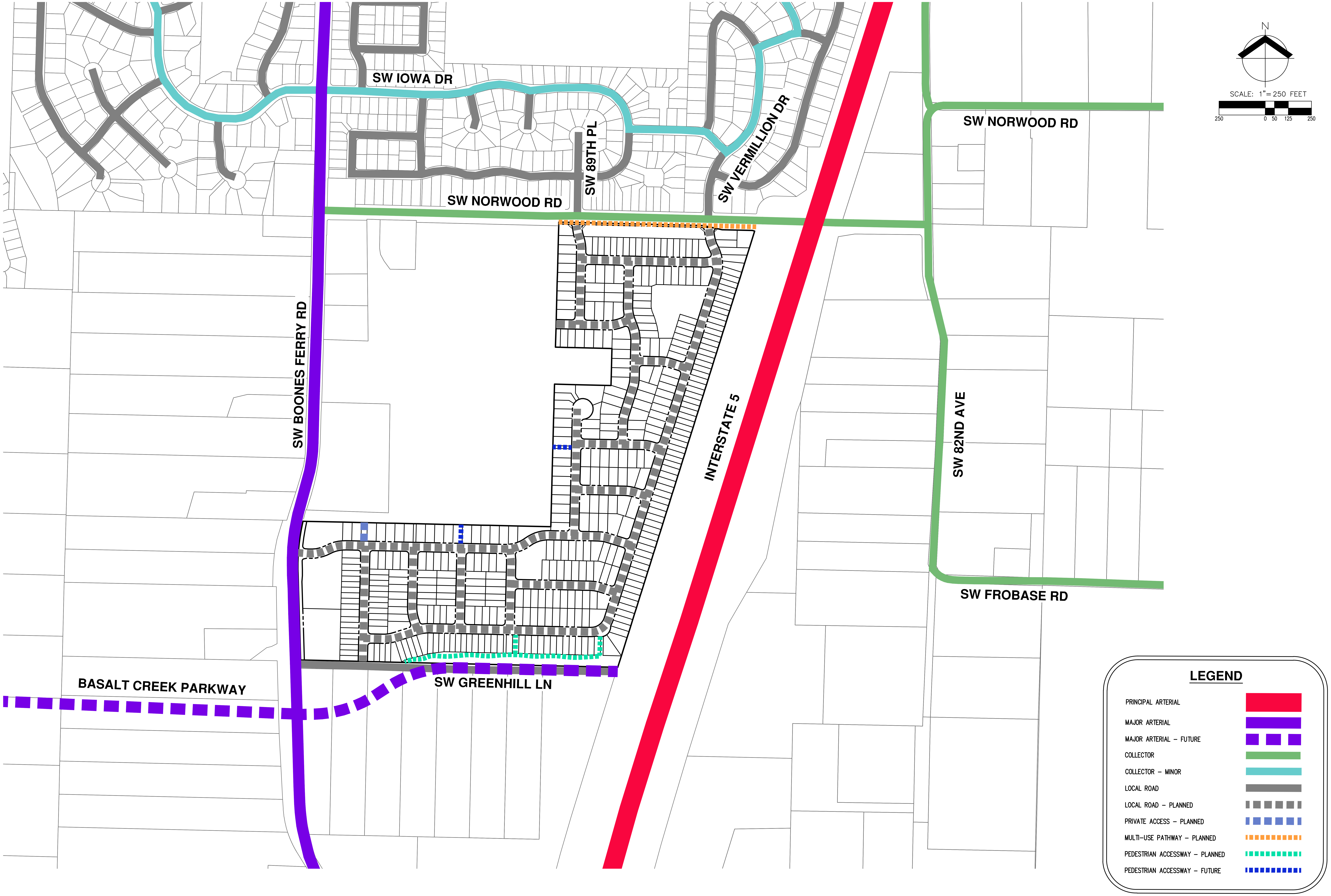
PO-04



AKS DRAWING FILE: 7454 CIRCULATION.DWG | LAYOUT: PO-05

PRELIMINARY CIRCULATION PLAN
AUTUMN SUNRISE SUBDIVISON
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TUALATIN, OREGON

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REGISTERED PROFESSIONAL ENGINEER
84806PE
OREGON
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DARKO SIMIC
PRELIMINARY
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PO-05

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5. BUILDING FOOTPRINTS ARE MEASURED TO SIDING UNLESS NOTED OTHERWISE. CONTACT SURVEYOR WITH QUESTIONS REGARDING BUILDING TIES.

6. CONTOUR INTERVAL IS 1 FOOT.

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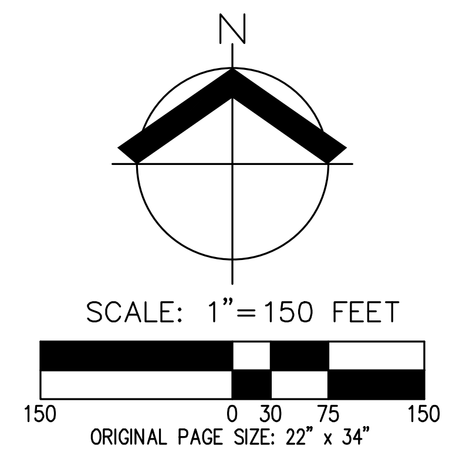

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EXISTING CONDITIONS OVERVIEW
AUTUMN SUNRISE SUBDIVISON
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TUALATIN, OREGON

REGISTERED
PROFESSIONAL
LAND SURVEYOR

OREGON
JANUARY 12, 2016
MICHAEL S. KALINA
89558PLS

PRELIMINARY

RENEWS: 6/30/23

JOB NUMBER:	7454
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EX-00

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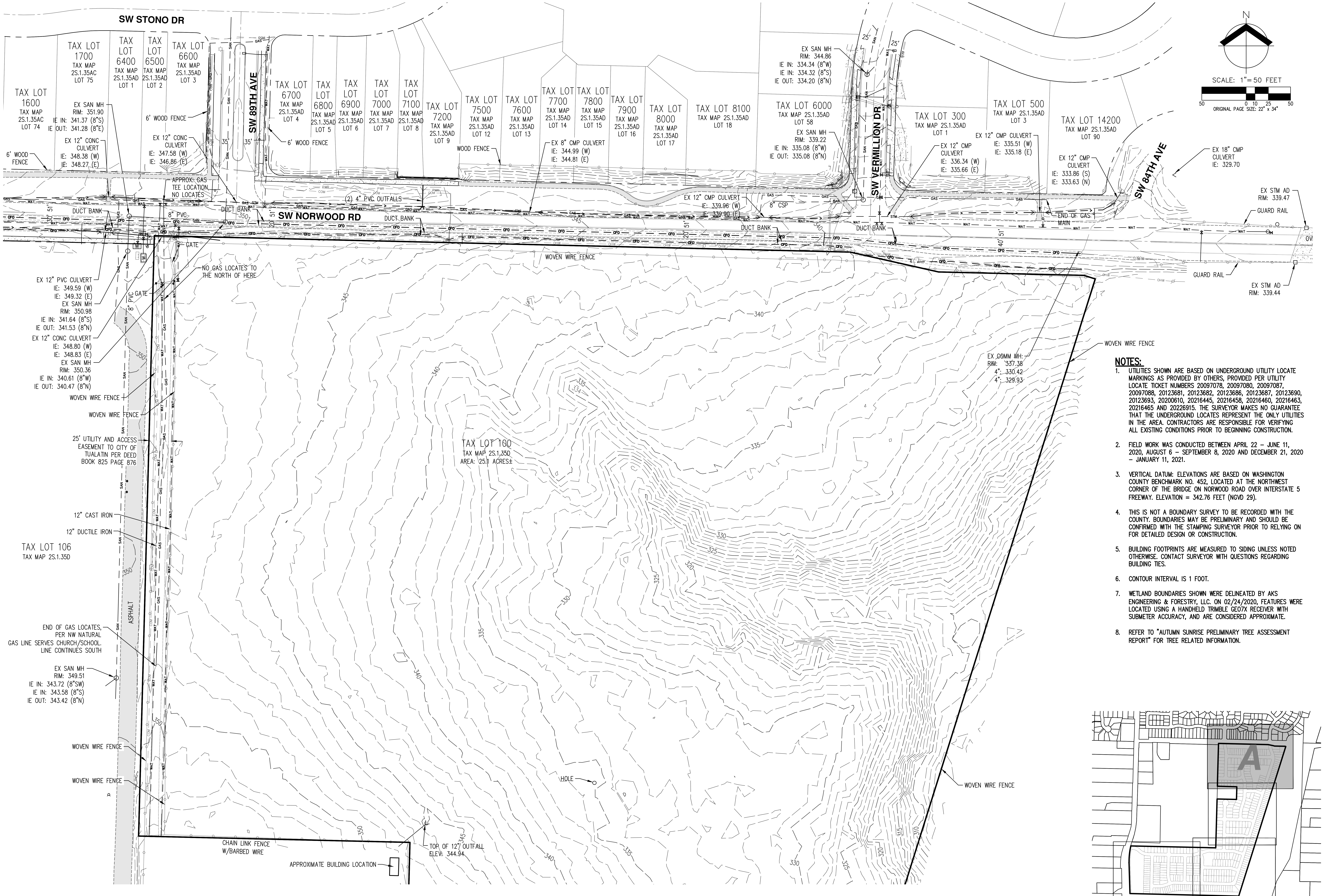

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8. REFER TO "AUTUMN SUNRISE PRELIMINARY TREE ASSESSMENT REPORT" FOR TREE RELATED INFORMATION.

AKS DRAWING FILE: 7454 EXCOND.DWG | LAYOUT: EX-01

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TUALATIN, OREGON

REGISTERED
PROFESSIONAL
LAND SURVEYOR
OREGON
JANUARY 12, 2016
MICHAEL S. KALINA
89558PLS
RENEWS: 6/30/23
PRELIMINARY

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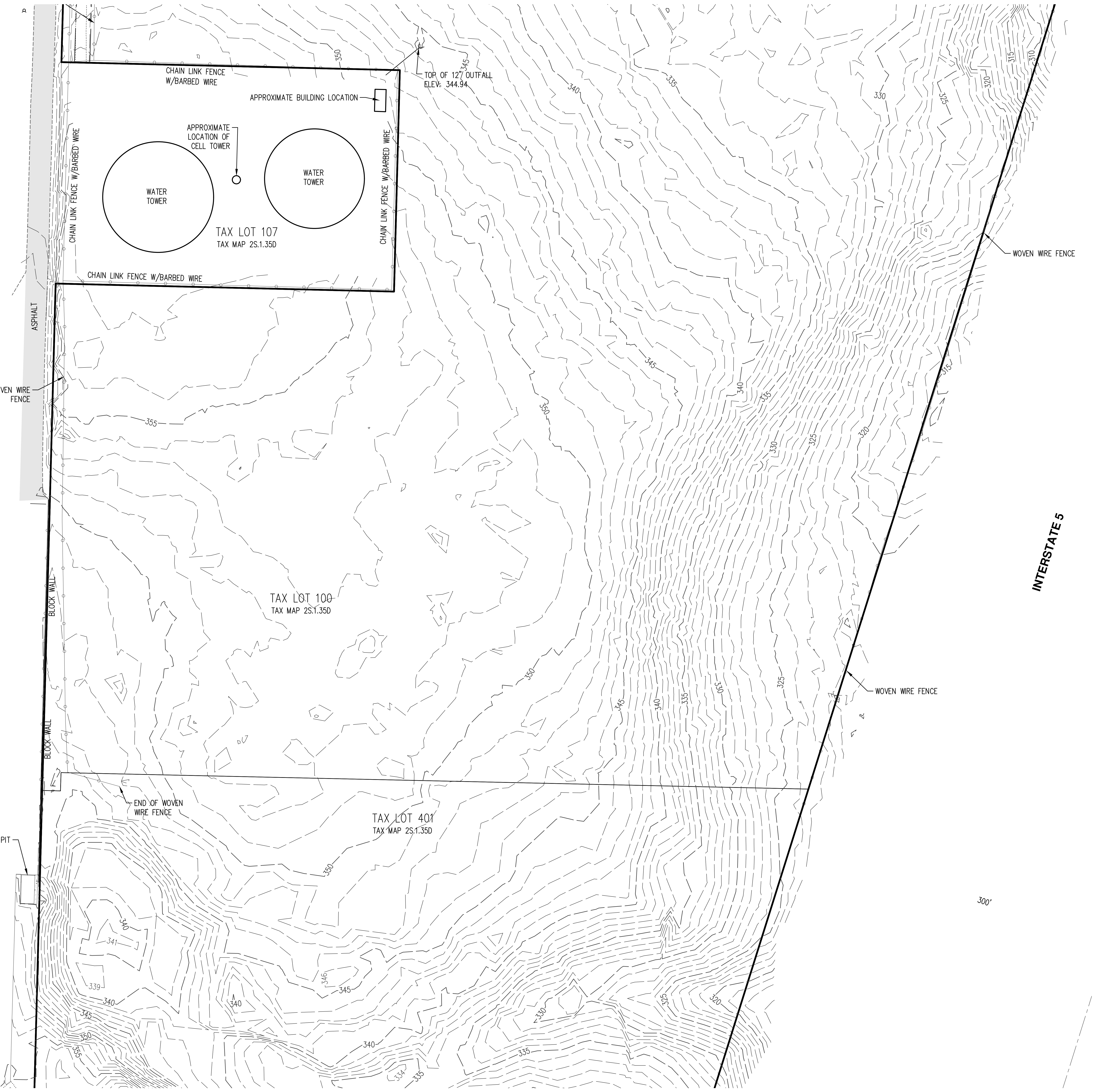

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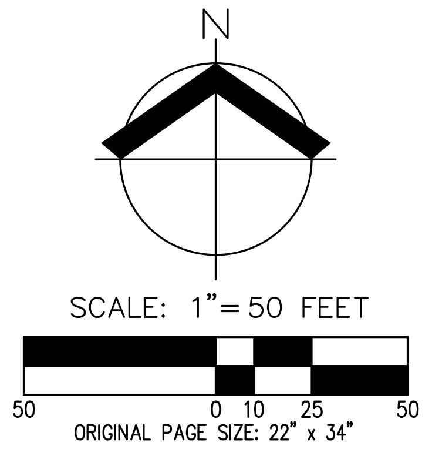

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LENNAR NORTHWEST, INC.
TUALATIN, OREGON

REGISTERED
PROFESSIONAL
LAND SURVEYOR
PRELIMINARY
OREGON
JANUARY 12, 2016
MICHAEL S. KALINA
89558PLS
RENEWS: 6/30/23

JOB NUMBER:	7454
DATE:	7/1/2021
DESIGNED BY:	JSM
DRAWN BY:	JSM
CHECKED BY:	DS

EX-02

AKS DRAWING FILE: 7454 EXCOND.DWG | LAYOUT: EX-02

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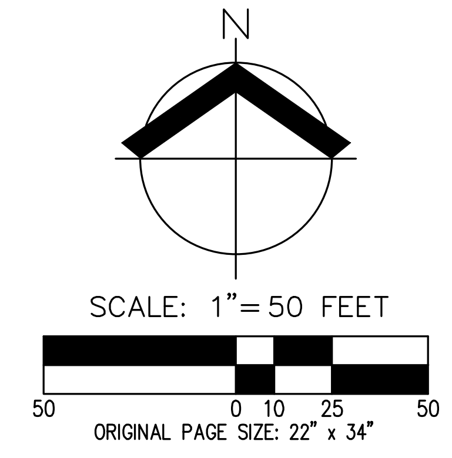

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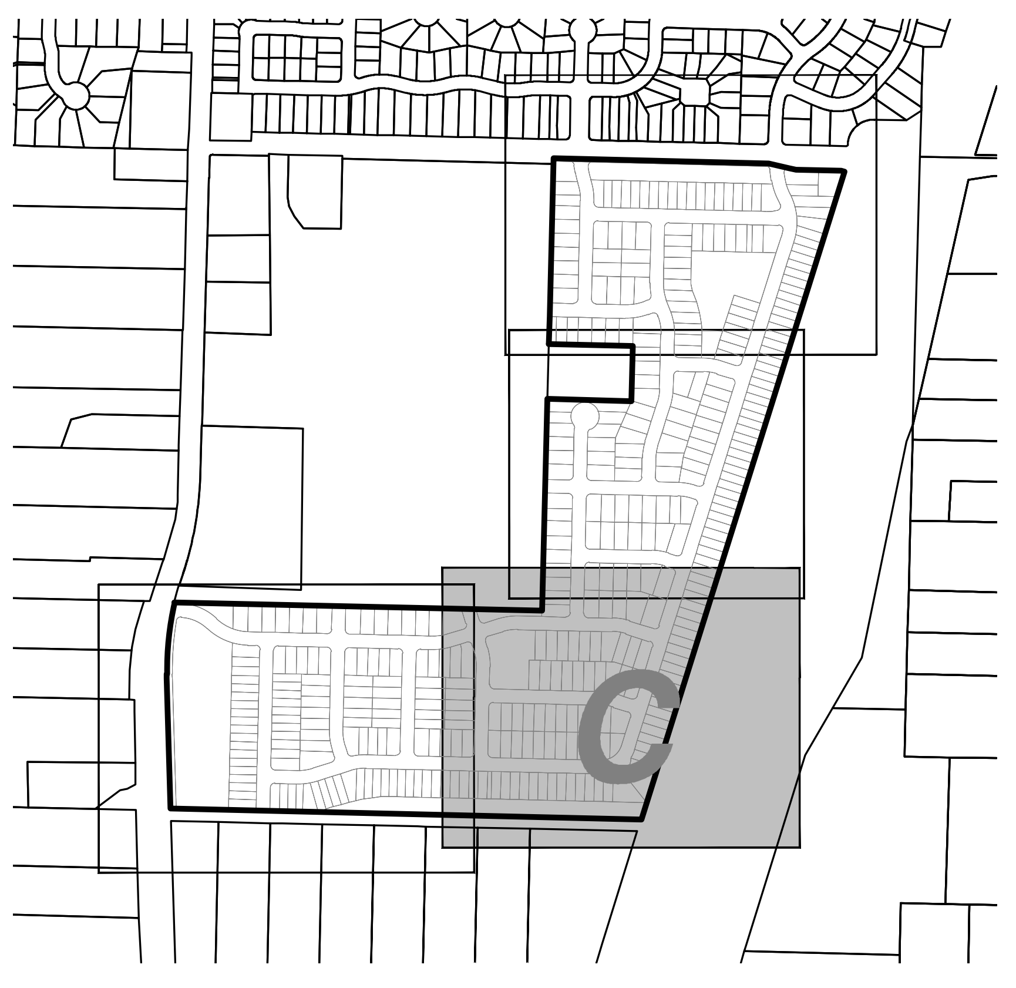

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EXISTING CONDITIONS (SE)
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PROFESSIONAL
LAND SURVEYOR

OREGON
JANUARY 12, 2016
MICHAEL S. KALINA
89558PLS

PRELIMINARY

RENEWS: 6/30/23

JOB NUMBER:	7454
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DESIGNED BY:	JSM
DRAWN BY:	JSM
CHECKED BY:	DS

EX-03

AKS DRAWING FILE: 7454 EXCOND.DWG | LAYOUT: EX-03

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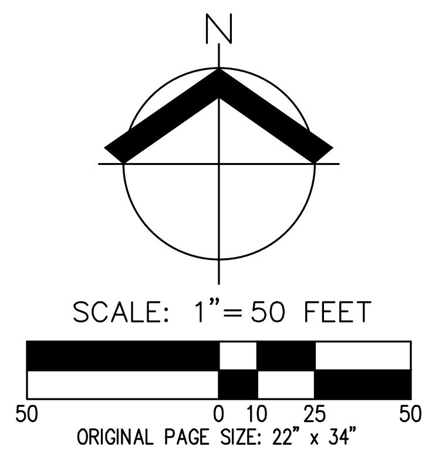

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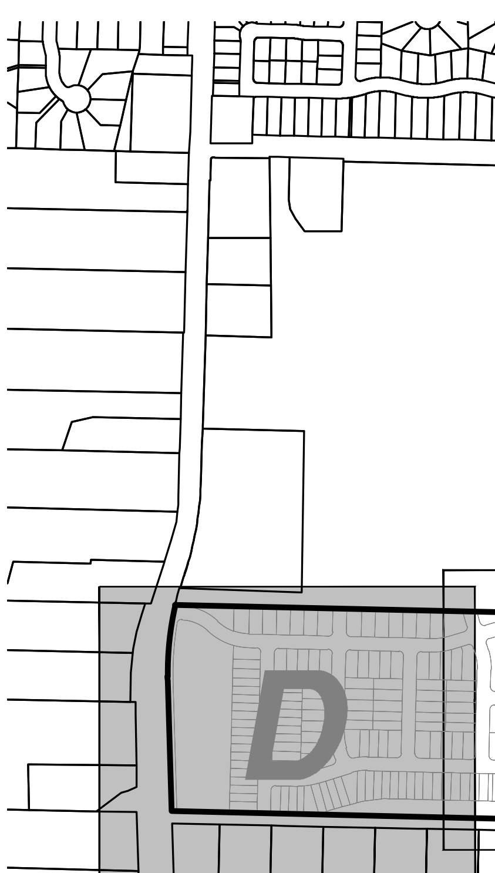

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OREGON
JANUARY 12, 2016
MICHAEL S. KALINA
89558PLS

PRELIMINARY

RENEWS: 6/30/23

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EX-04

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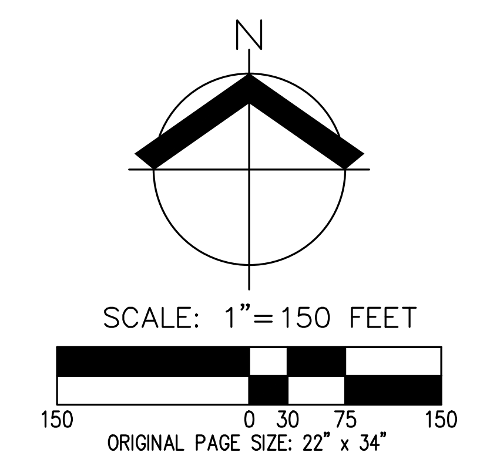

TRACT NOTES:

TRACT A:	OPEN SPACE AREA TO BE OWNED AND MAINTAINED BY THE AUTUMN SUNRISE HOA.
TRACT B:	PRIVATE ACCESS TO BE OWNED AND MAINTAINED BY THE CITY OF TUALATIN.
TRACT C:	STORMWATER FACILITY TO BE OWNED AND MAINTAINED BY THE CITY OF TUALATIN WITH A STORM DRAINAGE, SURFACE DRAINAGE, AND ACCESS EASEMENT TO CLEAN WATER SERVICES.
TRACT D:	OPEN SPACE AREA TO BE OWNED AND MAINTAINED BY THE AUTUMN SUNRISE HOA. PEDESTRIAN EASEMENT TO CITY OF TUALTATIN AS SHOWN.
TRACT E:	OPEN SPACE AREA TO BE OWNED AND MAINTAINED BY THE AUTUMN SUNRISE HOA.
TRACT F:	SANITARY SEWER PUMP STATION TO BE OWNED AND MAINTAINED BY CLEAN WATER SERVICES.
TRACT G:	OPEN SPACE AREA TO BE OWNED AND MAINTAINED BY THE AUTUMN SUNRISE HOA.
TRACT H:	OPEN SPACE TO BE OWNED AND MAINTAINED BY THE CITY OF TUALATIN. FUTURE CITY RESERVOIR AREA.
TRACT I:	OPEN SPACE WITH FUTURE PEDESTRIAN ACCESS TO BE OWNED AND MAINTAINED BY THE AUTUMN SUNRISE HOA. PEDESTRIAN EASEMENT TO CITY OF TUALATIN.
TRACT J:	OPEN SPACE WITH PEDESTRIAN PATH TO BE OWNED AND MAINTAINED BY THE AUTUMN SUNRISE HOA. PEDESTRIAN EASEMENT TO CITY OF TUALATIN AS SHOWN.
TRACT K:	STORMWATER FACILITY TO BE OWNED AND MAINTAINED BY THE CITY OF TUALATIN WITH A STORM DRAINAGE, SURFACE DRAINAGE, AND ACCESS EASEMENT TO CLEAN WATER SERVICES.
TRACT L:	PRIVATE ACCESS TRACT TO BE OWNED AND MAINTAINED BY TAX LOT 303.
TRACT M:	NEIGHBORHOOD PARK TO BE OWNED AND MAINTAINED BY THE AUTUMN SUNRISE HOA.
TRACT N:	OPEN SPACE WITH FUTURE PEDESTRIAN ACCESS TO BE OWNED AND MAINTAINED BY THE AUTUMN SUNRISE HOA. PEDESTRIAN EASEMENT TO CITY OF TUALATIN.
TRACT O:	OPEN SPACE AREA TO BE OWNED AND MAINTAINED BY THE AUTUMN SUNRISE HOA.

AKS DRAWING FILE: 7454 PLAT OVERVIEW.DWG | LAYOUT: PP-00

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PRELIMINARY PLAT OVERVIEW
AUTUMN SUNRISE SUBDIVISON
LENNAR NORTHWEST, INC.
TUALATIN, OREGON

REGISTERED
PROFESSIONAL
LAND SURVEYOR
OREGON
JANUARY 12, 2016
MICHAEL S. KALINA
89558PLS
RENEWS: 6/30/23
PRELIMINARY

JOB NUMBER:	7454
DATE:	7/1/2021
DESIGNED BY:	JSM
DRAWN BY:	JSM
CHECKED BY:	DS

PP-00

SW 89TH AVE ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T1	10+00.00		74.92'			S08°42'20"E
℄C1	10+74.92	200.00'	35.71'	10°13'45"	35.66	S13°49'12"E
℄C2	11+10.63	200.00'	70.83'	20°17'25"	70.46	S08°47'22"E
℄T2	11+81.46		425.90'			S01°21'21"W

A STREET ALIGNMENT TABLE

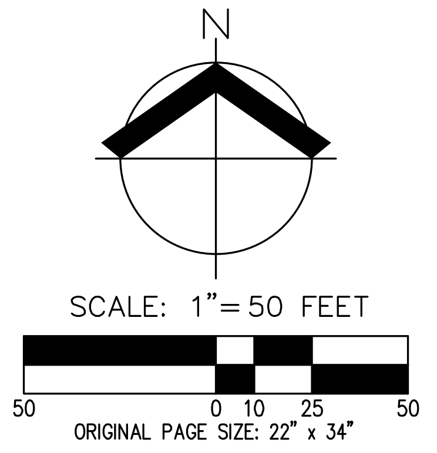
CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T3	0+75.00		679.80'			S88°38'39"E
℄C3	7+54.80	200.00'	28.13'	8°03'28"	28.10	N87°19'37"E
℄T4	7+82.93		82.21'			N83°17'53"E

B STREET ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T5	0+75.00		270.58'			S01°21'21"W
℄C4	3+45.58	190.00'	72.10'	21°44'30"	71.67	S09°30'54"E
℄T6	4+17.68		46.24'			S20°23'09"E
℄C5	4+63.93	200.00'	75.89'	21°44'30"	75.44	S09°30'54"E
℄T7	5+39.82		197.25'			S01°21'21"W

C STREET ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T12	0+75.00		79.63'			S69°36'51"W
℄C10	1+54.63	200.00'	75.89'	21°44'30"	75.44	S80°29'06"W
℄T13	2+30.52		475.76'			N88°38'39"W

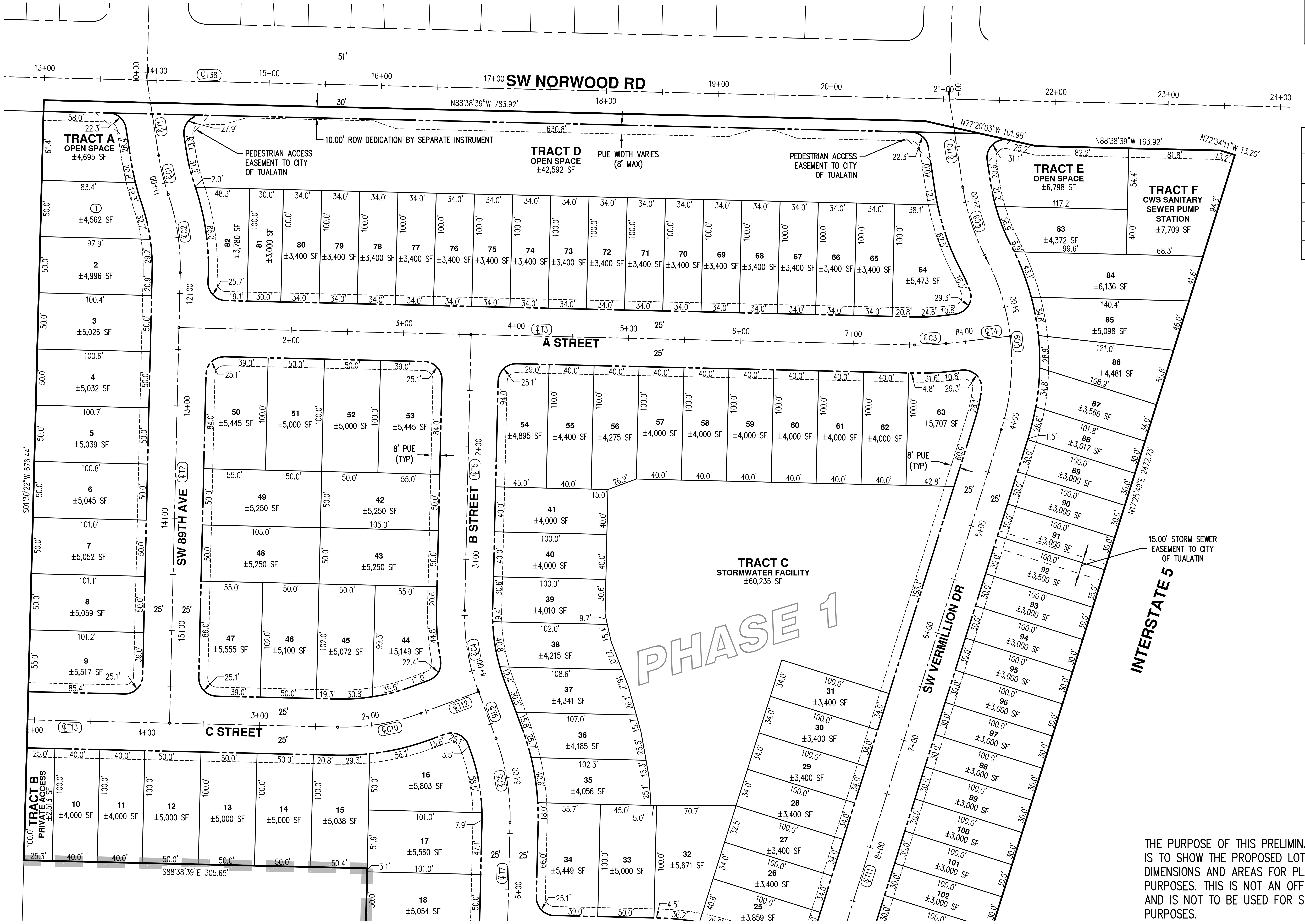


SW NORWOOD RD ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T38	0+00.00		2892.61'			S88°38'39"E

SW VERMILLION DR ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T10	1+00.00		86.47'			S08°37'17"E
℄C8	1+86.47	200.00'	66.43'	19°01'50"	66.12	S18°08'13"E
℄C9	2+52.90	200.00'	157.37'	45°04'57"	153.34	S05°06'39"E
℄T11	4+10.27		1942.76'			S17°25'49"W



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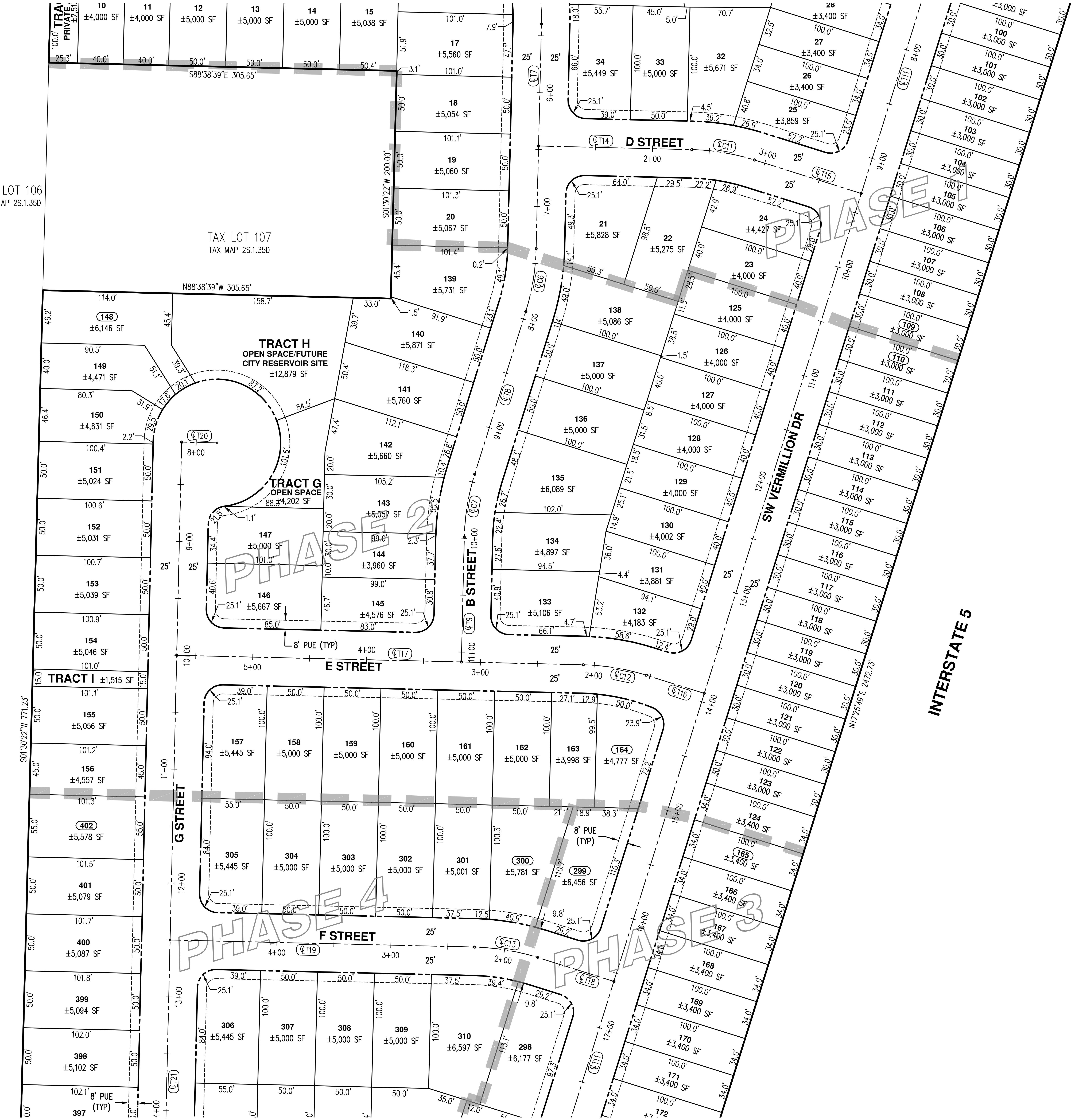

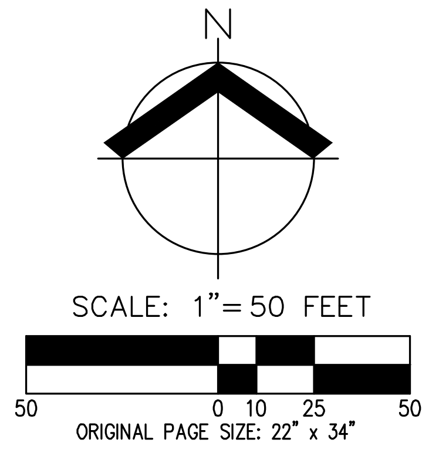

SW VERMILLION DR ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T11	4+10.27		1942.76'			S17°25'49"W

B STREET ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T7	5+39.82		197.25'			S01°21'21"W
℄C6	7+37.07	200.00'	56.11'	16°04'28"	55.93	S09°23'35"W
℄T8	7+93.18		149.70'			S17°25'49"W
℄C7	9+42.89	200.00'	56.19'	16°05'50"	56.01	S09°22'54"W
℄T9	9+99.08		134.54'			S01°19'59"W

D STREET ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T14	0+75.00		159.50'			S88°38'39"E
℄C11	2+34.50	200.00'	56.11'	16°04'28"	55.93	S80°36'25"E
℄T15	2+90.62		123.19'			S72°34'11"E

E STREET ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T16	0+75.00		78.45'			N72°34'11"W
℄C12	1+53.45	200.00'	56.19'	16°05'50"	56.01	N80°37'06"W
℄T17	2+09.64		382.09'			N88°40'01"W

F STREET ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T18	0+75.00		95.22'			N72°34'11"W
℄C13	1+70.22	200.00'	56.19'	16°05'50"	56.01	N80°37'06"W
℄T19	2+26.41		292.48'			N88°40'01"W

G STREET ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T20	7+81.76		31.00'			N88°40'01"W
℄T21	8+12.76		712.24'			S01°19'59"W

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89558PLS
RENEWS: 6/30/23
PRELIMINARY

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DRAWN BY:	JSM
CHECKED BY:	DS

PP-02

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G STREET ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T21	8+12.76		712.24'			S01°19'59"W

SW VERMILLION DR ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T11	4+10.27		1942.76'			S17°25'49"W
℄C19	23+53.03	100.00'	128.98'	73°54'10"	120.23	S54°22'54"W
℄T29	24+82.01		873.75'			N88°40'01"W

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H STREET ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T22	0+75.00		157.13'			N72°34'11"W
℄C14	2+32.13	200.00'	56.19'	16°05'50"	56.01	N80°37'06"W
℄T23	2+88.32		267.20'			N88°40'01"W
℄C15	5+55.52	185.00'	121.43'	37°36'28"	119.26	S72°31'45"W
℄C16	6+76.95	200.00'	131.28'	37°36'28"	128.93	S72°31'45"W
℄T24	8+08.22		860.77'			N88°40'01"W

I STREET ALIGNMENT TABLE

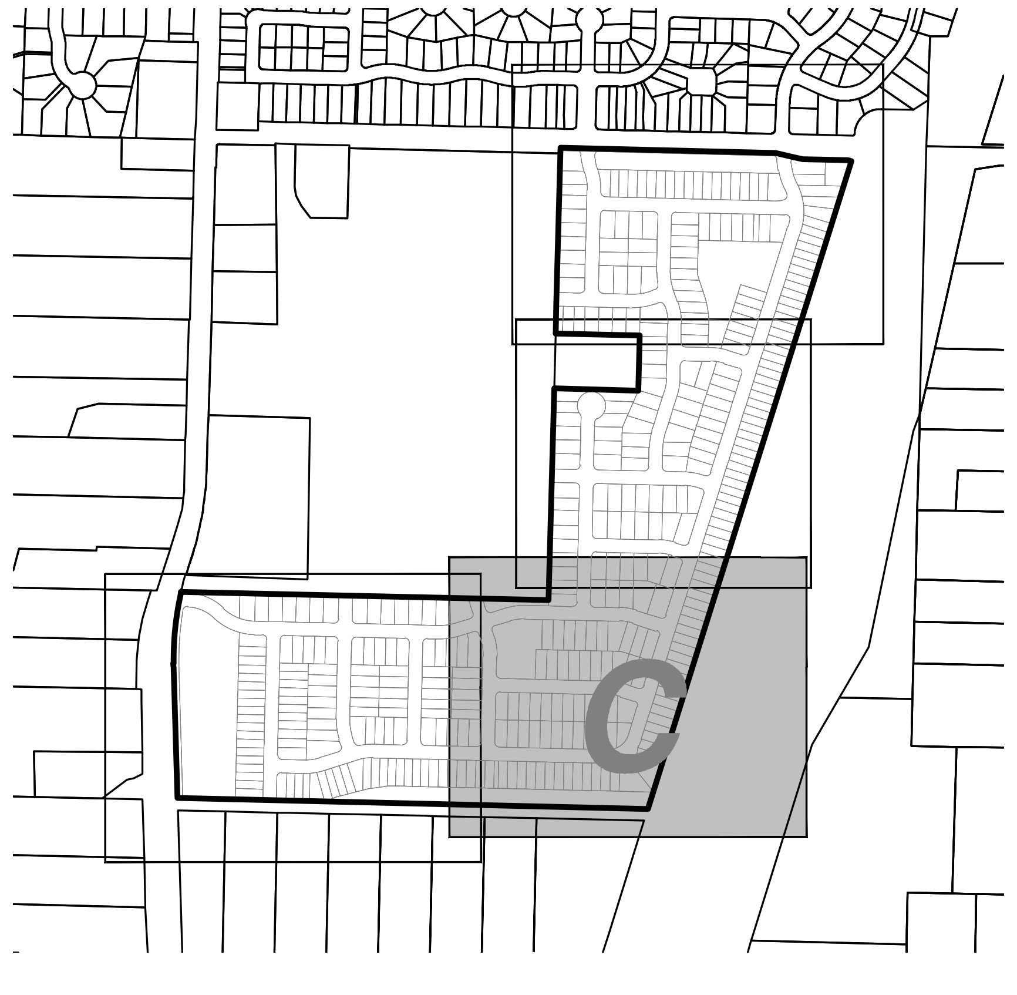
CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T25	0+75.00		119.44'			N72°34'11"W
℄C17	1+94.44	200.00'	56.19'	16°05'50"	56.01	N80°37'06"W
℄T26	2+50.63		454.79'			N88°40'01"W

J STREET ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T27	0+75.00		391.19'			N01°19'59"E
℄C18	4+66.19	185.00'	24.51'	7°35'25"	24.49	N02°27'43"W
℄T28	4+90.70		74.51'			N06°15'26"W

K STREET ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T30	0+75.00		488.00'			N01°19'59"E



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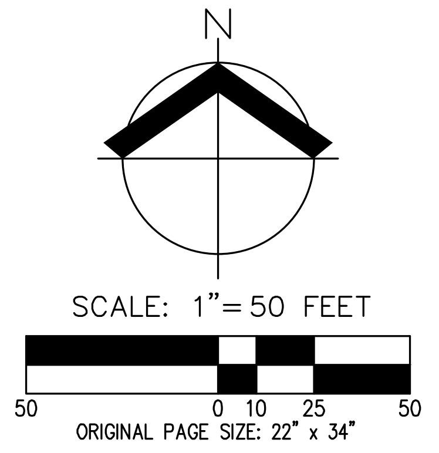

H STREET ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T24	8+08.22		860.77'			N88°40'01"W
℄C23	16+68.99	200.06'	101.85'	29°10'10"	100.76	S76°44'45"W
℄C24	17+70.84	200.00'	108.71'	31°08'39"	107.38	S78°15'08"W
℄T36	18+79.55		99.93'			N86°10'33"W

SW VERMILLION DR ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T29	24+82.01		873.75'			N88°40'01"W
℄C21	33+55.76	196.52'	64.46'	18°47'37"	64.17	S81°56'10"W
℄T33	34+20.22		129.27'			S72°32'22"W
℄C22	35+49.49	200.00'	65.60'	18°47'37"	65.31	S81°56'10"W
℄T34	36+15.09		129.57'			N88°40'01"W

SW BOONES FERRY RD ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T37	22+94.44		1261.46'			S01°43'34"E
℄C25	18+88.10	1300.00'	406.34'	17°54'32"	404.69	S07°13'42"W

K STREET ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T30	0+75.00		488.00'			N01°19'59"E

L STREET ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T31	0+75.00		87.61'			N17°27'39"W
℄C20	1+62.61	200.00'	65.60'	18°47'38"	65.31	N08°03'50"W
℄T32	2+28.22		349.95'			N01°19'59"E

M STREET ALIGNMENT TABLE

CURVE/ TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
℄T35	0+75.00		650.79'			S01°19'59"W

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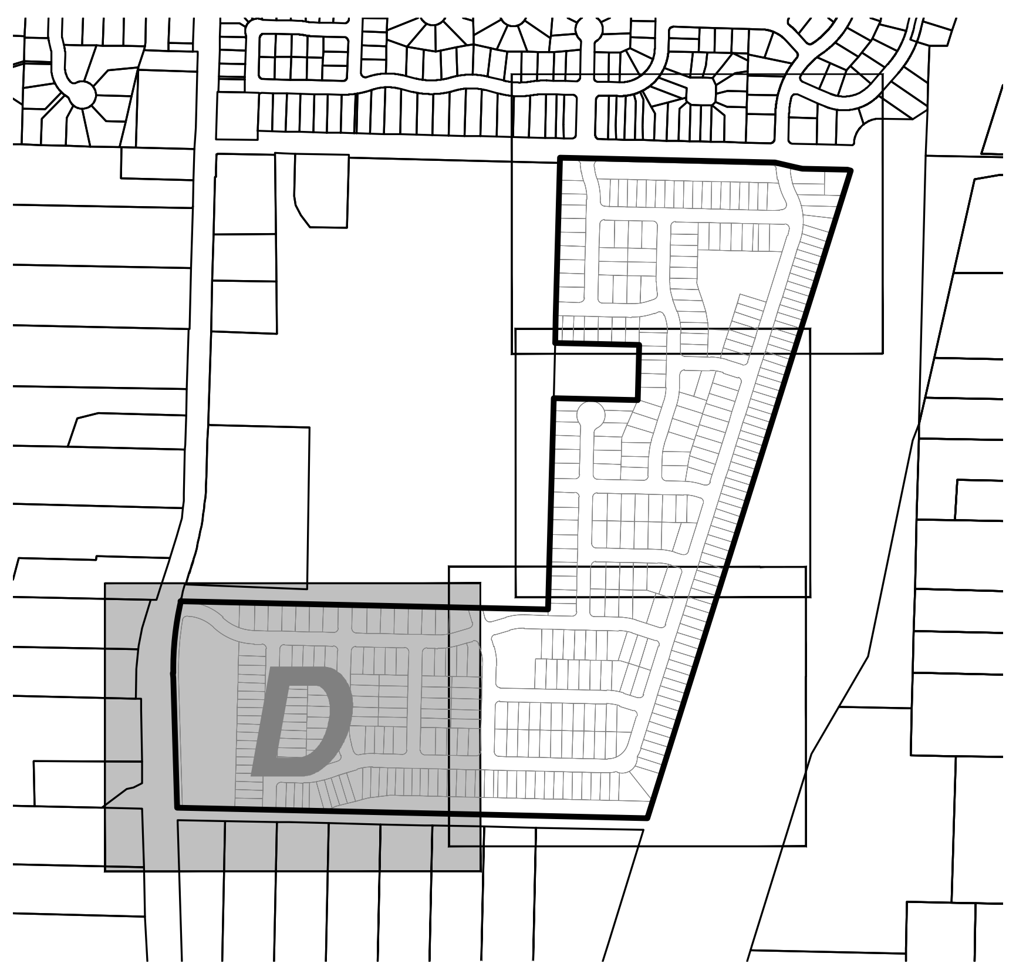

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LENNAR NORTHWEST, INC.
TUALATIN, OREGON

REGISTERED PROFESSIONAL LAND SURVEYOR
PRELIMINARY
OREGON
JANUARY 12, 2016
MICHAEL S. KALINA
89558PLS
RENEWS: 6/30/23

JOB NUMBER:	7454
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DRAWN BY:	JSM
CHECKED BY:	DS

PP-04

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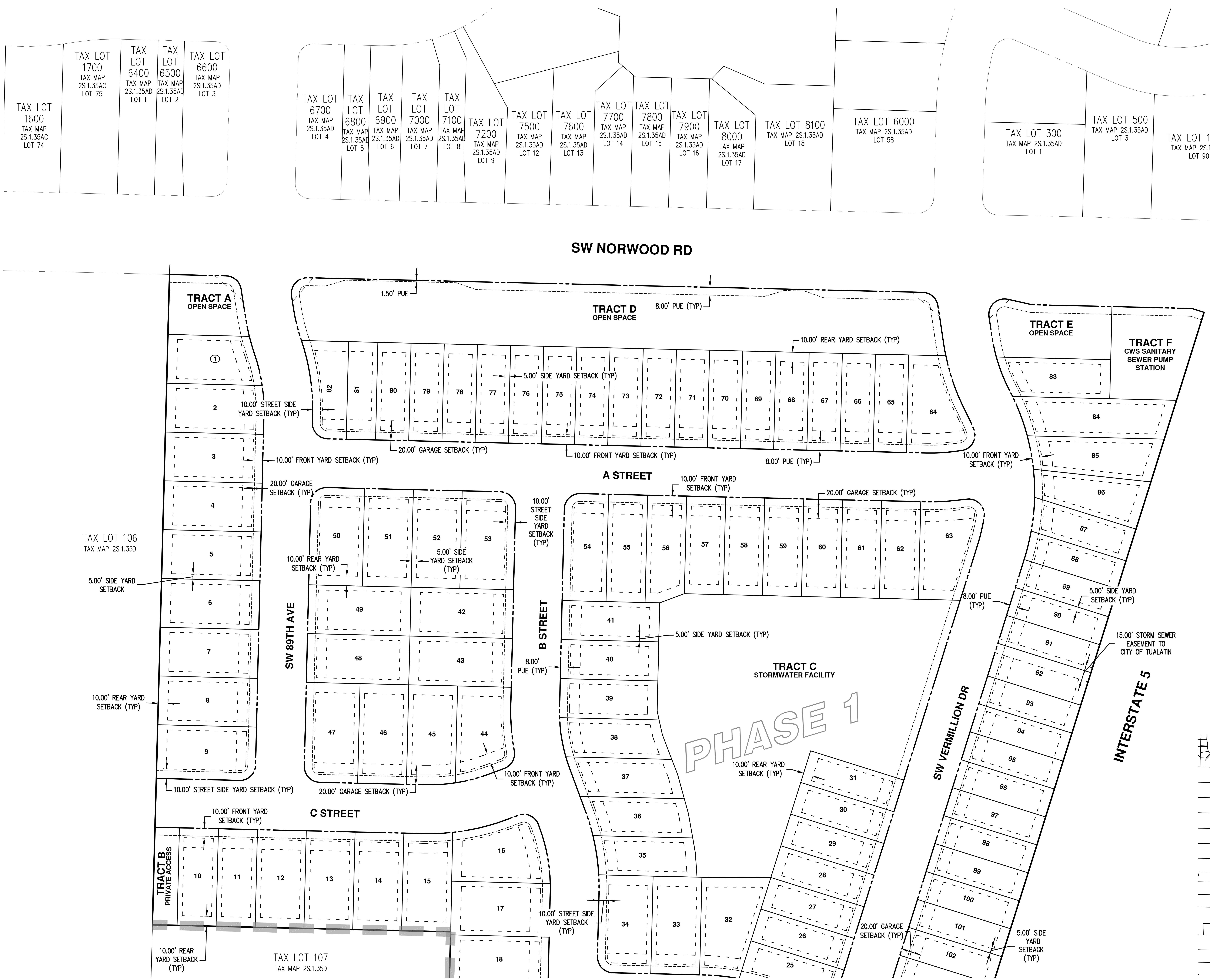

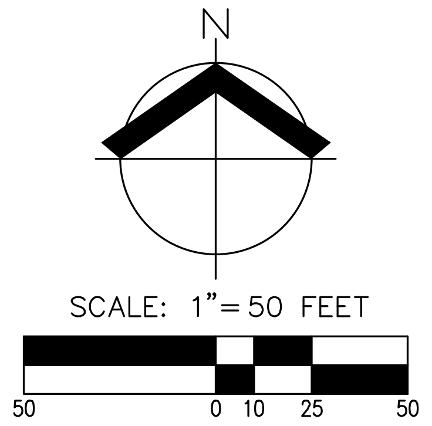

SINGLE FAMILY DETACHED SETBACKS

FRONT YARD:	10 FT
GARAGE:	20 FT
SIDE YARD:	5 FT
STREET SIDE YARD:	10 FT
REAR YARD:	10 FT

ATTACHED TOWNHOME SETBACKS

FRONT YARD:	10 FT
GARAGE:	20 FT
SIDE YARD:	5 FT
STREET SIDE YARD:	10 FT
REAR YARD:	10 FT

ATTACHED UNIT SETBACKS TO BE DETERMINED THROUGH SUBSEQUENT ARCHITECTURAL REVIEW APPLICATION.

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TUALATIN, OREGON

REGISTERED PROFESSIONAL ENGINEER
84806PE
OREGON
JULY 12, 2016
DARKO SIMIC
PRELIMINARY
RENEWAL DATE: 6/30/22

JOB NUMBER:	7454
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DRAWN BY:	JSM
CHECKED BY:	DS

SB-01

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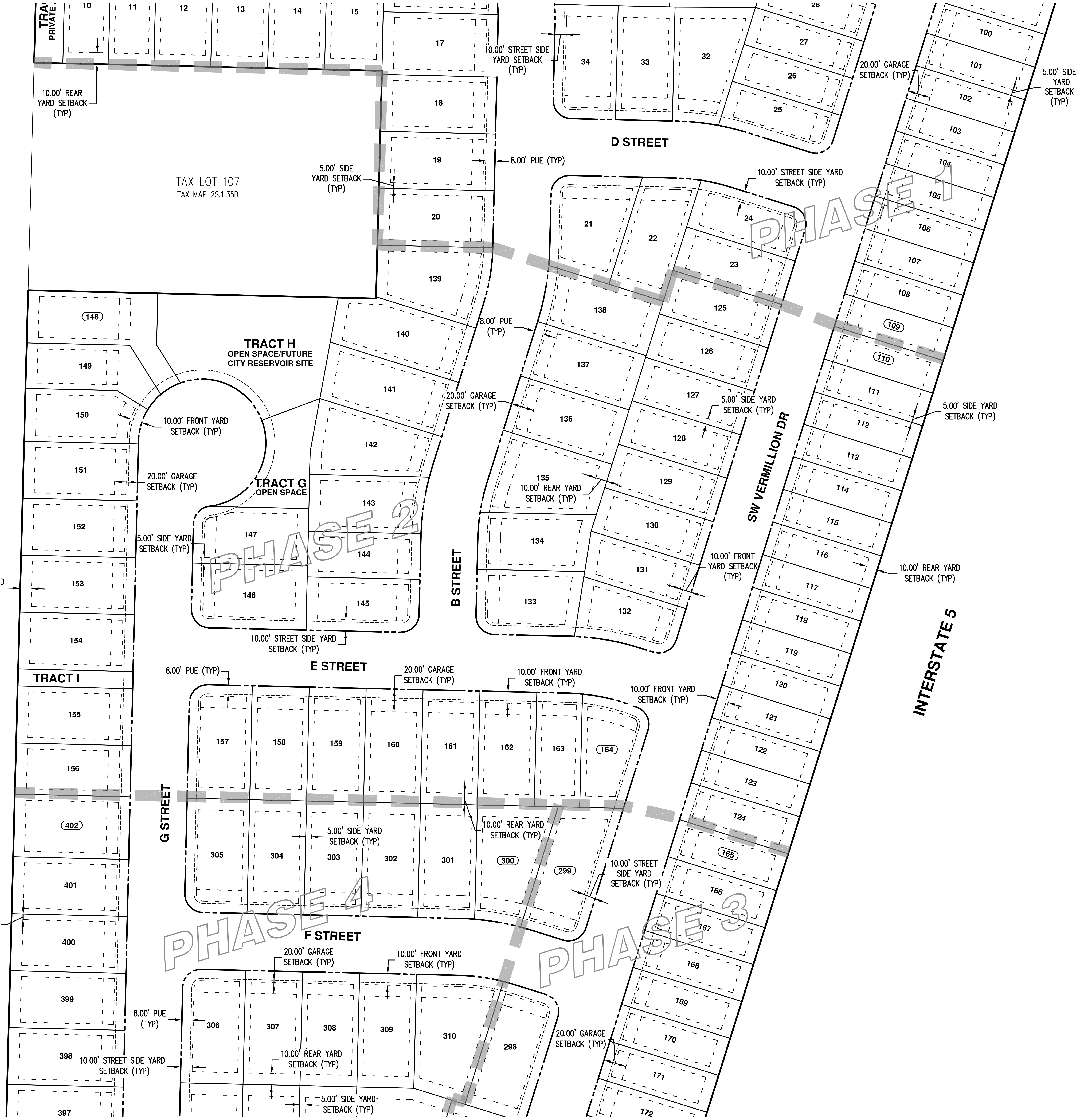

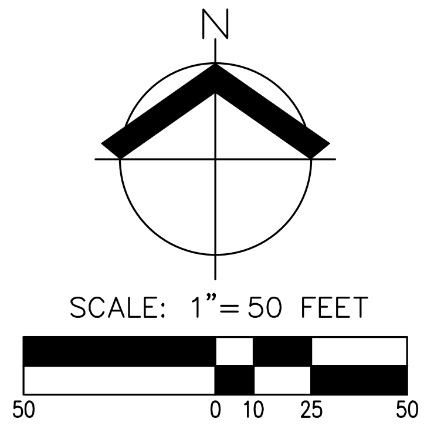

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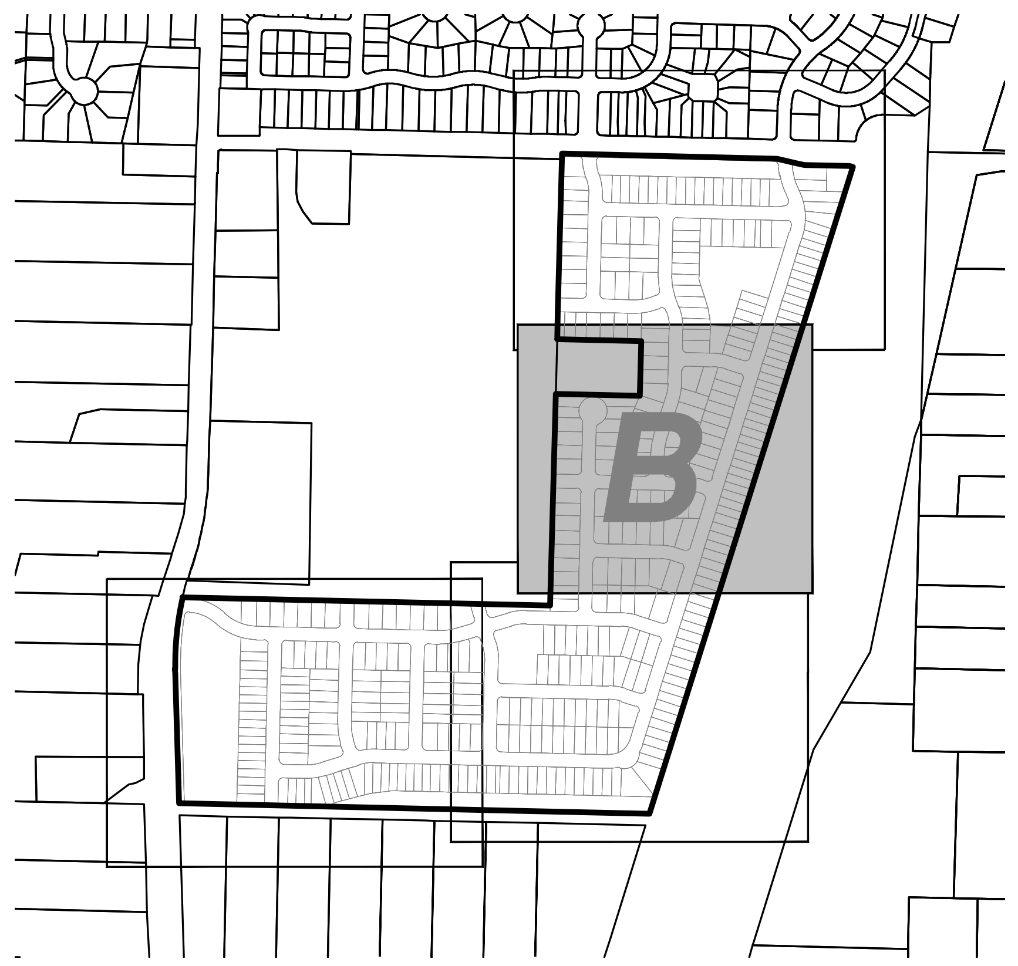

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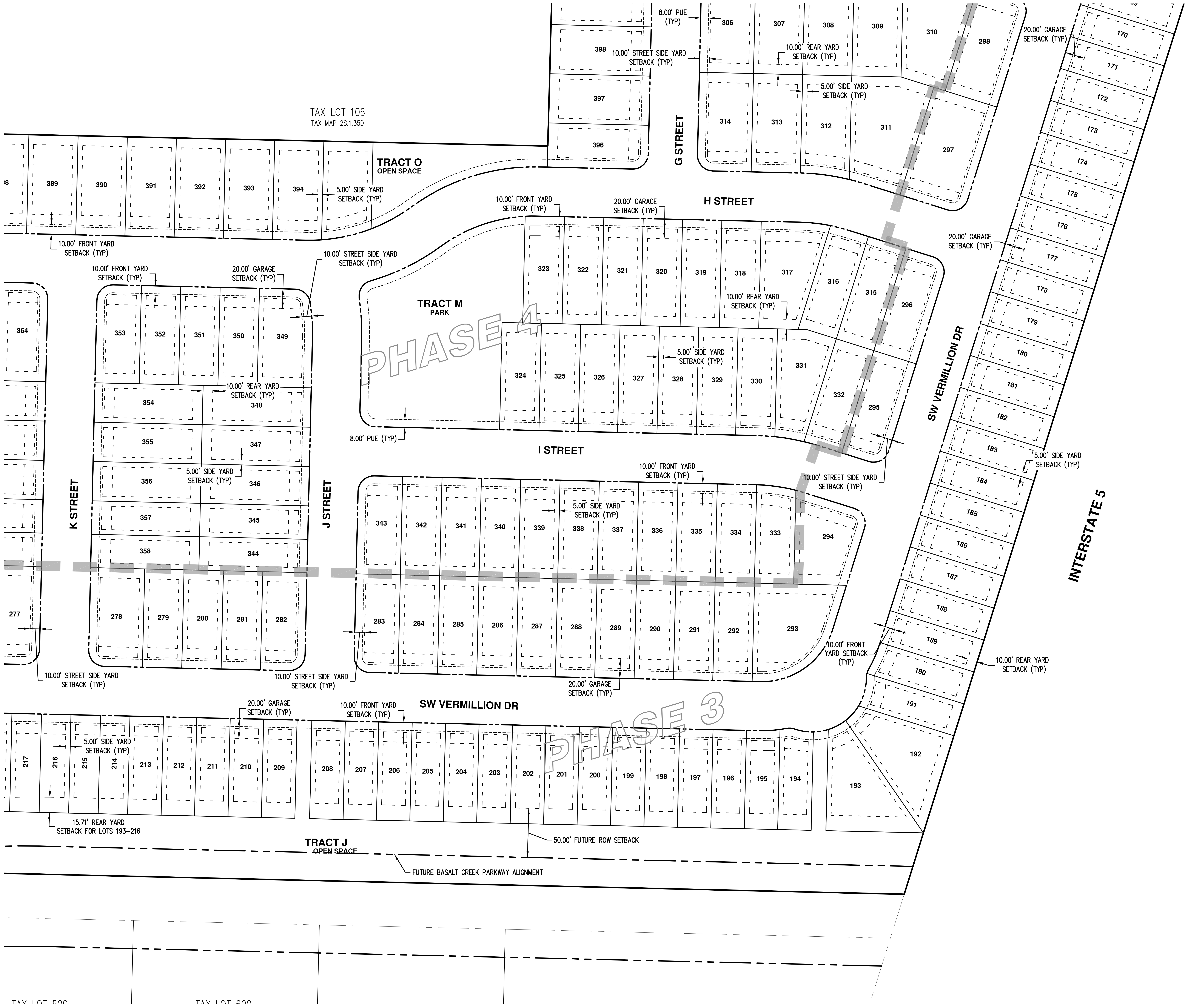

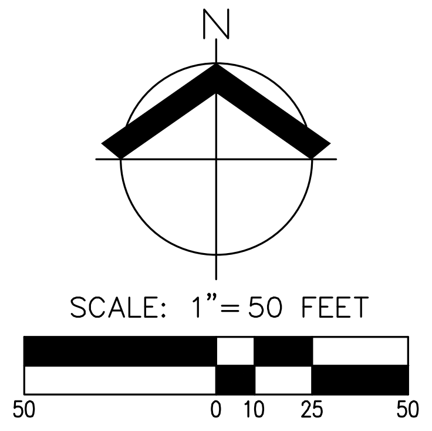

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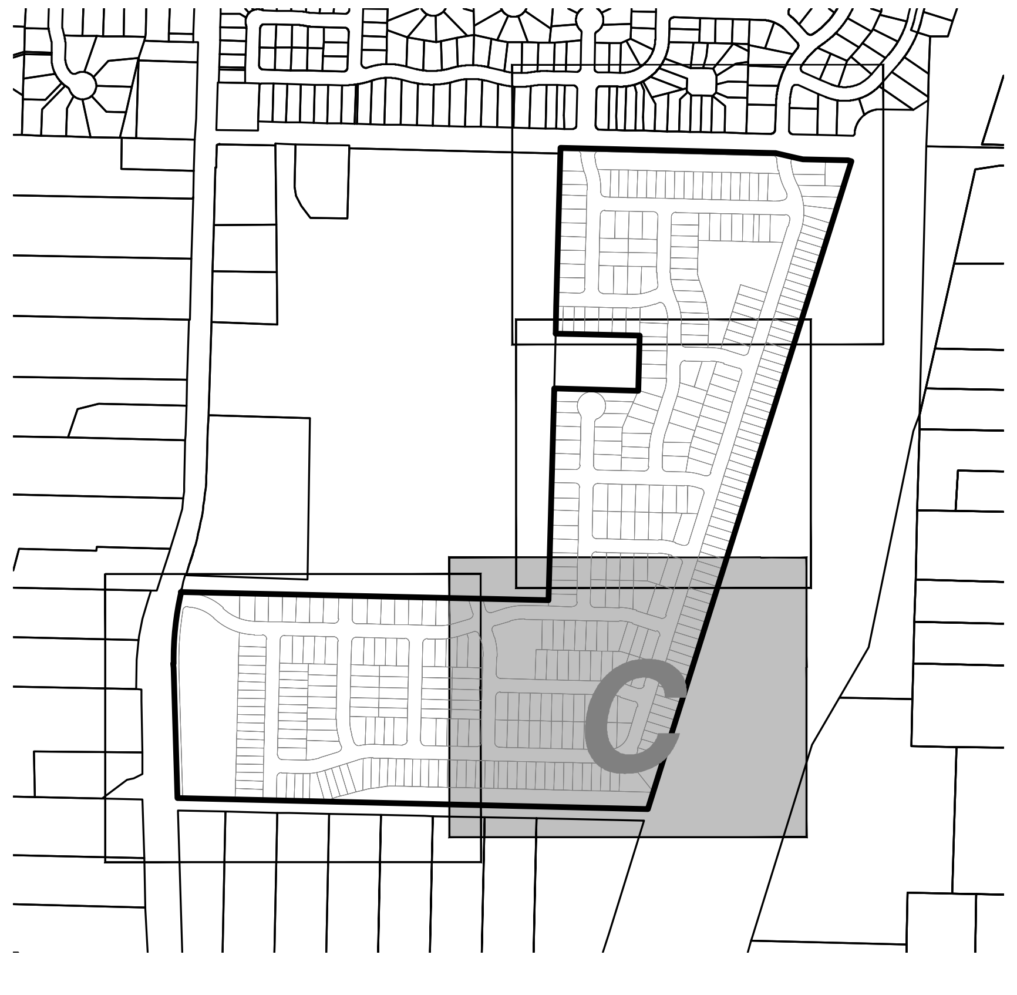

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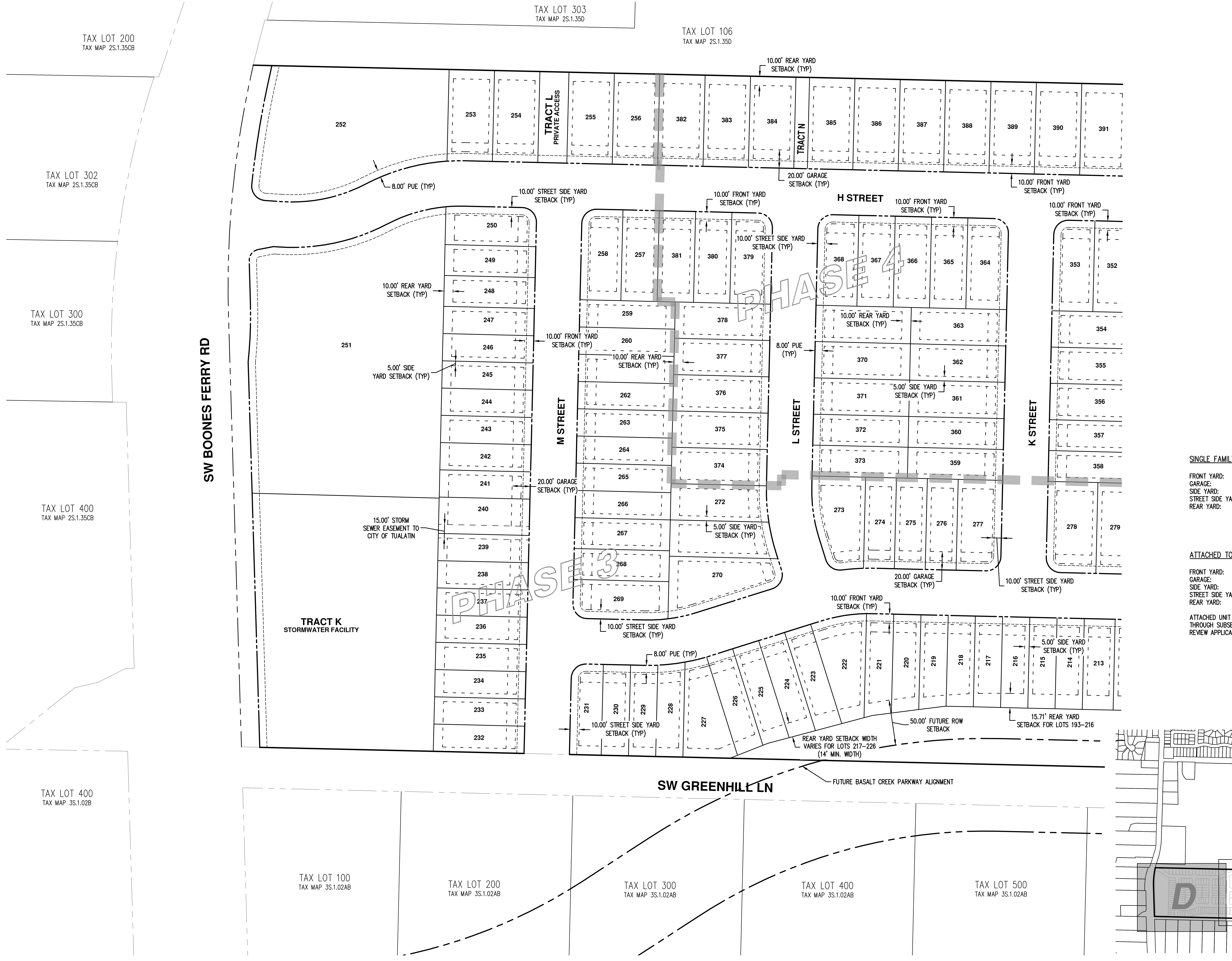
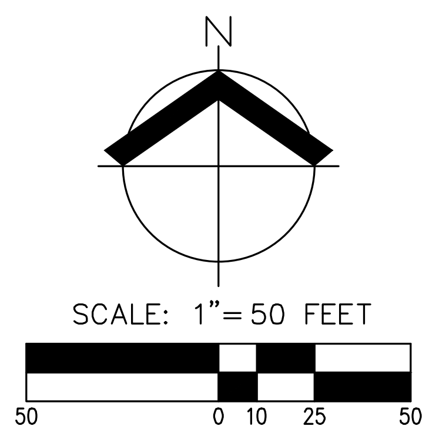
SB-03

AKS DRAWING FILE: 7454 SETBACKS.DWG | LAYOUT: SB-03





SINGLE FAMILY DETACHED SETBACKS

FRONT YARD:	10 FT
GARAGE:	20 FT
SIDE YARD:	5 FT
STREET SIDE YARD:	10 FT
REAR YARD:	10 FT

ATTACHED TOWNHOME SETBACKS

FRONT YARD:	10 FT
GARAGE:	20 FT
SIDE YARD:	5 FT
STREET SIDE YARD:	10 FT
REAR YARD:	10 FT

ATTACHED UNIT SETBACKS TO BE DETERMINED THROUGH SUBSEQUENT ARCHITECTURAL REVIEW APPLICATION.

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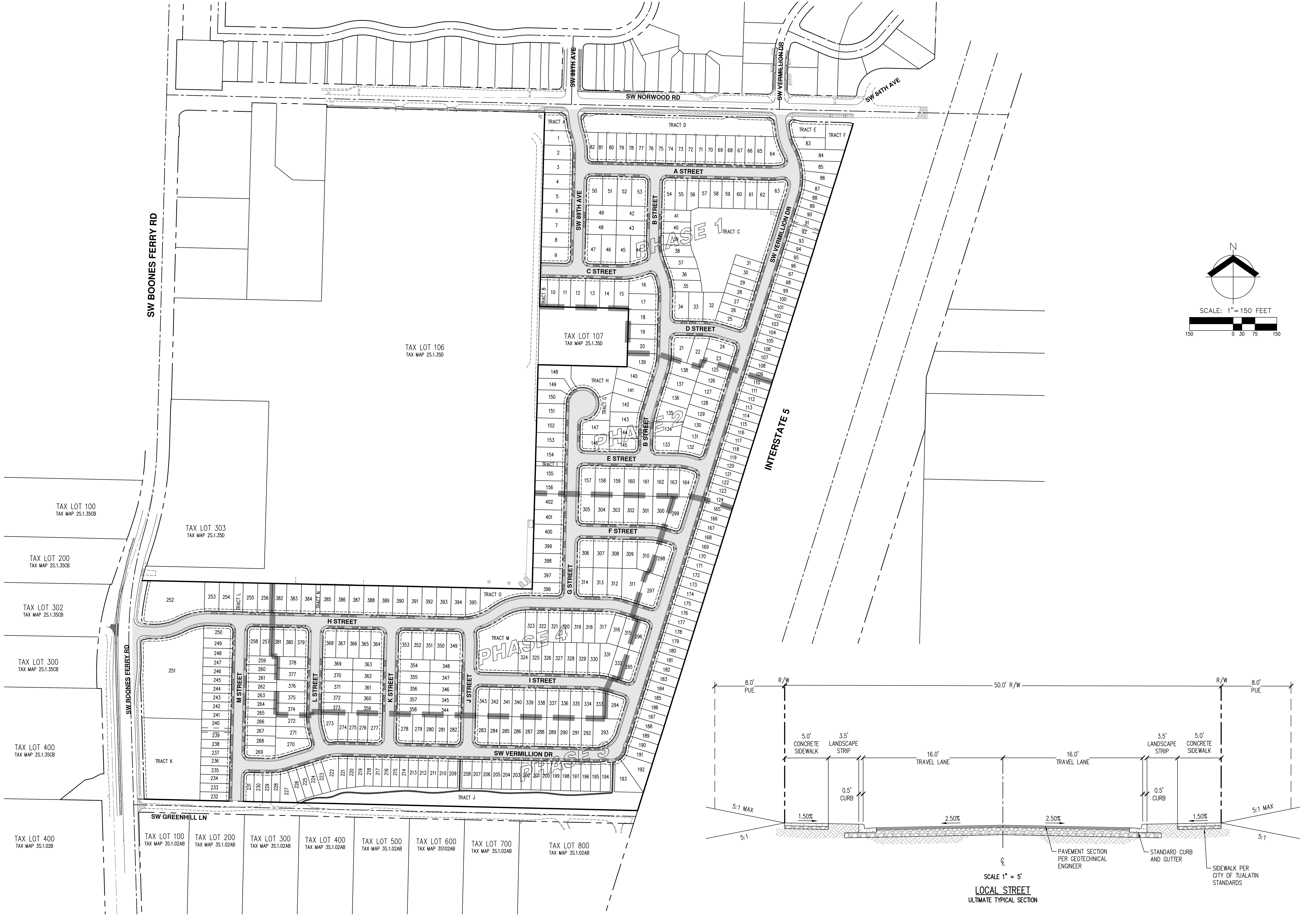
OREGON
JULY 12, 2016
DARKO SIMIC
PRELIMINARY
RENEWAL DATE: 6/30/22

JOB NUMBER:	7454
DATE:	7/1/2021
DESIGNED BY:	JSM
DRAWN BY:	JSM
CHECKED BY:	DS

SB-04



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OREGON
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DARKO SIMIC
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SP-00

LEGEND

- ▩ — CONCRETE SIDEWALK CONSTRUCTED BY CONTRACTOR
- ░ — CONCRETE SIDEWALK CONSTRUCTED BY HOME BUILDER
- ▢ — NEW AC PAVEMENT BY CONTRACTOR
- ▨ — VISION CLEARANCE TRIANGLE
- ▦ — RESIDENTIAL CONCRETE DRIVEWAY BY HOME BUILDER
- ▒ — COMMERCIAL DRIVEWAY BY CONTRACTOR
- ◜ — ADA RAMP CONSTRUCTED BY CONTRACTOR
- ▭ — PARKING SPACE

TOTAL ON-STREET PARKING SPACES: 429
TOTAL OFF-STREET PARKING SPACES: 1600

AKS DRAWING FILE: 7454 STREETS.DWG | LAYOUT: SP-01

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OREGON
JULY 12, 2016
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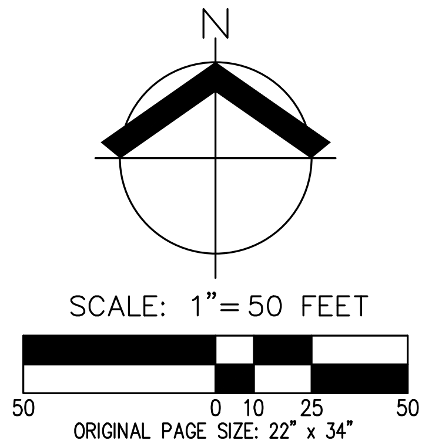

SCALE: 1"=50 FEET

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ORIGINAL PAGE SIZE: 22" x 34"

LEGEND

▩	CONCRETE SIDEWALK CONSTRUCTED BY CONTRACTOR
░	CONCRETE SIDEWALK CONSTRUCTED BY HOME BUILDER
▢	NEW AC PAVEMENT BY CONTRACTOR
▨	VISION CLEARANCE TRIANGLE
▦	RESIDENTIAL CONCRETE DRIVEWAY BY HOME BUILDER
▒	COMMERCIAL DRIVEWAY BY CONTRACTOR
◜	ADA RAMP CONSTRUCTED BY CONTRACTOR
▭	PARKING SPACE

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TOTAL OFF-STREET PARKING SPACES: 1600

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OREGON
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SP-02

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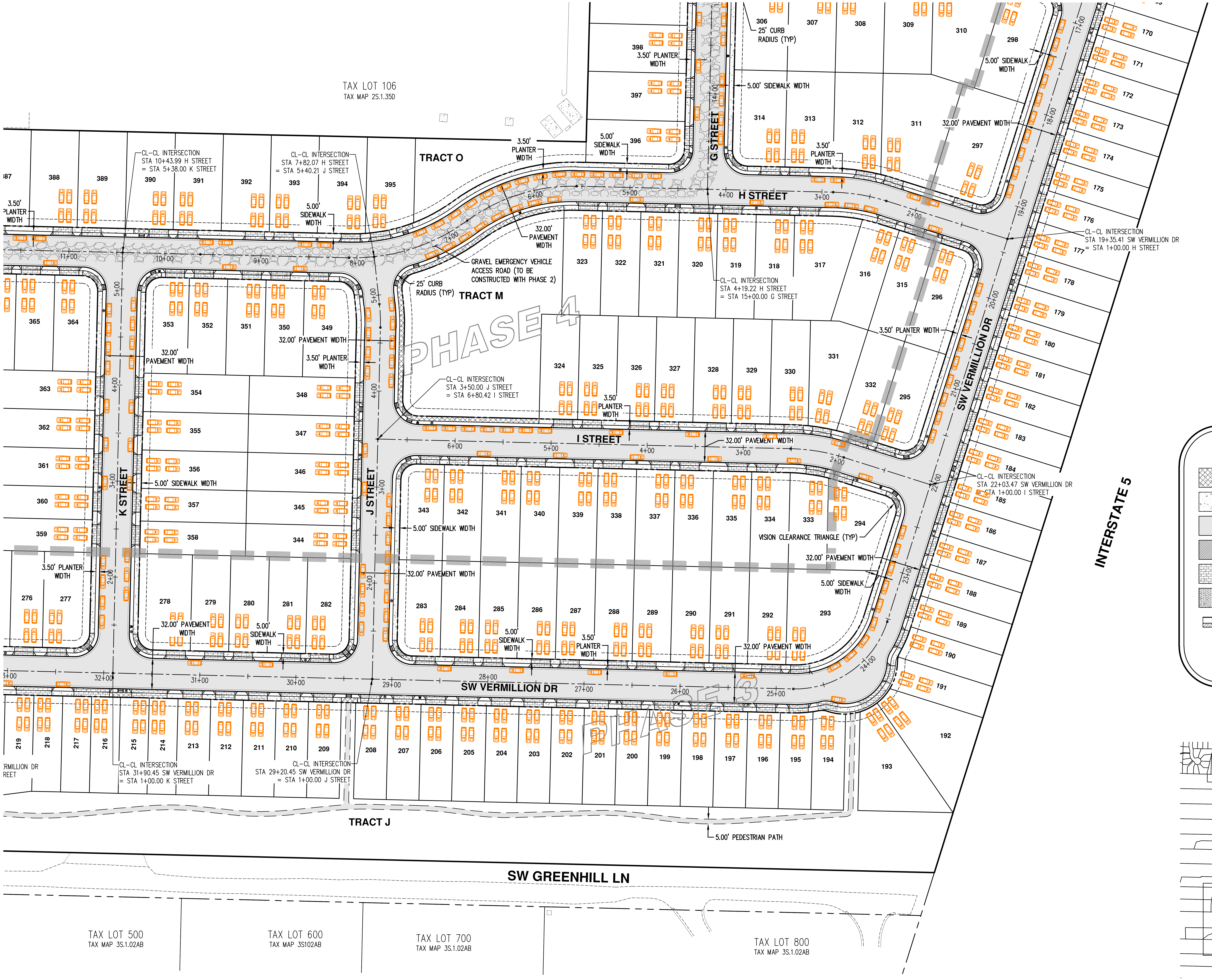

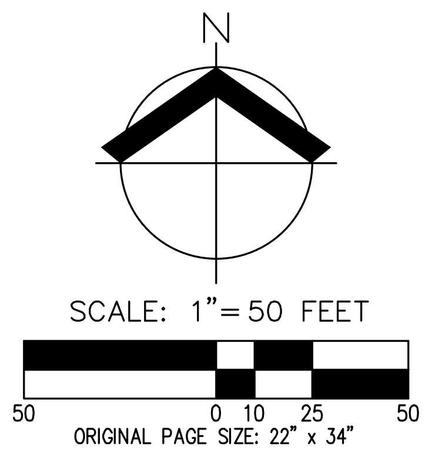

LEGEND

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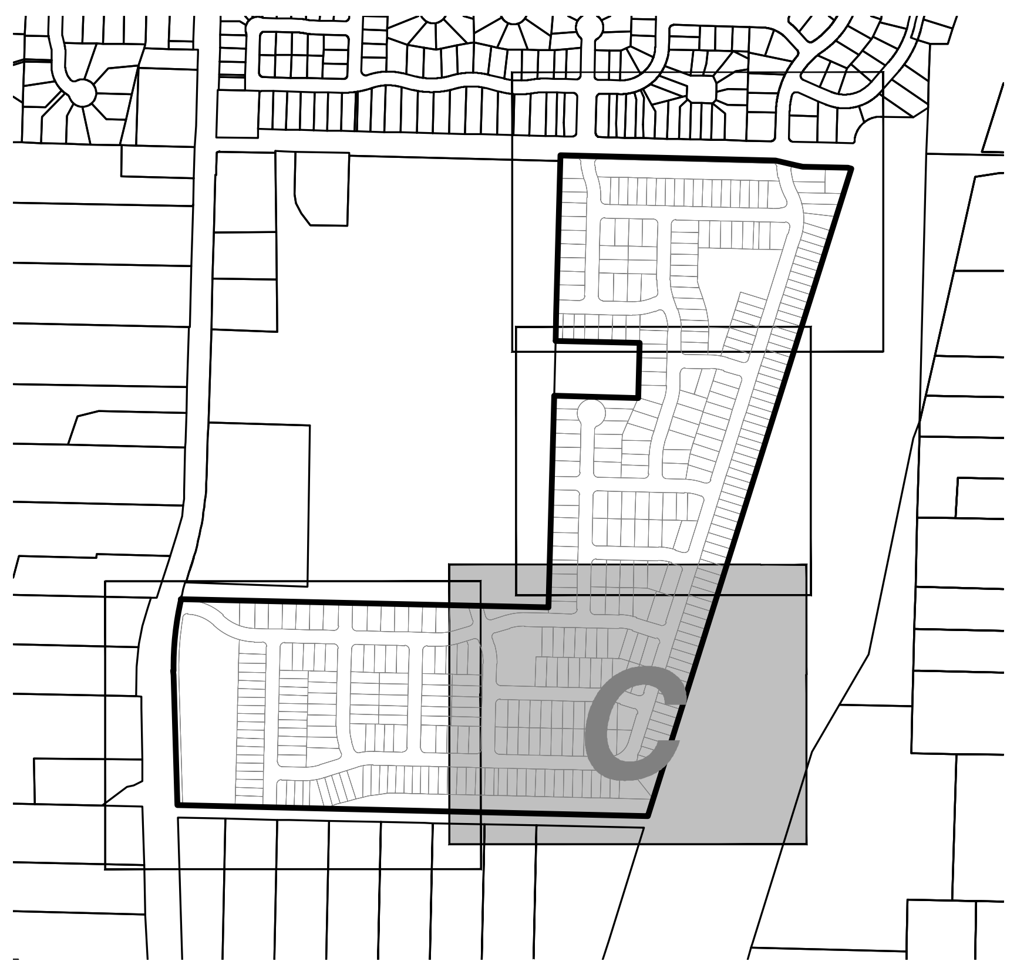

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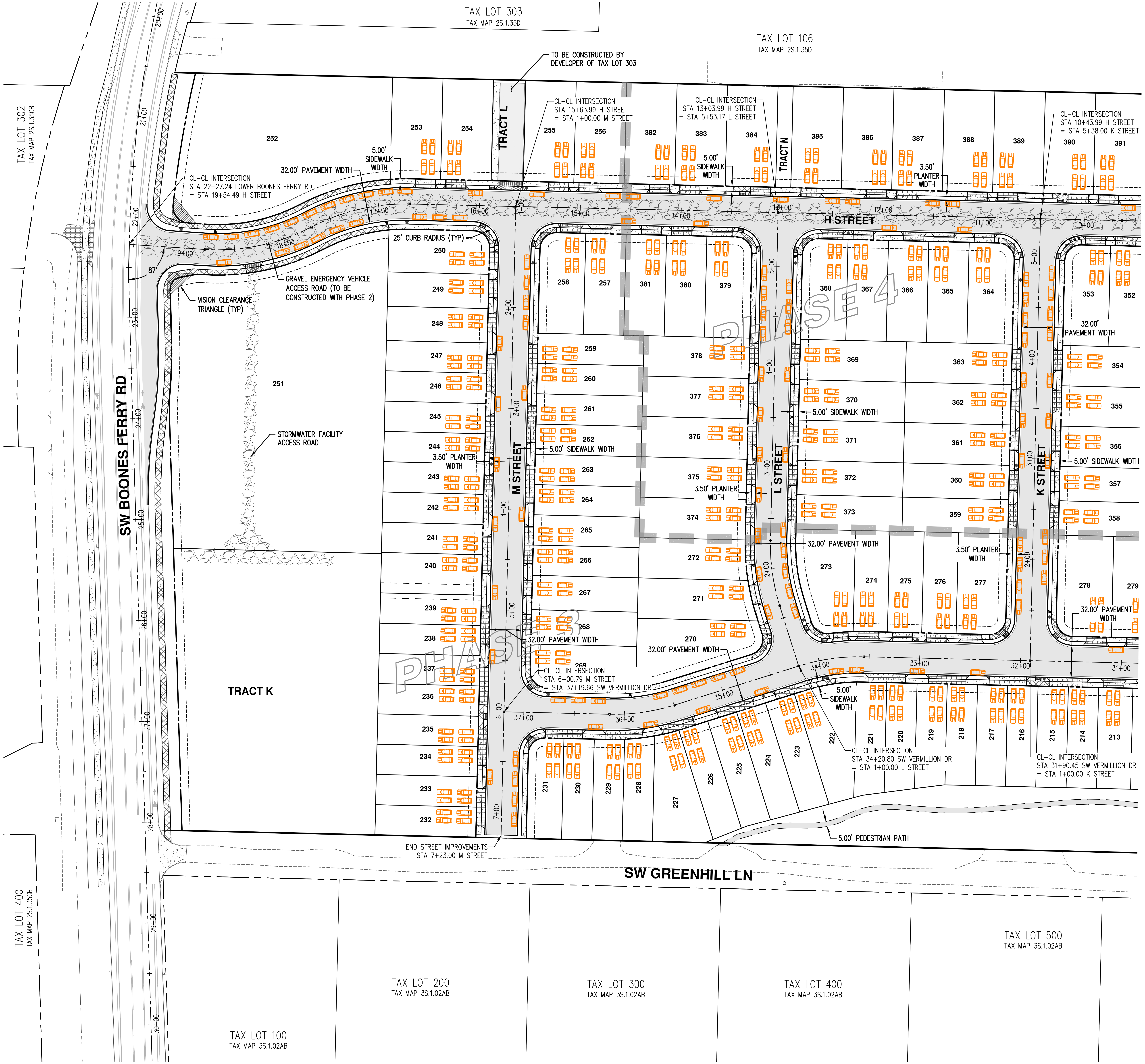

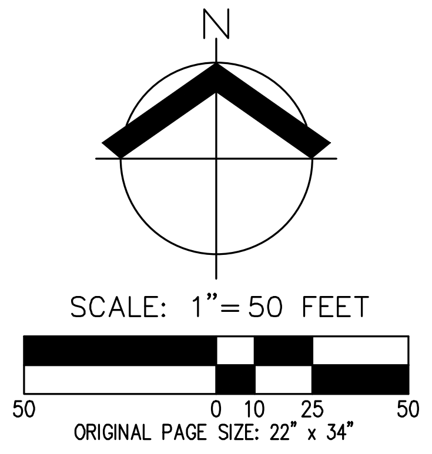

LEGEND

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░	CONCRETE SIDEWALK CONSTRUCTED BY HOME BUILDER
▭	NEW AC PAVEMENT BY CONTRACTOR
▧	VISION CLEARANCE TRIANGLE
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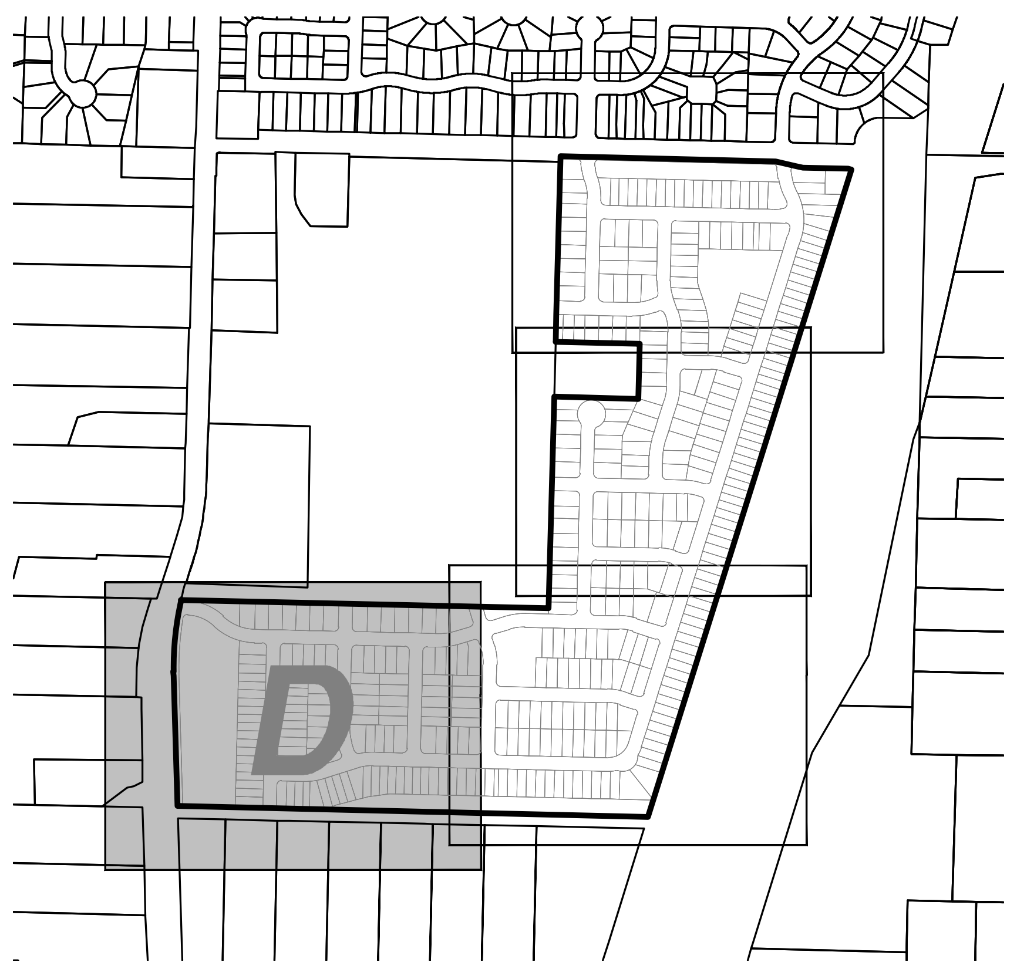

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SP-04

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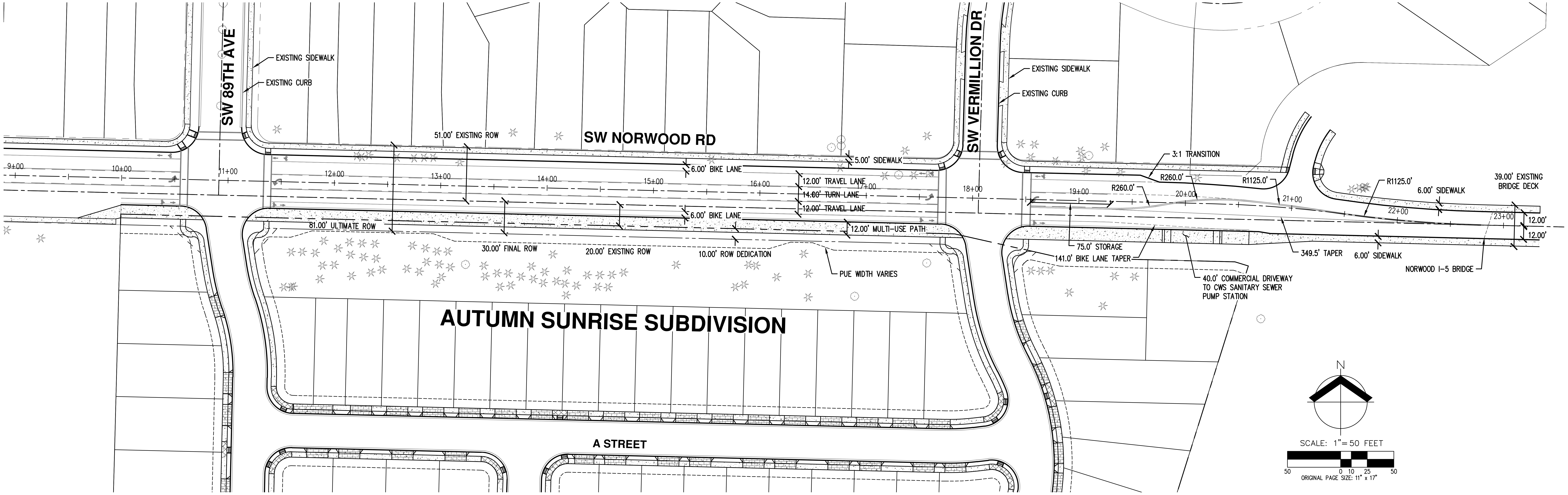

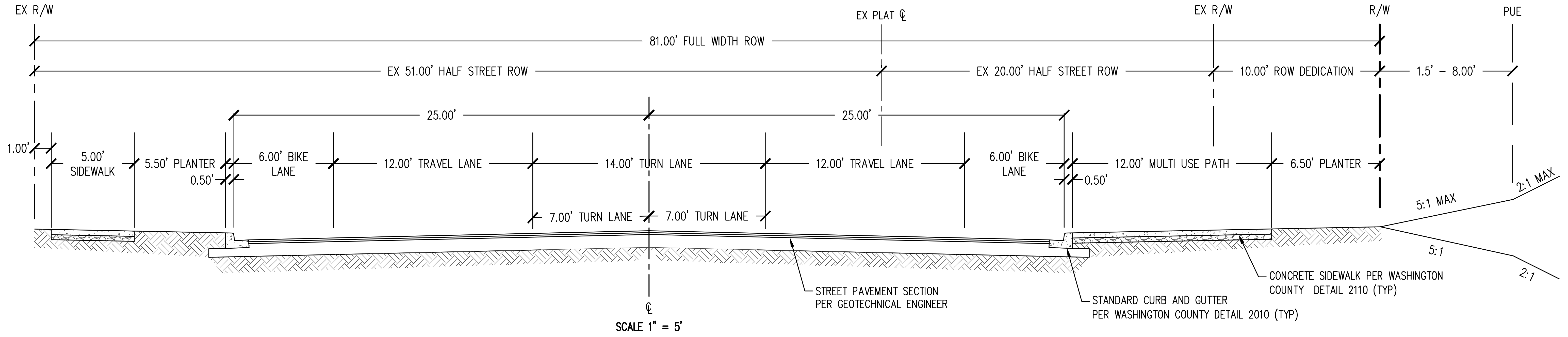

SW NORWOOD ROAD – COLLECTOR

ULTIMATE TYPICAL SECTION

THE PURPOSE OF THIS PRELIMINARY PLAN IS TO SHOW THE POTENTIAL FUTURE NORWOOD ROAD ULTIMATE ALIGNMENT FOR PLANNING PURPOSES.

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PRELIMINARY
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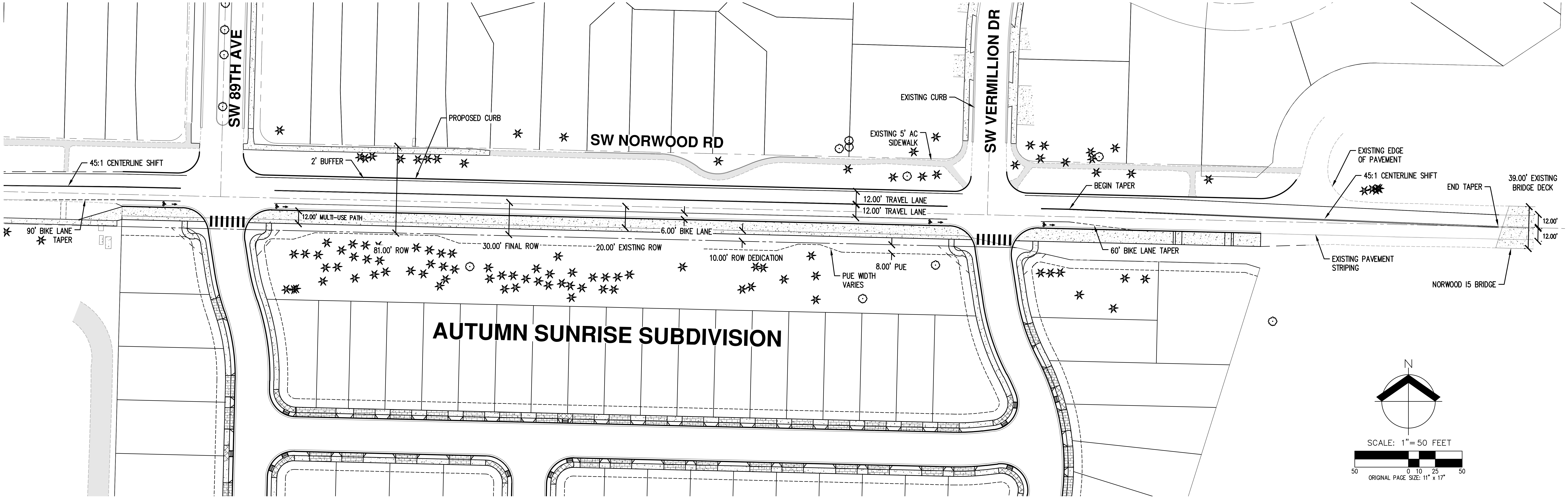

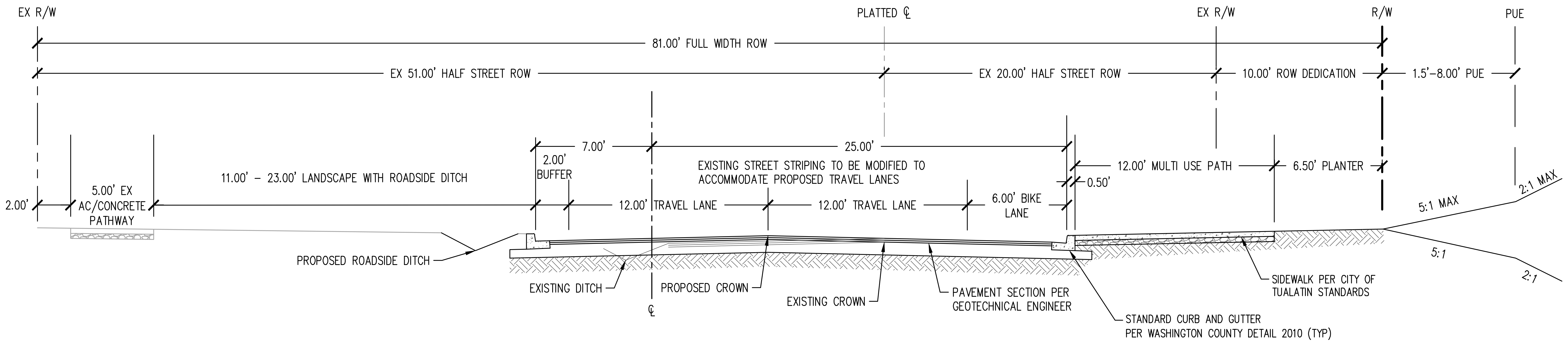

SCALE 1" = 5'

SW NORWOOD ROAD – COLLECTOR
INTERIM TYPICAL SECTION

THE PURPOSE OF THIS PRELIMINARY PLAN IS TO SHOW THE INTERIM NORWOOD ROAD ALIGNMENT FOR PLANNING PURPOSES.

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JULY 12, 2016
PRELIMINARY
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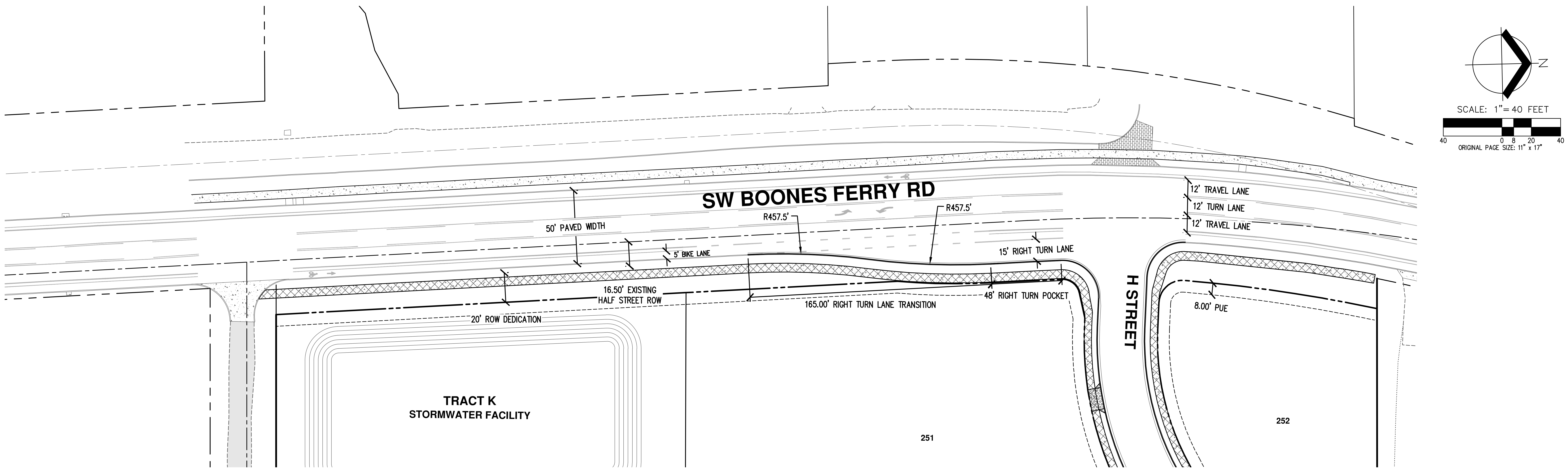

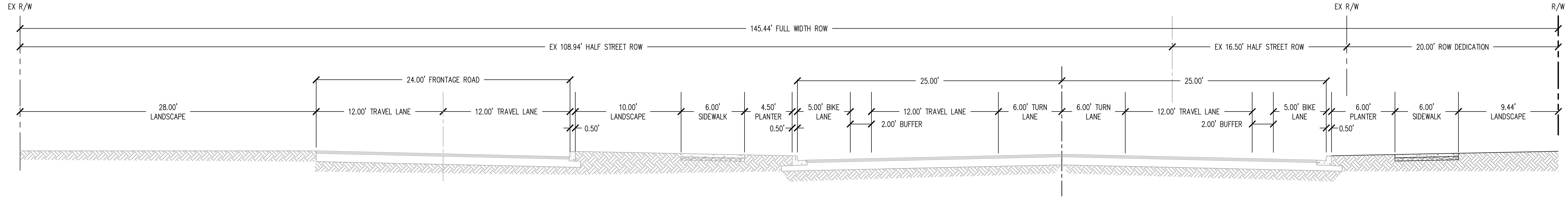

SCALE 1" = 5'

SW BOONES FERRY ROAD – ARTERIAL
TYPICAL SECTION

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DARKO SIMIC
PRELIMINARY
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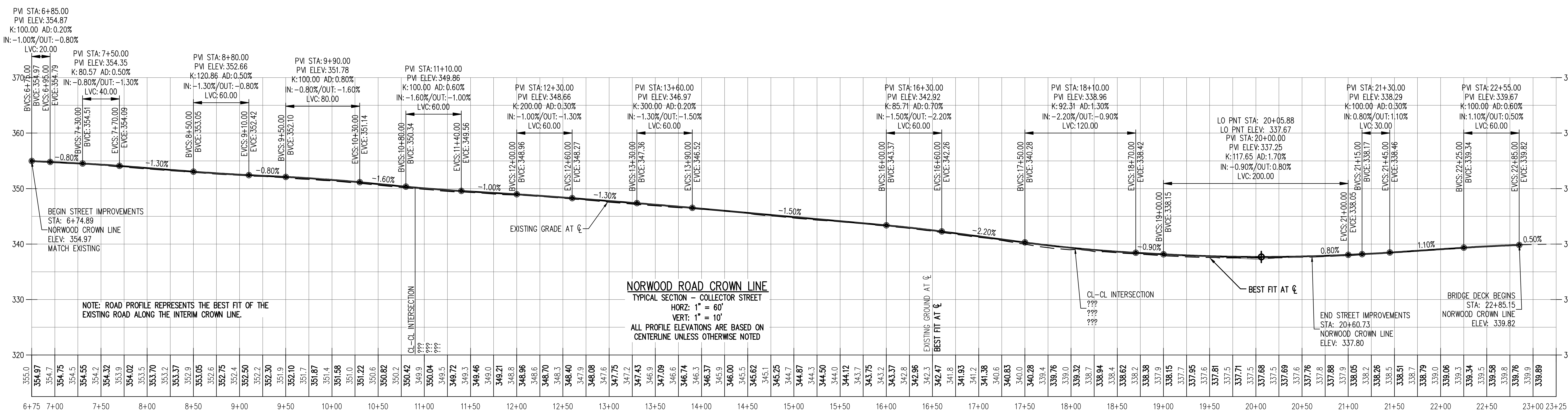
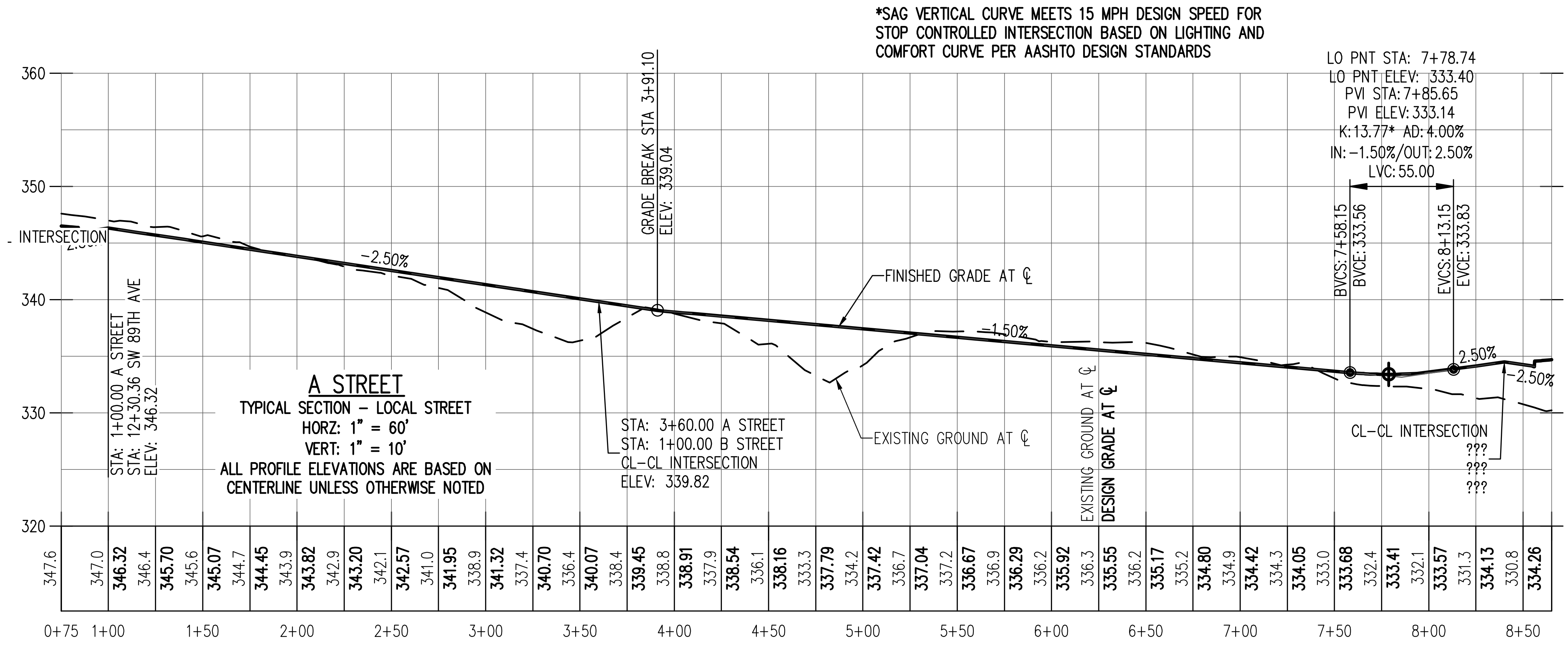
SP-08



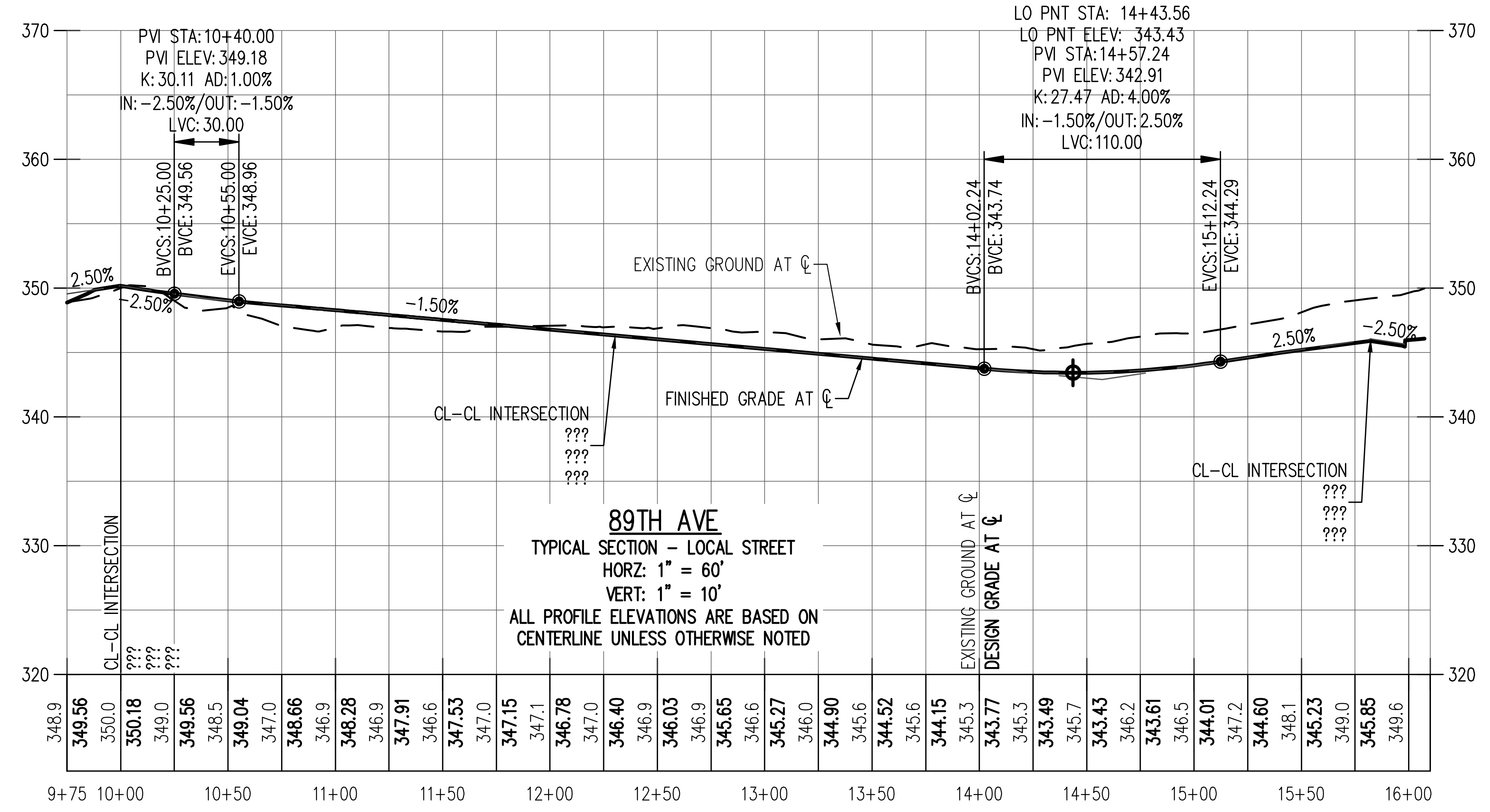
NORWOOD ROAD CROWN LINE
TYPICAL SECTION – COLLECTOR STREET
HORZ: 1" = 60'
VERT: 1" = 10'
ALL PROFILE ELEVATIONS ARE BASED ON CENTERLINE UNLESS OTHERWISE NOTED

NOTE: ROAD PROFILE REPRESENTS THE BEST FIT OF THE EXISTING ROAD ALONG THE INTERIM CROWN LINE.

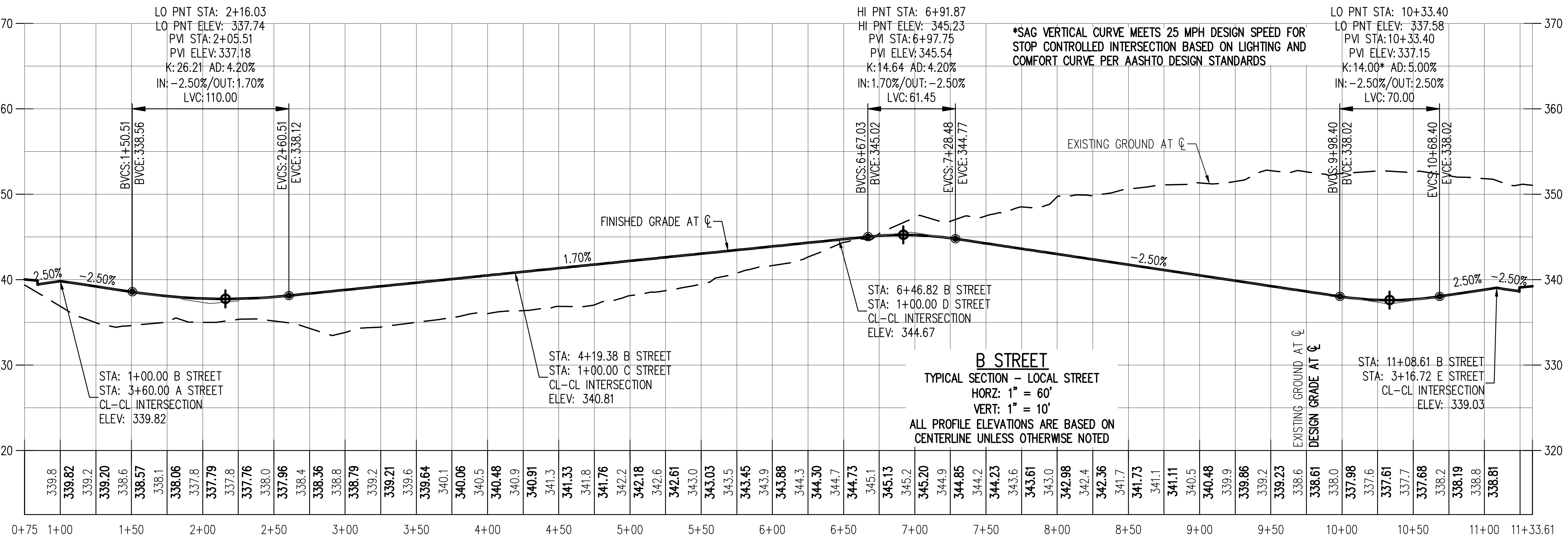


A STREET
TYPICAL SECTION – LOCAL STREET
HORZ: 1" = 60'
VERT: 1" = 10'
ALL PROFILE ELEVATIONS ARE BASED ON CENTERLINE UNLESS OTHERWISE NOTED

*SAG VERTICAL CURVE MEETS 15 MPH DESIGN SPEED FOR STOP CONTROLLED INTERSECTION BASED ON LIGHTING AND COMFORT CURVE PER AASHTO DESIGN STANDARDS

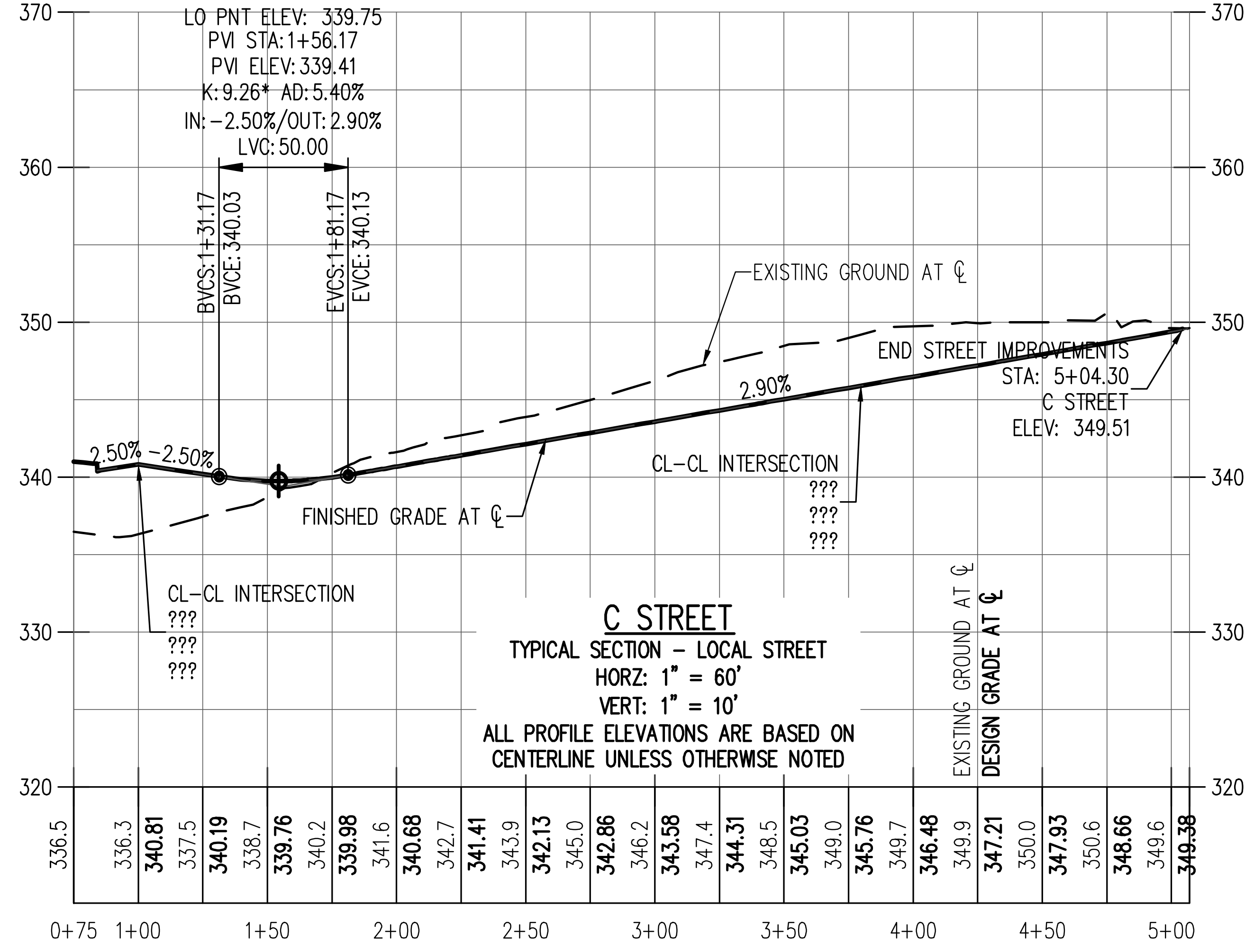


89TH AVE
TYPICAL SECTION – LOCAL STREET
HORZ: 1" = 60'
VERT: 1" = 10'
ALL PROFILE ELEVATIONS ARE BASED ON CENTERLINE UNLESS OTHERWISE NOTED



B STREET
TYPICAL SECTION – LOCAL STREET
HORZ: 1" = 60'
VERT: 1" = 10'
ALL PROFILE ELEVATIONS ARE BASED ON CENTERLINE UNLESS OTHERWISE NOTED

*SAG VERTICAL CURVE MEETS 25 MPH DESIGN SPEED FOR STOP CONTROLLED INTERSECTION BASED ON LIGHTING AND COMFORT CURVE PER AASHTO DESIGN STANDARDS



C STREET
TYPICAL SECTION – LOCAL STREET
HORZ: 1" = 60'
VERT: 1" = 10'
ALL PROFILE ELEVATIONS ARE BASED ON CENTERLINE UNLESS OTHERWISE NOTED

*SAG VERTICAL CURVE MEETS 15 MPH DESIGN SPEED FOR STOP CONTROLLED INTERSECTION BASED ON LIGHTING AND COMFORT CURVE PER AASHTO DESIGN STANDARDS

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OREGON
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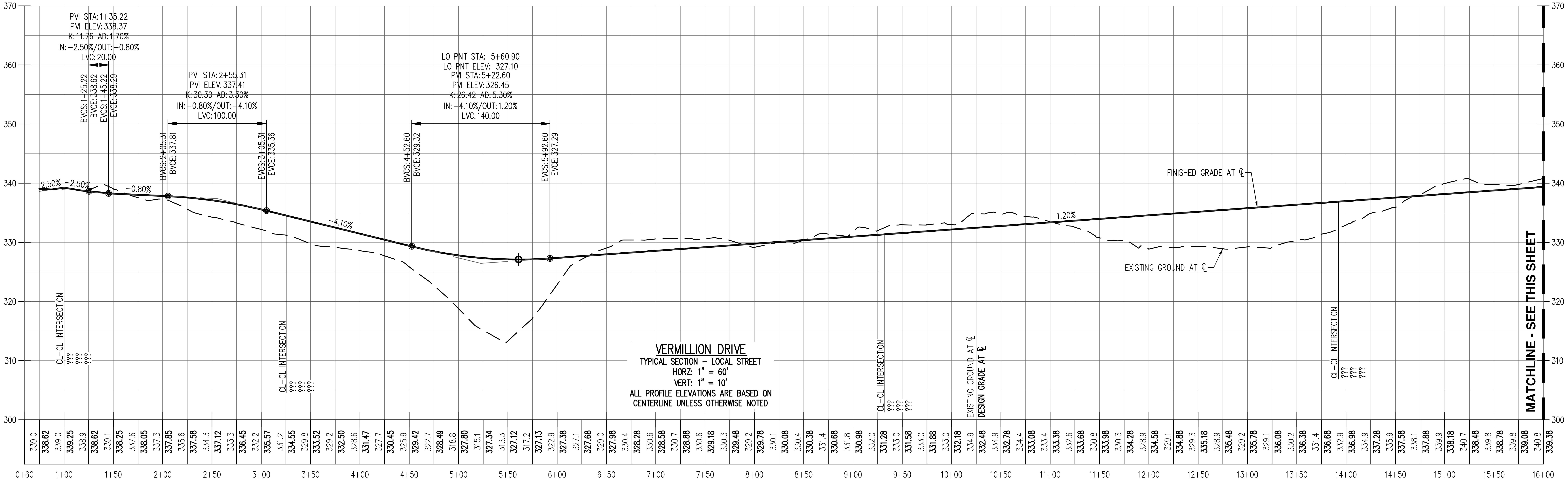

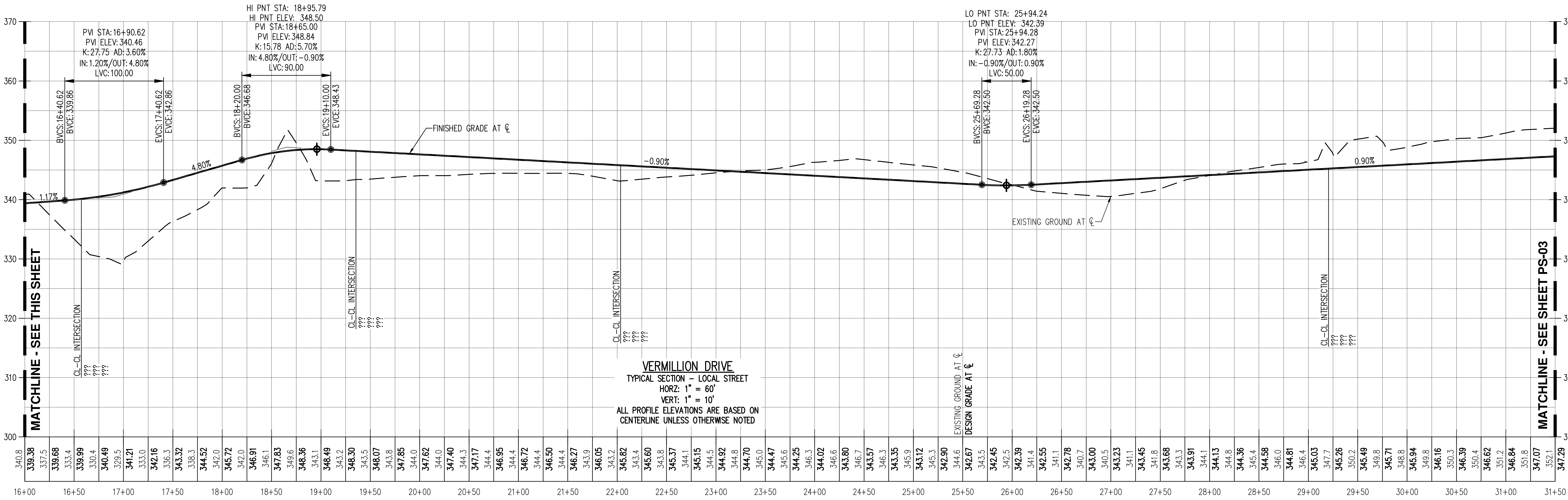

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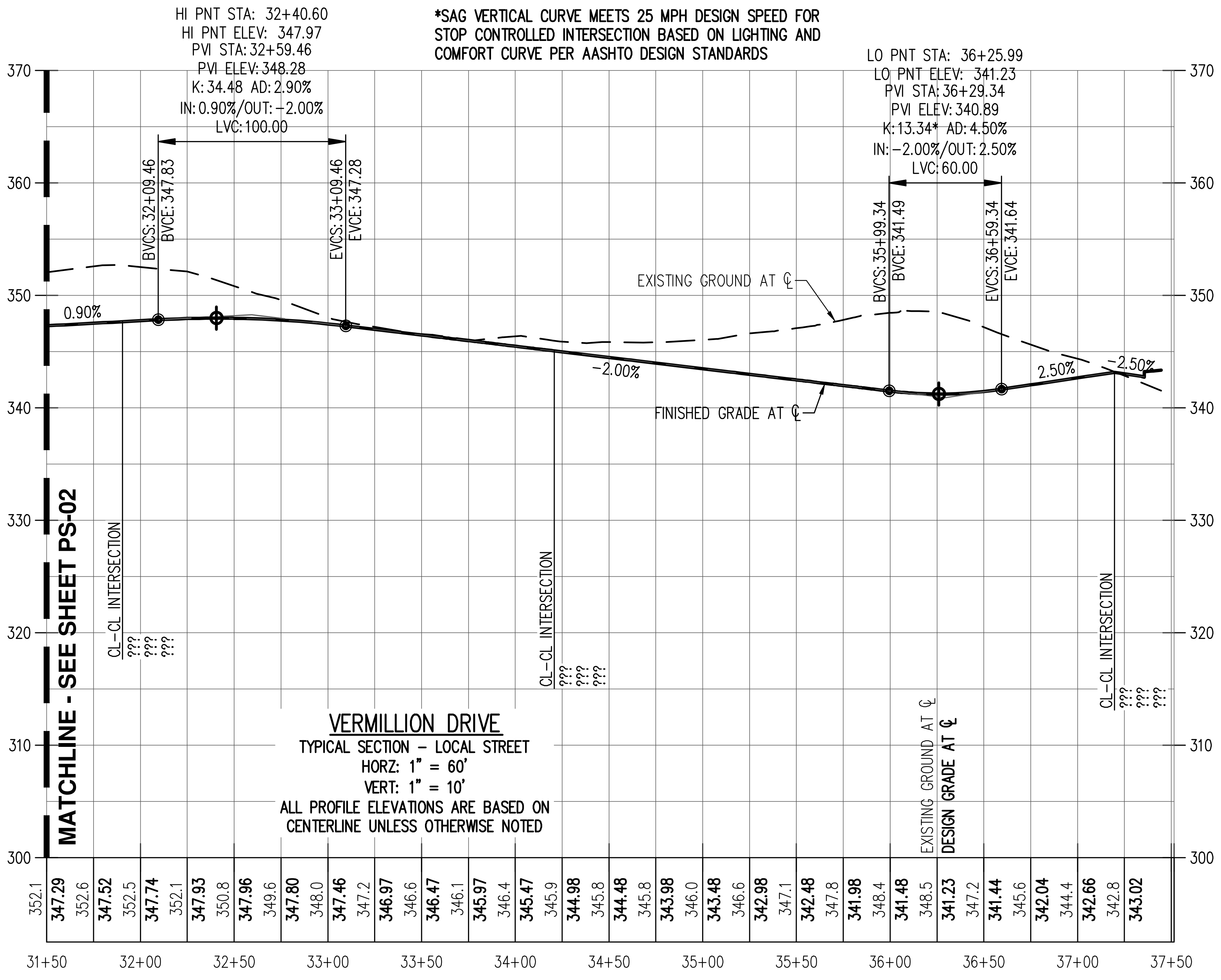

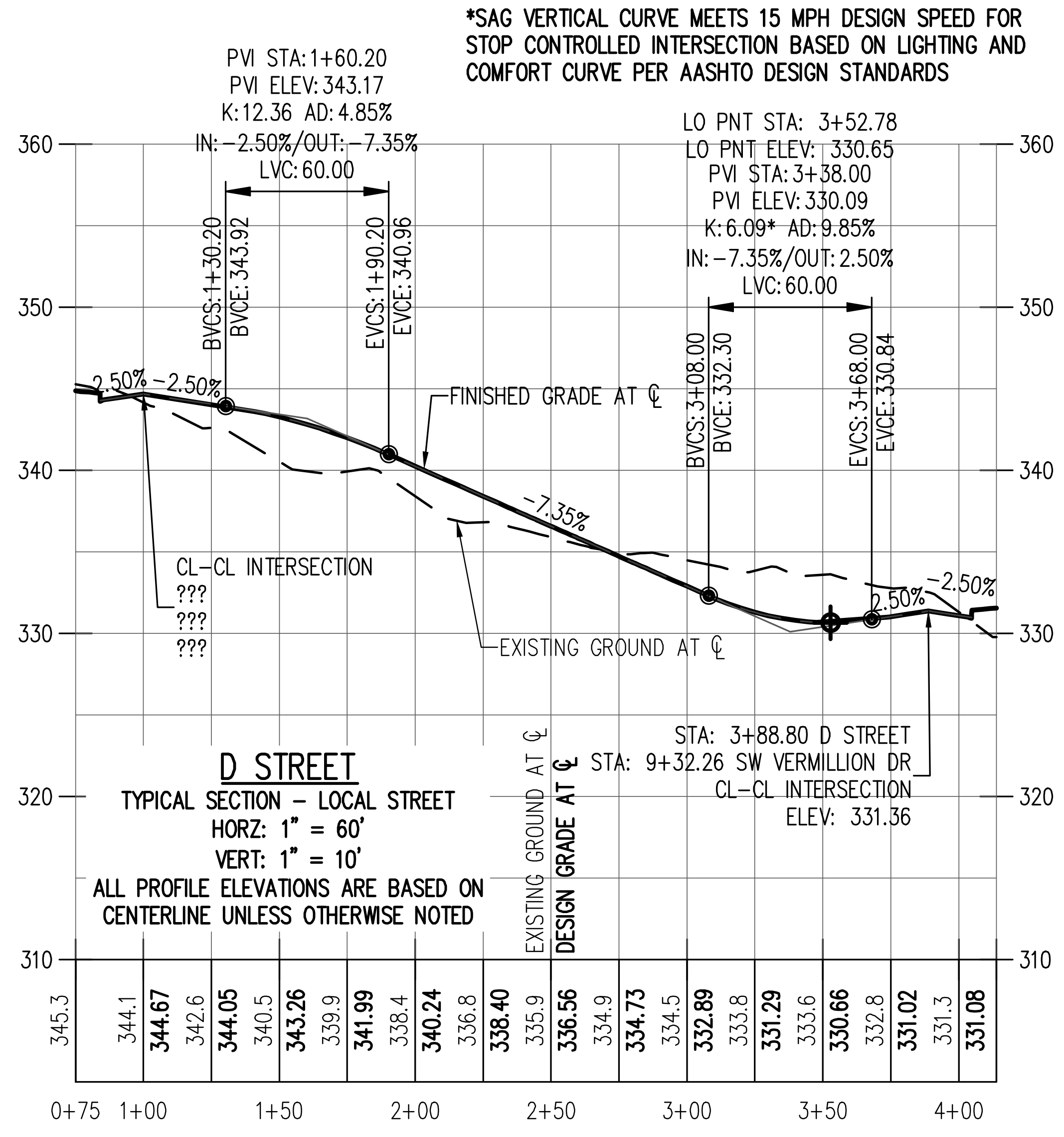

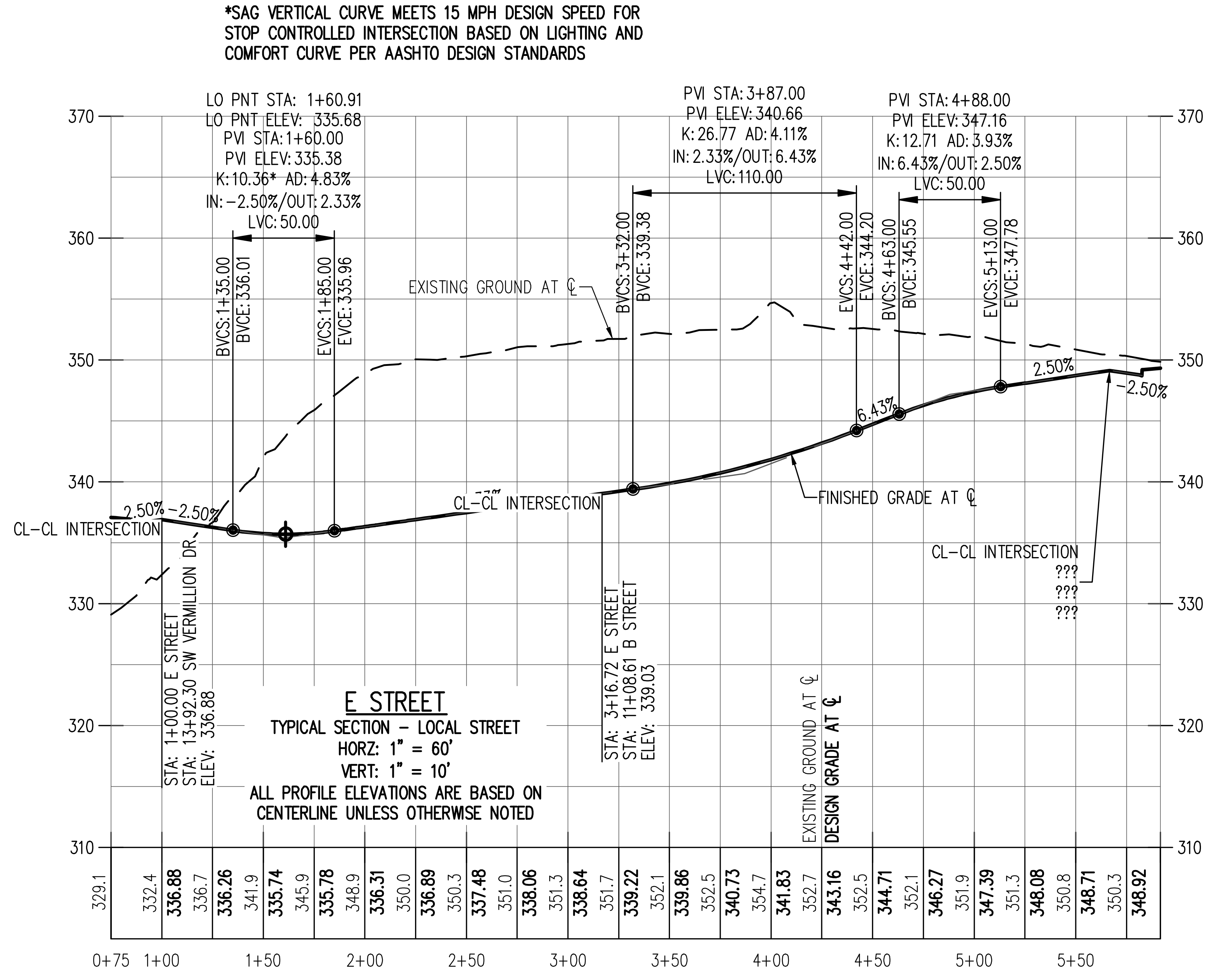

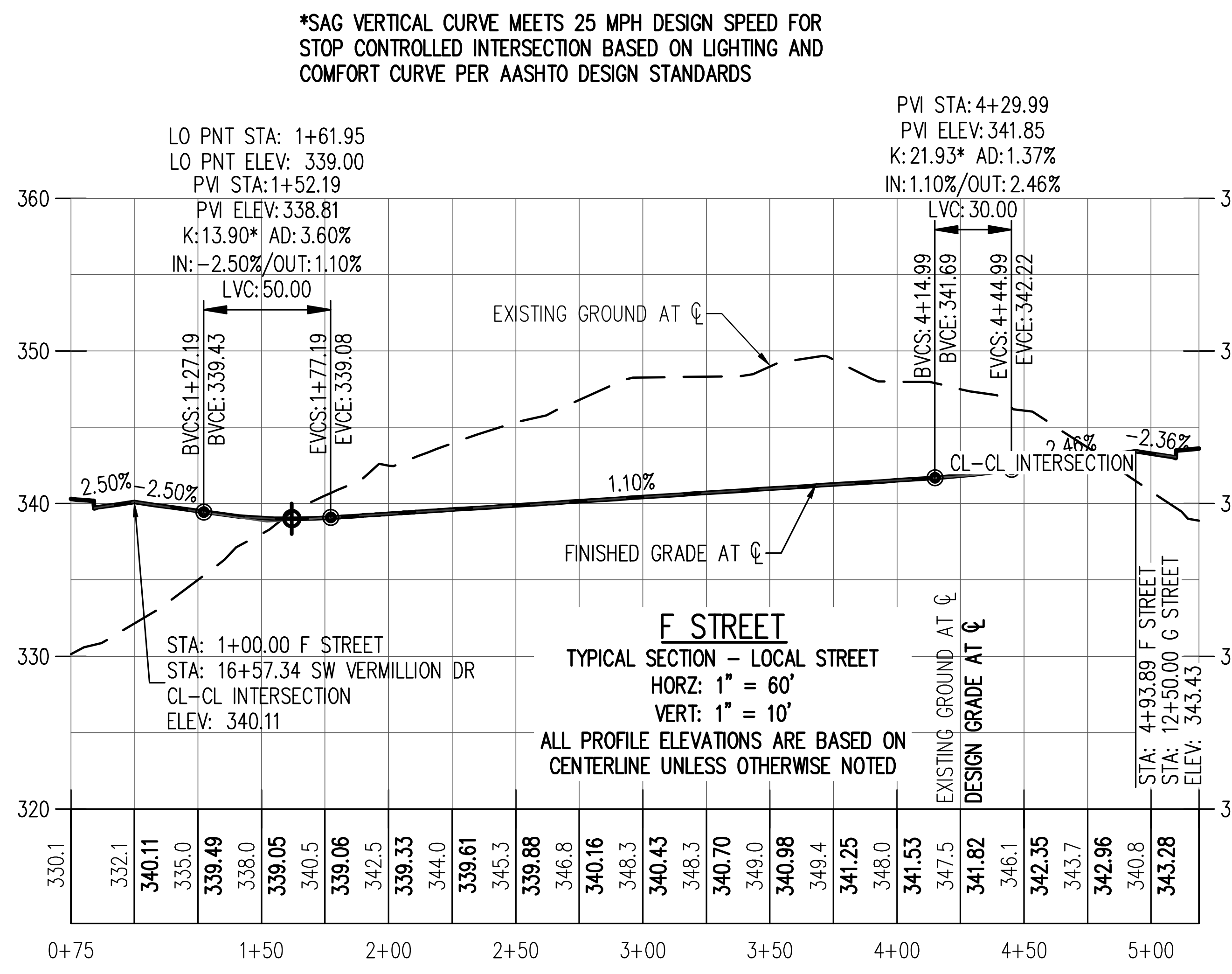

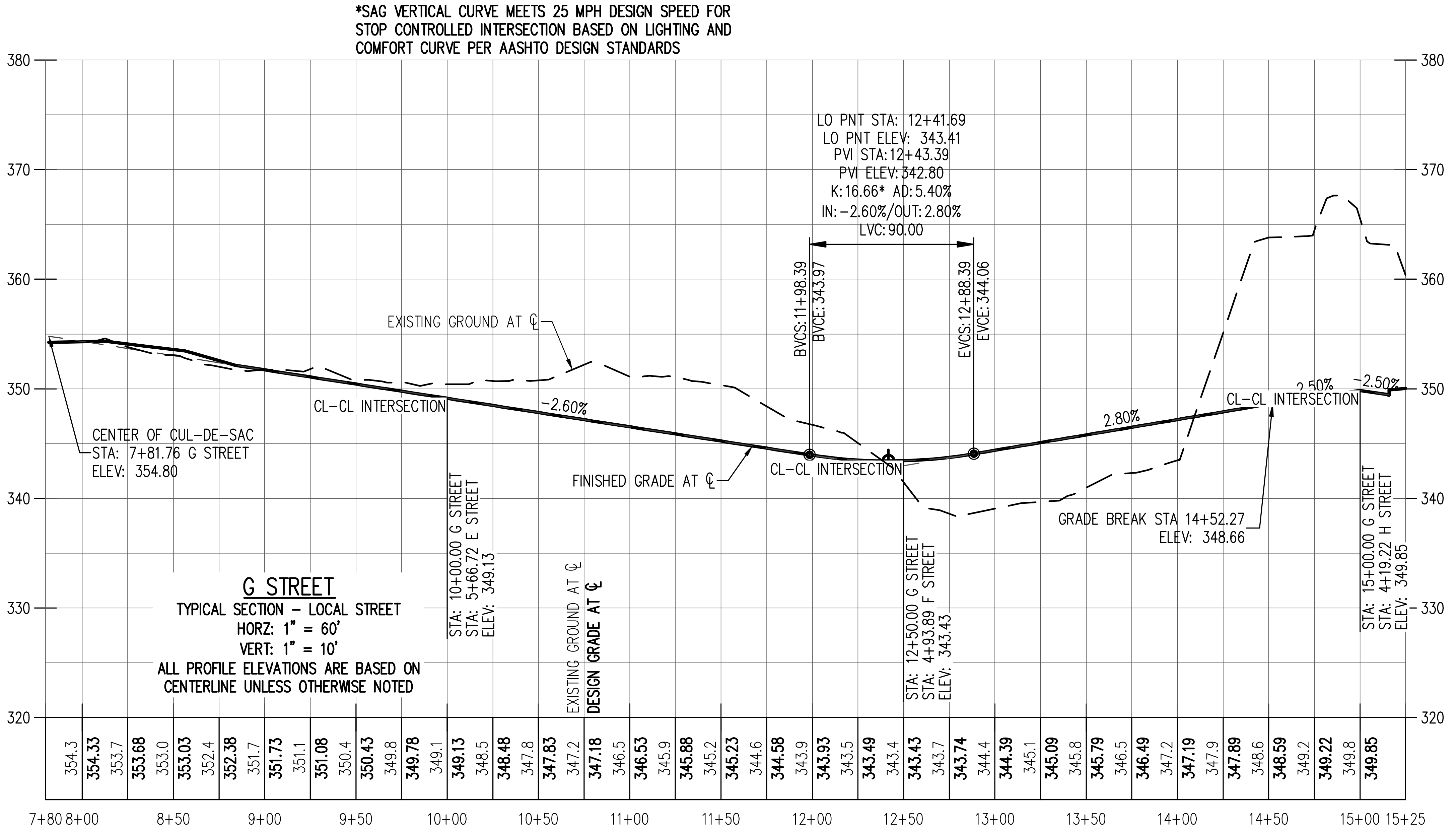

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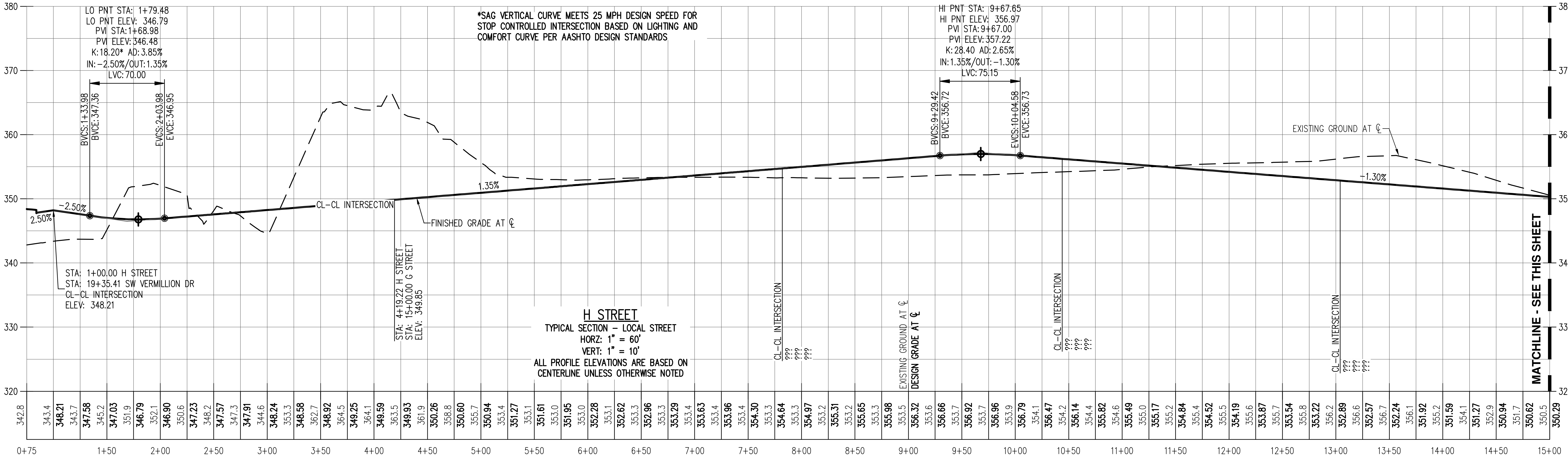

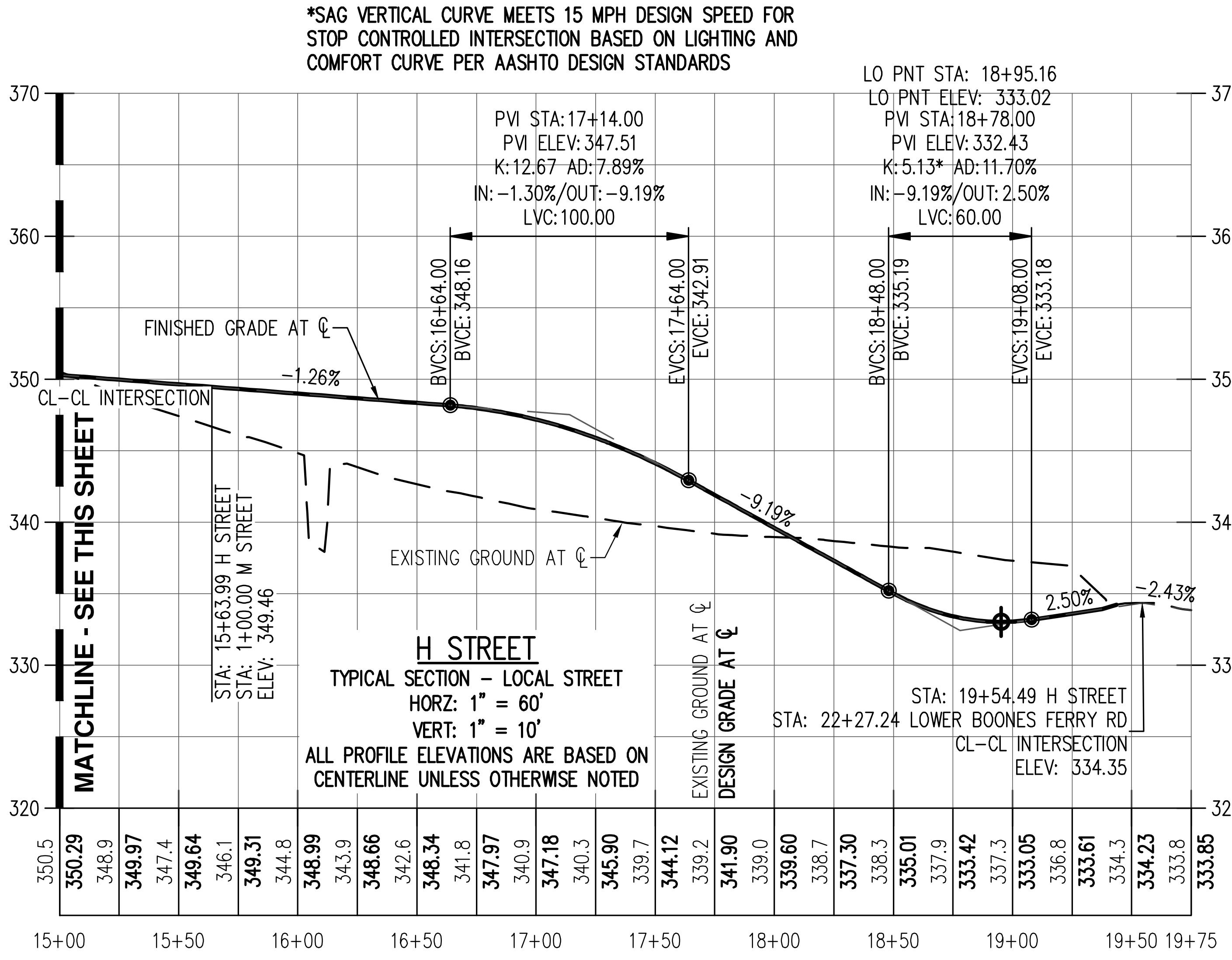

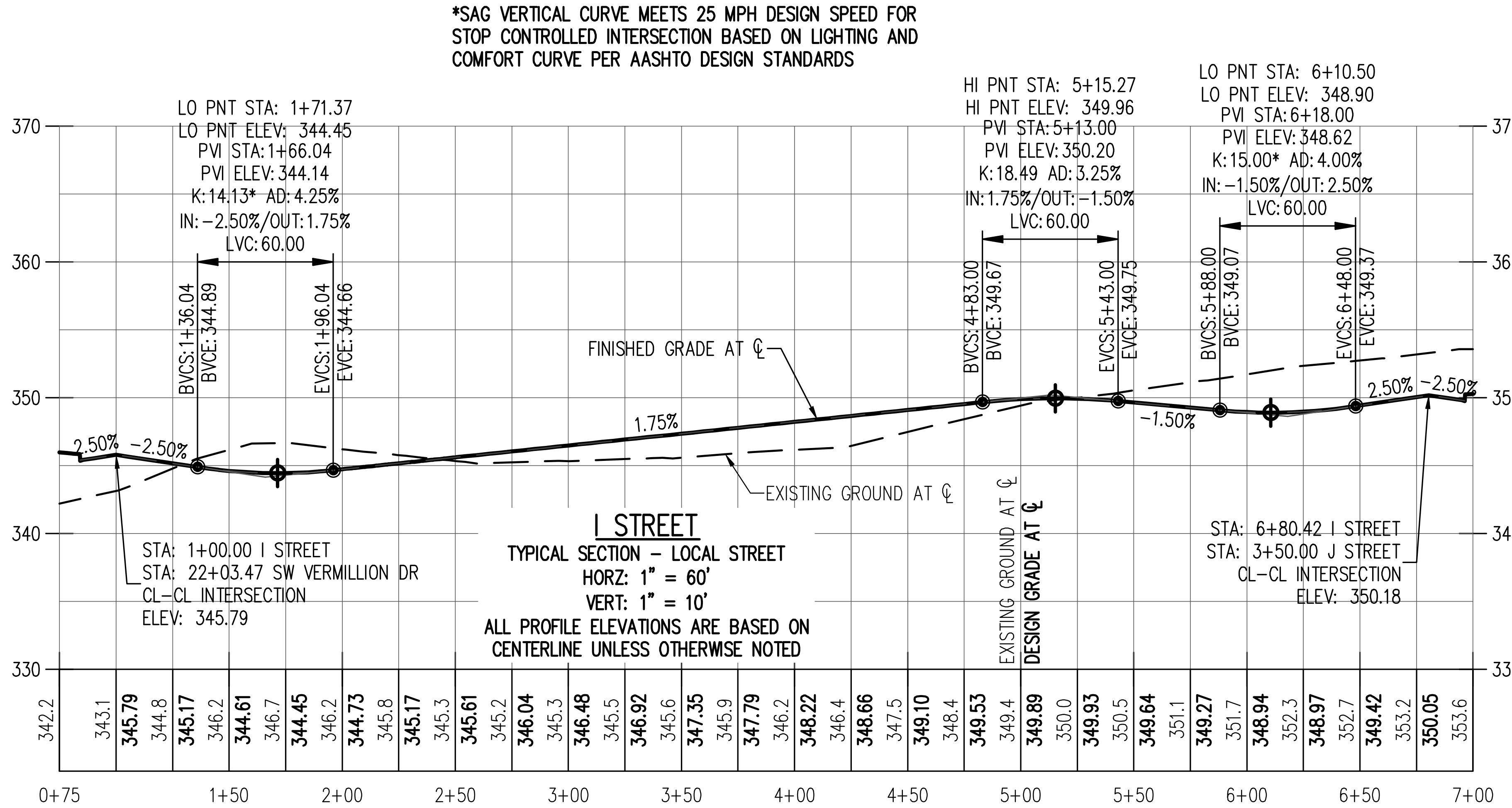

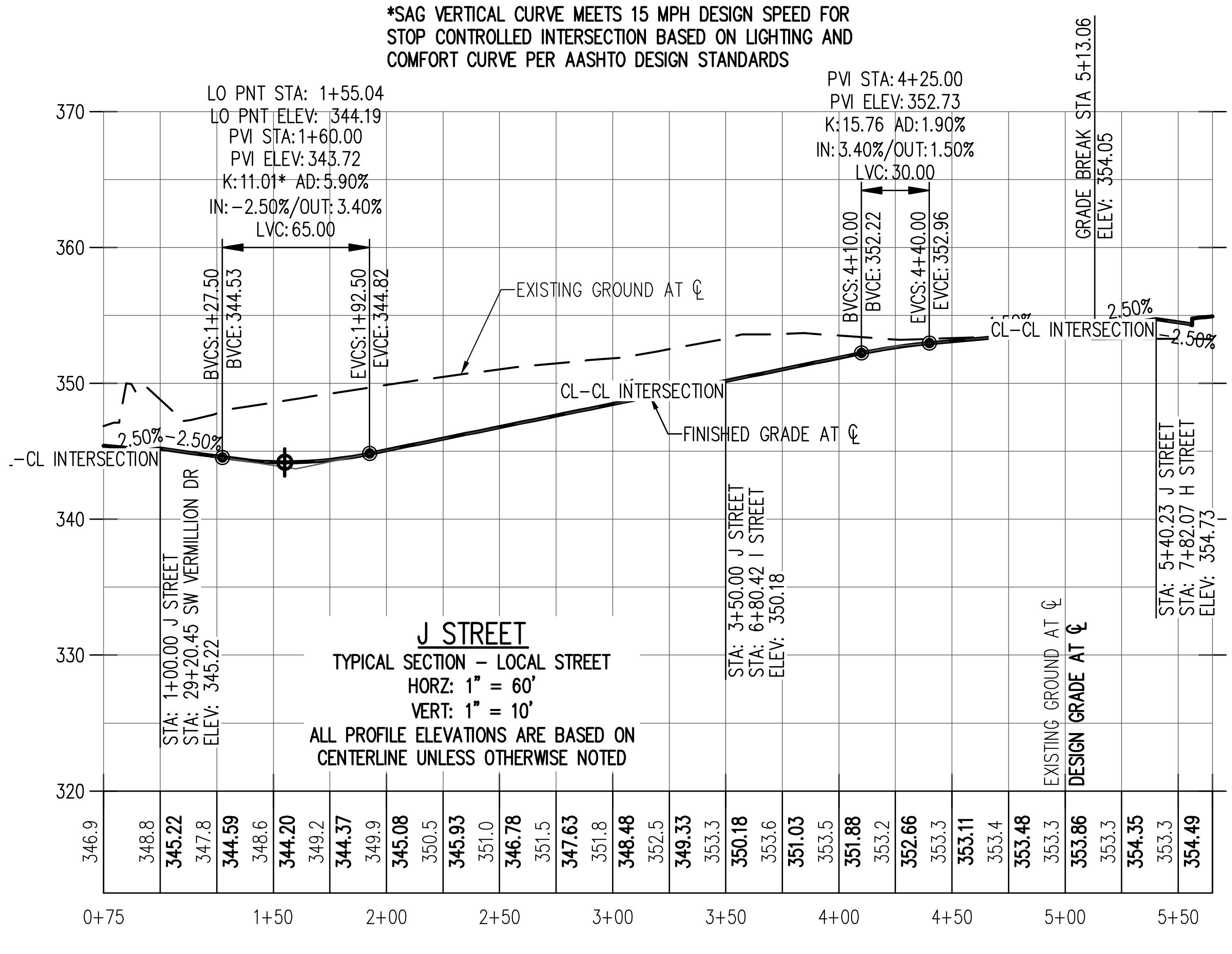

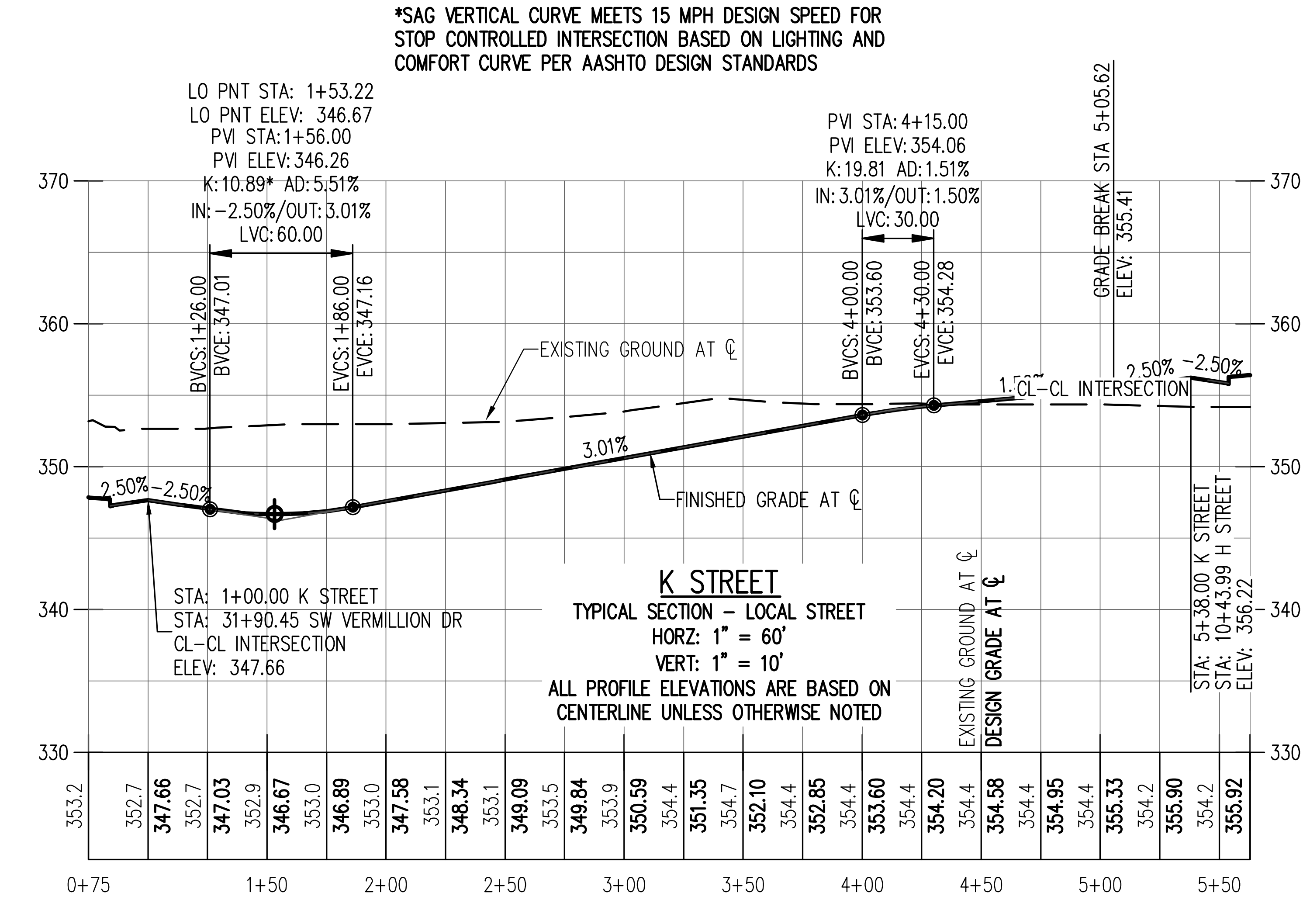

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OREGON
DARKO SIMIC
PRELIMINARY
RENEWAL DATE: 6/30/22

JOB NUMBER:	7454
DATE:	7/1/2021
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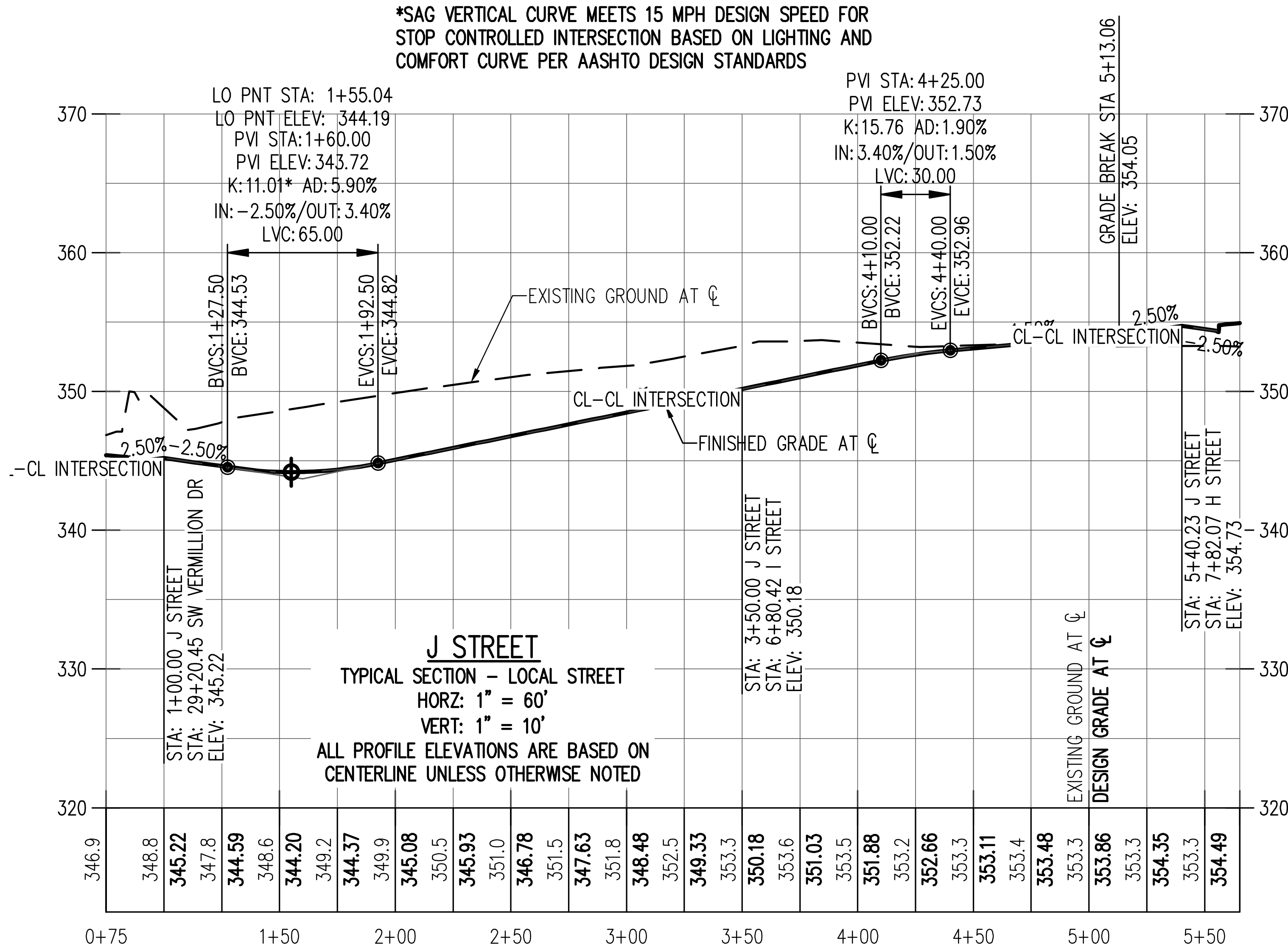
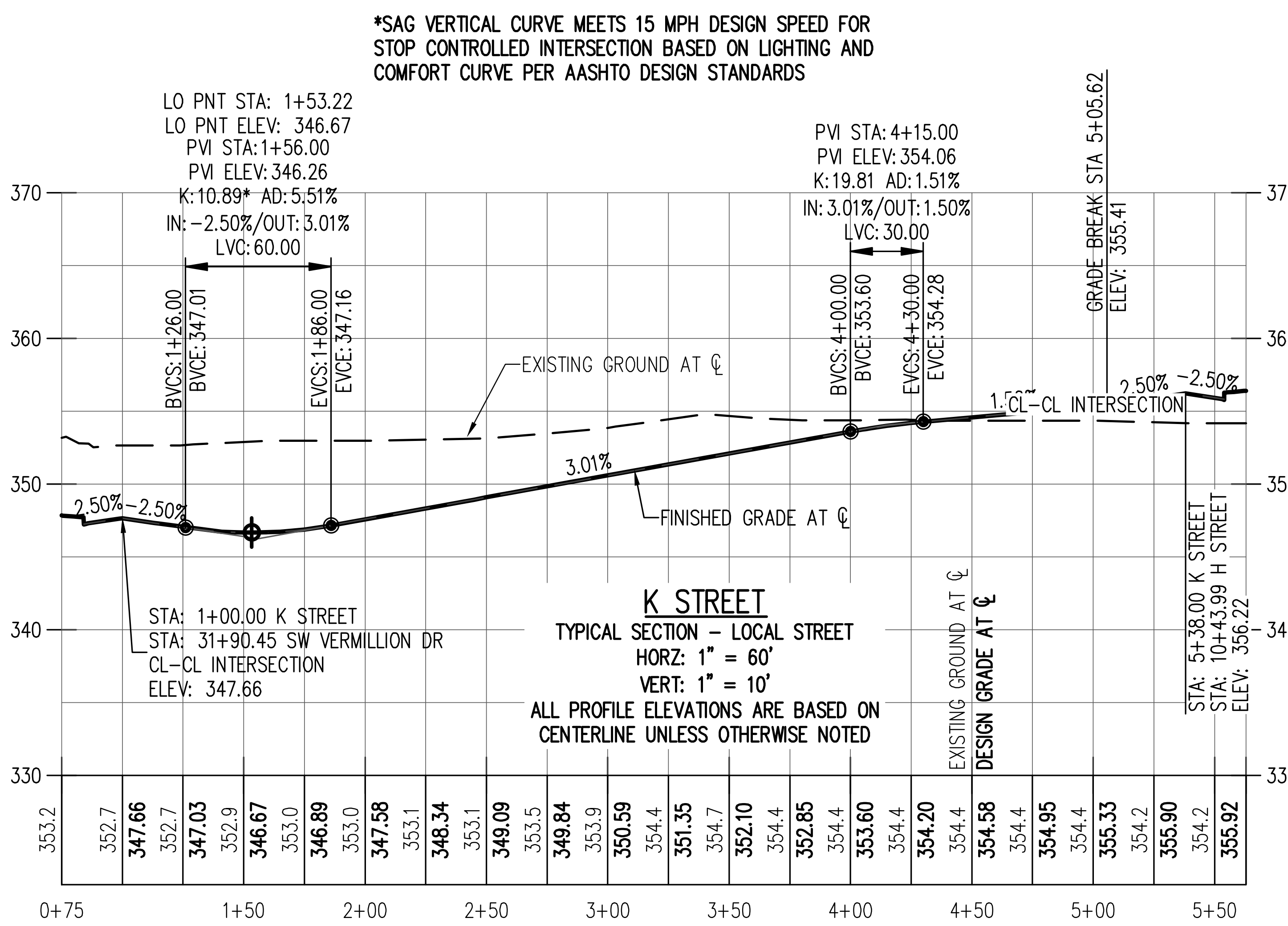
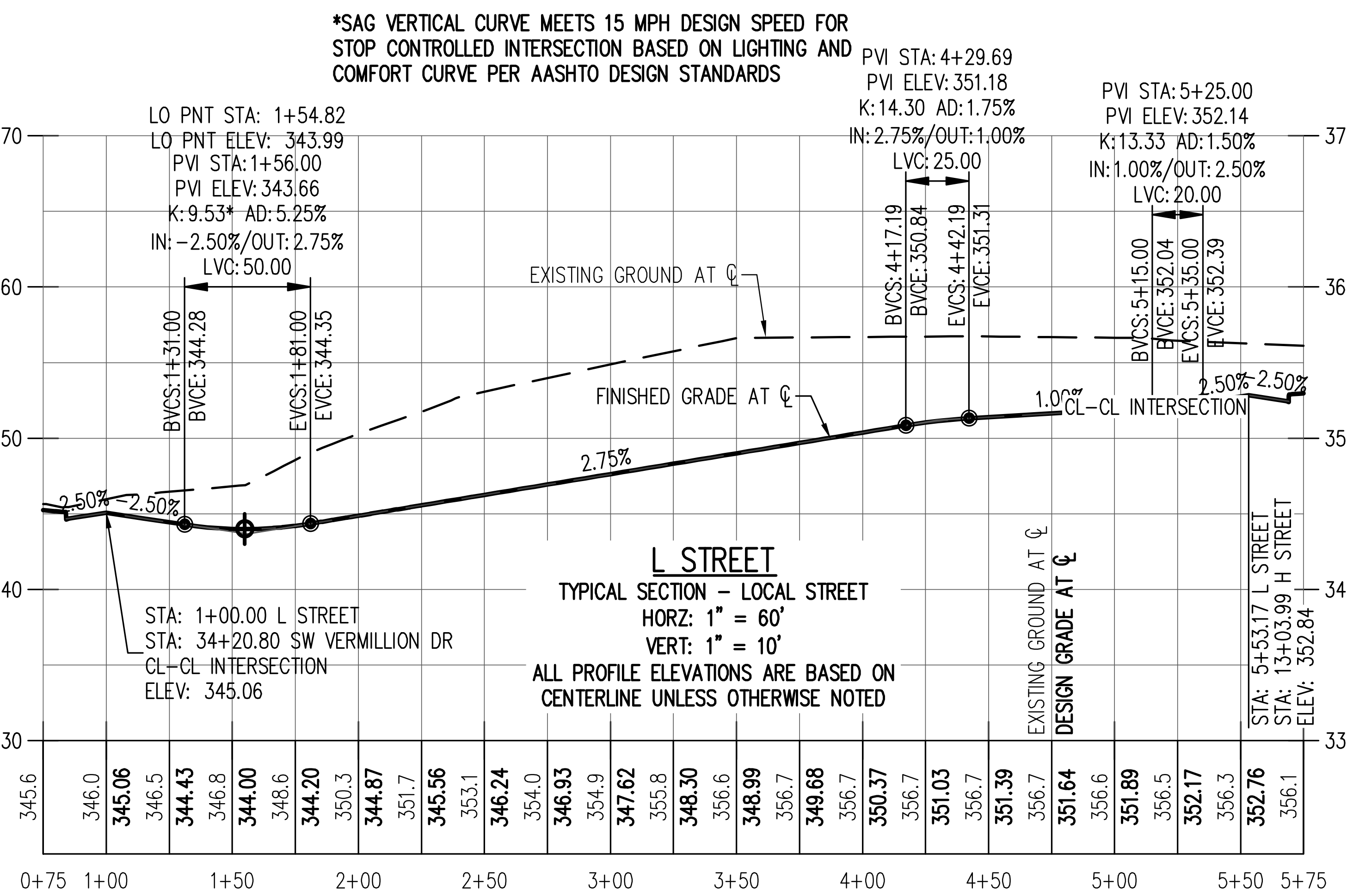
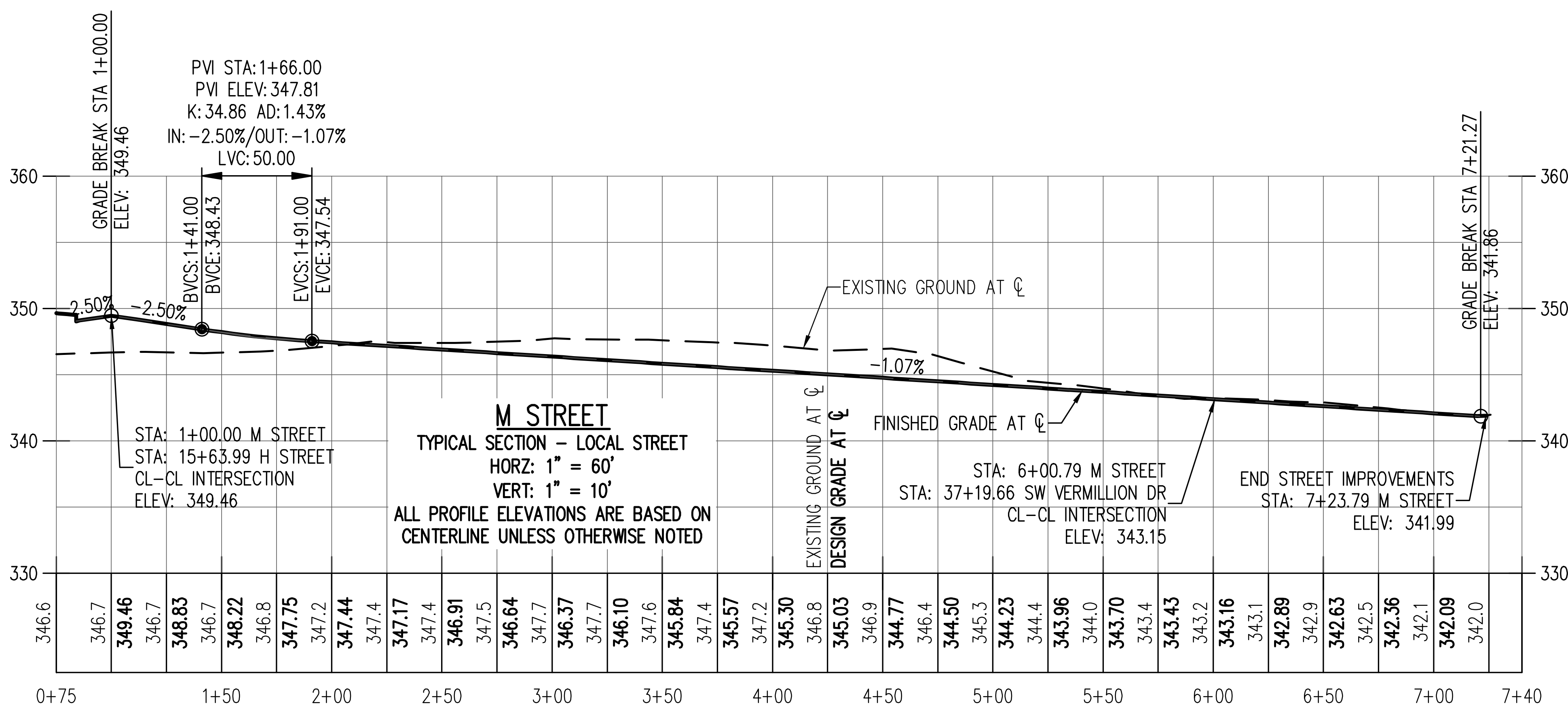
PS-04

AKS DRAWING FILE: 7454 STREETS PROFILES.DWG | LAYOUT: PS-04









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PRELIMINARY COMPOSITE UTILITY OVERVIEW
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OREGON
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DARKO SIMIC
PRELIMINARY
RENEWAL DATE: 6/30/22

JOB NUMBER:	7454
DATE:	7/1/2021
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CU-00

AKS DRAWING FILE: 7454 COMP UTILITY OVERVIEW.DWG | LAYOUT: CU-00

AKS DRAWING FILE: 7454 COMP UTILITY.DWG | LAYOUT: CU-01

PRELIMINARY COMPOSITE UTILITY PLAN (N)

AUTUMN SUNRISE SUBDIVISON

LENNAR NORTHWEST, INC.
TUALATIN, OREGON

REGISTERED PROFESSIONAL ENGINEER
84800PE
OREGON
MAY 12, 2016
DARKO SIMIC
PRELIMINARY
RENEWAL DATE: 6/30/22

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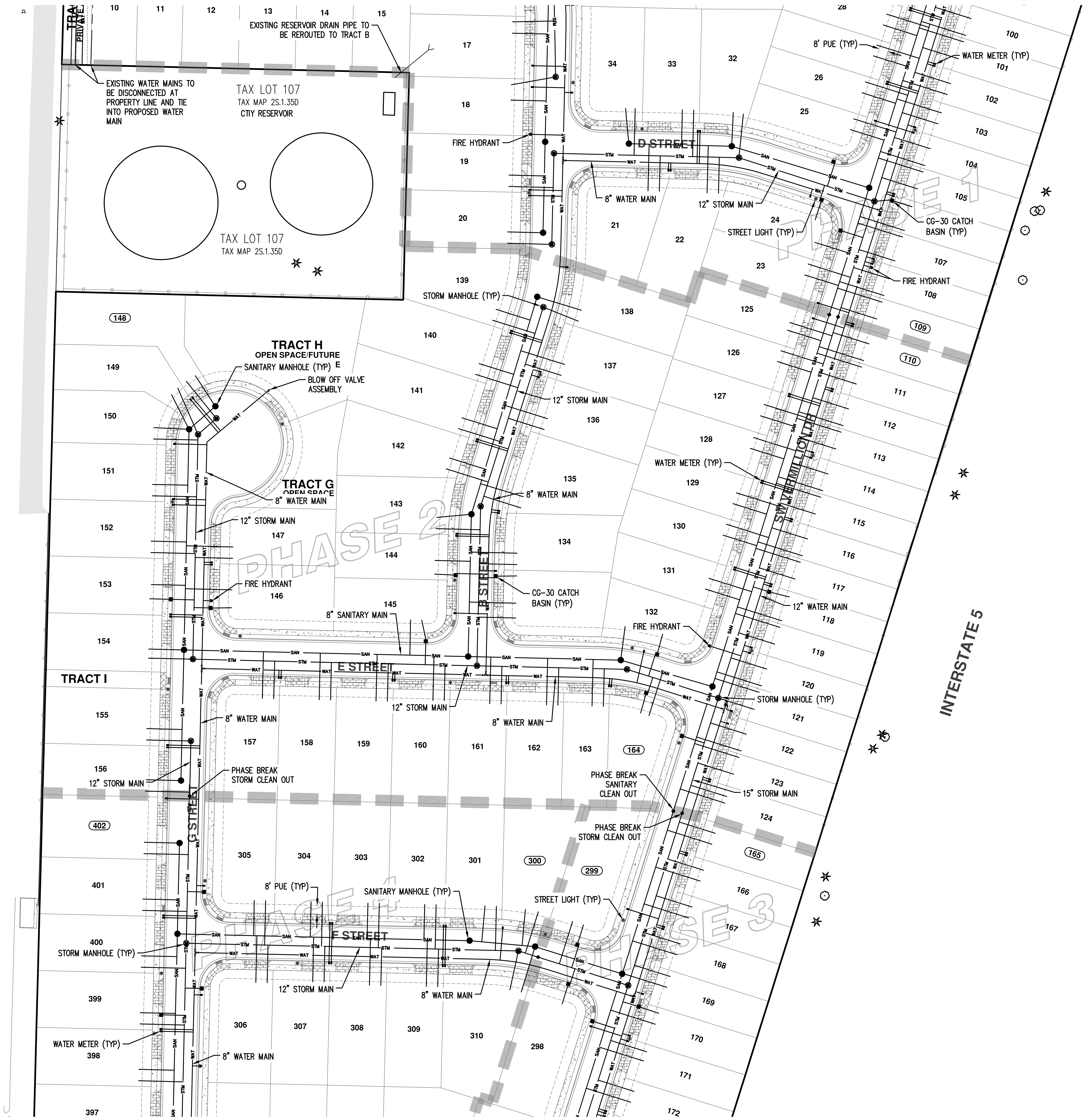

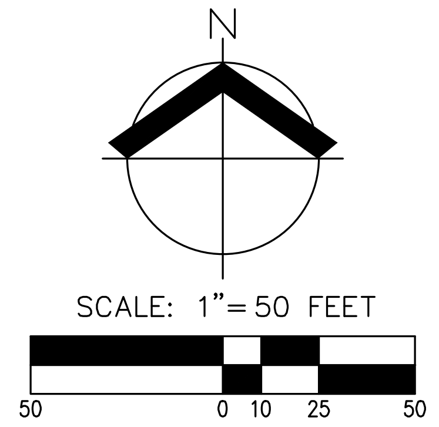

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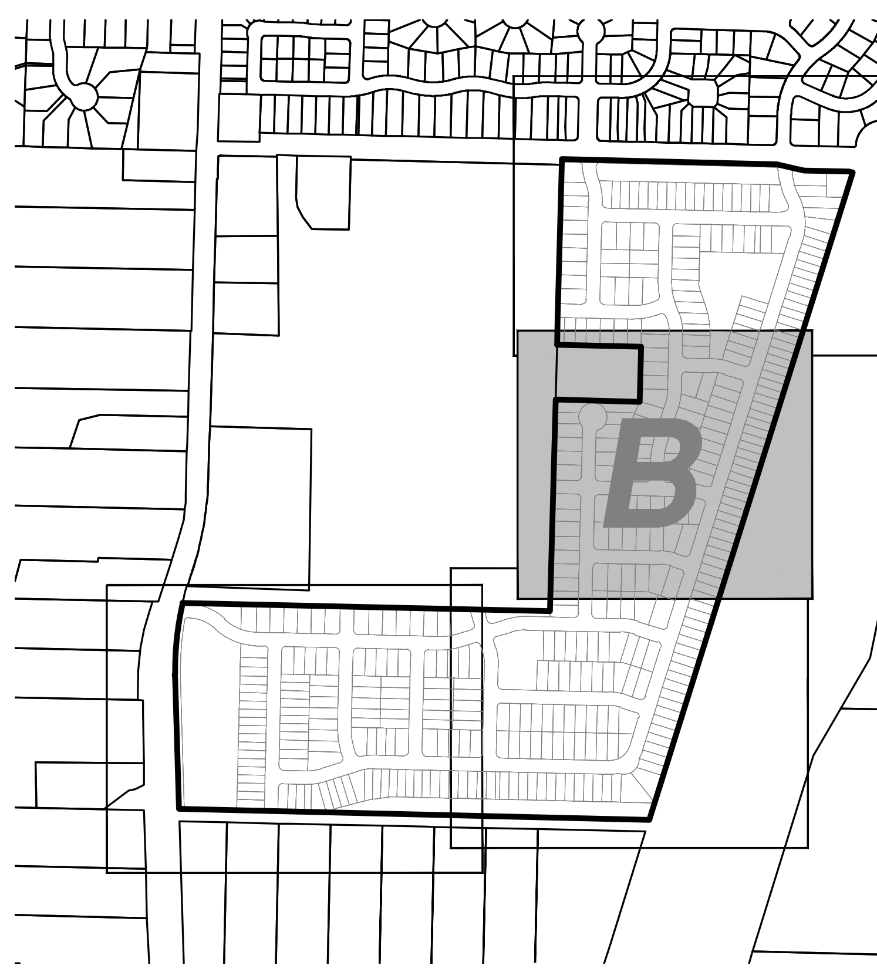

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DARKO SIMIC
PRELIMINARY
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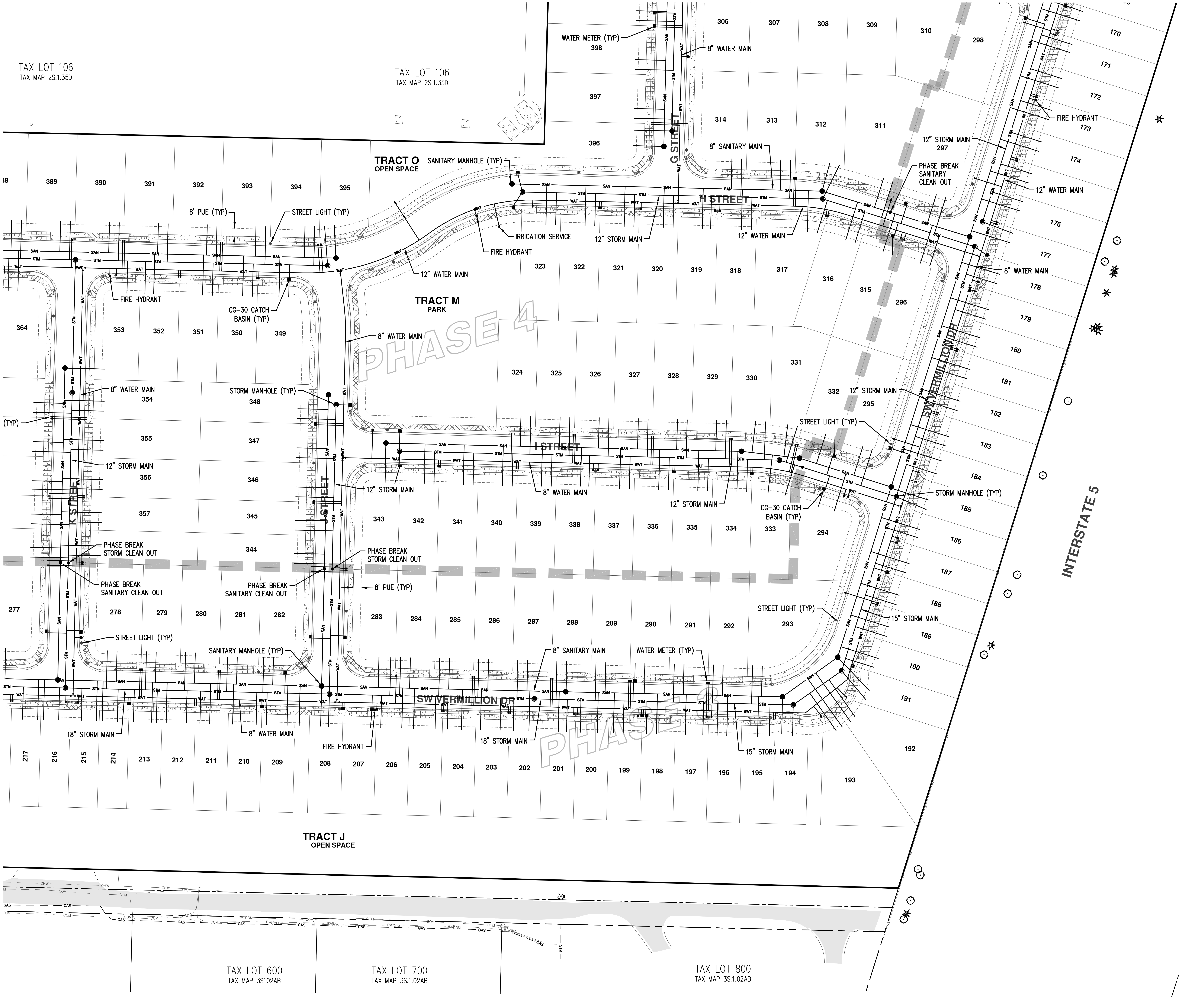

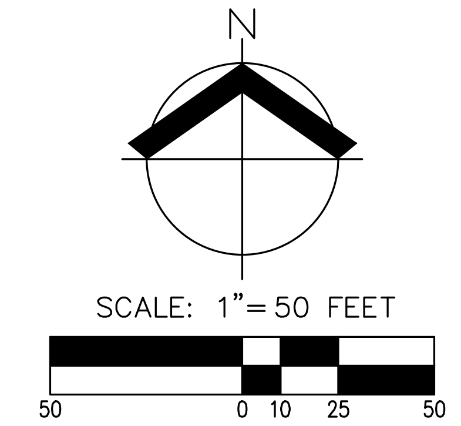

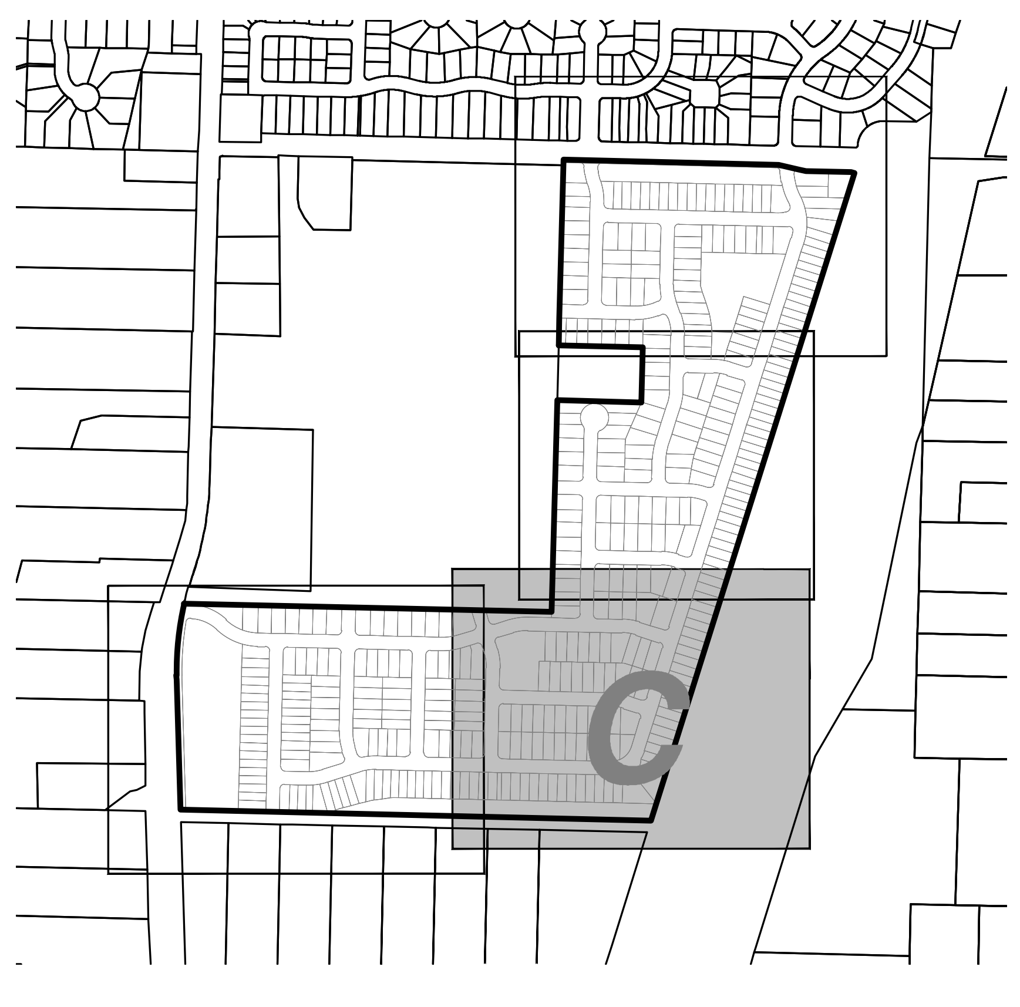

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DARKO SIMIC
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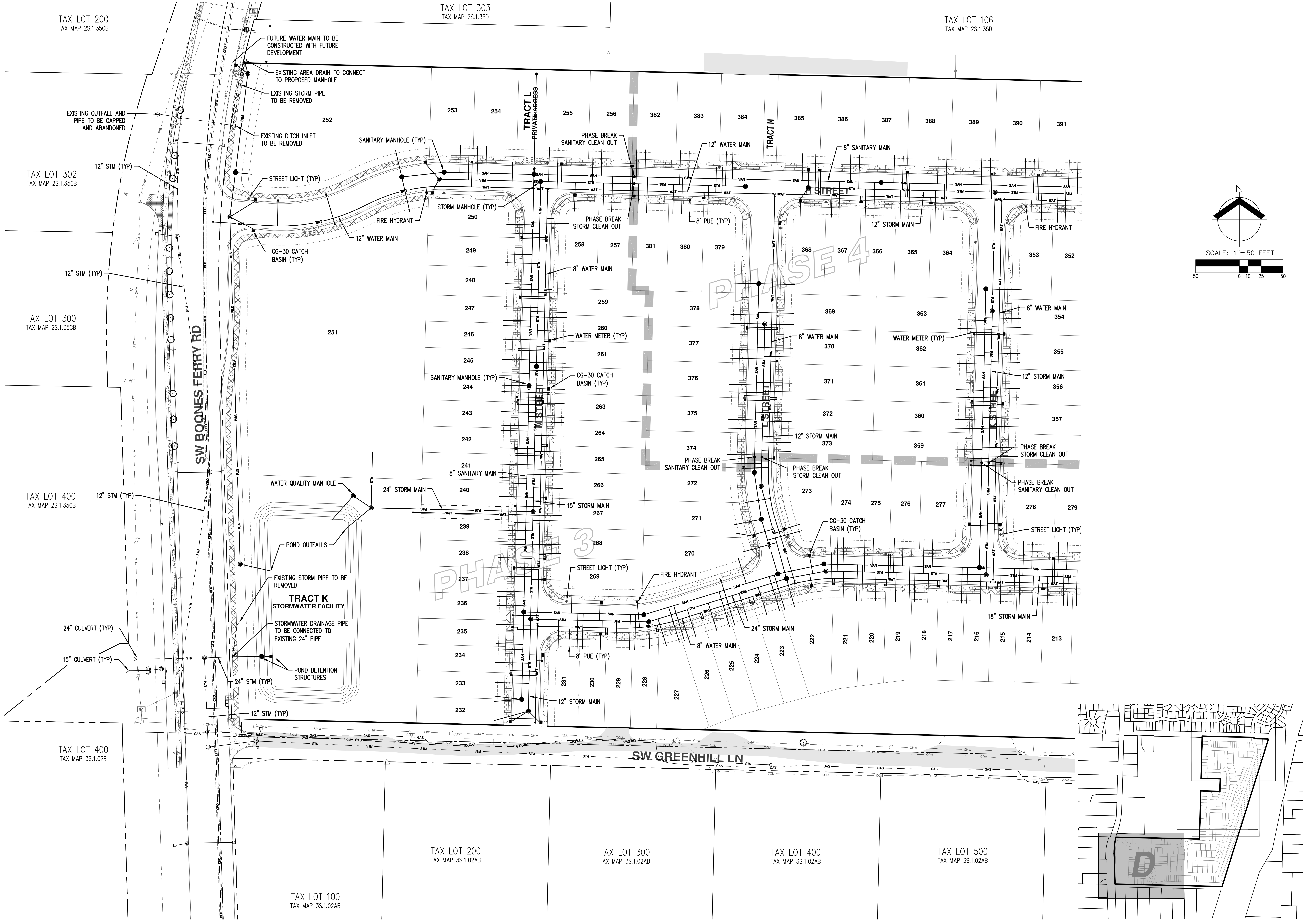

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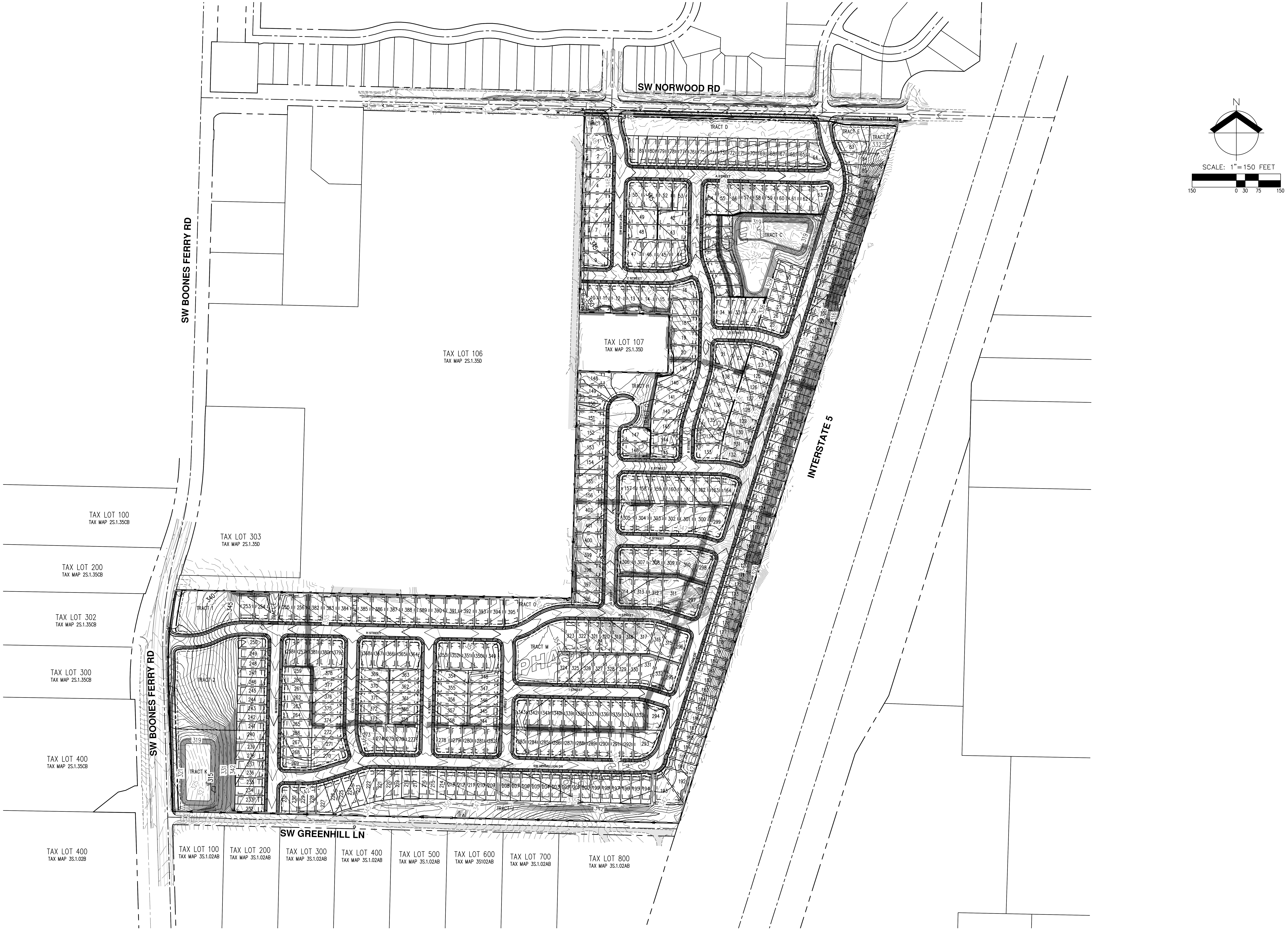

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OREGON
JULY 12, 2016
DARKO SIMIC
PRELIMINARY
RENEWAL DATE: 6/30/22

JOB NUMBER:	7454
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PG-00

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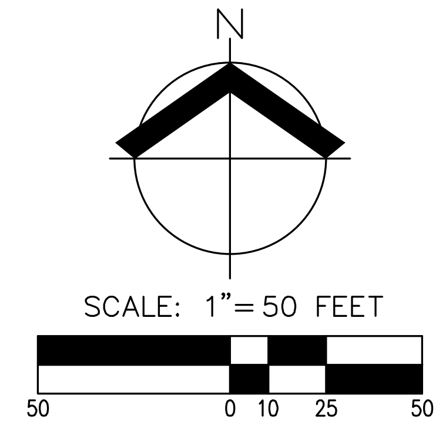

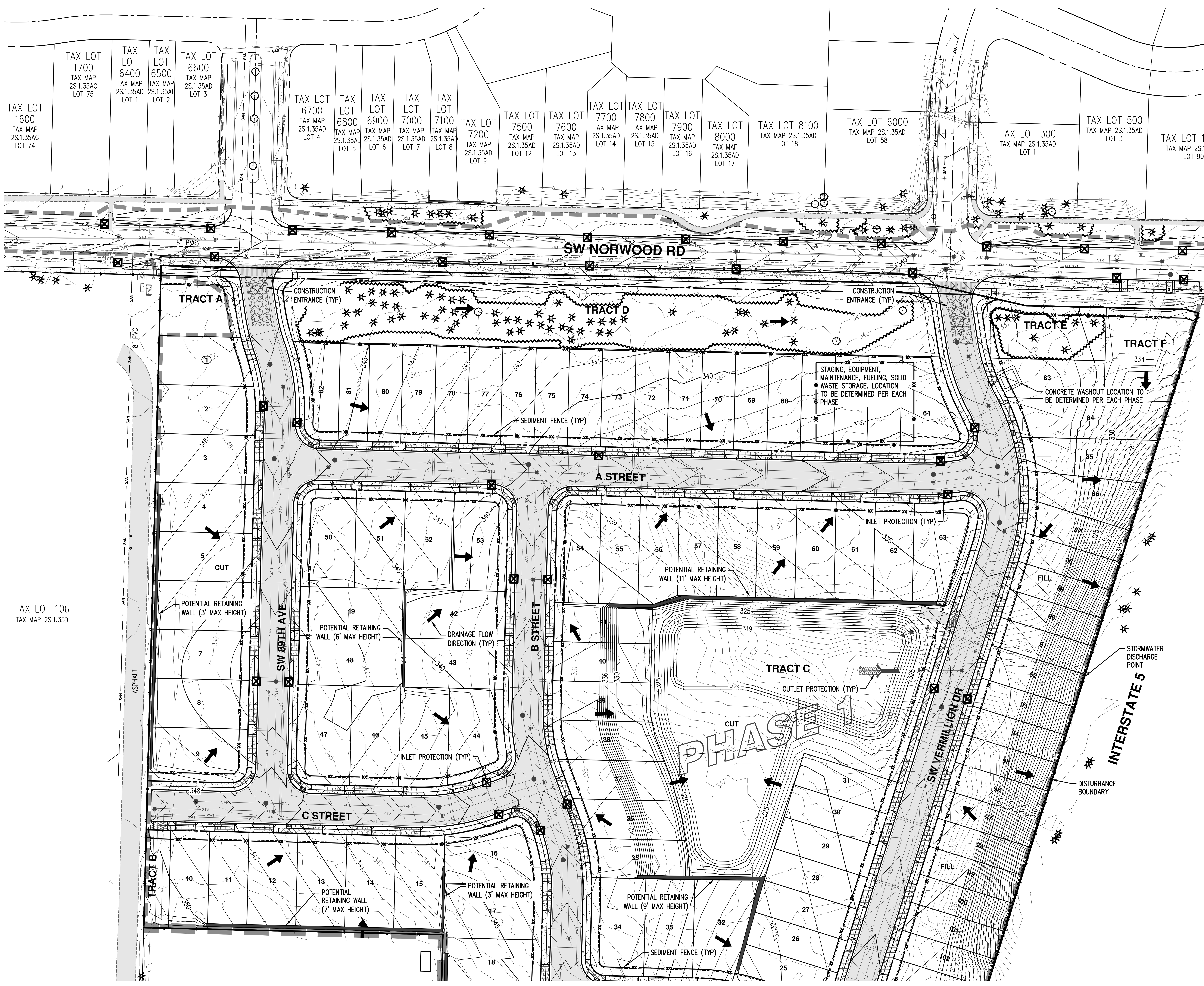

EROSION AND SEDIMENT CONTROL NOTES:

1. ALL PERVIOUS SURFACES SHALL RECEIVE TEMPORARY SEEDING.
2. ALL SLOPES GREATER THAN 25% SHALL RECEIVE SLOPE MATTING.

LEGEND

EXISTING GROUND CONTOUR (1 FT)	– – – –
EXISTING GROUND CONTOUR (5 FT)	– – 180 – –
FINISHED GRADE CONTOUR (1 FT)	——
FINISHED GRADE CONTOUR (5 FT)	—180—
SEDIMENT FENCE (INSTALLED PRIOR TO GRADING)	—x—x—
SEDIMENT FENCE AND SECONDARY BMP (INSTALLED AFTER TO GRADING)	—xx—
CURB INLET PROTECTION (TYP)	☒
CONCRETE WASHOUT AREA	⧄
DRAINAGE FLOW DIRECTION	➡
GRAVEL CONSTRUCTION ENTRANCE	▨
HARDSCAPE (AC/CONCRETE)	▨
DISTURBANCE BOUNDARY	– – –
OUTLET PROTECTION	➡
EXISTING TREE TO REMAIN	✱ ○
TREE PROTECTION FENCE	〰

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OREGON
JULY 12, 2016
MARKO SIMIC
PRELIMINARY
RENEWAL DATE: 6/30/22

JOB NUMBER:	7454
DATE:	7/1/2021
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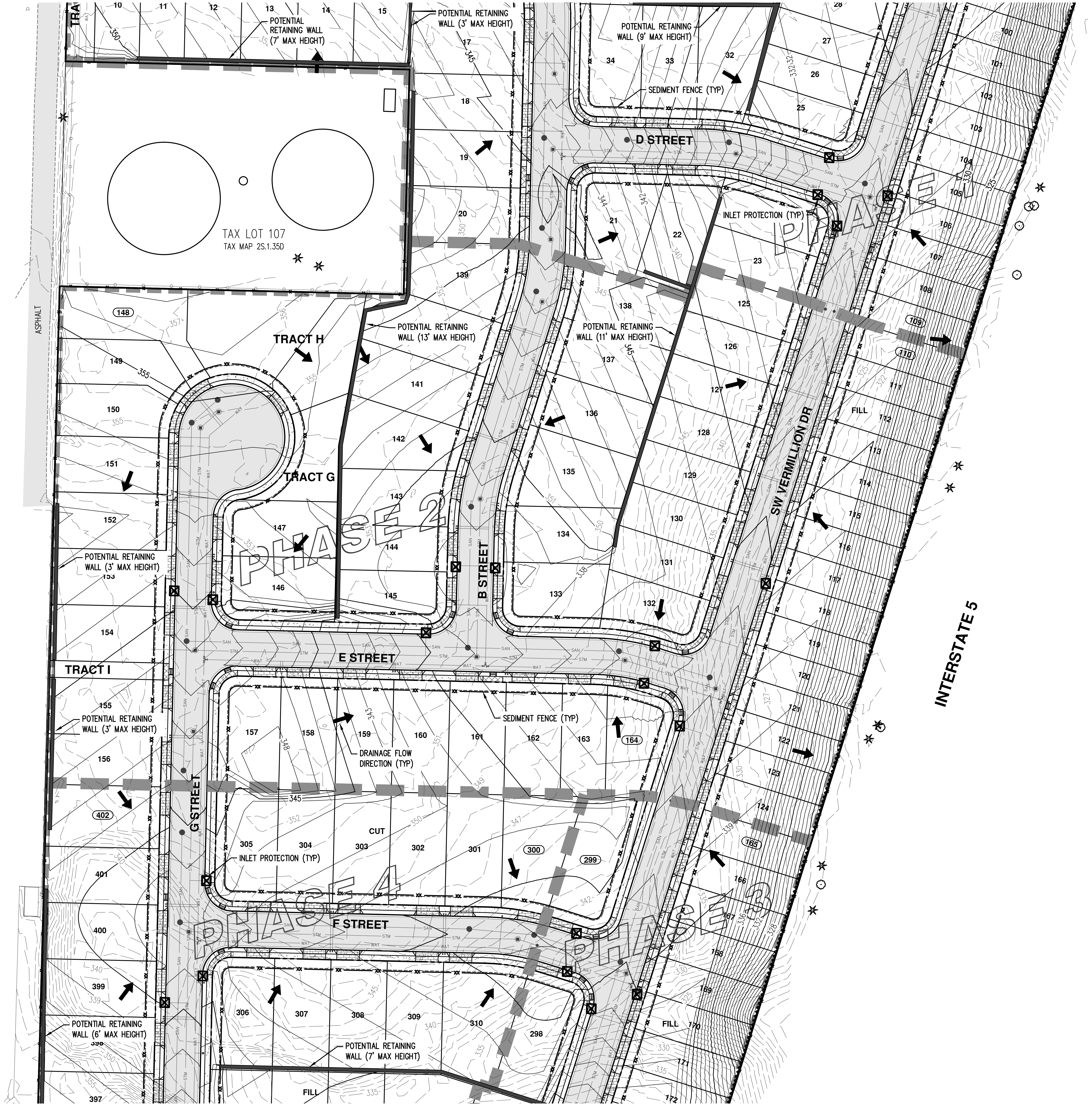
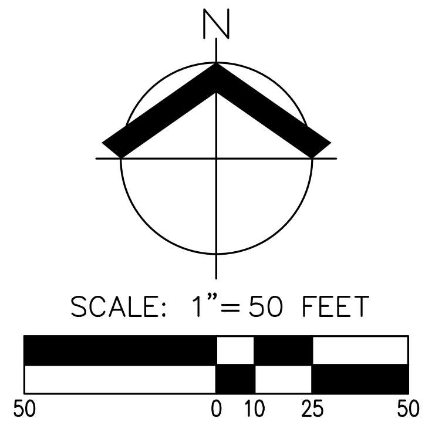
PG-01

AKS DRAWING FILE: 7454 GRADING ESC.DWG | LAYOUT: PG-01





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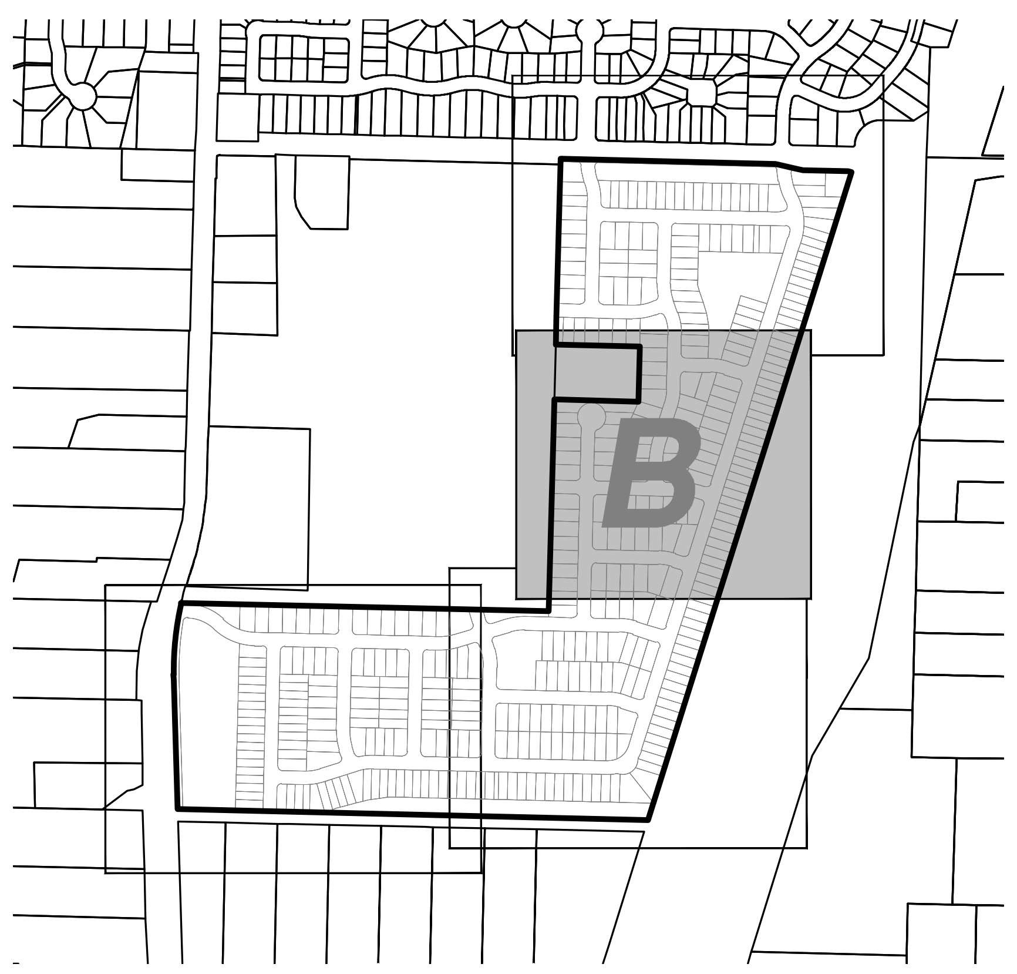
2. ALL SLOPES GREATER THAN 25% SHALL RECEIVE SLOPE MATTING.

LEGEND

EXISTING GROUND CONTOUR (1 FT)	— — — — —
EXISTING GROUND CONTOUR (5 FT)	— —180— —
FINISHED GRADE CONTOUR (1 FT)	———————
FINISHED GRADE CONTOUR (5 FT)	———180———
SEDIMENT FENCE (INSTALLED PRIOR TO GRADING)	—x——x—
SEDIMENT FENCE AND SECONDARY BMP (INSTALLED AFTER TO GRADING)	———xx———
CURB INLET PROTECTION (TYP)	☒
CONCRETE WASHOUT AREA	⧄
DRAINAGE FLOW DIRECTION	➡
GRAVEL CONSTRUCTION ENTRANCE	▨
HARDSCAPE (AC/CONCRETE)	◩
DISTURBANCE BOUNDARY	▬ ▬ ▬ ▬
OUTLET PROTECTION	▨➤
EXISTING TREE TO REMAIN	✶ ○
TREE PROTECTION FENCE	〰〰〰



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OREGON
JULY 12, 2016
DARKO SIMIC
PRELIMINARY
RENEWAL DATE: 6/30/22

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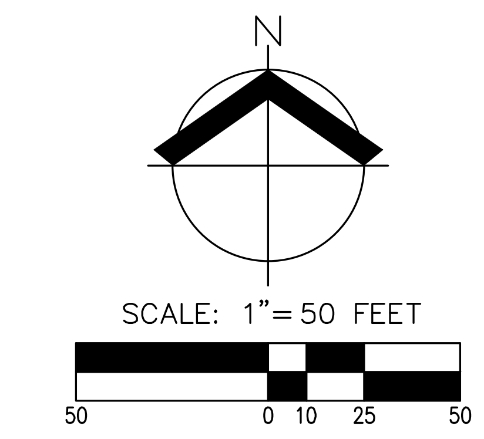

EROSION AND SEDIMENT CONTROL NOTES:

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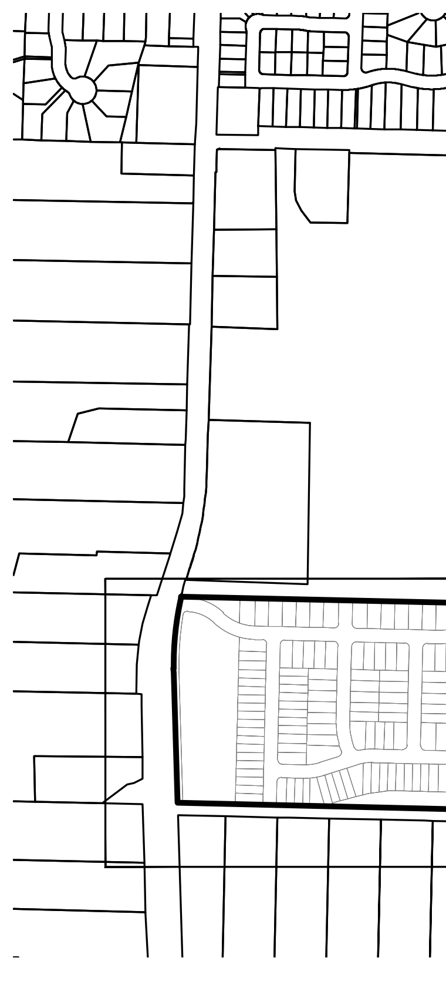
2. ALL SLOPES GREATER THAN 25% SHALL RECEIVE SLOPE MATTING.

LEGEND

EXISTING GROUND CONTOUR (1 FT)	— — — — —
EXISTING GROUND CONTOUR (5 FT)	— —180— —
FINISHED GRADE CONTOUR (1 FT)	———————
FINISHED GRADE CONTOUR (5 FT)	———180———
SEDIMENT FENCE (INSTALLED PRIOR TO GRADING)	—x——x—
SEDIMENT FENCE AND SECONDARY BMP (INSTALLED AFTER TO GRADING)	———xx———
CURB INLET PROTECTION (TYP)	☒
CONCRETE WASHOUT AREA	⊠
DRAINAGE FLOW DIRECTION	➡
GRAVEL CONSTRUCTION ENTRANCE	▨
HARDSCAPE (AC/CONCRETE)	◩
DISTURBANCE BOUNDARY	▬ ▬ ▬ ▬
OUTLET PROTECTION	▨➔
EXISTING TREE TO REMAIN	✶ ○
TREE PROTECTION FENCE	∿∿∿∿∿



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DARKO SIMIC
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RENEWAL DATE: 6/30/22

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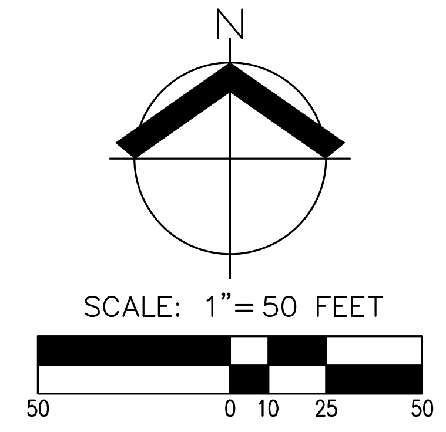
PG-03

AKS DRAWING FILE: 7454 GRADING ESC.DWG | LAYOUT: PG-03



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2. ALL SLOPES GREATER THAN 25% SHALL RECEIVE SLOPE MATTING.

LEGEND

EXISTING GROUND CONTOUR (1 FT)	— — — — —
EXISTING GROUND CONTOUR (5 FT)	—— ——180—— ——
FINISHED GRADE CONTOUR (1 FT)	————————
FINISHED GRADE CONTOUR (5 FT)	————180————
SEDIMENT FENCE (INSTALLED PRIOR TO GRADING)	—— x ———— x ——
SEDIMENT FENCE AND SECONDARY BMP (INSTALLED AFTER TO GRADING)	———— xx ————
CURB INLET PROTECTION (TYP)	☒
CONCRETE WASHOUT AREA	⧄
DRAINAGE FLOW DIRECTION	➡
GRAVEL CONSTRUCTION ENTRANCE	▨
HARDSCAPE (AC/CONCRETE)	◩
DISTURBANCE BOUNDARY	▬ ▬ ▬ ▬
OUTLET PROTECTION	▨➡
EXISTING TREE TO REMAIN	✲ ○
TREE PROTECTION FENCE	~~~~~~~

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TUALATIN, OREGON

REGISTERED PROFESSIONAL ENGINEER
84800PE
OREGON
JULY 12, 2016
DARKO SIMIC
PRELIMINARY
RENEWAL DATE: 6/30/22

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PG-04

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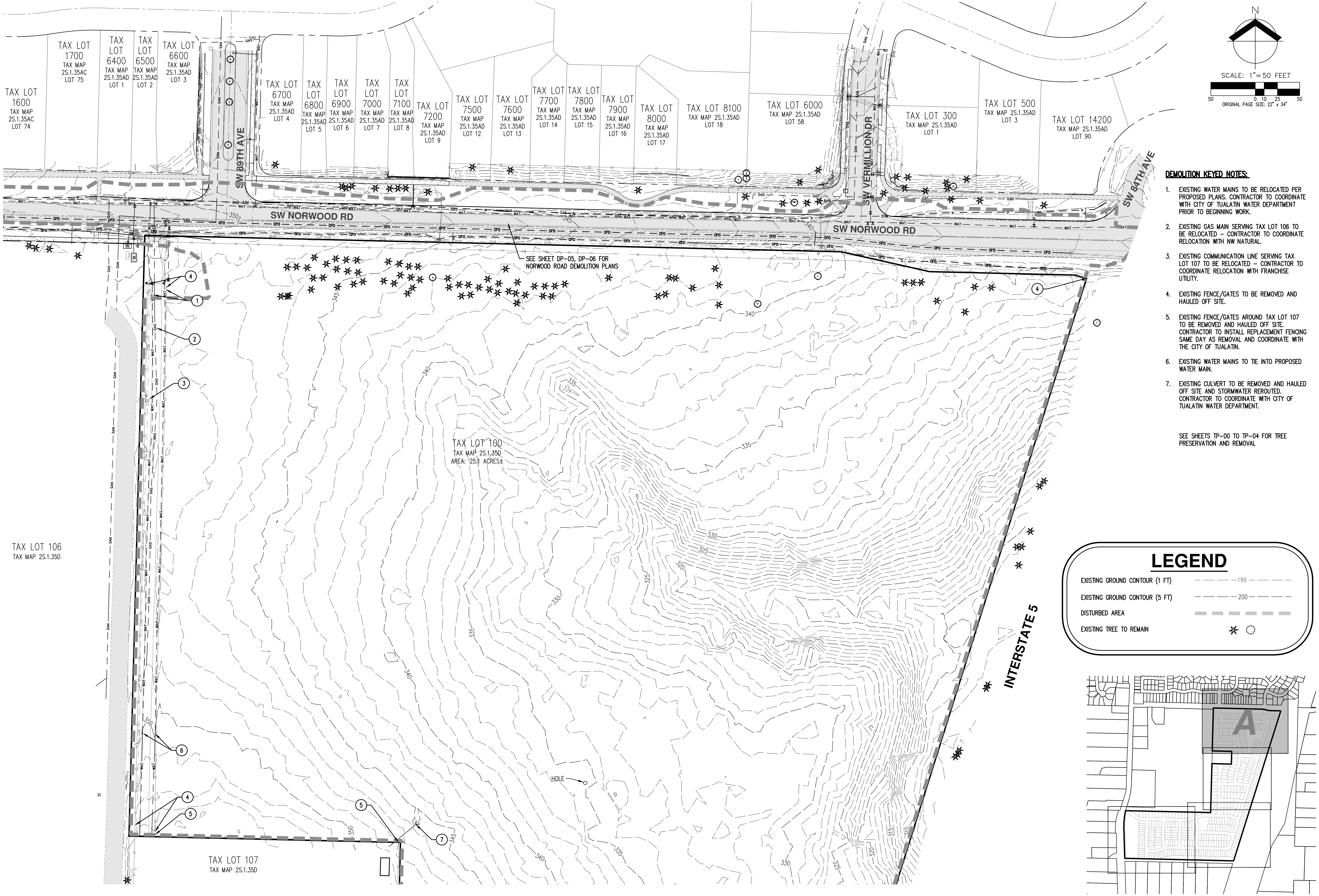

DEMOLITION KEYED NOTES:

1. EXISTING WATER MAINS TO BE RELOCATED PER PROPOSED PLANS. CONTRACTOR TO COORDINATE WITH CITY OF TUALATIN WATER DEPARTMENT PRIOR TO BEGINNING WORK.
2. EXISTING GAS MAIN SERVING TAX LOT 106 TO BE RELOCATED – CONTRACTOR TO COORDINATE RELOCATION WITH NW NATURAL.
3. EXISTING COMMUNICATION LINE SERVING TAX LOT 107 TO BE RELOCATED – CONTRACTOR TO COORDINATE RELOCATION WITH FRANCHISE UTILITY.
4. EXISTING FENCE/GATES TO BE REMOVED AND HAULED OFF SITE.
5. EXISTING FENCE/GATES AROUND TAX LOT 107 TO BE REMOVED AND HAULED OFF SITE. CONTRACTOR TO INSTALL REPLACEMENT FENCING SAME DAY AS REMOVAL AND COORDINATE WITH THE CITY OF TUALATIN.
6. EXISTING WATER MAINS TO TIE INTO PROPOSED WATER MAIN.
7. EXISTING CULVERT TO BE REMOVED AND HAULED OFF SITE AND STORMWATER REROUTED. CONTRACTOR TO COORDINATE WITH CITY OF TUALATIN WATER DEPARTMENT.

SEE SHEETS TP-00 TO TP-04 FOR TREE PRESERVATION AND REMOVAL

LEGEND

EXISTING GROUND CONTOUR (1 FT)	– – – –199– – – –
EXISTING GROUND CONTOUR (5 FT)	——200——
DISTURBED AREA	▬ ▬ ▬
EXISTING TREE TO REMAIN	✳ ○

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TUALATIN, OREGON

PRELIMINARY

DARKO SIMIC
JULY 12, 2016
RENEWAL DATE: 6/30/22

JOB NUMBER:	7454
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DP-01

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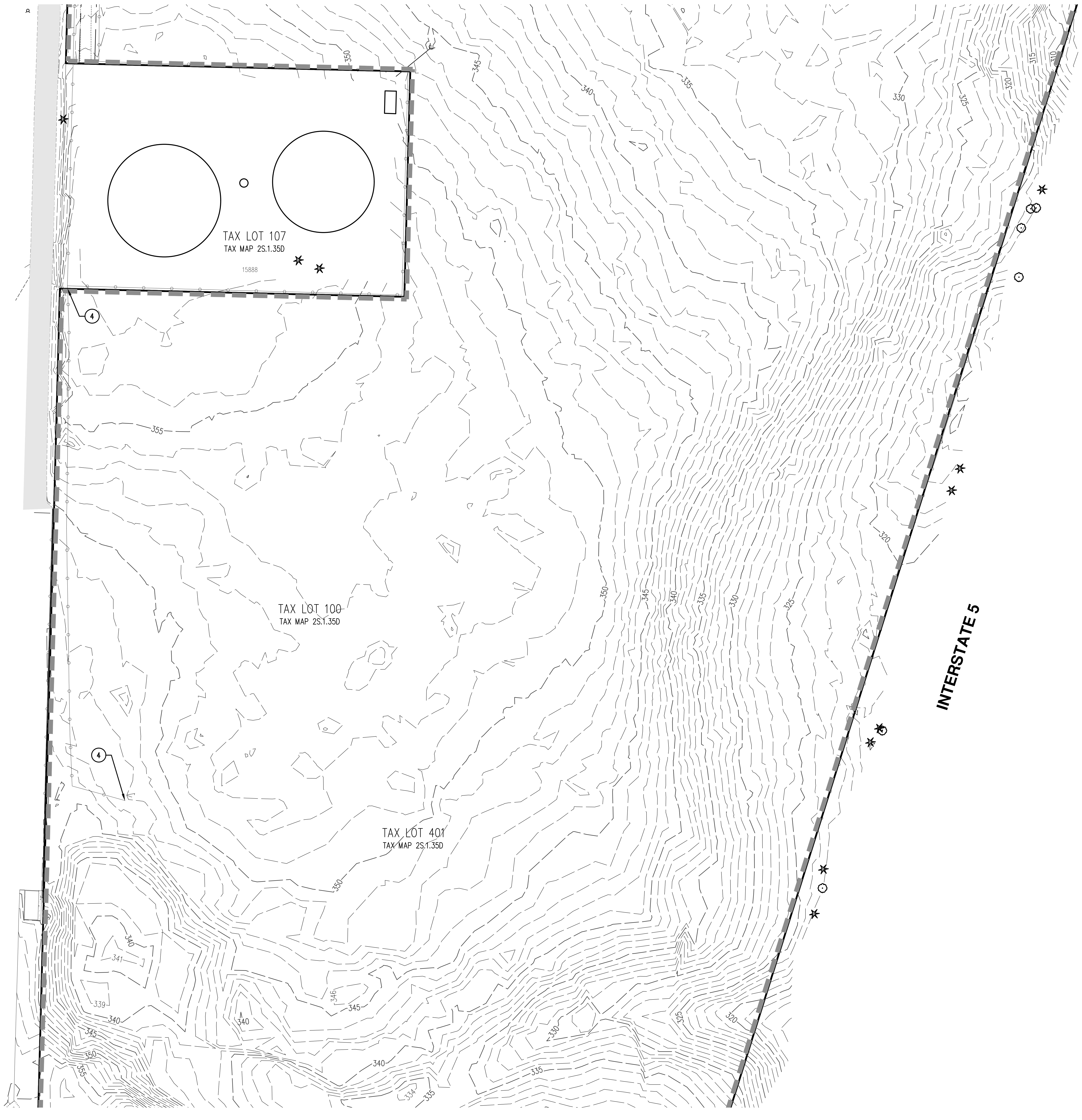
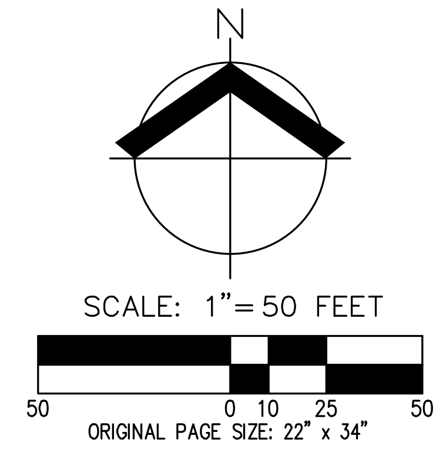




DEMOLITION KEYED NOTES:

4. EXISTING FENCE/GATES TO BE REMOVED AND HAULED OFF SITE

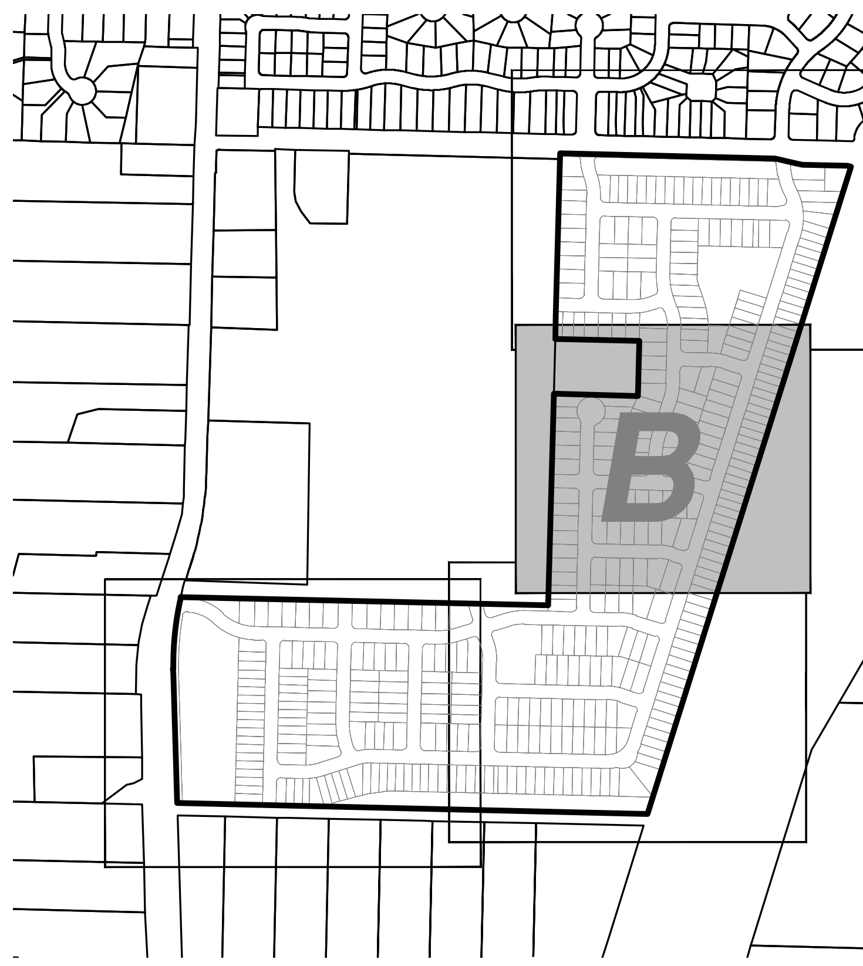
5. EXISTING FENCE/GATES AROUND TAX LOT 107 TO BE REMOVED AND HAULED OFF SITE. CONTRACTOR TO INSTALL REPLACEMENT FENCING SAME DAY AS REMOVAL AND COORDINATE WITH THE CITY OF TUALATIN.

7. EXISTING CULVERT TO BE REMOVED AND HAULED OFF SITE AND STORMWATER REROUTED. CONTRACTOR TO COORDINATE WITH CITY OF TUALATIN WATER DEPARTMENT.

SEE SHEETS TP-00 TO TP-04 FOR TREE PRESERVATION AND REMOVAL

LEGEND

EXISTING GROUND CONTOUR (1 FT)	— — —199— — —
EXISTING GROUND CONTOUR (5 FT)	— — —200— — —
DISTURBED AREA	▬ ▬ ▬ ▬ ▬
EXISTING TREE TO REMAIN	✱ ○



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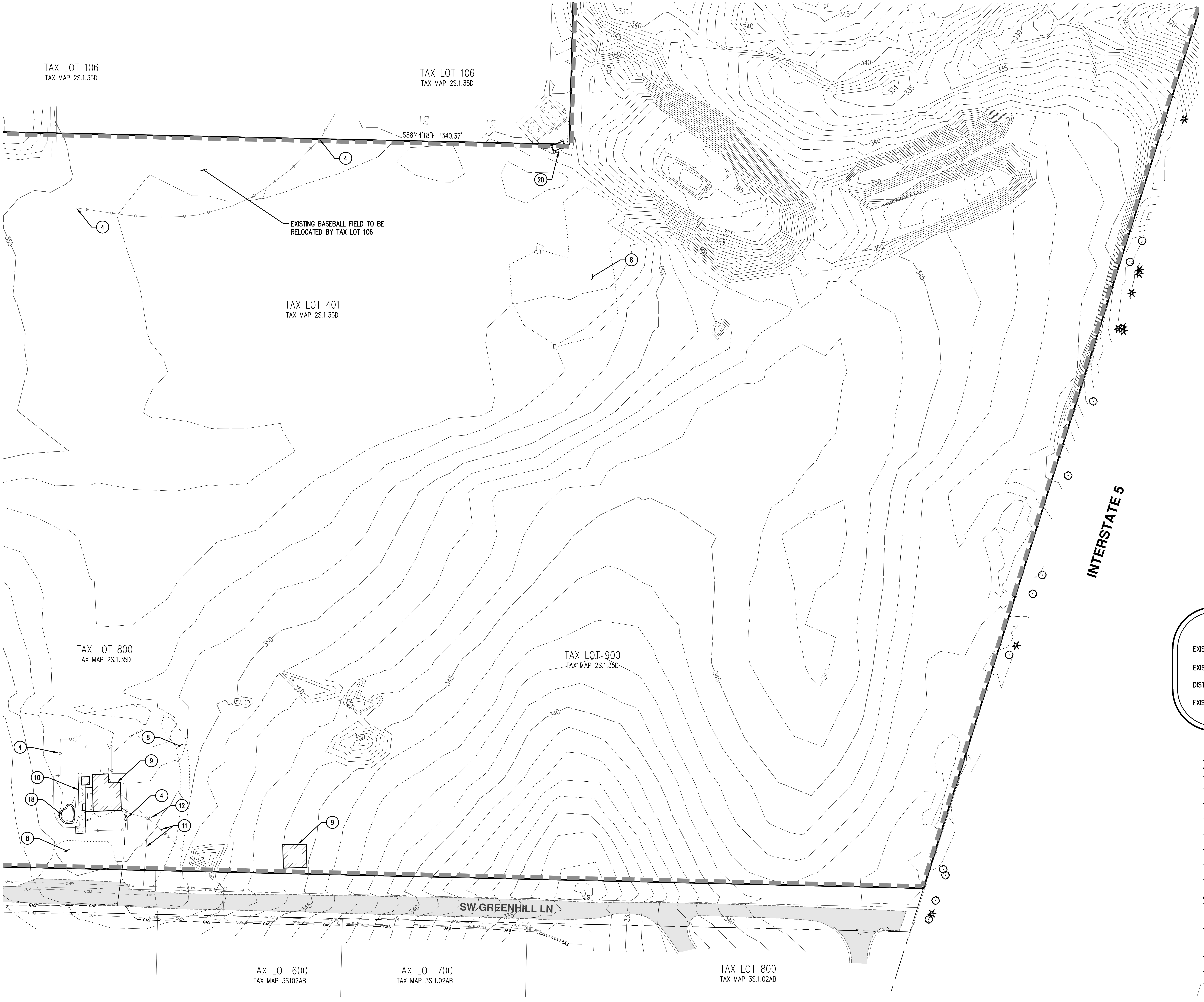
PRELIMINARY DEMOLITION PLAN (CEN)
AUTUMN SUNRISE SUBDIVISON
LENNAR NORTHWEST, INC.
TUALATIN, OREGON

84806PE
JULY 12, 2016
DARKO SIMIC
PRELIMINARY
RENEWAL DATE: 6/30/22

JOB NUMBER:	7454
DATE:	7/1/2021
DESIGNED BY:	JSM
DRAWN BY:	JSM
CHECKED BY:	DS

DP-02

AKS DRAWING FILE: 7454 DEMO.DWG | LAYOUT: DP-02



N

SCALE: 1"=50 FEET

50 0 10 25 50

ORIGINAL PAGE SIZE: 22" x 34"

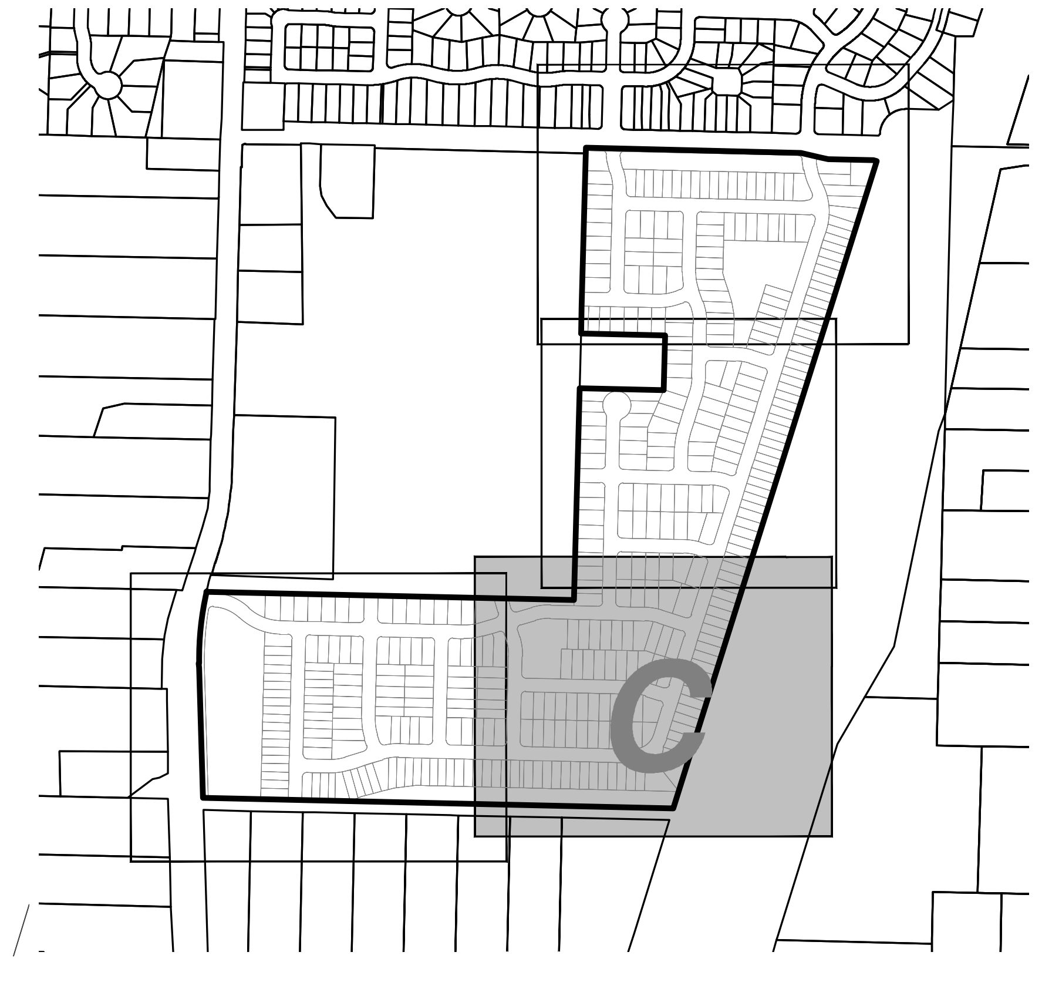
DEMOLITION KEYED NOTES:

4. EXISTING FENCE/GATES TO BE REMOVED AND HAULED OFF SITE.
8. EXISTING GRAVEL TO BE RELOCATED TO AN ON-SITE STOCKPILE LOCATION
9. EXISTING BUILDING TO BE DEMOLISHED AND HAULED OFF SITE
10. EXISTING CONCRETE TO BE REMOVED AND HAULED OFF SITE
11. EXISTING OVERHEAD WIRE TO BE REMOVED – COORDINATE REMOVAL WITH UTILITY COMPANY
12. EXISTING POWER POLE AND WIRE TO BE REMOVED – COORDINATE REMOVAL WITH UTILITY COMPANY
18. EXISTING POOL TO BE REMOVED AND BACKFILLED
20. EXISTING STRUCTURE TO BE RELOCATED – CONTRACTOR TO COORDINATE WITH PROPERTY OWNER

SEE SHEETS TP-00 TO TP-04 FOR TREE PRESERVATION AND REMOVAL

LEGEND

EXISTING GROUND CONTOUR (1 FT)	— — 199 — —
EXISTING GROUND CONTOUR (5 FT)	— — 200 — —
DISTURBED AREA	▬ ▬ ▬
EXISTING TREE TO REMAIN	✳ ○



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PRELIMINARY
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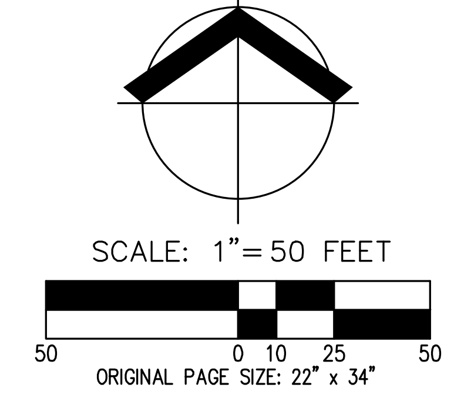
DP-03

AKS DRAWING FILE: 7454 DEMO.DWG | LAYOUT: DP-03



DEMOLITION KEYED NOTES:

4. EXISTING FENCE/GATES TO BE REMOVED AND HAULED OFF SITE.

8. EXISTING GRAVEL TO BE RELOCATED TO AN ON-SITE STOCKPILE LOCATION.

9. EXISTING BUILDING TO BE DEMOLISHED AND HAULED OFF SITE.

10. EXISTING CONCRETE TO BE REMOVED AND HAULED OFF SITE.

11. EXISTING OVERHEAD WIRE TO BE REMOVED – COORDINATE REMOVAL WITH UTILITY COMPANY

12. EXISTING POWER POLE AND WIRE TO BE REMOVED – COORDINATE REMOVAL WITH UTILITY COMPANY.

13. EXISTING SEPTIC HOLES TO BE FILLED DURING GRADING.

14. EXISTING COMMUNICATION LINE TO BE REMOVED – CONTRACTOR TO COORDINATE REMOVAL WITH FRANCHISE UTILITY.

15. EXISTING POWER STRUCTURE TO BE REMOVED AND HAULED OFF SITE.

16. EXISTING DITCH INLET TO BE REMOVED – CONTRACTOR TO COORDINATE WITH CWS.

17. EXISTING CATCH BASIN TO BE RELOCATED – CONTRACTOR TO COORDINATE WITH CWS.

18. EXISTING POOL TO BE REMOVED AND BACKFILLED.

19. EXISTING STORM PIPE TO BE ABANDONED AND CAPPED.

21. EXISTING CURB AND STRIPING TO BE REMOVED

22. EXISTING AC PAVEMENT TO BE REMOVED AND HAULED OFF SITE.

SEE SHEETS TP-00 TO TP-04 FOR TREE PRESERVATION AND REMOVAL

LEGEND

EXISTING GROUND CONTOUR (1 FT)	— — — 199 — — —
EXISTING GROUND CONTOUR (5 FT)	— — — 200 — — —
AC SAWCUT	- - - - - - - -
AC GRIND AND OVERLAY	▨
DISTURBED AREA	▬ ▬ ▬
EXISTING TREE TO REMAIN	✲ ○

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84806PE
OREGON
JULY 12, 2016
DARKO SIMIC
PRELIMINARY
RENEWAL DATE: 6/30/22

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DRAWN BY:	JSM
CHECKED BY:	DS

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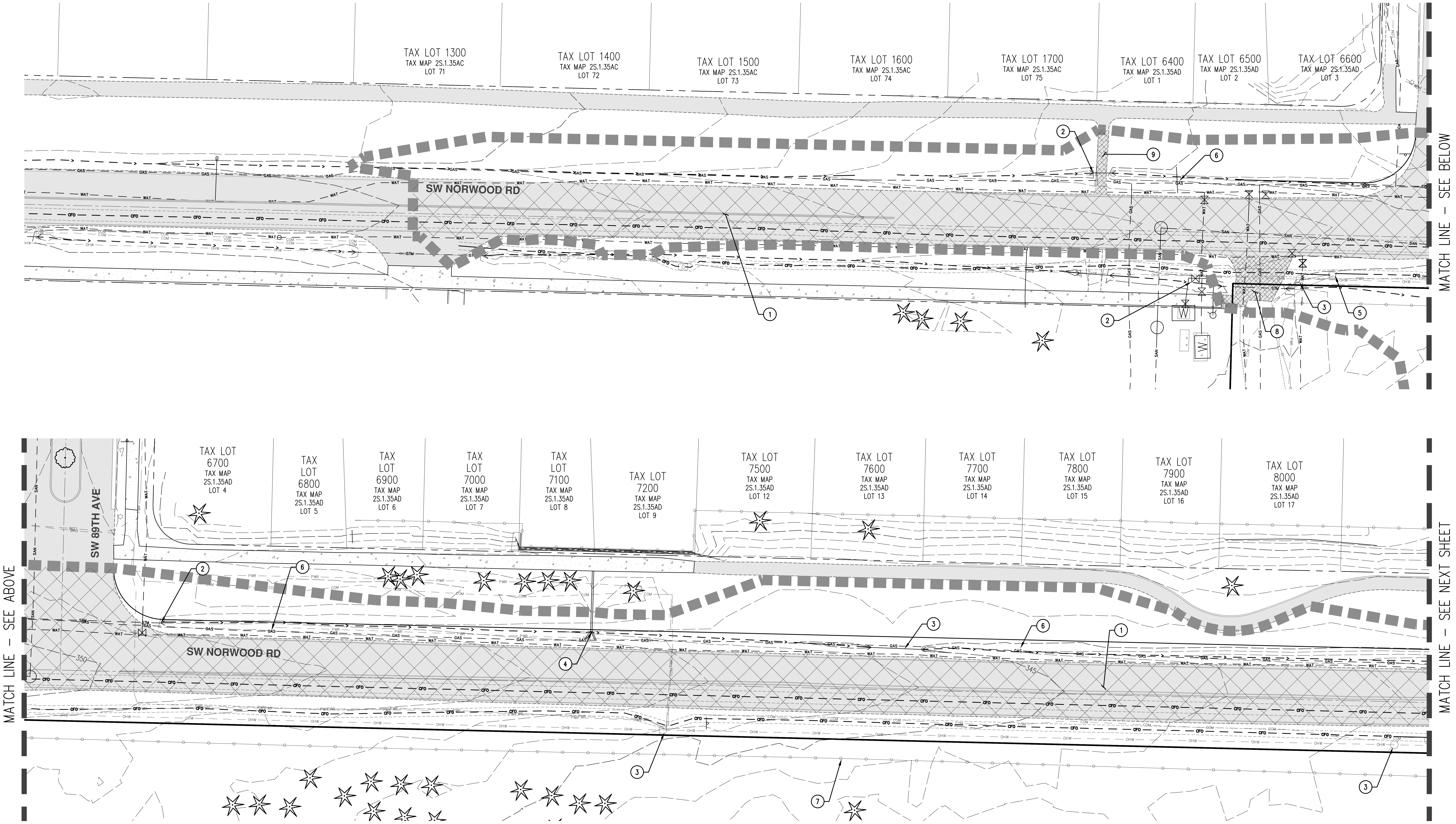
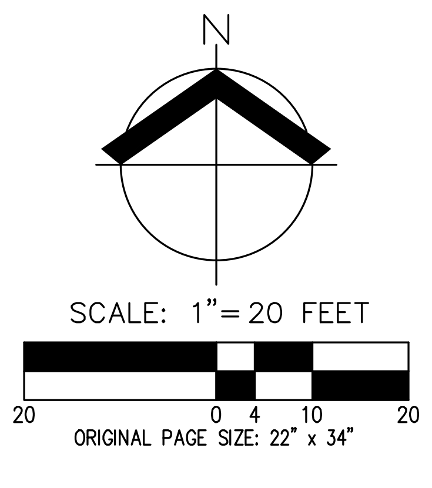


DEMOLITION KEYED NOTES: ⑧

1. EXISTING PAVEMENT TO BE GROUND AND OVERLAID. SEE PROPOSED IMPROVEMENTS FOR FURTHER DETAILS
2. EXISTING CULVERT TO BE REMOVED
3. EXISTING POWER POLE TO BE RELOCATED – REMOVAL AND RELOCATION TO BE COORDINATED WITH UTILITY COMPANY
4. EXISTING STORM PIPES TO BE MODIFIED FOR PROPOSED IMPROVEMENTS. CONTRACTOR TO ENSURE PIPES ARE FREE FLOWING DURING CONSTRUCTION AND TAX LOT 7100 AND 7200 SERVICE IS NOT INTERRUPTED
5. EXISTING COMMUNICATION BOX TO BE RELOCATED – CONTRACTOR TO COORDINATE WITH FRANCHISE UTILITY
6. EXISTING GAS LINE TO BE RELOCATED – CONTRACTOR TO COORDINATE WITH NW NATURAL
7. EXISTING FENCE/GATES TO BE REMOVED AND HAULED OFF SITE
8. SAWCUT AND REMOVE EXISTING AC PAVEMENT
9. SAWCUT AND REPLACE WITH NEW AC PAVEMENT
10. EXISTING WATER STRUCTURES TO BE PROTECTED BY THE CONTRACTOR DURING DEMOLITION AND CONSTRUCTION



LEGEND

EXISTING GROUND CONTOUR (1 FT)	— — —199— — —
EXISTING GROUND CONTOUR (5 FT)	——— 200 ———
AC SAWCUT	- - - - - - - - - -
AC GRIND AND OVERLAY	▨
AC REMOVAL	▨
DISTURBED AREA	■ ■ ■ ■ ■ ■
EXISTING TREE TO REMAIN	✳ ○

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OREGON
JULY 12, 2016
DARKO SIMIC
PRELIMINARY
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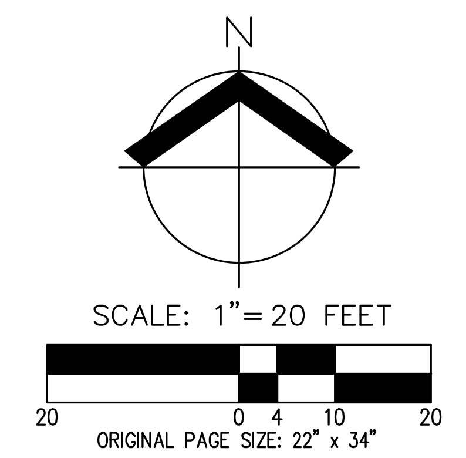

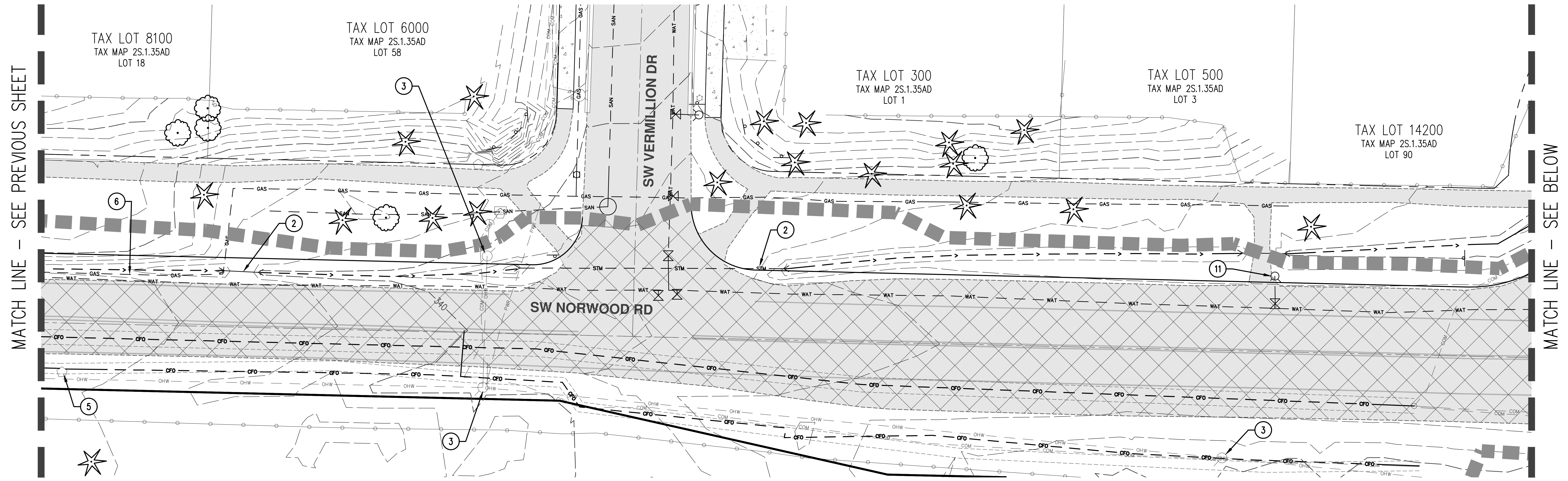

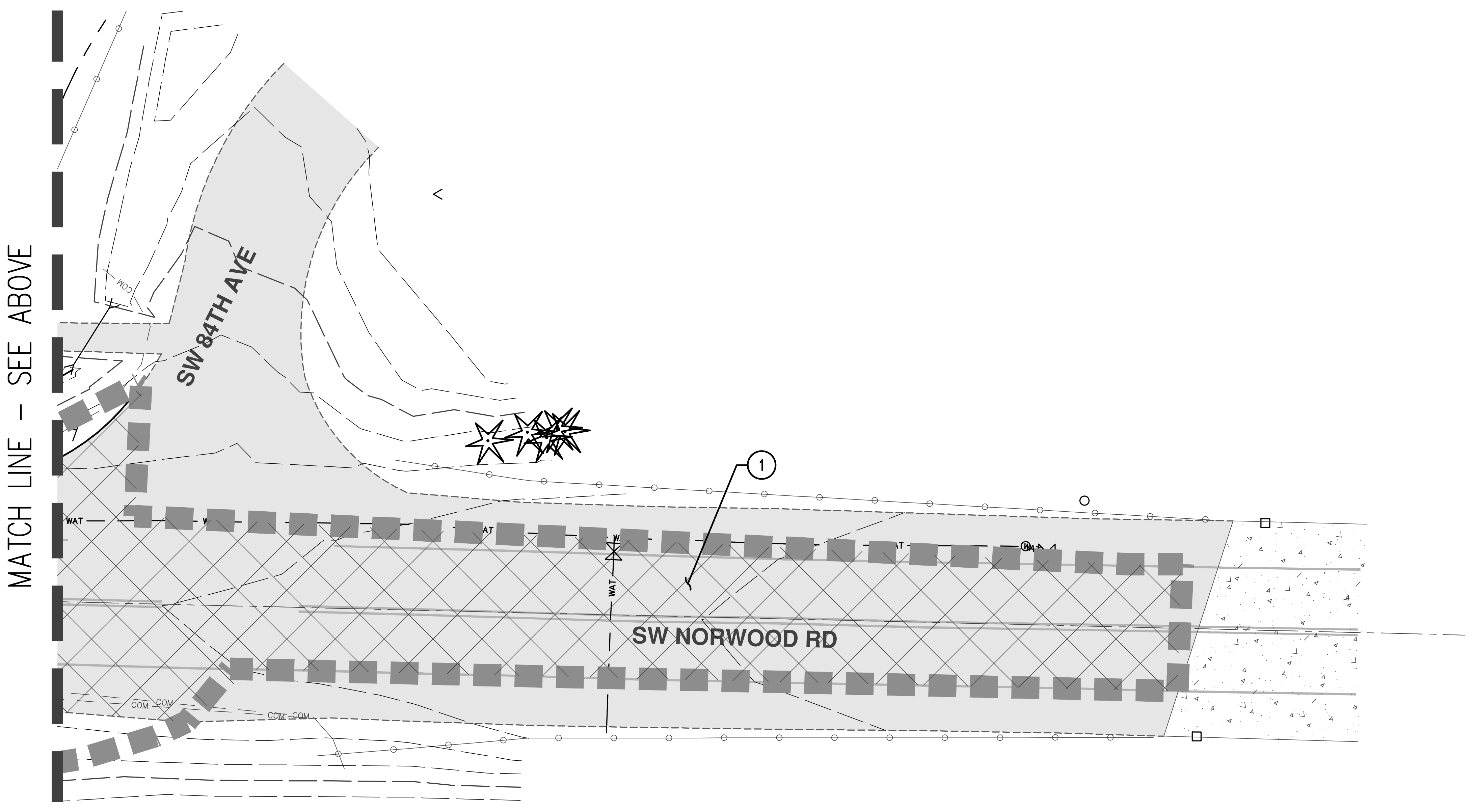

DEMOLITION KEYED NOTES:

1. EXISTING PAVEMENT TO BE GROUND AND OVERLAID. SEE PROPOSED IMPROVEMENTS FOR FURTHER DETAILS
2. EXISTING CULVERT TO BE REMOVED
3. EXISTING POWER POLE TO BE RELOCATED – REMOVAL AND RELOCATION TO BE COORDINATED WITH UTILITY COMPANY
4. EXISTING STORM PIPES TO BE MODIFIED FOR PROPOSED IMPROVEMENTS. CONTRACTOR TO ENSURE PIPES ARE FREE FLOWING DURING CONSTRUCTION AND TAX LOT 7100 AND 7200 SERVICE IS NOT INTERRUPTED
6. EXISTING GAS LINE TO BE RELOCATED – CONTRACTOR TO COORDINATE WITH NW NATURAL
7. EXISTING FENCE/GATES TO BE REMOVED AND HAULED OFF SITE
11. HYDRANT TO BE RELOCATED, CONTRACTOR TO COORDINATE WITH TVFR AND CITY OF TUALATIN WATER DEPARTMENT

LEGEND

EXISTING GROUND CONTOUR (1 FT)	— — —199— — —
EXISTING GROUND CONTOUR (5 FT)	— — —200— — —
AC SAWCUT	- - - - - - - - - -
AC GRIND AND OVERLAY	▨
DISTURBED AREA	■ ■ ■ ■ ■ ■
EXISTING TREE TO REMAIN	✱ ○

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84806PE
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DARKO SIMIC
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CHECKED BY:	DS

DP-06

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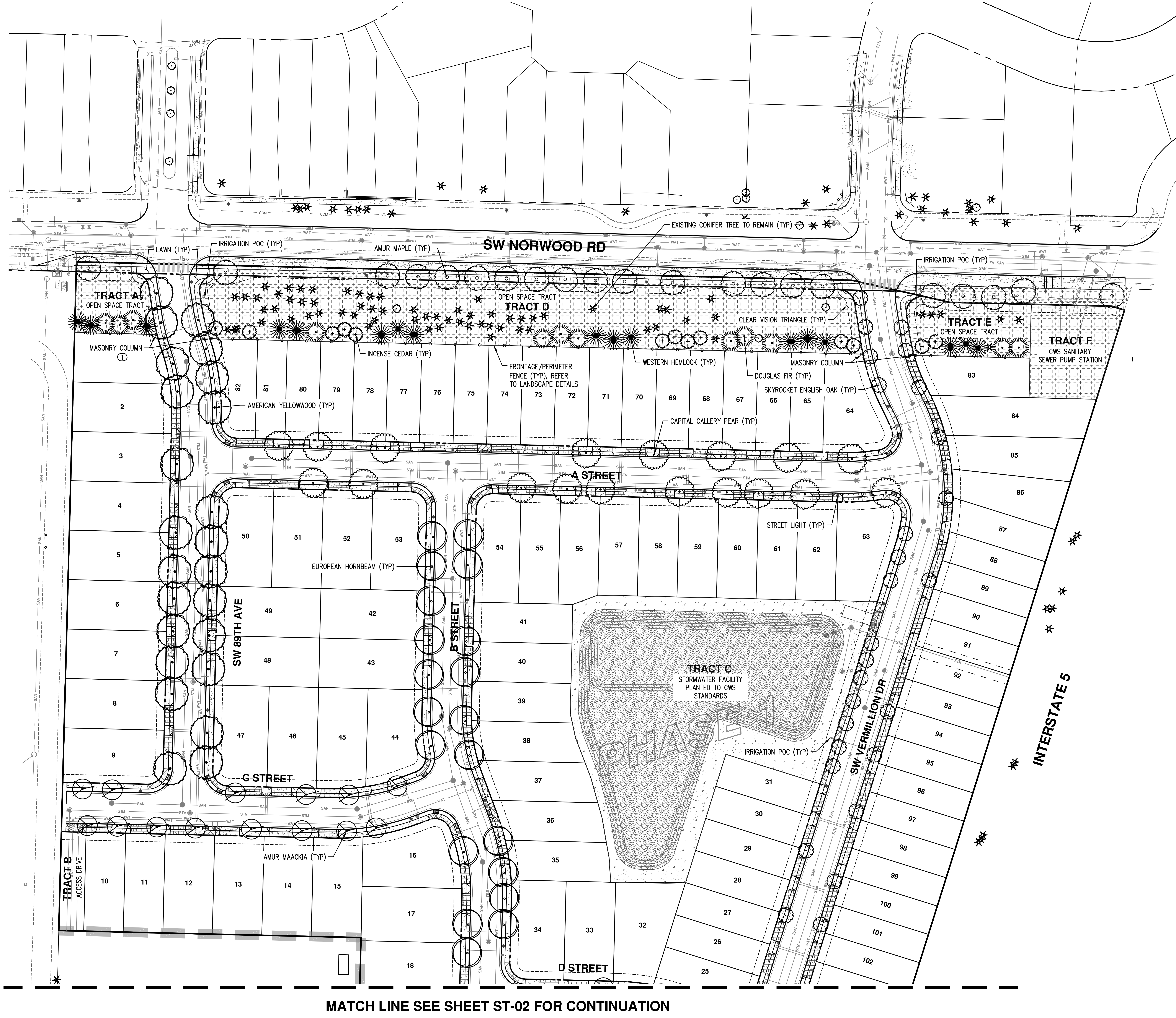
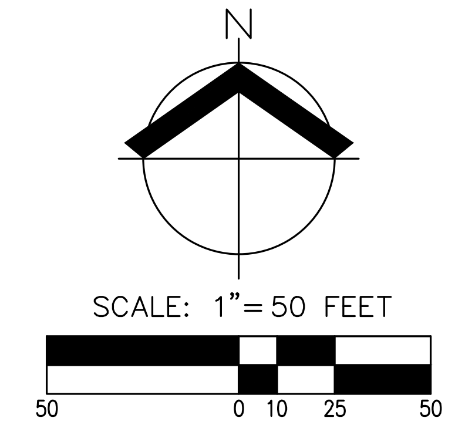


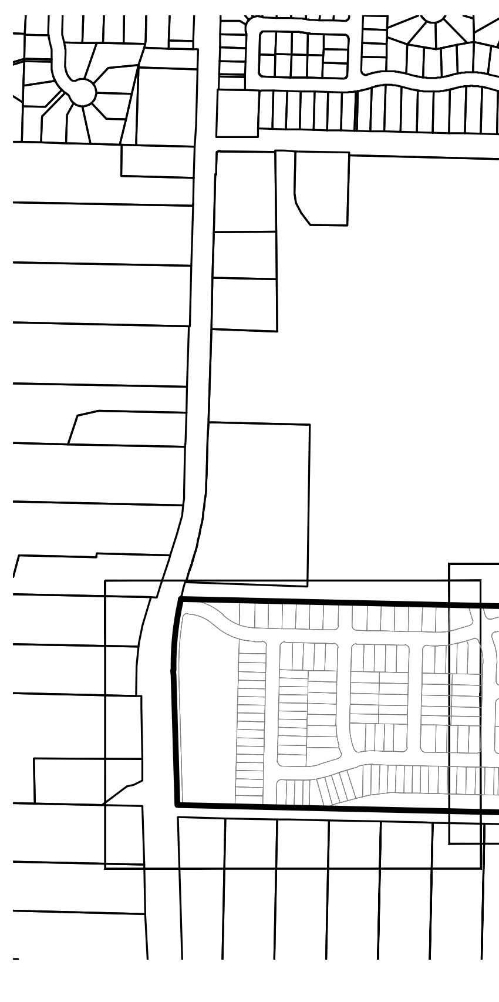
MATCH LINE SEE SHEET ST-02 FOR CONTINUATION



GENERAL LANDSCAPING NOTES:

1. STREET TREES AND OTHER PLANTINGS ARE PRELIMINARY. REVISIONS OR SUBSTITUTIONS TO PLANT SPECIES, SIZES, SPACING, QUANTITIES, CONDITION, ETC. DUE TO UNFORESEEN SITE CONDITIONS, UTILITY INSTALLATION, FINAL DRIVEWAY LOCATION, PLANT AVAILABILITY AND COST, ETC. PRIOR TO FINAL INSTALLATION, MAY BE PERMITTED WHERE ALLOWED BY THE CITY OF TUALATIN'S DESIGN STANDARDS.
2. LANDSCAPING AND IRRIGATION WORK SHALL BE PERFORMED BY A LANDSCAPE CONTRACTOR LICENSED AND BONDED IN THE STATE OF OREGON. LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR FAMILIARIZING THEMSELVES WITH CURRENT CITY OF TUALATIN'S MUNICIPAL CODE REQUIREMENTS, AND ALL ASPECTS OF SITE WORK NECESSARY FOR THE FULL COMPLETION OF THE PROJECT. COORDINATE LANDSCAPE WORK WITH GENERAL CONTRACTOR AND OWNER.
3. ALL PLANTINGS SHALL CONFORM TO TUALATIN DESIGN STANDARDS AND TO THE AMERICAN NURSERY STANDARDS FOR NURSERY STOCK (ANSI Z60.1, CURRENT EDITION). PLANT IN ACCORDANCE WITH BEST-PRACTICE INDUSTRY STANDARDS, SUCH AS THOSE ADOPTED BY THE OREGON LANDSCAPE CONTRACTORS BOARD (OLCB).
4. ALL PLANTING AREAS SHALL HAVE SUFFICIENT SOIL DEPTH AND FERTILITY TO SUPPORT HEALTHY PLANT GROWTH. FINISH GRADE OF NEW PLANTING AREAS SHALL SEAMLESSLY MEET EXISTING GRADE OF SURROUNDING PLANTING AREAS AND PROVIDE POSITIVE DRAINAGE. GRADE SHALL BE SMOOTH, AND FREE FROM DEBRIS AND LOW OR HIGH SPOTS WHERE WATER MAY COLLECT. CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE OF OFF-SITE ALL ORGANIC AND/OR UNSUITABLE MATERIALS INCLUDING TREES, STUMPS, ROOTS, BRUSH AND GRASS IN SUCH A MANNER TO MEET ALL APPLICABLE REGULATIONS.
5. ALL PLANTER STRIPS TO HAVE LAWN OR OTHER VEGETATIVE GROUNDCOVER. STREET TREES AND LAWNS SHALL BE PLANTED AND MAINTAINED BY INDIVIDUAL HOME OWNERS/HOME BUILDERS AT TIME OF HOME CONSTRUCTION.
6. STREET TREES SHALL, WHERE APPLICABLE, BE CENTERED IN THE PLANTING STRIP BETWEEN CURB AND SIDEWALK. OTHER STREET TREES SHALL BE PLANTED A MINIMUM OF 3' O.C. FROM BACK OF SIDEWALK OR OTHER HARDSCAPING. FIELD ADJUST IF NECESSARY TO MAINTAIN MINIMUM 3' FROM SIDEWALKS, 5' FROM DRIVEWAY INTERSECTIONS, 5' FROM FIRE HYDRANTS, 10' FROM MANHOLES AND CATCH BASINS, 5' FROM WATER METERS AND UTILITY BOXES, 20' FROM STREET LIGHTS.
7. MULCH: APPLY MULCH AROUND STREET TREES A MINIMUM OF 3' LONG BY THE WIDTH OF PLANTER STRIP TO PROTECT TREES AND RETAIN SOIL MOISTURE. MULCH SHALL BE 3" DEEP AND CONSIST OF WELL-AGED DARK HEMLOCK, MEDIUM GRIND, UNDER AND AROUND ALL STREET TREES IN PARKING STRIPS.

REFER TO SHEET ST-02 FOR PRELIMINARY PLANT SCHEDULE. QUANTITIES SHOWN INCLUDE ALL STREET TREES FOR THE ENTIRE PROJECT. REFER TO SHEETS PO-01 THROUGH PO-04 FOR PLANTING LOCATIONS.



PRELIMINARY STREET TREE AND PLANTING PLAN (N)
AUTUMN SUNRISE SUBDIVISON
LENNAR NORTHWEST, INC.
TUALATIN, OREGON

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REGISTERED LANDSCAPE ARCHITECT
797
KIRSTI A. HAUSWALD
OREGON
06/06/13
PRELIMINARY

JOB NUMBER:	7454
DATE:	7/1/2021
DESIGNED BY:	NKP
DRAWN BY:	NKP
CHECKED BY:	KAH

ST-01

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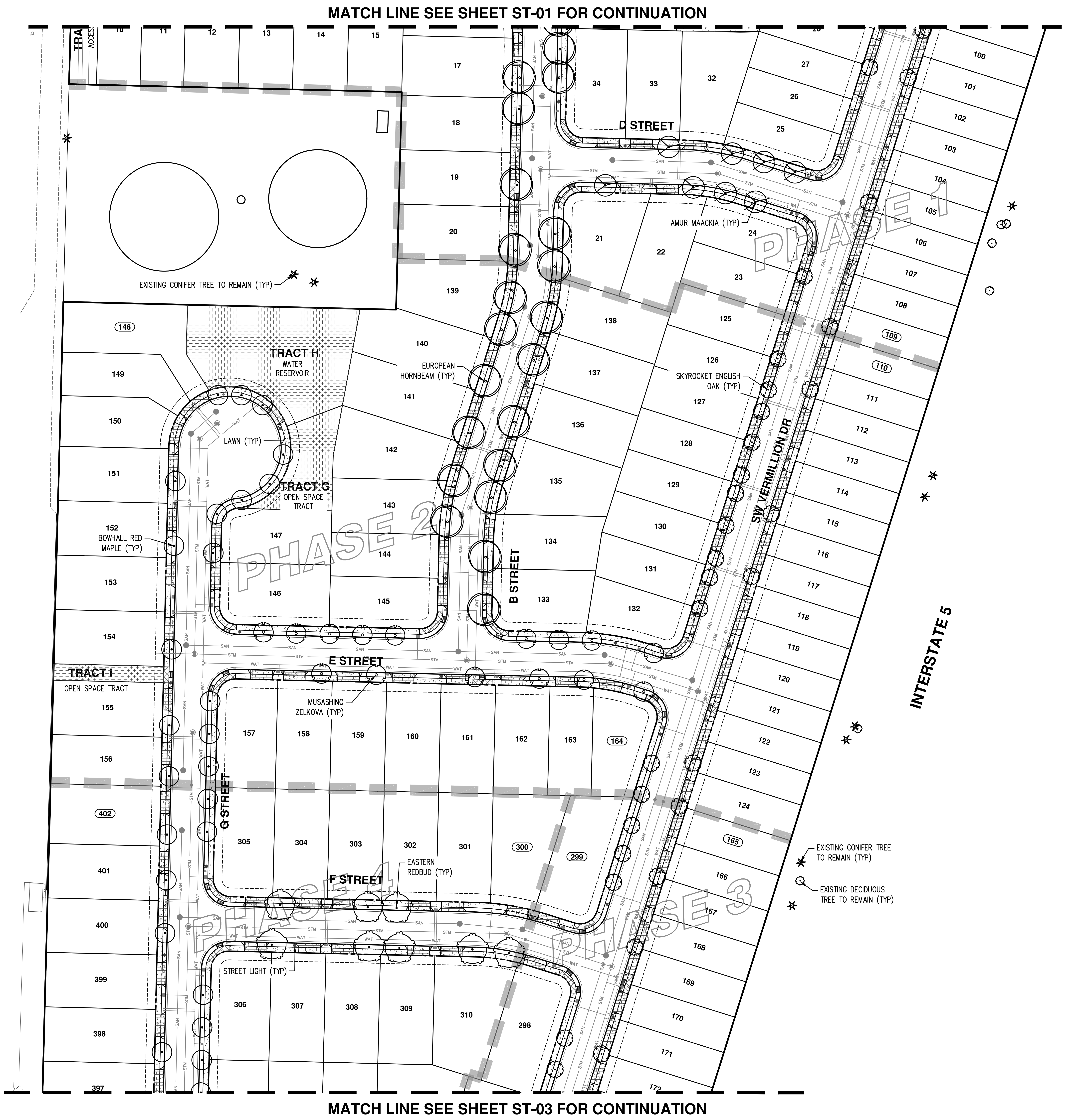
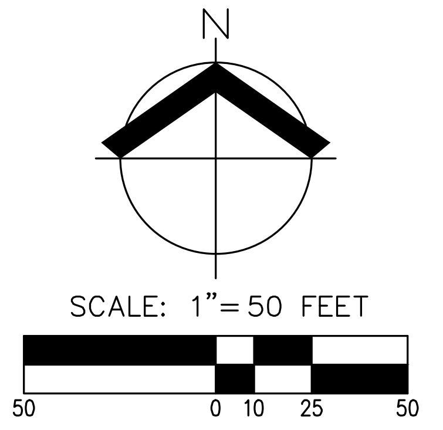


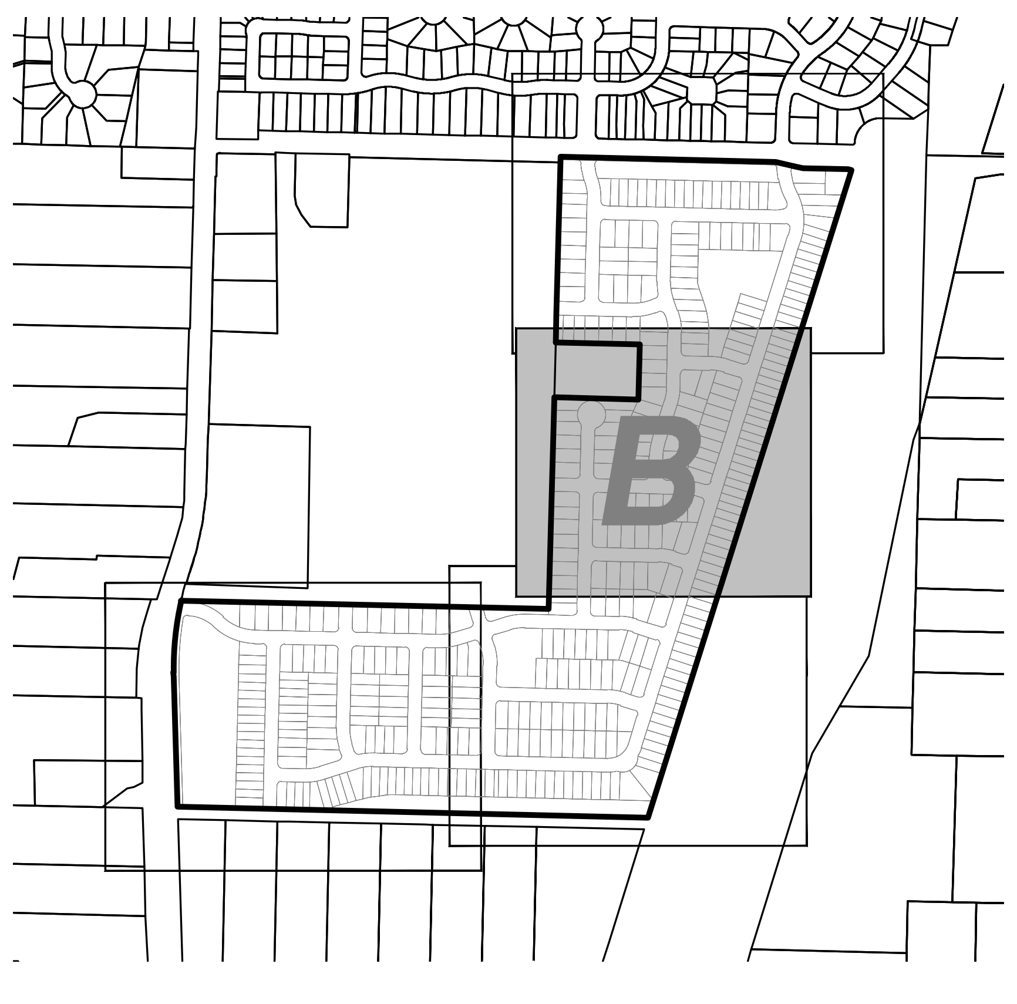
PRELIMINARY PLANT SCHEDULE

BUFFER TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER	SPACING
	13	CALOCEDRUS DECURRENS	INCENSE CEDAR	6'-7' HT. B&B	AS SHOWN
	12	PSEUDOTSUGA MENZIESII	DOUGLAS FIR	6'-7' HT. B&B	AS SHOWN
	17	TSUGA HETEROPHYLLA	WESTERN HEMLOCK	6'-7' HT. B&B	AS SHOWN
STREET TREES	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE/CONTAINER**	**SPACING**
	41	ACER GINNALA	AMUR MAPLE	1.5" MIN. CAL. B&B	AS SHOWN
	46	ACER RUBRUM 'BOWHALL'	BOWHALL RED MAPLE	1.5" MIN. CAL. B&B	AS SHOWN
	51	CARPINUS BETULUS	EUROPEAN HORNBEAM	1.5" MIN. CAL. B&B	AS SHOWN
	29	CERCIS CANADENSIS	EASTERN REDBUD	1.5" MIN. CAL. B&B	AS SHOWN
	24	CLADRASTIS KENTUKEA	AMERICAN YELLOWWOOD	1.5" MIN. CAL. B&B	AS SHOWN
	39	MAACKIA AMURENSIS	AMUR MAACKIA	1.5" MIN. CAL. B&B	AS SHOWN
	75	PARROTIA PERSICA	PERSIAN PARROTIA	1.5" MIN. CAL. B&B	AS SHOWN
	35	PYRUS CALLERYANA 'CAPITAL'	CAPITAL CALLERY PEAR	1.5" MIN. CAL. B&B	AS SHOWN
	119	QUERCUS ROBUR 'FASTIGIATA' TM	SKYROCKET ENGLISH OAK	1.5" MIN. CAL. B&B	AS SHOWN
	15	ZELKOVA SERRATA 'MUSASHINO'	MUSASHINO ZELKOVA	1.5" MIN. CAL. B&B	AS SHOWN

GROUND COVERS	DESCRIPTION
▨	FREEBOARD AREA SEED MIX
▨	LAWN: SEED OR SOD
▨	OPEN SPACE TRACT – COMBINATION OF LAWN, SHRUBS AND TREES
▨	STORMWATER FACILITY PLANTED TO CWS STANDARDS

PRELIMINARY PLANT SCHEDULE. QUANTITIES SHOWN INCLUDE ALL STREET TREES FOR THE ENTIRE PROJECT. REFER TO SHEETS PO-01 THROUGH PO-04 FOR PLANTING LOCATIONS.





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LENNAR NORTHWEST, INC.
TUALATIN, OREGON

REGISTERED LANDSCAPE ARCHITECT
797
KIRSTI AUSWALD
OREGON
06/06/13
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DRAWN BY:	NKP
CHECKED BY:	KAH

ST-02

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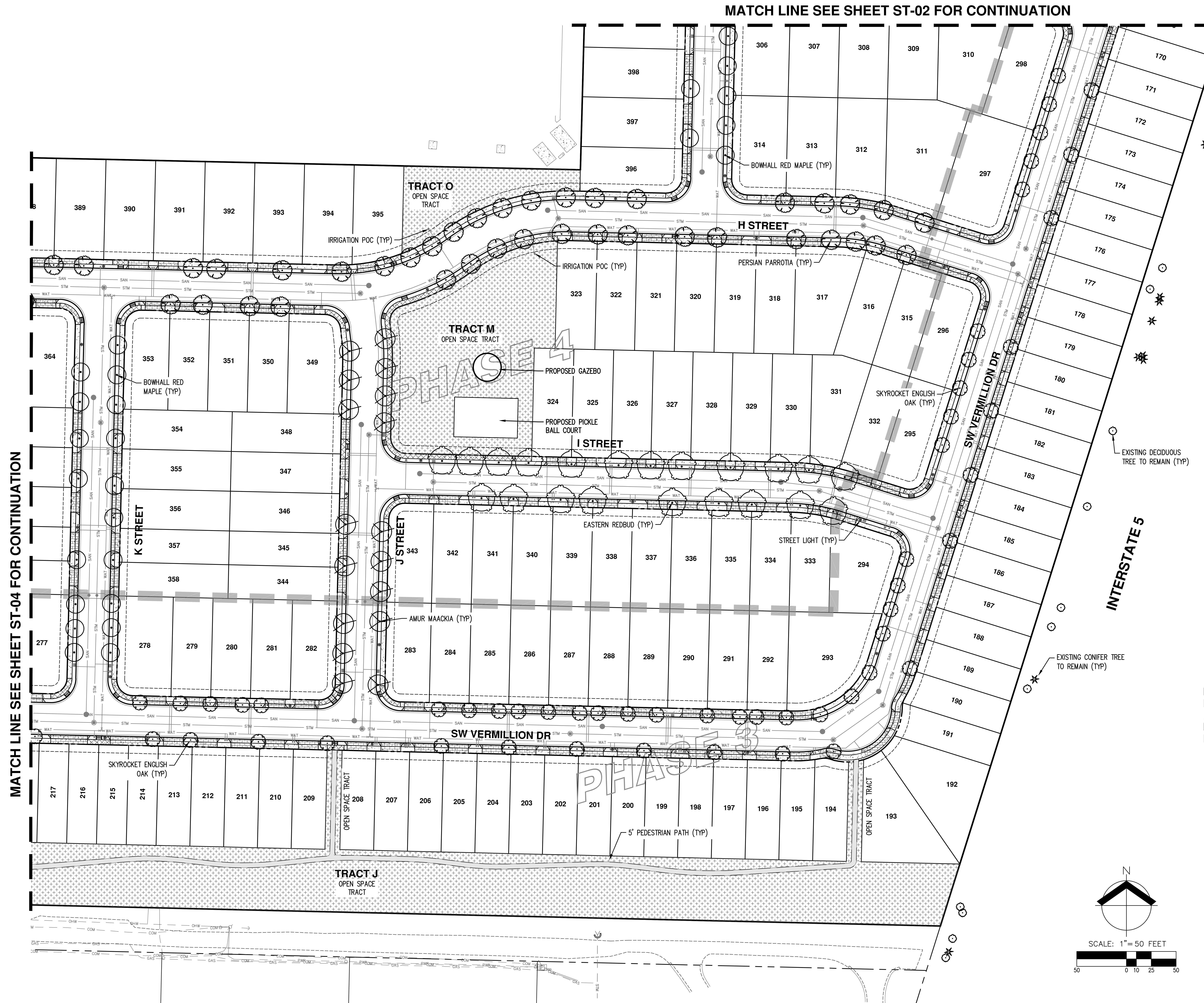

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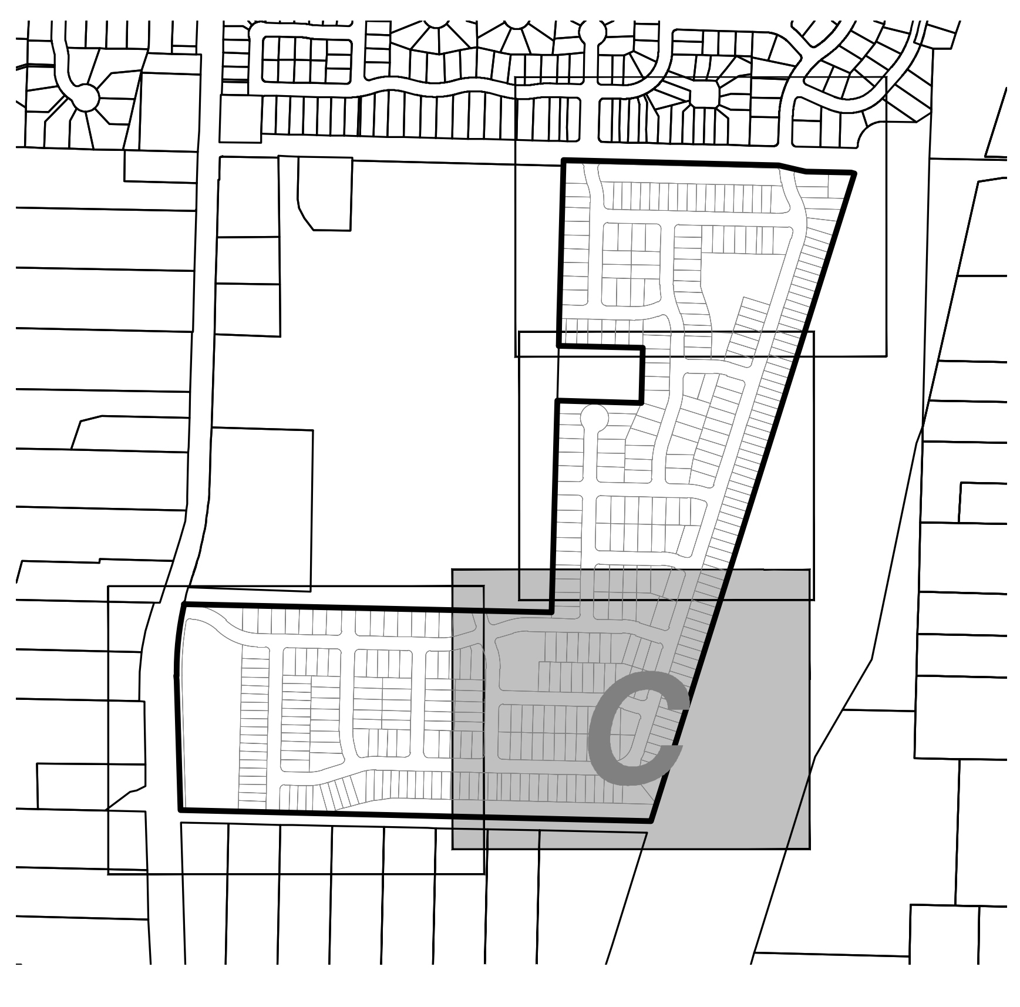

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PRELIMINARY STREET TREE AND PLANTING PLAN (SE)
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08/06/13
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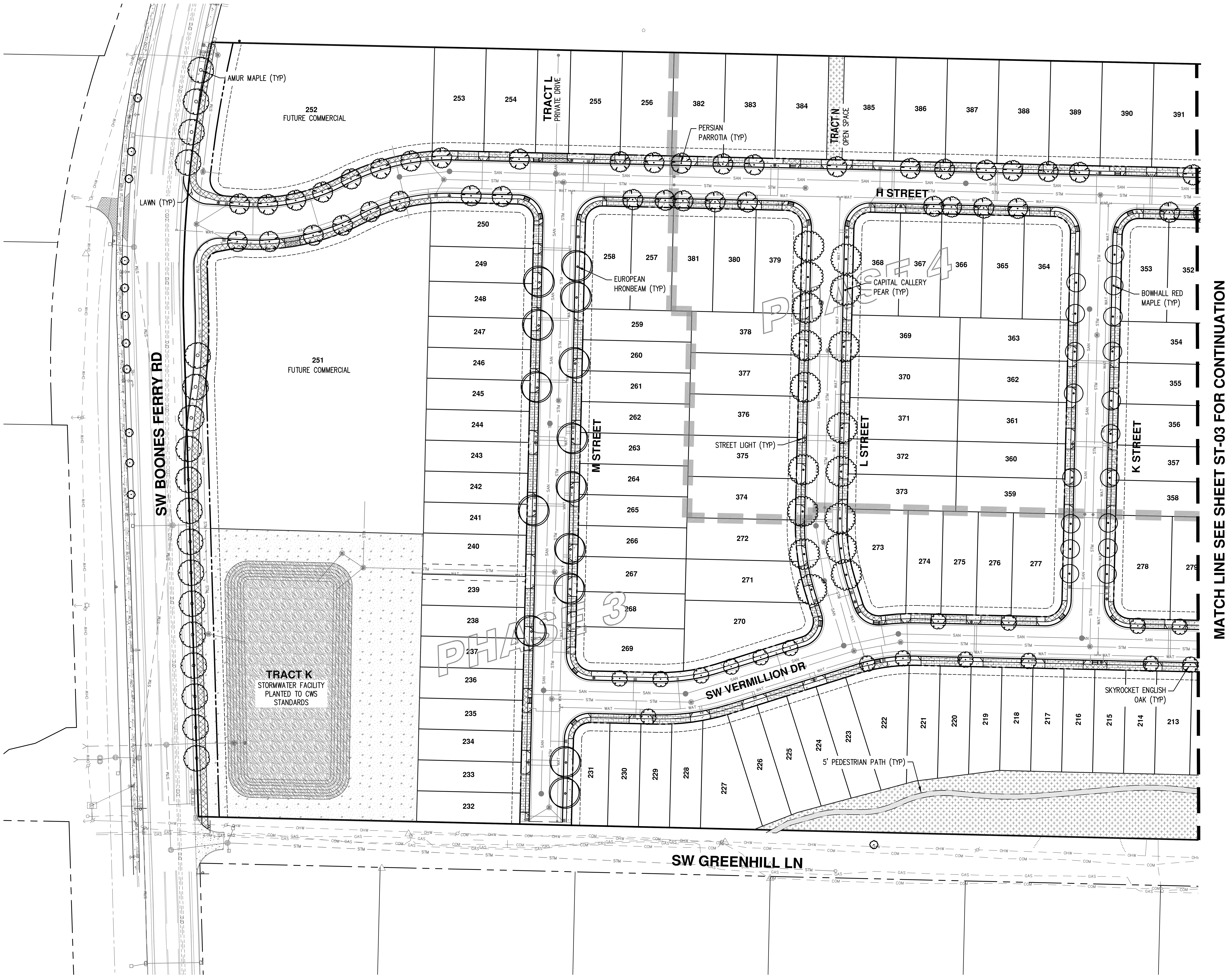
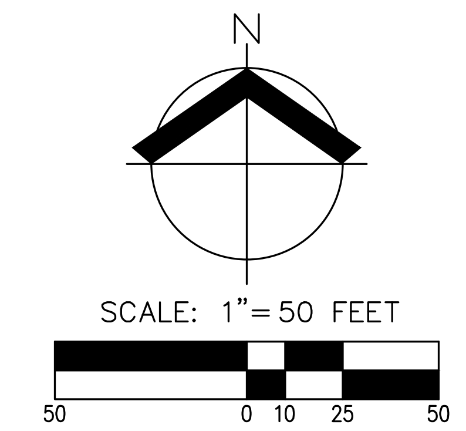
ST-03





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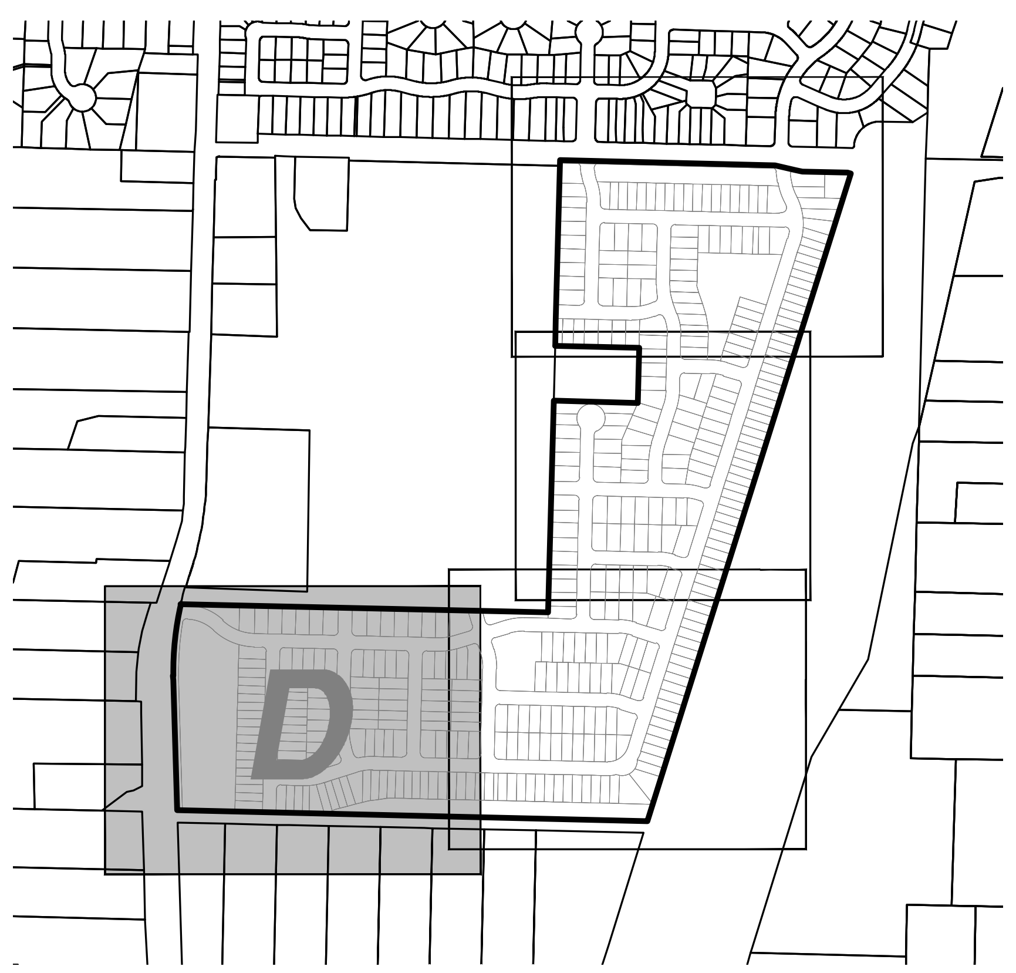

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PRELIMINARY STREET TREE AND PLANTING PLAN (SW)
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LENNAR NORTHWEST, INC.
TUALATIN, OREGON

REGISTERED
797
KIRSTI A. HAUSWALD
OREGON
06/06/13
LANDSCAPE ARCHITECT
PRELIMINARY

JOB NUMBER:	7454
DATE:	7/1/2021
DESIGNED BY:	NKP
DRAWN BY:	NKP
CHECKED BY:	KAH

ST-04

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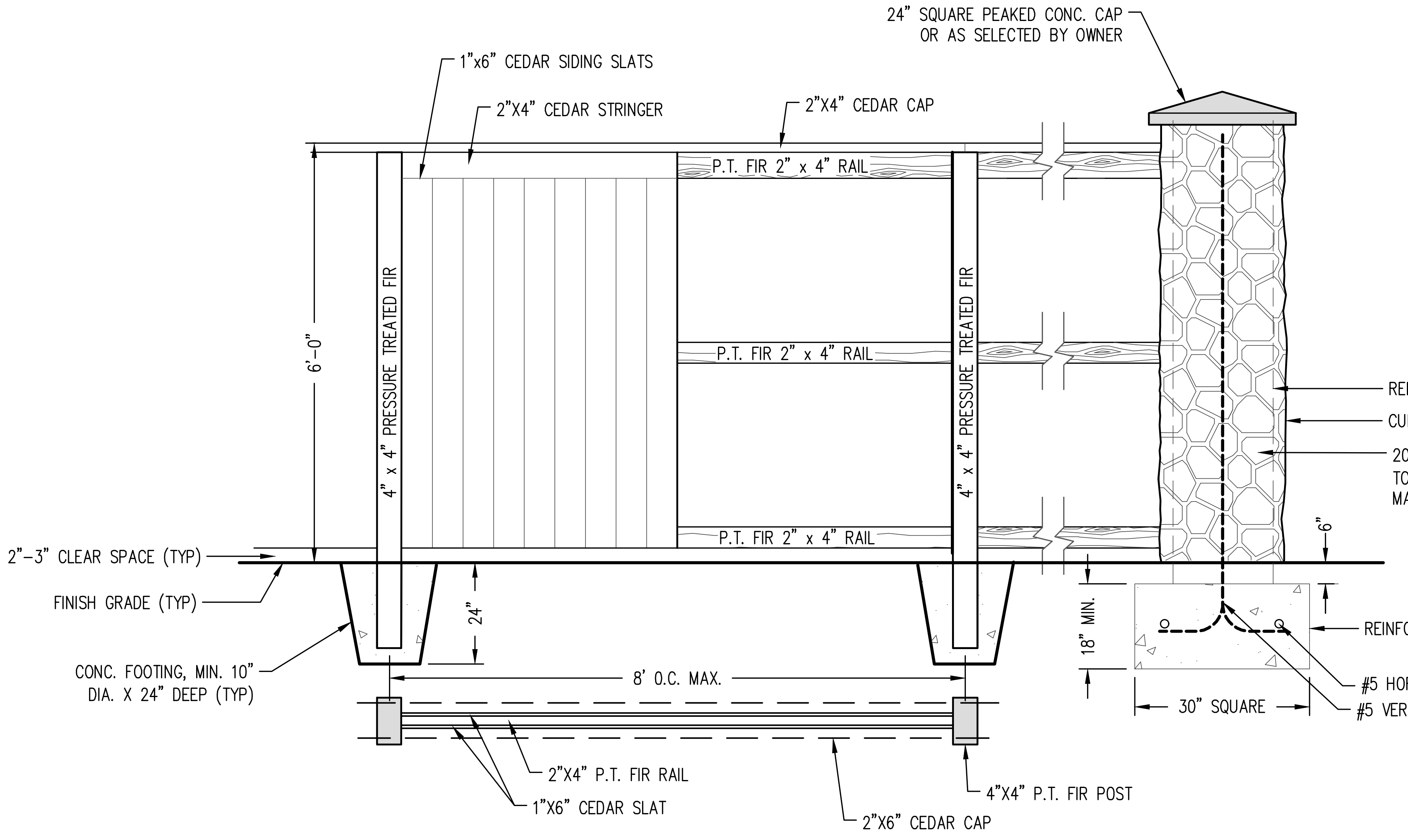
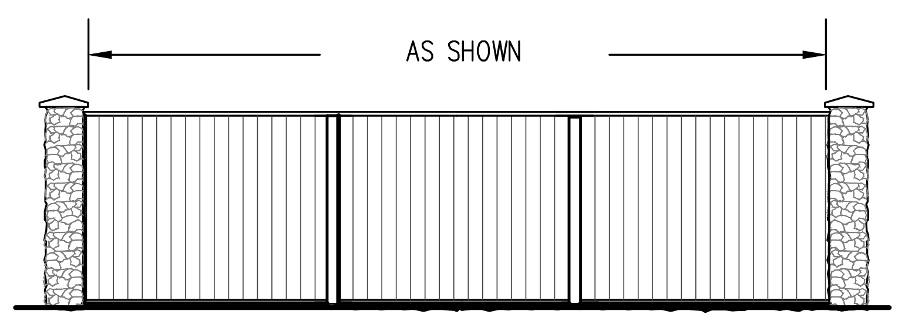
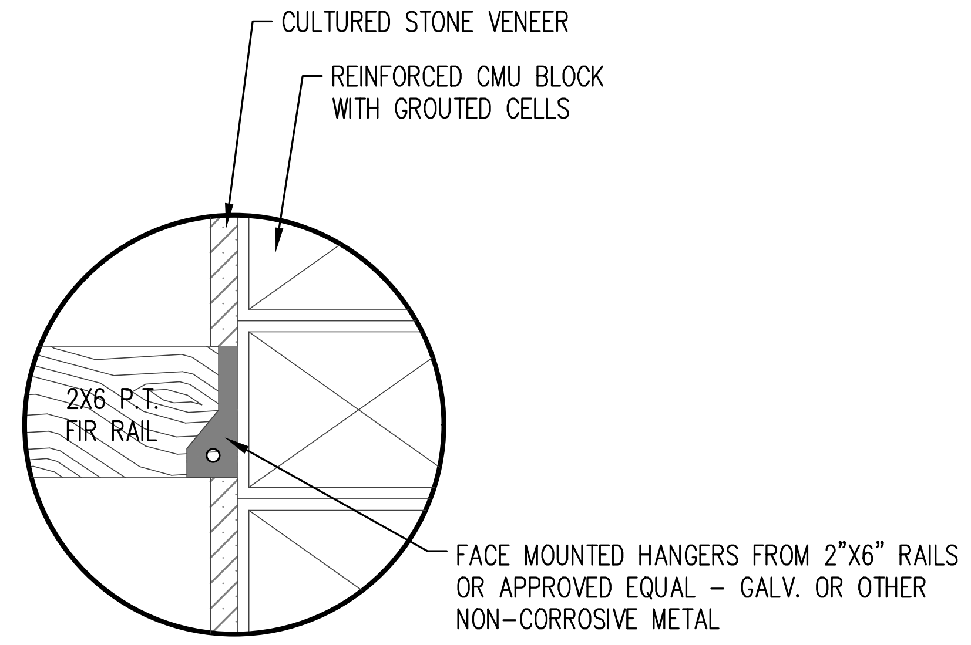




FRONTAGE/PERIMETER-FENCE AND COLUMN ELEVATION

NOT TO SCALE



FENCE TO COLUMN CONNECTION DETAIL

NOT TO SCALE

1 ST-05 FRONTAGE/PERIMETER FENCE AND COLUMN DETAIL (TO BE CONSTRUCTED ALONG SOUTH PROPERTY LINE OF TRACTS A, D, AND E)

NTS

NOTES:
1. DETAIL IS FOR REFERENCE ONLY, COLUMNS AND FOOTINGS HAVE NOT BEEN STRUCTURALLY ENGINEERED. FINAL LOCATION TO BE DETERMINE WITH CONSTRUCTION PLANS.
2. ALL POSTS, RAILINGS, AND CAPS TO BE PRESSURE TREATED (P.T.) FIR.
3. PERIMETER FENCE WITH COLUMNS SHALL BE INSTALLED WHERE SHOWN ON SW NORWOOD RD BUFFER. MINIMUM HEIGHT OF FENCE TO BE 6'.
4. FENCE STAIN, STONE VENEER, AND COLUMN CAP PER OWNER.
5. ALL METAL HANGERS, FASTENERS, SCREWS, NAILS, ETC. TO BE GALVANIZED OR OTHER NON-CORROSIVE METAL.

AKS DRAWING FILE: 7454 LANDSCAPE.DWG | LAYOUT: OP-05

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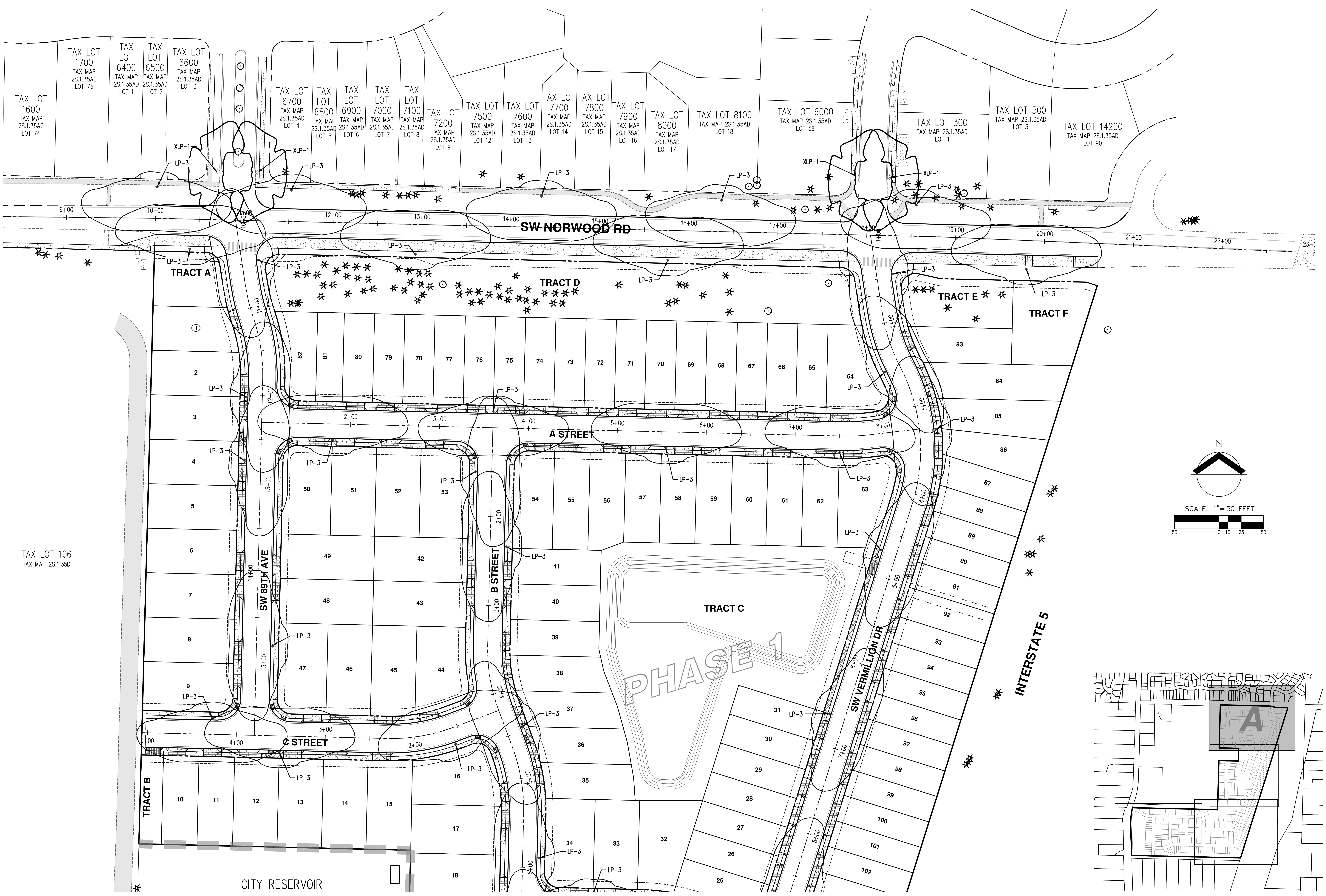

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REGISTERED PROFESSIONAL ENGINEER
84806PE
OREGON
JULY 12, 2016
DARKO SIMIC
PRELIMINARY
RENEWAL DATE: 6/30/22

JOB NUMBER:	7454
DATE:	7/1/2021
DESIGNED BY:	JSM
DRAWN BY:	JSM
CHECKED BY:	DS

LP-01

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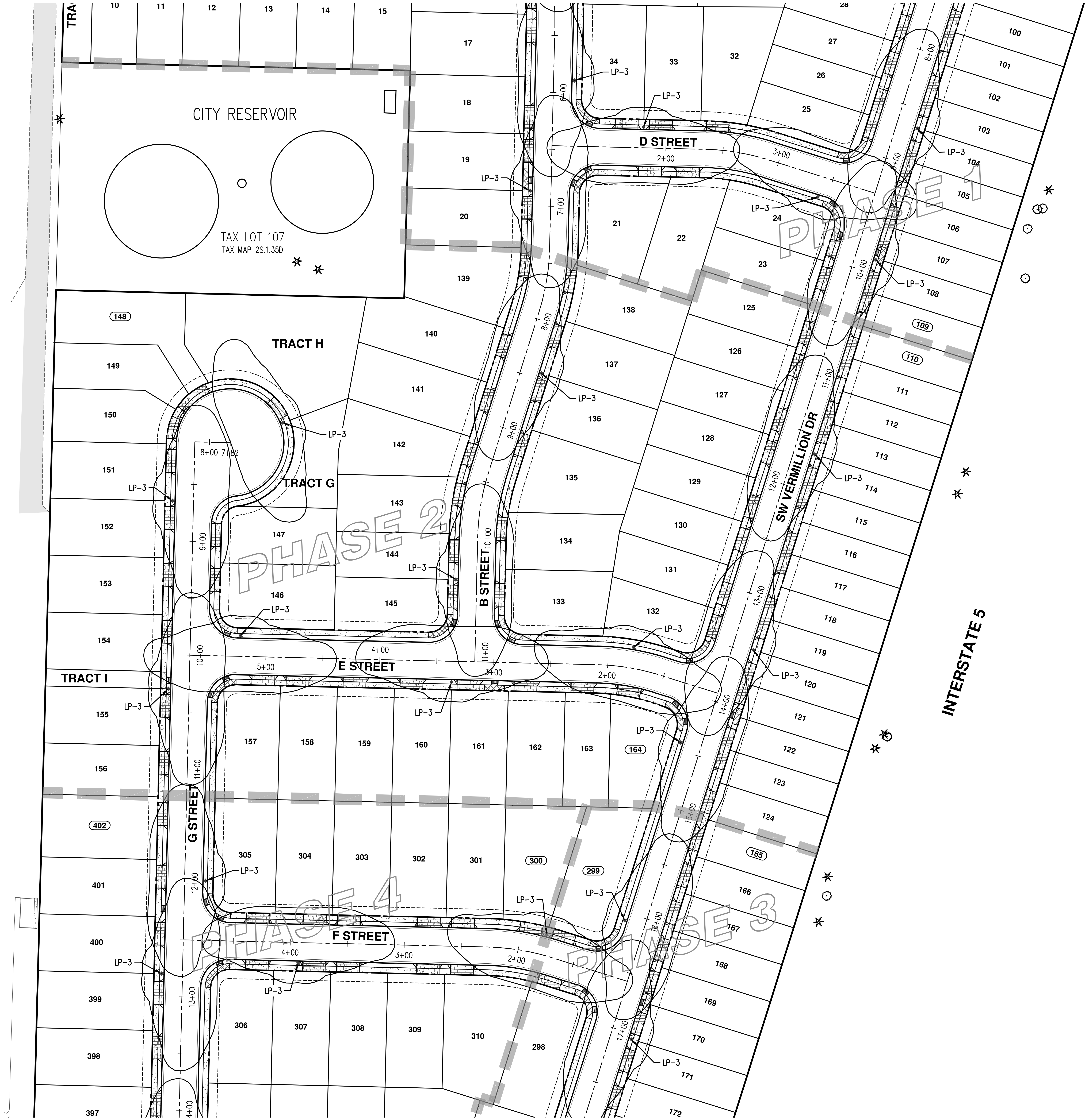

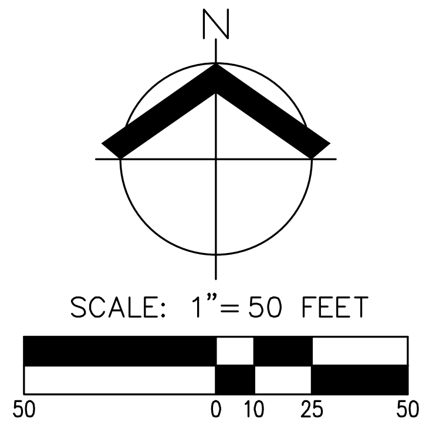

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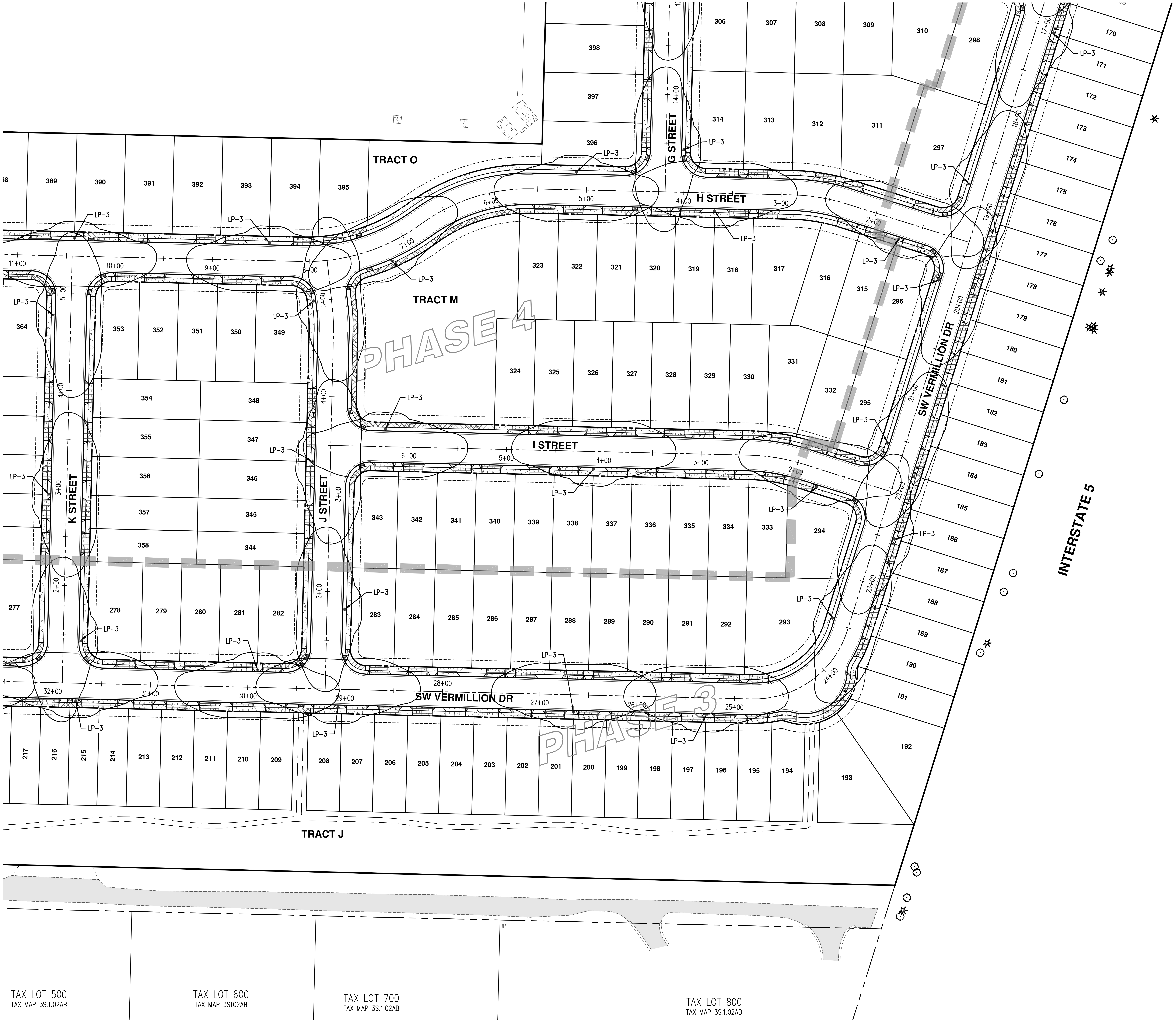
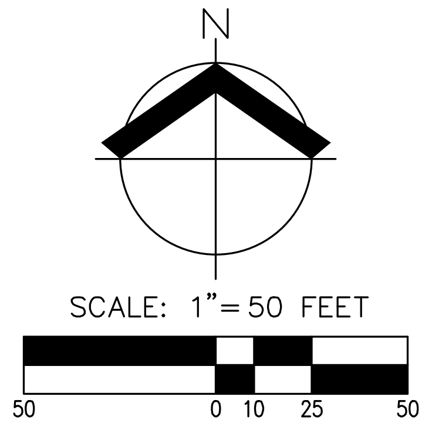
PRELIMINARY
RENEWAL DATE: 6/30/22

JOB NUMBER: 7454
DATE: 7/1/2021
DESIGNED BY: JSM
DRAWN BY: JSM
CHECKED BY: DS

LP-02

AKS DRAWING FILE: 7454 LIGHTING.DWG | LAYOUT: LP-02





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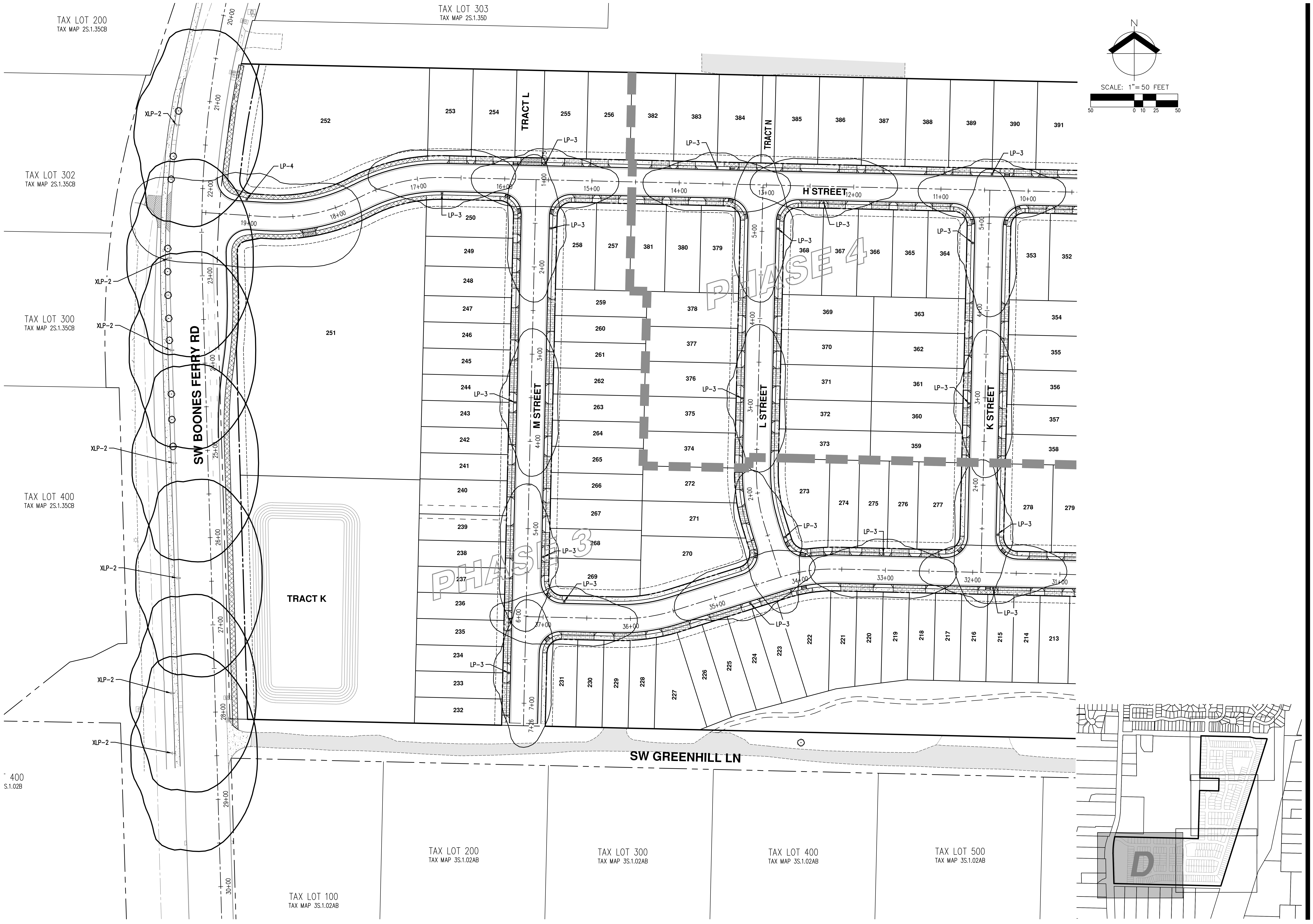
PRELIMINARY
84806PE
JULY 12, 2016
DARKO SIMIC
RENEWAL DATE: 6/30/22

JOB NUMBER:	7454
DATE:	7/1/2021
DESIGNED BY:	JSM
DRAWN BY:	JSM
CHECKED BY:	DS

LP-03

AKS DRAWING FILE: 7454 LIGHTING.DWG | LAYOUT: LP-03



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REGISTERED PROFESSIONAL ENGINEER
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OREGON
JULY 12, 2016
DARKO SIMIC
RENEWAL DATE: 6/30/22
PRELIMINARY

JOB NUMBER:	7454
DATE:	7/1/2021
DESIGNED BY:	JSM
DRAWN BY:	JSM
CHECKED BY:	DS

LP-04

LUMINAIRE AND LIGHT POLE SCHEDULE

SYMBOL	QUANTITY	LABEL	STYLE	LUMINAIRE						LIGHT POLE
				TYPE	INITIAL DELIVERED LUMENS	WATTS	LLF	DISTRIBUTION	BUG RATING	POLE STYLE
☼	4	XLP-1	EXISTING	HPS	5,200	100W	0.800	TYPE 2	B2-U0-G1	DECORATIVE 16' CAST ALUMINUM POLE, ACORN
☼	7	XLP-2	EXISTING	LED	13,500	182W	0.800	TYPE 3	B3-U0-G3	COBRAHEAD (35' M.H., 8' MAST ARM)
✸	91	LP-3	PROPOSED	LED	5,020	45W	0.800	TYPE 2	B1-U0-G1	COBRAHEAD (25' M.H., 6' MAST ARM)
✸	1	LP-4	PROPOSED	LED	18,700	160W	0.800	TYPE 3	B3-U0-G3	COBRAHEAD (35' M.H., 8' MAST ARM)

NOTE:
* M.H. IS ABOVE ROAD GRADE

LIGHT LEVEL SUMMARY

ROADWAY	CLASSIFICATION	PEDESTRIAN CONFLICT	MATERIAL	LIGHT LEVEL		UNIFORMITY	MAX	MIN	MAX / MIN
SW BOONES FERRY RD	ARTERIAL	LOW	ASPHALT	TARGET	≥ 0.9 Fc AVE	≤ 3:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.9 Fc	3:1	1.7	0.3	6:1
SW NORWOOD RD	COLLECTOR	LOW	ASPHALT	TARGET	≥ 0.6 Fc AVE	≤ 4:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.6 Fc	3:1	1.5	0.2	8:1
SW 89TH AVE	LOCAL	LOW	ASPHALT	TARGET	≥ 0.4 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.5 Fc	5:1	1.4	0.1	14:1
SW VERMILLION DR	LOCAL	LOW	ASPHALT	TARGET	≥ 0.4 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.5 Fc	5:1	1.5	0.1	15:1
ROAD A	LOCAL	LOW	ASPHALT	TARGET	≥ 0.4 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.5 Fc	5:1	1.4	0.1	14:1
ROAD B	LOCAL	LOW	ASPHALT	TARGET	≥ 0.4 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.5 Fc	5:1	1.5	0.1	15:1
ROAD C	LOCAL	LOW	ASPHALT	TARGET	≥ 0.4 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.5 Fc	5:1	1.5	0.1	15:1
ROAD D	LOCAL	LOW	ASPHALT	TARGET	≥ 0.4 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.6 Fc	6:1	1.4	0.1	14:1
ROAD E	LOCAL	LOW	ASPHALT	TARGET	≥ 0.4 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.5 Fc	5:1	1.4	0.1	14:1
ROAD F	LOCAL	LOW	ASPHALT	TARGET	≥ 0.4 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.5 Fc	5:1	1.4	0.1	14:1
ROAD G	LOCAL	LOW	ASPHALT	TARGET	≥ 0.4 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.5 Fc	5:1	1.5	0.1	15:1
ROAD H	LOCAL	LOW	ASPHALT	TARGET	≥ 0.4 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.5 Fc	5:1	3.5	0.1	35:1
ROAD I	LOCAL	LOW	ASPHALT	TARGET	≥ 0.4 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.4 Fc	4:1	1.4	0.1	14:1
ROAD J	LOCAL	LOW	ASPHALT	TARGET	≥ 0.4 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.5 Fc	5:1	1.5	0.1	15:1
ROAD K	LOCAL	LOW	ASPHALT	TARGET	≥ 0.4 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.5 Fc	5:1	1.4	0.1	14:1
ROAD L	LOCAL	LOW	ASPHALT	TARGET	≥ 0.4 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.5 Fc	5:1	1.4	0.1	14:1
ROAD M	LOCAL	LOW	ASPHALT	TARGET	≥ 0.4 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.5 Fc	5:1	1.4	0.1	14:1

LIGHT LEVEL SUMMARY

INTERSECTION	CLASSIFICATION	PEDESTRIAN CONFLICT	MATERIAL	LIGHT LEVEL		UNIFORMITY	MAX	MIN	MAX / MIN
SW BOONES FERRY RD / H ST	ARTERIAL / LOCAL	LOW	ASPHALT	TARGET	≥ 1.3 Fc AVE	≤ 3:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	1.4 Fc	2:1	3.6	0.6	6:1
SW NORWOOD RD / SW 89TH ST	COLLECTOR / LOCAL	LOW	ASPHALT	TARGET	≥ 1.0 Fc AVE	≤ 4:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	1.1 Fc	4:1	6.2	0.3	21:1
SW NORWOOD RD / SW VERMILLION DR	COLLECTOR / LOCAL	LOW	ASPHALT	TARGET	≥ 1.0 Fc AVE	≤ 4:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	1.0 Fc	3:1	4.8	0.3	16:1
SW 89TH AVE / A ST	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	3:1	1.5	0.3	5:1
SW 89TH AVE / C ST	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.9 Fc	4:1	1.5	0.2	8:1
A ST / B ST	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.9 Fc	5:1	1.6	0.2	8:1
A ST / SW VERMILLION DR	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	4:1	1.5	0.2	8:1
B ST / C ST	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	4:1	1.4	0.2	7:1
B ST / D ST	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	3:1	1.4	0.3	5:1
B ST / E ST	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	4:1	1.5	0.2	8:1
D ST / SW VERMILLION DR	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	2:1	1.3	0.4	3:1
E ST / G ST	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.9 Fc	4:1	1.5	0.2	8:1
E ST / SW VERMILLION DR	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	3:1	1.4	0.3	5:1
F ST / G ST	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.9 Fc	4:1	1.5	0.2	8:1
F ST / SW VERMILLION DR	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	3:1	1.3	0.3	4:1
G ST / H ST	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	4:1	1.4	0.2	7:1
H ST / J ST	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	2:1	1.4	0.4	4:1
H ST / K ST	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	4:1	1.6	0.2	8:1
H ST / L ST	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	3:1	1.2	0.3	4:1
H ST / M ST	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.9 Fc	3:1	1.6	0.3	5:1
H ST / SW VERMILLION DR	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	3:1	1.3	0.3	4:1
I ST / J ST	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	4:1	1.6	0.2	8:1
I ST / SW VERMILLION DR	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	4:1	1.4	0.2	7:1
J ST / SW VERMILLION DR	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	4:1	1.5	0.2	8:1
K ST / SW VERMILLION DR	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.9 Fc	5:1	1.7	0.2	9:1
L ST / SW VERMILLION DR	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	3:1	1.3	0.3	4:1
M ST / SW VERMILLION DR	LOCAL / LOCAL	LOW	ASPHALT	TARGET	≥ 0.8 Fc AVE	≤ 6:1 AVE/MIN	N/A	N/A	N/A
				ACHIEVED	0.8 Fc	3:1	1.4	0.3	5:1

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TUALATIN, OREGON

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84806
JULY 12, 2016
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RENEWAL DATE: 6/30/22

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DRAWN BY:	JSM
CHECKED BY:	DS

LP-05

Exhibit G: Preliminary Tree Assessment Report and Tree Inventory

Exhibit G: Preliminary Tree Assessment Report and Tree Inventory

Autumn Sunrise
Preliminary Tree Assessment Report

Date: July 1, 2021

Prepared For:
Lennar Northwest, Inc.
11807 NE 99th Street, Suite 1170
Vancouver, WA 98682

Prepared By:
Bruce R. Baldwin
ISA Certified Arborist No.: PN-6666A
ISA Qualified Tree Risk Assessor
bruce@aks-eng.com

Site Location:
23620 & 23740 SW Boones Ferry Road;
9185, 9335, & 9415 SW Greenhill Lane
South of SW Norwood Road, east of SW Boones Ferry Road,
and north of SW Greenhill Lane; Tualatin, OR

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12965 SW Herman Road, Suite 100
Tualatin, OR 97062
(503) 563-6151

Project Summary

This project consists of a 400-lot subdivision for future detached single-family homes. The purpose of this Arborist Report is to document information related to existing on-site trees, planned tree preservation and removal for the project, and protection measures for trees to be preserved.

Tree Inventory & Evaluation

Site visits were conducted between February 1st & April 12th, 2021 to evaluate existing on-site trees. The trees were evaluated for species, DBH, average crown radius, and visually assessed for tree health and condition. Please refer to "Appendix A – Tree Inventory" for the above-mentioned information as well as additional tree related information.

Tree Preservation & Removal Plan

The Preliminary Tree Preservation and Removal Plan (dated July 1, 2021) was prepared by a Certified Arborist. For additional tree related information, protection measures, and tree protection fencing locations, please refer to the "Preliminary Tree Preservation and Removal Plan."

Arborist Disclosure Statement

Arborists are tree specialists who use their education, knowledge, training, and experience to examine trees, recommend measures to enhance the health of trees, and attempt to reduce the risk of living near trees. The Client and Jurisdiction may choose to accept or disregard the recommendations of the arborist, or seek additional advice. Arborists cannot detect every condition that could possibly lead to the structural failure of a tree. Trees are living organisms that fail in ways we do not fully understand. Conditions are often hidden within trees and below ground. Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time. Likewise, remedial treatments, like medicine, cannot be guaranteed. Trees can be managed, but they cannot be controlled. To live near trees is to accept some degree of risk. The only way to eliminate all risk associated with trees is to eliminate all trees.

Neither this author nor AKS Engineering & Forestry, LLC have assumed any responsibility for liability associated with the trees on or adjacent to this site.

Sincerely,
AKS ENGINEERING & FORESTRY, LLC

Bruce R. Baldwin
ISA Certified Arborist, ISA Qualified Tree Risk Assessor
12965 SW Herman Road, Suite 100, Tualatin, OR 97062
503-563-6151 | bruce@aks-eng.com

BRUCE R. BALDWIN
CERTIFICATE NUMBER: PN-6666A
EXPIRATION DATE: 12/31/23

Appendix A - Detailed Tree Inventory

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
10068	8,10	14	Pacific Dogwood (*Cornus nuttallii*)		1	1	Remove
10214	10	20	Bigleaf Maple (*Acer macrophyllum*)	Significant lean (E); Uprooting; Dead scaffold branches	2	3	Remove
10216	44	26	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark; 1-sided canopy (W)	1	2	Remove
10217	30	20	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
10221	23	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
10222	25	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
10224	8	20	Bigleaf Maple (*Acer macrophyllum*)	Bulges at base	2	1	Remove
10225	29	13	English Hawthorn (*Crataegus monogyna*)	Lean (W)	1	2	Remove
10229	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
10235	22	17	Oregon White Oak (*Quercus garryana*)		1	1	Remove
10239	9	8	Douglas-fir (*Pseudotsuga menziesii*)	Exposed buttress root with damage (S)	2	1	Remove
10244	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
10249	44	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
10251	20	21	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; 1-sided canopy (N)	1	2	Remove
10253	28	19	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; 1-sided canopy (E)	1	2	Remove
10254	9	9	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Remove
10255	31	12	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; 1-sided canopy (N)	1	2	Remove
10257	32	14	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Bore holes; 1-sided canopy (E)	2	2	Remove
10258	26	12	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; High canopy; Very sparse canopy; Branch dieback	2	3	Remove
10261	13	13	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**	1	1	Preserve
10264	19	13	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; High canopy; Sparse canopy	2	2	Remove
10266	25	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; 1-sided canopy (E)	1	2	Remove
10268	38	20	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Remove
10270	23	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Remove
10271	36	17	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Remove
10273	8	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (NE)	1	2	Remove
10274	43	19	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
10275	43	26	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
10278	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
10279	9,20	22	Bigleaf Maple (*Acer macrophyllum*)	Cavity with decay up bole	2	2	Remove
10281	16	12	Douglas-fir (*Pseudotsuga menziesii*)	Deformed bole	1	2	Remove
10282	22	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
10283	23	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
10285	29	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
10286	22	15	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top with included bark	1	2	Remove
10288	32	24	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
10291	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
10295	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
10299	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
10300	9	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
10301	11	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
10303	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
10363	34	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
10392	46	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
10394	35	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
10430	49	21	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE;** Some broken limbs	1	1	Preserve
10436	17	11	Maple (*Acer sp.*)	Evaluated behind fence; Crooked bole	1	2	Remove
10600	9,6	9	Cherry (*Prunus sp.*)	**OFFSITE**	1	1	Preserve
10789	14	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
10791	12	14	Cherry (*Prunus sp.*)	Evaluated behind fence	1	1	Remove
10792	16	30	Weeping Cypress (*Cupressus nootkatensis*)	Evaluated behind fence	1	1	Remove
10834	13	16	Basswood (*Tilia americana*)	Evaluated behind fence; Several medium cavities with decay	1	1	Remove
10846	10	6	Cottonwood (*Populus sp.*)	Evaluated behind fence	1	1	Remove
10867	13	14	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
10870	10	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
10871	13	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
10876	15	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
10879	14	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Codominant top	1	2	Preserve
10880	12	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
10881	8,7	14	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Codominant base with included bark	1	2	Preserve
10916	14	15	Maple (*Acer sp.*)	**OFFSITE**; Street Trees; Some broken limbs	1	1	Preserve
10919	15	13	Maple (*Acer sp.*)	**OFFSITE**; Street Trees; Some broken limbs	1	1	Preserve
10921	9	8	Maple (*Acer sp.*)	**OFFSITE**; Street Trees; Some broken limbs	1	1	Preserve
10923	16	15	Maple (*Acer sp.*)	**OFFSITE**; Street Trees; Some broken limbs	1	1	Preserve
11138	12	14	Scotch Pine (*Pinus sylvestris*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
11221	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
11222	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
11223	8	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
11225	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
11227	8	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
11237	44	30	Douglas-fir (*Pseudotsuga menziesii*)	N side pruned for overhead wires	1	1	Remove
11240	38	23	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11241	38	25	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11243	10	15	Bigleaf Maple (*Acer macrophyllum*)		1	1	Preserve
11253	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11254	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11256	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11257	9	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11262	31	22	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11263	32	21	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
11264	20	30	Bigleaf Maple (*Acer macrophyllum*)	Lean (N); Crooked bole; Dead lower scaffold branches; 1-sided canopy (W)	1	2	Remove
11265	11,11	35	Bigleaf Maple (*Acer macrophyllum*)	Stems lean (E&W)	1	2	Remove
11271	15,25	18	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base with included bark; Codominant top; High canopy	1	2	Remove
11272	8,8	17	Bigleaf Maple (*Acer macrophyllum*)	Lean (S); Crooked bole; Branch dieback	2	2	Remove
11273	14,16,17	22	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
11277	29	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11278	20	19	Bigleaf Maple (*Acer macrophyllum*)	1-sided canopy (E); Dead limbs	2	2	Remove
11280	21	17	Douglas-fir (*Pseudotsuga menziesii*)	Deformed bole	1	2	Remove
11282	31	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11312	24	21	Bigleaf Maple (*Acer macrophyllum*)	Large cavities with decay; Bulges; Crooked bole	2	2	Remove
11313	21,28	28	Bigleaf Maple (*Acer macrophyllum*)	Exposed roots (E); Lean (W)	1	2	Remove
11315	25	17	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; 1-sided canopy (W)	1	2	Remove
11320	31	14	Bigleaf Maple (*Acer macrophyllum*)	Large cavity with decay in base	2	3	Remove
11321	28	20	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
11322	8	0	Bigleaf Maple (*Acer macrophyllum*)	Dead	3	3	Remove
11324	12,12,15,16,16	20	Bigleaf Maple (*Acer macrophyllum*)	1-sided canopy (W)	1	2	Remove
11325	25,31	16	Bigleaf Maple (*Acer macrophyllum*)	Failed Codominant stems; 100% ivy coverage; Sparse canopy; In decline	3	3	Remove
11330	40	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11331	33	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11332	32	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
11334	36	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11336	24	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11338	21	16	Bigleaf Maple (*Acer macrophyllum*)	crooked bole	1	2	Remove
11339	21	17	Bigleaf Maple (*Acer macrophyllum*)	Some broken limbs	1	1	Remove
11340	25	14	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
11343	12,13,20	20	Bigleaf Maple (*Acer macrophyllum*)	Dead limbs; Exposed roots (S)	2	1	Remove
11344	10	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
11345	26	20	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
11346	27	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11349	18,14	19	Bigleaf Maple (*Acer macrophyllum*)	Lean (N)	1	2	Remove
11350	25	25	Bigleaf Maple (*Acer macrophyllum*)	Stems lean (E&W); Dead limbs	2	2	Remove
11351	10	16	Bigleaf Maple (*Acer macrophyllum*)	high canopy; Top lean (E)	1	2	Remove
11352	12	16	Bigleaf Maple (*Acer macrophyllum*)	high canopy; Top lean (E)	1	2	Remove
11353	15	17	Bigleaf Maple (*Acer macrophyllum*)	high canopy	1	2	Remove
11354	8	0	Bigleaf Maple (*Acer macrophyllum*)	Dead; lean (N)	3	3	Remove
11355	16	16	Bigleaf Maple (*Acer macrophyllum*)	Dead limbs; high canopy	2	2	Remove
11356	16	19	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
11357	16	16	Bigleaf Maple (*Acer macrophyllum*)	Crooked bole	1	2	Remove
11359	8,22,23	26	Bigleaf Maple (*Acer macrophyllum*)	1-sided canopy (S)	1	2	Remove
11360	25	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11361	18	21	Bigleaf Maple (*Acer macrophyllum*)	Lean (S); Broken limbs	1	2	Remove
11362	20,21,23	27	Bigleaf Maple (*Acer macrophyllum*)	1-sided canopy (W)	1	2	Remove
11363	29	30	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
11368	8	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
11377	30	22	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11380	44	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11385	37	40	Bigleaf Maple (*Acer macrophyllum*)	Weakly attached scaffold branches; 50% ivy coverage; Dead scaffold branches	2	2	Preserve
11388	21	0	Bigleaf Maple (*Acer macrophyllum*)	Snag	3	3	Remove
11389	21	25	Bigleaf Maple (*Acer macrophyllum*)	Lean (E); 100% ivy coverage; Dead scaffold branches	2	2	Remove
11391	28	0	Bigleaf Maple (*Acer macrophyllum*)	Dead; Broken at 30'	3	3	Remove
11392	12	0	Bigleaf Maple (*Acer macrophyllum*)	Dead; Broken at 30'	3	3	Remove
11393	11	18	Bigleaf Maple (*Acer macrophyllum*)	Dead limbs; Very sparse canopy; 1-sided canopy (E)	3	2	Remove
11394	21	19	Bigleaf Maple (*Acer macrophyllum*)	100% ivy coverage; high canopy	1	2	Remove
11396	27	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
11397	15	20	Bigleaf Maple (*Acer macrophyllum*)	High canopy; Lean (W)	1	2	Remove
11401	26	22	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
11403	27	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11412	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11422	22	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11426	57	18	Douglas-fir (*Pseudotsuga menziesii*)	Broken limbs	1	1	Remove
11430	43	19	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (SW)	1	2	Remove
11435	15	14	Bigleaf Maple (*Acer macrophyllum*)	Lean (S); Dead branches	2	2	Remove
11445	21	17	Oregon White Oak (*Quercus garryana*)		1	1	Remove
11447	30	23	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11448	33	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11453	35	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 15'	3	3	Remove
11456	15	0	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead	3	3	Preserve
11457	13	0	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead	3	3	Preserve
11459	10	6	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Epicormic sprouts	2	1	Preserve
11463	10	15	Willow (*Salix sp.*)	Lean (W)	1	2	Remove
11465	16	0	Willow (*Salix sp.*)	Dead	3	3	Remove
11467	22	17	Douglas-fir (*Pseudotsuga menziesii*)	Sweep (E); 50% ivy coverage; 1-sided canopy (E)	1	2	Remove
11468	27	23	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11469	22,6	13	Bigleaf Maple (*Acer macrophyllum*)	100% ivy coverage; high canopy; Dead branches	2	2	Remove
11472	20	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11474	11	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
11475	22	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11484	29	18	Douglas-fir (*Pseudotsuga menziesii*)	Sweep (N)	1	2	Remove
11486	29	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11487	18	13	Douglas-fir (*Pseudotsuga menziesii*)	Suppressed	2	2	Remove
11490	18	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11491	14,9,7	19	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
11494	14	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11496	30	15	Douglas-fir (*Pseudotsuga menziesii*)	Epicormic sprouts	2	1	Remove
11497	33	17	Douglas-fir (*Pseudotsuga menziesii*)	**LINE TREE**; Evaluated from property line; 1-sided canopy (E)	1	2	Remove
11498	23	18	Douglas-fir (*Pseudotsuga menziesii*)	**LINE TREE**; Evaluated from property line; 1-sided canopy (E)	1	2	Remove
11510	13	17	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (S)	1	2	Preserve
11511	13	6	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead top; Sparse canopy; In decline	3	2	Preserve
11514	13	17	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (S)	1	2	Remove
11516	26	14	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Remove
11517	28	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (E)	1	2	Remove
11518	20	14	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Remove
11520	24	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Remove
11521	26	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Remove
11523	26	0	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead (75')	3	3	Remove
11524	29	18	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Remove
11544	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11545	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11547	32	17	Douglas-fir (*Pseudotsuga menziesii*)	Epicormic sprouts	2	1	Remove
11548	23	19	Douglas-fir (*Pseudotsuga menziesii*)	Epicormic sprouts	2	1	Remove
11549	30	18	Douglas-fir (*Pseudotsuga menziesii*)	Epicormic sprouts; Dead limbs	2	1	Remove
11550	22	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11554	13	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
11555	24	16	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Epicormic sprouts; Small conks up bole	3	2	Remove
11557	13	11	Douglas-fir (*Pseudotsuga menziesii*)	Epicormic sprouts; Sparse canopy	2	2	Remove
11558	18	12	Douglas-fir (*Pseudotsuga menziesii*)	Epicormic sprouts; Sweep; high canopy	2	2	Remove
11559	10	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
11560	32	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11563	12	16	Douglas-fir (*Pseudotsuga menziesii*)	Suppressed; Crooked bole	2	2	Remove
11565	25	19	Douglas-fir (*Pseudotsuga menziesii*)	Epicormic sprouts	2	1	Remove
11567	29	20	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
11568	29	16	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
11569	22	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sded canopy (W)	1	2	Remove
11572	36	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11575	17	16	Oregon White Oak (*Quercus garryana*)		1	1	Remove
11577	14	18	Oregon White Oak (*Quercus garryana*)	1-sided canopy (N)	1	2	Remove
11578	32	27	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole; Codominant	1	2	Remove
11579	40	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11581	44	25	Black Cottonwood (*Populus trichocarpa*)	Codominant top with included bark; Dead limbs	2	2	Remove
11589	20	15	Douglas-fir (*Pseudotsuga menziesii*)	Epicormic sprouts; Sparse canopy	2	2	Remove
11591	20	12	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Sweep (N); Epicormic sprouts; Sluffing bark; In decline	3	2	Remove

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AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
11597	18	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Epicormic sprouts; Sparse canopy	2	2	Remove
11598	18	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; broken at 10'	3	3	Remove
11599	22	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11607	26	20	Douglas-fir (*Pseudotsuga menziesii*)	Sweep (N)	1	2	Remove
11608	38	18	Douglas-fir (*Pseudotsuga menziesii*)	Deformed bole; 1-sided canopy (S)	1	2	Remove
11612	29	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11623	20	19	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
11627	22	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
11628	22	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11629	23	14	Douglas-fir (*Pseudotsuga menziesii*)	Butt sweep; 1-isided canopy (S)	1	2	Remove
11633	30	10	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Sluffing bark; Epicormic sprouts; In decline	3	2	Remove
11635	14	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Epicormic Sprouts; Sparse canopy; 1-sided canopy (S)	2	2	Preserve
11636	14	13	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Epicormic Sprouts; Sparse canopy	2	2	Preserve
11644	30	16	Douglas-fir (*Pseudotsuga menziesii*)	Dead branches; Dead foliage	2	1	Remove
11645	9	12	English Hawthorn (*Crataegus monogyna*)	Broken top; Dead limbs	2	3	Remove
11646	21	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11649	24	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11652	29	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11658	10,12,14,20	27	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
11659	28	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11664	26	16	Douglas-fir (*Pseudotsuga menziesii*)	Sweep (E)	1	2	Remove
11665	17	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
11667	20	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11669	8	0	Bigleaf Maple (*Acer macrophyllum*)	Dead; Lean (S)	3	3	Remove
11670	36	17	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
11671	18	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11678	19	11	Douglas-fir (*Pseudotsuga menziesii*)	**LINE TREE**; Evaluated from property line; Broken branches; High canopy	1	2	Remove
11681	20	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
11682	10	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Suppressed; 1-sided canopy (W)	2	2	Preserve
11683	19	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
11686	14	20	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
11688	26	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11690	28	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11691	29	20	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
11694	28	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11695	15	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
11697	23	20	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
11699	15	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11704	9	9	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
11705	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11708	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Broken at 10'	3	3	Remove
11713	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; broken at 40'	3	3	Remove
11714	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; broken at 40'	3	3	Remove
11715	31	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11716	10	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; broken at 40'	3	3	Remove
11718	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11720	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; broken at 40'	3	3	Remove
11721	9	4	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11723	9	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
11724	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11725	8	4	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11729	14	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
11730	33	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11731	24	23	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11732	19	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
11733	17	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
11734	33	22	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11735	28	15	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark; High canopy; Sparse canopy	2	2	Remove
11736	16,17	20	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark; High canopy; Sparse canopy	2	2	Remove
11737	10,17	19	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base with included bark	1	2	Remove
11738	27	19	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11739	10	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
11740	10	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
11743	10	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11745	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11746	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11747	8	3	Douglas-fir (*Pseudotsuga menziesii*)	Sparse canopy; High canopy	2	2	Remove
11748	9	3	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11749	9	3	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11750	9	2	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11751	9	4	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11752	12	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
11753	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11754	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11755	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11756	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11757	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; broken at 20'	3	3	Remove
11760	11	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11761	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
11762	9	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11763	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11766	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11771	8,17	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11772	20	20	Douglas-fir (*Pseudotsuga menziesii*)	Bulges at base; 1-sided canopy (S)	2	2	Remove
11773	31	21	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
11774	39	25	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (SW); broken limbs	1	2	Remove
11775	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11777	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11778	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11779	14	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
11780	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11783	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11784	10	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
11785	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11786	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11787	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11788	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11790	11	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
11792	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11793	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11794	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11796	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11797	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11798	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11799	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11800	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11801	9	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
11802	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11803	8	4	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11805	9	4	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11806	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11808	12	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11810	10	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 50'	3	3	Remove
11811	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11812	9	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11813	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11814	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11816	12	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	1	Remove
11817	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11818	9	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
11819	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11821	10	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
11822	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11824	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11828	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11831	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
11832	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
11833	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
11834	9	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
11838	9	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11839	9	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11840	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Very top broken	2	2	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
11841	10	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11843	9	4	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11844	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11846	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11850	16	20	Willow (*Salix sp.*)	Lean (W); Many broken limbs	2	2	Remove
11851	14	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
11852	18	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11855	18	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
11856	21	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
11857	20	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11858	20	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11863	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11868	43	18	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
11869	33	22	Douglas-fir (*Pseudotsuga menziesii*)	Sweep; 1-sided canopy (N)	1	2	Remove
11872	9	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11873	10	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'; Lean (N)	3	3	Remove
11875	9	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
11878	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11882	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11883	9	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11885	12	11	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
11886	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11887	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11890	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11891	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
11892	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11895	13	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
11897	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11898	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11899	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11900	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11901	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11903	9	10	Douglas-fir (*Pseudotsuga menziesii*)	Uprooting (N)			Remove
11904	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11905	8	8	Douglas-fir (*Pseudotsuga menziesii*)	Lean (N)	1	2	Remove
11906	12	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
11907	11	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
11909	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11910	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11911	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11912	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11914	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11915	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11916	8	7	Douglas-fir (*Pseudotsuga menziesii*)	Uprooting (N)	2	3	Remove
11917	15	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11918	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11923	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11924	11	10	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top with included bark	1	2	Remove
11925	14	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
11927	13	9	Douglas-fir (*Pseudotsuga menziesii*)	Crooked top	1	2	Remove
11928	16	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11929	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11931	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11934	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11935	10	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
11936	16	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
11937	9	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
11942	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11943	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11944	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11945	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11946	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11947	12	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11949	10	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11950	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11952	8	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
11953	12	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11955	12	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
11957	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
11958	8	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
11960	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11961	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11963	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11965	12	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11967	10	11	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11971	9	10	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
11972	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11975	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Tree fallen on top	2	2	Remove
11980	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
11988	9	15	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; 1-sided canopy (N)	2	3	Remove
12001	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 10'	3	3	Remove
12009	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12020	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12025	19	20	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; 1-sided canopy (N)	2	3	Remove
12030	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12031	8	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
12032	8	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12058	10	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Preserve
12059	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12060	23	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12062	25	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12067	22	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12068	20	20	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
12071	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12073	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12075	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12076	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12080	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12083	8	8	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
12089	25	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12090	8	8	Douglas-fir (*Pseudotsuga menziesii*)	Suppressed	2	2	Remove
12091	25	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12093	30	20	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12098	28	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12100	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12101	8	9	Douglas-fir (*Pseudotsuga menziesii*)	Suppressed	2	2	Remove
12102	24	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12103	24	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12107	19	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
12108	19	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N); high canopy	1	2	Remove
12109	26	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12111	17	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12112	19	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N); Crooked bole	1	2	Remove
12118	14	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12120	8	6	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12122	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12123	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12124	10	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12126	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12128	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
12132	23	18	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Remove
12139	32	20	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Remove
12141	11	20	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
12144	15	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Suppressed	3	3	Remove
12145	22	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
12149	21	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12158	19	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12159	25	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12161	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12162	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12164	38	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12166	24	20	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
12172	17	17	Oregon White Oak (*Quercus garryana*)		1	1	Remove
12174	27	23	Douglas-fir (*Pseudotsuga menziesii*)	Lean (SE); High canopy; Crooked bole	1	2	Remove
12175	27	17	Douglas-fir (*Pseudotsuga menziesii*)	Sparse canopy; High canopy	2	2	Remove
12177	31	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12181	14	10	Oregon White Oak (*Quercus garryana*)		1	1	Remove
12184	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
12189	18	9	Douglas-fir (*Pseudotsuga menziesii*)	Dead branches	2	1	Remove
12192	18	25	Oregon White Oak (*Quercus garryana*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (W); Several failed limbs	2	2	Remove
12194	14	0	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead (60')	3	3	Preserve
12196	9,6	16	Oregon White Oak (*Quercus garryana*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (E)	1	2	Preserve
12198	14,14,9	22	Oregon White Oak (*Quercus garryana*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (W)	1	2	Preserve
12202	10	10	Oregon White Oak (*Quercus garryana*)	**OFFSITE**; Evaluated from property line; Lean (W)	1	2	Preserve
12212	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12216	20	22	Oregon White Oak (*Quercus garryana*)		1	1	Remove
12217	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12221	28	14	Douglas-fir (*Pseudotsuga menziesii*)	Sweep (E)	1	2	Remove
12223	28	18	Douglas-fir (*Pseudotsuga menziesii*)	Sweep (E); 1-sided canopy (W)	1	2	Remove
12225	12	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
12226	14	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 15'	3	3	Remove
12230	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12231	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12235	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12236	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12238	29	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12242	9	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (SW)	1	2	Remove
12244	29	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12245	17	15	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
12248	25	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12251	24	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12253	26,8	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12256	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12260	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12262	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12264	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12265	8	6	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
12266	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12267	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12268	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12270	11	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 20'	3	3	Remove
12271	9	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; 1-sided canopy (S)	2	3	Remove
12272	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12273	9	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
12274	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; broken at 40'	3	3	Remove
12275	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12277	12	12	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top; 1-sided canopy (E)	1	2	Remove
12278	10	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12279	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12280	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12281	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12282	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12283	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12284	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12285	11	15	Douglas-fir (*Pseudotsuga menziesii*)	2-sided canopy (S)	1	2	Remove
12288	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12289	11	12	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; 1-sided canopy (S)	2	3	Remove
12290	11	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12292	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12295	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12296	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12301	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12303	9	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12304	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12308	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12309	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12314	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12315	10	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Dead branches	2	3	Remove
12316	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12325	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12328	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
12329	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12330	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Sparse canopy	2	2	Remove
12335	8	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12337	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12338	10	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
12339	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12340	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12341	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12342	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12343	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12344	8	4	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12346	27	21	Douglas-fir (*Pseudotsuga menziesii*)	Sweep (W)	1	2	Remove
12350	40	21	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12352	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12353	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12354	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12355	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12357	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12358	13	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12359	9	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12363	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12364	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12365	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
12366	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12368	11	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12369	9	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12371	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12373	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12374	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12375	8	7	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
12377	18	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12380	8	4	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12382	13	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12383	10	6	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12384	10	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 50'	3	3	Remove
12385	10,11	7	Willow (*Salix sp.*)	Epicormic Sprouts; Dead branches	2	1	Remove
12386	8	14	Douglas-fir (*Pseudotsuga menziesii*)	Suppressed; 1-sided canopy (W)	2	2	Remove
12387	16	16	Douglas-fir (*Pseudotsuga menziesii*)	Deformed bole	1	2	Remove
12388	16	18	Douglas-fir (*Pseudotsuga menziesii*)	Deformed bole; Dead limbs	2	2	Remove
12389	22	19	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12391	23	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12396	35	25	Douglas-fir (*Pseudotsuga menziesii*)	Dead branches; Sparse canopy	2	2	Remove
12398	29	21	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12400	19	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12401	28	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12404	14	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12405	45	25	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
12407	15	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12413	26	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12414	25,7	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12415	29	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12416	8	4	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12417	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12418	23	13	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole; 1-sided canopy (S)	1	2	Remove
12419	9	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12420	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12421	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12427	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12433	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12434	10	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12435	9	15	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; 1-sided canopy (S)	2	3	Remove
12436	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
12441	9	9	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
12444	12	8	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12445	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
12446	9	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
12447	10	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12449	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12452	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
12454	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12456	29	20	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
12457	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12459	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12460	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

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Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
12461	9	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
12462	8	6	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
12464	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12465	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12466	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 30'	3	3	Remove
12467	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12469	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12470	11	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12471	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12472	8	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12473	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12475	8	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12476	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
12477	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12480	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12481	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12482	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12483	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12486	13	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12487	10	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12488	11	0	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12489	12	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12490	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12491	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12492	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12495	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12499	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12502	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12505	31	25	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12508	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12513	9	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12517	7,9	6	Willow (*Salix sp.*)	Dead limbs	2	1	Remove
12518	12	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
12519	8	6	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
12520	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12521	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12522	11	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12524	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12525	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12526	9	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12527	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12528	12	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12530	10	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12531	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12532	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12534	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12535	21	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12536	26	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12541	16	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
12542	23	15	Douglas-fir (*Pseudotsuga menziesii*)	Sweep	1	2	Remove
12543	26	21	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12545	8,9,11	8	Willow (*Salix sp.*)	Dead limbs	2	1	Remove
12549	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12552	13	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12556	8	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12568	28	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12581	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Significant lean (S); Uprooting	2	3	Remove
12583	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12585	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12586	15	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12587	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12588	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
12589	10	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 20'	3	3	Remove
12590	11	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12592	11	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12593	9	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
12594	8	10	Douglas-fir (*Pseudotsuga menziesii*)	Epicormic Sprouts; 1-sided canopy (W)	2	2	Remove
12595	10	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
12598	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

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Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
12599	11	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12600	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; broken at 50'	3	3	Remove
12602	10	8	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12603	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12604	12	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12607	15	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12608	10	9	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
12609	9	10	Douglas-fir (*Pseudotsuga menziesii*)	Broken at very top; 1-sided canopy (W)	2	2	Remove
12610	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12612	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12615	8	9	Douglas-fir (*Pseudotsuga menziesii*)	Top lean (S)	1	2	Remove
12616	10	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
12617	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12619	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12620	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12621	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Suppressed; Sparse canopy	2	2	Remove
12622	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12623	10	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
12626	14	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12628	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 20'	3	3	Remove
12629	9	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
12630	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12632	9	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
12633	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12634	9	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12635	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12637	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12638	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12639	8,6	0	Willow (*Salix sp.*)	Dead; Broken tops	3	3	Remove
12641	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12643	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12644	12	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12645	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12646	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12647	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12648	11,11	11	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base with included bark	1	2	Remove
12649	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12653	12	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
12654	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12655	9	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12656	10,12	10	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base with included bark	1	2	Remove
12658	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12659	10	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12660	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12661	11	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12662	14	15	Douglas-fir (*Pseudotsuga menziesii*)	Sweep	1	2	Remove
12663	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12665	14	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12668	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12669	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12670	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
12671	9	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12672	22	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12674	9	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12676	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12677	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
12678	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
12680	11	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12682	14	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12683	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12684	13	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12685	8	9	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
12692	10	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12693	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12695	27	23	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12696	21	20	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
12699	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12700	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12701	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
12702	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12704	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12705	12	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
12706	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12707	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12708	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
12709	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12710	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12711	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12712	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12713	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12714	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12716	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12717	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12719	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12720	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12721	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12723	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12724	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12727	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12728	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12729	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12730	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12731	9	4	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12733	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12734	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12735	10,8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12736	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12737	10	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12739	9	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
12740	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12741	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12743	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12748	9	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12751	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12752	8	8	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12755	10	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12758	14	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12761	8,6	15	Bigleaf Maple (*Acer macrophyllum*)	Tops lean (W)	1	2	Remove
12763	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12764	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12765	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
12766	12	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12770	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
12771	9	8	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12772	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12777	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
12780	10,11	18	Oregon White Oak (*Quercus garryana*)	Lean (W); Codominant base	1	2	Remove
12781	12	13	Oregon White Oak (*Quercus garryana*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
12785	21	14	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Remove
12790	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
12792	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; 1-sided canopy (E)	1	2	Remove
12793	15	12	Oregon White Oak (*Quercus garryana*)		1	1	Remove
12794	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 30'	3	3	Remove
12796	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12797	7,9,9,10,13	13	Bigleaf Maple (*Acer macrophyllum*)	Dead limbs; Codominant base with included bark	2	2	Remove
12799	8	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12800	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12801	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; broken at 40'	3	3	Remove
12802	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12803	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12804	10	14	Cherry (*Prunus sp.*)		1	1	Remove
12805	10	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12806	9,10	10	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base; Broken tops	2	3	Remove
12809	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12813	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12814	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12815	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12816	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
12817	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12819	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12820	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12823	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12829	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12838	21	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy	1	2	Preserve
12840	23	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
12844	26	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy; 1-sided canopy (N)	1	2	Remove
12846	24	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (S)	1	2	Remove
12848	9,7	10	Oregon Ash (*Fraxinus latifolia*)	**OFFSITE**; Evaluated from property line; Codominant with included bark	1	2	Remove
12850	11	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12851	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12852	6	6	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree	1	1	Preserve
12853	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12854	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12855	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12858	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12861	9	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12862	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12863	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12864	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12865	9	8	Willow (*Salix sp.*)	Broken top; Dead limbs; Sparse canopy	2	3	Remove
12867	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12868	8	9	Douglas-fir (*Pseudotsuga menziesii*)	Sparse canopy	2	2	Remove
12869	15	15	Cherry (*Prunus sp.*)	Crooked; Many broken limbs	2	2	Remove
12871	8	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12873	12	7	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top	1	2	Remove
12876	11	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 30'	3	3	Remove
12878	9,8,7	18	Bigleaf Maple (*Acer macrophyllum*)	Broken limbs; Dead limbs; 1-sided canopy (N)	2	2	Remove
12880	14	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12881	12	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
12883	12	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
12884	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12886	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12887	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12890	8	0	Willow (*Salix sp.*)	Dead; Lean (W)	3	3	Remove
12891	12	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12893	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12894	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12895	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12896	12	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12900	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12901	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12904	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12905	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12908	8	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12910	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12912	9	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
12914	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12918	8	2	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Very sparse canopy	3	3	Remove
12919	10	14	Cherry (*Prunus sp.*)		1	1	Remove
12920	11,7	15	Oregon Ash (*Fraxinus latifolia*)		1	1	Remove
12921	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12922	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12923	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12924	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12926	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12928	9	4	Douglas-fir (*Pseudotsuga menziesii*)	high canopy	1	2	Remove
12929	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12930	4	3	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree	1	1	Preserve
12933	8,7,6,6	13	Bigleaf Maple (*Acer macrophyllum*)	Some broken limbs	1	1	Remove
12935	8	4	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12936	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 30'	3	3	Remove
12937	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12938	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12940	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
12941	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	**DBH (in.)**	**Avg. Crown Radius (ft)**	**Tree Species** Common Name (*Scientific name*)	**Comments**	**Health Rating***	**Structure Rating****	**Remove/Preserve**
12942	8	11	Cherry (*Prunus sp.*)	1-sided canopy (E)	1	2	Remove
12946	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12947	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12948	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12950	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
12951	8,5,5	19	Oregon Ash (*Fraxinus latifolia*)		1	1	Remove
12960	4	6	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree	1	1	Preserve
13001	4	6	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree	1	1	Preserve
13002	6	6	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree	1	1	Preserve
13028	4	6	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree	1	1	Preserve
13056	4	6	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree	1	1	Preserve
13075	5	6	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree	1	1	Preserve
13123	4	6	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree	1	1	Preserve
13128	3	5	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree	1	1	Preserve
13221	2	3	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree; Large cavity with decay	2	2	Preserve
13222	5	5	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree	1	1	Preserve
13223	10	10	Scotch Pine (*Pinus sylvestris*)		1	1	Remove
13224	9	10	Scotch Pine (*Pinus sylvestris*)	Codominant with included bark	1	2	Remove
13225	9	11	Scotch Pine (*Pinus sylvestris*)	Broken top	2	3	Remove
13226	10	10	Scotch Pine (*Pinus sylvestris*)	Broken top	2	3	Remove
13227	10	10	Scotch Pine (*Pinus sylvestris*)	Broken top	2	3	Remove
13228	9	8	Scotch Pine (*Pinus sylvestris*)	Crooked bole	1	2	Remove
13229	10	11	Scotch Pine (*Pinus sylvestris*)		1	1	Remove
13230	8	7	Scotch Pine (*Pinus sylvestris*)		1	1	Remove
13231	8	8	Scotch Pine (*Pinus sylvestris*)	Broken top	2	3	Preserve
13232	14,8	13	Scotch Pine (*Pinus sylvestris*)	Broken top	2	3	Remove
13233	11	11	Scotch Pine (*Pinus sylvestris*)		1	1	Remove
13234	14	12	Scotch Pine (*Pinus sylvestris*)	**LINE TREE**; Codominant with included bark	1	2	Remove
13414	8,7,7	14	Cherry (*Prunus sp.*)	Large broken limbs	1	2	Remove
13421	8	9	Pine (*Pinus sp.*)	yellowing foliage	2	1	Preserve
13469	3	3	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree; Large cavity with decay	2	2	Preserve
15079	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
15080	8,7,7,6	11	Black Cottonwood (*Populus trichocarpa*)	Broken limbs	1	1	Remove
15301	36	20	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
15303	24	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
15304	30	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
15307	8	9	Cherry (*Prunus sp.*)		1	1	Remove
15489	24	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
15490	30	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
15491	8,7	15	Willow (*Salix sp.*)		1	1	Remove
15494	11	10	Willow (*Salix sp.*)	Dead limbs; Broken limbs	2	1	Remove
15504	8,7,6	12	Cherry (*Prunus sp.*)	Broken top on one stem	2	2	Remove
15505	10	12	Black Cottonwood (*Populus trichocarpa*)		1	1	Remove
15506	8,7	11	Willow (*Salix sp.*)	1-sided canopy (S)	1	2	Remove
15508	32	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
15518	23,11,8,8	17	Bigleaf Maple (*Acer macrophyllum*)	Bulges at base	2	1	Remove
15520	8	9	Willow (*Salix sp.*)		1	1	Remove
15547	8	0	Willow (*Salix sp.*)	Dead; Broken at 15'	3	3	Remove
15549	8,8	14	Willow (*Salix sp.*)	Some broken limbs	1	1	Remove
15554	8,6,6	12	Willow (*Salix sp.*)		1	1	Remove
15556	8,7	9	Willow (*Salix sp.*)		1	1	Remove
15561	8,6	12	Willow (*Salix sp.*)	Large cavity with decay	2	2	Remove
15568	8,6,6	12	Willow (*Salix sp.*)		1	1	Remove
15574	25	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy; Dead limbs; Epicormic sprouts	2	2	Remove
15575	8	11	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15576	27	17	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Exposed roots (W); High canopy	1	2	Remove
15578	29	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Epicormic sprouts; High canopy	2	2	Remove
15579	24	16	Douglas-fir (*Pseudotsuga menziesii*)	**LINE TREE**; Evaluated from property line; Epicormic sprouts; High canopy	2	2	Remove
15581	11	10	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy	1	2	Preserve
15582	9	11	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15585	11	7	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Conks; high canopy; Sparse canopy	3	2	Remove
15586	13	16	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15587	11	4	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead top; Very sparse canopy; In decline	3	2	Preserve
15588	8	15	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (SW)	1	2	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
15589	30	0	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead (~120')	3	3	Remove
15590	24	0	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead (~100')	3	3	Remove
15591	19	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W); Sparse canopy	2	2	Remove
15592	18	9	Douglas-fir (*Pseudotsuga menziesii*)	**LINE TREE**; 1-sided canopy (W); High canopy	2	2	Remove
15594	17	7	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy; Sparse canopy	2	2	Remove
15595	14	6	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy; Sparse canopy	2	2	Remove
15596	12	17	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15597	13	17	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15598	15	7	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy; Dead branches; Sparse canopy	2	2	Remove
15599	30	16	Douglas-fir (*Pseudotsuga menziesii*)	**LINE TREE**; High canopy	1	2	Remove
15613	9,9	10	Cherry (*Prunus sp.*)	Codominant with included bark; Cavity with decay	2	2	Remove
15614	9,6	10	Willow (*Salix sp.*)		1	1	Remove
15617	23	0	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead; Broken at 20'	3	3	Remove
15623	11	13	Willow (*Salix sp.*)		1	1	Remove
15624	9	3	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Sluffing bark; High canopy; Sparse canopy; In decline	3	2	Remove
15626	9	13	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (W)	1	2	Remove
15627	30	14	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy	1	2	Remove
15629	17	8	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy	1	2	Preserve
15630	21	11	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy; 1-sided canopy (W)	1	2	Remove
15634	21	13	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy	1	2	Remove
15635	11	14	Bigleaf Maple (*Acer macrophyllum*)	**LINE TREE**	1	1	Remove
15636	14	13	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy	1	2	Remove
15639	30	19	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy; 1-sided canopy (W)	1	2	Remove
15641	30	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy	1	2	Remove
15643	6	6	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15644	27	17	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15648	6	8	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15649	7	7	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15650	7	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15655	8	11	Cherry (*Prunus sp.*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15663	7,7	15	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15664	9	8	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (W)	1	2	Remove
15665	12	13	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy	1	2	Preserve
15666	13	13	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy	1	2	Preserve
15667	9	13	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15668	18	8	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy	1	2	Remove
15669	21	17	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy	1	2	Remove
15670	6	8	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15674	11	5	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy; A lot of sluffing bark; Sparse canopy; In decline	3	2	Preserve
15675	11	7	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead top; Suppressed	3	2	Preserve
15676	18	10	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy	1	2	Preserve
15677	23	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (S)	1	2	Preserve
15679	12,10	18	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15682	10	13	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15683	9,7,7	13	Cherry (*Prunus sp.*)	**OFFSITE**; Evaluated from property line; Butt sweep	1	2	Remove
15684	7	12	Cherry (*Prunus sp.*)	**OFFSITE**; Evaluated from property line; High canopy	1	1	Preserve
15691	8,8,7	17	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15692	6	10	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15697	11,9	20	Bigleaf Maple (*Acer macrophyllum*)	**LINE TREE**; Evaluated from property line; 1-sided canopy (W)	1	2	Remove
15698	19	0	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead (~100')	3	3	Remove
15702	11,8	20	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15703	11,7	20	Bigleaf Maple (*Acer macrophyllum*)	**LINE TREE**; Evaluated from property line	1	1	Remove
15704	12	15	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line; Large cavity with decay up bole	2	2	Preserve
15711	8	15	Bigleaf Maple (*Acer macrophyllum*)	Lean (N); 1-sided canopy (N)	1	2	Remove
15719	10	17	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
15720	9,8,7,6	17	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
15721	9,8	18	Bigleaf Maple (*Acer macrophyllum*)	1-sided canopy (S); Some broken limbs	1	2	Remove
15726	10	16	Bigleaf Maple (*Acer macrophyllum*)	1-sided canopy (W)	1	2	Remove
15727	13,13	19	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
15732	8,6	17	Bigleaf Maple (*Acer macrophyllum*)	1-sided canopy (W)	1	2	Remove
15736	9	10	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15737	17	15	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Preserve

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
15738	8,6	14	Willow (*Salix sp.*)	**OFFSITE**; Evaluated from property line; Dead branches; Sweep	2	2	Preserve
15739	26	12	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy; Sparse canopy; Epicormic sprouts	2	2	Remove
15741	6	14	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (W); Lean (W)	1	2	Preserve
15742	15,9	19	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15743	23,15	14	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; 15" stem sluffing bark; Sparse canopy	2	2	Remove
15745	11	12	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15746	10,10	22	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (W)	1	2	Remove
15747	7	9	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15748	11	0	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead; Lean (S)	3	3	Preserve
15749	11	12	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15750	11	14	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15751	6	20	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line; Lean (W)	1	2	Preserve
15753	13	18	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (SW)	1	2	Remove
15754	15,10	19	Bigleaf Maple (*Acer macrophyllum*)	50% ivy coverage; Codominant base; Stem lean (E)	2	2	Remove
15756	31	17	Douglas-fir (*Pseudotsuga menziesii*)	**LINE TREE**; Evaluated from property line; 50% ivy coverage; Sparse canopy	2	2	Remove
15758	15	20	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15759	8	7	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
15760	8,7,6,6,6,6,6	19	Bigleaf Maple (*Acer macrophyllum*)	Epicormic stems growing from horizontal log	2	2	Remove
15761	10	14	Sweet Cherry (*Prunus avium*)		1	1	Remove
15763	24	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy	1	2	Remove
15764	25	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (S)	1	2	Remove
15765	27	17	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; 50% ivy coverage	1	1	Remove
15767	11,8,6	20	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15768	8	14	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15769	15	11	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; 75% ivy coverage; Sparse canopy; Crooked top; High canopy	2	2	Remove
15777	23	18	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15781	11	18	Sweet Cherry (*Prunus avium*)	**LINE TREE**; Broken codominant stem; Crooked bole; Lean (S)	2	2	Remove
15784	8	14	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
15789	6	9	Sweet Cherry (*Prunus avium*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15790	10	16	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (W)	1	2	Preserve
15791	6	8	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (W)	1	2	Preserve
15794	9	14	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line; Lean (W)	1	2	Preserve
15795	14,10	19	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
15797	17	18	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15798	31	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15799	12,6	17	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
15871	39	30	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
15879	8,7,6	18	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**	1	1	Preserve
15882	13	14	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
15883	24	20	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
15887	24	17	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated behind fence; Recent trenching within 5' of tree	2	2	Preserve
15888	35	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated behind fence; Recent trenching within 5' of tree	2	2	Preserve
20072	10	10	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; 1-sided canopy (S); Lean (S)	1	2	Preserve
20073	8	3	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Broken top; Sparse canopy	2	3	Preserve
20074	8	3	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Broken top; Sparse canopy	2	3	Preserve
20076	13	18	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; 1-sided canopy (N); Lean (N)	1	2	Preserve
20077	18	17	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
20258	14	14	Western Redcedar (*Thuja plicata*)		1	1	Preserve
20261	17	14	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Codominant top; Exposed roots (N)	1	2	Remove
20296	12	17	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; 1-sided canopy (S)	1	2	Preserve
20329	8,6,6	17	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**	1	1	Preserve
20334	10	13	Blue Spruce (*Picea pungens*)	**OFFSITE**	1	1	Preserve
20336	10,13	11	Western Redcedar (*Thuja plicata*)	**OFFSITE**; Dead tops; Codominant base	3	2	Preserve
20338	8,11	19	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Codominant with included bark; Exposed roots with mechanical damage	2	2	Preserve
20418	10	13	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
20428	12	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
20433	8	14	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; 1-sided canopy (S)	1	2	Preserve
20710	9	10	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
20711	16	20	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**	1	1	Preserve
20712	9	14	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
20713	13	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
20723	20	20	Atlas Cedar (*Cedrus atlantica*)	**OFFSITE**	1	1	Preserve
20847	16	17	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; 1-sided canopy (S)	1	2	Remove
20848	16	17	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; 1-sided canopy (S); Exposed roots (S)	1	2	Preserve
20952	13	11	Black Cottonwood (*Populus trichocarpa*)	**OFFSITE**; Exposed roots with mechanical damage all around; Broken branches	2	2	Remove
20983	14	21	Black Cottonwood (*Populus trichocarpa*)	**OFFSITE**; Exposed roots with mechanical damage all around; Broken branches	2	2	Remove
21075	10,10	18	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Codominant with included bark	1	2	Preserve
21085	8	14	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**	1	1	Preserve
21126	7,16	21	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; 1-sided canopy (S)	1	2	Preserve
21128	16	20	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**	1	1	Preserve
21129	11,17	20	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; 11" stem dead	2	2	Preserve
21143	13	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve
21149	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21150	11	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
21151	10	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
21152	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21154	8	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
21156	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21158	8	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
21159	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21160	10	8	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
21161	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21162	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21163	10	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
21165	12	2	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
21166	10	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
21168	27	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21169	33	21	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
21170	22	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21171	29	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21172	11	6	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
21173	28	19	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
21174	16	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21175	9	7	Douglas-fir (*Pseudotsuga menziesii*)	Suppressed; 1-sided canopy (S)	2	2	Remove
21176	26	20	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
21177	21	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21178	14	10	Douglas-fir (*Pseudotsuga menziesii*)	Sweep (N)	1	2	Remove
21179	20	19	Douglas-fir (*Pseudotsuga menziesii*)	Bore holes	2	1	Remove
21182	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
21183	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21184	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21185	38	25	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21186	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
21188	23	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N); Crooked bole	1	2	Remove
21189	34	16	Douglas-fir (*Pseudotsuga menziesii*)	Weak attachment; Bulges; Lean (N)	2	2	Remove
21190	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21191	21	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
21192	27	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
21193	22	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
21194	24	19	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
21195	30	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21196	20	15	Douglas-fir (*Pseudotsuga menziesii*)	Sweep; 1-sided canopy (S)	1	2	Remove
21197	25	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21198	28	20	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S); Dead branches	2	2	Remove
21199	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21200	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
21204	9	6	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
21205	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21207	10	6	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
21209	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
21211	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
21212	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
21213	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21214	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
21215	9	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
21216	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21217	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21221	34	21	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
21222	27	19	Douglas-fir (*Pseudotsuga menziesii*)	Many broken branches; Sparse canopy; Crooked bole	2	2	Remove
21224	20	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21225	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
21226	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21227	10	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
21228	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21230	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21233	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21234	13	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21235	9	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Epicormic sprouts	2	2	Remove
21236	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
21237	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Lean (N); Mechanical damage	2	2	Remove
21239	9	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
50001	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50002	13	17	Sweet Cherry (*Prunus avium*)	Some broken limbs	1	1	Remove
50003	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Sparse canopy	2	2	Remove
50008	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50009	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50010	10	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50011	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50013	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50014	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50015	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50016	8,6	14	Bigleaf Maple (*Acer macrophyllum*)	Some dead limbs; Broken branches; Lean (E)	2	2	Remove
50017	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50018	9	8	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50019	8	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50021	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50026	22	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Epicormic sprouts; Over extended limbs	2	2	Remove
50030	9,20	10	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; High canopy	1	2	Remove
50041	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50046	12	0	Douglas-fir (*Pseudotsuga menziesii*)	**LINE TREE**; Evaluated from property line; Dead; broken at 10'	3	3	Remove
50047	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50051	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50052	9,9,9,9,6	20	Bigleaf Maple (*Acer macrophyllum*)	Some broken branches	1	1	Remove
50055	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50061	24	14	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50062	11	12	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
50064	23	10	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Epicormic sprots; Few dead limbs	2	1	Remove
50065	12	0	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead; Broken at 25'	3	3	Remove
50071	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50075	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; broken at 30'	3	3	Remove
50077	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50078	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50079	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50081	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50086	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50087	8,6	20	Bigleaf Maple (*Acer macrophyllum*)	Lean; Dead limbs	2	2	Remove
50088	9	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; 1-sided canopy (S)	1	2	Remove
50090	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50091	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; 1-sided canopy (S)	1	2	Remove
50092	8,8,6,6	15	Bigleaf Maple (*Acer macrophyllum*)	1-sided canopy (W)	1	2	Remove
50094	8	10	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50095	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50097	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50098	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50103	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 45'	3	3	Remove
50104	9,7,6,6,6	11	Bigleaf Maple (*Acer macrophyllum*)	Some broken limbs	1	1	Remove
50105	9	13	Sweet Cherry (*Prunus avium*)	Sweep	1	2	Remove
50107	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50109	9	10	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50112	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50113	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50117	8,8,7	14	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
50121	23	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; high canopy	1	2	Remove
50123	10	15	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
50124	13	8	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Preserve
50127	10,11	10	Oregon Ash (*Fraxinus latifolia*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
50129	8,7,6	14	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
50131	9	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50133	9,10,11	15	Bigleaf Maple (*Acer macrophyllum*)	Some broken limbs	1	1	Remove
50135	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50137	8	12	Douglas-fir (*Pseudotsuga menziesii*)	Top lean (E)	1	2	Remove
50138	8	14	Bigleaf Maple (*Acer macrophyllum*)	Suppressed; Dead branches	2	2	Remove
50139	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50140	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50142	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Sparse canopy	2	2	Remove
50143	10	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Sparse canopy	2	2	Remove
50146	12	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50148	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50149	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50151	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50152	10	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50153	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50154	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50155	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50157	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50160	9	4	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50161	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50164	9	8	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
50165	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50166	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50168	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50169	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50172	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50175	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50176	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50179	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50184	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50190	13	15	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
50193	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50194	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50195	9	4	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50196	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50197	8	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50199	9,8,8,7,6	20	Bigleaf Maple (*Acer macrophyllum*)	Some broken limbs	1	1	Remove
50200	9,7	17	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
50204	11	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50207	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50208	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50213	17,10	18	Bigleaf Maple (*Acer macrophyllum*)	Cavity with decay in base; 1-sided canopy (E)	2	2	Remove
50216	17	17	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
50218	8,8	0	Bigleaf Maple (*Acer macrophyllum*)	Dead; Broken at 30'	3	3	Remove
50219	8	0	Bigleaf Maple (*Acer macrophyllum*)	Dead; Broken at 30'	3	3	Remove
50223	9,11	15	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base with included bark	1	2	Remove
50224	9	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50226	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50229	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50233	9	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
50234	14	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50236	11	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
50239	10	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50242	13	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50244	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50245	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50246	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50248	12	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken branches; 1-sided canopy (E)	1	2	Remove
50250	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50251	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50252	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50253	10	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50257	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50258	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50259	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50260	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50261	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50264	11	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
50265	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50267	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50269	8,7	10	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base; 1 stem broken top	2	2	Remove
50270	11	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50272	10	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50273	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
50274	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50282	10	4	Douglas-fir (*Pseudotsuga menziesii*)	Sparse canopy	2	2	Remove
50284	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
50285	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50287	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50289	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
50291	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Sparse canopy; High canopy; 1-sided canopy (N)	2	2	Remove
50293	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
50294	10	9	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50295	8	14	Douglas-fir (*Pseudotsuga menziesii*)	Top lean (W)	1	2	Remove
50297	9	10	Sweet Cherry (*Prunus avium*)		1	1	Remove
50298	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50300	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50301	9,9,8,7,7,6	16	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
50303	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50304	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50306	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50307	10	18	Sweet Cherry (*Prunus avium*)	Exposed roots all around	1	1	Remove
50308	11	18	Sweet Cherry (*Prunus avium*)	Exposed roots all around	1	1	Remove
50310	10	16	Bigleaf Maple (*Acer macrophyllum*)	1-sided canopy (S)	1	2	Remove
50314	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50315	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50316	9	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (NE)	1	2	Remove
50319	8	6	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
50320	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50321	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50322	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50323	10	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50329	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
50331	9	10	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50334	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
50335	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50336	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50338	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50339	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50341	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50342	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50348	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50349	14,7,7,6	16	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
50358	20	10	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; high canopy	1	2	Preserve
50359	26	21	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line; Some broken limbs; Crooked bole	1	2	Preserve
50362	27	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; high canopy	1	2	Remove
50363	9	19	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line; Lean (W)	1	2	Remove
50364	9	12	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
50366	28	16	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; 25% ivy coverage; Epicormic sprouts	2	1	Remove
50370	12	15	Bigleaf Maple (*Acer macrophyllum*)	**OFFSITE**; Evaluated from property line	1	1	Remove
50372	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50380	9	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50382	8	0	Willow (*Salix sp.*)	Dead	3	3	Remove
50383	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50386	11	19	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
50387	12	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50388	12	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50389	13	17	Douglas-fir (*Pseudotsuga menziesii*)	Exposed roots (N)	1	2	Remove
50391	10	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50393	12	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50394	13	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50397	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50398	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50401	13	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50402	9	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50404	10	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
50406	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
50408	25	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50409	9	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50411	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50412	7	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50413	10	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50415	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50416	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50418	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50419	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50420	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50422	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50423	9	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50424	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50425	12	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50427	14	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50428	12	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Crooked bole	2	3	Remove
50433	10	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50434	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50435	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50443	13	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50444	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50445	12	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50446	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50447	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50449	9	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50450	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50452	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50453	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50454	12	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50457	11	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50458	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50460	12	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W); Crooked top	1	2	Remove
50463	11	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50466	7,6	0	Willow (*Salix sp.*)	Failed codominant stem; Other stem dead	3	3	Remove
50467	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50469	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
50470	10	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50471	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50472	9	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50474	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50476	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
50477	9	9	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50483	9	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50487	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50489	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50490	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50491	10	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50492	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50495	10	6	Douglas-fir (*Pseudotsuga menziesii*)	Codominant stem; High canopy	1	2	Remove
50498	8,7	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 50'	3	3	Remove
50499	9	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50500	9	8	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50503	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
50504	7,6	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
50505	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50507	9	8	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50508	9	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50510	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50513	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50515	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50516	9	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50519	10	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50520	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50523	10	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50524	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50526	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50528	10	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50529	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
50531	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
50532	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50533	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50534	9	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50536	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50537	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50539	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50540	11	13	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50541	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50543	9	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Crooked bole	1	2	Remove
50544	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50548	10	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50549	8	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50551	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50552	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50556	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50557	9	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50558	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
50559	8	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W); Lean (W); High canopy	1	2	Remove
50560	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50562	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50565	9	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50566	8	10	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50569	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50570	10	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50571	8	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50577	33	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50583	29	21	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50584	8	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50585	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50589	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50591	9	10	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	3	2	Remove
50594	13	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50597	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50598	12	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50600	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50601	14	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50602	7,7	6	Willow (*Salix sp.*)		1	1	Remove
50603	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
50604	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50610	14	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50611	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50612	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50613	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50615	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50616	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50619	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50620	10	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50621	10	6	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50623	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50624	8	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50625	10	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50626	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50627	10	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50630	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50631	10	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
50632	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50633	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50636	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50637	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50638	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50639	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50640	10	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50641	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 20'	3	3	Remove
50644	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
50645	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
50646	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50648	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50649	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 30'	3	3	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
50650	10	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
50654	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50655	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50656	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50658	11	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	1	Remove
50659	12	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50661	10	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50662	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50665	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50666	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50667	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50668	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50669	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50670	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50674	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50675	28	23	Douglas-fir (*Pseudotsuga menziesii*)	Crooked top	1	2	Remove
50676	10	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50677	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50680	7,6	4	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark; High canopy; Sparse canopy	2	2	Remove
50681	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50684	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50686	15	15	Cherry (*Prunus sp.*)	Failed codominant stem	2	2	Remove
50688	8	17	Cherry (*Prunus sp.*)	Lean (S)	1	2	Remove
50689	8,10	16	Cherry (*Prunus sp.*)	1-sided canopy (S)	1	2	Remove
50690	10	8	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50693	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
50695	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40"	3	3	Remove
50696	9,13	18	Cherry (*Prunus sp.*)		1	1	Remove
50698	9	10	Cherry (*Prunus sp.*)		1	1	Remove
50700	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50702	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50703	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50705	19,26	19	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base with included bark	1	2	Remove
50715	26	20	Douglas-fir (*Pseudotsuga menziesii*)	Many broken branches; Sparse canopy; High canopy	2	2	Remove
50716	25	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50717	24	24	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
50718	10	10	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50719	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50721	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50729	10,7	15	Cherry (*Prunus sp.*)	Codominant; Crooked bole	1	2	Remove
50730	26	20	Douglas-fir (*Pseudotsuga menziesii*)	Broken branches on east side	1	2	Remove
50732	26	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50736	10	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50738	9	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50739	8	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50743	10	9	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50745	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50746	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 30'	3	3	Remove
50750	29	19	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
50751	8	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50752	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50754	12	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50755	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50757	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50758	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50759	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50761	10	8	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
50763	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50765	11	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50766	10	9	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50768	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50770	8	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S); Damaged by failed trees	2	2	Remove
50771	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50772	13	13	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole; 1-sided canopy (S)	1	2	Remove
50773	14	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50775	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50776	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50778	8	8	Cherry (*Prunus sp.*)	Exposed roots (W)	1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
50779	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50781	10	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50782	10	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50784	10	10	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50785	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50786	10	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50799	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50800	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50803	9	15	Douglas-fir (*Pseudotsuga menziesii*)	Lean (S)	1	2	Remove
50805	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50816	10	10	Willow (*Salix sp.*)		1	1	Remove
50817	7,6	20	Willow (*Salix sp.*)	Broken branches; Lean (E)	1	2	Remove
50818	12	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50819	8	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Lean (W)	1	2	Remove
50820	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50822	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50823	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50824	13	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50825	33	17	Douglas-fir (*Pseudotsuga menziesii*)	Sweep; Crooked bole	1	2	Remove
50826	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50828	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50831	13	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50832	9	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50833	9	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50834	10	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50837	14	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50838	11	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (SW)	1	2	Remove
50840	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50842	11	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50843	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50844	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50846	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50848	10	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50855	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50861	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50862	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50865	10	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50866	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50867	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50871	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50872	8	0	European White Birch (*Betula pendula*)	Dead; Broken at 30'	3	3	Remove
50878	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50883	9	11	Cherry (*Prunus sp.*)	1-sided canopy (S); Codominant with included bark	1	2	Remove
50886	8,7	11	Cherry (*Prunus sp.*)		1	1	Remove
50887	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50891	12	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50892	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50895	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50896	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50897	8	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50898	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50900	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50902	10	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50903	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
50904	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
50906	9	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50907	9	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50912	11	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Sparse canopy	2	2	Remove
50913	11	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
50914	12	12	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50915	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50917	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50918	12	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50920	12	9	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50921	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50922	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50924	12	12	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
50927	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50928	10	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
50929	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50932	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50934	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50936	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50937	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50938	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
50939	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50940	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50941	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50944	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50945	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
50946	9	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Sparse canopy	2	2	Remove
50947	10	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50949	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
50950	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50952	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50954	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50956	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50957	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50958	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50960	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50962	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50963	9	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50965	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50966	9	11	Cherry (*Prunus sp.*)		1	1	Remove
50969	10,11	11	Cherry (*Prunus sp.*)		1	1	Remove
50970	9	11	Douglas-fir (*Pseudotsuga menziesii*)	Lean (N); High canopy	1	2	Remove
50971	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50972	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50973	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50975	13	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50978	9	10	Douglas-fir (*Pseudotsuga menziesii*)	Crooked; 1-sided canopy (S)	1	2	Remove
50979	12	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50981	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50983	14	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50984	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50989	15	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50990	8	9	Cherry (*Prunus sp.*)		1	1	Remove
50993	8	13	Cherry (*Prunus sp.*)	1-sided canopy (S)	1	2	Remove
50996	12	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
50997	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
50998	9	10	Cherry (*Prunus sp.*)		1	1	Remove
51012	7,7	16	Bigleaf Maple (*Acer macrophyllum*)	Codominant with included bark; 1-sided canopy (S)	1	2	Remove
51013	11	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
51014	11	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
51016	13	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
51019	30 9	28	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
51024	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51025	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51026	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51029	8	10	Cherry (*Prunus sp.*)		1	1	Remove
51031	8,6	11	Cherry (*Prunus sp.*)		1	1	Remove
51033	8	15	Cherry (*Prunus sp.*)	Lean (S); 1-sided canopy (S)	1	2	Remove
51035	13	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51036	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51037	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51038	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51039	13	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
51040	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Top lean (N)	1	2	Remove
51041	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51045	15	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51047	22	23	Douglas-fir (*Pseudotsuga menziesii*)	Bulges; Crooked bole; 1-sided canopy (S)	2	2	Remove
51048	22	14	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole; 1-sided canopy (S)	1	2	Remove
51050	13,21	17	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base; 1 bole crooked	1	2	Remove
51051	13	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
51052	13	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51053	49	25	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51056	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51058	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
51059	8	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51060	10	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
51062	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51063	10	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51064	8	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51069	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
51071	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51072	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
51078	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51081	27	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51084	26	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51089	9	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51090	8	10	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51094	12	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
51095	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51098	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51099	8	8	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51101	13	12	Douglas-fir (*Pseudotsuga menziesii*)	Deformed bole	1	2	Remove
51103	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51104	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51105	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51110	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51113	8	17	Willow (*Salix sp.*)	1-sided canopy (W)	1	2	Remove
51114	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51115	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51116	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51118	8	11	Willow (*Salix sp.*)	Large cavity with decay	2	2	Remove
51120	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51121	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51125	8	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51127	10	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51128	10	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51130	11	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51132	15	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51135	18	19	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy; 1-sided canopy (W)	2	3	Remove
51143	7,7	15	Willow (*Salix sp.*)	1-sided canopy (W); Broken branches	1	2	Remove
51149	9,8,7	18	Willow (*Salix sp.*)	1-sided canopy (W)	1	2	Remove
51155	8,9	14	Willow (*Salix sp.*)	1-sided canopy (W); Broken branches	1	2	Remove
51160	6,6,7	11	Willow (*Salix sp.*)	Clustered base; Broken limbs	1	2	Remove
51161	7,6	10	Willow (*Salix sp.*)	Broken limbs; Broken tops	2	2	Remove
51163	24	16	Douglas-fir (*Pseudotsuga menziesii*)	Large cavity with conks inside	2	3	Remove
51166	8,7,6	0	Willow (*Salix sp.*)	Dead	3	3	Remove
51168	11	10	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
51172	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51173	10	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
51176	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51177	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51178	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51182	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51183	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51184	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51186	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51188	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51193	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51194	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51195	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51197	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51198	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51199	11	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51201	10	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51203	15	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51204	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51206	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51207	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51208	10	11	Douglas-fir (*Pseudotsuga menziesii*)	Broken branches; Epicormic sprouts	2	1	Remove
51209	9	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51211	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
51213	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51214	28	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
51215	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51216	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51218	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51219	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51220	10	9	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
51221	9	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51224	8	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51225	22	19	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top	1	2	Remove
51228	6,6	10	Cherry (*Prunus sp.*)	Clustered base	1	2	Remove
51233	16	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51236	12,6	19	Cherry (*Prunus sp.*)	1-sided canopy (W)	1	2	Remove
51237	8,7,7	13	Cherry (*Prunus sp.*)	Broken tops on several stems	2	2	Remove
51239	8,7,7,6	17	Cherry (*Prunus sp.*)	Codominant base	1	2	Remove
51243	11	16	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top; 1-sided canopy (W)	1	2	Remove
51247	12	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51249	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51250	10	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51252	13	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51256	11	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51257	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51258	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51260	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51261	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51263	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51264	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51268	32	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51269	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51270	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51271	36	22	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
51273	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51275	8	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51276	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51278	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51279	9	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51280	10	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51282	10	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51283	10	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51285	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51287	9	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
51288	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51290	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51295	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51296	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51299	24	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W); Bore holes	2	2	Remove
51300	44,18	19	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base; Sweep	1	2	Remove
51301	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51305	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51306	7	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51308	9	8	Douglas-fir (*Pseudotsuga menziesii*)	Epicormic sprouts	2	1	Remove
51310	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51311	15	8	Douglas-fir (*Pseudotsuga menziesii*)	Epicormic sprouts	2	1	Remove
51312	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51314	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51316	12	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51320	9	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51321	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51322	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51325	9	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51326	8,6	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 30'	3	3	Remove
51327	8	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51328	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51333	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51335	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 30'	3	3	Remove
51336	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51339	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51340	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51341	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Sparse canopy; High canopy	2	2	Remove
51343	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51344	8	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy; 1-sided canopy (W)	2	3	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
51345	10	13	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51348	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51349	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51353	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51356	9	10	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy; 1-sided canopy (W)	2	3	Remove
51358	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51359	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51363	28	23	Douglas-fir (*Pseudotsuga menziesii*)	Dead branches; Sparse canopy	2	2	Remove
51366	8	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51367	10	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51370	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51371	11	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51372	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51375	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51376	12	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51379	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51380	11	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51383	8	9	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51384	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51386	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51387	10	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51389	7,6	12	Cherry (*Prunus sp.*)	1-sided canopy (W)	1	2	Remove
51392	6,6,7	11	Willow (*Salix sp.*)	Small cavities with decay	2	2	Remove
51398	20	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated behind fence; Recent trenching within 5' of tree	2	2	Preserve
51448	9	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51449	9	11	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; 1-sided canopy (W)	2	3	Remove
51451	35	22	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51453	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51454	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51455	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51456	12	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
51457	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51460	11	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
51461	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51462	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51463	11	10	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51464	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51465	14	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51466	11	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51467	10	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51468	13	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51469	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51470	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51471	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51472	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51473	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51474	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51475	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51476	9	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51477	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51478	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51479	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51480	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51482	6,6	9	English Hawthorn (*Crataegus monogyna*)		1	1	Remove
51483	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51484	8	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
51485	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51486	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51487	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51490	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51491	9	18	Willow (*Salix sp.*)	Lean (S); Dead branches	2	2	Remove
51492	26	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51493	14	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51494	13	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51496	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51498	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51499	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51500	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
51501	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51502	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51503	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51504	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51505	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51506	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51507	20	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51508	9	9	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51509	9	4	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51510	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
51511	10	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51512	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51513	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51514	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51515	10	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51516	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51517	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51518	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51519	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 20'	3	3	Remove
51520	17	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51521	18	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51524	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51525	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51526	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51527	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead ; Broken at 40'	3	3	Remove
51528	10	10	Douglas-fir (*Pseudotsuga menziesii*)	Broken at very top	2	2	Remove
51529	9	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51530	9	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken at very top	2	2	Remove
51531	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51532	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51533	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51534	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51535	9	10	Douglas-fir (*Pseudotsuga menziesii*)	Sparse canopy	2	2	Remove
51537	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51538	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
51539	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
51544	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
51545	8	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51547	7	0	Cherry (*Prunus sp.*)	Dead; Broken at 30'	3	3	Remove
51548	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
51549	9,10	0	Cherry (*Prunus sp.*)	Dead; Broken at 30'	3	3	Remove
51550	9	7	Cherry (*Prunus sp.*)		1	1	Remove
51551	9	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51553	39	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51555	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51557	9	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51564	33	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51565	14	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (NW)	1	2	Remove
51566	15	16	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
51567	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51568	12,8,8	17	Pacific Madrone (*Arbutus menziesii*)	1-sided canopy (W)	1	2	Remove
51569	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51571	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51573	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51575	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51576	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51577	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51578	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51580	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51582	8	10	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
51585	8	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51586	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51588	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51589	14	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51590	10	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51608	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51609	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51612	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; broken at 40'	3	3	Remove
51613	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
51615	10	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; broken at 40'	3	3	Remove
51616	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51619	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51620	9,6	6	Willow (*Salix sp.*)	Broken tops; Broken limbs	2	2	Remove
51621	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
51623	10	9	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51634	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51635	8	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51640	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51644	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51645	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51647	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51649	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
51650	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51651	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51652	9	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51653	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51654	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51655	11	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51657	46	24	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51658	10	5	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S); Sparse canopy; Epicormic sprouts	2	2	Remove
51661	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51665	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
51666	13	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (SW)	1	2	Remove
51670	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 30	3	3	Remove
51671	26	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51672	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 30	3	3	Remove
51673	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51677	10	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51678	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51680	12	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
51684	8	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51685	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51686	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 20'	3	3	Remove
51687	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51690	9	0	Willow (*Salix sp.*)	Dead; Lean (E)	3	3	Remove
51691	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51693	10	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Dead foliage	2	3	Remove
51699	14	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
51700	18	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (NW)	1	2	Remove
51702	25	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51705	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51706	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51707	10	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51709	27	15	Douglas-fir (*Pseudotsuga menziesii*)	**LINE TREE**	1	1	Remove
51710	24	17	Douglas-fir (*Pseudotsuga menziesii*)	**LINE TREE**; Sweep	1	2	Remove
51713	10	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51714	8	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; 1-sided canopy (S)	2	3	Remove
51717	28	16	Douglas-fir (*Pseudotsuga menziesii*)	**LINE TREE**	1	1	Remove
51719	34	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51722	10	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51725	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51726	9	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51728	9	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51732	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51733	10	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51735	9	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51736	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51740	14	14	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51741	12	0	European White Birch (*Betula pendula*)	Dead; Broken at 30'	3	3	Remove
51744	11	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51746	10	16	Pacific Yew (*Taxus brevifolia*)	1-sided canopy (E); Dead limbs	2	2	Remove
51753	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 20'	3	3	Remove
51762	19	17	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated behind fence	1	1	Remove
51766	47	25	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51771	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51774	22	20	Douglas-fir (*Pseudotsuga menziesii*)	Crooked; 1-sided canopy (S)	1	2	Remove
51779	23	17	Douglas-fir (*Pseudotsuga menziesii*)	**LINE TREE**	1	1	Remove
51786	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
51787	16	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51789	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
51791	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51794	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51796	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51797	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51800	9	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51801	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51802	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51804	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51805	9	7	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top	1	2	Remove
51813	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51817	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51819	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51822	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51825	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51826	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51827	8	10	Douglas-fir (*Pseudotsuga menziesii*)	Lean (W); High canopy	1	2	Remove
51828	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Lean (W)	2	3	Remove
51829	9	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51831	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51832	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51839	25	25	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51840	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51841	10	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
51845	12	10	Pacific Yew (*Taxus brevifolia*)	Suppressed	2	2	Remove
51846	29	20	Douglas-fir (*Pseudotsuga menziesii*)	Cavity in base with decay	2	2	Remove
51848	8	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51850	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
51855	24	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51857	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51859	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51863	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
51864	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51865	8	8	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51867	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51868	10	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51872	24	21	Douglas-fir (*Pseudotsuga menziesii*)	Broken branches	1	1	Remove
51876	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51880	48	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51881	18	20	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
51885	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Damaged by failed trees	1	1	Remove
51890	9	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
51896	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51899	22	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51902	22	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51903	17	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51904	12	7	Douglas-fir (*Pseudotsuga menziesii*)	Suppressed	2	2	Remove
51905	26	19	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top; Broken branches	2	2	Remove
51912	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51914	13	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51916	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51917	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51921	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51922	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
51923	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51926	8	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51930	8	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51931	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51935	10	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (NW)	1	2	Remove
51937	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51939	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51943	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51944	8	8	Douglas-fir (*Pseudotsuga menziesii*)	Top lean (W); High canopy	1	2	Remove
51945	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 30'	3	3	Remove
51948	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51949	11	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Epicormic sprouts	2	2	Remove
51950	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51951	12	10	Douglas-fir (*Pseudotsuga menziesii*)	Damaged by failed trees; High canopy	2	2	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
51957	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51961	12	9	Willow (*Salix sp.*)	Broken limbs; Codominant	1	2	Remove
51966	28	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51968	31	25	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
51969	16	19	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
51973	16	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51974	13	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51976	9	7	Douglas-fir (*Pseudotsuga menziesii*)	Mechanical damage; Seepage; Sparse canopy	2	2	Remove
51977	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51978	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51980	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51981	10	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
51982	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51983	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51985	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51986	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51988	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
51989	10	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
51990	11	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
51991	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
51994	8	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Damaged by failed trees	2	2	Remove
51996	8	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Sparse canopy	2	2	Remove
51998	8	10	Sweet Cherry (*Prunus avium*)		1	1	Remove
52001	53	26	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52002	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
52003	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52007	11	8	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
52009	10	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; 1-sided canopy (NW)	1	2	Remove
52010	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52012	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52015	9	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
52016	9	13	Douglas-fir (*Pseudotsuga menziesii*)	Very top broken	2	2	Remove
52017	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52019	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52020	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52023	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52024	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52026	10	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
52027	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52029	29	21	Oregon White Oak (*Quercus garryana*)	Codominant with included bark	1	2	Remove
52031	12	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52042	15	15	Sweet Cherry (*Prunus avium*)	Butt sweep	1	2	Remove
52043	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52045	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
52047	9	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
52049	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
52054	30	15	Douglas-fir (*Pseudotsuga menziesii*)	Failed Codominant stem; Very long cavity with significant decay	2	3	Remove
52057	13	13	Douglas-fir (*Pseudotsuga menziesii*)	Damaged by failed trees; 1-sided canopy (W)	2	2	Remove
52058	11	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
52062	11	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52063	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52066	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52067	11	10	Douglas-fir (*Pseudotsuga menziesii*)	Codominant	1	2	Remove
52068	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52069	12	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52073	14	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52074	14	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52078	8	8	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52079	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52081	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52082	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52088	11	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52091	8	8	Douglas-fir (*Pseudotsuga menziesii*)	Suppressed; Very sparse canopy	3	2	Remove
52092	8	8	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52093	10	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52096	12	11	Pacific Yew (*Taxus brevifolia*)	Lean (W); Some dead branches	2	2	Remove
52097	10	12	Sweet Cherry (*Prunus avium*)		1	1	Remove
52101	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove

Detailed Tree Inventory for Autumn Sunrise

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Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
52102	12	9	Sweet Cherry (*Prunus avium*)		1	1	Remove
52103	8	11	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; 1-sided canopy (W)	2	3	Remove
52106	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52109	28	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52110	30	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52111	28	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52113	25	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52114	30	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52116	29	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52122	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52123	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52125	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52127	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52128	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52129	9	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52130	11	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52131	9	9	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
52133	15,17,23	26	Bigleaf Maple (*Acer macrophyllum*)	Failed Codominant stem; Large cavity with decay; Splitting included bark; Broken top	2	3	Remove
52134	24	19	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
52137	9	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; 1-sided canopy (S)	2	3	Remove
52141	36	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52147	9	10	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
52150	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52152	30	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52155	10	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
52156	10	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
52157	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 30'	3	3	Remove
52158	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52159	13	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
52161	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52162	9	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
52166	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52167	8	10	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
52168	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52169	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52172	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52173	8	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
52174	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 30'	3	3	Remove
52175	29	21	Douglas-fir (*Pseudotsuga menziesii*)	Some broken branches	1	1	Remove
52182	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
52183	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52185	10	6	Douglas-fir (*Pseudotsuga menziesii*)	high canopy	1	2	Remove
52186	14	11	Douglas-fir (*Pseudotsuga menziesii*)	Epicormic sprouts; Some broken branches	2	1	Remove
52193	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52194	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52196	25	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52200	8,7,7,6	7	Willow (*Salix sp.*)	Broken tops on all stems	2	3	Remove
52201	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52204	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52205	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52207	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52208	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52211	13	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
52213	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52215	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52216	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52218	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52220	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
52221	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52223	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52224	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52225	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52226	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52228	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
52229	8	6	Douglas-fir (*Pseudotsuga menziesii*)	high canopy	1	2	Remove
52230	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52231	12	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52233	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

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Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
52234	9	6	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52237	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52238	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52241	8	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; 1-sided canopy (N)	2	3	Remove
52242	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
52244	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52246	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52248	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52251	24	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52252	18	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
52254	11	8	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52255	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52256	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52258	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
52261	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
52263	8	5	Douglas-fir (*Pseudotsuga menziesii*)	high canopy	1	2	Remove
52267	9	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52268	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52269	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52270	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
52273	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52274	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52275	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52276	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Damage at base with seepage	1	2	Remove
52277	10	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52279	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52281	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52282	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52286	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52287	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52288	12	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52289	8	8	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
52290	9	6	Douglas-fir (*Pseudotsuga menziesii*)	high canopy	1	2	Remove
52292	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
52293	10	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
52294	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52297	13	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (SE)	1	2	Remove
52298	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52300	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52302	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52304	11	0	Pacific Yew (*Taxus brevifolia*)	Dead	3	3	Remove
52306	25	22	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52309	9	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52310	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52312	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52313	14	12	Douglas-fir (*Pseudotsuga menziesii*)	Sweep	1	2	Remove
52318	29	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52320	8,22	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52322	10	10	Willow (*Salix sp.*)	Broken limbs; Codominant with included bark	1	2	Remove
52325	19	16	Douglas-fir (*Pseudotsuga menziesii*)	Sweep (N)	1	2	Remove
52331	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52333	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
52335	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52338	13	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52339	12	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52341	14	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52342	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52343	12	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52345	11	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52347	13	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52348	14	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52349	17	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52350	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52352	14	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52353	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52355	12	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52356	14	7	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
52357	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52358	12	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

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Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
52359	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52361	8	4	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52362	12,7	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52363	12	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52364	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52365	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52366	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52367	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52369	16	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52370	14	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52371	16	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52372	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52373	17	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52376	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52377	15	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52378	14	9	Douglas-fir (*Pseudotsuga menziesii*)	Sparse canopy; Dead branches	2	2	Remove
52379	16	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52380	15	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52381	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52382	15	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52383	12	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52385	15	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52386	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52387	21	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52388	9,10	7	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
52391	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
52392	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52393	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Deformed bole	1	2	Remove
52394	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52395	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52396	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52398	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52399	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52400	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52401	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52403	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52404	10,11	11	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
52405	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52406	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52407	11	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52409	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52410	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52411	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52412	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52414	15	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52415	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52416	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52417	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52419	15	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52420	17	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52421	11	7	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
52423	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52424	12	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52425	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52427	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52428	11	15	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole; Slight lean (W)	1	2	Remove
52430	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52433	11	7	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
52434	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52436	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52437	10	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
52439	16	9	Douglas-fir (*Pseudotsuga menziesii*)	Sweep	1	2	Remove
52441	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52443	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52445	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52447	10	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
52448	14	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52449	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52450	11	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
52452	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52453	15	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52454	9,9	7	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base with included bark	1	2	Remove
52456	14	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52457	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52458	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52459	16	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52461	10,11	16	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
52462	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52463	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52464	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52466	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52467	14	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52469	16	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52471	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52472	14	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52473	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52474	14	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52476	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52477	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52478	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52480	15	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52481	14	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52484	15	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52485	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52487	14	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52488	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52489	13	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52491	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52492	13	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52493	9,10	9	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
52494	15	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52495	14	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52496	15	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52499	15	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52500	12	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52501	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52502	13	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52503	15	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52504	15	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52507	12	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52508	15	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52510	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52511	12	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52514	30	24	Black Walnut (*Juglans nigra*)	Dead limbs; 1-sided canopy (W); Good wound wood closure	2	2	Remove
52516	12	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52517	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52520	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52521	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52522	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52523	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52524	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52525	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52526	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52527	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52529	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52530	15	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52531	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52532	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52535	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52536	11	9	Douglas-fir (*Pseudotsuga menziesii*)	Exposed buttress roots (S)	1	1	Remove
52537	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52538	14	23	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52540	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52541	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52542	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52544	14	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52545	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
52546	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52547	12	9	Douglas-fir (*Pseudotsuga menziesii*)	Exposed buttress roots (E)	1	1	Remove
52549	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52550	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52552	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52555	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52556	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52557	14	10	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
52559	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52561	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52562	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52564	12	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52565	12	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52567	23	20	Black Walnut (*Juglans nigra*)	Dead	3	3	Remove
52568	14	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52570	13	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52572	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52573	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52575	13	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52576	9,9	11	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base with included bark	1	2	Remove
52577	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52578	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52579	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52581	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52582	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52585	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52586	14	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52587	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52590	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52591	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52592	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52595	10	8	Douglas-fir (*Pseudotsuga menziesii*)	Mechanical damage; Seepage	2	1	Remove
52596	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52597	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52598	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52599	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52601	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52602	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52604	15	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52605	13	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52607	11	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52609	14	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52610	8	9	Douglas-fir (*Pseudotsuga menziesii*)	Mechanical damage; Seepage	2	1	Remove
52611	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52612	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
52613	13	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52614	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52616	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52617	15	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52619	11	13	Douglas-fir (*Pseudotsuga menziesii*)	Split bark with seepage	2	1	Remove
52622	15	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52624	14	10	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
52625	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52627	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52629	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52631	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52632	15	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52633	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52634	14	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52636	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52637	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52638	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52640	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52641	9	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52642	18	17	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top	1	2	Remove
52644	26	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52645	8	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W); Codominant top	1	2	Remove
52647	30	20	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52648	14	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
52649	16	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52650	24	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52652	20	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52653	18,6	16	Douglas-fir (*Pseudotsuga menziesii*)	Codominant	1	2	Remove
52654	25	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52656	25	19	Douglas-fir (*Pseudotsuga menziesii*)	Lean (S); Codominant stems; 1-sided canopy (S); Crooked bole	1	2	Remove
52657	22	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52658	16	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52659	16	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
52660	22	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52664	17	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52667	10	11	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Suppressed; Sparse canopy	2	2	Remove
52669	14	16	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; 1-sided canopy (E)	1	2	Remove
52670	13	10	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Sparse canopy	2	2	Remove
52671	10	15	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; 1-sided canopy (N)	1	2	Remove
52672	19	18	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; 1-sided canopy (S)	1	2	Remove
52675	9	14	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; 1-sided canopy (N)	1	2	Remove
52676	24	20	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S);	1	2	Remove
52677	10	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Sparse canopy; Branch dieback; Epicormic sprouts	3	2	Remove
52678	9	14	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Sparse canopy; 1-sided canopy (N)	2	2	Remove
52679	13	11	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Sparse canopy; 1-sided canopy (N)	2	2	Remove
52680	11	12	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Sparse canopy; 1-sided canopy (S)	2	2	Remove
52683	11	8	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Bulges; Epicormic sprouts; Dead branches	3	2	Remove
52684	11	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
52686	10	10	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
52687	20	19	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52688	17	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52690	10	8	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Bulges; Epicormic sprouts; Dead branches	3	2	Remove
52691	13	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52694	26	20	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52696	8	13	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Suppressed; Sparse canopy	2	2	Remove
52697	16	16	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; 1-sided canopy (N)	1	2	Remove
52698	34	21	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52700	11	20	Douglas-fir (*Pseudotsuga menziesii*)	Suppressed; crooked top; 1-sided canopy (W)	2	2	Remove
52701	8	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52704	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52706	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52707	15	10	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top with included bark	1	2	Remove
52708	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52709	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52711	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52712	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52713	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52714	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52715	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52717	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52718	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52719	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52720	14	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52721	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52724	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52725	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52727	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52728	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52729	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52731	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52733	13	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52735	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52737	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52738	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52740	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52741	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52742	9	9	Douglas-fir (*Pseudotsuga menziesii*)	Mechanical damage; Seepage; broken branches	2	2	Remove
52744	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52745	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52746	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52748	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
52749	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52750	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52752	9	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52753	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52754	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52755	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52758	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52759	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52762	11	9	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
52763	12	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52764	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52765	12	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52767	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52768	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52769	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52770	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52771	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52772	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52774	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52777	19	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52780	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52781	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52783	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52785	15	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52788	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52789	10	8	Douglas-fir (*Pseudotsuga menziesii*)	Mechanical damage with seepage at base	1	2	Remove
52816	17	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52817	23	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52819	23	22	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52820	21	20	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Preserve
52821	26	23	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
52822	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Preserve
52827	12	11	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Preserve
52828	38	30	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
52830	30	25	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52831	59	25	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
52832	23	25	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
52833	20	25	Douglas-fir (*Pseudotsuga menziesii*)	Deformed bole; Weakly attached scaffold branches; Broken codominant stems; 1-sided canopy (W)	2	3	Remove
52835	20	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52836	21	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52837	19	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52838	23	17	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
52839	20	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52840	20	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52841	19	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52844	14	9	Douglas-fir (*Pseudotsuga menziesii*)	Butt sweep	1	2	Remove
52845	24	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52848	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	3	2	Preserve
52849	9	8	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
52850	14	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Preserve
52851	14	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Preserve
52854	9	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Preserve
52855	10	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Preserve
52856	11	10	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
52861	10	11	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
52862	12	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Preserve
52863	14	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Preserve
52864	14	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
52867	13	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
52868	13	10	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
52872	36	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52873	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
52874	24	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52876	24	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52877	21	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
52878	20	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
52879	21	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
52881	24	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

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Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
52882	13	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52883	16	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52884	17	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52887	32	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52890	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
52893	15	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
52895	11	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Preserve
52896	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
52897	11	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
52898	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
52900	8	10	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
52904	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52910	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52921	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52922	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Codominant stem with included bark	1	2	Remove
52925	9	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52926	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52927	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52928	8	4	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52930	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52932	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52933	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52935	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52937	8	4	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52938	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52939	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52941	11	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52942	9	7	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top with included bark	1	2	Remove
52943	10	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52944	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52945	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52946	10	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52947	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52949	11	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52950	11	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52952	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52953	10	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52955	8	4	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52956	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52957	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
52958	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52959	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52960	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52962	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52963	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52967	13	11	Douglas-fir (*Pseudotsuga menziesii*)	Mechanical damage with seepage	2	1	Remove
52968	10	7	Douglas-fir (*Pseudotsuga menziesii*)	Mechanical damage with seepage; Several impacts up bole	2	2	Remove
52972	23	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52973	8	8	Douglas-fir (*Pseudotsuga menziesii*)	Several small cavities with seepage	2	1	Remove
52978	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Sparse canopy	2	2	Remove
52979	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52980	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52981	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52982	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52984	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52985	12	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52986	12	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52989	14	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52992	13	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52993	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52994	14	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52996	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52997	15	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
52998	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53000	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53001	14	7	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
53002	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53003	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53005	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

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Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
53006	15	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53008	14	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53009	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53011	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53012	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53013	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53014	10	6	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
53015	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53016	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53018	14	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53019	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53020	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53022	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53023	8	4	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole; Suppressed	2	2	Remove
53024	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53025	10	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53026	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53027	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53028	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53030	13	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53032	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53035	8	3	Douglas-fir (*Pseudotsuga menziesii*)	Suppressed	2	2	Remove
53036	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53037	15	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53039	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Suppressed; Codominant with included bark	2	2	Remove
53040	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53041	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53042	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53043	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53045	15	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53046	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53048	16	12	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
53050	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53051	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53052	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53053	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53054	13	9	Douglas-fir (*Pseudotsuga menziesii*)	Mechanical damage with seepage	2	1	Remove
53056	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53057	14	10	Douglas-fir (*Pseudotsuga menziesii*)	Mechanical damage with seepage	2	1	Remove
53059	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
53061	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53062	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53063	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53064	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53065	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53066	12	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53067	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53068	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53070	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53071	9	9	Douglas-fir (*Pseudotsuga menziesii*)	Mechanical damage with seepage	2	1	Remove
53072	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53073	12	10	Douglas-fir (*Pseudotsuga menziesii*)	Mechanical damage with seepage	2	1	Remove
53075	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
53076	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53077	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53078	13	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53080	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53081	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53082	15	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53083	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53084	8	0	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53085	29	18	Black Walnut (*Juglans nigra*)	Dead limbs; Several cavities at base	2	2	Remove
53086	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53088	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53089	9	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
53090	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53092	10	11	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
53095	8	12	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
53096	8	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove

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53098	10	11	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
53099	12	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
53100	13	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
53102	10	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
53103	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
53104	8	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Sparse canopy	2	2	Preserve
53110	14	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53112	14	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53115	14	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53116	10	7	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
53118	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53119	9	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53120	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53122	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53123	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53124	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53125	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53127	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53128	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53129	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53131	14	15	Douglas-fir (*Pseudotsuga menziesii*)		1	2	Remove
53134	12	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53135	15	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53137	16	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53139	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53140	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53141	13	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53142	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53144	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53146	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53148	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53149	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53151	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53152	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53153	10	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53154	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53156	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53157	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53159	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53160	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53161	10,11	11	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
53164	14	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53166	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53168	16	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53171	15	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53173	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53174	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53175	15	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53176	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53178	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53179	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53181	13	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53183	15	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
53185	15	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
53187	13	12	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
53188	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53189	14	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53190	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53191	14	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53192	15	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53193	12	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53194	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53195	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53196	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53197	9,10	8	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
53199	14	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53200	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53203	14	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53204	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
53205	14	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
53206	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53207	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53210	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53211	14	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53212	15	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53213	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53215	13	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53216	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53217	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53218	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53219	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53220	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53222	16	13	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole; 1-sided canopy (NW)	1	2	Remove
53223	10	6	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top	1	2	Remove
53224	9,10	6	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
53225	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53226	17	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53227	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top	1	2	Remove
53228	15	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53231	18	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53232	21	18	Douglas-fir (*Pseudotsuga menziesii*)	Some broken branches	1	1	Remove
53234	15	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
53235	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53236	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53237	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53238	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53240	17	17	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
53241	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53276	48	30	Douglas-fir (*Pseudotsuga menziesii*)	Codominant with included bark	1	2	Remove
53277	34	25	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top with included bark	1	2	Remove
53280	8	13	Sweet Cherry (*Prunus avium*)		1	1	Preserve
53281	13	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
53285	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
53286	9	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
53290	12	10	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
53292	9	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
53293	10	10	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
53295	8	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
53296	10	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
53297	9	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
53298	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53302	47	25	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
53304	22	21	Douglas-fir (*Pseudotsuga menziesii*)	Lean (W); 1-sided canopy (W)	1	2	Remove
53306	34	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53314	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53315	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
53317	8	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
53318	44	23	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53321	9	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
53322	9	8	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
53323	10	8	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
53324	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
53326	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
53327	10	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
53329	11	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
53330	9	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Preserve
53333	10	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
53337	34	26	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53338	9	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
53339	12	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
53341	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53344	14	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53345	8	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
53346	10	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
53348	8	9	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
53350	12	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
53351	8	10	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Sparse canopy	2	2	Remove
53356	8	10	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
53359	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
53361	8	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Sparse canopy	2	2	Preserve
53363	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
53364	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
53366	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
53371	33	25	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
53374	43	24	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53381	13	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
53382	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53385	15	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53386	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53389	14	13	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
53390	14	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53391	14	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53392	9	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
53396	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53399	23	18	Bigleaf Maple (*Acer macrophyllum*)	Dead tree with many epicormic stems	3	3	Remove
53414	38	21	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
53415	34	21	Douglas-fir (*Pseudotsuga menziesii*)	Slight lean (E); 1-sided canopy (E); Over extended limbs; Broken branches with decay	2	2	Remove
53439	21	19	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top	1	2	Remove
53556	22	17	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53663	7	11	Pacific Madrone (*Arbutus menziesii*)	**OFFSITE**	1	1	Preserve
53724	14	8	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top	1	2	Remove
53737	11	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
53738	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53739	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53740	13	12	Douglas-fir (*Pseudotsuga menziesii*)	Bulges at base	2	1	Remove
53741	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53742	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53744	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53745	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
53746	14	10	Douglas-fir (*Pseudotsuga menziesii*)	Medium size cavity with decay	2	2	Remove
53747	8	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
53749	13	8	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top	1	2	Remove
53750	14	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53751	12	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
53753	14	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53755	9	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
53756	11	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
53759	10	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53760	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53762	16	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53765	12	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
53770	10	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
53771	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53773	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53777	27,25	22	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base	1	2	Remove
53781	23	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53782	17	18	Douglas-fir (*Pseudotsuga menziesii*)	Butt sweep; 1-sided canopy (N)	1	2	Remove
53786	35	20	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base with included bark	1	2	Remove
53787	22	21	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
53788	22	22	Douglas-fir (*Pseudotsuga menziesii*)	Deformed bole; Many weakly attached limbs; Some failed limbs	2	2	Remove
53793	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53798	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53802	12	16	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
53803	9	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
53809	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53810	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
53812	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53813	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53814	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53817	29,30	18	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base	1	2	Remove
53821	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53822	10	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	1	Remove
53823	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53826	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53827	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53828	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
53829	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53830	11	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
53832	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53835	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53836	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53840	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53846	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
53847	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53848	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53859	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; broken at 30'	3	3	Remove
53862	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
53864	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
53865	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 40'	3	3	Remove
53870	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
53891	11	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
60000	29	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60007	14	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
60008	16	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
60009	18	11	Douglas-fir (*Pseudotsuga menziesii*)	Sweep	1	2	Remove
60011	24	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60012	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60013	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60014	22	22	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W); Deformed bole; Bore holes; Broken limbs	2	2	Remove
60015	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60016	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60017	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60018	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60020	10	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60021	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60022	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60023	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60024	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60025	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
60026	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60027	15	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60028	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60029	9	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60030	14	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60031	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60032	14	14	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
60033	14	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
60034	12	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60035	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60037	9	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60038	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60039	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60040	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60041	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60042	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60043	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60044	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60045	8,8	7	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base with included bark	1	2	Remove
60046	10	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60047	14	8	Douglas-fir (*Pseudotsuga menziesii*)	Deformed bole	1	2	Remove
60048	16	18	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
60049	12	12	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top	1	2	Remove
60050	8	10	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60051	9	9	Douglas-fir (*Pseudotsuga menziesii*)	Mechanical damage with seepage	2	1	Remove
60052	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60053	12	12	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60054	8	8	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole; High canopy; 1-sided canopy (E)	1	2	Remove
60055	13	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60075	50	25	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60077	19	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line	1	1	Remove
60085	11	8	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
60086	9	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60088	10	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
60089	13	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
60090	12,7	0	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base; Dead and broken top	2	3	Remove
60091	17	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60092	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
60093	14	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60094	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60095	10	6	Douglas-fir (*Pseudotsuga menziesii*)	Very top broken	2	2	Remove
60096	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60097	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60098	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60099	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60100	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60101	13	10	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60102	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60103	13,10	8	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base with included bark	1	2	Remove
60104	12	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
60105	14	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60106	12	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60107	14	10	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top	1	2	Remove
60108	18	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60109	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
60110	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60111	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60112	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60113	11	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60114	10	11	Cherry (*Prunus sp.*)	Codominant with included bark	1	2	Remove
60115	14	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60116	10	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60118	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60119	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60120	18	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60121	11	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
60122	35	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60123	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60124	14	13	Douglas-fir (*Pseudotsuga menziesii*)	Sweep	1	2	Remove
60125	18	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60126	10	11	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; 1-sided canopy (N)	1	2	Remove
60127	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60128	19	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60129	14	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60131	9	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60132	13	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 30'	3	3	Remove
60133	8	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60134	11	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60135	9	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60136	11	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
60137	8	12	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
60139	8	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W); High canopy	1	2	Remove
60140	34	12	Douglas-fir (*Pseudotsuga menziesii*)	**LINE TREE**; Evaluated from property line; Dead limbs; Epicormic sprouts	2	1	Remove
60145	20	15	Douglas-fir (*Pseudotsuga menziesii*)	Broken top with 2 large leaders	2	3	Remove
60146	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60147	18	15	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole; Codominant top	1	2	Remove
60148	8	5	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
60149	19	17	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
60150	12,7	15	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
60151	8	5	Douglas-fir (*Pseudotsuga menziesii*)	Sweep; High canopy	1	2	Remove
60153	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60154	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
60155	11	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60156	17	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60157	8	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
60159	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60160	9	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60161	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60162	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60163	15	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60164	10,11	6	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base with included bark	1	2	Remove
60165	8	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; Suppressed	2	2	Remove
60166	16	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
60167	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60168	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60169	15	17	Douglas-fir (*Pseudotsuga menziesii*)	Broken branches; 1-sided canopy (W)	1	2	Remove
60170	10,7	7	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base	1	2	Remove
60171	9	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60172	9	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60173	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60174	15	13	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60175	12	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60176	10	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60178	10	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60179	10	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60180	12	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60181	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60182	13	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60183	13	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60184	15	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60185	12	8	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
60186	15	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60187	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60188	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60189	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60190	9	3	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60191	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60192	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60193	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60195	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60196	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60197	8	9	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
60198	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60200	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60201	14	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60203	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60204	15	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60206	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60207	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60209	10	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60212	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60214	10	14	Pacific Yew (*Taxus brevifolia*)	Dead branches; Sparse canopy; 1-sided canopy (N)	2	2	Remove
60215	8	0	Pacific Yew (*Taxus brevifolia*)	Dead; Broken at 30'	3	3	Remove
60216	43	18	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60218	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60220	40	15	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated behind fence	1	1	Remove
60223	36	20	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated behind fence	1	1	Remove
60229	19	16	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60230	21	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60231	22	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60232	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60233	8	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
60234	12	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60235	20	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60236	23	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60237	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60238	13	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60239	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60240	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60241	14	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60242	13	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60243	14	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
60244	13	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
60245	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65000	19	19	Bigleaf Maple (*Acer macrophyllum*)	Broken stems; 75% ivy coverage; Sparse canopy	2	2	Remove
65001	15	7	Bigleaf Maple (*Acer macrophyllum*)	100% ivy coverage; Sparse canopy; High canopy	2	2	Remove
65002	23	17	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
65003	15	20	Bigleaf Maple (*Acer macrophyllum*)	Lean (W); 1-sided canopy (W)	1	2	Remove
65005	22	14	Douglas-fir (*Pseudotsuga menziesii*)	Deformed bole	1	2	Remove
65007	19,18	19	Bigleaf Maple (*Acer macrophyllum*)	Codominant base with included bark	1	2	Remove
65008	23	14	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65009	14	23	Pacific Madrone (*Arbutus menziesii*)	Lean (W); Dead limbs	2	2	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
65010	21	0	Bigleaf Maple (*Acer macrophyllum*)	Dead; Broken at 20'	3	3	Remove
65011	24	19	Bigleaf Maple (*Acer macrophyllum*)	Broken Codominant stem; 1-sided canopy (N)	2	2	Remove
65012	13,18	20	Bigleaf Maple (*Acer macrophyllum*)	Broken stems; Lean (W); 1-sided canopy (W)	1	2	Remove
65014	13	4	Douglas-fir (*Pseudotsuga menziesii*)	Epicormic sprouts; Very sparse canopy	3	2	Remove
65015	8	0	Bigleaf Maple (*Acer macrophyllum*)	Dead	3	3	Remove
65016	12	12	Bigleaf Maple (*Acer macrophyllum*)	High canopy; Sparse canopy	2	2	Remove
65018	22	18	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
65023	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65024	9	8	Douglas-fir (*Pseudotsuga menziesii*)	Lean (W); Uprooting	2	3	Remove
65025	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65028	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65030	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65031	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65032	8	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65033	13	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65036	11	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65037	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65038	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65044	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65045	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65046	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65047	10	8	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
65048	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65049	11	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65050	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65051	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65052	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65053	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65054	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65055	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65056	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65057	13	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65058	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65059	10	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
65060	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65061	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65062	10	4	Douglas-fir (*Pseudotsuga menziesii*)	Broken top	2	3	Remove
65063	10	7	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
65064	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
65065	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65066	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65067	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65068	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65069	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65070	12	5	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
65071	12	15	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65072	12	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65073	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65074	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65076	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65077	12	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
65078	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65079	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65080	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65082	21	20	Bigleaf Maple (*Acer macrophyllum*)	1-sided canopy (N)	1	2	Remove
65083	16,24	25	Bigleaf Maple (*Acer macrophyllum*)	1-sided canopy (S)	1	2	Remove
65088	42	26	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65089	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
65091	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
65094	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
65096	8	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65098	8	7	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
65099	8	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65103	8	8	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
65105	9	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65106	9	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65107	11	11	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
65108	12	10	Douglas-fir (*Pseudotsuga menziesii*)	Crooked top; 1-sided canopy (S)	1	2	Preserve
65110	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
65111	27	21	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65112	8	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Preserve
65113	51	35	Bigleaf Maple (*Acer macrophyllum*)	Broken codominant stem at base leaving cavity with decay; Broken scaffold branches	2	2	Remove
65115	33	23	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
65118	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65119	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65120	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65121	10	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
65123	8	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
65124	8	8	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
65125	8	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65126	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
65128	10	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
65129	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65131	8	6	Douglas-fir (*Pseudotsuga menziesii*)	High canopy; 1-sided canopy (W)	1	2	Remove
65133	9	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65140	11	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
65141	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65142	11	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
65143	10	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
65144	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65145	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65146	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65147	10	6	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top	1	2	Remove
65148	9	8	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (E)	1	2	Remove
65149	11	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65150	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65151	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65153	14	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65156	13	12	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65157	14	12	Douglas-fir (*Pseudotsuga menziesii*)	Codominant top with included bark; Crooked bole	1	2	Remove
65160	52	27	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
65163	8	7	Sweet Cherry (*Prunus avium*)	Crooked bole	1	2	Remove
65165	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65169	10	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (S)	1	2	Remove
65173	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65177	9	6	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
65178	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65183	10,15	12	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base	1	2	Remove
65184	10	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65185	15	26	Bigleaf Maple (*Acer macrophyllum*)	Failed limbs; 1-sided canopy (N)	1	2	Remove
65187	26	23	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65189	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65193	40	21	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65195	10	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65196	14	7	Douglas-fir (*Pseudotsuga menziesii*)	Crooked top	1	2	Remove
65197	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65198	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65201	44	24	Douglas-fir (*Pseudotsuga menziesii*)	Broken limbs; 1-sided canopy (S)	1	2	Remove
65202	30	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65203	31	16	Douglas-fir (*Pseudotsuga menziesii*)	Lean (S); Deformed bole	1	2	Remove
65204	32	12	Douglas-fir (*Pseudotsuga menziesii*)	Deformed bole; Codominant stem failed	2	2	Remove
65206	9	6	Douglas-fir (*Pseudotsuga menziesii*)	Tree fallen on top; Uprooting (W)	1	3	Remove
65208	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65210	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65216	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65218	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65219	8	5	Douglas-fir (*Pseudotsuga menziesii*)	high canopy	1	2	Remove
65220	9	7	Douglas-fir (*Pseudotsuga menziesii*)	Cavity with seepage	2	1	Remove
65227	9	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65228	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65230	10	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65231	9	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
65233	9	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65234	10	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead	3	3	Remove
65235	9	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
65236	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65242	8	5	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove

Detailed Tree Inventory for Autumn Sunrise

AKS Job No. 7454 - Evaluation Date: 2/1/2021 - 4/12/2021 - Evaluated by: BRK

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (*Scientific name*)	Comments	Health Rating*	Structure Rating**	Remove/Preserve
65244	11	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
65246	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
65247	8	4	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
65249	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65250	8,9	6	Douglas-fir (*Pseudotsuga menziesii*)	Codominant base with included bark	1	2	Remove
65253	29	25	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65254	14,23	20	Bigleaf Maple (*Acer macrophyllum*)	Codominant base with included bark	1	2	Remove
65257	11	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65258	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65259	9	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65260	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
65262	13	11	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
65263	9	10	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
65264	8	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
70000	8	10	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
70001	13	10	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
70002	13	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Preserve
70003	10	12	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Preserve
112633	7	9	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree	1	1	Preserve
112696	7	9	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree	1	1	Preserve
112721	7	9	Cherry (*Prunus sp.*)	**OFFSITE**; Street Tree	1	1	Preserve
120000	9	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120001	8	6	Douglas-fir (*Pseudotsuga menziesii*)	Broken top; Sparse canopy	2	3	Remove
120002	9	0	Douglas-fir (*Pseudotsuga menziesii*)	Dead; Broken at 30'	3	3	Remove
120003	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120004	10	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120005	8	7	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (N)	1	2	Remove
120006	16	13	Douglas-fir (*Pseudotsuga menziesii*)	Crooked; 1-sided canopy (W)	1	2	Remove
120007	12	10	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120008	8	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120009	10	11	Cherry (*Prunus sp.*)	Codominant with included bark; Exposed roots all around	1	2	Remove
120010	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120011	35	25	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120012	8,8,8,8,9,9	16	Willow (*Salix sp.*)	Broken branches; Clustered base	1	2	Remove
120013	31	20	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120014	28	25	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120015	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120016	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120017	11	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120018	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120019	12	8	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120020	12,8,8,8,7	10	Willow (*Salix sp.*)	Broken tops; Dead limbs; Broken limbs	2	2	Remove
120021	8	5	Douglas-fir (*Pseudotsuga menziesii*)	High canopy	1	2	Remove
120022	9	6	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120023	11	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120024	12	9	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120025	15	11	Douglas-fir (*Pseudotsuga menziesii*)	Sweep	1	2	Remove
120026	18	19	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120027	10	9	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
120028	10	7	Douglas-fir (*Pseudotsuga menziesii*)		1	1	Remove
120029	13	8	Douglas-fir (*Pseudotsuga menziesii*)	Crooked bole	1	2	Remove
120030	8	6	Douglas-fir (*Pseudotsuga menziesii*)	1-sided canopy (W)	1	2	Remove
120031	18	0	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead broken at 50'	3	3	Remove
120032	18	0	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead broken at 50'	3	3	Remove
120033	12	0	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**; Evaluated from property line; Dead broken at 20'	3	3	Remove
120036	35	20	Bigleaf Maple (*Acer macrophyllum*)		1	1	Remove
120037	8	8	Staghorn Sumac (*Rhus typhina*)	**OFFSITE**; Recently failed codominant stem leaving large cavity; Exposed roots (S)	1	2	Remove
120038	8	9	Douglas-fir (*Pseudotsuga menziesii*)	**OFFSITE**	1	1	Preserve

Total # of Existing Trees Inventoried = 3388

Total # of Existing Onsite Trees = 3141
Total # of Existing Onsite Trees to be Preserved = 77
Total # of Existing Onsite Trees to be Removed = 3064

Total # of Existing Line Trees = 18
Total # of Existing Line Trees to be Preserved = 0
Total # of Existing Line Trees to be Removed = 18

Total # of Existing Offsite Trees = 229
Total # of Existing Offsite Trees to be Preserved = 124
Total # of Existing Offsite Trees to be Removed = 105

***Health Rating:**

1 = Good Health - A tree that exhibits typical foliage, bark, and root characteristics, for its respective species, shows no signs of infection or infestation, and has a high level of vigor and vitality.

2 = Fair Health - A tree that exhibits some abnormal health characteristics and/or shows some signs of infection or infestation, but may be reversed or abated with supplemental treatment.

3 = Poor Health - A tree that is in significant decline, to the extent that supplemental treatment would not likely result in reversing or abating its decline.

****Structure Rating:**

1 = Good Structure - A tree that exhibits typical physical form characteristics, for its respective species, shows no signs of structural defects of the canopy, trunk, and/or root system.

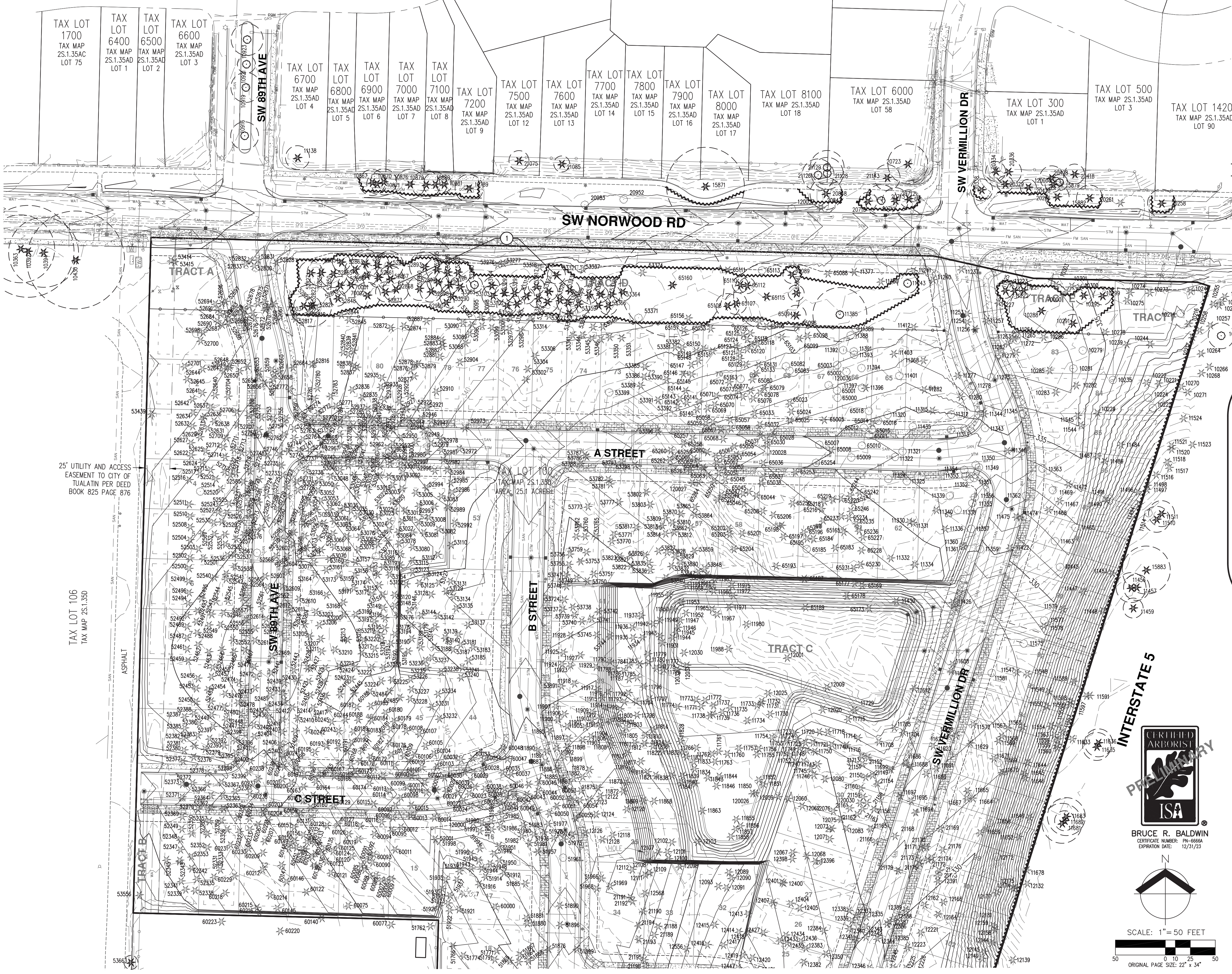
2 = Fair Structure - A tree that exhibits some abnormal physical form characteristics and/or some signs of structural defects, which reduce the structural integrity of the tree, but are not indicative of imminent physical failure, and may be corrected using arboricultural abatement methods.

3 = Poor Structure - A tree that exhibits extensively abnormal physical form characteristics and/or significant structural defects that substantially reduces the structural viability of the tree, cannot feasibly be abated, and are indicative of imminent physical failure.

Arborist Disclosure Statement:

Arborists are tree specialists who use their education, knowledge, training, and experience to examine trees, recommend measures to enhance the health of trees, and attempt to reduce the risk of living near trees. The Client and Jurisdiction may choose to accept or disregard the recommendations of the arborist, or seek additional advice. Arborists cannot detect every condition that could possibly lead to the structural failure of a tree. Trees are living organisms that fail in ways we do not fully understand. Conditions are often hidden within trees and below ground. Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time. Likewise, remedial treatments, like medicine, cannot be guaranteed. Trees can be managed, but they cannot be controlled. To live near trees is to accept some degree of risk. The only way to eliminate all risk associated with trees is to eliminate all trees. Neither this author nor AKS Engineering & Forestry, LLC have assumed any responsibility for liability associated with the trees on or adjacent to this site.

At the completion of construction, all trees should once again be reviewed. Land clearing and removal of adjacent trees can expose previously unseen defects and otherwise healthy trees can be damaged during construction.



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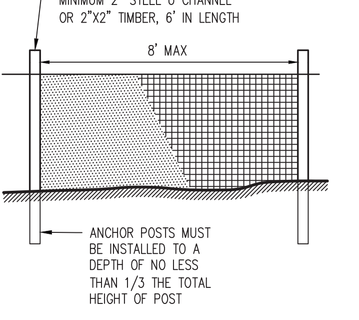
BRUCE R. BALDWIN
CERTIFICATE NUMBER: PN-6666A
EXPIRATION DATE: 12/31/23



NOTES:
1. CHAIN LINK FENCE FOR TREE PROTECTION DEVICE OR APPROVED EQUAL.
2. AVOID DAMAGE TO CRITICAL ROOT ZONE. DO NOT DAMAGE OR SEVER LARGE ROOTS WHEN INSTALLING POSTS.
3. DEVICE SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION.

TREE PROTECTION / CONSTRUCTION FENCE

TREE PROTECTION KEYED NOTES:

① TREES IN THIS AREA HAVE BEEN PRESERVED IN A CLUMPED CONFIGURATION TO REDUCE POTENTIAL WINDTHROW. CONTACT PROJECT ARBORIST IF SIGNS OF WINDTHROW IMPACTS ARE OBSERVED.

LEGEND

EXISTING GROUND CONTOUR (1 FT)	— — 149 — —
EXISTING GROUND CONTOUR (5 FT)	— — 150 — —
FINISHED GRADE CONTOUR (1 FT)	—— 149 ——
FINISHED GRADE CONTOUR (5 FT)	—— 150 ——
EXISTING CONIFEROUS TREE	✳
EXISTING DECIDUOUS TREE	⊙
TREE REMOVAL	⊙ ✳
TREE PROTECTION/CONSTRUCTION FENCE (TREE PROTECTION AREA)	〰〰〰
ASSUMED TREE ROOT ZONE (1-FT RADIUS PER 1-IN OF DBH)	◌

NOTE:

1. REFER TO THE "AUTUMN SUNRISE PRELIMINARY TREE ASSESSMENT REPORT" FOR ADDITIONAL TREE RELATED INFORMATION.
2. OWNER SHALL COORDINATE WITH ADJACENT PROPERTY OWNERS FOR PERMISSION AND REMOVAL OF LINE/OFFSITE TREES.
3. ARBORIST OBSERVATION REQUIRED FOR TREE REMOVAL BEHIND TREE PROTECTION FENCE

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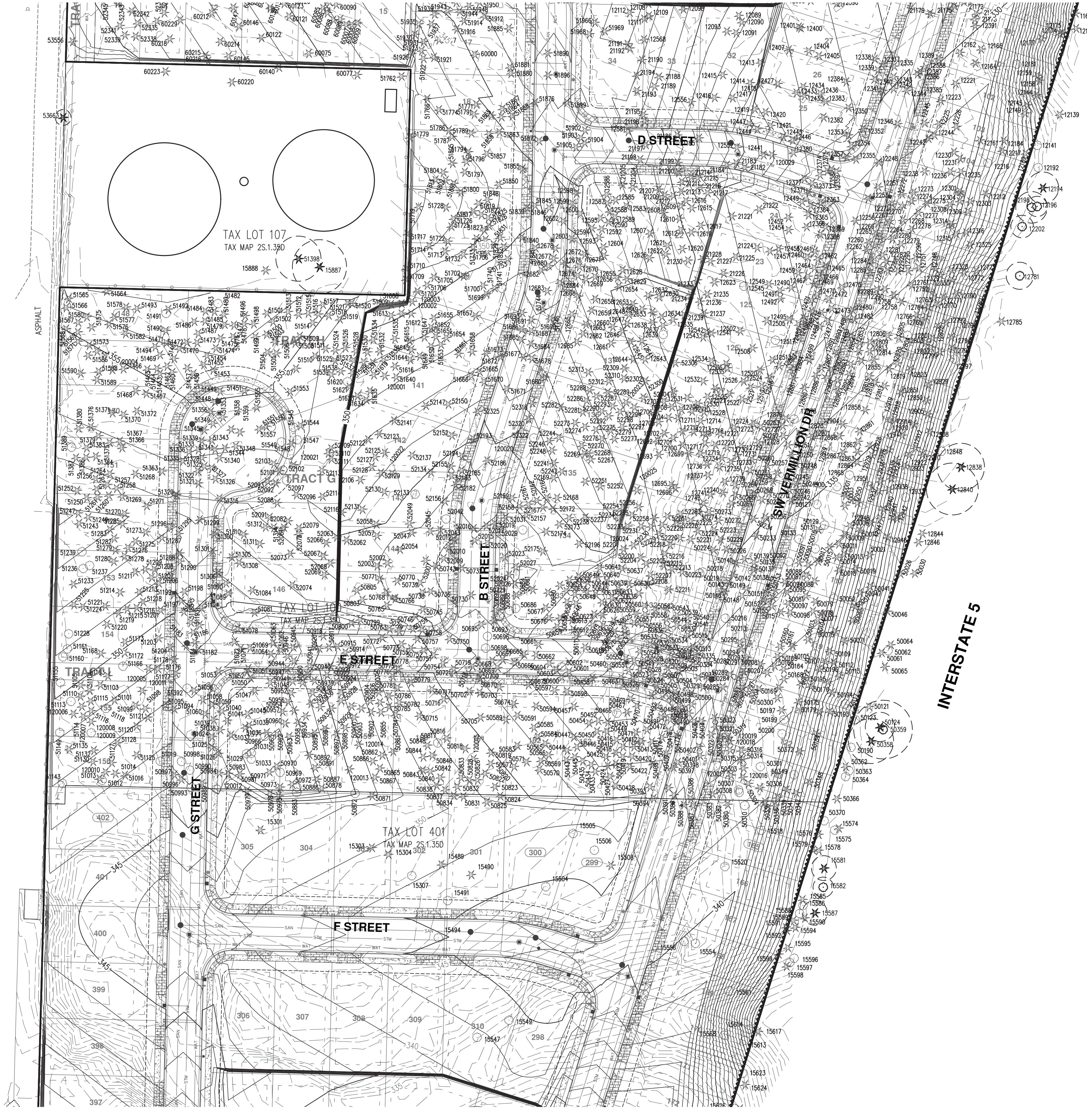
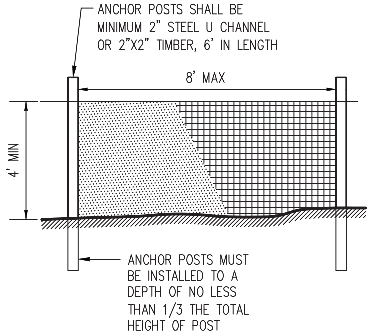
JOB NUMBER:	7454
DATE:	7/1/2021
DESIGNED BY:	JSM
DRAWN BY:	JSM
CHECKED BY:	DS

TP-01

AKS DRAWING FILE: 7454 TREE.DWG | LAYOUT: TP-01





NOTES:
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2. AVOID DAMAGE TO CRITICAL ROOT ZONE. DO NOT DAMAGE OR SEVER LARGE ROOTS WHEN INSTALLING POSTS.
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TREE PROTECTION / CONSTRUCTION FENCE

LEGEND

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EXISTING GROUND CONTOUR (5 FT)	— — 150 — —
FINISHED GRADE CONTOUR (1 FT)	—— 149 ——
FINISHED GRADE CONTOUR (5 FT)	—— 150 ——
EXISTING CONIFEROUS TREE	✳
EXISTING DECIDUOUS TREE	⊙
TREE REMOVAL	○ ✳
TREE PROTECTION/CONSTRUCTION FENCE (TREE PROTECTION AREA)	〰
ASSUMED TREE ROOT ZONE (1-FT RADIUS PER 1-IN OF DBH)	◌

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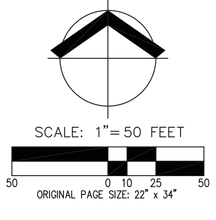

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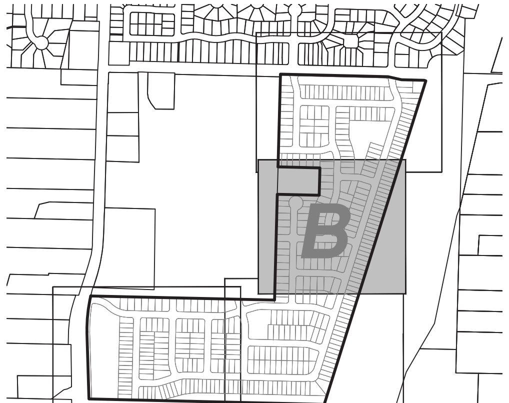

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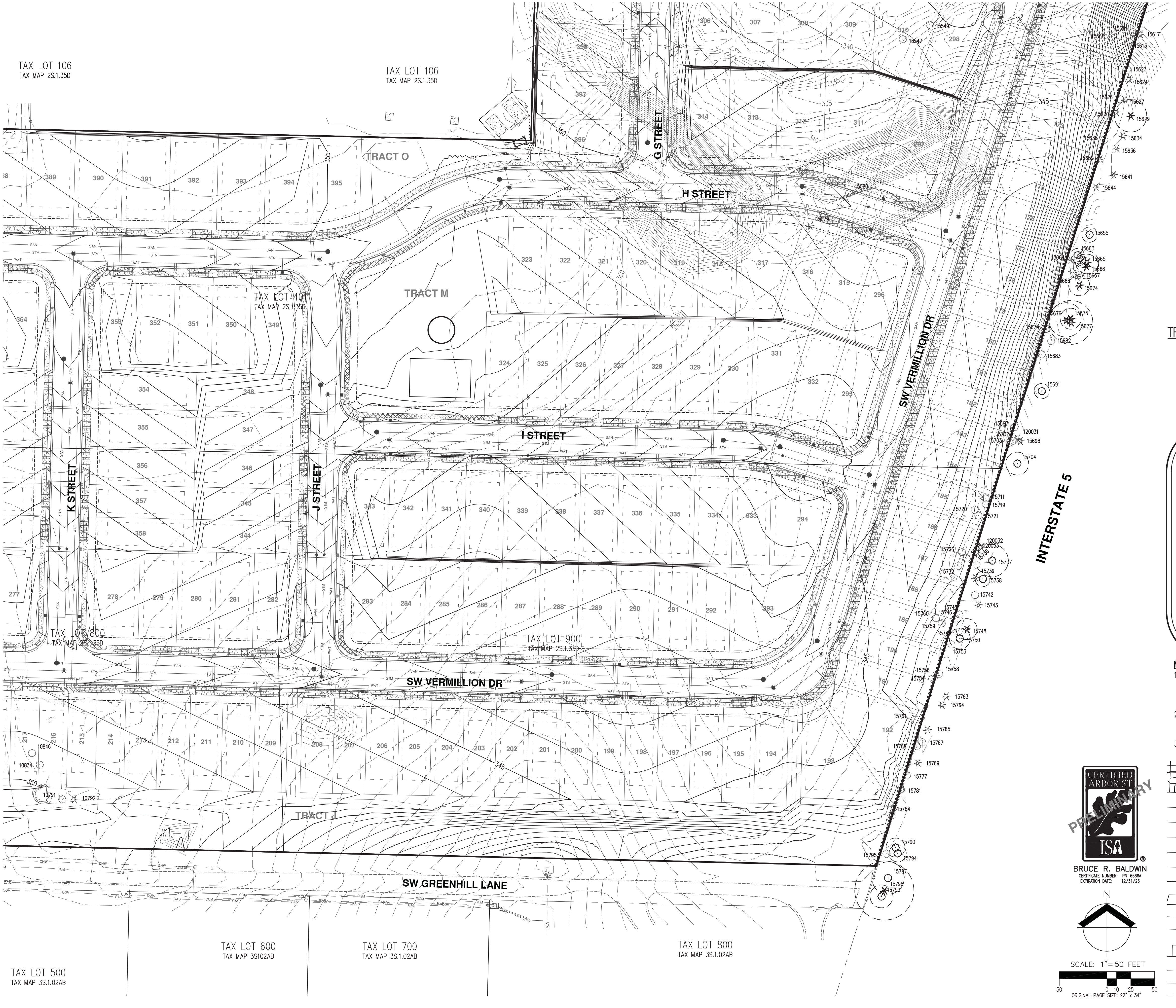

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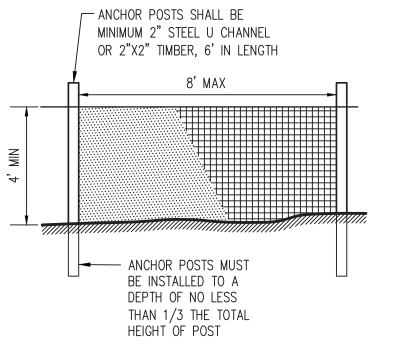

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TREE PROTECTION / CONSTRUCTION FENCE

LEGEND

EXISTING GROUND CONTOUR (1 FT)	149
EXISTING GROUND CONTOUR (5 FT)	150
FINISHED GRADE CONTOUR (1 FT)	149
FINISHED GRADE CONTOUR (5 FT)	150
EXISTING CONIFEROUS TREE	✳
EXISTING DECIDUOUS TREE	⊙
TREE REMOVAL	○ ✳
TREE PROTECTION/CONSTRUCTION FENCE (TREE PROTECTION AREA)	〰
ASSUMED TREE ROOT ZONE (1-FT RADIUS PER 1-IN OF DBH)	◌

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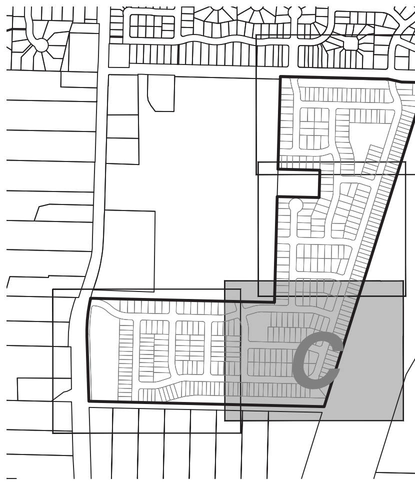

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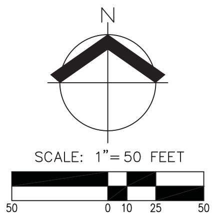

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TREE PROTECTION/CONSTRUCTION FENCE (TREE PROTECTION AREA)	〰〰〰
ASSUMED TREE ROOT ZONE (1-FT RADIUS PER 1-IN OF DBH)	◌

NOTE:

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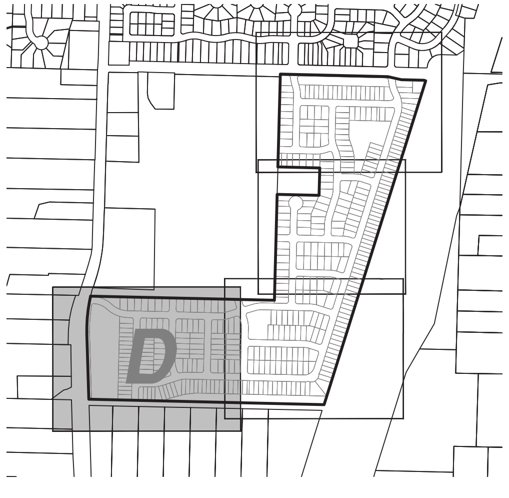

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CHECKED BY:	DS

TP-04

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lancaster
mobley

Autumn Sunrise Subdivision

Transportation Impact Analysis

Tualatin, Oregon

Date:
September 20, 2021a

Prepared for:
David Force, Lennar Northwest

Copy:
Mimi Doukas, AKS Engineering & Forestry, LLC

Prepared by:
Nick Mesler, EIT
Jennifer Danziger, PE

REGISTERED PROFESSIONAL
ENGINEER
16168
Jennifer E. Danziger
OREGON
SEPT. 15, 1992
JENNIFER ELISE DANZIGER

RENEWS: 12 · 31 · 21

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Executive Summary

1. The proposed Autumn Sunrise Subdivision includes the development of 400 residential lots on a site located south of SW Norwood Road, west of Interstate 5, north of SW Greenhill Lane, and east of SW Boones Ferry Road in Tualatin, Oregon. Although the site also includes two lots zoned for neighborhood commercial use, this report does not incorporate the impacts of the future commercial development on those lots. In coordination with agency staff, a separate land use application and traffic study will be prepared at the time that development of those lots is proposed.
2. The site will initially take all access from SW Norwood Road but includes a connection to SW Boones Ferry Road will be added with later phases.
3. The project site (Tax Lots 2S135D 100, 400, 401, 500, 501, 600, 800, & 900) is approximately 61.99 acres and is zoned medium low density residential. The surrounding land uses are compatible to the proposed project, consisting of predominately residential neighborhoods and schools that serve the residents.
4. The proposed development is estimated to generate 271 morning peak hour, 358 evening peak hour, and 3,596 daily trips.
5. Based on a review of the most recent five years of available crash data, no significant trends or crash patterns were identified at any of the study intersections. Accordingly, no safety mitigation is recommended per the crash data analysis.
6. At the proposed site access on SW Boones Ferry Road, field observations show that at least 500 feet is available looking in either direction as measured from the edge of the closest vehicular travel lane.
7. At the proposed site accesses on SW Norwood Road, dense foliage restricts existing sight lines; however, preliminary assessment or horizontal and vertical curvature indicate that the 500-foot sight distance requirement is expected to be satisfied.
8. On SW Boones Ferry Road, the access spacing standard of 600 feet will not be met with construction of the access aligned opposite a future frontage road connection on the west side of the street, as requested by Washington County. Overall spacing will be improved with consolidation of access on the street's east side.
9. On SW Norwood Road, the access spacing standard of 100 feet will be met with construction of the site accesses aligned opposite existing roadways.
10. Left-turn lane warrants are not met at either proposed site access intersection on SW Norwood Road for either peak hour under the 2026 buildout scenario for any analysis period or direction of travel.
11. Right-turn lane warrants are met at the proposed site access on SW Boones Ferry Road under the 2026 buildout scenario for both analysis periods. Given the 45-mph posted speed and higher traffic volumes, a northbound turn lane is recommended at this access.
12. Right-turn lane warrants are not met at either proposed site access intersection on SW Norwood Road for either peak hour under the 2026 buildout scenario for any analysis period. The warrant is initially met at the site access opposite SW 89th Avenue at SW Norwood Road under 2024 Buildout conditions; however, the lane is not needed once the site access at SW Boones Ferry Road is opened. Therefore, no right-turn lane is recommended.

13. Traffic signal warrants are not met at any unsignalized intersection in the study area under either buildout scenario for any analysis period.
14. Three intersections show operational results that do not meet standards under at least one scenario:
    - The intersection of SW Boones Ferry Road at SW Avery Street is expected to operate acceptably under all scenarios except the 2026 Buildout conditions without the Basalt Creek Parkway extension. Based on the operational analysis, which shows that construction of the Basalt Creek Parkway Extension is expected to result in improved operations, and the conservatively high estimates of forecast growth, no mitigation is recommended at this intersection.
    - The intersection of SW Boones Ferry Road at SW Iowa Drive is expected to operate with LOS F conditions under all scenarios and demand is expected to exceed capacity under 2026 Buildout conditions during the morning peak hour. Since signal warrants are not met and field observations show that delays are lower because the eastbound approach operates with a separate right-turn lane during congested conditions, no mitigation is recommended. However, the City could consider striping separate left- and right-turn lanes on the eastbound approach to formalize the lane configuration.
    - The intersection of the I-5 Southbound Off-Ramp at SW Elligsen Road is expected to operate with a v/c ratio that exceeds the OHP mobility target of 0.85 for freeway ramps for the morning peak hour for the existing condition and all subsequent scenarios. The 2018 RTP includes Project 11489 in the financially-constrained list, which would construct a second right-turn lane on the exit ramp. With this improvement, the ramps would operate well below the 0.85 mobility target. Although the RTP project acknowledges that conditions are currently congested, the time period for the improvement is identified as 2028-2040. Since the planned improvements for the interchange are part of the financially-constrained RTP and the contributing volumes and impact of the proposed development is relatively small, no project mitigation is recommended for this intersection.
15. All other study area intersections are projected to operate acceptably per each applicable performance standard under all analysis scenarios; no other mitigation is recommended.
16. Storage recommendations for the site access intersection at SW Boones Ferry Road include:
    - Maximum queues were estimated at two vehicles or 50 feet for the southbound left, which can easily be accommodated in the existing center refuge lane. The recommended striping for the southbound left-turn lane should include 100 feet of storage and the appropriate deceleration for the 45-mph posted speed.
    - The northbound left will rarely have a queue since frontage road to the west will only serve a few homes. This lane is recommended to be striped as a two-way, left-turn lane to allow for a two-stage westbound left-turn movement from the site access.
    - Maximum queues were estimated at six vehicles or 150 feet for the westbound left-movement with a two-lane approach for the site access. These queues will not affect the closest public street connection ("M" Street) to the east.

Project Description

Introduction

The proposed Autumn Sunrise Subdivision includes the development of 400 residential lots on a site located south of SW Norwood Road, west of Interstate 5, north of SW Greenhill Lane, and east of SW Boones Ferry Road in Tualatin, Oregon. Although the site also includes two lots zoned for neighborhood commercial use, this report does not incorporate the impacts of the future commercial development on those lots. In coordination with agency staff, a separate land use application and traffic study will be prepared at the time that development of those lots is proposed. The site will initially take all access from SW Norwood Road but includes a connection to SW Boones Ferry Road will be added with later phases. A site plan is provided in Appendix A.

The purpose of this study is to determine whether the transportation system within the vicinity of the site is capable of safely and efficiently supporting the proposed development and to determine any mitigation that may be necessary to do so.

Based on prior scoping coordination with the City of Tualatin, Washington County, and ODOT, the report includes safety and capacity analyses at 15 intersections:

1. SW Boones Ferry Road & SW Sagert Street
2. SW Boones Ferry Road & SW Avery Street
3. SW Boones Ferry Road & SW Ibach Street
4. SW Boones Ferry Road & SW Iowa Drive
5. SW Boones Ferry Road & SW Norwood Road
6. SW Boones Ferry Road & Site Access
7. SW Boones Ferry Road & SW Greenhill Lane
8. SW Boones Ferry Road & SW Day Road
9. SW Boones Ferry Road & SW 95th Avenue
10. I-5 Southbound Ramps & SW Elligsen Road
11. I-5 Northbound Ramps & SW Elligsen Road
12. Site Access/SW 89th Avenue & SW Norwood Road
13. Site Access/SW Vermillion Drive & SW Norwood Road
14. SW 82nd Avenue & SW Norwood Road
15. SW 65th Avenue & SW Norwood Road

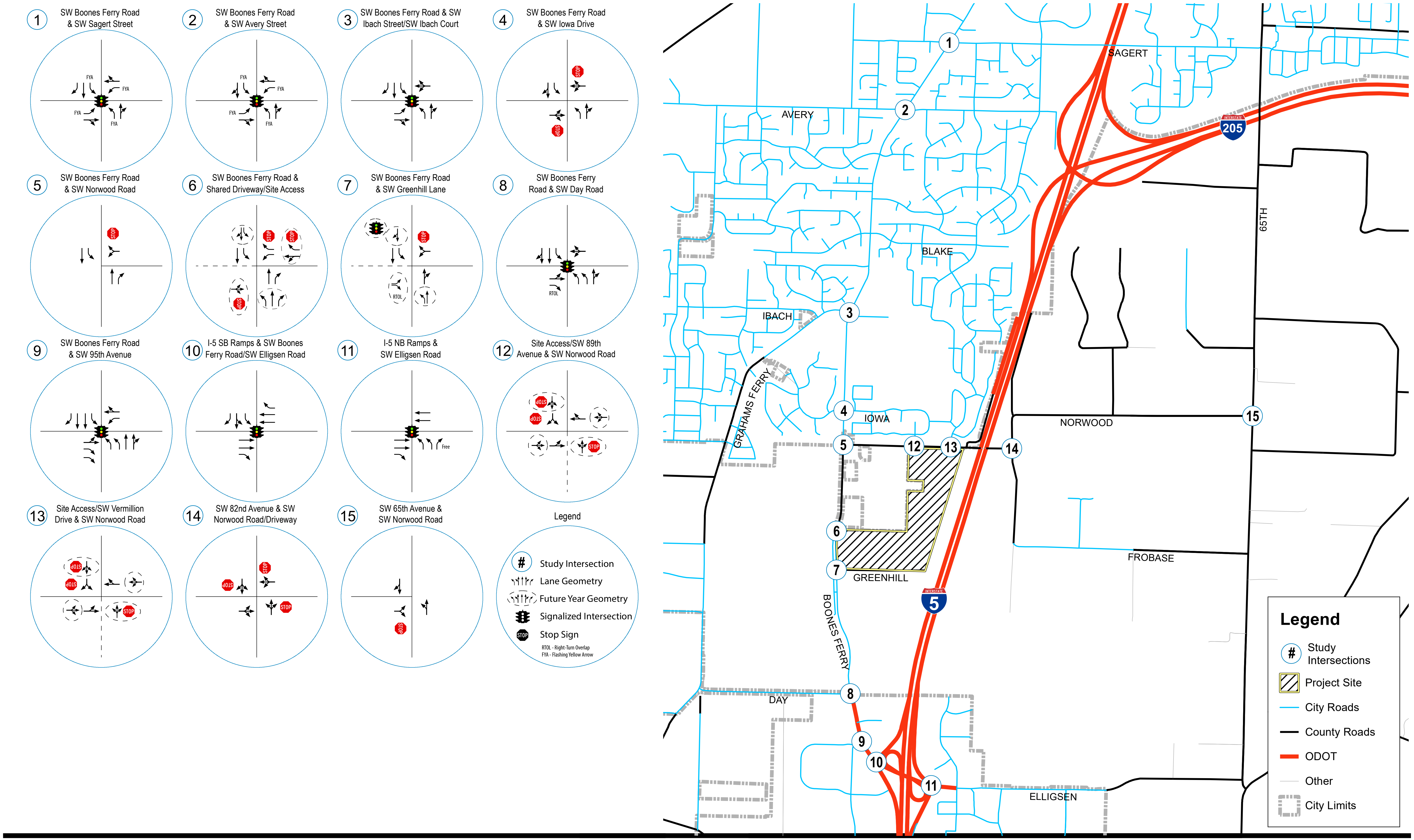
Detailed information on traffic counts, trip generation calculations, safety analyses, and level of service calculations are included in the appendix to this report.

Location Description

The project site (Tax Lots 2S135D 100, 400, 401, 500, 501, 600, 800, & 900) is approximately 61.99 acres and is zoned medium low density residential. The surrounding land uses are compatible to the proposed project, consisting of predominately residential neighborhoods and schools that serve the residents. Future access to the site will be provided via three new, proposed driveways:

- A full access driveway directly across SW Norwood Road from the SW 89th Avenue intersection
- A full access driveway directly across SW Norwood Road from the SW Vermillion Drive intersection
- A full access driveway along SW Boones Ferry Road across from a future frontage road connection

A site plan is included in Appendix A and the site location is shown in Figure 1.



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Intersection Lane Geometry

NOT TO SCALE

Figure 1
Autumn Sunrise Subdivision TIS
6/24/2021

Vicinity Streets

Thirteen roadways within the study area are expected to be impacted by the proposed development. The characteristics of these roadways are summarized in Table 1.

Table 1: Roadway Characteristics

Street Name	Jurisdiction	Functional Classification	Posted Speed	Curbs & Sidewalks	On-Street Parking	Bicycle Facilities
SW Boones Ferry Road	City of Tualatin / Washington County / ODOT	Major Arterial / Arterial / District Highway	35 / 45 / 35 mph	Both Sides (Sidewalks Added with Project)	None	Class II Bike Lanes
SW 89th Avenue	City of Tualatin	Local	25 mph[1]	Both Sides	Permitted	None
SW Vermillion Drive	City of Tualatin	Local	25 mph	Both Sides	Permitted	None
SW 82nd Avenue	Washington County	Major Collector	45 mph	None	None	None
SW 65th Avenue	Washington County	Arterial	45 mph	None	None	None
SW Sagert Street	City of Tualatin	Minor / Major Collector	25 / 30 mph	Partial Both Sides	None	Class II Bike Lanes
SW Avery Street	City of Tualatin	Major / Minor Collector	35 / 25 mph	Both Sides	None	Class II Bike Lanes
SW Ibach Street / Court	City of Tualatin	Major Collector / Local	35 / 25 mph	Both Sides	None	Class II Bike Lanes
SW Iowa Drive	City of Tualatin	Minor Collector	25 mph	Both Sides	None	None
SW Norwood Road	Washington County	Collector (Major Collector[2])	45 mph	Both Sides	None	None
SW Day Road	City of Wilsonville	Major Arterial	40 mph	South Side	None	Class II Bike Lanes
SW Elligsen Road	ODOT	District Highway (Major Arterial[3])	35 mph	Both Sides	None	Class II Bike Lanes
SW 95th Avenue	City of Wilsonville	Minor Arterial	35 mph	Both Sides	None	Class II Bike Lanes

Notes:

1. Statutory speed.

2. City of Tualatin Classification.

3. City of Wilsonville Classification.

Study Intersections

Through coordination with the City of Tualatin, Washington County, and ODOT, fifteen (15) study intersections were identified for evaluation. The existing characteristics of these intersections are summarized in Table 2. A vicinity map showing the project site, vicinity streets, and study intersection configurations is shown in Figure 1.

Table 2: Vicinity Intersection Descriptions

Intersection		Geometry	Traffic Control	Phasing/Stopped Approaches
1	SW Boones Ferry Road & SW Sagert Street	Four-Legs	Signalized	All Protected/ Permitted Left
2	SW Boones Ferry Road & SW Avery Street	Four-Legs	Signalized	All Protected/ Permitted Left
3	SW Boones Ferry Road & SW Ibach Street/SW Ibach Court	Four-Legs	Signalized	Protected NB/SB Left
4	SW Boones Ferry Road & SW Iowa Drive	Four-Legs	Stop-Controlled	WB/EB Stop-Controlled
5	SW Boones Ferry Road & SW Norwood Road	Three-Legs	Stop-Controlled	WB Stop-Controlled
6	SW Boones Ferry Road & Site Access (Future)	Three-Legs	Stop-Controlled	WB Stop-Controlled
7	SW Boones Ferry Road & SW Greenhill Lane	Three-Legs	Stop-Controlled	WB Stop-Controlled
8	SW Boones Ferry & SW Day Road	Four-Legs	Signalized	Protected NB/SB Left Right Turn Overlap
9	SW Boones Ferry & SW 95th Avenue	Four-Legs	Signalized	NB/SB Protected Left EB Right Turn Overlap
10	I-5 Southbound Off-Ramp & SW Elligsen Road	Four-Legs	Signalized	Partial SB Right Turn Overlap with EB Through EB/WB Right Yield Controlled
11	I-5 Northbound Off-Ramp & SW Elligsen Road	Four-Legs	Signalized	EB/NB Right Yield Controlled
12	SW 89th Avenue/Site Access (Future) & SW Norwood Road	Three-Legs[1]	Stop-Controlled	SB Stop-Controlled
13	SW Vermillion Drive/Site Access (Future) & SW Norwood Road	Three-Legs[1]	Stop-Controlled	SB Stop-Controlled
14	SW 82nd Avenue & SW Norwood Road	Four-Legs	Stop-Controlled	NB/SB Stop-Controlled Except SB Free Right
15	SW 65th Avenue & SW Norwood Road	Three-Legs	Stop-Controlled	EB Stop-Controlled

Note

1. The southern leg of intersections 12 and 13 will be constructed by the project and will be stop controlled.

Public Transit

The project is located near one transit line that has stops within an approximate one-half mile walking/biking distance of the site.

Route 96 – Tualatin/I-5 provides weekday rush-hour service between Commerce Circle and the Mohawk Park & Ride in Tualatin, and regular service between Mohawk Park & Ride and Portland City Center. Weekday service is scheduled from approximately 5:15 AM to 9:10 PM with headways of approximately 30 to 60 minutes. There is currently no weekend or holiday service. The nearest bus stops to the site are currently located at:

- SW Boones Ferry Road and SW Norwood Road
- SW Boones Ferry Road and SW Greenhill Lane

Trimet might consider adding another stop at the proposed site access on SW Boones Ferry Road to serve the proposed development.

Site Trips

The proposed development includes the construction of 320 detached home lots and 80 attached home lots. A supplemental memorandum addressing potential development of the commercial parcels abutting SW Boones Ferry Road is included in Appendix E. This memorandum includes trip generation for several potential commercial development scenarios of different intensities.

Trip Generation

To estimate trips that will be generated by the redevelopment, trip equations from the *Trip Generation Manual*[1] were used based on the number of dwelling units (DU). Land Use 210 – *Single-Family Detach Housing* was applied to the 320 detached units in the site while Land Use 220 – *Multifamily Housing (Low-Rise)* was applied to the 80 attached units.

As shown in Table 3, the trip generation calculations show that the proposed Autumn Sunrise Subdivision is estimated to generate 271 trips during the morning peak hour, 358 trips during the evening peak hour, and 3,596 daily trips during the average weekday.

Table 3: Trip Generation Summary

ITE Code	Intensity (DU)	Morning Peak Hour			Evening Peak Hour			Daily Trips
		In	Out	Total	In	Out	Total	
Single-Family Detached Housing	320	58	174	232	195	115	310	3,032
Multifamily Housing (Low-Rise)	80	9	30	39	30	18	48	564
Total	400	67	204	271	225	133	358	3,596

Note: Trip equations were applied for these land uses.

Table 4 presents the number and type of housing units and the trip generation by phase of development. With Phases 1 and 2, all site access will be taken from SW Norwood Road. The site access to SW Boones Ferry Road will be constructed with the completion of Phase 3. Phase 1 is expected to be constructed in year 2023 with each phase completed the subsequent year. Full buildout would occur in year 2026.

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[1] Institute of Transportation Engineers (ITE), *Trip Generation Manual*, 10th Edition, 2017.

Table 4: Trip Generation by Phase

Phase	Intensity (DU)			Morning Peak Hour			Evening Peak Hour			Daily Trips
	Single	Multi	Total	In	Out	Total	In	Out	Total	
1	85	24	109 (27%)	18	55	73	61	36	97	975
2	41	14	55 (14%)	9	28	37	30	18	48	487
3	91	42	133 (33%)	21	65	86	71	42	113	1,158
4	103	0	103 (26%)	19	56	75	63	37	100	976
Subtotal (1-2)	*126*	*38*	*164 (41%)*	*27*	*83*	*110*	*91*	*54*	*145*	*1,462*
Subtotal (1-3)	*217*	*80*	*297 (74%)*	*48*	*148*	*196*	*162*	*96*	*258*	*2,620*
Total (1-4)	320	80	400	67	204	271	225	133	358	3,596

Trip Distribution

The directional distribution of site trips to/from the project site is necessary to identify intersections to be included in the study area of the TIA. A select zone analysis using Metro's Regional Travel Demand Forecasting Model for the base year and future year were conducted for the site's Transportation Analysis Zone (TAZ). The trip distribution in this memorandum reports general consistency with the findings from the model.

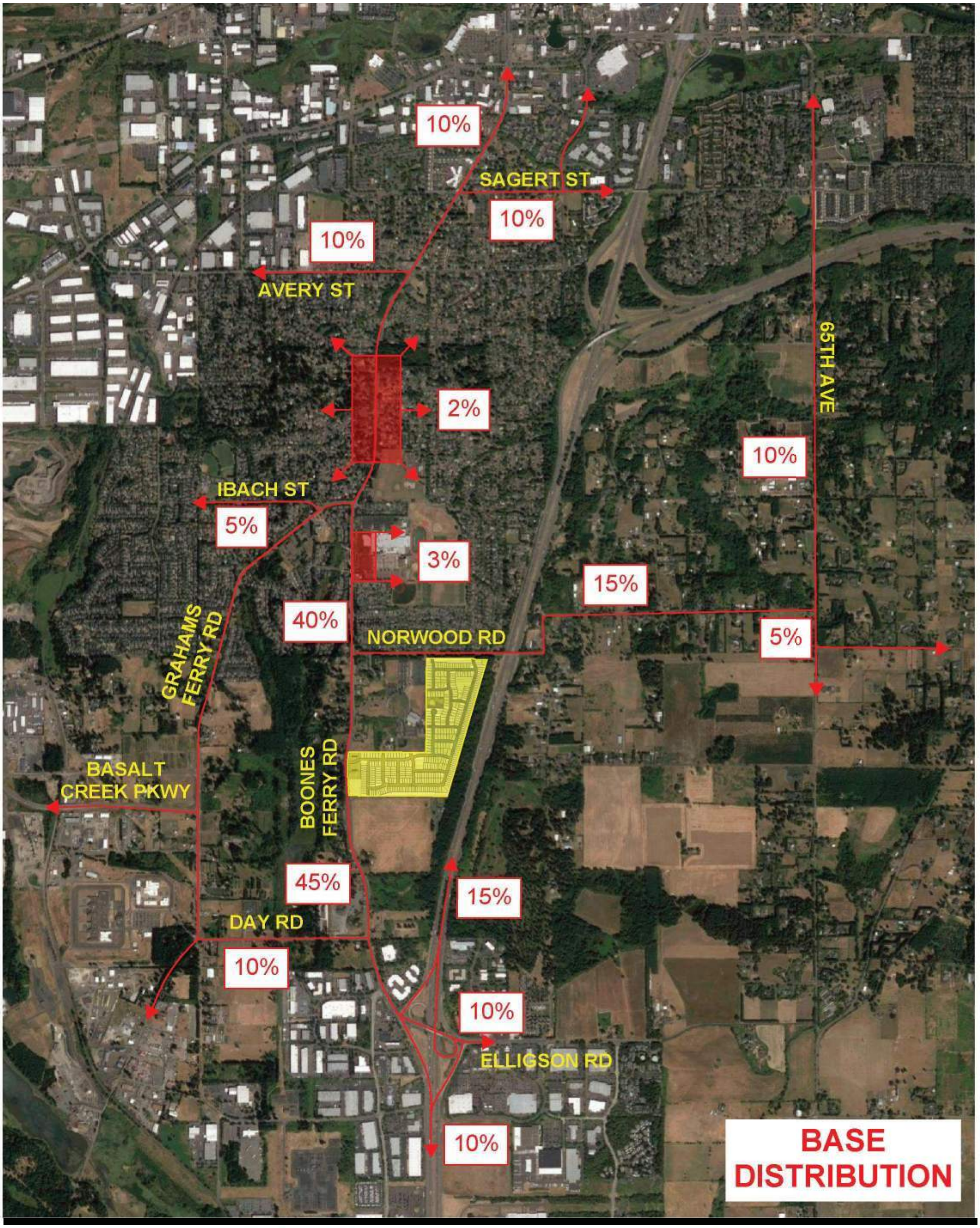
- Approximately 40 percent of site trips will travel to/from the north on SW Boones Ferry Road
    - Approximately 3 percent of site trips will travel to/from Tualatin High School
    - Approximately 5 percent of site trips will travel to/from the west along SW Ibach Street
    - Approximately 2 percent of site trips will travel to/from northern neighborhoods
    - Approximately 10 percent of site trips will travel to/from the west along SW Avery Street
    - Approximately 10 percent of site trips will travel to/from the east along SW Sagert Street
    - Approximately 10 percent of site trips will continue to/from the north along SW Boones Ferry Road
- Approximately 45 percent of site trips will travel to/from the south on SW Boones Ferry Road
    - Approximately 10 percent will travel to/from west on SW Day Road
    - Approximately 15 percent will travel to/from north on Interstate 5
    - Approximately 10 percent will travel to/from south on Interstate 5
    - Approximately 10 percent will travel to/from east on SW Elligsen Road
- Approximately 15 percent of site trips will travel to/from the east on SW Norwood Road
    - Approximately 10 percent will travel to/from the north on SW 65th Avenue
    - Approximately 5 percent will travel to/from the south on SW 65th Avenue

Basalt Creek Parkway extension

Washington County is currently engineering the extension of the Basalt Creek Parkway eastward from SW Grahams Ferry Road to SW Boones Ferry Road at a connection just south of SW Greenhill Lane. Both city and county staff requested an analysis of the study area without and with the extension. The following changes in trip distribution with the Basalt Creek Parkway extension anticipated are:

- Shift seven (7) percent of project trips heading north on SW Boones Ferry Road (continuing onto SW Ibach Street and SW Avery Street) to the Basalt Creek Parkway extension.
- Shift eight (8) percent of project trips heading south on SW Boones Ferry Road (continuing onto SW Day Road) to the Basalt Creek Parkway extension.

These changes are not anticipated to change the project study area. The anticipated project trip distribution and assignment of site trips generated during the morning and evening peak hours without and with the Basalt Creek Parkway extension are provided in Figure 2A and B, respectively.



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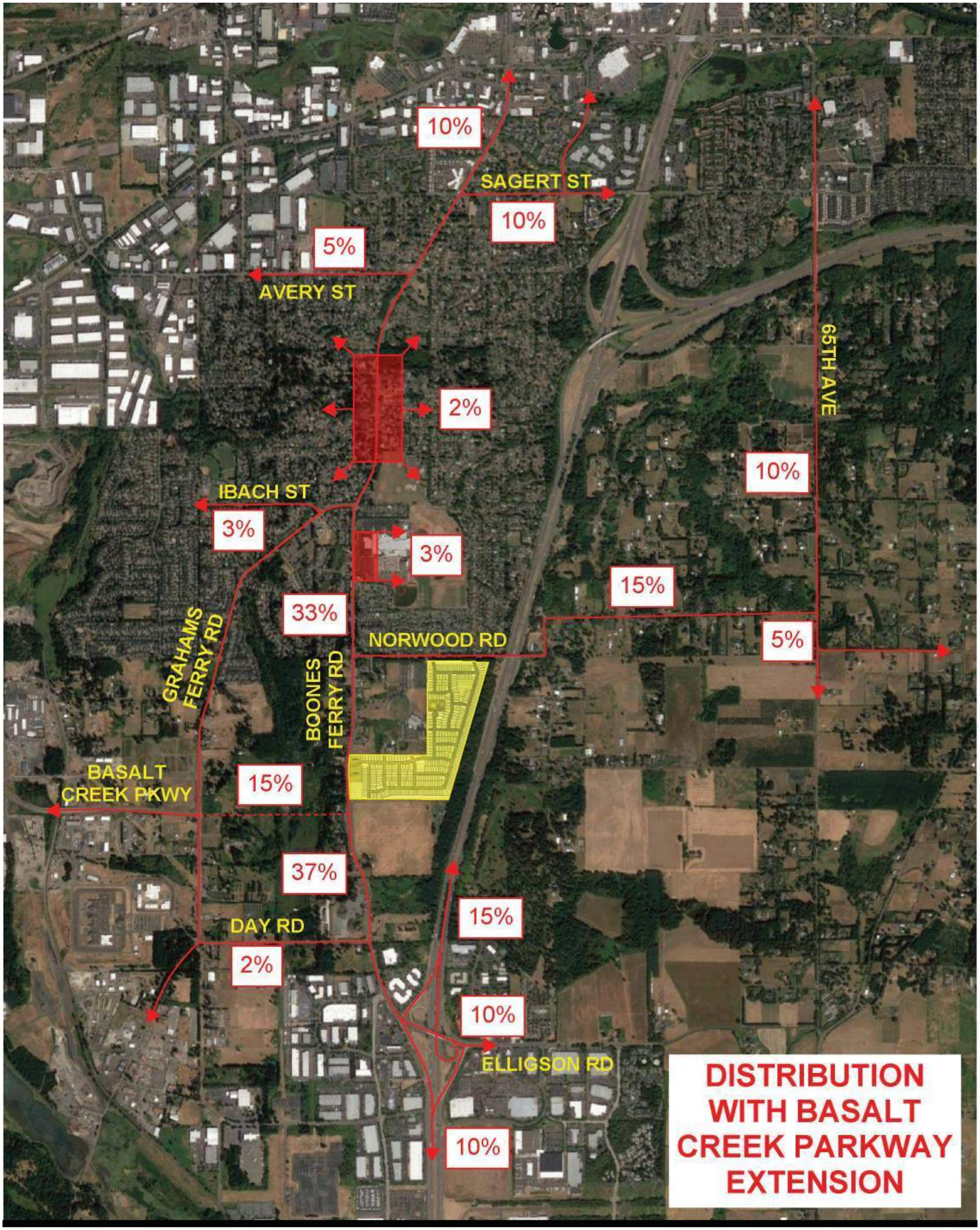
Trip Distribution

NOT TO SCALE

Figure 2A
Autumn Sunrise Subdivision TIS
6/25/2021



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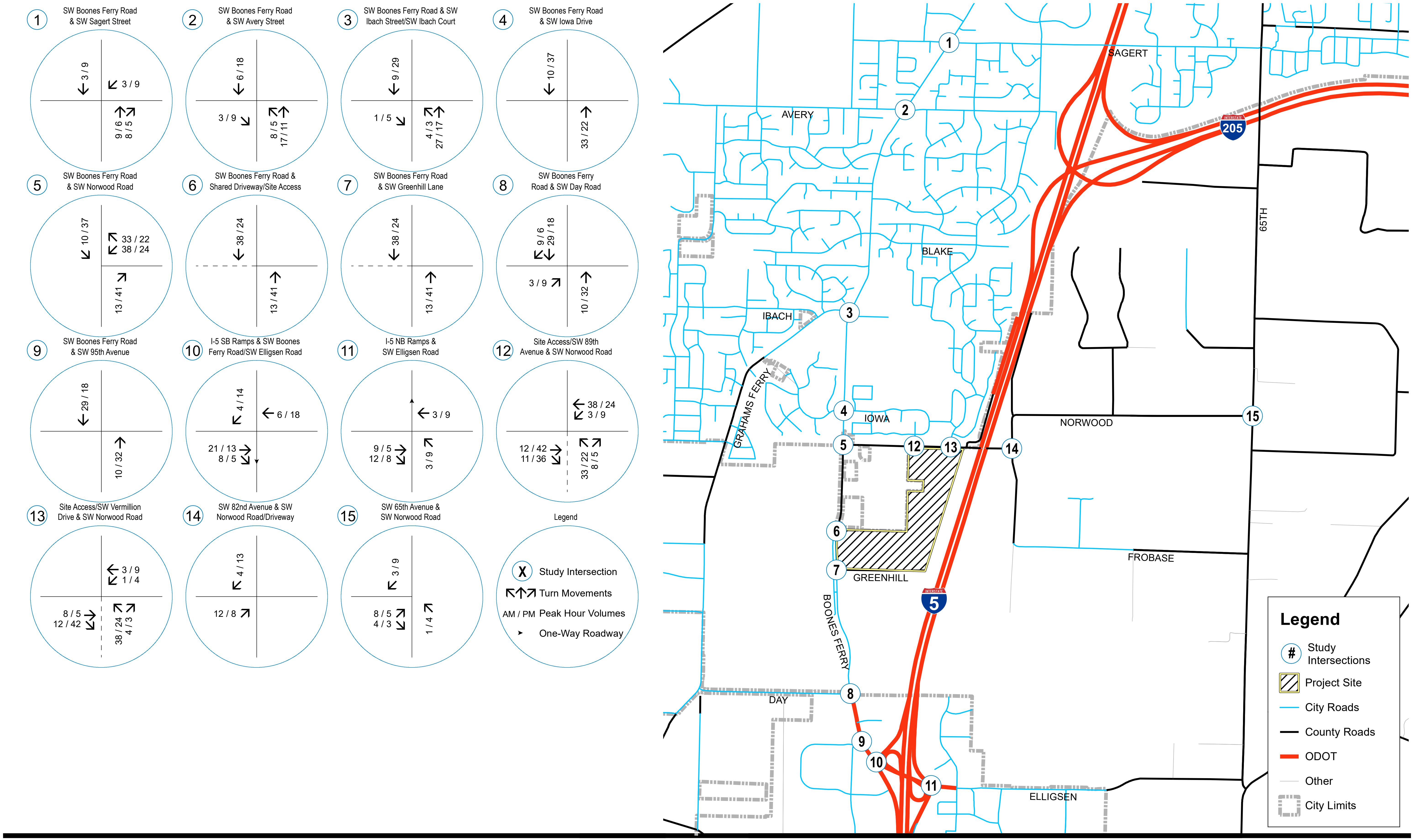
Trip Distribution

NOT TO SCALE

Figure 2B
Autumn Sunrise Subdivision TIS
6/25/2021



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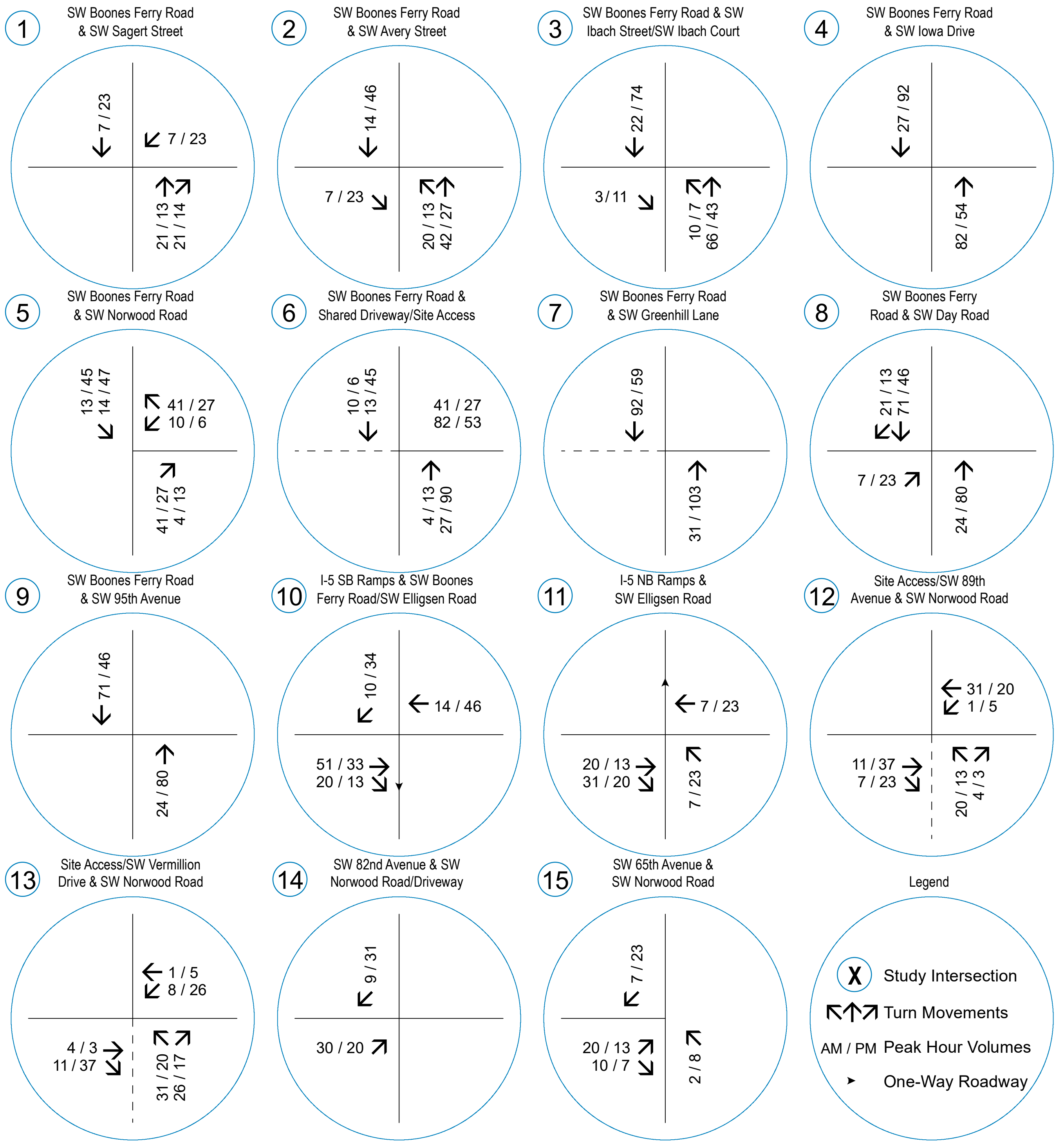
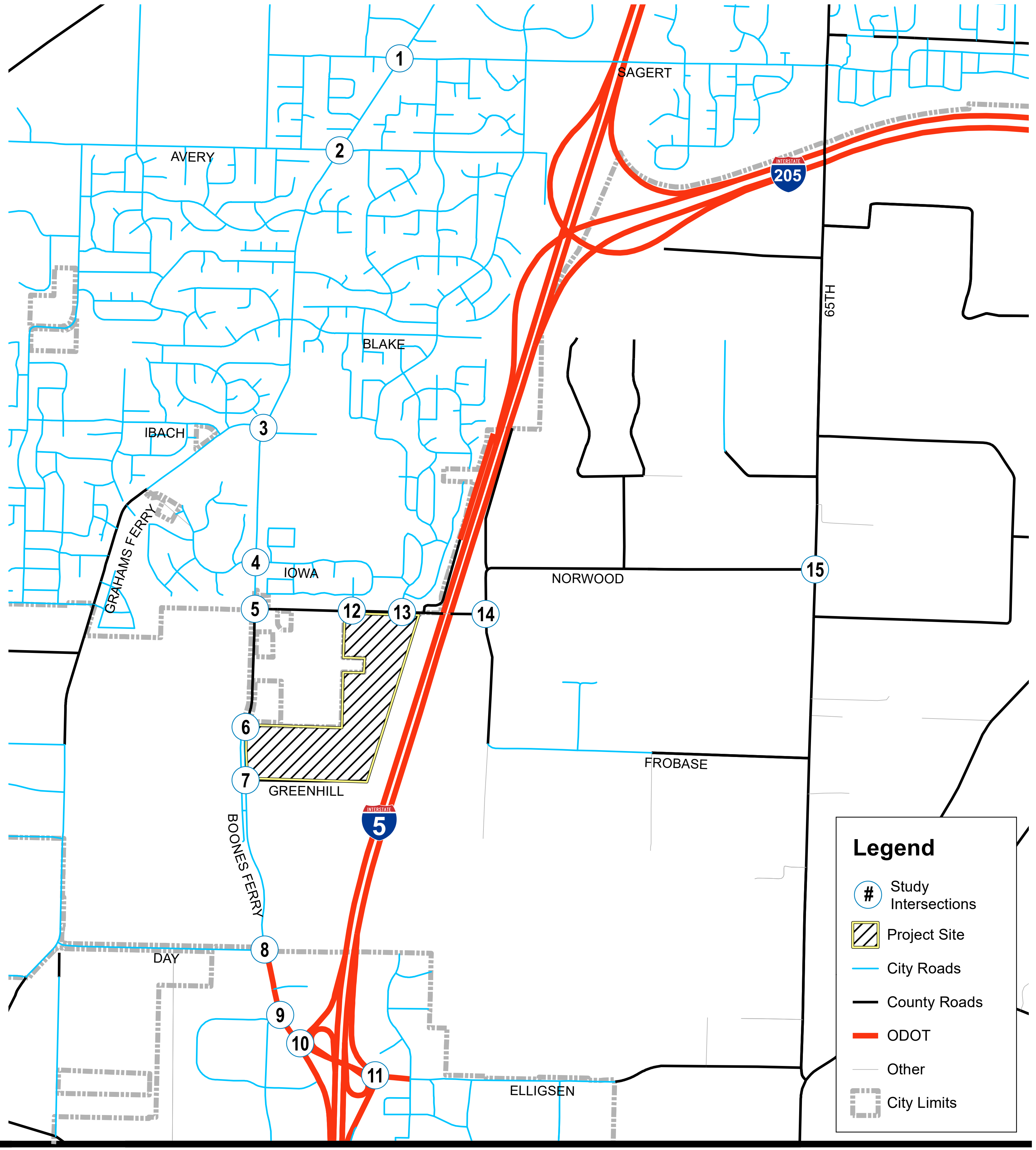
TRAFFIC VOLUMES

Trip Assignment - Phases 1-2

NOT TO SCALE

Figure 3A
Autumn Sunrise Subdivision TIS
6/24/2021





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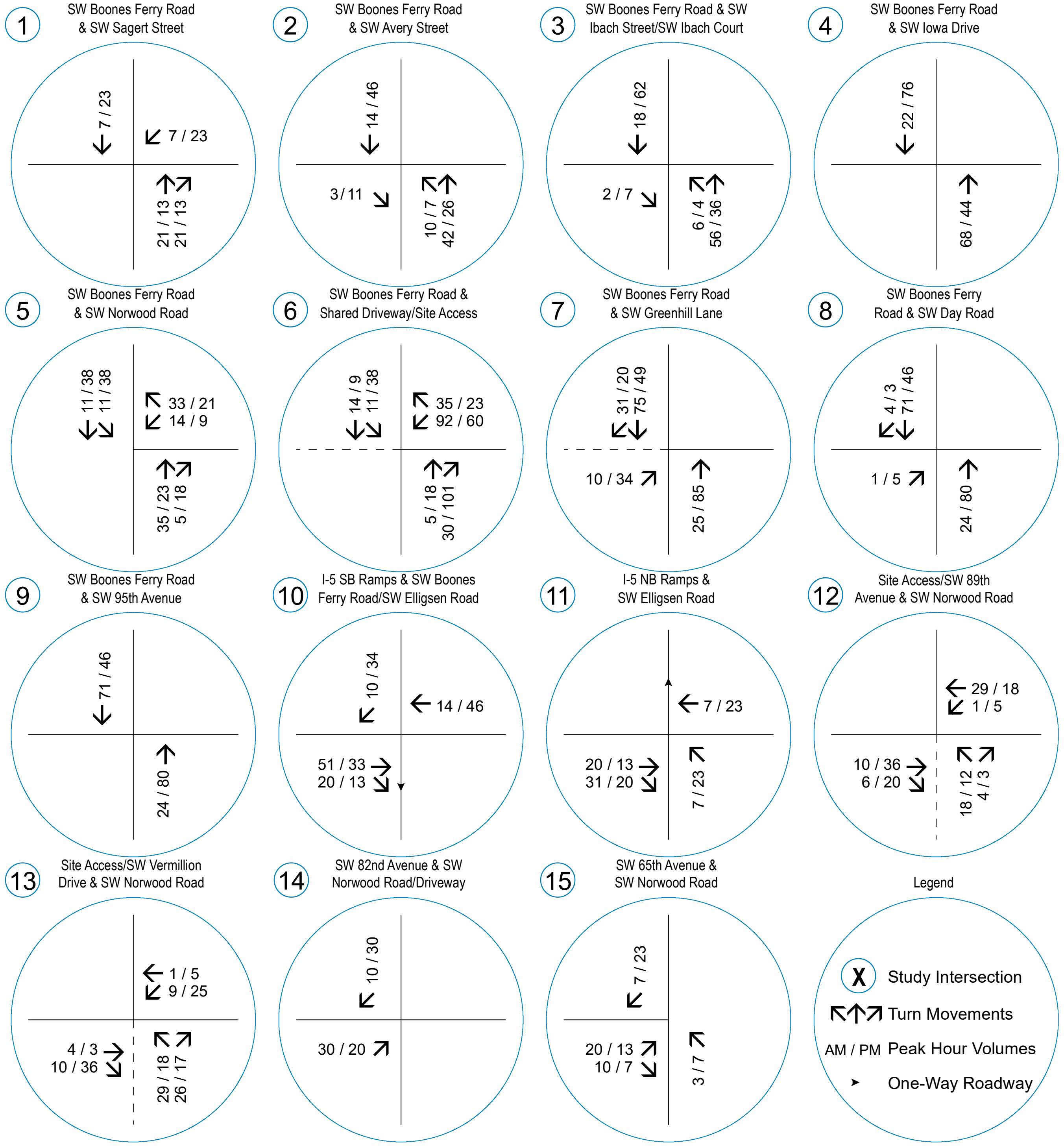
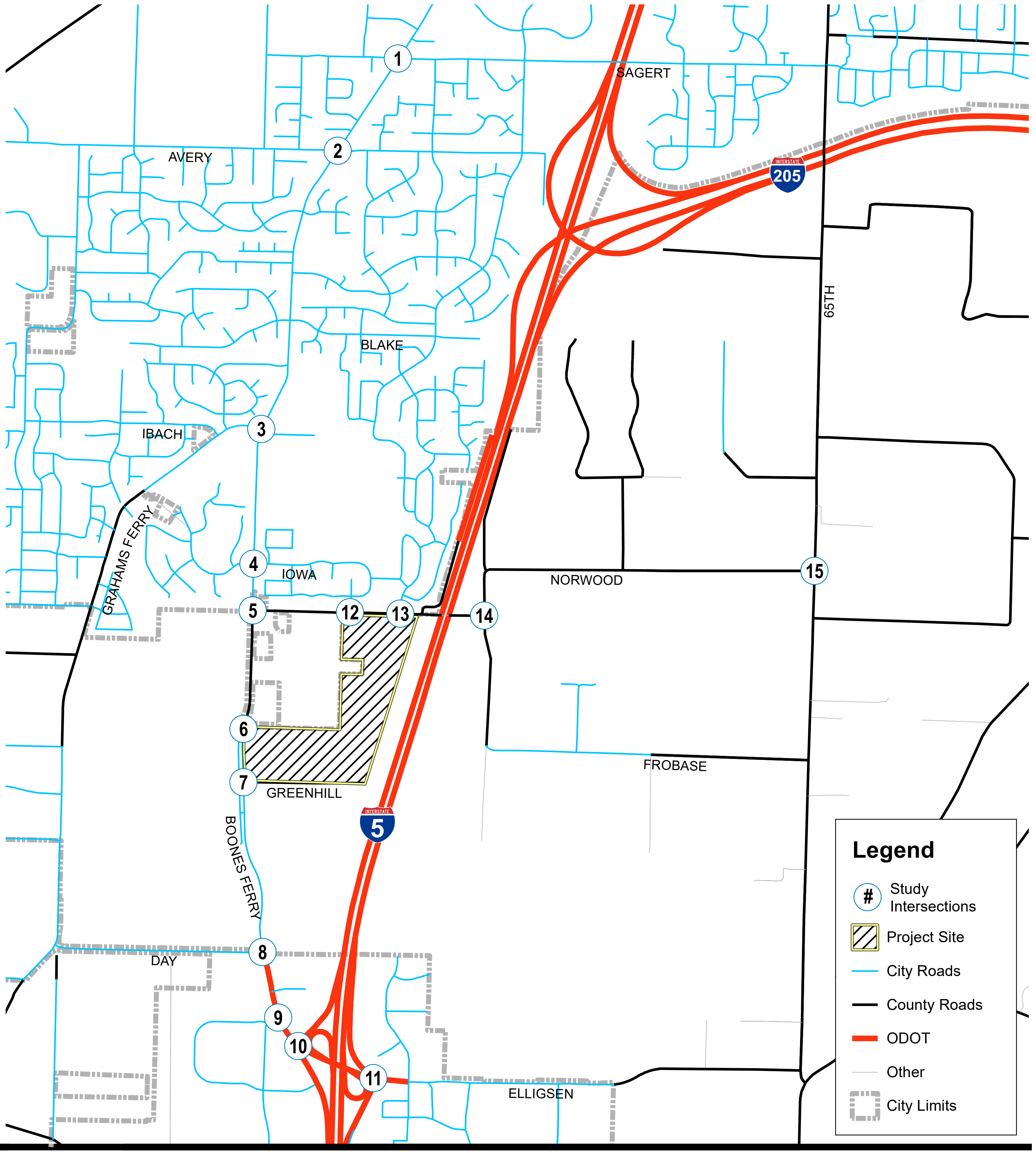
TRAFFIC VOLUMES

Trip Assignment - Phases 1-4

NOT TO SCALE

Figure 3B
Autumn Sunrise Subdivision TIS
6/24/2021





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TRAFFIC VOLUMES

Trip Assignment - Phases 1-4 with Basalt Creek Extension

NOT TO SCALE

Figure 3C
Autumn Sunrise Subdivision TIS
6/24/2021

Traffic Volumes

Existing Conditions

The COVID-19 pandemic initiated a significant decrease in traffic due to policies on social distancing that have closed or limited business operations, reduced commuting as many people work from home, and shifted schools to distance learning. Data collection under these altered conditions does not reflect normal volumes on the study area roadways. Historical traffic data was available at some locations, but many of the study area intersections did not have counts in the past five years or were not reflective of the current roadway network. Therefore, a combination of current counts and historical traffic counts were used to approximate year 2021 existing conditions. Agency staff from City of Tualatin, Washington County, and ODOT approved the general methodology for adjusting counts during the scoping of this project; the specific dates and adjustments are presented in Table 5.

Table 5: Year 2021 Existing Condition Traffic Volume Development

Intersection		Count Date	Adjustment Methodology
1	SW Boones Ferry Road & SW Sagert Street	5/6/2021	• AM/PM adjustment factors of 1.345/1.125 derived from historical link count on SW Boones Ferry Road • Volumes balanced with adjacent intersection to south
2	SW Boones Ferry Road & SW Avery Street	10/29/2019	• Historical count grown by 2%
3	SW Boones Ferry Road & SW Ibach Street	4/27/2017	• Historical count grown by 4% • Volumes balanced with adjacent intersection to north
4	SW Boones Ferry Road & SW Iowa Drive	9/29/2020	• AM/PM adjustment factors from SW Norwood Road applied to intersection • Volumes balanced with adjacent intersection to south
5	SW Boones Ferry Road & SW Norwood Road	9/29/2020	• AM adjustment factor of 1.827 derived from historical link counts grown at 2%/year to year 2021 on SW Boones Ferry Road and SW Norwood Road • PM adjustment factor of 1.071 derived from historical turning movement count grown at 2%/year to year 2021
6	SW Boones Ferry Road & Site Access (Future)	-	• Through volumes balanced with adjacent intersection to north
7	SW Boones Ferry Road & SW Greenhill Lane	-	• Through volumes balanced with adjacent intersection to north • Turning movements from ITE rates for residences on SW Greenhill Lane

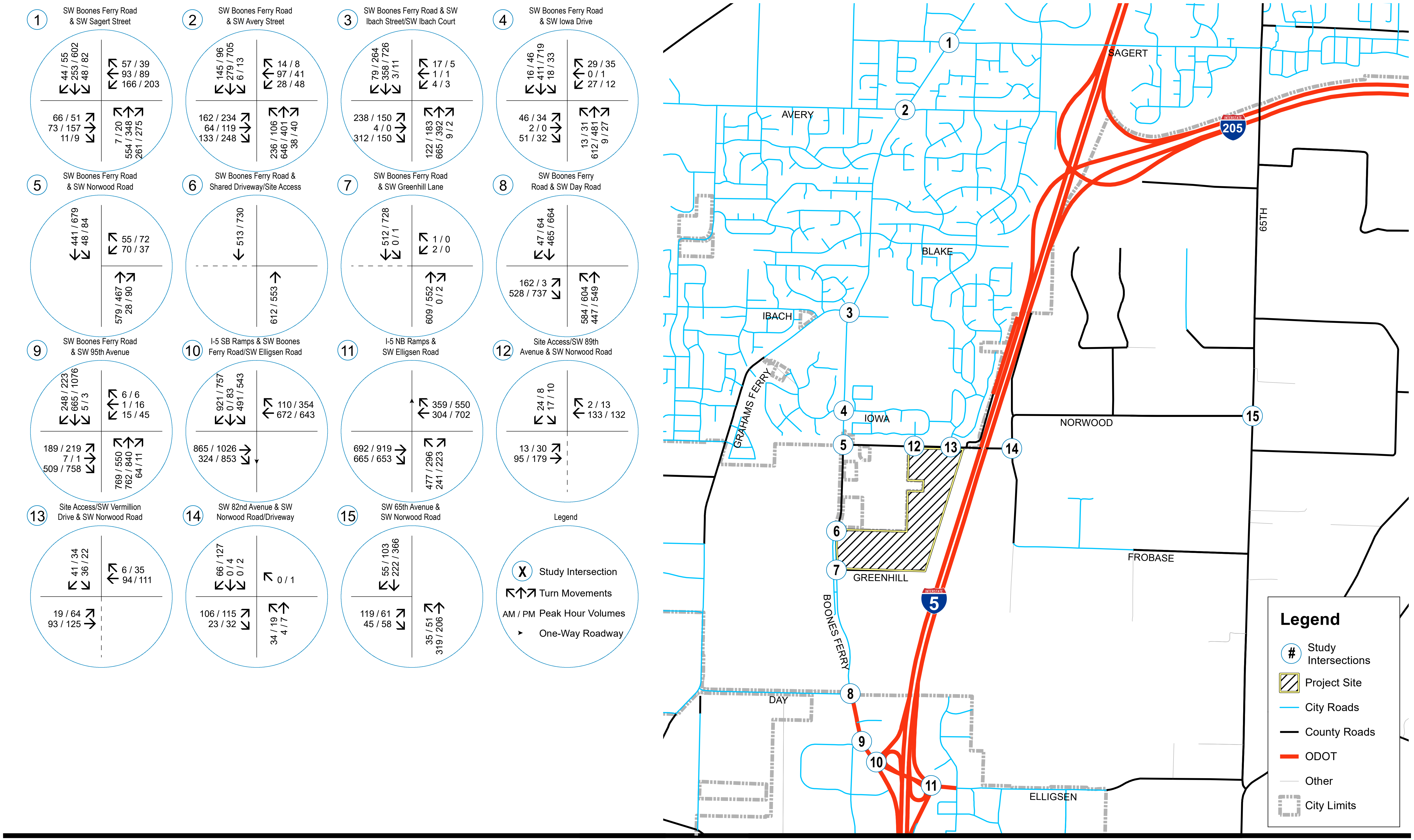
Table 5: Year 2021 Existing Condition Traffic Volume Development

Intersection		Count Date	Adjustment Methodology
8	SW Boones Ferry & SW Day Road	3/30/2021	• AM/PM adjustment factors of 1.489/1.326 for south leg derived from historical count on SW Boones Ferry Road to south grown at 2%/year to year 2021 • Turning movements on west and east legs balanced with adjacent intersection to north
9	SW Boones Ferry & SW 95th Avenue	6/8/2021	• AM/PM adjustment factors of 1.214/1.117 derived from historical counts on SW Boones Ferry Road grown at 2%/year to year 2021 • Volumes balanced with adjacent intersection to south
10	I-5 Southbound Off-Ramp & SW Elligsen Road	9/29/2020	• AM/PM adjustment factors of 1.241/1.070 derived from historical link counts on SW Boones Ferry Road and interchange ramps grown at 2%/year to year 2021 • Volumes balanced with adjacent intersection to west & east
11	I-5 Northbound Off-Ramp & SW Elligsen Road	9/29/2020	• AM/PM adjustment factors of 1.241/1.070 derived from historical link counts on SW Boones Ferry Road and interchange ramps grown at 2%/year to year 2021 • Volumes balanced with adjacent intersection to west
12	SW 89th Avenue & SW Norwood Road	9/29/2020	• AM/PM adjustment factors of 1.876/1.596 derived from historical link counts on SW Norwood Road at 2%/year to year 2021
13	SW Vermillion Drive & SW Norwood Road	9/29/2020	• AM/PM adjustment factors of 1.876/1.596 derived from historical link counts on SW Norwood Road east of SW Boones Ferry Road at 2%/year to year 2021 • Volumes balanced with adjacent intersection to west
14	SW 82nd Avenue & SW Norwood Road	10/7/2020	• AM/PM adjustment factors of 2.114/1.238 derived from historical link counts on SW Norwood Road east of SW 82nd Avenue at 2%/year to year 2021 • Volumes balanced with adjacent intersection to west
15	SW 65th Avenue & SW Norwood Road	9/29/2020	• AM/PM adjustment factors of 2.588/1.566 derived from historical turning movement count at intersection at 2%/year to year 2021

One notable trend about the adjustment factors is that they are consistently greater during the morning peak hour than the evening peak hour. The morning volumes appear to be much lower than historical traffic due to the pandemic's impacts on both commuting and school. The differences were generally greater at the intersections closer to Tualatin High School and lesser at the intersections further away.

Another notable trend was that peak hour factors for the data collected during the pandemic were lower than many of the historical factors. This trend likely reflects less congestion on the area roadways and, consequently, less peak traffic spreading over the hour. For the operations analysis, the higher peak hour factors were applied to the intersection volumes.

The resulting 2021 existing condition traffic volumes during the morning and evening peak hours are displayed in Figure 4.



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TRAFFIC VOLUMES

Existing Conditions AM & PM Peak Hour

NOT TO SCALE

Figure 4
Autumn Sunrise Subdivision TIS
6/24/2021

Background Conditions

To provide analysis of the impact of the proposed development on the nearby transportation facilities, an estimate of future traffic volumes is required. Two components were included in the background traffic estimates: 1) general growth and 2) growth associated with planned developments.

For the background growth, an annual growth rate of two percent per year was applied to the adjusted year 2021 existing traffic volumes. This growth rate is generally consistent with historical growth rates on study area roadways.

For planned development related growth, the Affordable Housing development known as Plambeck Gardens, is planned to be constructed to the north of the project site along SW Boones Ferry Road. The buildout year for this project was assumed to be 2025, which corresponds with the Phase 3 development year the proposed Autumn Sunrise project. Therefore, trip assignment associated with this nearby development was included in the 2026 background year scenario. Plambeck Gardens traffic was assumed to share the access on SW Boones Ferry Road with Autumn Sunrise. Detailed project trip information can be found in Appendix B.

Background Year 2024

Phases 1 and 2 of the proposed development are anticipated to be completed in the year 2024 with all site access taken from SW Norwood Road; the site access on SW Boones Ferry Road will not be constructed with these phases. Background traffic volumes were estimated to correspond with this interim access condition Background Year 2024 conditions assume three years of growth. The year 2024 background traffic volumes are displayed in Figure 5A.

Background Year 2026

By the year 2026, all phases of the proposed development are anticipated be completed with site access on both SW Norwood Road and SW Boones Ferry Road. Background traffic volumes were estimated to correspond with this full access condition. Background Year 2026 conditions assume five years of growth plus the planned Plambeck Gardens project. The year 2026 background traffic volumes are displayed in Figure 5B.

Background Year 2026 with Basalt Creek Parkway Extension

Washington County is currently engineering the extension of the Basalt Creek Parkway eastward from SW Grahams Ferry Road to SW Boones Ferry Road at a connection just south of SW Greenhill Lane. Construction is planned to begin in 2023 with completion anticipated in 2025 but is contingent on securing funding for the project.

Since funding and the construction timeline are indefinite, this project was not assumed as part of the base transportation network. However, an analysis scenario with the planned project has been developed to understand how it might change traffic operations with the proposed project. Short-term traffic volumes were not developed in the County study for this phase of the Basalt Creek Parkway project; therefore, several assumptions about traffic shifts were assumed to estimate study area traffic with completion of the extension:

- 50 percent of the northbound traffic currently turning left from SW Boones Ferry Road to SW Day Road will continue traveling northward and turn left on the Basalt Creek Parkway Extension.

- 50 percent of the eastbound traffic currently turning right from SW Day Road to SW Boones Ferry Road will travel along the Basalt Creek Parkway Extension and turn right on SW Boones Ferry Road at the new intersection.
- 80 percent of the southbound traffic currently turning right from SW Boones Ferry Road to SW Day Road will turn on the Basalt Creek Parkway Extension instead of continuing south to SW Day Road.
- 80 percent of the eastbound traffic currently turning left from SW Day Road to SW Boones Ferry Road will travel along the Basalt Creek Parkway Extension and turn left onto SW Boones Ferry Road at the new intersection.
- Traffic shifts from roadways north of SW Day Road are anticipated to be relatively small as most shifts from those roads likely occurred when earlier phases of the project were constructed. The earlier phases included the extension of SW 124th Avenue southward from SW Tualatin-Sherwood Road to SW Tonquin Road and the construction of the Basalt Creek Parkway connection between SW Tonquin Road and SW Grahams Ferry Road.
- The Basalt Creek Parkway Extension will disconnect the western north-south frontage road along the west side of at SW Boones Ferry Road from its current access point. The frontage road connection opposite the proposed Autumn Sunrise site access is assumed to be opened with the Basalt Creek Parkway Extension.

The year 2026 background traffic volumes with the Basalt Creek Parkway Extension are displayed in Figure 5C.

Buildout Conditions

Buildout traffic volumes were estimated by adding the trip assignment for the proposed development (shown in Figure 3A, Figure 3B, and Figure 3C) to the background traffic volumes.

Background Year 2024

Peak hour trips associated with Phases 1 and 2 were added to the projected year 2024 background volumes to obtain the expected 2024 buildout volumes. The resulting year 2024 buildout traffic volumes are shown in Figure 6A.

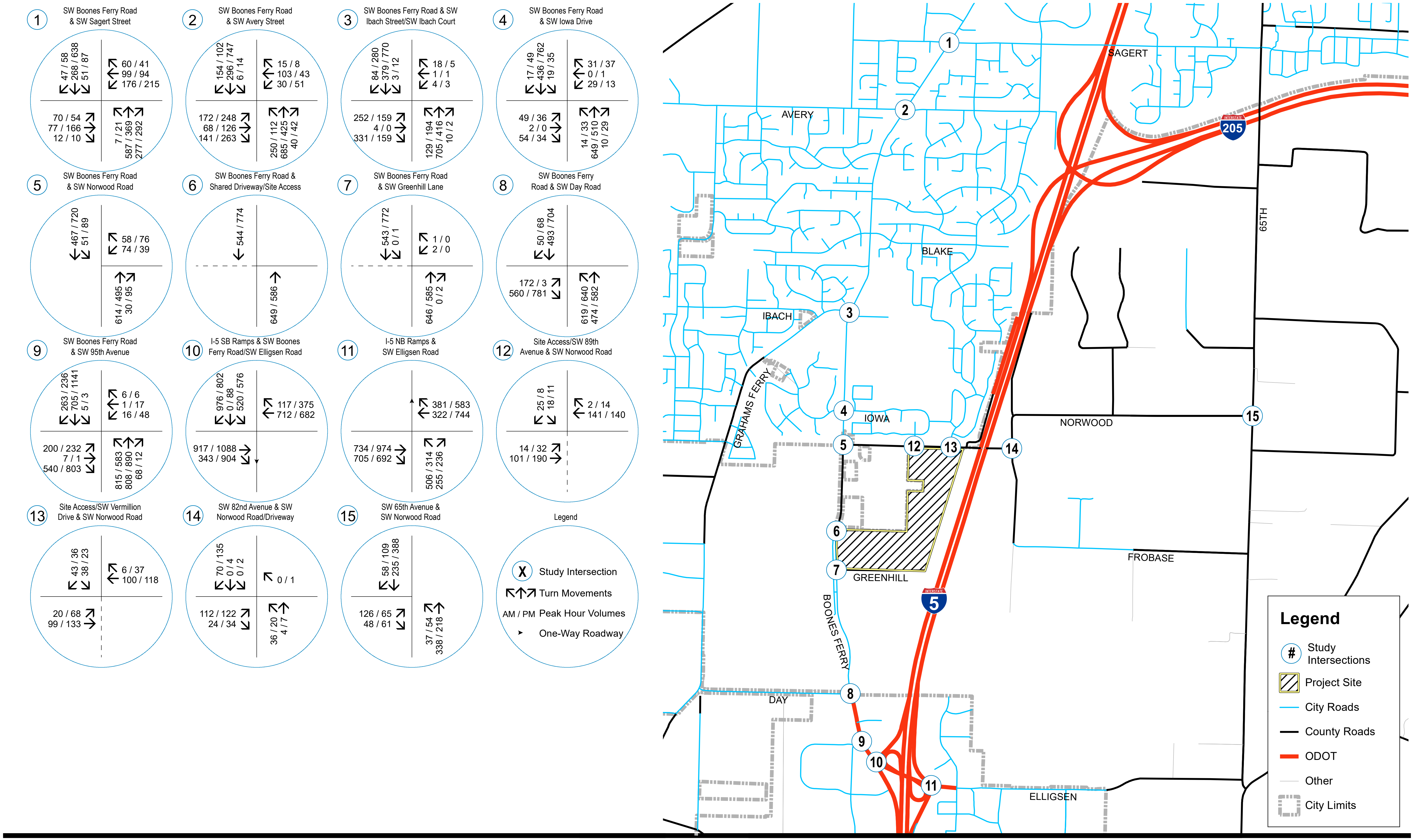
Buildout Year 2026

Peak hour trips associated with all development phases were added to the projected year 2026 background volumes obtain the expected 2026 buildout volumes. The year 2026 buildout traffic volumes are shown in Figure 6B.

Buildout Year 2026 with Basalt Creek Parkway Extension

The Basalt Creek Parkway Extension is expected to change traffic patterns for the project trips as well as background conditions. The peak hour trip assignment with the Basalt Creek Parkway extension were added to the projected year 2026 background volumes with the extension to obtain the expected 2026 buildout volumes with the extension. The year 2026 buildout traffic volumes with the Basalt Creek Parkway extension are shown in Figure 6C.

Traffic volumes for the site access at SW Boones Ferry Road with potential commercial development scenarios of different intensities are presented in a supplemental memorandum included in Appendix E..



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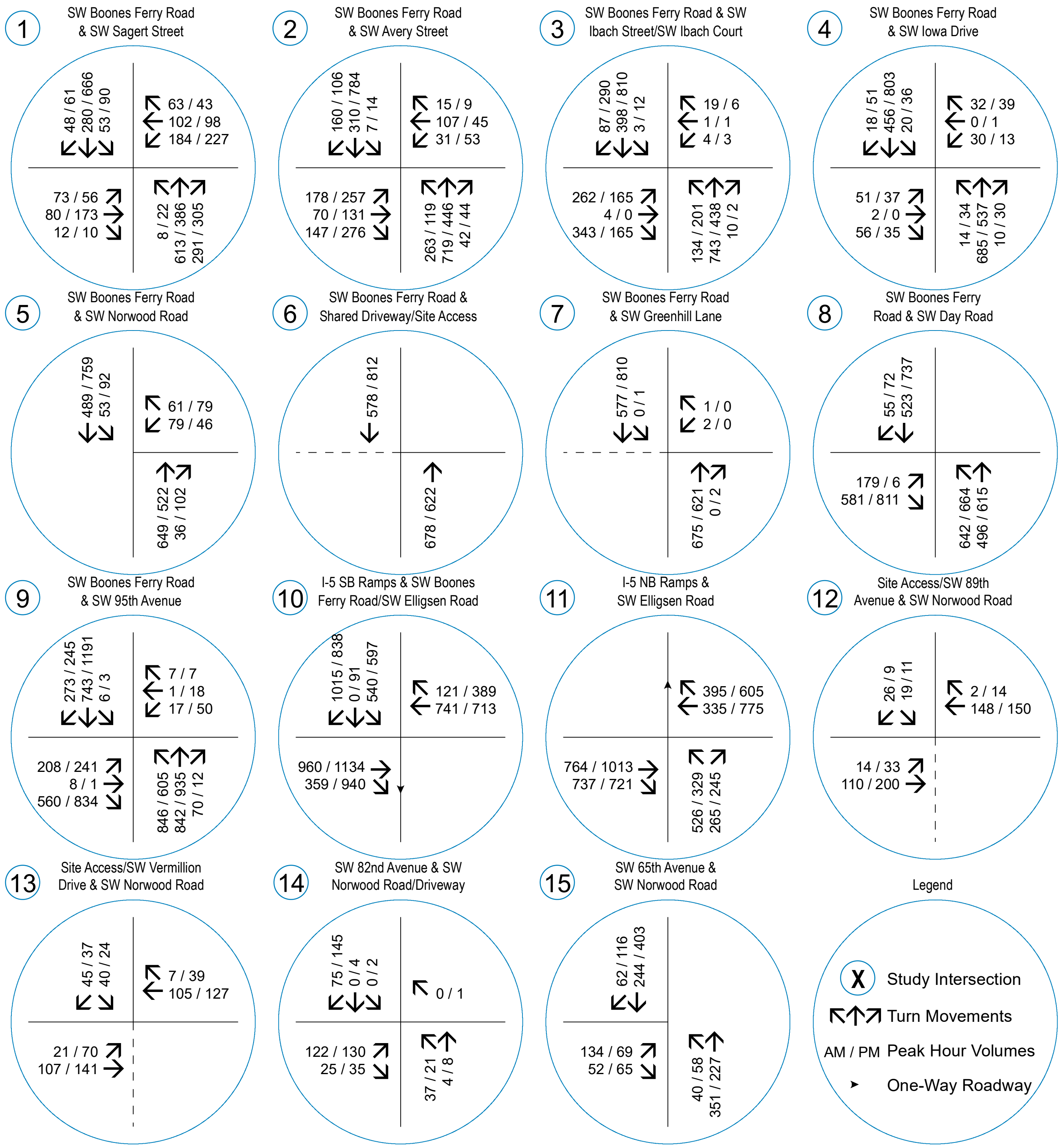
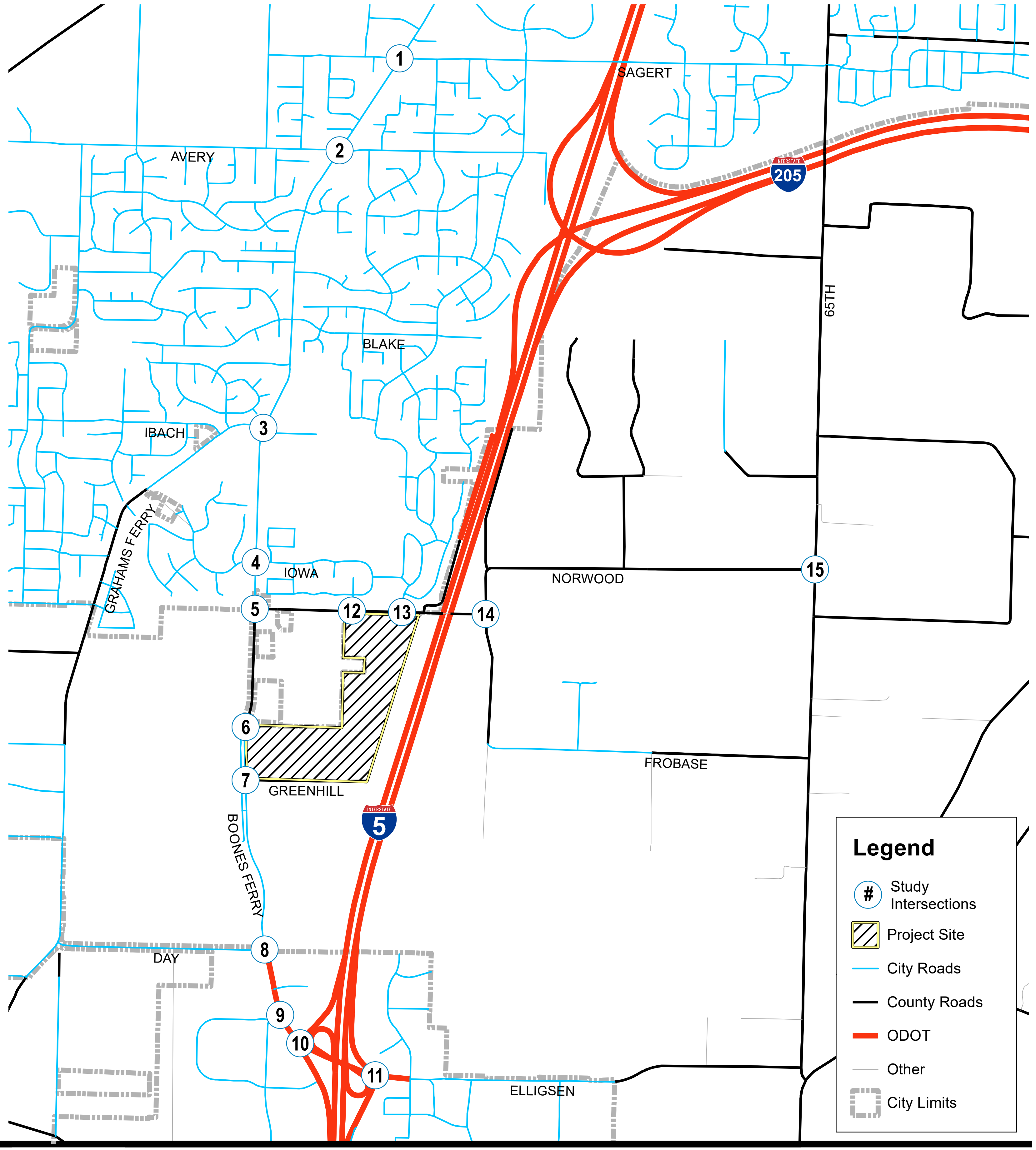
TRAFFIC VOLUMES

Background Conditions 2024

NOT TO SCALE

Figure 5A
Autumn Sunrise Subdivision TIS
9/9/2021





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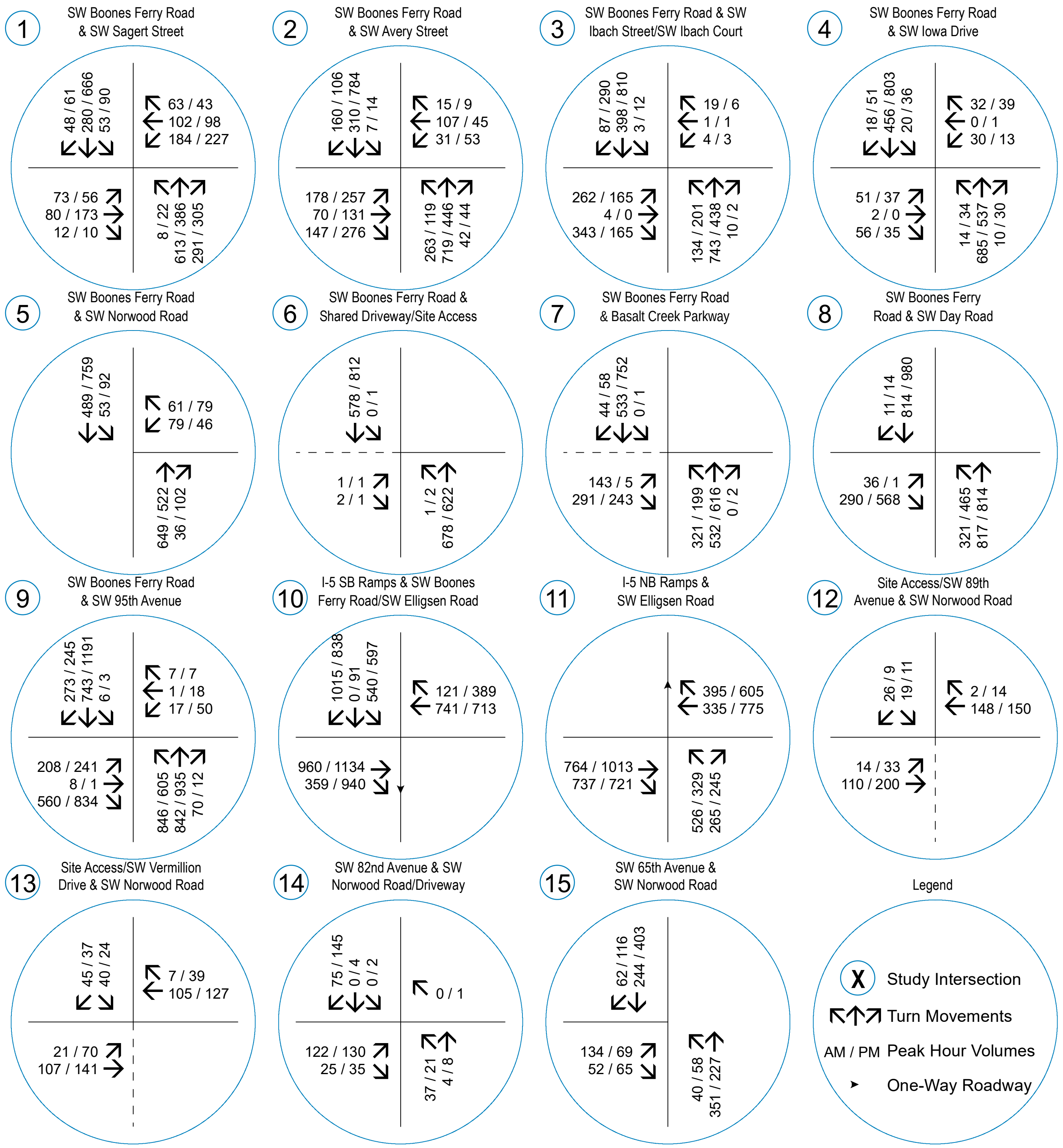
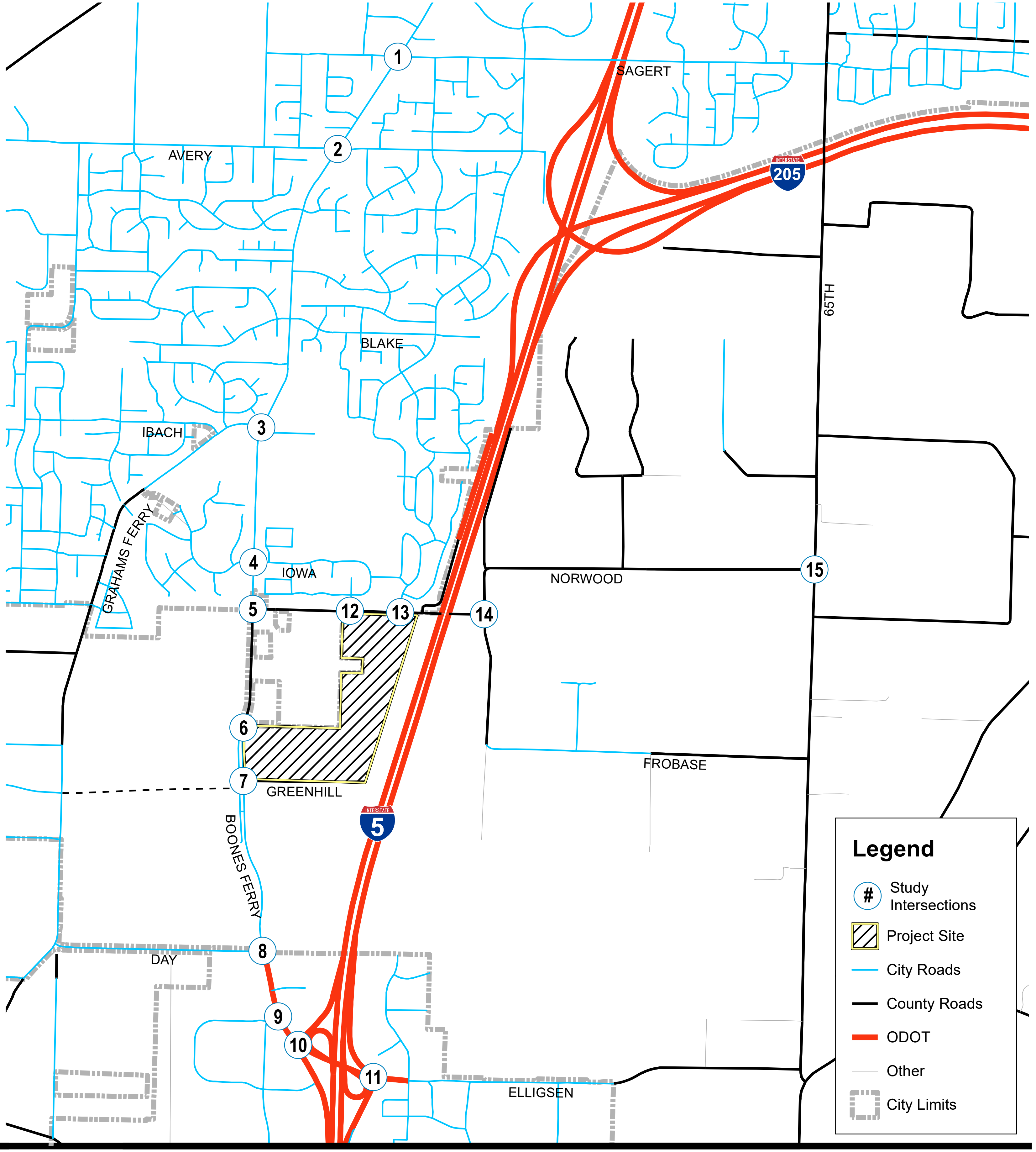
TRAFFIC VOLUMES

Background Conditions 2026

NOT TO SCALE

Figure 5B
Autumn Sunrise Subdivision TIS
6/24/2021





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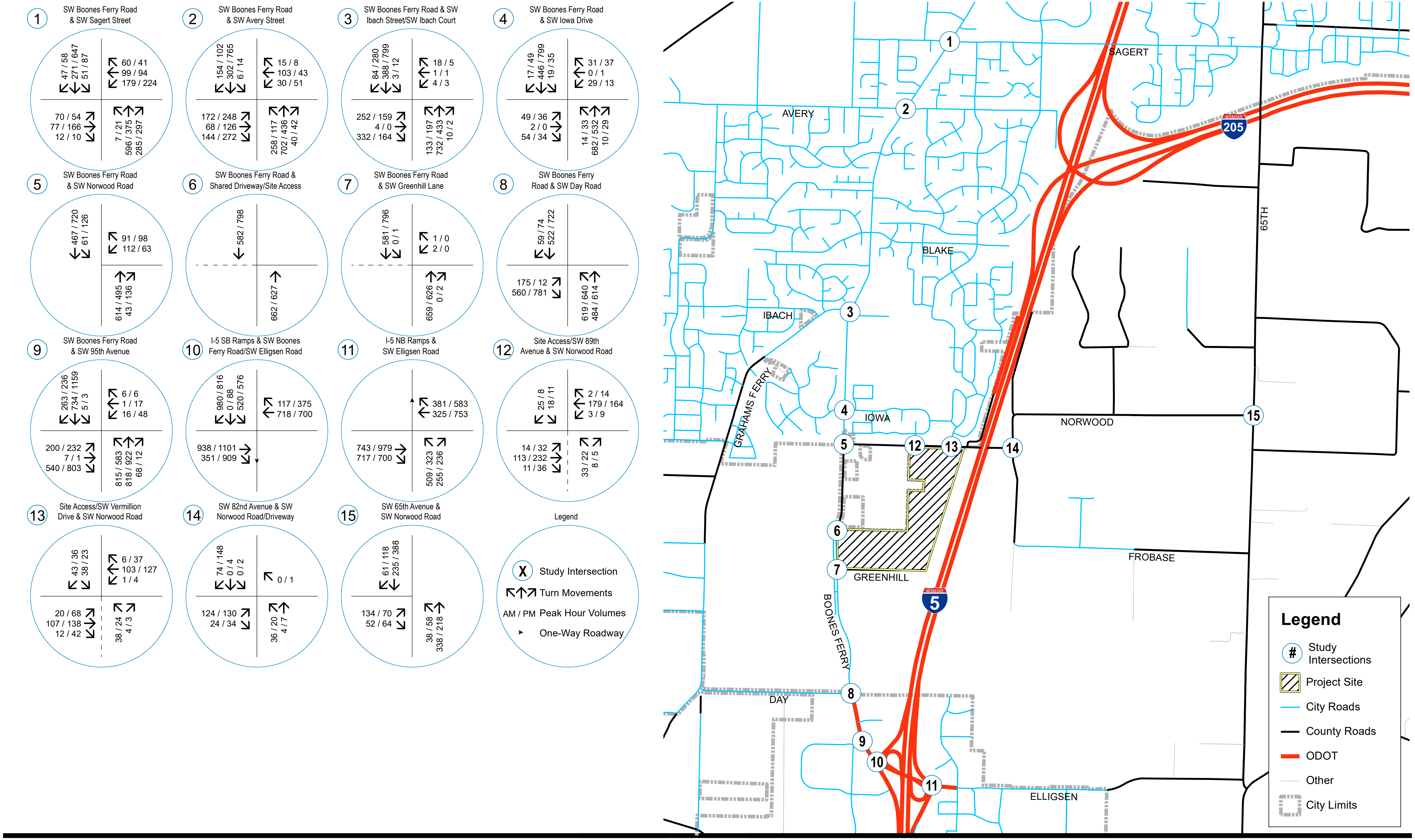
TRAFFIC VOLUMES

Background Conditions 2026 with Basalt Creek Extension

NOT TO SCALE

Figure 5C
Autumn Sunrise Subdivision TIS
6/25/2021



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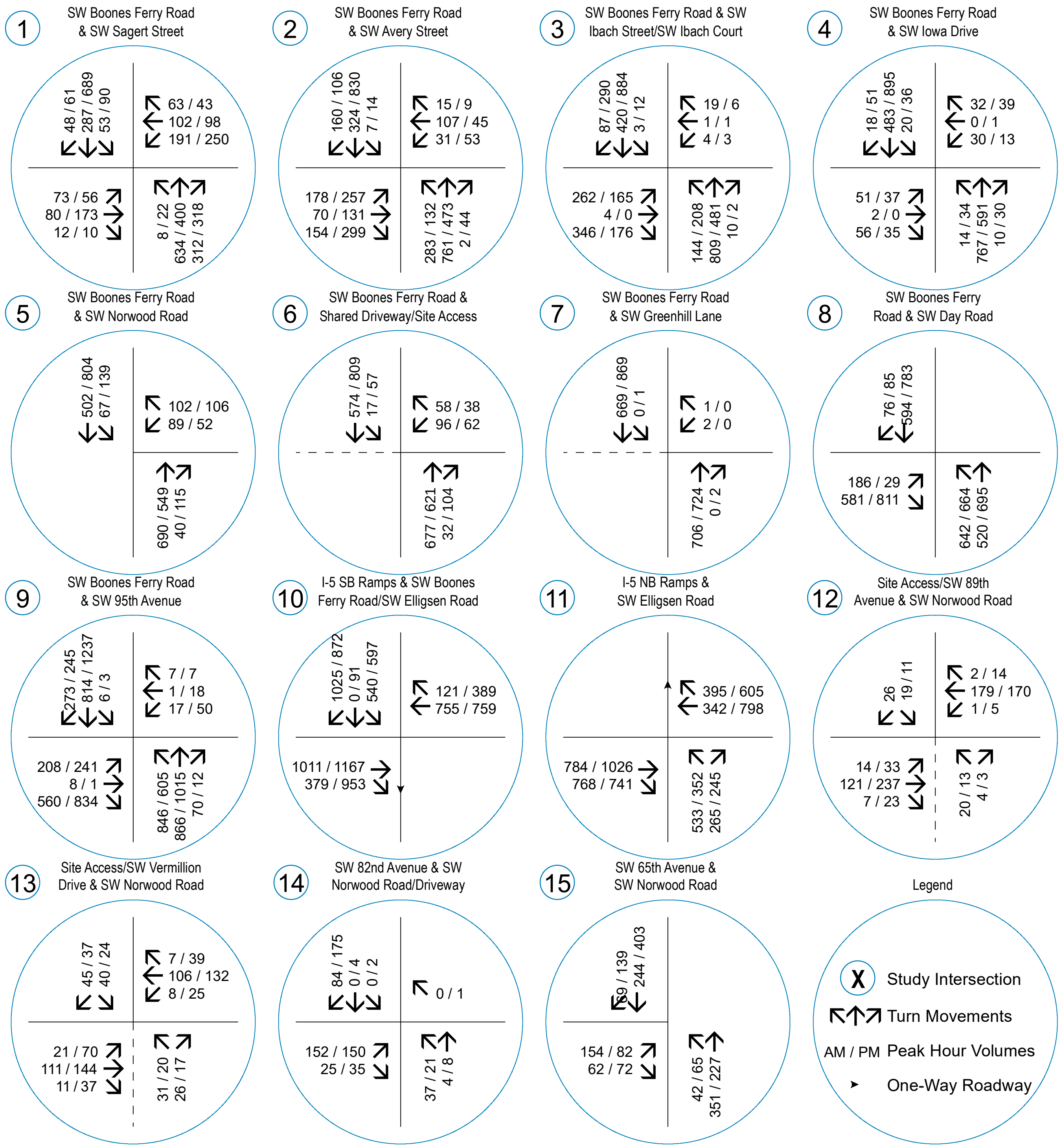
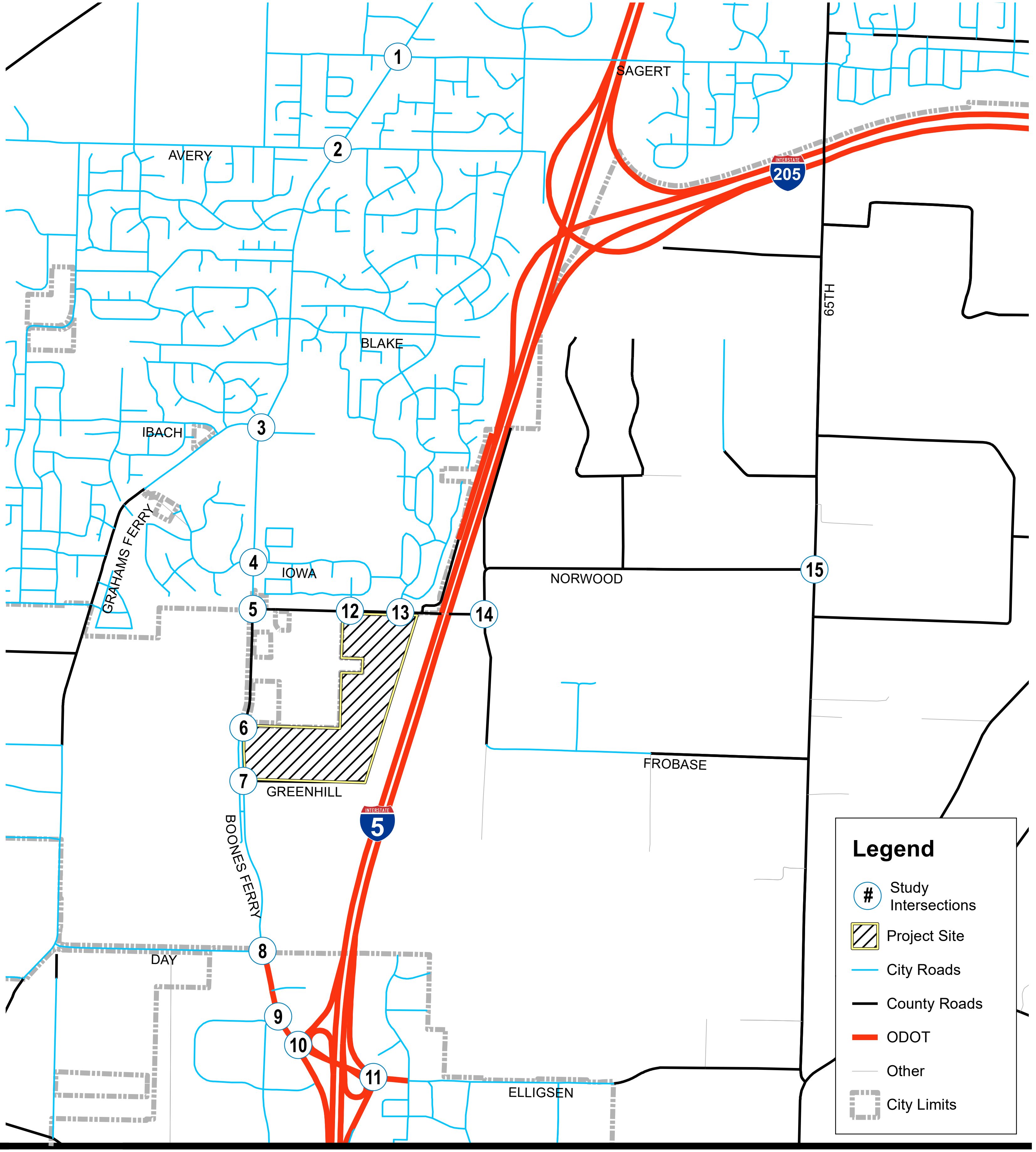
TRAFFIC VOLUMES

Buildout Conditions 2024

NOT TO SCALE

Figure 6A
Autumn Sunrise Subdivision TIS
9/9/2021





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TRAFFIC VOLUME

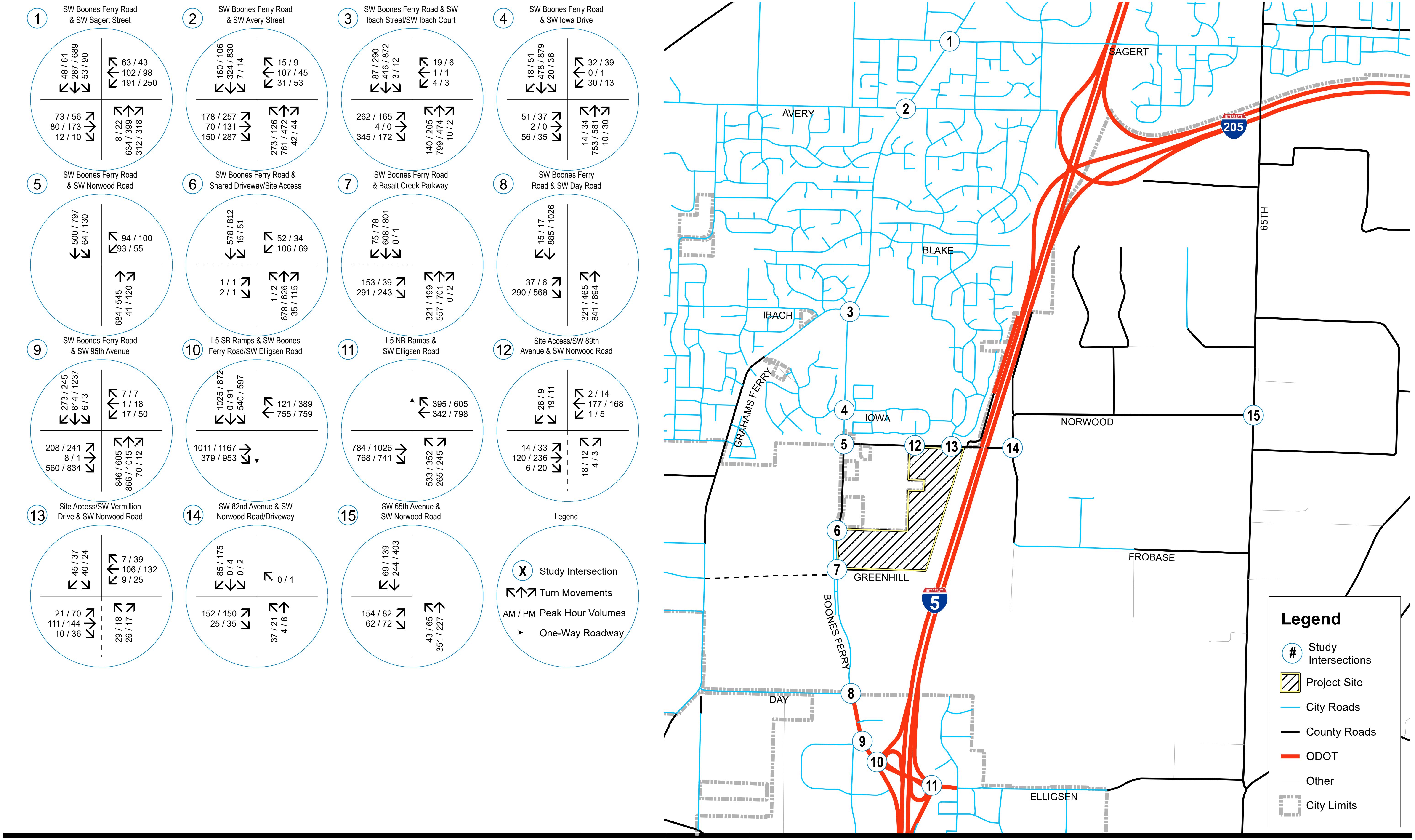
Buildout Conditions 2026

NOT TO SCALE

Figure 6B

Autumn Sunrise Subdivision TIS

6/24/2021



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TRAFFIC VOLUME

Buildout Conditions 2026 with Basalt Creek Extension

NOT TO SCALE

Figure 6C
Autumn Sunrise Subdivision TIS
6/24/2021

Safety Analysis

Crash History Review

Using data obtained from ODOT's Crash Data System, a review of approximately five years of the most recent available crash history (January 2015 through December 2019) was performed at the study intersections. The crash data was evaluated based on the number of crashes, the type of collisions, and the severity of the collisions. Crash severity is based on injuries sustained by people involved in the crash, and includes five categories:

- Property Damage Only (PDO)
- Possible Injury (Injury C)
- Non-Incapacitating Injury (Injury B)
- Incapacitating Injury (Injury A)
- Fatality or Fatal Injury

Crash rates provide the ability to compare safety risks at different intersections by accounting for both the number of crashes that have occurred during the study period and the number of vehicles that typically travel through the intersection. Crash rates were calculated using the common assumption that traffic counted during the evening peak period represents approximately 10 percent of the annual average daily traffic (ADT) at the intersection.

Table 6 provides a summary of crash types while Table 7 summarizes crash severities and rates for each of the study intersections. Detailed ODOT crash reports are included in Appendix C.

Table 6: Crash Type Summary

Intersection		Crash Type								Total Crashes
		Rear End	Turning	Fixed Object	Angle	Bicycle	Head On	Ped Involved	Sideswipe	
1	SW Boones Ferry Road & SW Sagert Street	8	7	0	2	2	0	0	0	19
2	SW Boones Ferry Road & SW Avery Street	17	4	2	0	0	0	0	0	23
3	SW Boones Ferry Road & SW Ibach Street/Court	3	1	1	0	0	0	1	0	6
4	SW Boones Ferry Road & SW Iowa Drive	1	2	0	0	2	0	0	0	5
5	SW Boones Ferry Road & SW Norwood Road	1	3	1	0	0	0	0	0	5
8	SW Boones Ferry Road & SW Day Road	9	2	1	0	0	1	0	1	14
9	SW Boones Ferry Road & SW 95th Avenue	3	1	1	0	0	0	0	0	5

Table 6: Crash Type Summary

Intersection		Crash Type								Total Crashes
		Rear End	Turning	Fixed Object	Angle	Bicycle	Head On	Ped Involved	Sideswipe	
10	I-5 Southbound Off-Ramp & SW Elligsen Road	30	7	0	2	0	0	0	0	39
11	I-5 Northbound Off-Ramp & SW Elligsen Road	18	2	0	1	0	0	0	0	21
15	SW 65th Avenue & SW Norwood Road	1	1	0	0	0	0	0	0	2

Table 7: Crash Severity and Rate Summary

Intersection		Crash Severity					Total Crashes	PHV	Crash Rate	90th % Rate
		PDO	C	B	A	Fatal				
1	SW Boones Ferry Road & SW Sagert Street	8	6	4	1	0	19	1,968	0.53	0.860
2	SW Boones Ferry Road & SW Avery Street	14	8	1	0	0	23	2,101	0.60	0.860
3	SW Boones Ferry Road & SW Ibach Street	1	4	1	0	0	6	1,918	0.17	0.860
4	SW Boones Ferry Road & SW Iowa Drive	1	1	2	1	0	5	1,411	0.19	0.408
5	SW Boones Ferry Road & SW Norwood Road	4	1	0	0	0	5	1,429	0.19	0.293
8	SW Boones Ferry Road & SW Day Road	7	6	0	1	0	14	2,621	0.29	0.509
9	SW Boones Ferry Road & SW 95th Avenue	4	1	0	0	0	5	3,814	0.07	0.860
10	I-5 Southbound Off-Ramp & SW Elligsen Road	25	13	1	0	0	39	4,428	0.48	0.509
11	I-5 Northbound Off-Ramp & SW Elligsen Road	9	11	1	0	0	21	3,469	0.33	0.509
15	SW 65th Avenue & SW Norwood Road	1	0	1	0	0	2	845	0.13	0.293

Crash Severity

None of the crashes reported in the five-year analysis period resulted in a fatality but three of the crashes resulted in an incapacitating injury (Type A):

- A turning collision reported at the intersection of SW Boones Ferry Road at SW Sagert Street resulted in two incapacitating injuries. The crash involved three vehicles with the driver at fault making an improper turn.
- A turning collision reported at the intersection of SW Boones Ferry Road at SW Iowa Drive resulted in one incapacitating injury. The crash involved two vehicles with the driver at fault failing to yield the right of way.
- A fixed object collision reported at the intersection of SW Boones Ferry Road at SW Day Road resulted in one incapacitating injury. The crash involved a single vehicle on a rainy day with the driver at fault driving improperly

Pedestrian and Bicycle Collisions

Four of the report crashes involved a bicyclist and one of the reported crashes involved a pedestrian:

- A bicyclist traveling southbound on SW Boones Ferry Road was reportedly struck by a westbound vehicle on SW Sagert Street making a right turn. The bicyclist sustained Type B (non-incapacitating) injuries and the driver was reported at fault.
- A bicyclist riding westbound on the sidewalk on SW Sagert Street was reportedly struck by a vehicle backing northbound from an alley near SW Boones Ferry Road. The bicyclist sustained Type B (non-incapacitating) injuries and the driver was reported as having an obstructed view.
- A pedestrian walking southbound in the west crosswalk was reportedly struck by a northbound vehicle making a left turn onto SW Ibach Street. The pedestrian sustained Type C (possible) injuries and the driver was report at fault for disregarding the traffic signal.
- A bicyclist traveling northbound on SW Boones Ferry Road was reportedly struck by a northbound vehicle making a right turn onto SW Iowa Drive. The bicyclist sustained Type B (non-incapacitating) injuries and the driver was reported at fault.
- A bicyclist traveling northbound on SW Boones Ferry Road was reportedly struck by a northbound vehicle making a left turn onto SW Iowa Drive. The bicyclist sustained Type B (non-incapacitating) injuries and the driver was reported at fault.

ODOT 90th Percentile Crash Rates

Intersection crash rates were compared to the published statewide 90th percentile crash rates within ODOT's Analysis Procedures Manual (APM). According to Exhibit 4-1: Intersection Crash Rates per MEV by Land Type and Traffic Control in the APM, intersections which experience crash rates in excess of 90th percentile crash rates should be "flagged for further analysis".

None of the intersections in the study area were calculated to have crash rates that exceed the 90th percentile crash rates for the intersection type.

ODOT SPIS Review

According to the ODOT TransGIS website, none of the study area intersections were listed in the worst 15 percent of ODOT's 2019 Safety Priority Index System (SPIS) list.

Washington County SPIS List

One of the study area intersections is listed in the Washington County 2015-2017 SPIS List. The intersection of SW Day Road is ranked 323 of 365 based on 11 crashes over a three-year period. The crash analysis shows that most (65 percent) crashes were rear-end collisions and the severity was generally low.

Conclusion

Based on a review of the most recent five years of available crash data, no significant trends or crash patterns were identified at any of the study intersections. Accordingly, no safety mitigation is recommended per the crash data analysis.

Sight Distance

Both SW Boones Ferry Road and SW Norwood Road are under Washington County jurisdiction so intersection sight distance (ISD) was measured and evaluated in accordance with Washington County Community Development Code (CDC) Section 501-8.5.F. Sight distance measurements were made from an entering driver's eye height of 3.5 feet above the roadway surface 15 feet behind the curb line/edge of pavement of the intersecting street to the position of an oncoming vehicle in the major-street traffic lane 4.25 feet above the roadway.

SW Boones Ferry Road Site Access

At the proposed site access on SW Boones Ferry Road, the posted speed is 45 mph, and the roadway has a bike lane which shifts the closest travel lane approximately 7 feet from the curb. Assuming a travel speed 5 mph over the posted speed results in an intersection sight distance requirement of 500 feet. Observations at the proposed site access show that at least 500 feet is available looking in either direction as measured from the edge of the closest vehicular travel lane. Photos are included in Appendix C.

SW Norwood Road Site Accesses

At the proposed site accesses on SW Norwood Road, the posted speed is 45 mph, and the roadway has no bike facilities. Assuming a travel speed 5 mph over the posted speed results in an intersection sight distance requirement of 500 feet. Due to foliage along the roadside, accurate sight distance measurements cannot be taken along the future roadway frontage. SW Norwood Road is straight and horizontal curvature is not anticipated to be an issue. The elevation profiles show that vertical curvature is unlikely to be an issue as well. Based on this preliminary assessment, the 500-foot sight distance requirement is expected to be satisfied at both site accesses on SW Norwood Road. The profiles are included in Appendix C.

Access Spacing

Since all site access will be taken from roadways under Washington County jurisdiction, the county access requirements in in Article V of the Community Development Code apply.

SW Boones Ferry Road Site Access

For SW Boones Ferry Road with an arterial classification, the access spacing standard is 600 feet measured between the edge of travel lanes or easements on both sides of the roadway.

To the south, the proposed site access is planned to be approximately 560 feet north of SW Greenhill Lane and aligned opposite a future frontage road connection on the west side of the street, as requested by Washington County. This frontage road is currently closed but will likely be opened when the Basalt Creek Parkway is extended. Siting the driveway further to the north to meet the 600-foot standard on the east side would create an offset intersection but the offset would not create the hazard where vehicles traveling in opposing directions could meet head on in the center refuge lane. However, when measuring the spacing from driveways on the opposite side of the street, the standards would still not be met.

To the north, the proposed site access is planned to be approximately 150 feet south an existing access serving some of the Horizon Christian School facilities. Overall spacing will be improved with consolidation this access, the school facilities access, and the Plambeck Gardens access on the east side of the street. Thus, on the east side of SW Boones Ferry Road, the main entrance to the school would become the closest access at more than 800 feet. On the west side of SW Boones Ferry Road, a driveway serving a single-family home will be the closest access at approximately 270 feet.

SW Norwood Road Site Accesses

For SW Norwood Road with a collector classification, the access spacing standard is 100 feet measured between the edge of travel lanes or easements on both sides of the roadway. Both proposed site accesses will meet this standard.

Warrant Analysis

Turn lane warrants and preliminary traffic signal warrants were examined for the study intersections where such treatments would be applicable. A supplemental memorandum addressing potential development of the commercial parcels abutting SW Boones Ferry Road is included in Appendix E. This memorandum includes warrant evaluations for several potential commercial development scenarios of different intensities.

Left-Turn Lane Warrants

SW Boones Ferry Road already has a center refuge lane that would be serve as a left-turn lane for the site access at that location; however, left-turn lanes are not present on SW Norwood Road. The left-turn lane warrants were examined at the two site accesses on SW Norwood Road using the methodology outlined in the National Cooperative Highway Research Program Report (NCHRP) 457, published by the Transportation Research Board in 2001. These turn-lane warrants are evaluated based on the number of left-turning vehicles, the number of advancing and opposing vehicles, and the roadway travel speed. The results are summarized in Table 8 for year 2026 conditions with full buildout of the proposed development. Detailed information on the warrant analysis is included in Appendix C.

Table 8: Summary of Left-Turn Lane Warrant Evaluation

Intersection & Scenario & Direction	Warrant Met?	
	Morning Peak	Evening Peak
12. SW 89th Ave/Site Access SW Norwood Road		
2026 Buildout – Phases 1–4 – Eastbound	No	No
2026 Buildout – Phases 1–4 – Westbound	No	No
13. SW Vermillion Drive/Site Access SW Norwood Road		
2026 Buildout – Phases 1–4 – Eastbound	No	No
2026 Buildout – Phases 1–4 – Westbound	No	No

As shown in Table 8, left-turn lane warrants are not met at either proposed site access intersection for either peak hour under the 2026 buildout scenario for any analysis period or direction of travel.

Right-Turn Lane Warrants

Right-turn lane warrants were examined all three site accesses using and ODOT methodology. These turn-lane warrants were evaluated based on the number of right-turning vehicles, the number of advancing vehicles, and the roadway travel speed. The results are summarized in Table 9 for Year 2024 conditions with Phases 1 and 2 and Year 2026 conditions with full buildout of the proposed development. Detailed information on the warrant analysis is included in Appendix C.

Table 9: Summary of Right-Turn Lane Warrant Evaluation

Intersection & Scenario	Warrant Met?	
	Morning Peak	Evening Peak
6. SW Boones Ferry Road/Site Access – Northbound		
2026 Buildout – Phases 1–4	Yes	Yes
12. SW 89th Avenue/Site Access/SW Norwood Road – Eastbound		
2024 Buildout – Phases 1–2	No	Yes
2026 Buildout – Phases 1–4	No	No
13. SW Vermillion Drive/Site Access/SW Norwood Road – Eastbound		
2024 Buildout – Phases 1–2	No	No
2026 Buildout – Phases 1–4	No	No

As shown in Table 9, right-turn lane warrants are met at the proposed site access on SW Boones Ferry Road under the 2026 buildout scenario for both analysis periods. Given the 45-mph posted speed and higher traffic volumes, a northbound turn lane is recommended at this access.

Right-turn lane warrants are not met at either proposed site access on SW Norwood Road for either peak hour under the 2026 buildout scenario for any analysis period. The warrant is initially met at the site access opposite

SW 89th Avenue at SW Norwood Road under 2024 Buildout conditions; however, the lane is not needed once the site access at SW Boones Ferry Road is opened. Therefore, no right-turn lane is recommended.

Preliminary Traffic Signal Warrants

Preliminary traffic signal warrants were examined at the unsignalized study area intersections to determine whether the installation of a new traffic signal will be warranted at these intersections upon completion of the proposed development. The results are summarized in Table 10 for Year 2024 conditions with Phases 1 and 2 and Year 2026 conditions with full buildout of the proposed development. Detailed information on the warrant analysis is included in Appendix C.

Table 10: Summary of Preliminary Traffic Signal Warrant Evaluation

Intersection & Scenario	Warrant Met?	
	Based on Morning Peak	Based on Evening Peak
4. SW Iowa Street at SW Boones Ferry Road		
2026 Buildout – Phases 1–4	No	No
5. SW Norwood Road at SW Boones Ferry Road		
2024 Buildout – Phase 1–2	No	No
2026 Buildout – Phases 1–4	No	No
6. Site Access/Frontage Road at SW Boones Ferry Road		
2026 Buildout – Phases 1–4	No	No
12. SW 89th Avenue/Site Access/SW Norwood Road		
2024 Buildout – Phase 1–2	No	No
2026 Buildout – Phases 1–4	No	No
13. SW Vermillion Drive/Site Access/SW Norwood Road		
2024 Buildout – Phase 1–2	No	No
2026 Buildout – Phases 1–4	No	No
14. SW 82nd Avenue & SW Norwood Road		
2026 Buildout – Phases 1–4	No	No
15. SW 65th Avenue &R SW Norwood Road		
2026 Buildout – Phases 1–4	No	No

As shown in Table 10, traffic signal warrants are not met at any of these intersection for either peak hour under either buildout scenario for any analysis period.

Operational Analysis

The operations of the transportation were evaluated for the morning and evening peak hours for existing conditions and the future scenarios without and with the proposed development presented in this TIS. A supplemental memorandum addressing potential development of the commercial parcels abutting SW Boones Ferry Road is included in Appendix E. This memorandum includes operations analysis for several potential commercial development scenarios of different intensities.

Intersection Capacity Analysis

A capacity and delay analysis were conducted for each of the study intersections per the signalized and unsignalized intersection analysis methodologies in the *Highway Capacity Manual* (HCM)[2]. Intersections are generally evaluated based on the average control delay experienced by vehicles and are assigned a grade according to their operation. The level of service (LOS) of an intersection can range from LOS A, which indicates very little, or no delay experienced by vehicles, to LOS F, which indicates a high degree of congestion and delay. The volume-to-capacity (v/c) ratio is a measure that compares the traffic volumes (demand) against the available capacity of an intersection.

The analysis was performed using the Synchro (version 10) software which applies the HCM6 methodologies for all but one signalized intersection. At the intersection of the I-5 Southbound Ramps at SW Elligsen Road, the intersection has a nonstandard signal phasing plan that is not accepted by HCM6. Therefore, the HCM2000 methodology was applied at this intersection.

The overall signalized v/c ratios were calculated following the methodologies in Chapter 16 of the ODOT APM for the critical intersection v/c ratio. This methodology was performed for all signalized intersections.

Performance Standards

The following agency performance standards are applicable in the study area:

- The **City of Tualatin** requires intersections to operate at a minimum D and E for signalized and unsignalized intersections, respectively.
- **Washington County** requires intersections to operate with a v/c ratio of 0.99 or less.
- **ODOT** has a target v/c ratio of 0.99 or less for facilities inside Metro except for intersections with highway ramps, which have a target v/c ratio of 0.85.

Delay & Capacity Analysis

The LOS, delay, and v/c results of the capacity analysis are shown in Table 11 for the morning and evening peak hours and six scenarios. Detailed calculations as well as tables showing the relationship between delay and LOS are included in Appendix D.

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[2] Transportation Research Board, *Highway Capacity Manual 6th Edition*, 2016.

Table 11: Capacity Analysis Summary

Intersection & Scenario	Performance Standard	Morning Peak Hour			Evening Peak Hour		
		LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
1. SW Boones Ferry Road & SW Sagert Street							
2021 Existing	D	C	21	0.83	C	21	0.82
2024 Background		C	27	0.87	C	24	0.85
2024 Buildout (Phases 1-2)		C	28	0.88	C	24	0.86
2026 Background		C	30	0.90	C	25	0.88
2026 Buildout (Phases 1-4)		D	35	0.94	C	27	0.91
2026 Buildout w/ BCPE		D	35	0.94	C	27	0.91
2. SW Boones Ferry Road & SW Avery Street							
2021 Existing	E	C	20	0.82	C	34	0.92
2024 Background		C	22	0.84	C	32	0.92
2024 Buildout (Phases 1-2)		C	23	0.85	C	34	0.93
2026 Background		C	25	0.87	D	37	0.96
2026 Buildout (Phases 1-4)		C	28	0.89	D	46	1.01
2026 Buildout w/ BCPE		C	28	0.89	D	44	0.99
3. SW Boones Ferry Road & SW Ibach Street							
2021 Existing	E	B	18	0.78	B	19	0.75
2024 Background		C	21	0.80	C	21	0.79
2024 Buildout (Phases 1-2)		C	23	0.80	C	22	0.81
2026 Background		C	24	0.83	C	23	0.82
2026 Buildout (Phases 1-4)		C	29	0.86	C	27	0.86
2026 Buildout w/ BCPE		C	28	0.86	C	26	0.85
4. SW Boones Ferry Road & SW Iowa Drive							
2021 Existing	E	E	50	0.61	F	52	0.49
2024 Background		F	72	0.75	F	71	0.61
2024 Buildout (Phases 1-2)		F	86	0.81	F	85	0.67
2026 Background		F	100	0.87	F	92	0.70
2026 Buildout (Phases 1-4)		F	165	1.06	F	158	0.90
2026 Buildout w/ BCPE		F	153	1.02	F	140	0.85

Table 11: Capacity Analysis Summary

Intersection & Scenario	Performance Standard	Morning Peak Hour			Evening Peak Hour		
		LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
5. SW Boones Ferry Road & SW Norwood Road							
2021 Existing	E	C	22	0.40	C	17	0.28
2024 Background		C	24	0.45	C	18	0.31
2024 Buildout (Phases 1-2)		E	38	0.71	C	25	0.49
2026 Background		D	27	0.51	C	21	0.36
2026 Buildout (Phases 1-4)		E	42	0.72	D	27	0.51
2026 Buildout w/ BCPE		E	40	0.70	D	26	0.5
6. SW Boones Ferry Road & Shared Driveway							
2026 Buildout (Phases 1-4)	E	C	21	0.33	C	21	0.23
2026 Buildout w/ BCPE		D	27	0.43	D	27	0.31
7. SW Boones Ferry Road & Greenhill Lane							
2021 Existing	0.99	B	14	0.01	A	9	0.00
2024 Background		B	15	0.01	A	9	0.00
2024 Buildout (Phases 1-2)		B	15	0.01	A	9	0.00
2026 Background		C	15	0.01	A	9	0.00
2026 Buildout (Phases 1-4)		C	16	0.01	A	9	0.00
2026 Buildout w/ BCPE		C	16	0.01	A	9	0.00
8. SW Boones Ferry Road & SW Day Road							
2021 Existing	0.99	D	37	0.62	C	31	0.61
2024 Background		D	38	0.65	D	42	0.71
2024 Buildout (Phases 1-2)		D	38	0.67	D	50	0.75
2026 Background		D	38	0.65	D	52	0.78
2026 Buildout (Phases 1-4)		D	37	0.73	D	50	0.79
2026 Buildout w/ BCPE		B	19	0.52	C	34	0.67
9. SW Boones Ferry Road & SW 95th Avenue							
2021 Existing	0.99	C	26	0.74	C	23	0.76
2024 Background		C	26	0.78	C	23	0.81
2024 Buildout (Phases 1-2)		C	26	0.79	C	23	0.81
2026 Background		C	26	0.82	C	23	0.84
2026 Buildout (Phases 1-4)		C	26	0.85	C	22	0.86
2026 Buildout w/ BCPE		C	26	0.85	C	23	0.86

Table 11: Capacity Analysis Summary

Intersection & Scenario	Performance Standard	Morning Peak Hour			Evening Peak Hour		
		LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
10. I-5 Southbound Off-Ramp & SW Elligsen Road							
2021 Existing	0.85	C	22	0.86	C	22	0.65
2024 Background		C	25	0.91	C	22	0.70
2024 Buildout (Phases 1-2)		C	25	0.92	C	22	0.72
2026 Background		C	28	0.96	C	21	0.74
2026 Buildout (Phases 1-4)		C	29	0.96	C	21	0.78
2026 Buildout w/ BCPE		C	29	0.96	C	20	0.78
11. I-5 Northbound Off-Ramp & SW Elligsen Road							
2021 Existing	0.85	C	23	0.42	A	8	0.41
2024 Background		C	23	0.45	A	8	0.43
2024 Buildout (Phases 1-2)		C	24	0.45	A	9	0.44
2026 Background		C	24	0.46	A	9	0.45
2026 Buildout (Phases 1-4)		C	24	0.47	A	9	0.46
2026 Buildout w/ BCPE		C	24	0.47	A	9	0.46
12. SW 89th Avenue/Site Access & SW Norwood Road							
2021 Existing	0.99	B	10	0.07	B	10	0.03
2024 Background		B	10	0.07	B	11	0.03
2024 Buildout (Phases 1-2)		B	12	0.09	B	13	0.06
2026 Background		B	10	0.08	B	11	0.03
2026 Buildout (Phases 1-4)		B	12	0.09	B	13	0.04
2026 Buildout w/ BCPE		B	12	0.08	B	13	0.04
13. SW Vermillion Drive/Site Access & SW Norwood Road							
2021 Existing	0.99	B	10	0.12	B	11	0.12
2024 Background		B	10	0.13	B	12	0.13
2024 Buildout (Phases 1-2)		B	12	0.13	C	16	0.14
2026 Background		B	10	0.14	B	12	0.14
2026 Buildout (Phases 1-4)		B	11	0.15	B	14	0.16
2026 Buildout w/ BCPE		B	11	0.15	B	13	0.14

Table 11: Capacity Analysis Summary

Intersection & Scenario	Performance Standard	Morning Peak Hour			Evening Peak Hour		
		LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
14. SW 82nd Avenue & SW Norwood Road							
2021 Existing	0.99	B	11	0.07	B	11	0.09
2024 Background		B	11	0.08	B	12	0.09
2024 Buildout (Phases 1-2)		B	12	0.09	B	12	0.10
2026 Background		B	11	0.09	B	12	0.10
2026 Buildout (Phases 1-4)		B	12	0.11	B	13	0.11
2026 Buildout w/ BCPE		B	12	0.1	B	13	0.11
15. SW 65th Avenue &R SW Norwood Road							
2021 Existing	0.99	C	19	0.41	C	18	0.32
2024 Background		C	21	0.46	C	19	0.36
2024 Buildout (Phases 1-2)		C	22	0.50	C	20	0.39
2026 Background		C	23	0.52	C	21	0.40
2026 Buildout (Phases 1-4)		D	27	0.61	C	24	0.49
2026 Buildout w/ BCPE		D	27	0.61	C	24	0.49
SW Boones Ferry Road & Basalt Creek Parkway Extension							
2026 Buildout w/ BCPE	0.99	C	29	0.86	C	21	0.72

Notes:
BCPE = Basalt Creek Parkway Extension
Locations that do not meet standards are BOLDED.

Three intersections show operational results that do not meet standards under at least one scenario.

SW Boones Ferry Road at SW Avery Road

The intersection of SW Boones Ferry Road at SW Avery Street is expected to operate acceptably under all scenarios except the 2026 Buildout conditions where the overall v/c ratio is expected to exceed capacity. With construction of the Basalt Creek Parkway Extension, the intersection is expected to remain congested but would meet the City of Tualatin LOS standard and demand would not exceed capacity.

Another consideration at this intersection is the amount of forecast traffic growth used in this analysis. For background traffic estimates, all study area volumes were grown at an annual rate of 2 percent per year. By 2026, the background growth alone is estimated at 10 percent. With the added traffic from the Plambeck Gardens site as well as the proposed development, the overall growth in volumes at this intersection is estimated at 15.3 percent in the AM peak hour and 16.2 percent during the PM peak hour. A review of historical trends on SW Avery Street from ODOT's Transportation Data Management System shows growth is relatively slow, averaging less than 1 percent per year. Similar trends are present on SW Boones Ferry Road at locations north of SW Sagert Street and north of SW Norwood Road. These trends indicate that the forecasts used in the analysis are very conservative representations of traffic volume forecasts and the intersection is likely to operate better than the analysis shows.

Although the Tualatin TSP does identify that this intersection will exceed capacity in the long-range forecast (2035), it does not identify any mitigation to address the deficiency.

Based on the operational analysis, which shows that construction of the Basalt Creek Parkway Extension is expected to result in improved operations, and the conservatively high estimates of forecast growth, no mitigation is recommended at this intersection.

SW Boones Ferry Road at SW Iowa Drive

The intersection of SW Boones Ferry Road at SW Iowa Drive is expected to operate with LOS F conditions under all scenarios and demand is expected to exceed capacity under 2026 Buildout conditions during the morning peak hour. Signal warrants are not met at this intersection.

Field observations show that the eastbound approach operates with separate left- and right-turn lanes even though no lane striping is present. The width of the pavement is approximately 40 feet, which allows drivers to naturally create the two lanes so that right turns can be made without having to wait behind a left-turning vehicle. Analysis shows that approach delays are lower, and capacity is adequate when a right-turn lane is added to the eastbound approach.

The westbound approach does not have the same width and cannot as easily accommodate this lane configuration.

The traffic volume forecasts at this intersection are also conservatively high at this intersection, which contributes to the substantial increases in delay forecast for the side streets. The proposed development will not add any traffic to SW Iowa Drive, all traffic is anticipated to travel through on SW Boones Ferry Road.

Since signal warrants are not met and field observations show that delays are lower because the eastbound approach operates with a separate right-turn lane during congested conditions, no mitigation is recommended. However, the City could consider striping separate left- and right-turn lanes on the eastbound approach to formalize the lane configuration.

I-5 Southbound Off-Ramp & SW Elligsen Road

The intersection of the I-5 Southbound Off-Ramp at SW Elligsen Road is expected to operate with a v/c ratio that exceeds the OHP mobility target of 0.85 for freeway ramps for the morning peak hour for the existing condition and all subsequent scenarios.

The 2018 Regional Transportation Plan (RTP) includes Project 11489 at the I-5 Southbound Off-Ramp at SW Boones Ferry (SW Elligsen Road) in the Financially-Constrained project list. The project would construct a second right-turn lane on the exit ramp with the primary purpose to “relieve current congestion” with a secondary objective to “relieve future congestion.” The City of Wilsonville is the nominating agency although the project is on an ODOT facility.

As shown in Table 12, with the addition of the second southbound lane on the off-ramp, the ramps would operate well below the 0.85 mobility target.

Table 12: Capacity Analysis Summary – I-5 Southbound Off-Ramp with RTP Improvement

Intersection & Scenario	Performance Standard	AM Peak Hour			PM Peak Hour		
		LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
10. I-5 Southbound Off-Ramp & SW Elligsen Road							
2026 Background	0.85	C	20	0.63	B	17	0.60
2026 Buildout (Phases 1-4)		C	20	0.66	B	17	0.61

Although the RTP project acknowledges that conditions are currently congested, the time period for the improvement is identified as 2028-2040 with an estimated cost of $1.06 million in 2016 dollars. This project is not in the current 2021-2024 Statewide Transportation Improvement Program (STIP). The 2024-2027 STIP will have more than $2 billion in funding to preserve and improve the state transportation system, but projects have not been identified to date.

During the morning peak hour, when the intersection exceeds the mobility target, the proposed development will contribute less than 2.5 percent of the total traffic through the intersection under the 2026 buildout scenario and only 1.0 percent of the traffic on the off-ramp. The difference between the year 2024 background and buildout conditions is 0.01 in the v/c ratio and less than a second of average delay. The difference between the year 2026 background and buildout conditions is negligible for the v/c ratio and about a second of average delay.

Based on the planned improvements for the interchange that are part of the financially-constrained RTP and the relatively small impact of the proposed development, no project mitigation is recommended for this intersection.

Queue Storage

An analysis of queuing was conducted for the site access to review the storage requirements for the site access intersection at SW Boones Ferry Road. The analysis was conducted based on the results of a SimTraffic simulation. Five (5) simulations were conducted, averaged, and the 95th percentile queue estimates were rounded up to the nearest 25 feet, or the approximate length of one vehicle to estimate the queue lengths. Findings include:

- Maximum queues were estimated at two vehicles or 50 feet for the southbound left, which can easily be accommodated in the existing center refuge lane. The recommended striping for the southbound left-turn lane should include 100 feet of storage and the appropriate deceleration for the 45-mph posted speed.
- The northbound left will rarely have a queue since frontage road to the west will only serve a few homes. This lane is recommended to be striped as a two-way, left-turn lane to allow for a two-stage westbound left-turn movement from the site access.
- Maximum queues were estimated at six vehicles or 150 feet for the westbound left-movement with a two-lane approach for the site access. These queues will not affect the closest public street connection ("M" Street) to the east.

Conclusions

Key findings of this study include:

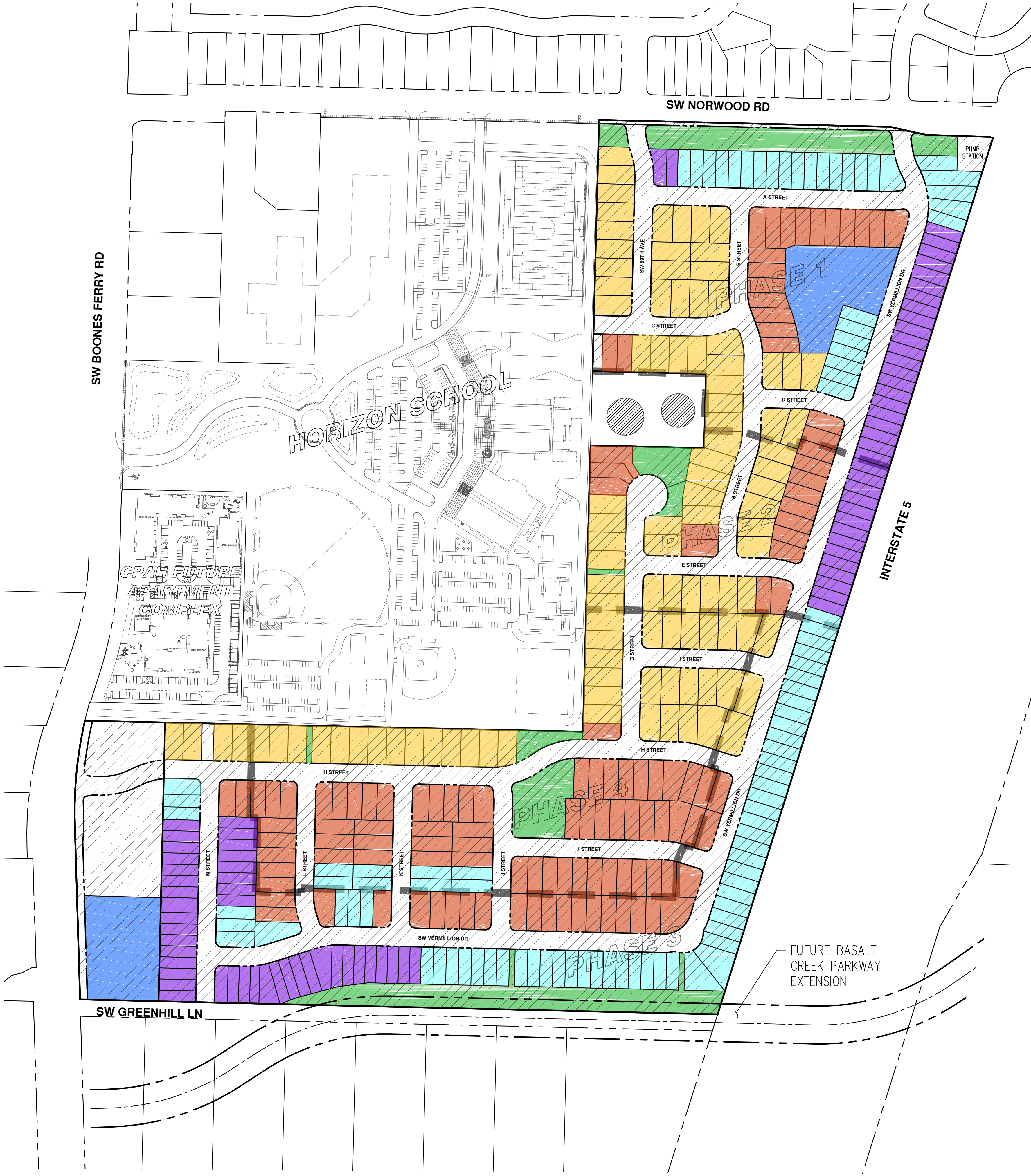
1. The proposed development is estimated to generate 271 morning peak hour, 358 evening peak hour, and 3,596 daily trips.
2. Based on a review of the most recent five years of available crash data, no significant trends or crash patterns were identified at any of the study intersections. Accordingly, no safety mitigation is recommended per the crash data analysis.
3. At the proposed site access on SW Boones Ferry Road, field observations show that at least 500 feet is available looking in either direction as measured from the edge of the closest vehicular travel lane.
4. At the proposed site accesses on SW Norwood Road, dense foliage restricts existing sight lines; however, preliminary assessment or horizontal and vertical curvature indicate that the 500-foot sight distance requirement is expected to be satisfied.
5. On SW Boones Ferry Road, the access spacing standard of 600 feet will not be met with construction of the access aligned opposite a future frontage road connection on the west side of the street, as requested by Washington County. Overall spacing will be improved with consolidation of access on the east side of the street.
6. On SW Norwood Road, the access spacing standard of 100 feet will be met with construction of the site accesses aligned opposite existing roadways.
7. Left-turn lane warrants are not met at either proposed site access intersection on SW Norwood Road for either peak hour under the 2026 buildout scenario for any analysis period or direction of travel.
8. Right-turn lane warrants are met at the proposed site access on SW Boones Ferry Road under the 2026 buildout scenario for both analysis periods. Given the 45-mph posted speed and higher traffic volumes, a northbound turn lane is recommended at this access.
9. Right-turn lane warrants are not met at either proposed site access intersection on SW Norwood Road for either peak hour under the 2026 buildout scenario for any analysis period. The warrant is initially met at the site access opposite SW 89th Avenue at SW Norwood Road under 2024 Buildout conditions; however, the lane is not needed once the site access at SW Boones Ferry Road is opened. Therefore, no right-turn lane is recommended.
10. Traffic signal warrants are not met at any unsignalized intersection in the study area under either buildout scenario for any analysis period.
11. Three intersections show operational results that do not meet standards under at least one scenario:
    - The intersection of SW Boones Ferry Road at SW Avery Street is expected to operate acceptably under all scenarios except the 2026 Buildout conditions without the Basalt Creek Parkway extension. Based on the operational analysis, which shows that construction of the Basalt Creek Parkway Extension is expected to result in improved operations, and the conservatively high estimates of forecast growth, no mitigation is recommended at this intersection.

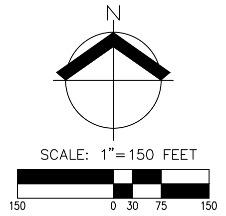
  - The intersection of SW Boones Ferry Road at SW Iowa Drive is expected to operate with LOS F conditions under all scenarios and demand is expected to exceed capacity under 2026 Buildout conditions during the morning peak hour. Since signal warrants are not met and field observations show that delays are lower because the eastbound approach operates with a separate right-turn lane during congested conditions, no mitigation is recommended. However, the City could consider striping separate left- and right-turn lanes on the eastbound approach to formalize the lane configuration.
  - The intersection of the I-5 Southbound Off-Ramp at SW Elligsen Road is expected to operate with a v/c ratio that exceeds the OHP mobility target of 0.85 for freeway ramps for the morning peak hour for the existing condition and all subsequent scenarios. The 2018 RTP includes Project 11489 in the financially-constrained list, which would construct a second right-turn lane on the exit ramp. With this improvement, the ramps would operate well below the 0.85 mobility target. Although the RTP project acknowledges that conditions are currently congested, the time period for the improvement is identified as 2028-2040. Since the planned improvements for the interchange are part of the financially-constrained RTP and the contributing volumes and impact of the proposed development is relatively small, no project mitigation is recommended for this intersection.
- All other study area intersections are projected to operate acceptably per each applicable performance standard under all analysis scenarios; no other mitigation is recommended.
- Storage recommendations for the site access intersection at SW Boones Ferry Road include:
  - Maximum queues were estimated at two vehicles or 50 feet for the southbound left, which can easily be accommodated in the existing center refuge lane. The recommended striping for the southbound left-turn lane should include 100 feet of storage and the appropriate deceleration for the 45-mph posted speed.
  - The northbound left will rarely have a queue since frontage road to the west will only serve a few homes. This lane is recommended to be striped as a two-way, left-turn lane to allow for a two-stage westbound left-turn movement from the site access.
  - Maximum queues were estimated at six vehicles or 150 feet for the westbound left-movement with a two-lane approach for the site access. These queues will not affect the closest public street connection (“M” Street) to the east.

Appendix A – Site Data

Site Plan

Trip Generation





▨ - CH ZONING

▨ - RML ZONING

DENSITY CALCULATIONS

RML ZONE	SQ. FT.	ACRES
GROSS SITE AREA:	± 2,688,206	± 61.71
PUBLIC R.O.W. DEDICATION AREA:	± 629,282	± 14.45
CITY RESERVIOR DEDICATION OPEN SPACE AREA:	± 12,879	± 0.30
PRIVATE STREET/ACCESS AREA:	± 5,718	± 0.13
STORMWATER FACILITY AREA:	± 155,691	± 3.57
COMMERCIAL AREA:	± 87,960	± 2.02
PUMP STATION DEDICATION AREA:	± 7,709	± 0.18
NET DEVELOPABLE:	± 1,788,967	± 41.07
AUTUMN SUNRISE SUBDIVISION		
MAXIMUM DENSITY (10 DU PER ACRE)	411	LOTS
MINIMUM DENSITY (7 DU PER ACRE)	287	LOTS

REQUIRED OPEN SPACE AREA (5% GROSS):	± 134,410	SQ. FT.
OPEN SPACE PROVIDED:	± 168,629	SQ. FT.

PLANNED DENSITY:	400	LOTS
AVERAGE LOT AREA (ALL DU):	± 4,151	SQ. FT.
AVERAGE LOT AREA FOR SF DETACHED DU	± 4,411	SQ. FT.
AVERAGE LOT AREA FOR SF ATTACHED DU	± 3,109	SQ. FT.

MAXIMUM LOT SIZE	± 7,731	SQ. FT.
MINIMUM LOT SIZE	± 2,546	SQ. FT.

LOT DIMENSION	HOUSE TYPE	PH-1	PH-2	PH-3	PH-4	TOTAL UNITS
50'x100'	Detached	35	25	7	35	102
40'x100'	Detached	21	15	25	60	121
34'x100'	Detached	29	1	59	8	97
29'x100'	Attached	24	14	42	-	80
	TOTAL UNITS	109	55	133	103	400

AKS DRAWING FILE: 7454 PRODUCT DIST.DWG | LAYOUT: PP-00

PRODUCT DISTRIBUTION PLAN
AUTUMN SUNRISE SUBDIVISON
LENNAR NORTHWEST, INC.
TUALATIN, OREGON

LENNAR®

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
503.563.6151
WWW.AKS-ENG.COM

ENGINEERING · SURVEYING · NATURAL RESOURCES
FORESTRY · PLANNING · LANDSCAPE ARCHITECTURE

PRELIMINARY

84806PE
DARKO SIMIC
RENEWAL DATE: 6/30/22

JOB NUMBER: 7454
DATE: 06/23/2021
DESIGNED BY: JSM
DRAWN BY: JSM
CHECKED BY: DS

PO-04

TRIP GENERATION CALCULATIONS

Land Use: Single-Family Detached Housing
Land Use Code: 210
Setting/Location General Urban/Suburban
Variable: Dwelling Units
Variable Value: 320

AM PEAK HOUR

Trip Equation: $T = 0.71(X) + 4.80$

	Enter	Exit	Total
Directional Distribution	25%	75%	
Trip Ends	58	174	232

PM PEAK HOUR

Trip Equation: $Ln(T)=0.96Ln(X)+0.20$

	Enter	Exit	Total
Directional Distribution	63%	37%	
Trip Ends	195	115	310

WEEKDAY

Trip Equation: $Ln(T)=0.92Ln(X)+2.71$

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	1,516	1,516	3,032

SATURDAY

Trip Equation: $Ln(T)=0.94Ln(X)+2.56$

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	1,464	1,464	2,928

Source: Trip Generation Manual, Tenth Edition

TRIP GENERATION CALCULATIONS

Land Use: Multifamily Housing (Low-Rise)
Land Use Code: 220
Setting/Location General Urban/Suburban
Variable: Dwelling Units
Variable Value: 80

AM PEAK HOUR

Trip Equation: Ln(T)=0.95Ln(X)-0.51

	Enter	Exit	Total
Directional Distribution	23%	77%	
Trip Ends	9	30	39

PM PEAK HOUR

Trip Equation: Ln(T)=0.89Ln(X)-0.02

	Enter	Exit	Total
Directional Distribution	63%	37%	
Trip Ends	30	18	48

WEEKDAY

Trip Equation: T=7.56(X)-40.86

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	282	282	564

SATURDAY

Trip Equation: T=14.01(X)-521.69

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	300	300	600

Source: TRIP GENERATION, Tenth Edition

Appendix B – Traffic Counts

Traffic Counts

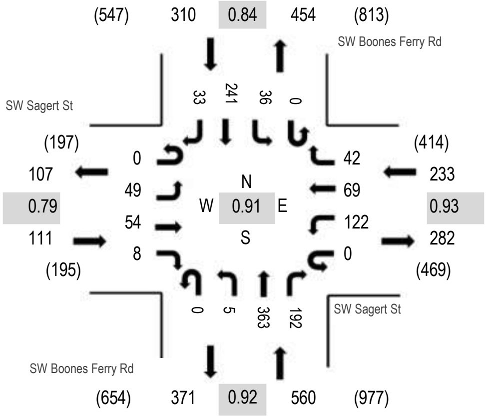
In Process Traffic

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

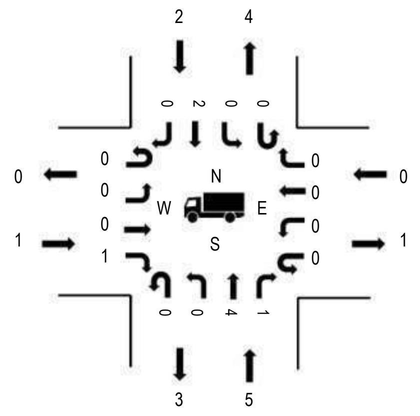
Location: 1 SW Boones Ferry Rd & SW Sagert St AM
Date: Thursday, May 6, 2021
Peak Hour: 07:30 AM - 08:30 AM
Peak 15-Minutes: 07:50 AM - 08:05 AM

Peak Hour

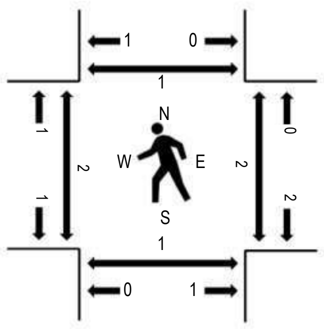
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.9%	0.79
WB	0.0%	0.93
NB	0.9%	0.92
SB	0.6%	0.84
All	0.7%	0.91

Traffic Counts - Motorized Vehicles

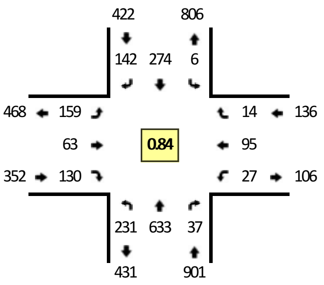
Interval Start Time	SW Sagert St Eastbound				SW Sagert St Westbound				SW Boones Ferry Rd Northbound				SW Boones Ferry Rd Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
7:00 AM	0	4	2	0	0	5	4	1	0	1	25	8	0	2	10	2	64	1,008
7:05 AM	0	3	2	0	0	7	2	0	0	0	18	4	0	0	13	4	53	1,054
7:10 AM	0	4	6	0	0	5	5	1	0	0	9	8	0	2	10	1	51	1,105
7:15 AM	0	3	2	0	0	10	4	4	0	0	20	4	0	3	9	1	60	1,160
7:20 AM	0	4	1	0	0	8	5	2	0	2	25	16	0	1	16	5	85	1,189
7:25 AM	0	4	4	0	0	10	6	2	0	1	34	7	0	2	9	4	83	1,209
7:30 AM	0	5	3	0	0	6	2	6	0	1	31	3	0	3	20	0	80	1,214
7:35 AM	0	7	4	0	0	11	12	2	0	1	37	14	0	5	16	3	112	1,206
7:40 AM	0	2	2	0	0	11	2	3	0	0	34	11	0	5	23	4	97	1,201
7:45 AM	0	3	6	0	0	8	8	5	0	1	38	13	0	1	15	2	100	1,186
7:50 AM	0	5	7	3	0	11	10	4	0	0	30	14	0	2	28	5	119	1,186
7:55 AM	0	4	3	0	0	6	5	2	0	1	30	21	0	5	23	4	104	1,153
8:00 AM	0	8	6	0	0	11	10	4	0	0	23	21	0	2	24	1	110	1,125
8:05 AM	0	5	4	1	0	6	5	2	0	0	29	27	0	3	19	3	104	
8:10 AM	0	0	7	2	0	14	3	3	0	0	34	19	0	0	20	4	106	
8:15 AM	0	2	5	0	0	16	4	3	0	0	22	19	0	3	12	3	89	
8:20 AM	0	6	4	2	0	12	6	2	0	1	27	18	0	1	26	0	105	
8:25 AM	0	2	3	0	0	10	2	6	0	0	28	12	0	6	15	4	88	
8:30 AM	0	2	3	0	0	10	2	3	0	0	19	11	0	2	17	3	72	
8:35 AM	0	5	2	1	0	10	6	6	0	1	31	15	0	1	26	3	107	
8:40 AM	0	4	4	1	0	11	3	2	0	1	21	15	0	1	17	2	82	
8:45 AM	0	4	7	0	0	10	4	3	0	1	31	9	0	5	22	4	100	
8:50 AM	0	2	5	0	0	10	2	3	0	0	28	14	0	4	16	2	86	
8:55 AM	0	1	4	0	0	7	5	3	0	0	28	10	0	1	13	4	76	
Count Total	0	89	96	10	0	225	117	72	0	12	652	313	0	60	419	68	2,133	
Peak Hour	0	49	54	8	0	122	69	42	0	5	363	192	0	36	241	33	1,214	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
7:00 AM	0	1	0	0	1	7:00 AM	0	0	0	0	0	7:00 AM	0	0	0	1	1
7:05 AM	0	0	0	0	0	7:05 AM	0	0	0	0	0	7:05 AM	0	0	0	3	3
7:10 AM	0	0	0	0	0	7:10 AM	0	0	1	0	1	7:10 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0	7:15 AM	0	0	0	0	0	7:15 AM	0	0	0	3	3
7:20 AM	0	0	0	0	0	7:20 AM	0	0	0	0	0	7:20 AM	0	0	0	1	1
7:25 AM	0	0	0	0	0	7:25 AM	0	0	0	0	0	7:25 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0	7:30 AM	0	0	0	0	0	7:30 AM	0	0	0	0	0
7:35 AM	0	1	0	0	1	7:35 AM	0	0	0	0	0	7:35 AM	0	1	1	0	2
7:40 AM	0	0	0	1	1	7:40 AM	0	0	0	0	0	7:40 AM	0	0	0	0	0
7:45 AM	0	1	0	0	1	7:45 AM	0	0	0	0	0	7:45 AM	0	0	0	0	0
7:50 AM	0	1	0	1	2	7:50 AM	0	0	0	0	0	7:50 AM	1	0	0	0	1
7:55 AM	0	0	0	0	0	7:55 AM	0	0	0	0	0	7:55 AM	0	0	0	1	1
8:00 AM	0	2	0	0	2	8:00 AM	0	0	0	0	0	8:00 AM	0	0	0	0	0
8:05 AM	0	0	0	0	0	8:05 AM	0	0	0	0	0	8:05 AM	0	0	0	0	0
8:10 AM	1	0	0	0	1	8:10 AM	0	1	0	0	1	8:10 AM	1	0	0	0	1
8:15 AM	0	0	0	0	0	8:15 AM	0	0	0	0	0	8:15 AM	0	0	0	0	0
8:20 AM	0	0	0	0	0	8:20 AM	0	0	0	1	1	8:20 AM	0	0	1	0	1
8:25 AM	0	0	0	0	0	8:25 AM	0	0	0	0	0	8:25 AM	0	0	0	0	0
8:30 AM	0	0	0	1	1	8:30 AM	0	0	0	0	0	8:30 AM	0	0	0	0	0
8:35 AM	0	0	0	0	0	8:35 AM	0	0	0	0	0	8:35 AM	0	0	0	1	1
8:40 AM	0	0	0	0	0	8:40 AM	0	0	0	0	0	8:40 AM	0	0	0	0	0
8:45 AM	0	1	0	0	1	8:45 AM	0	0	0	0	0	8:45 AM	0	0	0	0	0
8:50 AM	0	0	0	0	0	8:50 AM	0	0	0	0	0	8:50 AM	0	0	0	0	0
8:55 AM	0	0	0	0	0	8:55 AM	0	0	0	0	0	8:55 AM	0	2	0	0	2
Count Total	1	7	0	3	11	Count Total	0	1	1	1	3	Count Total	2	3	2	10	17
Peak Hour	1	5	0	2	8	Peak Hour	0	1	0	1	2	Peak Hour	2	1	2	1	6

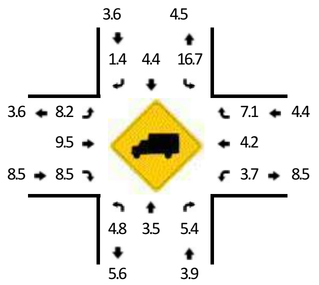
Type of peak hour being reported: Intersection Peak Method for determining peak hour: Total Entering Volume

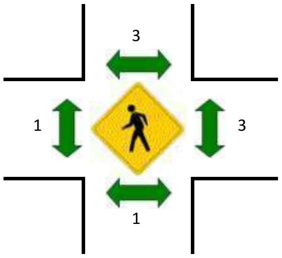
LOCATION: SW Boones Ferry Rd -- SW Avery St **QC JOB #:** 15109507
CITY/STATE: Washington, OR **DATE:** Tue, Oct 29 2019

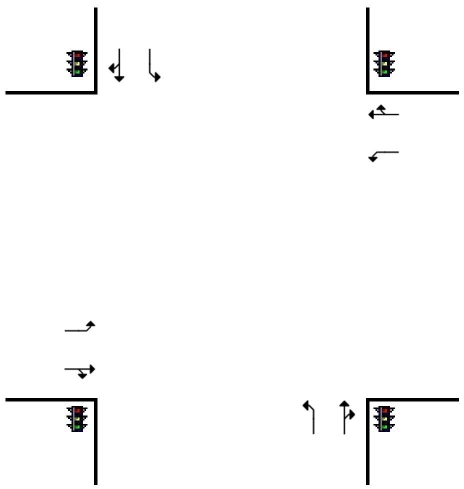


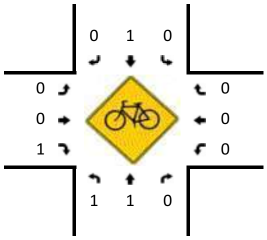
Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 7:35 AM -- 7:50 AM

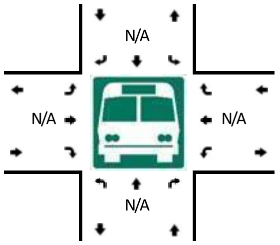
Quality Counts
DATA THAT DRIVES COMMUNITIES

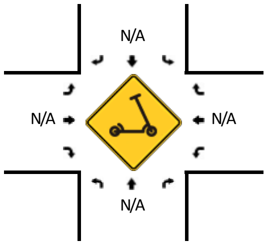












5-Min Count Period Beginning At	SW Boones Ferry Rd (Northbound)				SW Boones Ferry Rd (Southbound)				SW Avery St (Eastbound)				SW Avery St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:30 AM	20	52	1	0	0	27	16	0	16	3	5	0	2	7	2	0	151	
7:35 AM	32	59	1	0	0	21	20	0	18	7	15	0	2	13	0	0	188	
7:40 AM	23	45	3	0	3	23	9	0	17	5	19	0	3	8	4	0	162	
7:45 AM	17	63	3	0	0	34	22	0	15	3	16	0	6	7	0	0	186	
7:50 AM	20	47	0	0	0	28	9	0	12	4	11	0	2	14	2	0	149	
7:55 AM	22	65	2	0	0	26	14	0	6	4	14	0	5	10	0	0	168	
8:00 AM	16	55	2	0	1	24	9	0	17	11	9	0	1	12	3	0	160	
8:05 AM	13	52	8	0	0	17	12	0	12	10	13	0	2	8	1	0	148	
8:10 AM	13	69	6	0	0	12	10	0	15	4	4	0	1	5	1	0	140	
8:15 AM	21	53	7	0	2	15	7	0	13	9	7	0	1	4	0	0	139	
8:20 AM	16	42	3	0	0	25	8	0	11	0	11	0	1	4	0	0	121	
8:25 AM	18	31	1	0	0	22	6	0	7	3	6	0	1	3	1	0	99	1811

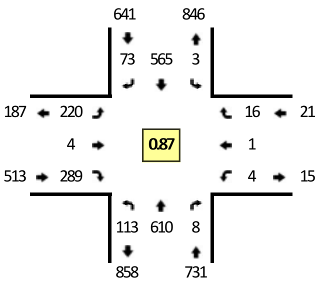
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	288	668	28	0	12	312	204	0	200	60	200	0	44	112	16	0	2144
Heavy Trucks	8	20	0		4	8	0		4	20	16		4	4	0		88
Buses																	
Pedestrians		0				4				4				4			12
Bicycles	0	0	0		0	4	0		0	0	0		0	0	0		4
Scooters																	

Comments:

Report generated on 5/7/2021 4:34 PM SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

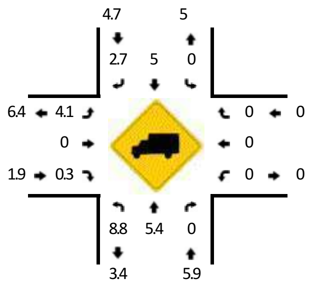
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

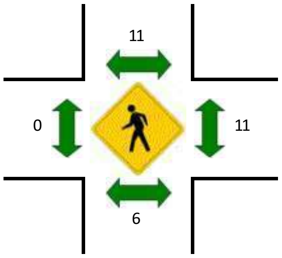
LOCATION: SW Boones Ferry Rd -- SW Ibach St | **QC JOB #:** 14391101
CITY/STATE: Tualatin, OR | **DATE:** Thu, Apr 27 2017

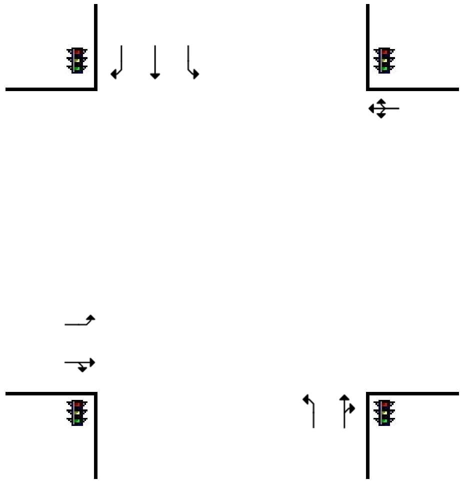


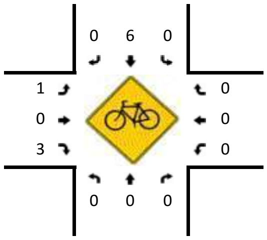
Peak-Hour: 7:10 AM -- 8:10 AM
Peak 15-Min: 7:40 AM -- 7:55 AM

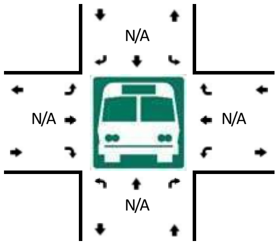
Quality Counts
DATA THAT DRIVES COMMUNITIES

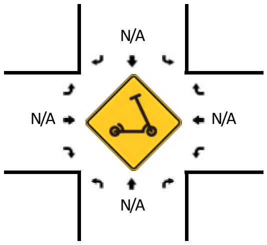












5-Min Count Period Beginning At	SW Boones Ferry Rd (Northbound)				SW Boones Ferry Rd (Southbound)				SW Ibach St (Eastbound)				SW Ibach St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	5	47	1	0	0	18	2	0	23	0	8	0	1	0	0	0	105	
7:05 AM	3	44	0	0	0	23	4	0	25	0	4	0	0	0	0	0	103	
7:10 AM	2	54	0	0	1	30	3	0	14	0	9	0	2	0	2	0	117	
7:15 AM	8	57	1	0	1	39	3	0	20	0	15	0	1	0	0	0	145	
7:20 AM	7	53	0	0	0	46	5	0	19	0	17	0	0	0	4	0	151	
7:25 AM	5	58	0	0	0	46	4	0	22	0	19	0	0	0	0	0	154	
7:30 AM	8	44	1	0	0	44	8	0	10	1	15	0	0	0	1	0	132	
7:35 AM	6	56	0	0	0	42	6	0	22	0	27	0	0	0	1	0	160	
7:40 AM	14	59	0	0	0	53	5	0	23	0	31	0	0	0	0	0	185	
7:45 AM	16	52	2	0	0	47	4	0	17	1	30	0	0	0	1	0	170	
7:50 AM	7	42	0	0	0	69	3	0	29	1	40	0	1	0	1	0	193	
7:55 AM	14	44	2	0	0	54	11	0	16	0	38	0	0	1	2	0	182	1797
8:00 AM	14	43	1	0	1	50	5	0	14	0	30	0	0	0	2	0	160	1852
8:05 AM	12	48	1	0	0	45	16	0	14	1	18	0	0	0	2	0	157	1906
8:10 AM	4	39	0	0	0	35	16	0	18	0	3	0	0	0	1	0	116	1905
8:15 AM	3	33	0	0	0	33	5	0	17	0	5	0	0	0	0	0	96	1856
8:20 AM	8	43	2	0	0	30	7	0	19	1	6	0	0	0	0	0	116	1821
8:25 AM	7	29	0	0	0	27	9	0	16	1	6	0	0	2	0	0	97	1764
8:30 AM	2	35	0	0	0	25	5	0	8	0	6	0	0	0	0	0	81	1713
8:35 AM	4	22	1	0	0	22	4	0	17	0	3	0	0	0	0	0	73	1626
8:40 AM	5	26	0	0	0	30	12	0	16	0	8	0	0	0	0	0	97	1538
8:45 AM	3	33	0	0	1	15	4	0	21	0	5	0	0	0	1	0	83	1451
8:50 AM	5	24	0	0	0	16	4	0	17	0	6	0	1	0	1	0	74	1332
8:55 AM	7	22	0	0	0	22	7	0	16	0	4	0	0	0	0	0	78	1228

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	148	612	8	0	0	676	48	0	276	8	404	0	4	0	8	0	2192
Heavy Trucks	4	12	0		0	12	0		8	0	0		0	0	0		36
Buses																	
Pedestrians		12				12				0				12			36
Bicycles	0	0	0		0	8	0		0	0	4		0	0	0		12
Scooters																	

Comments:

Report generated on 10/7/2020 10:23 AM

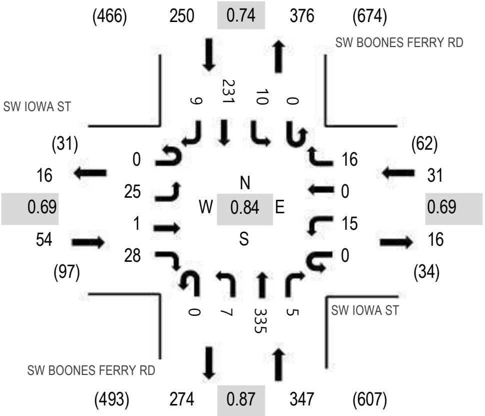
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

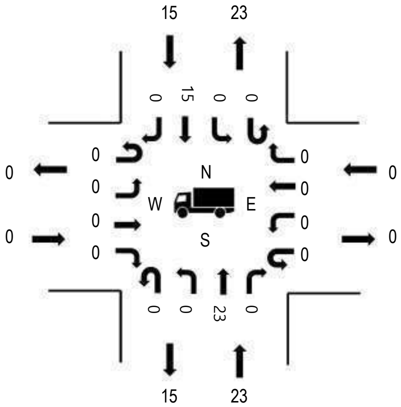
Location: 2 SW BOONES FERRY RD & SW IOWA ST AM
Date: Tuesday, September 29, 2020
Peak Hour: 07:15 AM - 08:15 AM
Peak 15-Minutes: 07:40 AM - 07:55 AM

Peak Hour

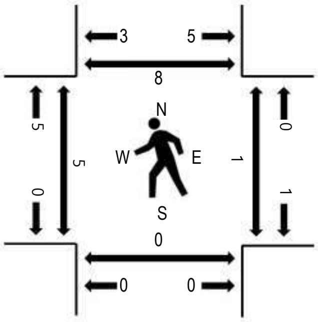
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.69
WB	0.0%	0.69
NB	6.6%	0.87
SB	6.0%	0.74
All	5.6%	0.84

Traffic Counts - Motorized Vehicles

Interval Start Time	SW IOWA ST Eastbound				SW IOWA ST Westbound				SW BOONES FERRY RD Northbound				SW BOONES FERRY RD Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
7:00 AM	0	2	0	0	0	0	0	1	0	0	30	0	0	1	17	1	52	673
7:05 AM	0	3	0	1	0	0	0	2	0	0	27	2	0	0	19	0	54	675
7:10 AM	0	2	0	0	0	0	0	0	0	0	24	0	0	0	15	0	41	670
7:15 AM	0	1	0	3	0	1	0	1	0	1	30	1	0	1	15	0	54	682
7:20 AM	0	0	0	0	0	1	0	0	0	0	25	0	0	0	20	0	46	669
7:25 AM	0	0	0	3	0	1	0	2	0	0	37	0	0	0	19	1	63	662
7:30 AM	0	2	0	3	0	1	0	2	0	1	31	1	0	1	14	0	56	640
7:35 AM	0	4	0	3	0	1	0	2	0	0	30	0	0	1	15	0	56	623
7:40 AM	0	1	1	3	0	1	0	0	0	2	33	0	0	1	23	2	67	607
7:45 AM	0	5	0	4	0	3	0	0	0	0	30	0	0	1	28	0	71	591
7:50 AM	0	3	0	1	0	1	0	4	0	0	25	0	0	1	28	1	64	575
7:55 AM	0	3	0	2	0	2	0	2	0	1	15	0	0	2	19	3	49	551
8:00 AM	0	4	0	3	0	2	0	1	0	2	24	2	0	0	15	1	54	559
8:05 AM	0	0	0	1	0	1	0	0	0	0	29	1	0	1	16	0	49	
8:10 AM	0	2	0	2	0	0	0	2	0	0	26	0	0	1	19	1	53	
8:15 AM	0	2	0	1	0	1	0	3	0	1	16	0	0	4	13	0	41	
8:20 AM	0	2	0	1	0	0	0	1	0	0	18	0	0	0	17	0	39	
8:25 AM	0	2	0	3	0	2	0	2	0	1	19	0	0	0	12	0	41	
8:30 AM	0	2	0	2	0	1	0	1	0	0	19	1	0	1	12	0	39	
8:35 AM	0	0	0	2	0	1	0	1	0	1	19	1	0	1	14	0	40	
8:40 AM	0	2	0	2	0	1	0	1	0	1	25	0	0	0	15	4	51	
8:45 AM	0	5	0	2	0	1	0	5	0	0	21	0	0	1	17	3	55	
8:50 AM	0	2	0	1	0	0	0	4	0	1	13	1	0	1	16	1	40	
8:55 AM	0	3	0	1	0	0	0	3	0	1	16	2	0	2	29	0	57	
Count Total	0	52	1	44	0	22	0	40	0	13	582	12	0	21	427	18	1,232	
Peak Hour	0	25	1	28	0	15	0	16	0	7	335	5	0	10	231	9	682	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

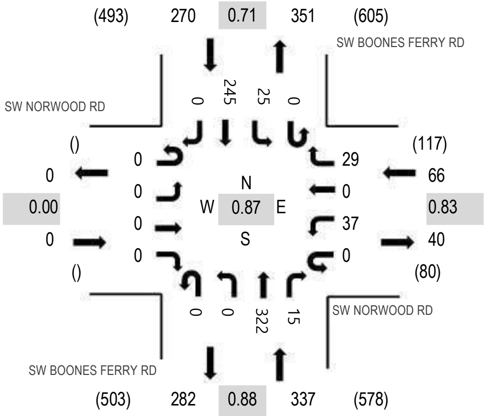
Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
7:00 AM	0	3	0	0	3	7:00 AM						7:00 AM	0	0	1	0	1
7:05 AM	0	1	0	0	1	7:05 AM						7:05 AM	1	0	0	0	1
7:10 AM	0	1	0	2	3	7:10 AM						7:10 AM	0	0	1	0	1
7:15 AM	0	0	0	0	0	7:15 AM						7:15 AM	0	0	1	0	1
7:20 AM	0	3	0	0	3	7:20 AM						7:20 AM	0	0	0	2	2
7:25 AM	0	0	0	0	0	7:25 AM						7:25 AM	0	0	0	1	1
7:30 AM	0	2	0	3	5	7:30 AM						7:30 AM	1	0	0	0	1
7:35 AM	0	2	0	1	3	7:35 AM						7:35 AM	0	0	0	2	2
7:40 AM	0	3	0	2	5	7:40 AM						7:40 AM	0	0	0	1	1
7:45 AM	0	1	0	2	3	7:45 AM						7:45 AM	3	0	0	0	3
7:50 AM	0	2	0	1	3	7:50 AM						7:50 AM	0	0	0	0	0
7:55 AM	0	1	0	0	1	7:55 AM						7:55 AM	0	0	0	2	2
8:00 AM	0	2	0	2	4	8:00 AM						8:00 AM	0	0	0	0	0
8:05 AM	0	2	0	1	3	8:05 AM						8:05 AM	0	0	0	0	0
8:10 AM	0	5	0	3	8	8:10 AM						8:10 AM	1	0	0	0	1
8:15 AM	0	0	0	3	3	8:15 AM						8:15 AM	0	0	0	0	0
8:20 AM	0	1	0	0	1	8:20 AM						8:20 AM	0	0	0	0	0
8:25 AM	0	1	0	0	1	8:25 AM						8:25 AM	0	0	2	0	2
8:30 AM	0	1	0	1	2	8:30 AM						8:30 AM	0	0	0	0	0
8:35 AM	0	2	0	2	4	8:35 AM						8:35 AM	0	0	0	0	0
8:40 AM	0	2	0	1	3	8:40 AM						8:40 AM	0	0	0	0	0
8:45 AM	0	1	0	2	3	8:45 AM						8:45 AM	1	0	0	1	2
8:50 AM	0	1	0	3	4	8:50 AM						8:50 AM	0	0	0	1	1
8:55 AM	0	0	0	4	4	8:55 AM						8:55 AM	0	0	0	0	0
Count Total	0	37	0	33	70	Count Total						Count Total	7	0	5	10	22
Peak Hour	0	23	0	15	38	Peak Hour						Peak Hour	5	0	1	8	14

(303) 216-2439
www.alltrafficdata.net

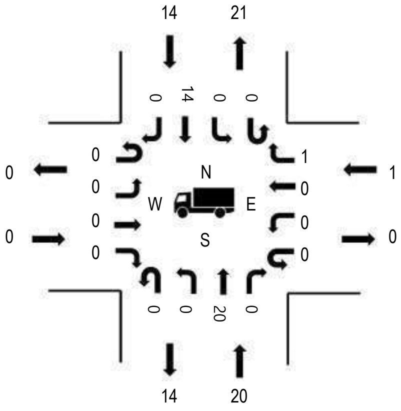
Location: 3 SW BOONES FERRY RD & SW NORWOOD RD AM
Date: Tuesday, September 29, 2020
Peak Hour: 07:10 AM - 08:10 AM
Peak 15-Minutes: 07:35 AM - 07:50 AM

Peak Hour

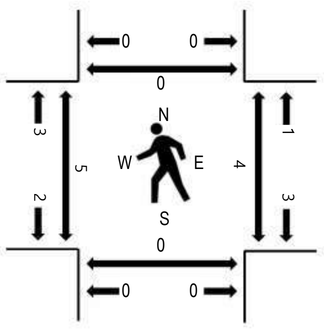
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.00
WB	1.5%	0.83
NB	5.9%	0.88
SB	5.2%	0.71
All	5.2%	0.87

Traffic Counts - Motorized Vehicles

Interval Start Time	SW NORWOOD RD Eastbound				SW NORWOOD RD Westbound				SW BOONES FERRY RD Northbound				SW BOONES FERRY RD Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
7:00 AM	0	0	0	0	0	1	0	1	0	0	30	0	0	3	18	0	53	665
7:05 AM	0	0	0	0	0	1	0	2	0	0	24	1	0	1	14	0	43	657
7:10 AM	0	0	0	0	0	5	0	3	0	0	27	1	0	5	13	0	54	673
7:15 AM	0	0	0	0	0	1	0	3	0	0	25	0	0	3	21	0	53	665
7:20 AM	0	0	0	0	0	4	0	1	0	0	27	0	0	2	16	0	50	649
7:25 AM	0	0	0	0	0	3	0	3	0	0	34	0	0	1	20	0	61	637
7:30 AM	0	0	0	0	0	5	0	1	0	0	27	2	0	1	18	0	54	618
7:35 AM	0	0	0	0	0	1	0	4	0	0	32	1	0	2	17	0	57	603
7:40 AM	0	0	0	0	0	7	0	2	0	0	26	2	0	2	31	0	70	582
7:45 AM	0	0	0	0	0	1	0	2	0	0	29	3	0	1	31	0	67	568
7:50 AM	0	0	0	0	0	2	0	3	0	0	18	1	0	3	28	0	55	538
7:55 AM	0	0	0	0	0	2	0	2	0	0	24	0	0	3	17	0	48	521
8:00 AM	0	0	0	0	0	2	0	2	0	0	18	3	0	2	18	0	45	523
8:05 AM	0	0	0	0	0	4	0	3	0	0	35	2	0	0	15	0	59	
8:10 AM	0	0	0	0	0	2	0	4	0	0	16	2	0	2	20	0	46	
8:15 AM	0	0	0	0	0	3	0	2	0	0	11	3	0	1	17	0	37	
8:20 AM	0	0	0	0	0	3	0	2	0	0	19	0	0	4	10	0	38	
8:25 AM	0	0	0	0	0	3	0	4	0	0	19	1	0	1	14	0	42	
8:30 AM	0	0	0	0	0	2	0	3	0	0	14	2	0	2	16	0	39	
8:35 AM	0	0	0	0	0	1	0	3	0	0	14	1	0	3	14	0	36	
8:40 AM	0	0	0	0	0	2	0	3	0	0	29	2	0	1	19	0	56	
8:45 AM	0	0	0	0	0	1	0	0	0	0	18	2	0	1	15	0	37	
8:50 AM	0	0	0	0	0	2	0	3	0	0	14	2	0	2	15	0	38	
8:55 AM	0	0	0	0	0	1	0	2	0	0	17	0	0	3	27	0	50	
Count Total	0	0	0	0	0	59	0	58	0	0	547	31	0	49	444	0	1,188	
Peak Hour	0	0	0	0	0	37	0	29	0	0	322	15	0	25	245	0	673	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval	Heavy Vehicles					Interval	Bicycles on Roadway					Interval	Pedestrians/Bicycles on Crosswalk				
Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total
7:00 AM	0	2	1	0	3	7:00 AM						7:00 AM	1	0	0	0	1
7:05 AM	0	1	0	0	1	7:05 AM						7:05 AM	0	0	0	0	0
7:10 AM	0	1	0	2	3	7:10 AM						7:10 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0	7:15 AM						7:15 AM	0	0	1	0	1
7:20 AM	0	1	1	0	2	7:20 AM						7:20 AM	0	0	0	0	0
7:25 AM	0	1	0	1	2	7:25 AM						7:25 AM	1	0	0	0	1
7:30 AM	0	1	0	2	3	7:30 AM						7:30 AM	1	0	0	0	1
7:35 AM	0	3	0	2	5	7:35 AM						7:35 AM	1	0	1	0	2
7:40 AM	0	2	0	2	4	7:40 AM						7:40 AM	1	0	1	0	2
7:45 AM	0	1	0	2	3	7:45 AM						7:45 AM	0	0	1	0	1
7:50 AM	0	2	0	0	2	7:50 AM						7:50 AM	0	0	0	0	0
7:55 AM	0	3	0	1	4	7:55 AM						7:55 AM	0	0	0	0	0
8:00 AM	0	2	0	1	3	8:00 AM						8:00 AM	0	0	0	0	0
8:05 AM	0	3	0	1	4	8:05 AM						8:05 AM	1	0	0	0	1
8:10 AM	0	3	0	3	6	8:10 AM						8:10 AM	0	0	0	0	0
8:15 AM	0	0	0	3	3	8:15 AM						8:15 AM	0	0	0	0	0
8:20 AM	0	2	0	0	2	8:20 AM						8:20 AM	0	0	0	0	0
8:25 AM	0	1	0	0	1	8:25 AM						8:25 AM	2	0	1	0	3
8:30 AM	0	1	0	2	3	8:30 AM						8:30 AM	0	0	0	0	0
8:35 AM	0	1	1	1	3	8:35 AM						8:35 AM	0	0	0	0	0
8:40 AM	0	1	0	1	2	8:40 AM						8:40 AM	0	0	0	0	0
8:45 AM	0	1	0	2	3	8:45 AM						8:45 AM	1	0	0	0	1
8:50 AM	0	1	0	3	4	8:50 AM						8:50 AM	0	0	0	0	0
8:55 AM	0	0	0	4	4	8:55 AM						8:55 AM	0	0	0	0	0
Count Total	0	34	3	33	70	Count Total						Count Total	9	0	5	0	14
Peak Hour	0	20	1	14	35	Peak Hour						Peak Hour	5	0	4	0	9

ALL TRAFFIC DATA SERVICES
(303) 216-2439
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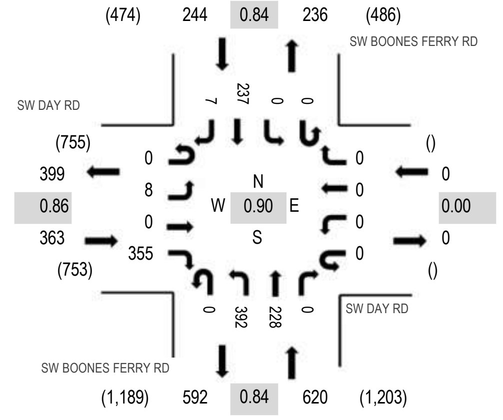
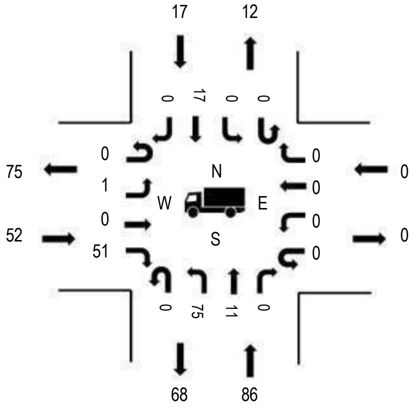
Location: 1 SW BOONES FERRY RD & SW DAY RD AM
Date: Tuesday, March 30, 2021
Peak Hour: 08:00 AM - 09:00 AM
Peak 15-Minutes: 08:20 AM - 08:35 AM

Peak Hour

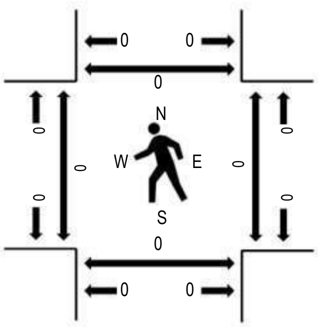
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	14.3%	0.86
WB	0.0%	0.00
NB	13.9%	0.84
SB	7.0%	0.84
All	12.6%	0.90

Traffic Counts - Motorized Vehicles

	SW DAY RD				SW DAY RD				SW BOONES FERRY RD				SW BOONES FERRY RD					
	Eastbound				Westbound				Northbound				Southbound					
Interval Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	Rolling Hour
7:00 AM	0	2	0	34	0	0	0	0	0	33	22	0	0	0	21	1	113	1,203
7:05 AM	0	3	0	31	0	0	0	0	0	16	15	0	0	0	18	4	87	1,183
7:10 AM	0	2	0	29	0	0	0	0	0	42	23	0	0	0	22	1	119	1,179
7:15 AM	0	1	0	29	0	0	0	0	0	28	21	0	0	0	24	1	104	1,154
7:20 AM	0	0	0	24	0	0	0	0	0	21	23	0	0	0	20	4	92	1,135
7:25 AM	0	0	0	32	0	0	0	0	0	21	17	0	0	0	12	0	82	1,170
7:30 AM	0	0	0	33	0	0	0	0	0	34	34	0	0	0	25	1	127	1,197
7:35 AM	0	0	0	32	0	0	0	0	0	21	19	0	0	0	9	0	81	1,176
7:40 AM	0	1	0	36	0	0	0	0	0	35	23	0	0	0	16	1	112	1,210
7:45 AM	0	0	0	42	0	0	0	0	0	31	15	0	0	0	18	0	106	1,204
7:50 AM	0	0	0	34	0	0	0	0	0	24	18	0	0	0	21	0	97	1,212
7:55 AM	0	0	0	25	0	0	0	0	0	36	11	0	0	0	10	1	83	1,196
8:00 AM	0	0	0	30	0	0	0	0	0	27	20	0	0	0	16	0	93	1,227
8:05 AM	0	1	0	20	0	0	0	0	0	37	14	0	0	0	11	0	83	
8:10 AM	0	1	0	29	0	0	0	0	0	34	12	0	0	0	18	0	94	
8:15 AM	0	0	0	20	0	0	0	0	0	22	16	0	0	0	26	1	85	
8:20 AM	0	0	0	35	0	0	0	0	0	56	14	0	0	0	22	0	127	
8:25 AM	0	2	0	29	0	0	0	0	0	32	24	0	0	0	21	1	109	
8:30 AM	0	1	0	22	0	0	0	0	0	29	29	0	0	0	24	1	106	
8:35 AM	0	0	0	39	0	0	0	0	0	26	24	0	0	0	26	0	115	
8:40 AM	0	0	0	30	0	0	0	0	0	30	24	0	0	0	20	2	106	
8:45 AM	0	1	0	37	0	0	0	0	0	38	21	0	0	0	17	0	114	
8:50 AM	0	0	0	27	0	0	0	0	0	27	14	0	0	0	13	0	81	
8:55 AM	0	2	0	37	0	0	0	0	0	34	16	0	0	0	23	2	114	
Count Total	0	17	0	736	0	0	0	0	0	734	469	0	0	0	453	21	2,430	
Peak Hour	0	8	0	355	0	0	0	0	0	392	228	0	0	0	237	7	1,227	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
7:00 AM	8	4	0	3	15	7:00 AM	0	0	0	0	0	7:00 AM	0	0	0	0	0
7:05 AM	7	2	0	1	10	7:05 AM	0	0	0	0	0	7:05 AM	0	0	0	0	0
7:10 AM	2	6	0	1	9	7:10 AM	0	0	0	0	0	7:10 AM	0	0	0	0	0
7:15 AM	5	2	0	0	7	7:15 AM	0	0	0	0	0	7:15 AM	0	0	0	0	0
7:20 AM	3	5	0	3	11	7:20 AM	0	0	0	0	0	7:20 AM	0	0	0	0	0
7:25 AM	6	4	0	0	10	7:25 AM	0	0	0	0	0	7:25 AM	0	0	0	0	0
7:30 AM	5	11	0	2	18	7:30 AM	0	0	0	0	0	7:30 AM	0	0	0	0	0
7:35 AM	6	7	0	0	13	7:35 AM	0	0	0	0	0	7:35 AM	0	0	0	0	0
7:40 AM	3	7	0	0	10	7:40 AM	0	0	0	0	0	7:40 AM	0	0	0	0	0
7:45 AM	10	8	0	0	18	7:45 AM	0	0	0	0	0	7:45 AM	0	0	0	0	0
7:50 AM	7	2	0	2	11	7:50 AM	0	0	0	0	0	7:50 AM	0	0	0	0	0
7:55 AM	2	3	0	1	6	7:55 AM	0	0	0	0	0	7:55 AM	0	0	0	0	0
8:00 AM	5	5	0	2	12	8:00 AM	0	0	0	0	0	8:00 AM	0	0	0	0	0
8:05 AM	2	2	0	3	7	8:05 AM	0	0	0	0	0	8:05 AM	0	0	0	0	0
8:10 AM	5	6	0	2	13	8:10 AM	0	0	0	0	0	8:10 AM	0	0	0	0	0
8:15 AM	2	7	0	2	11	8:15 AM	0	0	0	0	0	8:15 AM	0	0	0	0	0
8:20 AM	7	9	0	1	17	8:20 AM	0	0	0	0	0	8:20 AM	0	0	0	0	0
8:25 AM	6	15	0	1	22	8:25 AM	0	0	0	0	0	8:25 AM	0	0	0	0	0
8:30 AM	4	9	0	3	16	8:30 AM	0	0	0	0	0	8:30 AM	0	0	0	0	0
8:35 AM	1	6	0	1	8	8:35 AM	0	0	0	0	0	8:35 AM	0	0	0	0	0
8:40 AM	2	1	0	0	3	8:40 AM	0	0	0	0	0	8:40 AM	0	0	0	0	0
8:45 AM	6	7	0	2	15	8:45 AM	0	0	0	0	0	8:45 AM	0	0	0	0	0
8:50 AM	8	10	0	0	18	8:50 AM	0	0	0	0	0	8:50 AM	0	0	0	0	0
8:55 AM	4	9	0	0	13	8:55 AM	0	0	0	0	0	8:55 AM	0	0	0	0	0
Count Total	116	147	0	30	293	Count Total	0	0	0	0	0	Count Total	0	0	0	0	0
Peak Hour	52	86	0	17	155	Peak Hour	0	0	0	0	0	Peak Hour	0	0	0	0	0

ALL TRAFFIC DATA SERVICES
(303) 216-2439
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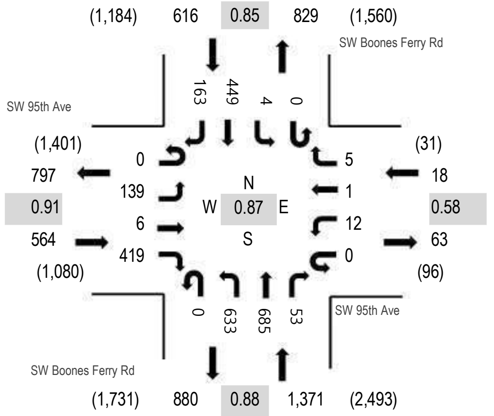
Location: SW Boones Ferry Rd & SW 95th Ave AM
Date: Tuesday, June 8, 2021
Peak Hour: 07:20 AM - 08:20 AM
Peak 15-Minutes: 07:40 AM - 07:55 AM

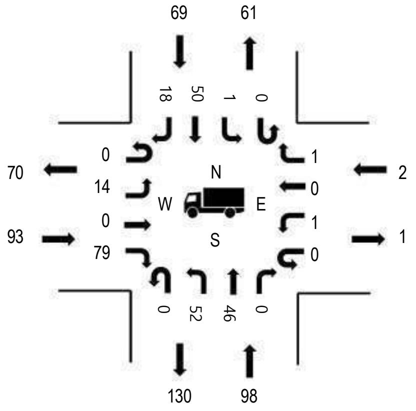
Peak Hour

Motorized Vehicles

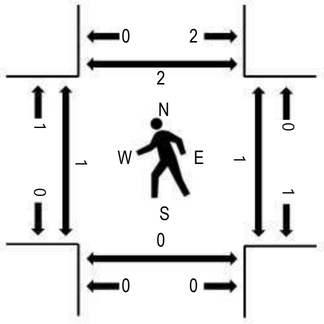


Note: Total study counts contained in parentheses.

Heavy Vehicles



Pedestrians



	HV%	PHF
EB	16.5%	0.91
WB	11.1%	0.58
NB	7.1%	0.88
SB	11.2%	0.85
All	10.2%	0.87

Traffic Counts - Motorized Vehicles

Interval Start Time	SW 95th Ave Eastbound				SW 95th Ave Westbound				SW Boones Ferry Rd Northbound				SW Boones Ferry Rd Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
7:00 AM	0	21	0	30	0	0	0	0	0	39	63	2	0	0	31	8	194	2,552
7:05 AM	0	12	0	32	0	0	0	0	0	32	57	2	0	0	44	8	187	2,566
7:10 AM	0	10	0	32	0	0	0	0	0	44	36	3	0	0	42	12	179	2,561
7:15 AM	0	4	1	41	0	0	1	0	0	47	39	2	0	0	37	7	179	2,553
7:20 AM	0	11	1	38	0	0	0	0	0	56	62	3	0	0	39	14	224	2,569
7:25 AM	0	13	0	34	0	0	0	0	0	50	50	4	0	0	45	10	206	2,542
7:30 AM	0	8	1	42	0	0	0	1	0	54	74	4	0	0	20	6	210	2,518
7:35 AM	0	11	1	32	0	0	0	0	0	44	61	9	0	1	45	11	215	2,497
7:40 AM	0	9	0	43	0	4	1	0	0	57	64	1	0	3	49	10	241	2,456
7:45 AM	0	14	1	48	0	1	0	0	0	59	63	4	0	0	35	18	243	2,401
7:50 AM	0	9	0	36	0	1	0	1	0	64	64	5	0	0	52	20	252	2,345
7:55 AM	0	18	1	34	0	0	0	0	0	65	55	9	0	0	24	16	222	2,269
8:00 AM	0	11	1	26	0	2	0	2	0	58	51	3	0	0	35	19	208	2,236
8:05 AM	0	10	0	29	0	0	0	0	0	40	49	4	0	0	35	15	182	
8:10 AM	0	12	0	29	0	1	0	0	0	36	42	4	0	0	37	10	171	
8:15 AM	0	13	0	28	0	3	0	1	0	50	50	3	0	0	33	14	195	
8:20 AM	0	10	0	26	0	0	0	1	0	39	56	1	0	0	54	10	197	
8:25 AM	0	12	1	30	0	0	1	0	0	40	40	7	0	0	43	8	182	
8:30 AM	0	13	0	36	0	0	0	0	0	38	58	3	0	0	29	12	189	
8:35 AM	0	5	0	28	0	0	0	0	0	35	53	1	0	0	43	9	174	
8:40 AM	0	11	0	34	0	0	1	0	0	38	58	3	0	0	32	9	186	
8:45 AM	0	12	0	33	0	3	1	0	0	49	44	2	0	0	31	12	187	
8:50 AM	0	7	1	36	0	2	1	0	0	38	52	1	0	0	29	9	176	
8:55 AM	0	4	0	34	0	2	0	0	0	44	53	3	0	0	37	12	189	
Count Total	0	260	9	811	0	19	6	6	0	1,116	1,294	83	0	4	901	279	4,788	
Peak Hour	0	139	6	419	0	12	1	5	0	633	685	53	0	4	449	163	2,569	

Location: SW Boones Ferry Rd & SW 95th Ave AM

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
7:00 AM	9	3	0	9	21	7:00 AM	0	0	0	0	0	7:00 AM	0	0	1	1	2
7:05 AM	10	3	0	10	23	7:05 AM	0	0	0	0	0	7:05 AM	0	0	0	0	0
7:10 AM	7	1	0	9	17	7:10 AM	0	0	0	0	0	7:10 AM	0	0	0	0	0
7:15 AM	13	1	0	6	20	7:15 AM	0	1	0	0	1	7:15 AM	0	0	0	0	0
7:20 AM	10	7	0	5	22	7:20 AM	0	0	0	0	0	7:20 AM	0	0	0	0	0
7:25 AM	9	6	0	8	23	7:25 AM	0	0	0	0	0	7:25 AM	1	0	0	0	1
7:30 AM	5	12	0	7	24	7:30 AM	0	0	0	0	0	7:30 AM	0	0	0	1	1
7:35 AM	8	4	0	8	20	7:35 AM	0	0	0	0	0	7:35 AM	0	0	0	0	0
7:40 AM	14	7	0	9	30	7:40 AM	0	0	0	1	1	7:40 AM	0	0	0	0	0
7:45 AM	10	9	1	6	26	7:45 AM	0	0	0	0	0	7:45 AM	0	0	0	0	0
7:50 AM	6	13	0	4	23	7:50 AM	0	0	0	0	0	7:50 AM	0	0	0	0	0
7:55 AM	7	8	0	6	21	7:55 AM	0	0	0	0	0	7:55 AM	0	0	0	0	0
8:00 AM	7	12	1	5	25	8:00 AM	0	0	0	0	0	8:00 AM	0	0	1	0	1
8:05 AM	6	2	0	4	12	8:05 AM	0	0	0	0	0	8:05 AM	0	0	0	1	1
8:10 AM	5	6	0	3	14	8:10 AM	0	0	0	0	0	8:10 AM	0	0	0	0	0
8:15 AM	6	12	0	4	22	8:15 AM	0	0	0	0	0	8:15 AM	0	0	0	0	0
8:20 AM	3	7	0	5	15	8:20 AM	0	0	0	0	0	8:20 AM	0	0	0	0	0
8:25 AM	10	7	0	5	22	8:25 AM	0	0	0	0	0	8:25 AM	0	0	0	0	0
8:30 AM	6	8	0	3	17	8:30 AM	0	0	0	0	0	8:30 AM	2	0	0	1	3
8:35 AM	9	13	0	6	28	8:35 AM	0	0	0	0	0	8:35 AM	0	0	0	0	0
8:40 AM	6	17	0	3	26	8:40 AM	0	0	0	0	0	8:40 AM	0	0	0	0	0
8:45 AM	4	17	1	3	25	8:45 AM	1	0	0	0	1	8:45 AM	0	0	0	0	0
8:50 AM	6	11	1	1	19	8:50 AM	0	0	0	0	0	8:50 AM	0	0	0	0	0
8:55 AM	6	18	0	9	33	8:55 AM	0	0	0	1	1	8:55 AM	0	0	0	0	0
Count Total	182	204	4	138	528	Count Total	1	1	0	2	4	Count Total	3	0	2	4	9
Peak Hour	93	98	2	69	262	Peak Hour	0	0	0	1	1	Peak Hour	1	0	1	2	4

ALL TRAFFIC DATA SERVICES
(303) 216-2439
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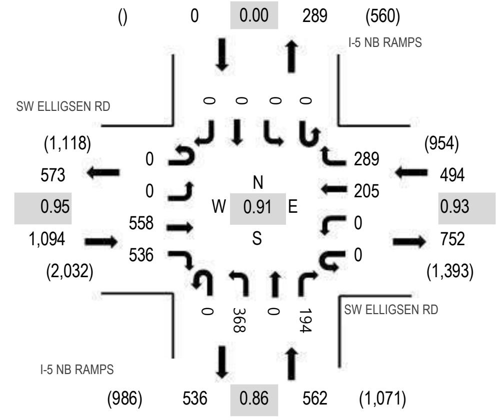
Location: 9 I-5 NB RAMPS & SW ELLIGSEN RD AM
Date: Tuesday, September 29, 2020
Peak Hour: 07:30 AM - 08:30 AM
Peak 15-Minutes: 07:50 AM - 08:05 AM

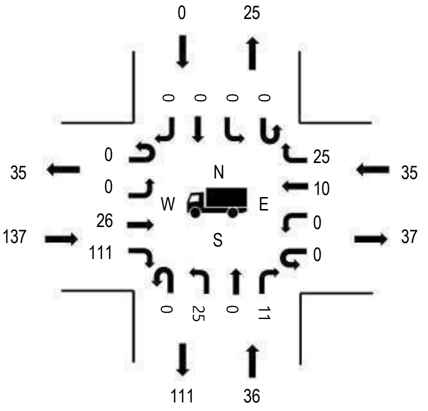
Peak Hour

Motorized Vehicles

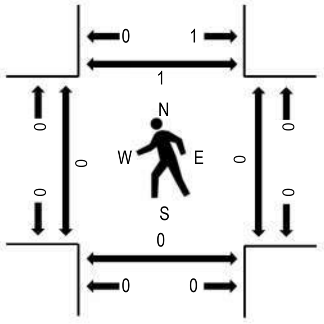


Note: Total study counts contained in parentheses.

Heavy Vehicles



Pedestrians



	HV%	PHF
EB	12.5%	0.95
WB	7.1%	0.93
NB	6.4%	0.86
SB	0.0%	0.00
All	9.7%	0.91

Traffic Counts - Motorized Vehicles

Interval	SW ELLIGSEN RD Eastbound				SW ELLIGSEN RD Westbound				I-5 NB RAMPS Northbound				I-5 NB RAMPS Southbound					Rolling
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	Hour
7:00 AM	0	0	33	34	0	0	9	15	0	40	0	4	0	0	0	0	135	2,044
7:05 AM	0	0	34	31	0	0	19	17	0	30	0	9	0	0	0	0	140	2,102
7:10 AM	0	0	29	27	0	0	10	21	0	28	0	12	0	0	0	0	127	2,125
7:15 AM	0	0	32	50	0	0	26	30	0	41	0	9	0	0	0	0	188	2,148
7:20 AM	0	0	42	31	0	0	12	16	0	50	0	10	0	0	0	0	161	2,133
7:25 AM	0	0	38	42	0	0	21	23	0	42	0	12	0	0	0	0	178	2,147
7:30 AM	0	0	41	40	0	0	20	26	0	27	0	12	0	0	0	0	166	2,150
7:35 AM	0	0	40	51	0	0	12	28	0	39	0	11	0	0	0	0	181	2,148
7:40 AM	0	0	50	57	0	0	9	23	0	36	0	10	0	0	0	0	185	2,125
7:45 AM	0	0	40	44	0	0	13	28	0	36	0	24	0	0	0	0	185	2,110
7:50 AM	0	0	48	40	0	0	31	21	0	43	0	16	0	0	0	0	199	2,099
7:55 AM	0	0	60	43	0	0	23	13	0	40	0	20	0	0	0	0	199	2,070
8:00 AM	0	0	52	44	0	0	14	26	0	27	0	30	0	0	0	0	193	2,013
8:05 AM	0	0	47	41	0	0	17	24	0	19	0	15	0	0	0	0	163	
8:10 AM	0	0	48	40	0	0	11	23	0	19	0	9	0	0	0	0	150	
8:15 AM	0	0	50	33	0	0	18	35	0	25	0	12	0	0	0	0	173	
8:20 AM	0	0	34	47	0	0	22	23	0	32	0	17	0	0	0	0	175	
8:25 AM	0	0	48	56	0	0	15	19	0	25	0	18	0	0	0	0	181	
8:30 AM	0	0	42	31	0	0	18	24	0	22	0	27	0	0	0	0	164	
8:35 AM	0	0	55	35	0	0	12	25	0	19	0	12	0	0	0	0	158	
8:40 AM	0	0	43	34	0	0	18	37	0	22	0	16	0	0	0	0	170	
8:45 AM	0	0	55	44	0	0	19	26	0	17	0	13	0	0	0	0	174	
8:50 AM	0	0	46	40	0	0	19	19	0	28	0	18	0	0	0	0	170	
8:55 AM	0	0	39	51	0	0	6	18	0	17	0	11	0	0	0	0	142	
Count Total	0	0	1,046	986	0	0	394	560	0	724	0	347	0	0	0	0	4,057	
Peak Hour	0	0	558	536	0	0	205	289	0	368	0	194	0	0	0	0	2,150	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
7:00 AM	14	0	4	0	18	7:00 AM						7:00 AM	0	0	0	0	0
7:05 AM	11	1	4	0	16	7:05 AM						7:05 AM	0	0	0	0	0
7:10 AM	5	4	4	0	13	7:10 AM						7:10 AM	0	1	0	0	1
7:15 AM	15	7	3	0	25	7:15 AM						7:15 AM	0	1	0	0	1
7:20 AM	9	0	0	0	9	7:20 AM						7:20 AM	0	0	0	0	0
7:25 AM	8	3	2	0	13	7:25 AM						7:25 AM	0	0	0	0	0
7:30 AM	11	1	5	0	17	7:30 AM						7:30 AM	0	0	0	0	0
7:35 AM	17	3	1	0	21	7:35 AM						7:35 AM	0	0	0	0	0
7:40 AM	12	5	1	0	18	7:40 AM						7:40 AM	0	0	0	0	0
7:45 AM	15	5	1	0	21	7:45 AM						7:45 AM	0	0	0	0	0
7:50 AM	10	3	4	0	17	7:50 AM						7:50 AM	0	0	0	1	1
7:55 AM	14	2	4	0	20	7:55 AM						7:55 AM	0	0	0	0	0
8:00 AM	11	4	4	0	19	8:00 AM						8:00 AM	0	0	0	0	0
8:05 AM	9	1	1	0	11	8:05 AM						8:05 AM	0	0	0	0	0
8:10 AM	11	5	2	0	18	8:10 AM						8:10 AM	0	0	0	0	0
8:15 AM	10	3	8	0	21	8:15 AM						8:15 AM	0	0	0	0	0
8:20 AM	8	3	2	0	13	8:20 AM						8:20 AM	0	0	0	0	0
8:25 AM	9	1	2	0	12	8:25 AM						8:25 AM	0	0	0	0	0
8:30 AM	7	2	1	0	10	8:30 AM						8:30 AM	0	0	0	0	0
8:35 AM	13	4	2	0	19	8:35 AM						8:35 AM	0	0	0	0	0
8:40 AM	5	2	1	0	8	8:40 AM						8:40 AM	0	0	0	0	0
8:45 AM	16	4	4	0	24	8:45 AM						8:45 AM	0	0	0	0	0
8:50 AM	9	2	1	0	12	8:50 AM						8:50 AM	0	0	0	0	0
8:55 AM	11	1	1	0	13	8:55 AM						8:55 AM	0	0	0	0	0
Count Total	260	66	62	0	388	Count Total						Count Total	0	2	0	1	3
Peak Hour	137	36	35	0	208	Peak Hour						Peak Hour	0	0	0	1	1

ALL TRAFFIC DATA SERVICES
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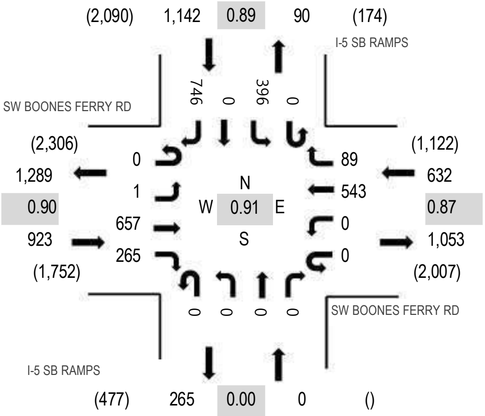
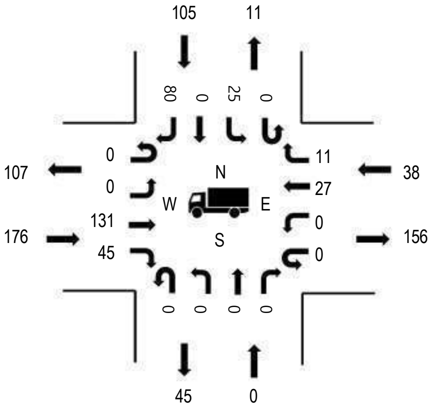
Location: 8 I-5 SB RAMPS & SW BOONES FERRY RD AM
Date: Tuesday, September 29, 2020
Peak Hour: 07:10 AM - 08:10 AM
Peak 15-Minutes: 07:40 AM - 07:55 AM

Peak Hour

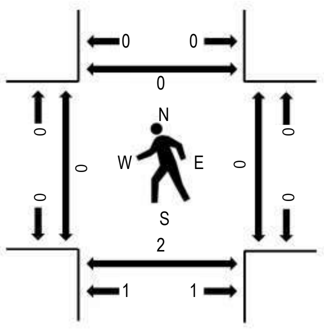
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	19.1%	0.90
WB	6.0%	0.87
NB	0.0%	0.00
SB	9.2%	0.89
All	11.8%	0.91

Traffic Counts - Motorized Vehicles

Interval Start Time	SW BOONES FERRY RD Eastbound				SW BOONES FERRY RD Westbound				I-5 SB RAMPS Northbound				I-5 SB RAMPS Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
7:00 AM	0	0	39	19	0	0	52	7	0	0	0	0	0	15	0	56	188	2,634
7:05 AM	0	0	41	27	0	0	42	5	0	0	0	0	0	15	0	49	179	2,676
7:10 AM	0	0	44	16	0	0	37	7	0	0	0	0	0	34	0	57	195	2,697
7:15 AM	0	0	57	23	0	0	56	7	0	0	0	0	0	22	0	37	202	2,691
7:20 AM	0	0	43	20	0	0	62	8	0	0	0	0	0	33	0	68	234	2,679
7:25 AM	0	0	51	26	0	0	48	5	0	0	0	0	0	18	0	51	199	2,639
7:30 AM	0	0	61	20	0	0	43	5	0	0	0	0	0	35	0	66	230	2,624
7:35 AM	0	1	59	29	0	0	38	6	0	0	0	0	0	26	0	68	227	2,589
7:40 AM	0	0	69	25	0	0	41	12	0	0	0	0	0	39	0	74	260	2,548
7:45 AM	0	0	49	30	0	0	56	9	0	0	0	0	0	31	0	63	238	2,460
7:50 AM	0	0	60	17	0	0	48	9	0	0	0	0	0	39	0	74	247	2,426
7:55 AM	0	0	59	19	0	0	38	8	0	0	0	0	0	45	0	66	235	2,373
8:00 AM	0	0	64	25	0	0	34	6	0	0	0	0	0	33	0	68	230	2,330
8:05 AM	0	0	41	15	0	0	42	7	0	0	0	0	0	41	0	54	200	
8:10 AM	0	0	54	16	0	0	26	4	0	0	0	0	0	34	0	55	189	
8:15 AM	0	0	46	34	0	0	27	11	0	0	0	0	0	26	0	46	190	
8:20 AM	0	0	67	11	0	0	39	3	0	0	0	0	0	14	0	60	194	
8:25 AM	0	0	46	15	0	0	32	10	0	0	0	0	0	32	0	49	184	
8:30 AM	0	0	50	12	0	0	29	10	0	0	0	0	0	37	0	57	195	
8:35 AM	0	0	53	17	0	0	32	4	0	0	0	0	0	25	0	55	186	
8:40 AM	0	0	42	11	0	0	37	8	0	0	0	0	0	25	0	49	172	
8:45 AM	0	0	53	21	0	0	31	9	0	0	0	0	0	42	1	47	204	
8:50 AM	0	0	57	11	0	0	31	7	0	0	0	0	0	43	0	45	194	
8:55 AM	0	0	70	17	0	0	28	6	0	0	0	0	0	28	0	43	192	
Count Total	0	1	1,275	476	0	0	949	173	0	0	0	0	0	732	1	1,357	4,964	
Peak Hour	0	1	657	265	0	0	543	89	0	0	0	0	0	396	0	746	2,697	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval	Heavy Vehicles					Interval	Bicycles on Roadway					Interval	Pedestrians/Bicycles on Crosswalk				
Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total
7:00 AM	18	0	1	7	26	7:00 AM						7:00 AM	0	1	0	0	1
7:05 AM	11	0	3	6	20	7:05 AM						7:05 AM	0	0	0	0	0
7:10 AM	11	0	0	5	16	7:10 AM						7:10 AM	0	1	0	0	1
7:15 AM	12	0	9	4	25	7:15 AM						7:15 AM	0	1	0	0	1
7:20 AM	15	0	3	9	27	7:20 AM						7:20 AM	0	0	0	0	0
7:25 AM	12	0	1	7	20	7:25 AM						7:25 AM	0	0	0	0	0
7:30 AM	16	0	4	10	30	7:30 AM						7:30 AM	0	0	0	0	0
7:35 AM	15	0	3	15	33	7:35 AM						7:35 AM	0	0	0	0	0
7:40 AM	12	0	4	8	24	7:40 AM						7:40 AM	0	0	0	0	0
7:45 AM	11	0	4	7	22	7:45 AM						7:45 AM	0	0	0	0	0
7:50 AM	16	0	4	11	31	7:50 AM						7:50 AM	0	0	0	0	0
7:55 AM	19	0	2	4	25	7:55 AM						7:55 AM	0	0	0	0	0
8:00 AM	20	0	2	14	36	8:00 AM						8:00 AM	0	0	0	0	0
8:05 AM	17	0	2	11	30	8:05 AM						8:05 AM	0	0	0	0	0
8:10 AM	9	0	2	8	19	8:10 AM						8:10 AM	0	0	0	0	0
8:15 AM	15	0	3	6	24	8:15 AM						8:15 AM	0	0	0	0	0
8:20 AM	7	0	2	6	15	8:20 AM						8:20 AM	0	0	0	0	0
8:25 AM	9	0	1	13	23	8:25 AM						8:25 AM	0	2	0	0	2
8:30 AM	6	0	5	12	23	8:30 AM						8:30 AM	0	0	0	0	0
8:35 AM	10	0	2	11	23	8:35 AM						8:35 AM	0	0	0	0	0
8:40 AM	5	0	6	9	20	8:40 AM						8:40 AM	0	0	0	0	0
8:45 AM	15	0	2	7	24	8:45 AM						8:45 AM	0	0	0	0	0
8:50 AM	9	0	1	6	16	8:50 AM						8:50 AM	0	0	0	0	0
8:55 AM	15	0	1	9	25	8:55 AM						8:55 AM	0	0	0	0	0
Count Total	305	0	67	205	577	Count Total						Count Total	0	5	0	0	5
Peak Hour	176	0	38	105	319	Peak Hour						Peak Hour	0	2	0	0	2

ALL TRAFFIC DATA SERVICES
(303) 216-2439
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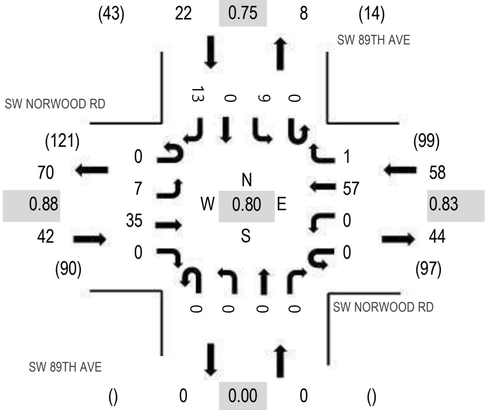
Location: 4 SW 89TH AVE & SW NORWOOD RD AM
Date: Tuesday, September 29, 2020
Peak Hour: 07:10 AM - 08:10 AM
Peak 15-Minutes: 08:00 AM - 08:15 AM

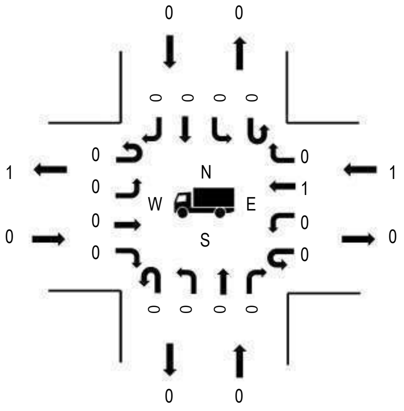
Peak Hour

Motorized Vehicles

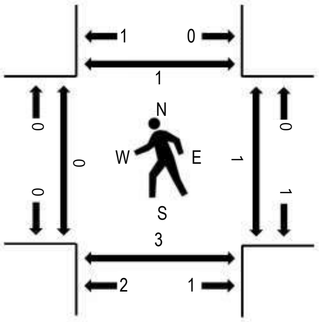


Note: Total study counts contained in parentheses.

Heavy Vehicles



Pedestrians



	HV%	PHF
EB	0.0%	0.88
WB	1.7%	0.83
NB	0.0%	0.00
SB	0.0%	0.75
All	0.8%	0.80

Traffic Counts - Motorized Vehicles

Interval Start Time	SW NORWOOD RD Eastbound				SW NORWOOD RD Westbound				SW 89TH AVE Northbound				SW 89TH AVE Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
7:00 AM	0	0	3	0	0	0	1	0	0	0	0	0	0	1	0	1	6	113
7:05 AM	0	0	4	0	0	0	3	0	0	0	0	0	0	0	0	1	8	116
7:10 AM	0	0	7	0	0	0	5	0	0	0	0	0	0	0	0	4	16	122
7:15 AM	0	0	2	0	0	0	4	0	0	0	0	0	0	0	0	1	7	121
7:20 AM	0	1	1	0	0	0	7	0	0	0	0	0	0	0	0	0	9	121
7:25 AM	0	1	1	0	0	0	5	1	0	0	0	0	0	1	0	0	9	120
7:30 AM	0	0	2	0	0	0	5	0	0	0	0	0	0	2	0	0	9	119
7:35 AM	0	1	4	0	0	0	5	0	0	0	0	0	0	2	0	0	12	121
7:40 AM	0	2	2	0	0	0	6	0	0	0	0	0	0	0	0	1	11	116
7:45 AM	0	0	4	0	0	0	4	0	0	0	0	0	0	2	0	3	13	114
7:50 AM	0	1	3	0	0	0	2	0	0	0	0	0	0	0	0	0	6	112
7:55 AM	0	0	2	0	0	0	5	0	0	0	0	0	0	0	0	0	7	115
8:00 AM	0	0	4	0	0	0	4	0	0	0	0	0	0	0	0	1	9	119
8:05 AM	0	1	3	0	0	0	5	0	0	0	0	0	0	2	0	3	14	
8:10 AM	0	0	6	0	0	0	7	0	0	0	0	0	0	1	0	1	15	
8:15 AM	0	1	3	0	0	0	2	0	0	0	0	0	0	0	0	1	7	
8:20 AM	0	1	3	0	0	0	3	0	0	0	0	0	0	0	0	1	8	
8:25 AM	0	0	2	0	0	0	5	0	0	0	0	0	0	0	0	1	8	
8:30 AM	0	1	4	0	0	0	4	0	0	0	0	0	0	1	0	1	11	
8:35 AM	0	0	3	0	0	0	2	0	0	0	0	0	0	2	0	0	7	
8:40 AM	0	0	4	0	0	0	4	0	0	0	0	0	0	0	0	1	9	
8:45 AM	0	1	3	0	0	0	4	0	0	0	0	0	0	1	0	2	11	
8:50 AM	0	0	4	0	0	0	2	1	0	0	0	0	0	2	0	0	9	
8:55 AM	0	0	5	0	0	0	2	1	0	0	0	0	0	1	0	2	11	
Count Total	0	11	79	0	0	0	96	3	0	0	0	0	0	18	0	25	232	
Peak Hour	0	7	35	0	0	0	57	1	0	0	0	0	0	9	0	13	122	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval	Heavy Vehicles					Interval	Bicycles on Roadway					Interval	Pedestrians/Bicycles on Crosswalk				
Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total
7:00 AM	0	0	0	0	0	7:00 AM						7:00 AM	0	0	0	0	0
7:05 AM	0	0	0	0	0	7:05 AM						7:05 AM	0	0	0	0	0
7:10 AM	0	0	0	0	0	7:10 AM						7:10 AM	0	0	0	0	0
7:15 AM	0	0	1	0	1	7:15 AM						7:15 AM	0	0	0	0	0
7:20 AM	0	0	0	0	0	7:20 AM						7:20 AM	0	0	0	0	0
7:25 AM	0	0	0	0	0	7:25 AM						7:25 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0	7:30 AM						7:30 AM	0	0	0	0	0
7:35 AM	0	0	0	0	0	7:35 AM						7:35 AM	0	0	0	0	0
7:40 AM	0	0	0	0	0	7:40 AM						7:40 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0	7:45 AM						7:45 AM	0	0	0	0	0
7:50 AM	0	0	0	0	0	7:50 AM						7:50 AM	0	1	0	0	1
7:55 AM	0	0	0	0	0	7:55 AM						7:55 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0	8:00 AM						8:00 AM	0	2	1	0	3
8:05 AM	0	0	0	0	0	8:05 AM						8:05 AM	0	0	0	1	1
8:10 AM	0	0	0	0	0	8:10 AM						8:10 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0	8:15 AM						8:15 AM	0	0	0	0	0
8:20 AM	0	0	0	0	0	8:20 AM						8:20 AM	0	0	0	1	1
8:25 AM	0	0	0	0	0	8:25 AM						8:25 AM	0	0	0	0	0
8:30 AM	0	0	1	0	1	8:30 AM						8:30 AM	0	0	0	1	1
8:35 AM	0	0	0	0	0	8:35 AM						8:35 AM	0	0	0	0	0
8:40 AM	0	0	0	0	0	8:40 AM						8:40 AM	0	1	0	0	1
8:45 AM	0	0	0	0	0	8:45 AM						8:45 AM	0	1	0	0	1
8:50 AM	0	0	0	0	0	8:50 AM						8:50 AM	0	0	0	0	0
8:55 AM	0	0	0	0	0	8:55 AM						8:55 AM	0	0	0	0	0
Count Total	0	0	2	0	2	Count Total						Count Total	0	5	1	3	9
Peak Hour	0	0	1	0	1	Peak Hour						Peak Hour	0	3	1	1	5

ALL TRAFFIC DATA SERVICES
(303) 216-2439
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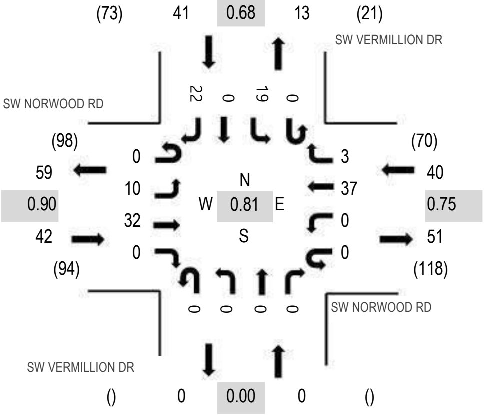
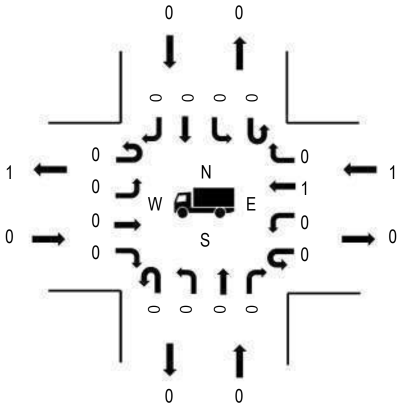
Location: 5 SW VERMILLION DR & SW NORWOOD RD AM
Date: Tuesday, September 29, 2020
Peak Hour: 07:15 AM - 08:15 AM
Peak 15-Minutes: 07:35 AM - 07:50 AM

Peak Hour

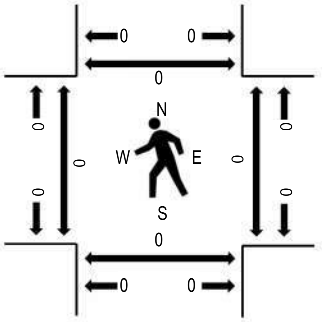
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.90
WB	2.5%	0.75
NB	0.0%	0.00
SB	0.0%	0.68
All	0.8%	0.81

Traffic Counts - Motorized Vehicles

	SW NORWOOD RD				SW NORWOOD RD				SW VERMILLION DR				SW VERMILLION DR					
	Eastbound				Westbound				Northbound				Southbound					
Interval Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	Rolling Hour
7:00 AM	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	1	5	115
7:05 AM	0	0	6	0	0	0	1	1	0	0	0	0	0	1	0	1	10	121
7:10 AM	0	0	5	0	0	0	1	0	0	0	0	0	0	2	0	3	11	120
7:15 AM	0	0	4	0	0	0	4	0	0	0	0	0	0	0	0	0	8	123
7:20 AM	0	0	1	0	0	0	4	0	0	0	0	0	0	1	0	2	8	123
7:25 AM	0	0	2	0	0	0	0	1	0	0	0	0	0	2	0	5	10	122
7:30 AM	0	0	2	0	0	0	3	0	0	0	0	0	0	1	0	4	10	122
7:35 AM	0	1	6	0	0	0	2	0	0	0	0	0	0	1	0	3	13	119
7:40 AM	0	0	1	0	0	0	4	1	0	0	0	0	0	4	0	4	14	121
7:45 AM	0	3	2	0	0	0	2	0	0	0	0	0	0	2	0	2	11	117
7:50 AM	0	1	3	0	0	0	2	0	0	0	0	0	0	2	0	0	8	115
7:55 AM	0	0	1	0	0	0	3	0	0	0	0	0	0	2	0	1	7	118
8:00 AM	0	1	3	0	0	0	5	0	0	0	0	0	0	2	0	0	11	122
8:05 AM	0	2	2	0	0	0	2	1	0	0	0	0	0	1	0	1	9	
8:10 AM	0	2	5	0	0	0	6	0	0	0	0	0	0	1	0	0	14	
8:15 AM	0	0	4	0	0	0	4	0	0	0	0	0	0	0	0	0	8	
8:20 AM	0	1	2	0	0	0	2	0	0	0	0	0	0	1	0	1	7	
8:25 AM	0	0	3	0	0	0	5	0	0	0	0	0	0	1	0	1	10	
8:30 AM	0	0	3	0	0	0	1	0	0	0	0	0	0	1	0	2	7	
8:35 AM	0	1	5	0	0	0	4	0	0	0	0	0	0	5	0	0	15	
8:40 AM	0	2	3	0	0	0	3	0	0	0	0	0	0	2	0	0	10	
8:45 AM	0	1	2	0	0	0	2	0	0	0	0	0	0	3	0	1	9	
8:50 AM	0	0	6	0	0	0	2	0	0	0	0	0	0	3	0	0	11	
8:55 AM	0	1	5	0	0	0	3	1	0	0	0	0	0	0	0	1	11	
Count Total	0	16	78	0	0	0	65	5	0	0	0	0	0	40	0	33	237	
Peak Hour	0	10	32	0	0	0	37	3	0	0	0	0	0	19	0	22	123	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval	Heavy Vehicles					Interval	Bicycles on Roadway					Interval	Pedestrians/Bicycles on Crosswalk				
Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total
7:00 AM	0	0	0	0	0	7:00 AM						7:00 AM	0	0	0	0	0
7:05 AM	0	0	0	0	0	7:05 AM						7:05 AM	0	0	0	0	0
7:10 AM	0	0	0	0	0	7:10 AM						7:10 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0	7:15 AM						7:15 AM	0	0	0	0	0
7:20 AM	0	0	1	0	1	7:20 AM						7:20 AM	0	0	0	0	0
7:25 AM	0	0	0	0	0	7:25 AM						7:25 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0	7:30 AM						7:30 AM	0	0	0	0	0
7:35 AM	0	0	0	0	0	7:35 AM						7:35 AM	0	0	0	0	0
7:40 AM	0	0	0	0	0	7:40 AM						7:40 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0	7:45 AM						7:45 AM	0	0	0	0	0
7:50 AM	0	0	0	0	0	7:50 AM						7:50 AM	0	0	0	0	0
7:55 AM	0	0	0	0	0	7:55 AM						7:55 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0	8:00 AM						8:00 AM	0	0	0	0	0
8:05 AM	0	0	0	0	0	8:05 AM						8:05 AM	0	0	0	0	0
8:10 AM	0	0	0	0	0	8:10 AM						8:10 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0	8:15 AM						8:15 AM	0	0	0	0	0
8:20 AM	0	0	0	0	0	8:20 AM						8:20 AM	0	0	0	0	0
8:25 AM	0	0	0	0	0	8:25 AM						8:25 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0	8:30 AM						8:30 AM	0	0	0	0	0
8:35 AM	0	0	1	0	1	8:35 AM						8:35 AM	0	0	0	0	0
8:40 AM	0	0	0	0	0	8:40 AM						8:40 AM	0	1	0	0	1
8:45 AM	0	0	0	0	0	8:45 AM						8:45 AM	0	0	0	1	1
8:50 AM	0	0	0	0	0	8:50 AM						8:50 AM	0	0	0	0	0
8:55 AM	0	0	0	0	0	8:55 AM						8:55 AM	0	0	0	0	0
Count Total	0	0	2	0	2	Count Total						Count Total	0	1	0	1	2
Peak Hour	0	0	1	0	1	Peak Hour						Peak Hour	0	0	0	0	0

ALL TRAFFIC DATA SERVICES
(303) 216-2439
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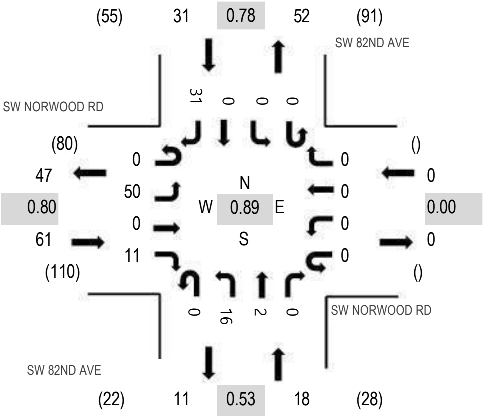
Location: 6 SW 82ND AVE & SW NORWOOD RD AM
Date: Wednesday, October 7, 2020
Peak Hour: 07:00 AM - 08:00 AM
Peak 15-Minutes: 07:35 AM - 07:50 AM

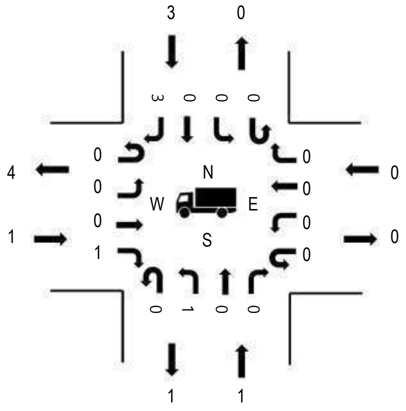
Peak Hour

Motorized Vehicles

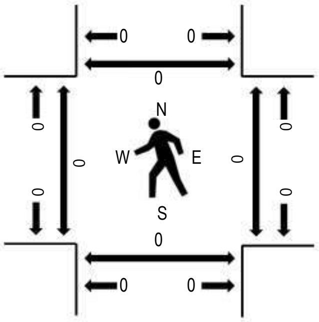


Note: Total study counts contained in parentheses.

Heavy Vehicles



Pedestrians



	HV%	PHF
EB	1.6%	0.80
WB	0.0%	0.00
NB	5.6%	0.53
SB	9.7%	0.78
All	4.5%	0.89

Traffic Counts - Motorized Vehicles

Interval Start Time	SW NORWOOD RD Eastbound				SW NORWOOD RD Westbound				SW 82ND AVE Northbound				SW 82ND AVE Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
7:00 AM	0	4	0	1	0	0	0	0	0	1	0	0	0	0	0	2	8	110
7:05 AM	0	4	0	1	0	0	0	0	0	2	0	0	0	0	0	1	8	108
7:10 AM	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	4	9	105
7:15 AM	0	6	0	2	0	0	0	0	0	1	1	0	0	0	0	3	13	99
7:20 AM	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	3	7	95
7:25 AM	0	3	0	0	0	0	0	0	0	2	0	0	0	0	0	2	7	95
7:30 AM	0	3	0	0	0	0	0	0	0	3	0	0	0	0	0	2	8	96
7:35 AM	0	3	0	2	0	0	0	0	0	2	0	0	0	0	0	3	10	88
7:40 AM	0	4	0	0	0	0	0	0	0	3	1	0	0	0	0	4	12	87
7:45 AM	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	3	9	80
7:50 AM	0	7	0	1	0	0	0	0	0	0	0	0	0	0	0	2	10	77
7:55 AM	0	5	0	0	0	0	0	0	0	2	0	0	0	0	0	2	9	78
8:00 AM	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	83
8:05 AM	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5	
8:10 AM	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	
8:15 AM	0	5	0	0	0	0	0	0	0	2	0	0	0	0	0	2	9	
8:20 AM	0	2	0	1	0	0	0	0	0	1	1	0	0	0	0	2	7	
8:25 AM	0	1	0	2	0	0	0	0	0	4	0	0	0	0	0	1	8	
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8:35 AM	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	4	9	
8:40 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	
8:45 AM	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0	1	6	
8:50 AM	0	6	0	2	0	0	0	0	0	0	0	0	0	0	0	3	11	
8:55 AM	0	6	0	2	0	0	0	0	0	2	0	0	0	0	0	4	14	
Count Total	0	88	0	22	0	0	0	0	0	25	3	0	0	0	0	55	193	
Peak Hour	0	50	0	11	0	0	0	0	0	16	2	0	0	0	0	31	110	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
7:00 AM	0	0	0	0	0	7:00 AM						7:00 AM	0	0	0	0	0
7:05 AM	0	0	0	0	0	7:05 AM						7:05 AM	0	0	0	0	0
7:10 AM	0	0	0	0	0	7:10 AM						7:10 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0	7:15 AM						7:15 AM	0	0	0	0	0
7:20 AM	0	0	0	1	1	7:20 AM						7:20 AM	0	0	0	0	0
7:25 AM	0	0	0	1	1	7:25 AM						7:25 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0	7:30 AM						7:30 AM	0	0	0	0	0
7:35 AM	1	0	0	1	2	7:35 AM						7:35 AM	0	0	0	0	0
7:40 AM	0	1	0	0	1	7:40 AM						7:40 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0	7:45 AM						7:45 AM	0	0	0	0	0
7:50 AM	0	0	0	0	0	7:50 AM						7:50 AM	0	0	0	0	0
7:55 AM	0	0	0	0	0	7:55 AM						7:55 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0	8:00 AM						8:00 AM	0	0	0	0	0
8:05 AM	0	0	0	0	0	8:05 AM						8:05 AM	0	0	0	0	0
8:10 AM	0	0	0	0	0	8:10 AM						8:10 AM	0	0	0	0	0
8:15 AM	0	1	0	0	1	8:15 AM						8:15 AM	0	0	0	0	0
8:20 AM	0	0	0	0	0	8:20 AM						8:20 AM	0	0	0	0	0
8:25 AM	0	0	0	0	0	8:25 AM						8:25 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0	8:30 AM						8:30 AM	0	0	0	0	0
8:35 AM	0	0	0	0	0	8:35 AM						8:35 AM	0	0	0	0	0
8:40 AM	0	0	0	0	0	8:40 AM						8:40 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0	8:45 AM						8:45 AM	0	0	0	0	0
8:50 AM	0	0	0	0	0	8:50 AM						8:50 AM	0	0	0	0	0
8:55 AM	0	1	0	0	1	8:55 AM						8:55 AM	0	0	0	0	0
Count Total	1	3	0	3	7	Count Total						Count Total	0	0	0	0	0
Peak Hour	1	1	0	3	5	Peak Hour						Peak Hour	0	0	0	0	0

ALL TRAFFIC DATA SERVICES
(303) 216-2439
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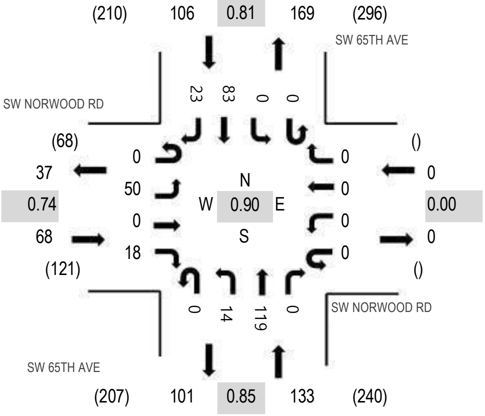
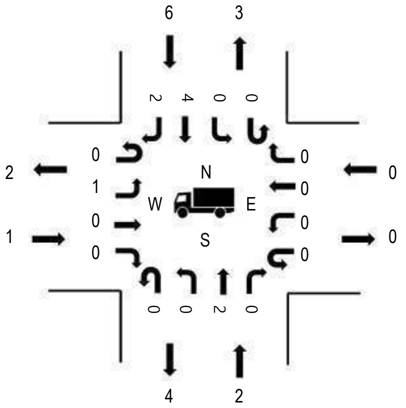
Location: 7 SW 65TH AVE & SW NORWOOD RD AM
Date: Tuesday, September 29, 2020
Peak Hour: 07:35 AM - 08:35 AM
Peak 15-Minutes: 08:05 AM - 08:20 AM

Peak Hour

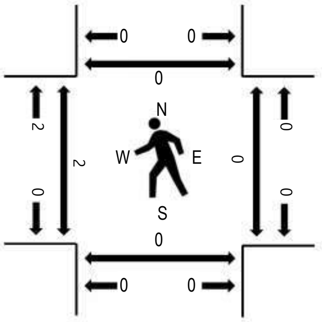
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	1.5%	0.74
WB	0.0%	0.00
NB	1.5%	0.85
SB	5.7%	0.81
All	2.9%	0.90

Traffic Counts - Motorized Vehicles

Interval Start Time	SW NORWOOD RD Eastbound U-Turn	Left	Thru	Right	SW NORWOOD RD Westbound U-Turn	Left	Thru	Right	SW 65TH AVE Northbound U-Turn	Left	Thru	Right	SW 65TH AVE Southbound U-Turn	Left	Thru	Right	Total	Rolling Hour
7:00 AM	0	1	0	3	0	0	0	0	0	1	14	0	0	0	9	1	29	280
7:05 AM	0	3	0	0	0	0	0	0	0	4	11	0	0	0	5	3	26	276
7:10 AM	0	3	0	0	0	0	0	0	0	1	11	0	0	0	11	0	26	279
7:15 AM	0	6	0	6	0	0	0	0	0	0	5	0	0	0	7	1	25	278
7:20 AM	0	3	0	4	0	0	0	0	0	1	7	0	0	0	6	1	22	284
7:25 AM	0	1	0	2	0	0	0	0	0	2	5	0	0	0	4	1	15	283
7:30 AM	0	1	0	1	0	0	0	0	0	0	4	0	0	0	2	1	9	296
7:35 AM	0	5	0	1	0	0	0	0	0	1	10	0	0	0	10	1	28	307
7:40 AM	0	4	0	4	0	0	0	0	0	1	18	0	0	0	3	0	30	296
7:45 AM	0	2	0	3	0	0	0	0	0	0	4	0	0	0	5	3	17	284
7:50 AM	0	6	0	1	0	0	0	0	0	0	12	0	0	0	7	2	28	291
7:55 AM	0	3	0	1	0	0	0	0	0	3	11	0	0	0	6	1	25	289
8:00 AM	0	4	0	0	0	0	0	0	0	1	8	0	0	0	9	3	25	291
8:05 AM	0	8	0	3	0	0	0	0	0	2	5	0	0	0	11	0	29	
8:10 AM	0	5	0	0	0	0	0	0	0	3	6	0	0	0	9	2	25	
8:15 AM	0	7	0	2	0	0	0	0	0	1	14	0	0	0	5	2	31	
8:20 AM	0	1	0	1	0	0	0	0	0	1	8	0	0	0	8	2	21	
8:25 AM	0	0	0	1	0	0	0	0	0	1	14	0	0	0	6	6	28	
8:30 AM	0	5	0	1	0	0	0	0	0	0	9	0	0	0	4	1	20	
8:35 AM	0	4	0	0	0	0	0	0	0	0	1	0	0	0	7	5	17	
8:40 AM	0	5	0	1	0	0	0	0	0	1	8	0	0	0	3	0	18	
8:45 AM	0	2	0	3	0	0	0	0	0	1	7	0	0	0	7	4	24	
8:50 AM	0	2	0	1	0	0	0	0	0	1	9	0	0	0	12	1	26	
8:55 AM	0	1	0	0	0	0	0	0	0	0	13	0	0	0	12	1	27	
Count Total	0	82	0	39	0	0	0	0	0	26	214	0	0	0	168	42	571	
Peak Hour	0	50	0	18	0	0	0	0	0	14	119	0	0	0	83	23	307	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

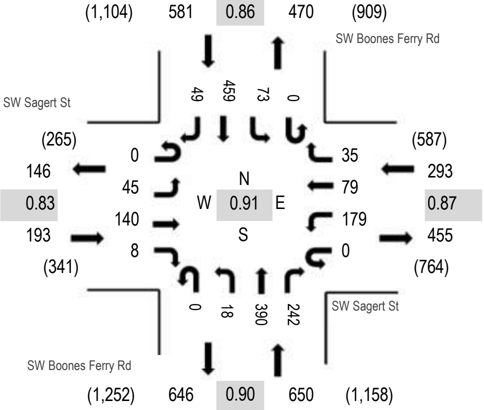
Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
7:00 AM	0	1	0	0	1	7:00 AM						7:00 AM	0	0	0	0	0
7:05 AM	0	0	0	0	0	7:05 AM						7:05 AM	0	0	0	0	0
7:10 AM	0	0	0	0	0	7:10 AM						7:10 AM	0	0	0	0	0
7:15 AM	1	0	0	0	1	7:15 AM						7:15 AM	0	0	0	0	0
7:20 AM	0	0	0	0	0	7:20 AM						7:20 AM	0	0	0	0	0
7:25 AM	0	0	0	1	1	7:25 AM						7:25 AM	0	0	0	0	0
7:30 AM	0	0	0	1	1	7:30 AM						7:30 AM	0	0	0	0	0
7:35 AM	0	0	0	0	0	7:35 AM						7:35 AM	0	0	0	0	0
7:40 AM	0	0	0	0	0	7:40 AM						7:40 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0	7:45 AM						7:45 AM	0	0	0	0	0
7:50 AM	0	0	0	0	0	7:50 AM						7:50 AM	2	0	0	0	2
7:55 AM	0	0	0	2	2	7:55 AM						7:55 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0	8:00 AM						8:00 AM	0	0	0	0	0
8:05 AM	0	0	0	0	0	8:05 AM						8:05 AM	0	0	0	0	0
8:10 AM	0	0	0	1	1	8:10 AM						8:10 AM	0	0	0	0	0
8:15 AM	0	2	0	0	2	8:15 AM						8:15 AM	0	0	0	0	0
8:20 AM	0	0	0	1	1	8:20 AM						8:20 AM	0	0	0	0	0
8:25 AM	0	0	0	1	1	8:25 AM						8:25 AM	0	0	0	0	0
8:30 AM	1	0	0	1	2	8:30 AM						8:30 AM	0	0	0	0	0
8:35 AM	0	0	0	0	0	8:35 AM						8:35 AM	0	0	0	0	0
8:40 AM	1	0	0	0	1	8:40 AM						8:40 AM	0	0	0	0	0
8:45 AM	0	0	0	1	1	8:45 AM						8:45 AM	0	0	0	0	0
8:50 AM	0	0	0	1	1	8:50 AM						8:50 AM	0	0	0	0	0
8:55 AM	0	1	0	2	3	8:55 AM						8:55 AM	0	0	0	0	0
Count Total	3	4	0	12	19	Count Total						Count Total	2	0	0	0	2
Peak Hour	1	2	0	6	9	Peak Hour						Peak Hour	2	0	0	0	2

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 1 SW Boones Ferry Rd & SW Sagert St PM
Date: Thursday, May 6, 2021
Peak Hour: 04:00 PM - 05:00 PM
Peak 15-Minutes: 04:15 PM - 04:30 PM

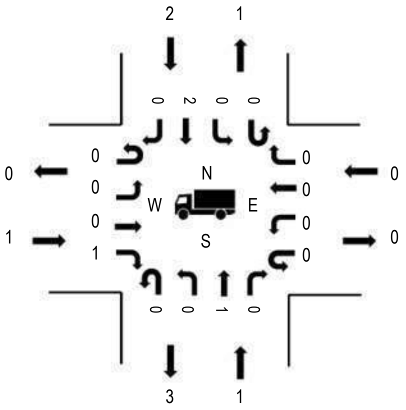
Peak Hour

Motorized Vehicles

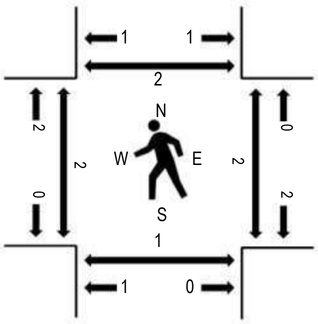


Note: Total study counts contained in parentheses.

Heavy Vehicles



Pedestrians



	HV%	PHF
EB	0.5%	0.83
WB	0.0%	0.87
NB	0.2%	0.90
SB	0.3%	0.86
All	0.2%	0.91

Traffic Counts - Motorized Vehicles

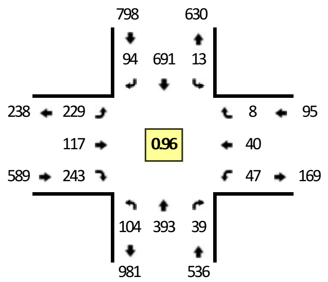
Interval Start Time	SW Sagert St Eastbound U-Turn	Left	Thru	Right	SW Sagert St Westbound U-Turn	Left	Thru	Right	SW Boones Ferry Rd Northbound U-Turn	Left	Thru	Right	SW Boones Ferry Rd Southbound U-Turn	Left	Thru	Right	Total	Rolling Hour
4:00 PM	0	3	11	0	0	15	7	3	0	0	30	17	0	6	29	1	122	1,717
4:05 PM	0	3	9	1	0	13	5	0	0	4	35	24	0	6	41	2	143	1,714
4:10 PM	0	3	12	0	0	16	7	1	0	0	31	20	0	7	47	3	147	1,705
4:15 PM	0	1	8	0	0	22	7	4	0	4	39	17	0	8	36	2	148	1,689
4:20 PM	0	4	5	2	0	14	11	3	0	1	35	20	0	7	56	5	163	1,692
4:25 PM	0	7	16	1	0	14	7	0	0	2	38	24	0	5	37	9	160	1,666
4:30 PM	0	4	10	1	0	16	6	6	0	0	29	28	0	5	30	6	141	1,657
4:35 PM	0	1	13	2	0	9	4	6	0	1	35	17	0	4	46	4	142	1,619
4:40 PM	0	3	21	1	0	15	5	3	0	0	29	14	0	6	40	6	143	1,591
4:45 PM	0	3	13	0	0	15	6	2	0	2	30	19	0	5	26	5	126	1,583
4:50 PM	0	7	6	0	0	17	6	3	0	0	30	22	0	10	38	3	142	1,569
4:55 PM	0	6	16	0	0	13	8	4	0	4	29	20	0	4	33	3	140	1,512
5:00 PM	0	3	5	0	0	13	3	4	0	0	28	18	0	7	34	4	119	1,473
5:05 PM	0	2	23	1	0	12	3	2	0	1	26	18	0	1	43	2	134	
5:10 PM	0	4	14	1	0	15	7	5	0	1	35	13	0	4	29	3	131	
5:15 PM	0	6	12	2	0	18	6	4	0	3	38	16	0	4	39	3	151	
5:20 PM	0	1	9	1	0	17	9	5	0	1	29	15	0	4	41	5	137	
5:25 PM	0	9	9	0	0	15	8	5	0	0	35	14	0	9	44	3	151	
5:30 PM	0	1	4	0	0	11	6	7	0	0	23	12	0	6	30	3	103	
5:35 PM	0	2	7	0	0	15	3	5	0	1	23	14	0	3	38	3	114	
5:40 PM	0	4	5	0	0	14	6	7	0	1	30	13	0	5	45	5	135	
5:45 PM	0	5	8	0	0	17	7	3	0	0	27	10	0	3	29	3	112	
5:50 PM	0	3	3	1	0	12	3	3	0	0	24	6	0	4	23	3	85	
5:55 PM	0	3	0	0	0	14	7	3	0	2	25	6	0	5	32	4	101	
Count Total	0	88	239	14	0	352	147	88	0	28	733	397	0	128	886	90	3,190	
Peak Hour	0	45	140	8	0	179	79	35	0	18	390	242	0	73	459	49	1,717	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0
4:05 PM	0	0	0	0	0	4:05 PM	0	1	0	0	1	4:05 PM	0	0	2	0	2
4:10 PM	0	0	0	1	1	4:10 PM	0	0	0	0	0	4:10 PM	1	1	0	0	2
4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0
4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0
4:25 PM	0	1	0	0	1	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
4:30 PM	1	0	0	0	1	4:30 PM	0	0	0	0	0	4:30 PM	1	0	0	0	1
4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	1	1
4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0	4:45 PM	0	1	0	0	1	4:45 PM	0	0	0	1	1
4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	2	2	4:50 PM	0	0	0	1	1
4:55 PM	0	0	0	1	1	4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0
5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0
5:10 PM	0	0	0	0	0	5:10 PM	0	1	0	0	1	5:10 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0	5:15 PM	0	0	1	0	1
5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	0	0	5:25 PM	0	0	2	0	2
5:30 PM	0	1	0	0	1	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0
5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0	5:40 PM	0	0	1	1	2
5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0	5:45 PM	2	2	0	0	4
5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0	5:55 PM	2	0	0	0	2
Count Total	1	2	0	2	5	Count Total	0	3	0	2	5	Count Total	6	3	6	4	19
Peak Hour	1	1	0	2	4	Peak Hour	0	2	0	2	4	Peak Hour	2	1	2	3	8

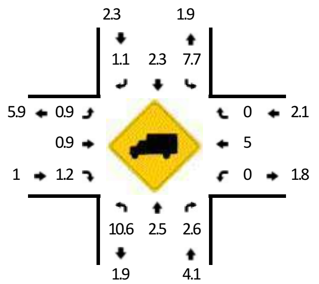
Type of peak hour being reported: Intersection Peak　　　Method for determining peak hour: Total Entering Volume

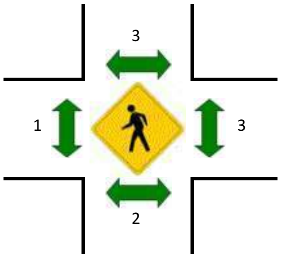
LOCATION: SW Boones Ferry Rd -- SW Avery St　　**QC JOB #:** 15109509
CITY/STATE: Washington, OR　　**DATE:** Tue, Oct 29 2019

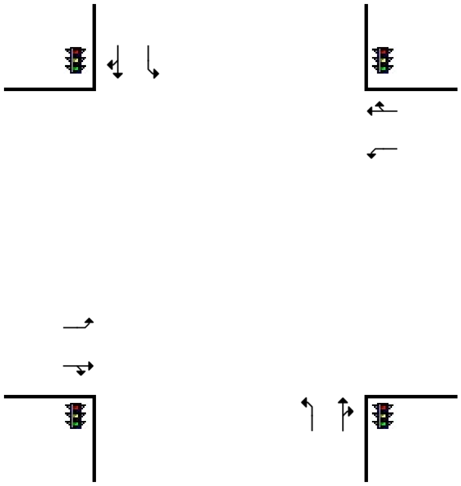


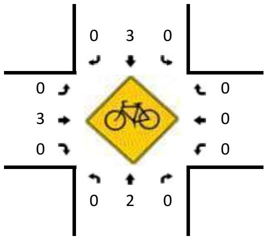
Peak-Hour: 4:25 PM -- 5:25 PM
Peak 15-Min: 5:10 PM -- 5:25 PM

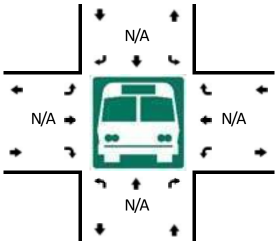
Quality Counts
DATA THAT DRIVES COMMUNITIES

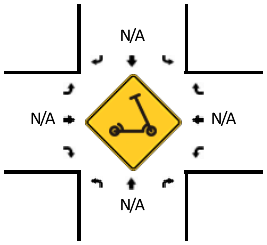












5-Min Count Period Beginning At	SW Boones Ferry Rd (Northbound)				SW Boones Ferry Rd (Southbound)				SW Avery St (Eastbound)				SW Avery St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	8	30	1	0	0	45	7	0	17	4	12	0	1	2	0	0	127	
4:05 PM	3	34	3	0	0	61	2	0	22	9	26	0	3	4	0	0	167	
4:10 PM	4	23	6	0	1	38	9	0	32	11	26	0	5	7	0	0	162	
4:15 PM	5	33	3	0	1	72	8	0	9	8	19	0	1	2	1	0	162	
4:20 PM	12	23	6	0	0	53	2	0	23	11	25	0	1	1	1	0	158	
4:25 PM	3	49	0	0	0	70	8	0	23	8	9	0	5	4	1	0	180	
4:30 PM	15	37	2	0	1	54	9	0	22	3	12	0	2	5	0	0	162	
4:35 PM	7	21	2	0	1	55	6	0	27	17	23	0	4	5	0	0	168	
4:40 PM	6	27	5	0	0	65	7	0	17	9	20	0	3	1	1	0	161	
4:45 PM	10	26	5	0	0	56	4	0	19	11	26	0	6	3	3	0	169	
4:50 PM	8	31	1	0	0	57	10	0	15	8	12	0	4	6	0	0	152	
4:55 PM	10	46	5	0	2	56	7	0	13	8	11	0	4	5	0	0	167	1935
5:00 PM	6	28	4	0	4	47	6	0	21	10	37	0	5	3	1	0	172	1980
5:05 PM	9	27	6	0	1	61	10	0	18	6	17	0	6	3	0	0	164	1977
5:10 PM	5	25	3	0	1	53	8	0	19	14	28	0	2	3	1	0	162	1977
5:15 PM	13	39	5	0	2	64	6	0	13	13	19	0	1	2	0	0	177	1992
5:20 PM	12	37	1	0	1	53	13	0	22	10	29	0	5	0	1	0	184	2018
5:25 PM	6	28	5	0	2	63	11	0	12	6	25	0	2	1	1	0	162	2000
5:30 PM	13	23	1	0	3	57	9	0	14	11	15	0	2	6	1	0	155	1993
5:35 PM	9	40	3	0	0	77	11	0	11	4	15	0	1	6	0	0	177	2002
5:40 PM	23	38	0	0	1	41	5	0	17	6	22	0	2	5	2	0	162	2003
5:45 PM	14	32	6	0	2	54	6	0	12	4	17	0	1	4	1	0	153	1987
5:50 PM	15	33	2	0	1	65	6	0	10	1	10	0	0	6	1	0	150	1985
5:55 PM	17	29	1	0	1	46	9	0	17	5	25	0	2	6	3	0	158	1976

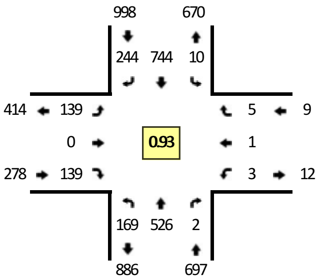
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	120	404	36	0	16	680	108	0	216	148	304	0	32	20	8	0	2092
Heavy Trucks	12	8	4		0	12	0		4	0	4		0	0	0		44
Buses																	
Pedestrians		0				12				4				0			16
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

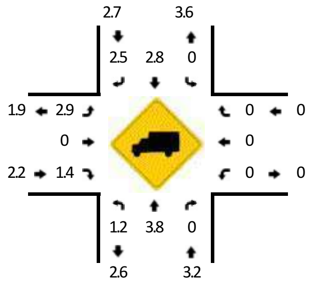
Report generated on 5/7/2021 4:34 PM　　SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

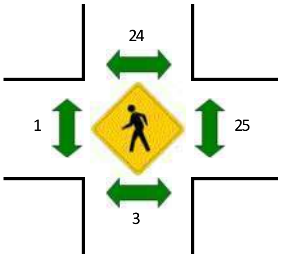
Type of peak hour being reported: Intersection Peak   Method for determining peak hour: Total Entering Volume

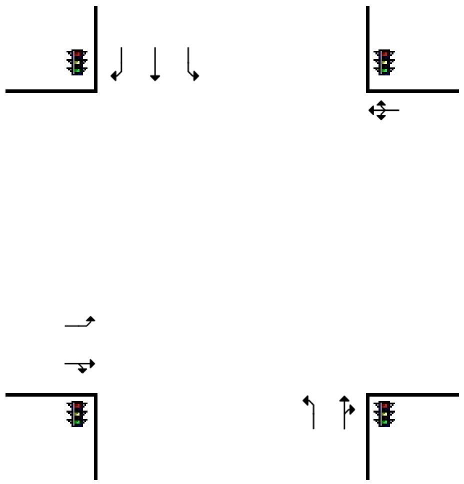
LOCATION: SW Boones Ferry Rd -- SW Ibach St   **QC JOB #:** 14391102
CITY/STATE: Tualatin, OR   **DATE:** Thu, Apr 27 2017

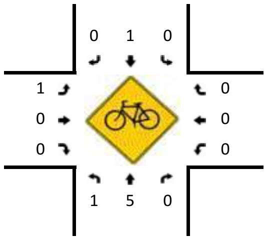


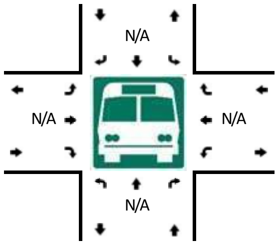
Peak-Hour: 4:40 PM -- 5:40 PM
Peak 15-Min: 5:10 PM -- 5:25 PM

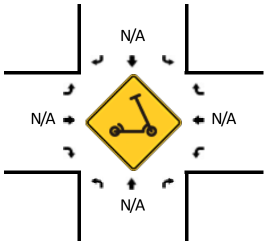












5-Min Count Period Beginning At	SW Boones Ferry Rd (Northbound)				SW Boones Ferry Rd (Southbound)				SW Ibach St (Eastbound)				SW Ibach St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
2:00 PM	3	24	0	0	0	27	11	0	6	0	8	0	0	0	0	0	79	
2:05 PM	9	35	0	0	0	35	8	0	15	0	13	0	0	0	1	0	116	
2:10 PM	2	32	0	0	0	23	11	0	7	0	3	0	0	0	0	0	78	
2:15 PM	6	32	0	0	0	28	12	0	9	0	5	0	0	0	1	0	93	
2:20 PM	4	26	0	0	0	35	11	0	9	0	11	0	0	0	0	0	96	
2:25 PM	10	29	0	0	1	34	6	0	7	0	9	0	0	0	0	0	96	
2:30 PM	8	31	0	0	1	31	7	0	8	0	8	0	0	0	1	0	95	
2:35 PM	2	30	0	0	3	47	9	0	5	0	8	0	0	0	0	0	104	
2:40 PM	5	32	0	0	3	51	14	0	4	0	11	0	1	0	0	0	121	
2:45 PM	5	25	0	0	2	57	18	0	5	0	9	0	0	0	0	0	121	
2:50 PM	13	30	0	0	1	59	12	0	15	1	17	0	1	0	0	0	149	
2:55 PM	9	36	3	0	2	40	10	0	10	2	12	0	1	0	0	0	125	1273
3:00 PM	14	38	3	0	5	44	12	0	7	1	11	0	1	1	0	0	137	1331
3:05 PM	18	54	2	0	1	54	12	0	12	2	4	0	0	0	5	0	164	1379
3:10 PM	25	58	1	0	5	56	11	0	10	4	10	0	1	7	8	0	196	1497
3:15 PM	23	62	0	0	2	52	20	0	4	0	17	0	0	3	8	0	191	1595
3:20 PM	21	78	0	0	0	46	13	0	11	0	13	0	0	0	2	0	184	1683
3:25 PM	12	30	0	0	3	36	19	0	13	0	11	0	0	0	1	0	125	1712
3:30 PM	11	28	0	0	0	51	17	0	7	0	10	0	0	0	0	0	124	1741
3:35 PM	9	49	1	0	0	45	14	0	7	0	20	0	0	1	1	0	147	1784
3:40 PM	9	38	0	0	0	74	13	0	4	0	10	0	1	0	0	0	149	1812
3:45 PM	5	30	0	0	0	54	19	0	18	1	14	0	0	0	0	0	141	1832
3:50 PM	9	33	0	0	0	65	19	0	12	1	15	0	0	0	1	0	155	1838
3:55 PM	6	31	0	0	1	56	15	0	13	0	5	0	1	1	0	0	129	1842
4:00 PM	8	35	0	0	1	54	16	0	11	0	10	0	0	1	0	0	136	1841
4:05 PM	5	53	0	0	0	63	16	0	21	0	11	0	0	0	0	0	169	1846
4:10 PM	4	38	0	0	1	45	12	0	14	1	5	0	1	0	0	0	121	1771
4:15 PM	10	30	1	0	1	72	14	0	16	0	8	0	0	0	1	0	153	1733
4:20 PM	8	34	0	0	1	63	21	0	9	0	13	0	0	0	0	0	149	1698
4:25 PM	10	33	1	0	1	64	11	0	13	0	6	0	0	0	1	0	140	1713
4:30 PM	10	43	0	0	2	44	19	0	8	0	4	0	0	0	1	0	131	1720
4:35 PM	11	39	0	0	0	66	15	0	11	0	13	0	0	0	0	0	155	1728
4:40 PM	8	56	0	0	1	62	9	0	13	0	12	0	1	0	0	0	162	1741
4:45 PM	11	44	0	0	0	68	32	0	9	0	12	0	0	0	0	0	176	1776
4:50 PM	14	39	0	0	2	61	13	0	13	0	22	0	0	0	0	0	164	1785
4:55 PM	16	42	0	0	2	63	21	0	12	0	9	0	0	0	0	0	165	1821
5:00 PM	15	37	0	0	0	63	10	0	14	0	12	0	0	1	1	0	153	1838
5:05 PM	14	38	2	0	1	55	19	0	10	0	13	0	1	0	2	0	155	1824

5-Min Count Period Beginning At	SW Boones Ferry Rd (Northbound)				SW Boones Ferry Rd (Southbound)				SW Ibach St (Eastbound)				SW Ibach St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:10 PM	20	47	0	0	1	54	31	0	9	0	8	0	0	0	1	0	171	1874
5:15 PM	12	38	0	0	0	76	27	0	11	0	13	0	0	0	0	0	177	1898
5:20 PM	14	46	0	0	2	72	23	0	15	0	11	0	1	0	0	0	184	1933
5:25 PM	15	56	0	0	1	57	16	0	18	0	5	0	0	0	0	0	168	1961
5:30 PM	13	34	0	0	0	47	25	0	6	0	13	0	0	0	0	0	138	1968
5:35 PM	17	49	0	0	0	66	18	0	9	0	9	0	0	0	1	0	169	1982
5:40 PM	9	40	0	0	1	57	17	0	13	0	12	0	1	0	0	0	150	1970
5:45 PM	12	34	0	0	0	62	19	0	11	1	6	0	1	0	0	0	146	1940
5:50 PM	8	36	0	0	2	57	32	0	11	0	6	0	0	0	1	0	153	1929
5:55 PM	4	34	1	0	1	43	18	0	13	0	6	0	0	0	1	0	121	1885

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	184	524	0	0	12	808	324	0	140	0	128	0	4	0	4	0	2128
Heavy Trucks	4	20	0		0	28	8		0	0	0		0	0	0		60
Buses																	
Pedestrians		8				8				4				12			32
Bicycles	0	4	0		0	4	0		0	0	0		0	0	0		8
Scooters																	

Comments:

Report generated on 10/7/2020 10:23 AM

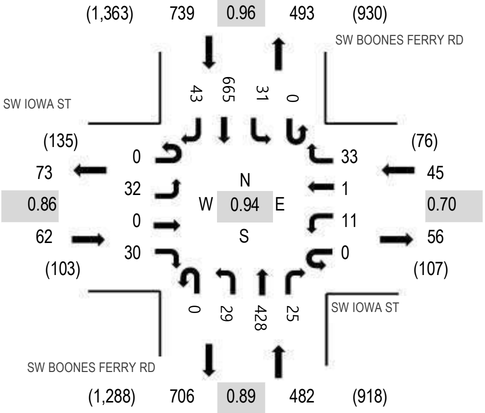
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

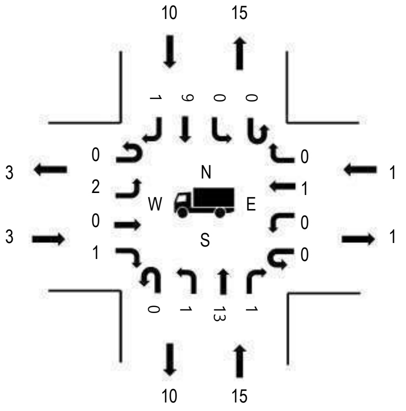
Location: 2 SW BOONES FERRY RD & SW IOWA ST PM
Date: Tuesday, September 29, 2020
Peak Hour: 04:35 PM - 05:35 PM
Peak 15-Minutes: 04:45 PM - 05:00 PM

Peak Hour

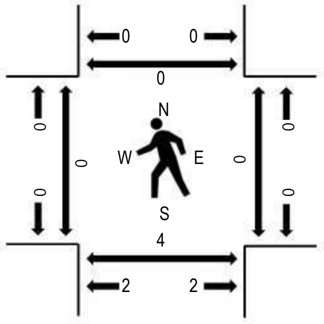
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	4.8%	0.86
WB	2.2%	0.70
NB	3.1%	0.89
SB	1.4%	0.96
All	2.2%	0.94

Traffic Counts - Motorized Vehicles

Interval	SW IOWA ST Eastbound				SW IOWA ST Westbound				SW BOONES FERRY RD Northbound				SW BOONES FERRY RD Southbound					Rolling
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	Hour
4:00 PM	0	2	0	2	0	0	0	2	0	3	31	0	0	2	48	1	91	1,278
4:05 PM	0	0	0	1	0	2	0	4	0	4	30	0	0	2	41	4	88	1,292
4:10 PM	0	4	0	0	0	1	0	0	0	1	35	1	0	2	51	1	96	1,313
4:15 PM	0	3	0	3	0	1	0	0	0	4	38	2	0	2	63	6	122	1,325
4:20 PM	0	3	0	1	0	1	0	3	0	1	30	6	0	3	48	2	98	1,307
4:25 PM	0	2	0	0	0	1	0	2	0	2	37	1	0	6	50	3	104	1,319
4:30 PM	0	1	0	1	0	1	0	2	0	3	34	1	0	2	55	2	102	1,323
4:35 PM	0	5	0	3	0	2	0	5	0	3	39	1	0	1	55	2	116	1,328
4:40 PM	0	1	0	1	0	0	0	1	0	0	39	2	0	3	56	6	109	1,311
4:45 PM	0	4	0	2	0	1	0	2	0	2	38	3	0	1	56	2	111	1,306
4:50 PM	0	2	0	1	0	0	1	4	0	3	46	4	0	4	55	8	128	1,281
4:55 PM	0	2	0	1	0	4	0	4	0	3	28	3	0	2	61	5	113	1,230
5:00 PM	0	3	0	2	0	0	0	1	0	1	37	2	0	3	55	1	105	1,182
5:05 PM	0	2	0	4	0	0	0	3	0	4	30	2	0	4	58	2	109	
5:10 PM	0	4	0	3	0	0	0	0	0	1	36	2	0	3	53	6	108	
5:15 PM	0	2	0	2	0	1	0	3	0	3	31	0	0	2	57	3	104	
5:20 PM	0	3	0	3	0	1	0	3	0	4	37	3	0	3	50	3	110	
5:25 PM	0	2	0	6	0	0	0	3	0	2	30	2	0	3	58	2	108	
5:30 PM	0	2	0	2	0	2	0	4	0	3	37	1	0	2	51	3	107	
5:35 PM	0	2	0	2	0	0	0	1	0	4	29	2	0	5	50	4	99	
5:40 PM	0	0	0	3	0	0	0	5	0	1	43	2	0	3	43	4	104	
5:45 PM	0	2	0	3	0	0	0	0	0	1	28	1	0	3	46	2	86	
5:50 PM	0	1	0	1	0	0	0	2	0	2	36	1	0	3	30	1	77	
5:55 PM	0	3	0	1	0	0	0	3	0	3	19	0	0	1	32	3	65	
Count Total	0	55	0	48	0	18	1	57	0	58	818	42	0	65	1,222	76	2,460	
Peak Hour	0	32	0	30	0	11	1	33	0	29	428	25	0	31	665	43	1,328	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval	Heavy Vehicles					Interval	Bicycles on Roadway					Interval	Pedestrians/Bicycles on Crosswalk				
Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total
4:00 PM	0	4	0	2	6	4:00 PM						4:00 PM	0	0	0	0	0
4:05 PM	0	1	0	0	1	4:05 PM						4:05 PM	0	0	0	0	0
4:10 PM	0	0	0	1	1	4:10 PM						4:10 PM	0	0	0	0	0
4:15 PM	1	1	0	2	4	4:15 PM						4:15 PM	0	0	0	0	0
4:20 PM	0	3	0	1	4	4:20 PM						4:20 PM	0	0	0	0	0
4:25 PM	0	2	0	2	4	4:25 PM						4:25 PM	1	0	0	0	1
4:30 PM	0	0	0	1	1	4:30 PM						4:30 PM	0	0	0	0	0
4:35 PM	0	4	0	0	4	4:35 PM						4:35 PM	0	0	0	0	0
4:40 PM	0	1	0	1	2	4:40 PM						4:40 PM	0	2	0	0	2
4:45 PM	0	2	0	2	4	4:45 PM						4:45 PM	0	0	0	0	0
4:50 PM	0	2	1	2	5	4:50 PM						4:50 PM	0	0	0	0	0
4:55 PM	0	2	0	2	4	4:55 PM						4:55 PM	0	0	0	0	0
5:00 PM	1	1	0	0	2	5:00 PM						5:00 PM	0	0	0	0	0
5:05 PM	1	0	0	0	1	5:05 PM						5:05 PM	0	2	0	0	2
5:10 PM	1	1	0	0	2	5:10 PM						5:10 PM	0	0	0	0	0
5:15 PM	0	0	0	1	1	5:15 PM						5:15 PM	0	0	0	0	0
5:20 PM	0	0	0	0	0	5:20 PM						5:20 PM	0	0	0	0	0
5:25 PM	0	1	0	1	2	5:25 PM						5:25 PM	0	0	0	0	0
5:30 PM	0	1	0	1	2	5:30 PM						5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	1	1	5:35 PM						5:35 PM	0	0	0	0	0
5:40 PM	0	2	0	2	4	5:40 PM						5:40 PM	1	0	0	0	1
5:45 PM	0	1	0	0	1	5:45 PM						5:45 PM	0	0	0	1	1
5:50 PM	0	2	0	0	2	5:50 PM						5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0	5:55 PM						5:55 PM	0	0	1	0	1
Count Total	4	31	1	22	58	Count Total						Count Total	2	4	1	1	8
Peak Hour	3	15	1	10	29	Peak Hour						Peak Hour	0	4	0	0	4

ALL TRAFFIC DATA SERVICES

(303) 216-2439
www.alltrafficdata.net

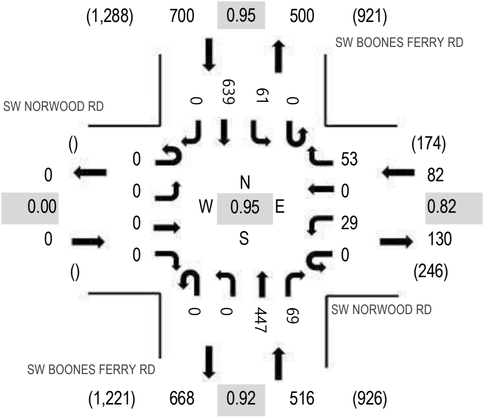
Location: 3 SW BOONES FERRY RD & SW NORWOOD RD PM

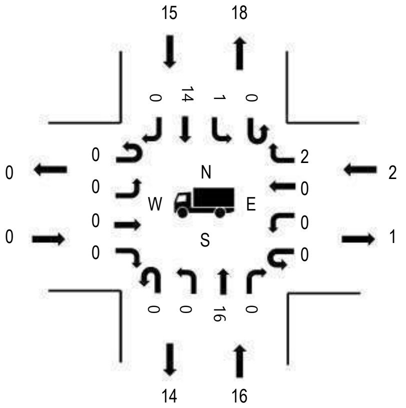
Date: Tuesday, September 29, 2020

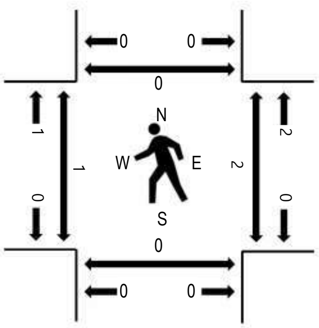
Peak Hour: 04:10 PM - 05:10 PM

Peak 15-Minutes: 04:40 PM - 04:55 PM

Peak Hour


Motorized Vehicles


Heavy Vehicles


Pedestrians

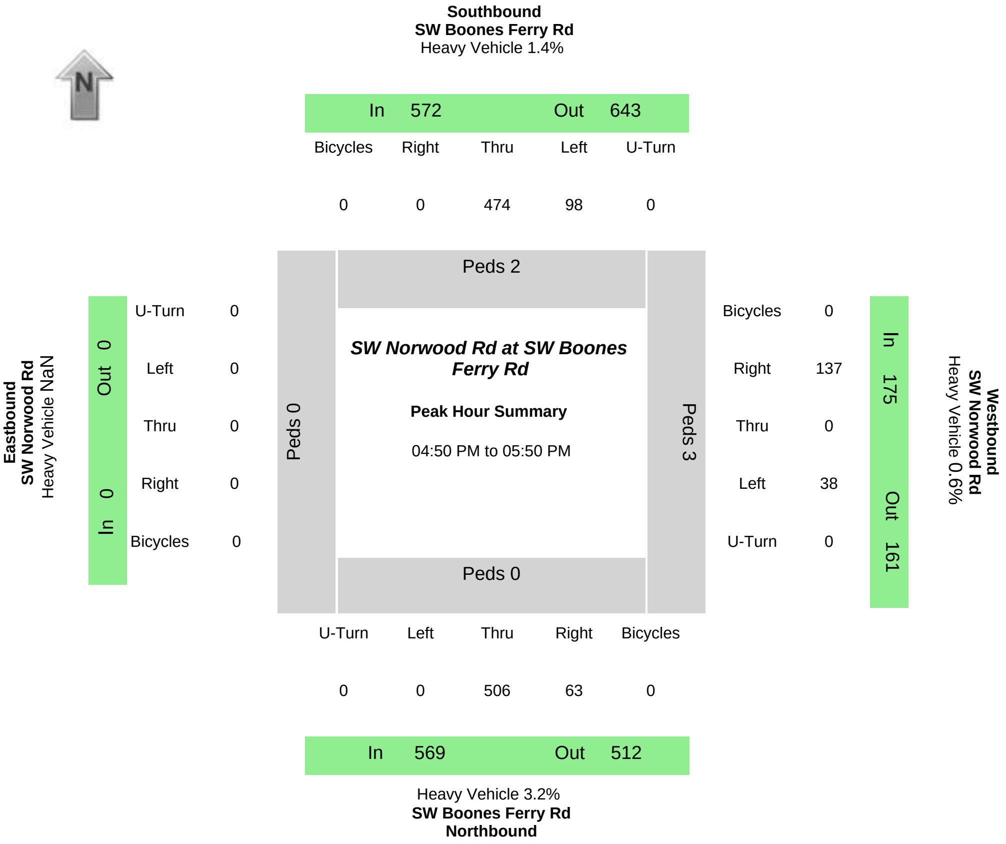
Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.00
WB	2.4%	0.82
NB	3.1%	0.92
SB	2.1%	0.95
All	2.5%	0.95

Traffic Counts - Motorized Vehicles

Interval Start Time	SW NORWOOD RD Eastbound				SW NORWOOD RD Westbound				SW BOONES FERRY RD Northbound				SW BOONES FERRY RD Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	0	0	0	0	5	0	5	0	0	31	4	0	2	48	0	95	1,255
4:05 PM	0	0	0	0	0	4	0	4	0	0	26	4	0	7	34	0	79	1,272
4:10 PM	0	0	0	0	0	4	0	6	0	0	39	4	0	8	49	0	110	1,298
4:15 PM	0	0	0	0	0	3	0	3	0	0	41	7	0	9	63	0	126	1,282
4:20 PM	0	0	0	0	0	0	0	4	0	0	32	4	0	6	44	0	90	1,260
4:25 PM	0	0	0	0	0	2	0	3	0	0	40	3	0	5	44	0	97	1,286
4:30 PM	0	0	0	0	0	1	0	5	0	0	35	5	0	3	53	0	102	1,291
4:35 PM	0	0	0	0	0	2	0	5	0	0	36	5	0	4	55	0	107	1,291
4:40 PM	0	0	0	0	0	3	0	5	0	0	34	8	0	4	54	0	108	1,271
4:45 PM	0	0	0	0	0	3	0	5	0	0	49	6	0	2	59	0	124	1,261
4:50 PM	0	0	0	0	0	4	0	5	0	0	35	8	0	3	56	0	111	1,221
4:55 PM	0	0	0	0	0	1	0	5	0	0	30	3	0	5	62	0	106	1,183
5:00 PM	0	0	0	0	0	3	0	4	0	0	38	12	0	6	49	0	112	1,133
5:05 PM	0	0	0	0	0	3	0	3	0	0	38	4	0	6	51	0	105	
5:10 PM	0	0	0	0	0	2	0	5	0	0	26	4	0	5	52	0	94	
5:15 PM	0	0	0	0	0	4	0	6	0	0	29	6	0	4	55	0	104	
5:20 PM	0	0	0	0	0	4	0	6	0	0	39	5	0	6	56	0	116	
5:25 PM	0	0	0	0	0	0	0	2	0	0	35	6	0	7	52	0	102	
5:30 PM	0	0	0	0	0	2	0	6	0	0	34	4	0	8	48	0	102	
5:35 PM	0	0	0	0	0	1	0	5	0	0	36	2	0	4	39	0	87	
5:40 PM	0	0	0	0	0	2	0	7	0	0	29	7	0	11	42	0	98	
5:45 PM	0	0	0	0	0	3	0	6	0	0	24	7	0	3	41	0	84	
5:50 PM	0	0	0	0	0	2	0	6	0	0	34	1	0	1	29	0	73	
5:55 PM	0	0	0	0	0	1	0	4	0	0	16	1	0	7	27	0	56	
Count Total	0	0	0	0	0	59	0	115	0	0	806	120	0	126	1,162	0	2,388	
Peak Hour	0	0	0	0	0	29	0	53	0	0	447	69	0	61	639	0	1,298	

Data Provided by K-D-N.com 503-594-4224	
N/S street	***SW Boones Ferry Rd***
E/W street	***SW Norwood Rd***
City, State	Tualatin OR
Site Notes	
Location	45.353654 - -122.7747
Start Date	Tuesday, October 22, 2019
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:50:00 PM
Peak 15 Min Start	05:00:00 PM
PHF (15-Min Int)	0.94



Southbound
SW Boones Ferry Rd
Heavy Vehicle 1.4%

In 572 Out 643

Bicycles	Right	Thru	Left	U-Turn
0	0	474	98	0

Peds 2

Eastbound
SW Norwood Rd
Heavy Vehicle NaN

Out 0
In 0

U-Turn	0
Left	0
Thru	0
Right	0
Bicycles	0

Peds 0

SW Norwood Rd at SW Boones Ferry Rd

Peak Hour Summary

04:50 PM to 05:50 PM

Peds 3

Bicycles	0
Right	137
Thru	0
Left	38
U-Turn	0

In 175
Out 161

Westbound
SW Norwood Rd
Heavy Vehicle 0.6%

Peds 0

U-Turn	Left	Thru	Right	Bicycles
0	0	506	63	0

In 569 Out 512

Heavy Vehicle 3.2%
SW Boones Ferry Rd
Northbound

Peak-Hour Volumes (PHV)

Northbound				**Southbound**				**Eastbound**				**Westbound**				**Entering**				**Leaving**			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
0	506	63	0	98	474	0	0	0	0	0	0	38	0	137	0	569	572	0	175	512	643	0	161

Percent Heavy Vehicles

0.0%	3.6%	0.0%	0.0%	1.0%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.6%	0.0%	0.0%	0.0%	3.2%	1.4%	NaN	0.6%	1.6%	2.8%	NaN	0.6%

PHV- Bicycles																	PHV - Pedestrians				
Northbound				**Southbound**				**Eastbound**				**Westbound**					in Crosswalk				
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	**Sum**	NB	SB	EB	WB	**Sum**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	3	5

All Vehicle Volumes

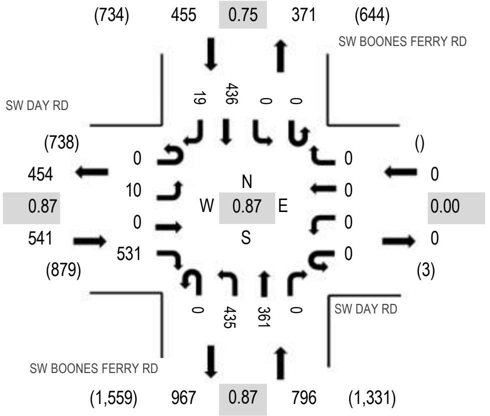
	Northbound				**Southbound**				**Eastbound**				**Westbound**					
	SW Boones Ferry Rd				SW Boones Ferry Rd				SW Norwood Rd				SW Norwood Rd				15 Min	1 HR
Time	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	Sum
04:00:00 PM	0	45	4	0	14	58	0	0	0	0	0	0	4	0	7	0		
04:05:00 PM	0	28	11	0	6	47	0	0	0	0	0	0	4	0	5	0		
04:10:00 PM	0	25	6	0	13	63	0	0	0	0	0	0	5	0	5	0	350	
04:15:00 PM	0	24	3	0	4	52	0	0	0	0	0	0	2	0	2	0	305	
04:20:00 PM	0	32	0	0	7	35	0	0	0	0	0	0	0	0	9	0	287	
04:25:00 PM	0	23	3	0	4	44	0	0	0	0	0	0	0	0	1	0	245	
04:30:00 PM	0	29	3	0	4	41	0	0	0	0	0	0	1	0	7	0	243	
04:35:00 PM	0	28	7	0	6	36	0	0	0	0	0	0	1	0	5	0	243	
04:40:00 PM	0	33	8	0	5	51	0	0	0	0	0	0	3	0	11	0	279	
04:45:00 PM	0	40	6	0	11	22	0	0	0	0	0	0	4	0	13	0	290	
04:50:00 PM	0	43	6	0	9	39	0	0	0	0	0	0	7	0	13	0	324	
04:55:00 PM	0	36	6	0	10	39	0	0	0	0	0	0	3	0	7	0	314	1188
05:00:00 PM	0	38	2	0	14	42	0	0	0	0	0	0	1	0	6	0	321	1159
05:05:00 PM	0	38	4	0	11	46	0	0	0	0	0	0	5	0	13	0	321	1175
05:10:00 PM	0	56	6	0	5	51	0	0	0	0	0	0	3	0	9	0	350	1188
05:15:00 PM	0	39	5	0	3	42	0	0	0	0	0	0	2	0	10	0	348	1202
05:20:00 PM	0	50	7	0	9	30	0	0	0	0	0	0	2	0	8	0	337	1225
05:25:00 PM	0	44	2	0	7	40	0	0	0	0	0	0	2	0	12	0	314	1257
05:30:00 PM	0	30	4	0	5	30	0	0	0	0	0	0	6	0	17	0	305	1264
05:35:00 PM	0	47	6	0	5	35	0	0	0	0	0	0	4	0	9	0	305	1287
05:40:00 PM	0	44	4	0	13	48	0	0	0	0	0	0	0	0	16	0	323	1301
05:45:00 PM	0	41	11	0	7	32	0	0	0	0	0	0	3	0	17	0	342	1316
05:50:00 PM	0	40	9	0	11	21	0	0	0	0	0	0	2	0	10	0	329	1292
05:55:00 PM	0	49	9	0	4	29	0	0	0	0	0	0	6	0	11	0	312	1299

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

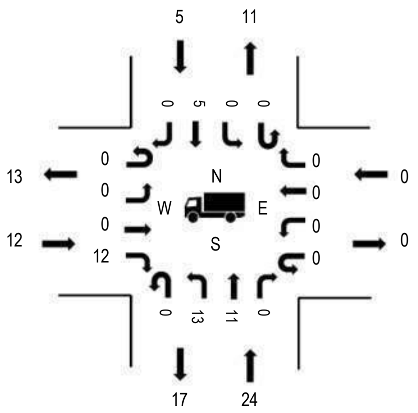
Location: 1 SW BOONES FERRY RD & SW DAY RD PM
Date: Tuesday, March 30, 2021
Peak Hour: 04:00 PM - 05:00 PM
Peak 15-Minutes: 04:10 PM - 04:25 PM

Peak Hour

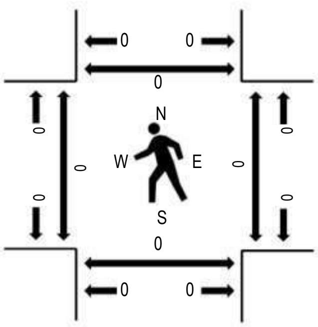
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	2.2%	0.87
WB	0.0%	0.00
NB	3.0%	0.87
SB	1.1%	0.75
All	2.3%	0.87

Traffic Counts - Motorized Vehicles

Interval Start Time	SW DAY RD Eastbound				SW DAY RD Westbound				SW BOONES FERRY RD Northbound				SW BOONES FERRY RD Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	2	0	56	0	0	0	0	0	53	29	0	0	0	44	2	186	1,792
4:05 PM	0	0	0	48	0	0	0	0	0	42	40	0	0	0	35	2	167	1,723
4:10 PM	0	1	0	49	0	0	0	0	0	31	32	0	0	0	41	2	156	1,678
4:15 PM	0	1	0	47	0	0	0	0	0	41	42	0	0	0	61	0	192	1,614
4:20 PM	0	2	0	50	0	0	0	0	0	33	37	0	0	0	46	1	169	1,541
4:25 PM	0	1	0	49	0	0	0	0	0	34	24	0	0	0	27	1	136	1,461
4:30 PM	0	0	0	37	0	0	0	0	0	27	24	0	0	0	24	0	112	1,411
4:35 PM	0	0	0	38	0	0	0	0	0	33	21	0	0	0	33	2	127	1,388
4:40 PM	0	0	0	43	0	0	0	0	0	34	25	0	0	0	32	3	137	1,342
4:45 PM	0	0	0	37	0	0	0	0	0	50	36	0	0	0	36	0	159	1,295
4:50 PM	0	2	0	41	0	0	0	0	0	33	27	0	0	0	26	2	131	1,213
4:55 PM	0	1	0	36	0	0	0	0	0	24	24	0	0	0	31	4	120	1,166
5:00 PM	0	0	0	38	0	0	0	0	0	28	28	0	0	0	20	3	117	1,152
5:05 PM	0	1	0	27	0	0	0	0	0	44	31	0	0	0	18	1	122	
5:10 PM	0	0	0	34	0	0	0	0	0	19	17	0	0	0	22	0	92	
5:15 PM	0	1	0	40	0	0	0	0	0	25	20	0	0	0	32	1	119	
5:20 PM	0	0	0	21	0	0	0	0	0	26	23	0	0	0	19	0	89	
5:25 PM	0	1	0	23	0	0	0	0	0	15	22	0	0	0	25	0	86	
5:30 PM	0	1	0	31	0	0	0	0	0	22	9	0	0	0	26	0	89	
5:35 PM	0	1	0	20	0	0	0	0	0	13	17	0	0	0	30	0	81	
5:40 PM	0	1	0	30	0	0	0	0	0	21	15	0	0	0	20	3	90	
5:45 PM	0	0	0	19	0	0	0	0	0	16	20	0	0	0	20	2	77	
5:50 PM	0	0	2	16	0	0	0	0	0	19	29	0	0	0	18	0	84	
5:55 PM	0	4	1	26	0	0	0	0	0	24	32	0	0	0	17	2	106	
Count Total	0	20	3	856	0	0	0	0	0	707	624	0	0	0	703	31	2,944	
Peak Hour	0	10	0	531	0	0	0	0	0	435	361	0	0	0	436	19	1,792	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	2	3	0	0	5	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0
4:05 PM	0	2	0	0	2	4:05 PM	0	0	0	0	0	4:05 PM	0	0	0	0	0
4:10 PM	3	2	0	0	5	4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	0	0
4:15 PM	2	2	0	1	5	4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0
4:20 PM	0	3	0	0	3	4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0
4:25 PM	2	1	0	1	4	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
4:30 PM	1	0	0	0	1	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:35 PM	0	0	0	1	1	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0
4:40 PM	1	7	0	0	8	4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0
4:45 PM	0	3	0	2	5	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0
4:50 PM	0	1	0	0	1	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0
4:55 PM	1	0	0	0	1	4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0
5:00 PM	1	0	0	1	2	5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0
5:05 PM	2	1	0	1	4	5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0
5:10 PM	1	0	0	0	1	5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0
5:15 PM	0	1	0	2	3	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:20 PM	2	0	0	0	2	5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0
5:25 PM	3	0	0	0	3	5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	0	0
5:30 PM	0	0	0	2	2	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	2	2	5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0
5:40 PM	0	2	0	0	2	5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0
5:45 PM	1	1	0	0	2	5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0
5:50 PM	2	1	0	0	3	5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0
5:55 PM	2	0	0	1	3	5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0
Count Total	26	30	0	14	70	Count Total	0	0	0	0	0	Count Total	0	0	0	0	0
Peak Hour	12	24	0	5	41	Peak Hour	0	0	0	0	0	Peak Hour	0	0	0	0	0

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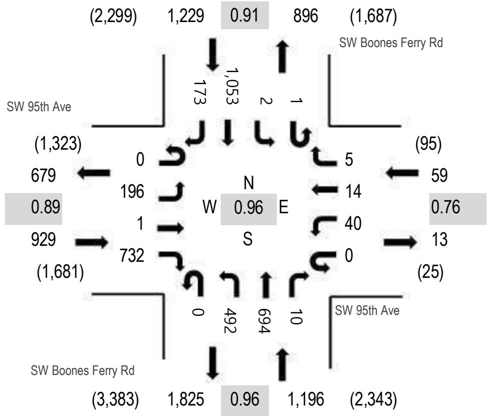
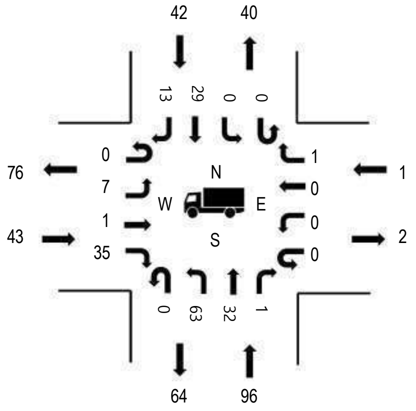
Location: SW Boones Ferry Rd & SW 95th Ave PM
Date: Tuesday, June 8, 2021
Peak Hour: 04:25 PM - 05:25 PM
Peak 15-Minutes: 05:00 PM - 05:15 PM

Peak Hour

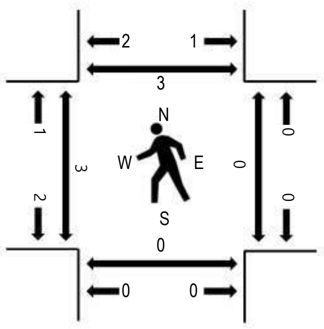
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	4.6%	0.89
WB	1.7%	0.76
NB	8.0%	0.96
SB	3.4%	0.91
All	5.3%	0.96

Traffic Counts - Motorized Vehicles

Interval Start Time	SW 95th Ave Eastbound U-Turn	Left	Thru	Right	SW 95th Ave Westbound U-Turn	Left	Thru	Right	SW Boones Ferry Rd Northbound U-Turn	Left	Thru	Right	SW Boones Ferry Rd Southbound U-Turn	Left	Thru	Right	Total	Rolling Hour
4:00 PM	0	8	0	64	0	2	1	1	0	41	68	0	0	0	93	16	294	3,328
4:05 PM	0	17	0	88	0	7	1	0	0	41	53	1	0	0	84	13	305	3,322
4:10 PM	0	8	0	50	0	1	1	0	0	25	51	2	0	0	115	16	269	3,293
4:15 PM	0	9	1	71	0	3	1	0	0	26	34	2	0	0	72	14	233	3,348
4:20 PM	0	6	0	54	0	4	0	1	0	33	56	1	0	0	72	20	247	3,398
4:25 PM	0	13	0	57	0	1	2	1	0	23	51	0	0	0	100	15	263	3,413
4:30 PM	0	12	0	58	0	1	1	0	0	41	56	1	0	1	81	15	267	3,392
4:35 PM	0	15	0	80	0	4	1	0	0	48	61	2	0	0	84	11	306	3,371
4:40 PM	0	19	0	80	0	5	0	1	0	34	47	1	0	0	86	18	291	3,313
4:45 PM	0	14	0	55	0	4	1	0	0	47	57	3	0	0	94	9	284	3,255
4:50 PM	0	24	0	63	0	2	3	0	0	38	50	0	0	1	83	8	272	3,211
4:55 PM	0	24	0	42	0	2	1	0	0	42	74	1	0	0	90	21	297	3,167
5:00 PM	0	16	0	63	0	8	0	2	0	39	56	0	0	0	89	15	288	3,090
5:05 PM	0	13	0	62	0	4	0	0	0	54	48	1	0	0	83	11	276	
5:10 PM	0	19	1	70	0	5	1	0	0	51	64	1	0	0	97	15	324	
5:15 PM	0	12	0	58	0	2	3	1	0	43	61	0	0	0	81	22	283	
5:20 PM	0	15	0	44	0	2	1	0	0	32	69	0	1	0	85	13	262	
5:25 PM	0	14	0	60	0	1	0	0	0	57	48	1	0	0	49	12	242	
5:30 PM	0	11	1	38	0	3	0	0	0	32	53	1	0	0	87	20	246	
5:35 PM	0	8	0	57	0	1	0	0	0	39	67	0	0	0	63	13	248	
5:40 PM	0	12	0	42	0	1	1	0	0	44	51	0	0	0	72	10	233	
5:45 PM	0	6	0	45	0	2	1	1	0	39	61	1	0	0	71	13	240	
5:50 PM	0	14	0	29	0	1	0	0	0	47	66	0	0	0	63	8	228	
5:55 PM	0	6	0	33	0	0	0	1	0	45	60	1	0	0	60	14	220	
Count Total	0	315	3	1,363	0	66	20	9	0	961	1,362	20	1	2	1,954	342	6,418	
Peak Hour	0	196	1	732	0	40	14	5	0	492	694	10	1	2	1,053	173	3,413	

Location: SW Boones Ferry Rd & SW 95th Ave PM

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval	Heavy Vehicles					Interval	Bicycles on Roadway					Interval	Pedestrians/Bicycles on Crosswalk				
Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total
4:00 PM	5	9	0	3	17	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0
4:05 PM	2	4	0	1	7	4:05 PM	0	0	0	0	0	4:05 PM	0	0	0	1	1
4:10 PM	2	7	0	4	13	4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	0	0
4:15 PM	5	3	0	0	8	4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0
4:20 PM	2	11	0	2	15	4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0
4:25 PM	1	9	1	4	15	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
4:30 PM	3	14	0	2	19	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:35 PM	4	6	0	3	13	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0
4:40 PM	5	8	0	4	17	4:40 PM	0	0	0	0	0	4:40 PM	1	0	0	1	2
4:45 PM	4	8	0	1	13	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0
4:50 PM	6	5	0	3	14	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0
4:55 PM	4	5	0	5	14	4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0
5:00 PM	3	11	0	4	18	5:00 PM	1	0	0	0	1	5:00 PM	0	0	0	0	0
5:05 PM	3	10	0	1	14	5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0
5:10 PM	5	7	0	4	16	5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0
5:15 PM	4	8	0	4	16	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:20 PM	1	5	0	7	13	5:20 PM	1	0	0	0	1	5:20 PM	2	0	0	2	4
5:25 PM	2	7	0	1	10	5:25 PM	0	1	0	0	1	5:25 PM	0	0	0	0	0
5:30 PM	0	11	0	7	18	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:35 PM	3	4	0	0	7	5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0
5:40 PM	3	2	0	1	6	5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0
5:45 PM	3	10	0	1	14	5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0
5:50 PM	2	6	0	2	10	5:50 PM	1	1	0	0	2	5:50 PM	0	0	0	1	1
5:55 PM	2	3	0	1	6	5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0
Count Total	74	173	1	65	313	Count Total	3	2	0	0	5	Count Total	3	0	0	5	8
Peak Hour	43	96	1	42	182	Peak Hour	2	0	0	0	2	Peak Hour	3	0	0	3	6

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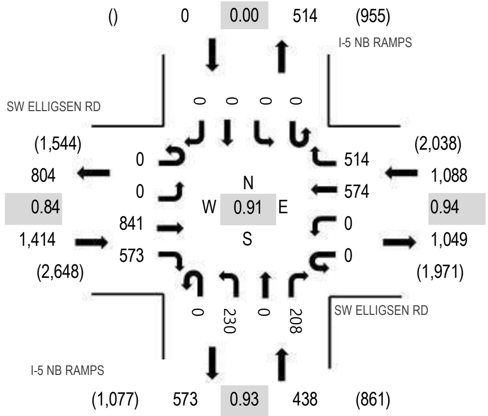
Location: 9 I-5 NB RAMPS & SW ELLIGSEN RD PM
Date: Tuesday, September 29, 2020
Peak Hour: 04:40 PM - 05:40 PM
Peak 15-Minutes: 05:05 PM - 05:20 PM

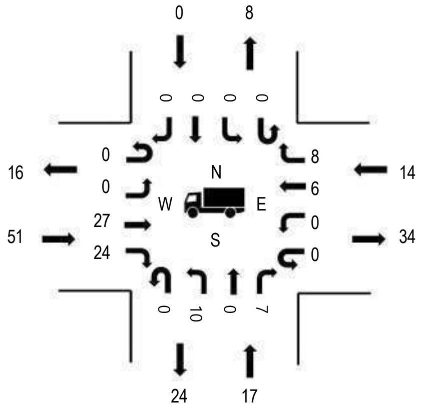
Peak Hour

Motorized Vehicles

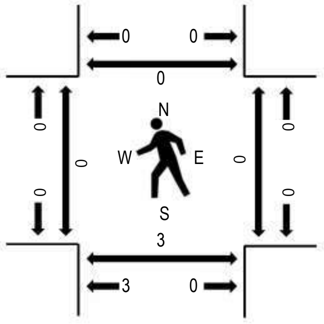


Note: Total study counts contained in parentheses.

Heavy Vehicles



Pedestrians



	HV%	PHF
EB	3.6%	0.84
WB	1.3%	0.94
NB	3.9%	0.93
SB	0.0%	0.00
All	2.8%	0.91

Traffic Counts - Motorized Vehicles

Interval Start Time	SW ELLIGSEN RD Eastbound				SW ELLIGSEN RD Westbound				I-5 NB RAMPS Northbound				I-5 NB RAMPS Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	0	68	44	0	0	41	39	0	15	0	17	0	0	0	0	224	2,766
4:05 PM	0	0	62	42	0	0	46	49	0	15	0	16	0	0	0	0	230	2,766
4:10 PM	0	0	62	55	0	0	46	40	0	12	0	15	0	0	0	0	230	2,819
4:15 PM	0	0	49	47	0	0	55	39	0	20	0	21	0	0	0	0	231	2,867
4:20 PM	0	0	64	47	0	0	49	33	0	13	0	21	0	0	0	0	227	2,887
4:25 PM	0	0	66	35	0	0	49	34	0	17	0	14	0	0	0	0	215	2,918
4:30 PM	0	0	62	35	0	0	41	40	0	35	0	13	0	0	0	0	226	2,930
4:35 PM	0	0	65	51	0	0	35	39	0	15	0	14	0	0	0	0	219	2,930
4:40 PM	0	0	69	53	0	0	49	43	0	22	0	18	0	0	0	0	254	2,940
4:45 PM	0	0	75	27	0	0	56	44	0	14	0	20	0	0	0	0	236	2,890
4:50 PM	0	0	65	35	0	0	33	45	0	19	0	17	0	0	0	0	214	2,869
4:55 PM	0	0	73	41	0	0	52	48	0	21	0	25	0	0	0	0	260	2,875
5:00 PM	0	0	57	43	0	0	49	45	0	12	0	18	0	0	0	0	224	2,781
5:05 PM	0	0	76	77	0	0	42	54	0	17	0	17	0	0	0	0	283	
5:10 PM	0	0	76	62	0	0	66	30	0	28	0	16	0	0	0	0	278	
5:15 PM	0	0	80	55	0	0	39	34	0	28	0	15	0	0	0	0	251	
5:20 PM	0	0	75	56	0	0	45	54	0	13	0	15	0	0	0	0	258	
5:25 PM	0	0	59	52	0	0	39	40	0	18	0	19	0	0	0	0	227	
5:30 PM	0	0	65	36	0	0	66	29	0	16	0	14	0	0	0	0	226	
5:35 PM	0	0	71	36	0	0	38	48	0	22	0	14	0	0	0	0	229	
5:40 PM	0	0	66	35	0	0	37	31	0	20	0	15	0	0	0	0	204	
5:45 PM	0	0	63	46	0	0	35	36	0	24	0	11	0	0	0	0	215	
5:50 PM	0	0	60	39	0	0	42	31	0	25	0	23	0	0	0	0	220	
5:55 PM	0	0	43	28	0	0	33	30	0	20	0	12	0	0	0	0	166	
Count Total	0	0	1,571	1,077	0	0	1,083	955	0	461	0	400	0	0	0	0	5,547	
Peak Hour	0	0	841	573	0	0	574	514	0	230	0	208	0	0	0	0	2,940	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	7	1	5	0	13	4:00 PM						4:00 PM	0	0	0	0	0
4:05 PM	5	4	1	0	10	4:05 PM						4:05 PM	0	0	0	0	0
4:10 PM	6	4	5	0	15	4:10 PM						4:10 PM	0	0	0	0	0
4:15 PM	7	4	1	0	12	4:15 PM						4:15 PM	0	0	0	0	0
4:20 PM	4	2	1	0	7	4:20 PM						4:20 PM	0	1	0	0	1
4:25 PM	3	1	1	0	5	4:25 PM						4:25 PM	0	0	0	0	0
4:30 PM	4	5	1	0	10	4:30 PM						4:30 PM	0	0	0	0	0
4:35 PM	4	4	1	0	9	4:35 PM						4:35 PM	0	0	0	0	0
4:40 PM	5	2	1	0	8	4:40 PM						4:40 PM	0	0	0	0	0
4:45 PM	3	0	3	0	6	4:45 PM						4:45 PM	0	0	0	0	0
4:50 PM	6	1	0	0	7	4:50 PM						4:50 PM	0	0	0	0	0
4:55 PM	6	2	3	0	11	4:55 PM						4:55 PM	0	0	0	0	0
5:00 PM	5	1	0	0	6	5:00 PM						5:00 PM	0	0	0	0	0
5:05 PM	8	2	2	0	12	5:05 PM						5:05 PM	0	0	0	0	0
5:10 PM	5	1	1	0	7	5:10 PM						5:10 PM	0	2	0	0	2
5:15 PM	3	4	0	0	7	5:15 PM						5:15 PM	0	0	0	0	0
5:20 PM	1	1	0	0	2	5:20 PM						5:20 PM	0	1	0	0	1
5:25 PM	3	1	2	0	6	5:25 PM						5:25 PM	0	0	0	0	0
5:30 PM	3	0	2	0	5	5:30 PM						5:30 PM	0	0	0	0	0
5:35 PM	3	2	0	0	5	5:35 PM						5:35 PM	0	0	0	0	0
5:40 PM	2	1	1	0	4	5:40 PM						5:40 PM	0	0	0	0	0
5:45 PM	7	2	1	0	10	5:45 PM						5:45 PM	0	0	0	0	0
5:50 PM	3	3	0	0	6	5:50 PM						5:50 PM	0	0	0	0	0
5:55 PM	3	1	1	0	5	5:55 PM						5:55 PM	0	0	0	0	0
Count Total	106	49	33	0	188	Count Total						Count Total	0	4	0	0	4
Peak Hour	51	17	14	0	82	Peak Hour						Peak Hour	0	3	0	0	3

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Location: 8 I-5 SB RAMPS & SW BOONES FERRY RD PM

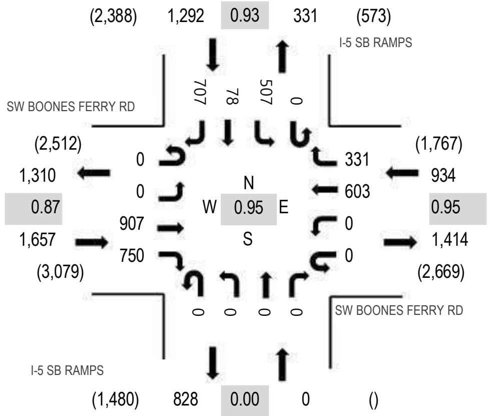
Date: Tuesday, September 29, 2020

Peak Hour: 04:30 PM - 05:30 PM

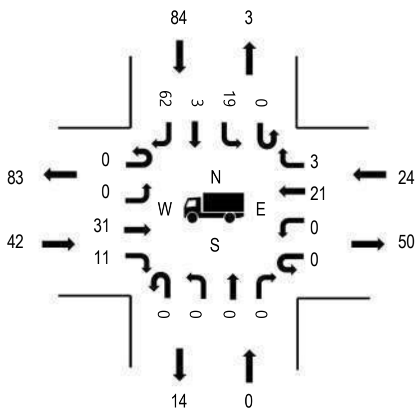
Peak 15-Minutes: 05:05 PM - 05:20 PM

Peak Hour

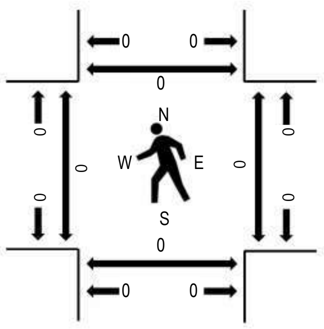
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	2.5%	0.87
WB	2.6%	0.95
NB	0.0%	0.00
SB	6.5%	0.93
All	3.9%	0.95

Traffic Counts - Motorized Vehicles

	SW BOONES FERRY RD				SW BOONES FERRY RD				I-5 SB RAMPS				I-5 SB RAMPS					
Interval	Eastbound				Westbound				Northbound				Southbound					Rolling
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	Hour
4:00 PM	0	0	79	70	0	0	56	21	0	0	0	0	0	38	4	46	314	3,747
4:05 PM	0	0	79	57	0	0	49	23	0	0	0	0	0	54	6	60	328	3,723
4:10 PM	0	0	67	65	0	0	63	21	0	0	0	0	0	38	4	34	292	3,752
4:15 PM	0	0	61	61	0	0	52	24	0	0	0	0	0	26	2	55	281	3,792
4:20 PM	0	0	86	63	0	0	45	23	0	0	0	0	0	39	1	67	324	3,849
4:25 PM	0	0	60	48	0	0	51	21	0	0	0	0	0	41	0	62	283	3,869
4:30 PM	0	0	71	64	0	0	40	22	0	0	0	0	0	51	6	76	330	3,883
4:35 PM	0	0	83	60	0	0	52	32	0	0	0	0	0	45	4	59	335	3,855
4:40 PM	0	0	64	66	0	0	57	30	0	0	0	0	0	48	9	55	329	3,826
4:45 PM	0	0	52	58	0	0	37	25	0	0	0	0	0	39	10	80	301	3,741
4:50 PM	0	0	61	60	0	0	56	28	0	0	0	0	0	44	7	52	308	3,723
4:55 PM	0	0	66	67	0	0	56	32	0	0	0	0	0	39	8	54	322	3,635
5:00 PM	0	0	83	63	0	0	43	20	0	0	0	0	0	25	6	50	290	3,487
5:05 PM	0	0	104	66	0	0	59	34	0	0	0	0	0	42	7	45	357	
5:10 PM	0	0	95	67	0	0	45	36	0	0	0	0	0	33	4	52	332	
5:15 PM	0	0	83	51	0	0	37	23	0	0	0	0	0	65	5	74	338	
5:20 PM	0	0	88	61	0	0	54	27	0	0	0	0	0	50	5	59	344	
5:25 PM	0	0	57	67	0	0	67	22	0	0	0	0	0	26	7	51	297	
5:30 PM	0	0	70	59	0	0	49	20	0	0	0	0	0	29	8	67	302	
5:35 PM	0	0	69	54	0	0	72	21	0	0	0	0	0	40	3	47	306	
5:40 PM	0	0	64	34	0	0	39	20	0	0	0	0	0	42	1	44	244	
5:45 PM	0	0	75	40	0	0	47	14	0	0	0	0	0	40	4	63	283	
5:50 PM	0	0	42	42	0	0	44	18	0	0	0	0	0	34	2	38	220	
5:55 PM	0	0	53	24	0	0	24	16	0	0	0	0	0	29	0	28	174	
Count Total	0	0	1,712	1,367	0	0	1,194	573	0	0	0	0	0	957	113	1,318	7,234	
Peak Hour	0	0	907	750	0	0	603	331	0	0	0	0	0	507	78	707	3,883	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	7	0	3	13	23	4:00 PM						4:00 PM	0	0	0	0	0
4:05 PM	5	0	1	9	15	4:05 PM						4:05 PM	0	0	0	0	0
4:10 PM	9	0	2	11	22	4:10 PM						4:10 PM	0	0	0	0	0
4:15 PM	4	0	4	9	17	4:15 PM						4:15 PM	0	0	0	0	0
4:20 PM	5	0	3	6	14	4:20 PM						4:20 PM	0	0	0	0	0
4:25 PM	5	0	4	10	19	4:25 PM						4:25 PM	0	0	0	0	0
4:30 PM	5	0	4	11	20	4:30 PM						4:30 PM	0	0	0	0	0
4:35 PM	4	0	6	7	17	4:35 PM						4:35 PM	0	0	0	0	0
4:40 PM	3	0	0	9	12	4:40 PM						4:40 PM	0	0	0	0	0
4:45 PM	1	0	0	10	11	4:45 PM						4:45 PM	0	0	0	0	0
4:50 PM	5	0	1	8	14	4:50 PM						4:50 PM	0	0	0	0	0
4:55 PM	3	0	2	2	7	4:55 PM						4:55 PM	0	0	0	0	0
5:00 PM	5	0	2	7	14	5:00 PM						5:00 PM	0	0	0	0	0
5:05 PM	4	0	2	8	14	5:05 PM						5:05 PM	0	0	0	0	0
5:10 PM	4	0	3	5	12	5:10 PM						5:10 PM	0	0	0	0	0
5:15 PM	2	0	1	9	12	5:15 PM						5:15 PM	0	0	0	0	0
5:20 PM	4	0	0	7	11	5:20 PM						5:20 PM	0	0	0	0	0
5:25 PM	2	0	3	1	6	5:25 PM						5:25 PM	0	0	0	0	0
5:30 PM	4	0	3	7	14	5:30 PM						5:30 PM	0	0	0	0	0
5:35 PM	4	0	3	4	11	5:35 PM						5:35 PM	0	0	0	0	0
5:40 PM	4	0	0	9	13	5:40 PM						5:40 PM	0	0	0	0	0
5:45 PM	6	0	3	3	12	5:45 PM						5:45 PM	0	0	0	0	0
5:50 PM	1	0	0	3	4	5:50 PM						5:50 PM	0	0	0	0	0
5:55 PM	3	0	1	3	7	5:55 PM						5:55 PM	0	1	0	0	1
Count Total	99	0	51	171	321	Count Total						Count Total	0	1	0	0	1
Peak Hour	42	0	24	84	150	Peak Hour						Peak Hour	0	0	0	0	0

ALL TRAFFIC DATA SERVICES
(303) 216-2439
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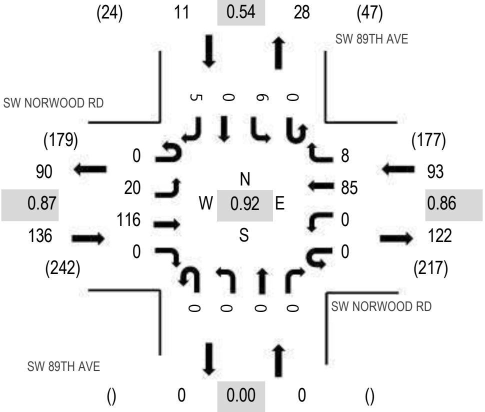
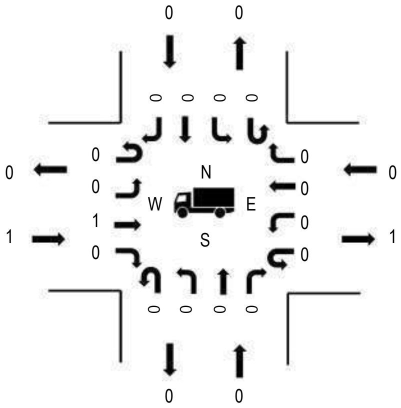
Location: 4 SW 89TH AVE & SW NORWOOD RD PM
Date: Tuesday, September 29, 2020
Peak Hour: 04:45 PM - 05:45 PM
Peak 15-Minutes: 05:20 PM - 05:35 PM

Peak Hour

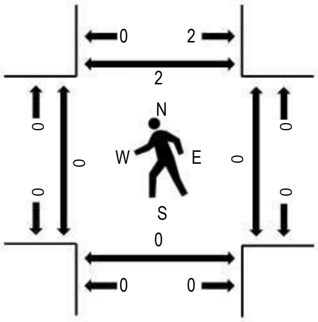
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.7%	0.87
WB	0.0%	0.86
NB	0.0%	0.00
SB	0.0%	0.54
All	0.4%	0.92

Traffic Counts - Motorized Vehicles

Interval	SW NORWOOD RD				SW NORWOOD RD				SW 89TH AVE				SW 89TH AVE					Rolling
	Eastbound				Westbound				Northbound				Southbound					
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	Hour
4:00 PM	0	0	5	0	0	0	6	0	0	0	0	0	0	0	0	2	13	222
4:05 PM	0	0	12	0	0	0	8	0	0	0	0	0	0	1	0	2	23	233
4:10 PM	0	1	10	0	0	0	8	1	0	0	0	0	0	0	0	2	22	227
4:15 PM	0	1	15	0	0	0	7	0	0	0	0	0	0	0	0	1	24	225
4:20 PM	0	1	5	0	0	0	5	1	0	0	0	0	0	0	0	0	12	214
4:25 PM	0	0	14	0	0	0	3	0	0	0	0	0	0	0	0	2	19	226
4:30 PM	0	1	6	0	0	0	8	0	0	0	0	0	0	0	0	0	15	229
4:35 PM	0	1	5	0	0	0	6	0	0	0	0	0	0	0	0	0	12	233
4:40 PM	0	4	6	0	0	0	9	1	0	0	0	0	0	1	0	1	22	233
4:45 PM	0	3	6	0	0	0	9	1	0	0	0	0	0	2	0	0	21	240
4:50 PM	0	0	9	0	0	0	6	1	0	0	0	0	0	0	0	0	16	238
4:55 PM	0	1	12	0	0	0	8	1	0	0	0	0	0	1	0	0	23	230
5:00 PM	0	2	13	0	0	0	7	2	0	0	0	0	0	0	0	0	24	221
5:05 PM	0	1	9	0	0	0	4	1	0	0	0	0	0	1	0	1	17	
5:10 PM	0	2	8	0	0	0	8	0	0	0	0	0	0	0	0	2	20	
5:15 PM	0	1	6	0	0	0	5	0	0	0	0	0	0	0	0	1	13	
5:20 PM	0	1	11	0	0	0	11	0	0	0	0	0	0	1	0	0	24	
5:25 PM	0	1	15	0	0	0	5	0	0	0	0	0	0	0	0	1	22	
5:30 PM	0	4	7	0	0	0	7	0	0	0	0	0	0	1	0	0	19	
5:35 PM	0	0	5	0	0	0	6	1	0	0	0	0	0	0	0	0	12	
5:40 PM	0	4	15	0	0	0	9	1	0	0	0	0	0	0	0	0	29	
5:45 PM	0	3	6	0	0	0	7	2	0	0	0	0	0	1	0	0	19	
5:50 PM	0	1	3	0	0	0	4	0	0	0	0	0	0	0	0	0	8	
5:55 PM	0	1	5	0	0	0	8	0	0	0	0	0	0	0	0	0	14	
Count Total	0	34	208	0	0	0	164	13	0	0	0	0	0	9	0	15	443	
Peak Hour	0	20	116	0	0	0	85	8	0	0	0	0	0	6	0	5	240	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval	Heavy Vehicles					Interval	Bicycles on Roadway					Interval	Pedestrians/Bicycles on Crosswalk				
Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM						4:00 PM	0	0	0	0	0
4:05 PM	1	0	0	0	1	4:05 PM						4:05 PM	0	0	0	0	0
4:10 PM	0	0	0	0	0	4:10 PM						4:10 PM	0	0	0	0	0
4:15 PM	1	0	0	0	1	4:15 PM						4:15 PM	0	0	0	0	0
4:20 PM	0	0	0	0	0	4:20 PM						4:20 PM	0	0	0	0	0
4:25 PM	0	0	0	0	0	4:25 PM						4:25 PM	0	0	0	0	0
4:30 PM	0	0	1	0	1	4:30 PM						4:30 PM	0	0	0	0	0
4:35 PM	0	0	0	0	0	4:35 PM						4:35 PM	0	0	0	0	0
4:40 PM	0	0	0	0	0	4:40 PM						4:40 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0	4:45 PM						4:45 PM	0	0	0	0	0
4:50 PM	0	0	0	0	0	4:50 PM						4:50 PM	0	0	0	2	2
4:55 PM	0	0	0	0	0	4:55 PM						4:55 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0	5:00 PM						5:00 PM	0	0	0	0	0
5:05 PM	0	0	0	0	0	5:05 PM						5:05 PM	0	0	0	0	0
5:10 PM	0	0	0	0	0	5:10 PM						5:10 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0	5:15 PM						5:15 PM	0	0	0	0	0
5:20 PM	0	0	0	0	0	5:20 PM						5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	0	0	5:25 PM						5:25 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0	5:30 PM						5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	0	0	5:35 PM						5:35 PM	0	0	0	0	0
5:40 PM	1	0	0	0	1	5:40 PM						5:40 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0	5:45 PM						5:45 PM	0	0	0	0	0
5:50 PM	0	0	0	0	0	5:50 PM						5:50 PM	0	0	0	2	2
5:55 PM	0	0	0	0	0	5:55 PM						5:55 PM	0	0	0	0	0
Count Total	3	0	1	0	4	Count Total						Count Total	0	0	0	4	4
Peak Hour	1	0	0	0	1	Peak Hour						Peak Hour	0	0	0	2	2

ALL TRAFFIC DATA SERVICES

(303) 216-2439
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Location: 5 SW VERMILLION DR & SW NORWOOD RD PM

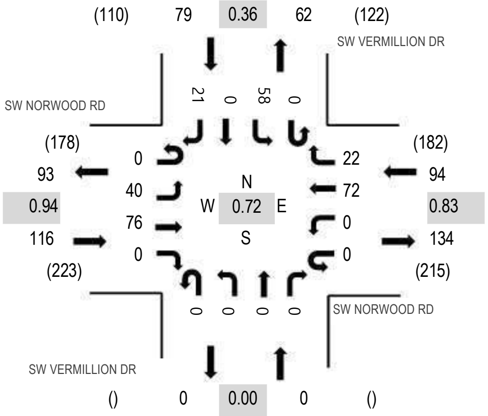
Date: Tuesday, September 29, 2020

Peak Hour: 04:45 PM - 05:45 PM

Peak 15-Minutes: 04:45 PM - 05:00 PM

Peak Hour

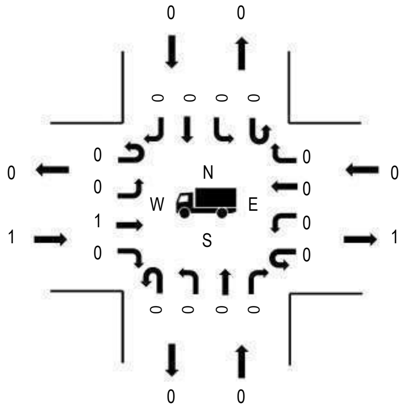
Motorized Vehicles



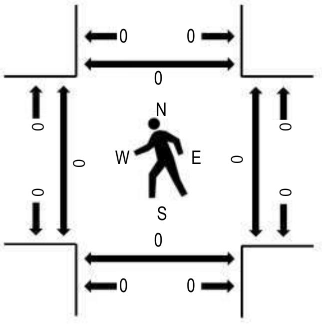
Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.9%	0.94
WB	0.0%	0.83
NB	0.0%	0.00
SB	0.0%	0.36
All	0.3%	0.72

Heavy Vehicles



Pedestrians



Traffic Counts - Motorized Vehicles

Interval Start Time	SW NORWOOD RD Eastbound				SW NORWOOD RD Westbound				SW VERMILLION DR Northbound				SW VERMILLION DR Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	3	3	0	0	0	6	0	0	0	0	0	0	1	0	2	15	270
4:05 PM	0	2	8	0	0	0	6	1	0	0	0	0	0	2	0	1	20	280
4:10 PM	0	7	7	0	0	0	5	2	0	0	0	0	0	2	0	2	25	280
4:15 PM	0	4	9	0	0	0	5	1	0	0	0	0	0	0	0	1	20	277
4:20 PM	0	3	6	0	0	0	8	5	0	0	0	0	0	0	0	1	23	272
4:25 PM	0	2	8	0	0	0	3	0	0	0	0	0	0	0	0	0	13	267
4:30 PM	0	5	6	0	0	0	1	3	0	0	0	0	0	0	0	4	19	279
4:35 PM	0	0	3	0	0	0	8	1	0	0	0	0	0	0	0	1	13	279
4:40 PM	0	5	6	0	0	0	6	2	0	0	0	0	0	1	0	2	22	284
4:45 PM	0	0	6	0	0	0	8	0	0	0	0	0	0	40	0	3	57	289
4:50 PM	0	5	4	0	0	0	6	1	0	0	0	0	0	5	0	2	23	258
4:55 PM	0	3	8	0	0	0	3	1	0	0	0	0	0	3	0	2	20	251
5:00 PM	0	6	5	0	0	0	7	4	0	0	0	0	0	0	0	3	25	245
5:05 PM	0	2	6	0	0	0	5	3	0	0	0	0	0	2	0	2	20	
5:10 PM	0	6	5	0	0	0	5	2	0	0	0	0	0	2	0	2	22	
5:15 PM	0	3	5	0	0	0	3	1	0	0	0	0	0	0	0	3	15	
5:20 PM	0	5	6	0	0	0	6	0	0	0	0	0	0	0	0	1	18	
5:25 PM	0	4	9	0	0	0	10	2	0	0	0	0	0	0	0	0	25	
5:30 PM	0	0	7	0	0	0	8	3	0	0	0	0	0	1	0	0	19	
5:35 PM	0	2	6	0	0	0	4	3	0	0	0	0	0	2	0	1	18	
5:40 PM	0	4	9	0	0	0	7	2	0	0	0	0	0	3	0	2	27	
5:45 PM	0	3	7	0	0	0	7	4	0	0	0	0	0	3	0	2	26	
5:50 PM	0	1	3	0	0	0	6	3	0	0	0	0	0	1	0	2	16	
5:55 PM	0	2	4	0	0	0	4	1	0	0	0	0	0	1	0	2	14	
Count Total	0	77	146	0	0	0	137	45	0	0	0	0	0	69	0	41	515	
Peak Hour	0	40	76	0	0	0	72	22	0	0	0	0	0	58	0	21	289	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval	Heavy Vehicles					Interval	Bicycles on Roadway					Interval	Pedestrians/Bicycles on Crosswalk				
Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM						4:00 PM	0	0	0	0	0
4:05 PM	1	0	0	0	1	4:05 PM						4:05 PM	0	0	0	0	0
4:10 PM	0	0	0	0	0	4:10 PM						4:10 PM	0	0	0	0	0
4:15 PM	1	0	0	0	1	4:15 PM						4:15 PM	0	0	0	0	0
4:20 PM	0	0	0	0	0	4:20 PM						4:20 PM	0	0	0	0	0
4:25 PM	0	0	0	0	0	4:25 PM						4:25 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0	4:30 PM						4:30 PM	0	0	0	0	0
4:35 PM	0	0	1	0	1	4:35 PM						4:35 PM	0	0	0	0	0
4:40 PM	0	0	0	0	0	4:40 PM						4:40 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0	4:45 PM						4:45 PM	0	0	0	0	0
4:50 PM	0	0	0	0	0	4:50 PM						4:50 PM	0	0	0	0	0
4:55 PM	0	0	0	0	0	4:55 PM						4:55 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0	5:00 PM						5:00 PM	0	0	0	0	0
5:05 PM	0	0	0	0	0	5:05 PM						5:05 PM	0	0	0	0	0
5:10 PM	0	0	0	0	0	5:10 PM						5:10 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0	5:15 PM						5:15 PM	0	0	0	0	0
5:20 PM	0	0	0	0	0	5:20 PM						5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	0	0	5:25 PM						5:25 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0	5:30 PM						5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	0	0	5:35 PM						5:35 PM	0	0	0	0	0
5:40 PM	1	0	0	0	1	5:40 PM						5:40 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0	5:45 PM						5:45 PM	0	0	0	0	0
5:50 PM	0	0	0	0	0	5:50 PM						5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0	5:55 PM						5:55 PM	0	0	0	0	0
Count Total	3	0	1	0	4	Count Total						Count Total	0	0	0	0	0
Peak Hour	1	0	0	0	1	Peak Hour						Peak Hour	0	0	0	0	0

ALL TRAFFIC DATA SERVICES
(303) 216-2439
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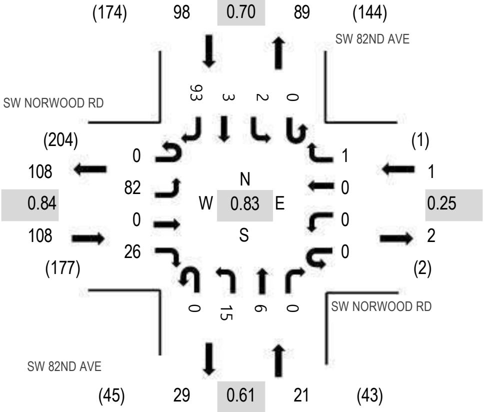
Location: 6 SW 82ND AVE & SW NORWOOD RD PM
Date: Wednesday, October 7, 2020
Peak Hour: 04:35 PM - 05:35 PM
Peak 15-Minutes: 05:15 PM - 05:30 PM

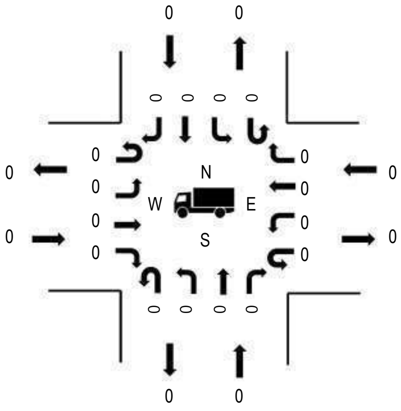
Peak Hour

Motorized Vehicles

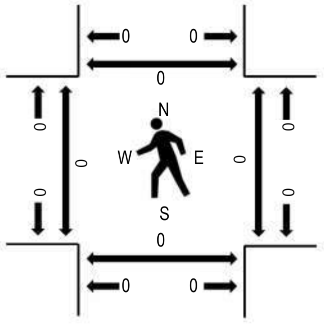


Note: Total study counts contained in parentheses.

Heavy Vehicles



Pedestrians



	HV%	PHF
EB	0.0%	0.84
WB	0.0%	0.25
NB	0.0%	0.61
SB	0.0%	0.70
All	0.0%	0.83

Traffic Counts - Motorized Vehicles

Interval	SW NORWOOD RD				SW NORWOOD RD				SW 82ND AVE				SW 82ND AVE					
	Eastbound				Westbound				Northbound				Southbound					Rolling
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	Hour
4:00 PM	0	5	0	3	0	0	0	0	0	4	1	0	0	0	0	4	17	186
4:05 PM	0	5	0	2	0	0	0	0	0	0	0	0	0	0	0	6	13	184
4:10 PM	0	3	0	0	0	0	0	0	0	3	0	0	0	0	0	7	13	194
4:15 PM	0	7	0	2	0	0	0	0	0	1	0	0	0	0	0	5	15	195
4:20 PM	0	6	0	1	0	0	0	0	0	1	0	0	0	0	0	5	13	199
4:25 PM	0	6	0	0	0	0	0	0	0	1	0	0	0	0	1	2	10	215
4:30 PM	0	7	0	0	0	0	0	0	0	2	0	0	0	0	0	7	16	226
4:35 PM	0	7	0	6	0	0	0	0	0	0	0	0	0	0	0	5	18	228
4:40 PM	0	5	0	3	0	0	0	0	0	0	5	0	0	0	1	8	22	222
4:45 PM	0	6	0	1	0	0	0	0	0	1	0	0	0	0	0	12	20	222
4:50 PM	0	9	0	1	0	0	0	0	0	2	0	0	0	0	0	7	19	221
4:55 PM	0	6	0	1	0	0	0	0	0	0	0	0	0	0	0	3	10	211
5:00 PM	0	5	0	0	0	0	0	0	0	3	1	0	0	0	0	6	15	209
5:05 PM	0	8	0	2	0	0	0	0	0	2	0	0	0	0	1	10	23	
5:10 PM	0	6	0	2	0	0	0	0	0	2	0	0	0	0	1	3	14	
5:15 PM	0	6	0	2	0	0	0	0	0	0	0	0	0	0	0	11	19	
5:20 PM	0	9	0	3	0	0	0	1	0	1	0	0	0	2	0	13	29	
5:25 PM	0	9	0	2	0	0	0	0	0	0	0	0	0	0	0	10	21	
5:30 PM	0	6	0	3	0	0	0	0	0	4	0	0	0	0	0	5	18	
5:35 PM	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	6	12	
5:40 PM	0	4	0	5	0	0	0	0	0	4	0	0	0	0	0	9	22	
5:45 PM	0	4	0	0	0	0	0	0	0	3	0	0	0	0	0	12	19	
5:50 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	7	9	
5:55 PM	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	5	8	
Count Total	0	136	0	41	0	0	0	1	0	36	7	0	0	2	4	168	395	
Peak Hour	0	82	0	26	0	0	0	1	0	15	6	0	0	2	3	93	228	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

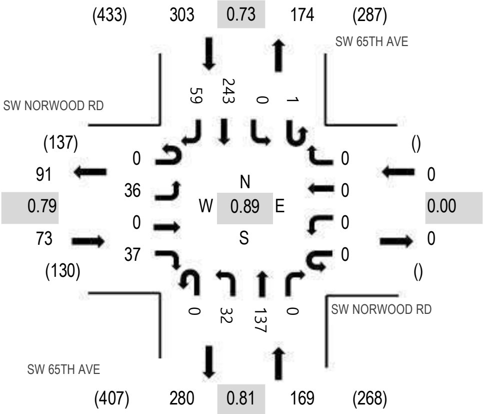
Interval	Heavy Vehicles					Interval	Bicycles on Roadway					Interval	Pedestrians/Bicycles on Crosswalk				
Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM						4:00 PM	0	0	0	0	0
4:05 PM	0	0	0	0	0	4:05 PM						4:05 PM	0	0	0	0	0
4:10 PM	0	0	0	0	0	4:10 PM						4:10 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0	4:15 PM						4:15 PM	0	0	0	0	0
4:20 PM	1	0	0	0	1	4:20 PM						4:20 PM	0	0	0	0	0
4:25 PM	0	0	0	0	0	4:25 PM						4:25 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0	4:30 PM						4:30 PM	0	0	0	0	0
4:35 PM	0	0	0	0	0	4:35 PM						4:35 PM	0	0	0	0	0
4:40 PM	0	0	0	0	0	4:40 PM						4:40 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0	4:45 PM						4:45 PM	0	0	0	0	0
4:50 PM	0	0	0	0	0	4:50 PM						4:50 PM	0	0	0	0	0
4:55 PM	0	0	0	0	0	4:55 PM						4:55 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0	5:00 PM						5:00 PM	0	0	0	0	0
5:05 PM	0	0	0	0	0	5:05 PM						5:05 PM	0	0	0	0	0
5:10 PM	0	0	0	0	0	5:10 PM						5:10 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0	5:15 PM						5:15 PM	0	0	0	0	0
5:20 PM	0	0	0	0	0	5:20 PM						5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	0	0	5:25 PM						5:25 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0	5:30 PM						5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	0	0	5:35 PM						5:35 PM	0	0	0	0	0
5:40 PM	0	0	0	0	0	5:40 PM						5:40 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0	5:45 PM						5:45 PM	0	0	0	0	0
5:50 PM	0	0	0	0	0	5:50 PM						5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0	5:55 PM						5:55 PM	0	0	0	0	0
Count Total	1	0	0	0	1	Count Total						Count Total	0	0	0	0	0
Peak Hour	0	0	0	0	0	Peak Hour						Peak Hour	0	0	0	0	0

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

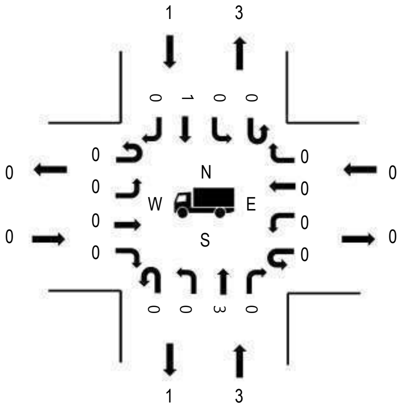
Location: 7 SW 65TH AVE & SW NORWOOD RD PM
Date: Tuesday, September 29, 2020
Peak Hour: 04:00 PM - 05:00 PM
Peak 15-Minutes: 04:15 PM - 04:30 PM

Peak Hour

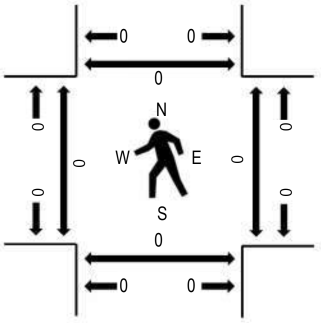
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.79
WB	0.0%	0.00
NB	1.8%	0.81
SB	0.3%	0.73
All	0.7%	0.89

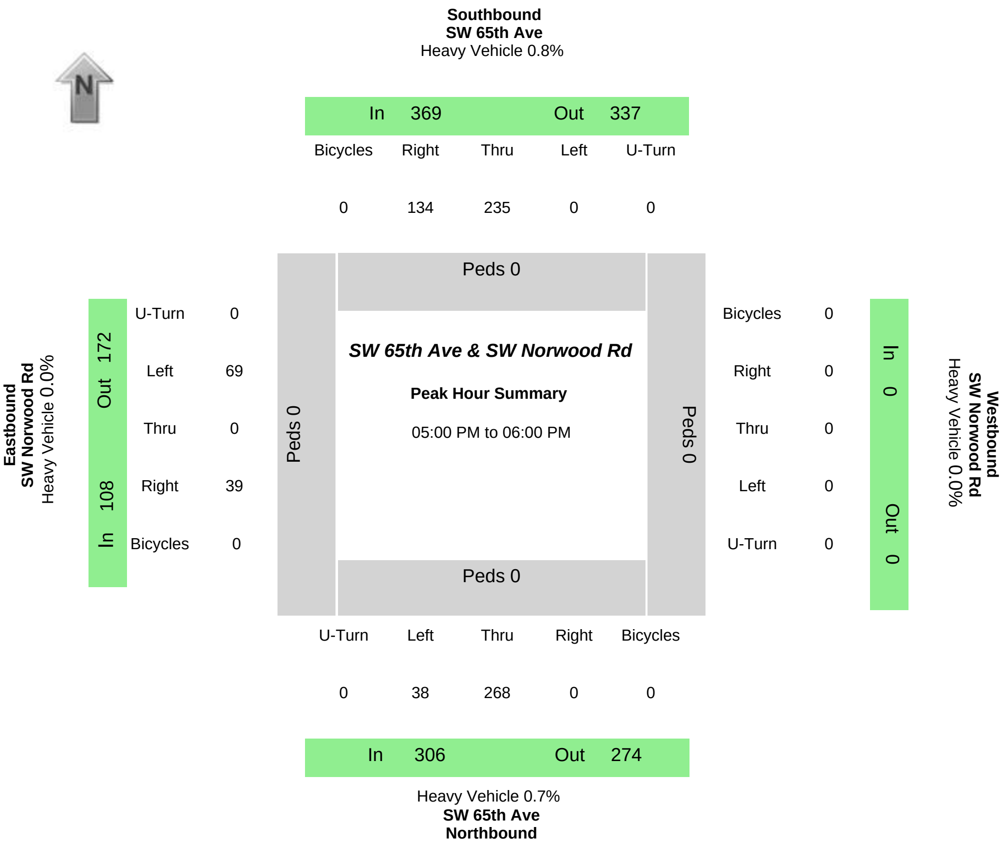
Traffic Counts - Motorized Vehicles

	SW NORWOOD RD				SW NORWOOD RD				SW 65TH AVE				SW 65TH AVE					
	Eastbound				Westbound				Northbound				Southbound					
Interval Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	Rolling Hour
4:00 PM	0	6	0	5	0	0	0	0	0	3	5	0	0	0	25	2	46	545
4:05 PM	0	2	0	4	0	0	0	0	0	2	9	0	0	0	24	10	51	523
4:10 PM	0	1	0	4	0	0	0	0	0	1	12	0	1	0	28	4	51	498
4:15 PM	0	2	0	5	0	0	0	0	0	3	3	0	0	0	32	5	50	468
4:20 PM	0	2	0	2	0	0	0	0	0	1	13	0	0	0	20	4	42	451
4:25 PM	0	2	0	1	0	0	0	0	0	7	16	0	0	0	29	6	61	438
4:30 PM	0	2	0	3	0	0	0	0	0	0	13	0	0	0	15	5	38	405
4:35 PM	0	10	0	3	0	0	0	0	0	1	13	0	0	0	19	4	50	384
4:40 PM	0	2	0	1	0	0	0	0	0	5	13	0	0	0	12	5	38	356
4:45 PM	0	0	0	7	0	0	0	0	0	4	12	0	0	0	12	9	44	345
4:50 PM	0	6	0	1	0	0	0	0	0	3	17	0	0	0	10	4	41	326
4:55 PM	0	1	0	1	0	0	0	0	0	2	11	0	0	0	17	1	33	303
5:00 PM	0	3	0	3	0	0	0	0	0	0	8	0	0	0	9	1	24	286
5:05 PM	0	2	0	0	0	0	0	0	0	1	16	0	0	0	7	0	26	
5:10 PM	0	0	0	0	0	0	0	0	0	2	10	0	0	0	7	2	21	
5:15 PM	0	3	0	5	0	0	0	0	0	2	5	0	0	0	13	5	33	
5:20 PM	0	5	0	0	0	0	0	0	0	2	7	0	0	0	14	1	29	
5:25 PM	0	2	0	1	0	0	0	0	0	2	6	0	0	0	15	2	28	
5:30 PM	0	2	0	0	0	0	0	0	0	2	2	0	0	0	11	0	17	
5:35 PM	0	2	0	3	0	0	0	0	0	1	2	0	0	0	11	3	22	
5:40 PM	0	4	0	4	0	0	0	0	0	2	6	0	0	0	6	5	27	
5:45 PM	0	10	0	3	0	0	0	0	0	1	4	0	0	0	4	3	25	
5:50 PM	0	1	0	3	0	0	0	0	0	2	7	0	0	0	4	1	18	
5:55 PM	0	1	0	0	0	0	0	0	0	4	5	0	0	0	4	2	16	
Count Total	0	71	0	59	0	0	0	0	0	53	215	0	1	0	348	84	831	
Peak Hour	0	36	0	37	0	0	0	0	0	32	137	0	1	0	243	59	545	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval	Heavy Vehicles					Interval	Bicycles on Roadway					Interval	Pedestrians/Bicycles on Crosswalk				
Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM						4:00 PM	0	0	0	0	0
4:05 PM	0	0	0	0	0	4:05 PM						4:05 PM	0	0	0	0	0
4:10 PM	0	0	0	0	0	4:10 PM						4:10 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0	4:15 PM						4:15 PM	0	0	0	0	0
4:20 PM	0	2	0	0	2	4:20 PM						4:20 PM	0	0	0	0	0
4:25 PM	0	1	0	1	2	4:25 PM						4:25 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0	4:30 PM						4:30 PM	0	0	0	0	0
4:35 PM	0	0	0	0	0	4:35 PM						4:35 PM	0	0	0	0	0
4:40 PM	0	0	0	0	0	4:40 PM						4:40 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0	4:45 PM						4:45 PM	0	0	0	0	0
4:50 PM	0	0	0	0	0	4:50 PM						4:50 PM	0	0	0	0	0
4:55 PM	0	0	0	0	0	4:55 PM						4:55 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0	5:00 PM						5:00 PM	0	0	0	0	0
5:05 PM	0	1	0	0	1	5:05 PM						5:05 PM	0	0	0	0	0
5:10 PM	0	0	0	0	0	5:10 PM						5:10 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0	5:15 PM						5:15 PM	0	0	0	0	0
5:20 PM	0	0	0	1	1	5:20 PM						5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	0	0	5:25 PM						5:25 PM	0	0	0	0	0
5:30 PM	0	1	0	0	1	5:30 PM						5:30 PM	0	0	0	0	0
5:35 PM	1	0	0	0	1	5:35 PM						5:35 PM	0	0	0	0	0
5:40 PM	0	0	0	0	0	5:40 PM						5:40 PM	2	2	0	0	4
5:45 PM	0	0	0	0	0	5:45 PM						5:45 PM	0	0	0	0	0
5:50 PM	0	0	0	0	0	5:50 PM						5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0	5:55 PM						5:55 PM	0	0	0	0	0
Count Total	1	5	0	2	8	Count Total						Count Total	2	2	0	0	4
Peak Hour	0	3	0	1	4	Peak Hour						Peak Hour	0	0	0	0	0

Data Provided by K-D-N.com 503-594-4224	
N/S street	***SW 65th Ave***
E/W street	***SW Norwood Rd***
City, State	Tualatin OR
Site Notes	
Location	45.355816 - -122.743809
Start Date	Tuesday, October 22, 2019
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	05:00:00 PM
Peak 15 Min Start	05:40:00 PM
PHF (15-Min Int)	0.74


Southbound
SW 65th Ave
Heavy Vehicle 0.8%

In 369 Out 337

Bicycles	Right	Thru	Left	U-Turn
0	134	235	0	0

Eastbound
SW Norwood Rd
Heavy Vehicle 0.0%

Out 172 In 108

U-Turn	0
Left	69
Thru	0
Right	39
Bicycles	0

Peds 0

SW 65th Ave & SW Norwood Rd

Peak Hour Summary

05:00 PM to 06:00 PM

Peds 0

Peds 0

Peds 0

Bicycles	0
Right	0
Thru	0
Left	0
U-Turn	0

In 0 Out 0

Westbound
SW Norwood Rd
Heavy Vehicle 0.0%

U-Turn	Left	Thru	Right	Bicycles
0	38	268	0	0

In 306 Out 274

Heavy Vehicle 0.7%
SW 65th Ave
Northbound

Peak-Hour Volumes (PHV)

Northbound				**Southbound**				**Eastbound**				**Westbound**				**Entering**				**Leaving**			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
38	268	0	0	0	235	134	0	69	0	39	0	0	0	0	0	306	369	108	0	274	337	172	0

Percent Heavy Vehicles

0.0%	0.7%	0.0%	0.0%	0.0%	0.9%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.8%	0.0%	0.0%	0.7%	0.6%	0.6%	0.0%

PHV- Bicycles / PHV - Pedestrians

Northbound				**Southbound**				**Eastbound**				**Westbound**					in Crosswalk				
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	**Sum**	NB	SB	EB	WB	**Sum**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

All Vehicle Volumes

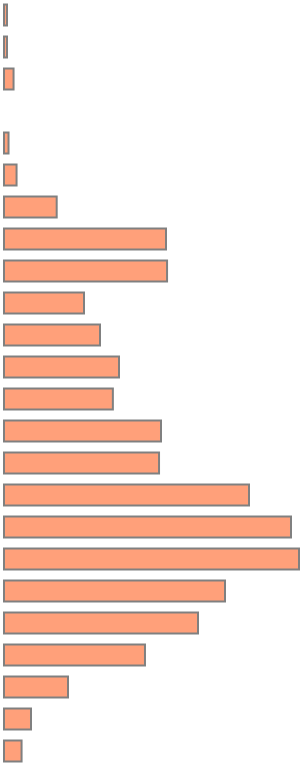
	Northbound				**Southbound**				**Eastbound**				**Westbound**					
	SW 65th Ave				SW 65th Ave				SW Norwood Rd				SW Norwood Rd				15 Min	1 HR
Time	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	Sum
04:00:00 PM	1	11	0	0	0	16	7	0	4	0	3	0	0	0	0	0		
04:05:00 PM	4	14	0	0	0	24	10	0	4	0	4	0	0	0	0	0		
04:10:00 PM	2	11	0	0	0	28	3	0	4	0	6	0	0	0	0	0	156	
04:15:00 PM	4	7	0	0	0	36	5	0	5	0	6	0	0	0	0	0	177	
04:20:00 PM	4	10	0	0	0	20	11	0	4	0	4	0	0	0	0	0	170	
04:25:00 PM	1	7	0	0	0	25	7	0	3	0	2	0	0	0	0	0	161	
04:30:00 PM	1	4	0	0	0	30	6	0	4	0	1	0	0	0	0	0	144	
04:35:00 PM	1	14	0	0	0	35	3	0	2	0	1	0	0	0	0	0	147	
04:40:00 PM	3	16	0	0	0	26	9	0	3	0	5	0	0	0	0	0	164	
04:45:00 PM	3	11	0	0	0	25	17	0	3	0	4	0	0	0	0	0	181	
04:50:00 PM	6	15	0	0	0	32	6	0	7	0	1	0	0	0	0	0	192	
04:55:00 PM	1	11	0	0	0	20	6	0	8	0	4	0	0	0	0	0	180	661
05:00:00 PM	3	8	0	0	0	20	12	0	3	0	2	0	0	0	0	0	165	667
05:05:00 PM	2	17	0	0	0	24	15	0	9	0	10	0	0	0	0	0	175	684
05:10:00 PM	2	14	0	0	0	24	10	0	3	0	4	0	0	0	0	0	182	687
05:15:00 PM	2	17	0	0	0	22	5	0	2	0	4	0	0	0	0	0	186	676
05:20:00 PM	4	18	0	0	0	17	11	0	7	0	1	0	0	0	0	0	167	681
05:25:00 PM	4	8	0	0	0	19	16	0	4	0	1	0	0	0	0	0	162	688
05:30:00 PM	1	18	0	0	0	17	7	0	4	0	3	0	0	0	0	0	160	692
05:35:00 PM	5	19	0	0	0	15	11	0	4	0	1	0	0	0	0	0	157	691
05:40:00 PM	7	31	0	0	0	21	14	0	10	0	3	0	0	0	0	0	191	715
05:45:00 PM	4	40	0	0	0	19	16	0	7	0	3	0	0	0	0	0	230	741
05:50:00 PM	3	41	0	0	0	19	9	0	10	0	6	0	0	0	0	0	263	762
05:55:00 PM	1	37	0	0	0	18	8	0	6	0	1	0	0	0	0	0	248	783

Type of report: Tube Count - Volume Data

LOCATION: Norwood Rd 0.1m E of Boones Ferry Rd - #443 **QC JOB #:** 14908836

SPECIFIC LOCATION: **DIRECTION:** EB

CITY/STATE: Washington, OR **DATE:** Apr 24 2019 - Apr 24 2019

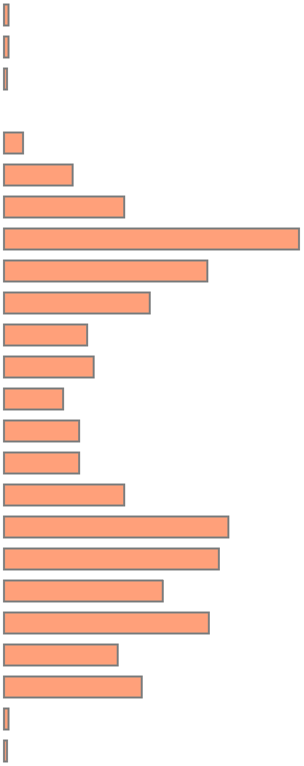
Start Time	Mon	Tue	Wed 24 Apr 19	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM			1			1			1	
01:00 AM			1			1			1	
02:00 AM			4			4			4	
03:00 AM			0			0			0	
04:00 AM			2			2			2	
05:00 AM			6			6			6	
06:00 AM			25			25			25	
07:00 AM			77			77			77	
08:00 AM			**78**			**78**			**78**	
09:00 AM			38			38			38	
10:00 AM			46			46			46	
11:00 AM			55			55			55	
12:00 PM			52			52			52	
01:00 PM			75			75			75	
02:00 PM			74			74			74	
03:00 PM			117			117			117	
04:00 PM			137			137			137	
05:00 PM			**141**			**141**			**141**	
06:00 PM			106			106			106	
07:00 PM			93			93			93	
08:00 PM			67			67			67	
09:00 PM			30			30			30	
10:00 PM			13			13			13	
11:00 PM			8			8			8	
Day Total			1246			1246			1246	
% Weekday Average			100%							
% Week Average			100%			100%				
AM Peak Volume			8:00 AM 78			8:00 AM 78			8:00 AM 78	
PM Peak Volume			5:00 PM 141			5:00 PM 141			5:00 PM 141	

Comments:

Report generated on 10/7/2020 10:18 AM SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Volume Data

LOCATION: Norwood Rd 0.1m E of Boones Ferry Rd - #443
QC JOB #: 14908836
SPECIFIC LOCATION:
DIRECTION: WB
CITY/STATE: Washington, OR
DATE: Apr 24 2019 - Apr 24 2019

Start Time	Mon	Tue	Wed 24 Apr 19	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM			2			2			2	
01:00 AM			2			2			2	
02:00 AM			1			1			1	
03:00 AM			0			0			0	
04:00 AM			8			8			8	
05:00 AM			29			29			29	
06:00 AM			51			51			51	
07:00 AM			**125**			**125**			**125**	
08:00 AM			86			86			86	
09:00 AM			62			62			62	
10:00 AM			35			35			35	
11:00 AM			38			38			38	
12:00 PM			25			25			25	
01:00 PM			32			32			32	
02:00 PM			32			32			32	
03:00 PM			51			51			51	
04:00 PM			**95**			**95**			**95**	
05:00 PM			91			91			91	
06:00 PM			67			67			67	
07:00 PM			87			87			87	
08:00 PM			48			48			48	
09:00 PM			58			58			58	
10:00 PM			2			2			2	
11:00 PM			1			1			1	
Day Total			1028			1028			1028	
% Weekday Average			100%							
% Week Average			100%			100%				
AM Peak Volume			7:00 AM 125			7:00 AM 125			7:00 AM 125	
PM Peak Volume			4:00 PM 95			4:00 PM 95			4:00 PM 95	

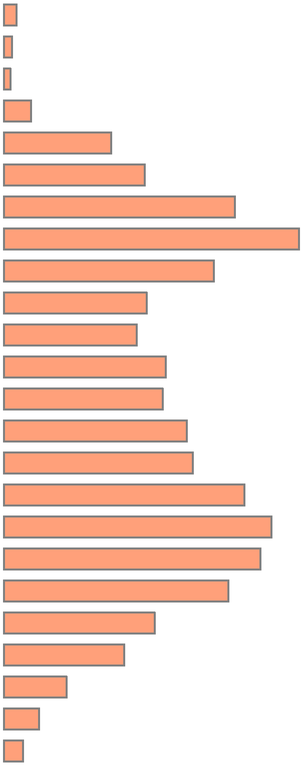
Comments:

Report generated on 10/7/2020 10:18 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Volume Data

LOCATION: #464 SW Boones Ferry Rd S of SW Norwood Rd
QC JOB #: 14908851
SPECIFIC LOCATION:
DIRECTION: NB
CITY/STATE: Washington, OR
DATE: Apr 24 2019 - Apr 24 2019

Start Time	Mon	Tue	Wed 24 Apr 19	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM			20			20			20	
01:00 AM			11			11			11	
02:00 AM			10			10			10	
03:00 AM			45			45			45	
04:00 AM			180			180			180	
05:00 AM			235			235			235	
06:00 AM			386			386			386	
07:00 AM			**493**			**493**			**493**	
08:00 AM			350			350			350	
09:00 AM			238			238			238	
10:00 AM			221			221			221	
11:00 AM			271			271			271	
12:00 PM			265			265			265	
01:00 PM			306			306			306	
02:00 PM			317			317			317	
03:00 PM			403			403			403	
04:00 PM			**448**			**448**			**448**	
05:00 PM			428			428			428	
06:00 PM			376			376			376	
07:00 PM			252			252			252	
08:00 PM			201			201			201	
09:00 PM			104			104			104	
10:00 PM			59			59			59	
11:00 PM			32			32			32	
Day Total			5651			5651			5651	
% Weekday Average			100%							
% Week Average			100%			100%				
AM Peak Volume			7:00 AM 493			7:00 AM 493			7:00 AM 493	
PM Peak Volume			4:00 PM 448			4:00 PM 448			4:00 PM 448	

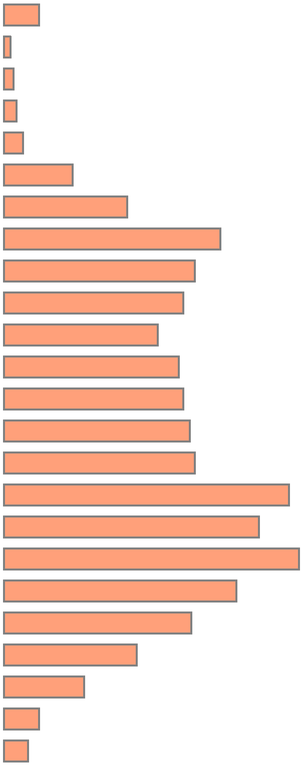
Comments:

Report generated on 10/7/2020 10:18 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Volume Data

LOCATION: #464 SW Boones Ferry Rd S of SW Norwood Rd | **QC JOB #:** 14908851
SPECIFIC LOCATION: | **DIRECTION:** SB
CITY/STATE: Washington, OR | **DATE:** Apr 24 2019 - Apr 24 2019

Start Time	Mon	Tue	Wed 24 Apr 19	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM			52			52			52	
01:00 AM			8			8			8	
02:00 AM			13			13			13	
03:00 AM			17			17			17	
04:00 AM			28			28			28	
05:00 AM			102			102			102	
06:00 AM			186			186			186	
07:00 AM			**325**			**325**			**325**	
08:00 AM			287			287			287	
09:00 AM			270			270			270	
10:00 AM			231			231			231	
11:00 AM			263			263			263	
12:00 PM			269			269			269	
01:00 PM			279			279			279	
02:00 PM			287			287			287	
03:00 PM			431			431			431	
04:00 PM			384			384			384	
05:00 PM			**444**			**444**			**444**	
06:00 PM			349			349			349	
07:00 PM			281			281			281	
08:00 PM			199			199			199	
09:00 PM			121			121			121	
10:00 PM			53			53			53	
11:00 PM			36			36			36	
Day Total			4915			4915			4915	
% Weekday Average			100%							
% Week Average			100%			100%				
AM Peak Volume			7:00 AM 325			7:00 AM 325			7:00 AM 325	
PM Peak Volume			5:00 PM 444			5:00 PM 444			5:00 PM 444	

Comments:

Report generated on 10/7/2020 10:18 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

BFR soouth of Norwood

		South		
	Day 1	Day 2	Average	1-Hr
7:00 AM	304	277	291	1042
7:15 AM	302	256	279	1000
7:30 AM	236	218	227	962
7:45 AM	254	236	245	961
8:00 AM	218	279	249	907
8:15 AM	239	242	241	827
8:30 AM	231	220	226	745
8:45 AM	174	207	191	678
9:00 AM	169	169	169	653
9:15 AM	168	150	159	
9:30 AM	177	140	159	
9:45 AM	150	182	166	
			291	1042
			PHF	0.90

		South		
	Day 1	Day 2	Average	1-Hr
4:00 PM	340	292	316	1318
4:15 PM	336	334	335	1319
4:30 PM	334	306	320	1291
4:45 PM	347	346	347	1217
5:00 PM	317	316	317	1090
5:15 PM	315	298	307	980
5:30 PM	264	228	246	855
5:45 PM	235	205	220	804
6:00 PM	221	192	207	730
6:15 PM	164	200	182	
6:30 PM	189	200	195	
6:45 PM	160	132	146	
			347	1319
			PHF	0.95

Location Info

Location ID	3287
Type	I-SECTION
Functional Class	4
Located On	Boones Ferry Rd
SOUTH OF	S.W. Norwood Road [0.01 miles]
Direction	2-WAY
Community	Tualatin
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	9/24/2018
End Date	9/25/2018
Start Time	1:45 PM
End Time	1:45 PM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	38	22	26	18	104
01:00 - 02:00	16	12	24	13	65
02:00 - 03:00	15	29	19	12	75
03:00 - 04:00	22	18	38	31	109
04:00 - 05:00	70	96	108	78	352
05:00 - 06:00	83	134	144	142	503
06:00 - 07:00	154	205	274	286	919
07:00 - 08:00	304	302	236	254	1096
08:00 - 09:00	218	239	231	174	862
09:00 - 10:00	169	168	177	150	664
10:00 - 11:00	156	140	147	151	594
11:00 - 12:00	172	166	198	189	725
12:00 - 13:00	182	192	180	206	760
13:00 - 14:00	197	214	194	200	805
14:00 - 15:00	223	240	276	308	1047
15:00 - 16:00	264	281	310	320	1175
16:00 - 17:00	340	336	334	347	1357
17:00 - 18:00	317	315	264	235	1131
18:00 - 19:00	221	164	189	160	734
19:00 - 20:00	172	139	122	110	543
20:00 - 21:00	106	84	98	74	362
21:00 - 22:00	67	58	53	29	207
22:00 - 23:00	42	36	33	32	143
23:00 - 24:00	34	15	30	27	106
TOTAL					14438

Location Info

Location ID	3287
Type	I-SECTION
Functional Class	4
Located On	Boones Ferry Rd
SOUTH OF	S.W. Norwood Road [0.01 miles]
Direction	2-WAY
Community	Tualatin
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	9/25/2018
End Date	9/26/2018
Start Time	1:45 PM
End Time	1:45 PM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	13	15	4	8	40
01:00 - 02:00	17	11	12	15	55
02:00 - 03:00	30	16	16	17	79
03:00 - 04:00	29	36	31	62	158
04:00 - 05:00	122	86	66	92	366
05:00 - 06:00	168	131	156	190	645
06:00 - 07:00	254	256	286	291	1087
07:00 - 08:00	277	256	218	236	987
08:00 - 09:00	279	242	220	207	948
09:00 - 10:00	169	150	140	182	641
10:00 - 11:00	166	149	170	166	651
11:00 - 12:00	158	182	204	242	786
12:00 - 13:00	199	202	226	253	880
13:00 - 14:00	192	252	235	242	921
14:00 - 15:00	216	290	267	272	1045
15:00 - 16:00	272	370	290	317	1249
16:00 - 17:00	292	334	306	346	1278
17:00 - 18:00	316	298	228	205	1047
18:00 - 19:00	192	200	200	132	724
19:00 - 20:00	151	135	112	114	512
20:00 - 21:00	82	88	90	71	331
21:00 - 22:00	63	48	49	48	208
22:00 - 23:00	28	36	44	34	142
23:00 - 24:00	29	15	46	24	114
TOTAL					14894

Boones Ferry Road at Day Road

	North				South			
	Day 1	Day 2	Average	1-Hr	Day 1	Day 2	Average	1-Hr
7:00 AM	311	310	311	1101	438	484	461	1702
7:15 AM	306	290	298	1042	454	413	434	1620
7:30 AM	280	219	250	982	450	377	414	1568
7:45 AM	254	230	242	945	360	425	393	1518
8:00 AM	216	288	252	902	352	406	379	1443
8:15 AM	244	232	238	819	402	362	382	1405
8:30 AM	210	216	213	745	403	324	364	1354
8:45 AM	186	212	199	686	316	320	318	1329
9:00 AM	165	172	169	646	353	328	341	1319
9:15 AM	170	158	164		309	352	331	
9:30 AM	167	140	154		342	335	339	
9:45 AM	144	174	159		318	297	308	
			311	1101			461	1702
			PHF	0.89			PHF	0.92

	North				South			
	Day 1	Day 2	Average	1-Hr	Day 1	Day 2	Average	1-Hr
4:00 PM	324	312	318	1339	534	502	518	2164
4:15 PM	332	351	342	1317	552	526	539	2205
4:30 PM	355	330	343	1310	530	560	545	2170
4:45 PM	343	329	336	1216	542	582	562	2072
5:00 PM	286	306	296	1110	584	533	559	1908
5:15 PM	354	316	335	1020	546	462	504	1721
5:30 PM	269	229	249	871	501	393	447	1524
5:45 PM	245	214	230	819	426	370	398	1368
6:00 PM	217	194	206	744	400	344	372	1214
6:15 PM	172	199	186		341	273	307	
6:30 PM	190	203	197		344	238	291	
6:45 PM	162	147	155		252	235	244	
			343	1339			562	2205
			PHF	0.98			PHF	0.98

Location Info

Location ID	15300
Type	I-SECTION
Functional Class	4
Located On	Boones Ferry Rd
NORTH OF	Day Street [0.02 miles]
Direction	2-WAY
Community	Wilsonville
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	9/24/2018
End Date	9/25/2018
Start Time	2:00 PM
End Time	2:00 PM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	42	22	27	22	113
01:00 - 02:00	16	15	18	13	62
02:00 - 03:00	16	32	14	18	80
03:00 - 04:00	20	16	38	37	111
04:00 - 05:00	68	102	106	78	354
05:00 - 06:00	81	143	140	153	517
06:00 - 07:00	152	205	285	278	920
07:00 - 08:00	311	306	280	254	1151
08:00 - 09:00	216	244	210	186	856
09:00 - 10:00	165	170	167	144	646
10:00 - 11:00	161	144	146	172	623
11:00 - 12:00	168	183	194	195	740
12:00 - 13:00	184	190	180	202	756
13:00 - 14:00	204	208	204	236	852
14:00 - 15:00	226	244	283	296	1049
15:00 - 16:00	262	296	314	318	1190
16:00 - 17:00	324	332	355	343	1354
17:00 - 18:00	286	354	269	245	1154
18:00 - 19:00	217	172	190	162	741
19:00 - 20:00	184	175	124	108	591
20:00 - 21:00	116	80	114	78	388
21:00 - 22:00	93	64	48	33	238
22:00 - 23:00	46	42	30	32	150
23:00 - 24:00	36	16	27	24	103
TOTAL					14739

Location Info

Location ID	15300
Type	I-SECTION
Functional Class	4
Located On	Boones Ferry Rd
NORTH OF	Day Street [0.02 miles]
Direction	2-WAY
Community	Wilsonville
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	9/25/2018
End Date	9/26/2018
Start Time	2:00 PM
End Time	2:00 PM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	16	15	5	8	44
01:00 - 02:00	16	11	12	18	57
02:00 - 03:00	30	12	16	22	80
03:00 - 04:00	31	36	34	64	165
04:00 - 05:00	121	83	66	96	366
05:00 - 06:00	176	132	143	190	641
06:00 - 07:00	260	250	285	308	1103
07:00 - 08:00	310	290	219	230	1049
08:00 - 09:00	288	232	216	212	948
09:00 - 10:00	172	158	140	174	644
10:00 - 11:00	189	140	164	163	656
11:00 - 12:00	169	168	200	242	779
12:00 - 13:00	207	212	232	248	899
13:00 - 14:00	210	234	237	258	939
14:00 - 15:00	229	296	285	286	1096
15:00 - 16:00	256	393	278	300	1227
16:00 - 17:00	312	351	330	329	1322
17:00 - 18:00	306	316	229	214	1065
18:00 - 19:00	194	199	203	147	743
19:00 - 20:00	161	138	123	112	534
20:00 - 21:00	78	97	100	70	345
21:00 - 22:00	62	48	48	50	208
22:00 - 23:00	28	41	39	37	145
23:00 - 24:00	26	16	44	23	109
TOTAL					15164

Location Info

Location ID	3289
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
SOUTH OF	Day Street [0.05 miles]
Direction	2-WAY
Community	-
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	8/7/2018
End Date	8/8/2018
Start Time	1:00 PM
End Time	1:00 PM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	76	43	50	41	210
01:00 - 02:00	24	20	40	29	113
02:00 - 03:00	46	58	42	42	188
03:00 - 04:00	28	46	61	53	188
04:00 - 05:00	113	164	191	150	618
05:00 - 06:00	227	262	352	270	1111
06:00 - 07:00	368	446	450	430	1694
07:00 - 08:00	438	454	450	360	1702
08:00 - 09:00	352	402	403	316	1473
09:00 - 10:00	353	309	342	318	1322
10:00 - 11:00	328	383	382	364	1457
11:00 - 12:00	344	401	346	381	1472
12:00 - 13:00	370	396	386	429	1581
13:00 - 14:00	436	390	400	433	1659
14:00 - 15:00	405	479	472	423	1779
15:00 - 16:00	446	452	546	555	1999
16:00 - 17:00	534	552	530	542	2158
17:00 - 18:00	584	546	501	426	2057
18:00 - 19:00	400	341	344	252	1337
19:00 - 20:00	259	225	176	186	846
20:00 - 21:00	192	160	171	165	688
21:00 - 22:00	143	110	144	135	532
22:00 - 23:00	82	73	64	52	271
23:00 - 24:00	50	59	42	42	193
TOTAL					26648

Location Info

Location ID	3289_NB
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
SOUTH OF	Day Street [0.05 miles]
Direction	NB
Community	-
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	8/7/2018
End Date	8/8/2018
Start Time	1:00 PM
End Time	1:00 PM
Direction	NB
Notes	
Count Source	
File Name	Vol_Short
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	30	14	16	16	76
01:00 - 02:00	10	10	20	14	54
02:00 - 03:00	24	18	14	8	64
03:00 - 04:00	16	30	40	39	125
04:00 - 05:00	84	128	144	112	468
05:00 - 06:00	159	182	236	172	749
06:00 - 07:00	234	280	282	232	1028
07:00 - 08:00	236	230	248	188	902
08:00 - 09:00	188	222	207	146	763
09:00 - 10:00	186	145	182	134	647
10:00 - 11:00	152	194	202	179	727
11:00 - 12:00	166	194	190	195	745
12:00 - 13:00	196	160	190	212	758
13:00 - 14:00	232	172	180	181	765
14:00 - 15:00	184	204	212	179	779
15:00 - 16:00	194	192	201	177	764
16:00 - 17:00	242	232	256	246	976
17:00 - 18:00	262	256	220	190	928
18:00 - 19:00	194	173	174	136	677
19:00 - 20:00	140	118	98	100	456
20:00 - 21:00	100	96	86	81	363
21:00 - 22:00	80	66	62	52	260
22:00 - 23:00	34	47	34	28	143
23:00 - 24:00	22	32	25	24	103
TOTAL					13320

Location Info

Location ID	3289_SB
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
SOUTH OF	Day Street [0.05 miles]
Direction	SB
Community	-
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	8/7/2018
End Date	8/8/2018
Start Time	1:00 PM
End Time	1:00 PM
Direction	SB
Notes	
Count Source	
File Name	Vol_Short
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	46	29	34	25	134
01:00 - 02:00	14	10	20	15	59
02:00 - 03:00	22	40	28	34	124
03:00 - 04:00	12	16	21	14	63
04:00 - 05:00	29	36	47	38	150
05:00 - 06:00	68	80	116	98	362
06:00 - 07:00	134	166	168	198	666
07:00 - 08:00	202	224	202	172	800
08:00 - 09:00	164	180	196	170	710
09:00 - 10:00	167	164	160	184	675
10:00 - 11:00	176	189	180	185	730
11:00 - 12:00	178	207	156	186	727
12:00 - 13:00	174	236	196	217	823
13:00 - 14:00	204	218	220	252	894
14:00 - 15:00	221	275	260	244	1000
15:00 - 16:00	252	260	345	378	1235
16:00 - 17:00	292	320	274	296	1182
17:00 - 18:00	322	290	281	236	1129
18:00 - 19:00	206	168	170	116	660
19:00 - 20:00	119	107	78	86	390
20:00 - 21:00	92	64	85	84	325
21:00 - 22:00	63	44	82	83	272
22:00 - 23:00	48	26	30	24	128
23:00 - 24:00	28	27	17	18	90
TOTAL					13328

Location Info

Location ID	3289
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
SOUTH OF	Day Street [0.05 miles]
Direction	2-WAY
Community	-
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	8/8/2018
End Date	8/9/2018
Start Time	1:00 PM
End Time	1:00 PM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	33	34	35	28	130
01:00 - 02:00	32	22	26	37	117
02:00 - 03:00	47	24	34	29	134
03:00 - 04:00	52	68	84	132	336
04:00 - 05:00	234	140	190	234	798
05:00 - 06:00	337	262	371	444	1414
06:00 - 07:00	516	472	468	456	1912
07:00 - 08:00	484	413	377	425	1699
08:00 - 09:00	406	362	324	320	1412
09:00 - 10:00	328	352	335	297	1312
10:00 - 11:00	400	334	371	368	1473
11:00 - 12:00	358	406	404	418	1586
12:00 - 13:00	388	430	405	380	1603
13:00 - 14:00	422	415	412	457	1706
14:00 - 15:00	449	488	428	463	1828
15:00 - 16:00	504	527	558	506	2095
16:00 - 17:00	502	526	560	582	2170
17:00 - 18:00	533	462	393	370	1758
18:00 - 19:00	344	273	238	235	1090
19:00 - 20:00	219	160	206	159	744
20:00 - 21:00	154	176	180	101	611
21:00 - 22:00	115	108	92	55	370
22:00 - 23:00	79	47	40	73	239
23:00 - 24:00	52	47	57	40	196
TOTAL					26733

Location Info

Location ID	3289_NB
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
SOUTH OF	Day Street [0.05 miles]
Direction	NB
Community	-
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	8/8/2018
End Date	8/9/2018
Start Time	1:00 PM
End Time	1:00 PM
Direction	NB
Notes	
Count Source	
File Name	Vol_Short
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	14	8	20	16	58
01:00 - 02:00	10	8	14	18	50
02:00 - 03:00	16	8	14	17	55
03:00 - 04:00	28	42	70	102	242
04:00 - 05:00	183	110	150	176	619
05:00 - 06:00	230	176	255	294	955
06:00 - 07:00	318	300	266	252	1136
07:00 - 08:00	288	244	206	229	967
08:00 - 09:00	234	180	178	156	748
09:00 - 10:00	156	142	158	141	597
10:00 - 11:00	176	170	174	174	694
11:00 - 12:00	186	203	210	202	801
12:00 - 13:00	157	212	181	170	720
13:00 - 14:00	208	203	172	153	736
14:00 - 15:00	203	192	210	188	793
15:00 - 16:00	226	207	234	210	877
16:00 - 17:00	226	236	254	264	980
17:00 - 18:00	247	228	212	180	867
18:00 - 19:00	176	158	128	114	576
19:00 - 20:00	115	80	118	88	401
20:00 - 21:00	80	98	98	53	329
21:00 - 22:00	66	42	32	28	168
22:00 - 23:00	43	25	20	36	124
23:00 - 24:00	24	22	17	14	77
TOTAL					13570

Location Info

Location ID	3289_SB
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
SOUTH OF	Day Street [0.05 miles]
Direction	SB
Community	-
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	8/8/2018
End Date	8/9/2018
Start Time	1:00 PM
End Time	1:00 PM
Direction	SB
Notes	
Count Source	
File Name	Vol_Short
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	19	26	15	12	72
01:00 - 02:00	22	14	12	19	67
02:00 - 03:00	31	16	20	12	79
03:00 - 04:00	24	26	14	30	94
04:00 - 05:00	51	30	40	58	179
05:00 - 06:00	107	86	116	150	459
06:00 - 07:00	198	172	202	204	776
07:00 - 08:00	196	169	171	196	732
08:00 - 09:00	172	182	146	164	664
09:00 - 10:00	172	210	177	156	715
10:00 - 11:00	224	164	197	194	779
11:00 - 12:00	172	203	194	216	785
12:00 - 13:00	231	218	224	210	883
13:00 - 14:00	214	212	240	304	970
14:00 - 15:00	246	296	218	275	1035
15:00 - 16:00	278	320	324	296	1218
16:00 - 17:00	276	290	306	318	1190
17:00 - 18:00	286	234	181	190	891
18:00 - 19:00	168	115	110	121	514
19:00 - 20:00	104	80	88	71	343
20:00 - 21:00	74	78	82	48	282
21:00 - 22:00	49	66	60	27	202
22:00 - 23:00	36	22	20	37	115
23:00 - 24:00	28	25	40	26	119
TOTAL					13163

Boones Ferry Road at I-5 SB

	West				East			
	Day 1	Day 2	Average	1-Hr	Day 1	Day 2	Average	1-Hr
7:00 AM	631	681	656	2532	284	300	292	1066
7:15 AM	682	637	660	2471	262	256	259	1008
7:30 AM	693	612	653	2367	256	228	242	961
7:45 AM	577	549	563	2272	270	276	273	923
8:00 AM	565	625	595	2178	216	252	234	859
8:15 AM	560	551	556	2106	224	200	212	851
8:30 AM	622	494	558	2072	186	222	204	860
8:45 AM	462	476	469	2020	198	220	209	858
9:00 AM	542	503	523	2052	238	214	226	884
9:15 AM	502	541	522		222	219	221	
9:30 AM	488	523	506		188	215	202	
9:45 AM	503	499	501		234	236	235	
			660	2532			292	1066
			PHF	0.96			PHF	0.91

	West				East			
	Day 1	Day 2	Average	1-Hr	Day 1	Day 2	Average	1-Hr
4:00 PM	793	712	753	3147	306	260	283	1077
4:15 PM	775	776	776	3218	298	278	288	1017
4:30 PM	792	864	828	3158	278	257	268	919
4:45 PM	766	813	790	2997	213	262	238	821
5:00 PM	863	784	824	2759	215	231	223	720
5:15 PM	773	658	716	2460	184	196	190	648
5:30 PM	700	634	667	2167	172	168	170	610
5:45 PM	609	494	552	1918	110	163	137	561
6:00 PM	610	440	525	1711	142	160	151	538
6:15 PM	449	397	423		160	144	152	
6:30 PM	490	346	418		126	116	121	
6:45 PM	358	332	345		116	112	114	
			828	3218			288	1077
			PHF	0.97			PHF	0.93

Location Info

Location ID	3290
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
EAST OF	Commercial Circle [0.04 miles]
Direction	2-WAY
Community	Wilsonville
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	8/7/2018
End Date	8/8/2018
Start Time	1:30 PM
End Time	1:30 PM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	92	74	52	60	278
01:00 - 02:00	42	43	53	59	197
02:00 - 03:00	63	66	68	65	262
03:00 - 04:00	55	81	103	110	349
04:00 - 05:00	144	214	292	229	879
05:00 - 06:00	300	360	520	415	1595
06:00 - 07:00	530	605	683	580	2398
07:00 - 08:00	631	682	693	577	2583
08:00 - 09:00	565	560	622	462	2209
09:00 - 10:00	542	502	488	503	2035
10:00 - 11:00	508	538	492	568	2106
11:00 - 12:00	560	607	617	597	2381
12:00 - 13:00	580	590	552	645	2367
13:00 - 14:00	564	598	557	606	2325
14:00 - 15:00	597	674	680	632	2583
15:00 - 16:00	710	693	756	739	2898
16:00 - 17:00	793	775	792	766	3126
17:00 - 18:00	863	773	700	609	2945
18:00 - 19:00	610	449	490	358	1907
19:00 - 20:00	342	342	277	218	1179
20:00 - 21:00	266	217	222	221	926
21:00 - 22:00	196	175	150	173	694
22:00 - 23:00	132	115	99	91	437
23:00 - 24:00	66	105	68	60	299
TOTAL					38958

Location Info

Location ID	3290
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
EAST OF	Commercial Circle [0.04 miles]
Direction	2-WAY
Community	Wilsonville
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	8/8/2018
End Date	8/9/2018
Start Time	1:30 PM
End Time	1:30 PM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	57	57	61	43	218
01:00 - 02:00	50	52	57	44	203
02:00 - 03:00	66	42	60	54	222
03:00 - 04:00	90	105	109	149	453
04:00 - 05:00	267	270	220	309	1066
05:00 - 06:00	429	490	426	549	1894
06:00 - 07:00	683	670	689	684	2726
07:00 - 08:00	681	637	612	549	2479
08:00 - 09:00	625	551	494	476	2146
09:00 - 10:00	503	541	523	499	2066
10:00 - 11:00	554	538	550	584	2226
11:00 - 12:00	592	585	580	648	2405
12:00 - 13:00	568	629	626	530	2353
13:00 - 14:00	564	598	572	634	2368
14:00 - 15:00	630	700	675	708	2713
15:00 - 16:00	678	757	779	787	3001
16:00 - 17:00	712	776	864	813	3165
17:00 - 18:00	784	658	634	494	2570
18:00 - 19:00	440	397	346	332	1515
19:00 - 20:00	312	257	235	224	1028
20:00 - 21:00	224	216	263	204	907
21:00 - 22:00	167	156	118	108	549
22:00 - 23:00	101	117	74	87	379
23:00 - 24:00	89	80	72	88	329
TOTAL					38981

Location Info

Location ID	17484
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
	PACIFIC HIGHWAY-ELLIGSEN ROAD CONN., SW Elligsen Road (OR141), 0.02 mile west of SW Parkway Avenue
Direction	2-WAY
Community	Wilsonville
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	5/13/2014
End Date	5/14/2014
Start Time	8:30 AM
End Time	8:30 AM
Direction	
Notes	
Count Source	
File Name	Pre2017_Vol_Short
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	4	8	8	11	31
01:00 - 02:00	3	9	8	14	34
02:00 - 03:00	17	16	8	21	62
03:00 - 04:00	19	31	12	36	98
04:00 - 05:00	37	61	68	174	340
05:00 - 06:00	112	132	155	238	637
06:00 - 07:00	236	265	282	350	1133
07:00 - 08:00	284	262	256	270	1072
08:00 - 09:00	216	224	186	198	824
09:00 - 10:00	238	222	188	234	882
10:00 - 11:00	234	200	224	249	907
11:00 - 12:00	252	273	217	258	1000
12:00 - 13:00	258	232	262	236	988
13:00 - 14:00	211	235	258	236	940
14:00 - 15:00	228	252	220	228	928
15:00 - 16:00	227	264	268	284	1043
16:00 - 17:00	306	298	278	213	1095
17:00 - 18:00	215	184	172	110	681
18:00 - 19:00	142	160	126	116	544
19:00 - 20:00	106	98	85	97	386
20:00 - 21:00	62	82	73	43	260
21:00 - 22:00	52	40	29	35	156
22:00 - 23:00	24	10	7	17	58
23:00 - 24:00	13	7	17	7	44
TOTAL					14143

Location Info

Location ID	17484
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
	PACIFIC HIGHWAY-ELLIGSEN ROAD CONN., SW Elligsen Road (OR141), 0.02 mile west of SW Parkway Avenue
Direction	2-WAY
Community	Wilsonville
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	5/14/2014
End Date	5/15/2014
Start Time	8:30 AM
End Time	8:30 AM
Direction	
Notes	
Count Source	5222
File Name	Pre2017_Vol_Short
Weather	
Study	
Owner	
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	5	10	6	18	39
01:00 - 02:00	5	10	15	24	54
02:00 - 03:00	9	8	12	32	61
03:00 - 04:00	14	25	20	46	105
04:00 - 05:00	40	49	76	151	316
05:00 - 06:00	107	154	169	226	656
06:00 - 07:00	196	264	276	284	1020
07:00 - 08:00	300	256	228	276	1060
08:00 - 09:00	252	200	222	220	894
09:00 - 10:00	214	219	215	236	884
10:00 - 11:00	224	208	240	256	928
11:00 - 12:00	276	246	266	250	1038
12:00 - 13:00	234	254	260	282	1030
13:00 - 14:00	247	242	214	234	937
14:00 - 15:00	220	196	215	220	851
15:00 - 16:00	252	214	218	291	975
16:00 - 17:00	260	278	257	262	1057
17:00 - 18:00	231	196	168	163	758
18:00 - 19:00	160	144	116	112	532
19:00 - 20:00	131	94	106	94	425
20:00 - 21:00	84	78	68	45	275
21:00 - 22:00	42	39	40	35	156
22:00 - 23:00	19	21	13	17	70
23:00 - 24:00	16	7	8	11	42
TOTAL					14163

I-5 Elligson Ramps

	Southbound Off				Northbound Off				Southbound On from West				Southbound On from East			
	Day 1	Day 2	Average	1-Hr	Day 1	Day 2	Average	1-Hr	Day 1	Day 2	Average	1-Hr	Day 1	Day 2	Average	1-Hr
7:00 AM	304	302	303	1451	143		143	523	86	87	87	355	35	35	35	132
7:15 AM	339	381	360	1492	126		126	489	89	90	90	341	31	31	31	132
7:30 AM	380	380	380	1475	140		140	461	98	64	81	328	38	38	38	125
7:45 AM	392	423	408	1418	114		114	450	100	94	97	326	28	28	28	127
8:00 AM	336	351	344	1351	109		109	443	66	80	73	300	35	35	35	124
8:15 AM	332	353	343	1294	98		98	441	81	73	77	284	24	24	24	124
8:30 AM	290	356	323	1231	129		129	436	81	77	79	268	40	40	40	122
8:45 AM	309	372	341	1159	107		107	412	67	74	71	255	25	25	25	122
9:00 AM	299	274	287	1044	107		107	434	54	60	57	240	35	35	35	123
9:15 AM	289	271	280		93		93		55	66	61		22	22	22	
9:30 AM	255	246	251		105		105		49	82	66		40	40	40	
9:45 AM	227	225	226		129		129		58	54	56		26	26	26	
			408	1492			143	523			97	355			40	132
			PHF	0.91			PHF	0.91			PHF	0.91			PHF	0.83

	Northbound On from West				Northound On from East			
	Day 1	Day 2	Average	1-Hr	Day 1	Day 2	Average	1-Hr
7:00 AM	82	73	78	321	149	149	149	549
7:15 AM	89	82	86	323	128	128	128	531
7:30 AM	73	63	68	330	137	137	137	520
7:45 AM	81	96	89	371	135	135	135	498
8:00 AM	79	81	80	373	131	131	131	487
8:15 AM	86	100	93	393	117	117	117	466
8:30 AM	116	101	109	398	115	115	115	484
8:45 AM	80	101	91	428	124	124	124	496
9:00 AM	97	102	100	465	110	110	110	492
9:15 AM	92	103	98		135	135	135	
9:30 AM	130	148	139		127	127	127	
9:45 AM	124	131	128		120	120	120	
			139	465			149	549
			PHF	0.84			PHF	0.92

	Southbound Off				Northbound Off				Southbound On from West				Southbound On from East			
	Day 1	Day 2	Average	1-Hr	Day 1	Day 2	Average	1-Hr	Day 1	Day 2	Average	1-Hr	Day 1	Day 2	Average	1-Hr
4:00 PM	335	333	334	1330	138		138	556	234	233	234	896	64	64	64	275
4:15 PM	318	327	323	1326	166		166	551	252	205	229	880	46	46	46	310
4:30 PM	356	303	330	1310	147		147	493	216	210	213	844	82	82	82	359
4:45 PM	331	355	343	1340	105		105	426	240	199	220	788	83	83	83	361
5:00 PM	358	302	330	1308	133		133	412	234	202	218	691	99	99	99	344
5:15 PM	276	337	307	1241	108		108	350	227	158	193	564	95	95	95	309
5:30 PM	320	400	360	1165	80		80	307	198	116	157	465	84	84	84	266
5:45 PM	286	336	311	1010	91		91	282	147	99	123	386	66	66	66	224
6:00 PM	262	264	263	887	71		71	246	89	93	91	326	64	64	64	199
6:15 PM	243	219	231		65		65		103	84	94		52	52	52	
6:30 PM	184	225	205		55		55		91	65	78		42	42	42	
6:45 PM	157	218	188		55		55		56	70	63		41	41	41	
			360	1340			166	556			234	896			99	361
			PHF	0.93			PHF	0.84			PHF	0.96			PHF	0.91

	Northbound On from West				Northound On from East			
	Day 1	Day 2	Average	1-Hr	Day 1	Day 2	Average	1-Hr
4:00 PM	193	195	194	720	219	219	219	606
4:15 PM	197	187	192	694	165	165	165	495
4:30 PM	158	193	176	641	121	121	121	426
4:45 PM	142	173	158	602	101	101	101	385
5:00 PM	170	165	168	545	108	108	108	350
5:15 PM	137	140	139	465	96	96	96	303
5:30 PM	125	149	137	415	80	80	80	252
5:45 PM	100	102	101	359	66	66	66	254
6:00 PM	80	95	88	335	61	61	61	234
6:15 PM	99	79	89		45	45	45	
6:30 PM	72	89	81		82	82	82	
6:45 PM	74	79	77		46	46	46	
			194	720			219	606
			PHF	0.93			PHF	0.69

Location Info

Location ID	15938
Type	I-SECTION
Functional Class	1
Located On	PACIFIC HIGHWAY NO. 1
	STAFFORD ROAD CONN. NO. 1, SB I-5 off-
Direction	1-WAY
Community	Wilsonville
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	4/3/2017
End Date	4/4/2017
Start Time	12:15 AM
End Time	12:15 AM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	16	15	20	15	66
01:00 - 02:00	19	15	10	10	54
02:00 - 03:00	17	6	14	13	50
03:00 - 04:00	20	15	36	36	107
04:00 - 05:00	19	33	65	80	197
05:00 - 06:00	93	127	199	293	712
06:00 - 07:00	226	274	287	366	1153
07:00 - 08:00	304	339	380	392	1415
08:00 - 09:00	336	332	290	309	1267
09:00 - 10:00	299	289	255	227	1070
10:00 - 11:00	213	223	251	230	917
11:00 - 12:00	230	243	261	255	989
12:00 - 13:00	259	289	256	308	1112
13:00 - 14:00	289	271	260	271	1091
14:00 - 15:00	262	273	279	280	1094
15:00 - 16:00	239	249	249	284	1021
16:00 - 17:00	335	318	356	331	1340
17:00 - 18:00	358	276	320	286	1240
18:00 - 19:00	262	243	184	157	846
19:00 - 20:00	155	172	129	122	578
20:00 - 21:00	111	106	80	128	425
21:00 - 22:00	102	98	79	60	339
22:00 - 23:00	48	56	42	42	188
23:00 - 24:00	29	39	25	24	117
TOTAL					17388

Location Info

Location ID	15938
Type	I-SECTION
Functional Class	1
Located On	PACIFIC HIGHWAY NO. 1
	STAFFORD ROAD CONN. NO. 1, SB I-5 off-
Direction	1-WAY
Community	Wilsonville
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	4/4/2017
End Date	4/5/2017
Start Time	12:15 AM
End Time	12:15 AM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	17	16	21	21	75
01:00 - 02:00	17	12	24	13	66
02:00 - 03:00	17	21	10	11	59
03:00 - 04:00	20	19	30	37	106
04:00 - 05:00	31	30	48	106	215
05:00 - 06:00	110	137	193	296	736
06:00 - 07:00	222	257	322	376	1177
07:00 - 08:00	302	381	380	423	1486
08:00 - 09:00	351	353	356	372	1432
09:00 - 10:00	274	271	246	225	1016
10:00 - 11:00	218	198	219	253	888
11:00 - 12:00	239	260	273	293	1065
12:00 - 13:00	265	275	268	265	1073
13:00 - 14:00	295	322	333	300	1250
14:00 - 15:00	275	307	266	235	1083
15:00 - 16:00	259	300	290	324	1173
16:00 - 17:00	333	327	303	355	1318
17:00 - 18:00	302	337	400	336	1375
18:00 - 19:00	264	219	225	218	926
19:00 - 20:00	185	175	129	109	598
20:00 - 21:00	117	113	121	119	470
21:00 - 22:00	120	104	87	68	379
22:00 - 23:00	79	64	58	45	246
23:00 - 24:00	25	34	29	21	109
TOTAL					18321

Location Info

Location ID	17481
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
OFF-R TO	Elligsen Road [on I5 NB]
Direction	1-WAY
Community	Wilsonville
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	4/3/2017
End Date	4/4/2017
Start Time	1:15 AM
End Time	1:15 AM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	4	6	5	5	20
01:00 - 02:00	1	26	10	19	56
02:00 - 03:00	14	10	15	27	66
03:00 - 04:00	30	47	105	117	299
04:00 - 05:00	74	102	176	173	525
05:00 - 06:00	142	162	221	204	729
06:00 - 07:00	165	182	212	222	781
07:00 - 08:00	143	126	140	114	523
08:00 - 09:00	109	98	129	107	443
09:00 - 10:00	107	93	105	129	434
10:00 - 11:00	97	120	94	131	442
11:00 - 12:00	101	122	110	120	453
12:00 - 13:00	128	115	99	109	451
13:00 - 14:00	137	144	127	114	522
14:00 - 15:00	111	118	111	124	464
15:00 - 16:00	120	124	138	115	497
16:00 - 17:00	138	166	147	105	556
17:00 - 18:00	133	108	80	91	412
18:00 - 19:00	71	65	55	55	246
19:00 - 20:00	58	48	33	37	176
20:00 - 21:00	52	27	22	28	129
21:00 - 22:00	17	21	23	29	90
22:00 - 23:00	11	16	5	7	39
23:00 - 24:00	5	9	3	4	21
TOTAL					8374

Location Info

Location ID	17480
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
ON-R FROM	SW Boones Ferry Road [on I5 SB]
Direction	1-WAY
Community	Wilsonville
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	4/4/2017
End Date	4/5/2017
Start Time	12:30 AM
End Time	12:30 AM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	18	20	5	9	52
01:00 - 02:00	9	6	3	2	20
02:00 - 03:00	7	11	10	10	38
03:00 - 04:00	3	3	8	1	15
04:00 - 05:00	9	12	7	14	42
05:00 - 06:00	8	9	25	29	71
06:00 - 07:00	31	49	54	78	212
07:00 - 08:00	86	89	98	100	373
08:00 - 09:00	66	81	81	67	295
09:00 - 10:00	54	55	49	58	216
10:00 - 11:00	61	37	57	62	217
11:00 - 12:00	44	51	49	61	205
12:00 - 13:00	73	91	85	63	312
13:00 - 14:00	52	72	70	75	269
14:00 - 15:00	108	136	103	143	490
15:00 - 16:00	137	189	187	253	766
16:00 - 17:00	234	252	216	240	942
17:00 - 18:00	234	227	198	147	806
18:00 - 19:00	89	103	91	56	339
19:00 - 20:00	62	33	49	19	163
20:00 - 21:00	42	36	35	31	144
21:00 - 22:00	31	30	28	33	122
22:00 - 23:00	22	14	19	11	66
23:00 - 24:00	14	10	19	4	47
TOTAL					6222

Location Info

Location ID	17480
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
ON-R FROM	SW Boones Ferry Road [on I5 SB]
Direction	1-WAY
Community	Wilsonville
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	4/12/2021
End Date	4/13/2021
Start Time	12:00 PM
End Time	12:00 PM
Direction	
Notes	ordot
Count Source	174800000
File Name	17480_V.PRN
Weather	
Study	
Owner	claycarney
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	16	12	10	6	44
01:00 - 02:00	19	9	11	6	45
02:00 - 03:00	13	15	22	4	54
03:00 - 04:00	10	9	4	2	25
04:00 - 05:00	12	14	18	24	68
05:00 - 06:00	24	24	50	47	145
06:00 - 07:00	46	66	62	66	240
07:00 - 08:00	87	90	64	94	335
08:00 - 09:00	80	73	77	74	304
09:00 - 10:00	60	66	82	54	262
10:00 - 11:00	78	66	87	70	301
11:00 - 12:00	68	90	70	97	325
12:00 - 13:00	72	78	97	87	334
13:00 - 14:00	86	74	86	116	362
14:00 - 15:00	94	100	163	146	503
15:00 - 16:00	178	156	258	231	823
16:00 - 17:00	233	205	210	199	847
17:00 - 18:00	202	158	116	99	575
18:00 - 19:00	93	84	65	70	312
19:00 - 20:00	48	44	38	46	176
20:00 - 21:00	40	22	26	33	121
21:00 - 22:00	30	22	21	27	100
22:00 - 23:00	16	19	22	20	77
23:00 - 24:00	18	15	13	5	51
TOTAL					6429

Location Info

Location ID	17486
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
NORTH OF	SW Elligsen Road (OR141) [PACIFIC HIGHWAY-
Direction	1-WAY
Community	Wilsonville
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	4/3/2017
End Date	4/4/2017
Start Time	12:15 AM
End Time	12:15 AM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	0	9	4	2	15
01:00 - 02:00	5	0	0	1	6
02:00 - 03:00	1	0	5	7	13
03:00 - 04:00	4	0	7	4	15
04:00 - 05:00	6	8	3	9	26
05:00 - 06:00	10	8	7	8	33
06:00 - 07:00	13	27	29	20	89
07:00 - 08:00	35	31	38	28	132
08:00 - 09:00	35	24	40	25	124
09:00 - 10:00	35	22	40	26	123
10:00 - 11:00	28	39	42	50	159
11:00 - 12:00	47	57	63	58	225
12:00 - 13:00	57	54	77	58	246
13:00 - 14:00	73	63	58	54	248
14:00 - 15:00	66	62	80	63	271
15:00 - 16:00	80	60	76	91	307
16:00 - 17:00	64	46	82	83	275
17:00 - 18:00	99	95	84	66	344
18:00 - 19:00	64	52	42	41	199
19:00 - 20:00	43	38	30	29	140
20:00 - 21:00	40	25	35	20	120
21:00 - 22:00	17	11	13	13	54
22:00 - 23:00	16	8	13	17	54
23:00 - 24:00	4	7	15	4	30
TOTAL					3248

Location Info

Location ID	17486
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
NORTH OF	SW Elligsen Road (OR141) [PACIFIC HIGHWAY-
Direction	1-WAY
Community	Wilsonville
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	4/4/2017
End Date	4/5/2017
Start Time	12:15 AM
End Time	12:15 AM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	4	8	10	11	33
01:00 - 02:00	0	0	3	1	4
02:00 - 03:00	1	1	1	1	4
03:00 - 04:00	2	7	1	4	14
04:00 - 05:00	8	6	5	9	28
05:00 - 06:00	3	7	4	6	20
06:00 - 07:00	17	18	19	28	82
07:00 - 08:00	31	39	31	47	148
08:00 - 09:00	29	34	48	39	150
09:00 - 10:00	41	32	21	22	116
10:00 - 11:00	19	46	42	42	149
11:00 - 12:00	41	55	60	52	208
12:00 - 13:00	64	70	71	55	260
13:00 - 14:00	66	55	60	60	241
14:00 - 15:00	69	80	95	73	317
15:00 - 16:00	74	56	78	76	284
16:00 - 17:00	77	59	97	83	316
17:00 - 18:00	98	103	77	69	347
18:00 - 19:00	59	46	51	33	189
19:00 - 20:00	39	48	43	27	157
20:00 - 21:00	34	32	30	20	116
21:00 - 22:00	18	15	18	13	64
22:00 - 23:00	11	9	9	17	46
23:00 - 24:00	10	5	18	16	49
TOTAL					3342

Location Info

Location ID	17483
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
	PACIFIC HIGHWAY-ELLIGSEN ROAD CONN.,
Direction	1-WAY
Community	Wilsonville
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	4/3/2017
End Date	4/4/2017
Start Time	1:45 AM
End Time	1:45 AM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	7	4	10	3	24
01:00 - 02:00	2	7	5	8	22
02:00 - 03:00	10	5	8	14	37
03:00 - 04:00	27	22	24	19	92
04:00 - 05:00	36	36	29	61	162
05:00 - 06:00	54	78	88	79	299
06:00 - 07:00	74	70	87	97	328
07:00 - 08:00	82	89	73	81	325
08:00 - 09:00	79	86	116	80	361
09:00 - 10:00	97	92	130	124	443
10:00 - 11:00	137	143	134	141	555
11:00 - 12:00	119	120	117	132	488
12:00 - 13:00	143	135	125	151	554
13:00 - 14:00	148	130	165	122	565
14:00 - 15:00	125	140	176	152	593
15:00 - 16:00	163	140	155	161	619
16:00 - 17:00	193	197	158	142	690
17:00 - 18:00	170	137	125	100	532
18:00 - 19:00	80	99	72	74	325
19:00 - 20:00	86	78	47	109	320
20:00 - 21:00	57	35	24	16	132
21:00 - 22:00	27	16	31	15	89
22:00 - 23:00	14	5	14	15	48
23:00 - 24:00	9	2	8	1	20
TOTAL					7623

Location Info

Location ID	17483
Type	I-SECTION
Functional Class	4
Located On	BEAVERTON-TUALATIN HIGHWAY NO. 141
	PACIFIC HIGHWAY-ELLIGSEN ROAD CONN.,
Direction	1-WAY
Community	Wilsonville
MPO_ID	
HPMS ID	
Agency	Oregon Traffic Monitoring System

Count Data Info

Start Date	4/4/2017
End Date	4/5/2017
Start Time	1:45 AM
End Time	1:45 AM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	5	4	10	8	27
01:00 - 02:00	11	7	13	10	41
02:00 - 03:00	9	15	19	12	55
03:00 - 04:00	28	16	17	16	77
04:00 - 05:00	19	40	36	61	156
05:00 - 06:00	74	93	93	88	348
06:00 - 07:00	87	102	82	75	346
07:00 - 08:00	73	82	63	96	314
08:00 - 09:00	81	100	101	101	383
09:00 - 10:00	102	103	148	131	484
10:00 - 11:00	106	122	136	130	494
11:00 - 12:00	133	162	141	121	557
12:00 - 13:00	152	115	132	127	526
13:00 - 14:00	141	131	154	142	568
14:00 - 15:00	140	143	173	125	581
15:00 - 16:00	174	148	163	164	649
16:00 - 17:00	195	187	193	173	748
17:00 - 18:00	165	140	149	102	556
18:00 - 19:00	95	79	89	79	342
19:00 - 20:00	66	80	67	57	270
20:00 - 21:00	42	29	31	23	125
21:00 - 22:00	33	20	25	16	94
22:00 - 23:00	13	18	13	9	53
23:00 - 24:00	12	9	8	1	30
TOTAL					7824

Location Info

Location ID	###
Type	I-
Functional Class	1
Located On	BEA
SOUTH OF	SW
Direction	1-
Community	Wils
MPO_ID	
HPMS ID	
Agency	Ore

Count Data

Start Date	4/3/2017
End Date	4/4/2017
Start Time	1:45 AM
End Time	1:45 AM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

Interval: 15 mins

Time	15				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	10	10	7	17	44
01:00 - 02:00	19	9	7	10	45
02:00 - 03:00	6	21	14	16	57
03:00 - 04:00	17	29	16	25	87
04:00 - 05:00	33	38	51	74	196
05:00 - 06:00	76	102	130	124	432
06:00 - 07:00	124	161	167	146	598
07:00 - 08:00	149	128	137	135	549
08:00 - 09:00	131	117	115	124	487
09:00 - 10:00	110	135	127	120	492
10:00 - 11:00	110	137	118	132	497
11:00 - 12:00	120	129	103	100	452
12:00 - 13:00	124	122	97	136	479
13:00 - 14:00	159	125	205	145	634
14:00 - 15:00	181	140	201	122	644
15:00 - 16:00	197	146	209	135	687
16:00 - 17:00	219	165	121	101	606
17:00 - 18:00	108	96	80	66	350
18:00 - 19:00	61	45	82	46	234
19:00 - 20:00	53	32	52	59	196
20:00 - 21:00	74	32	30	37	173
21:00 - 22:00	32	24	19	13	88
22:00 - 23:00	15	8	28	17	68
23:00 - 24:00	13	4	11	9	37
TOTAL					8132

Location Info

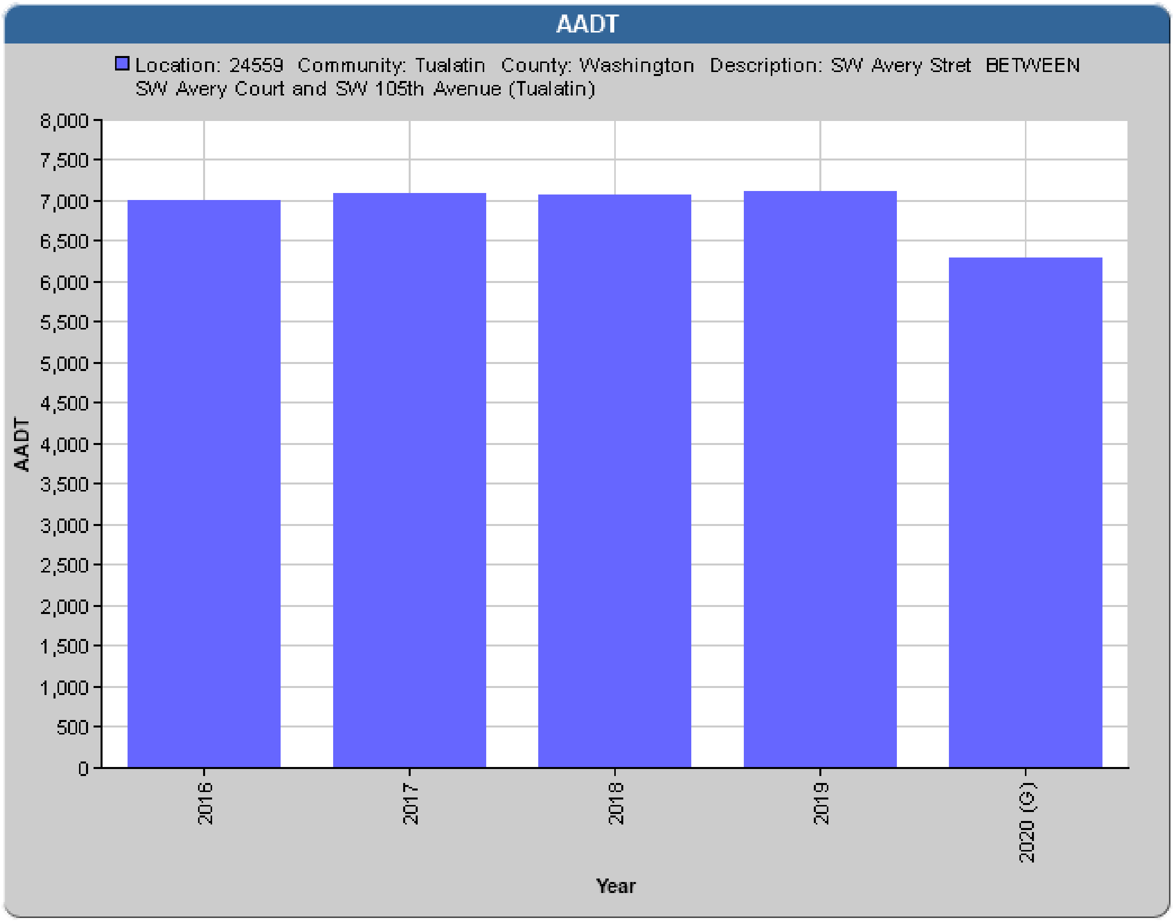
Location ID	###
Type	I-
Functional Class	1
Located On	BEA
SOUTH OF	SW
Direction	1-
Community	Wils
MPO_ID	
HPMS ID	
Agency	Ore

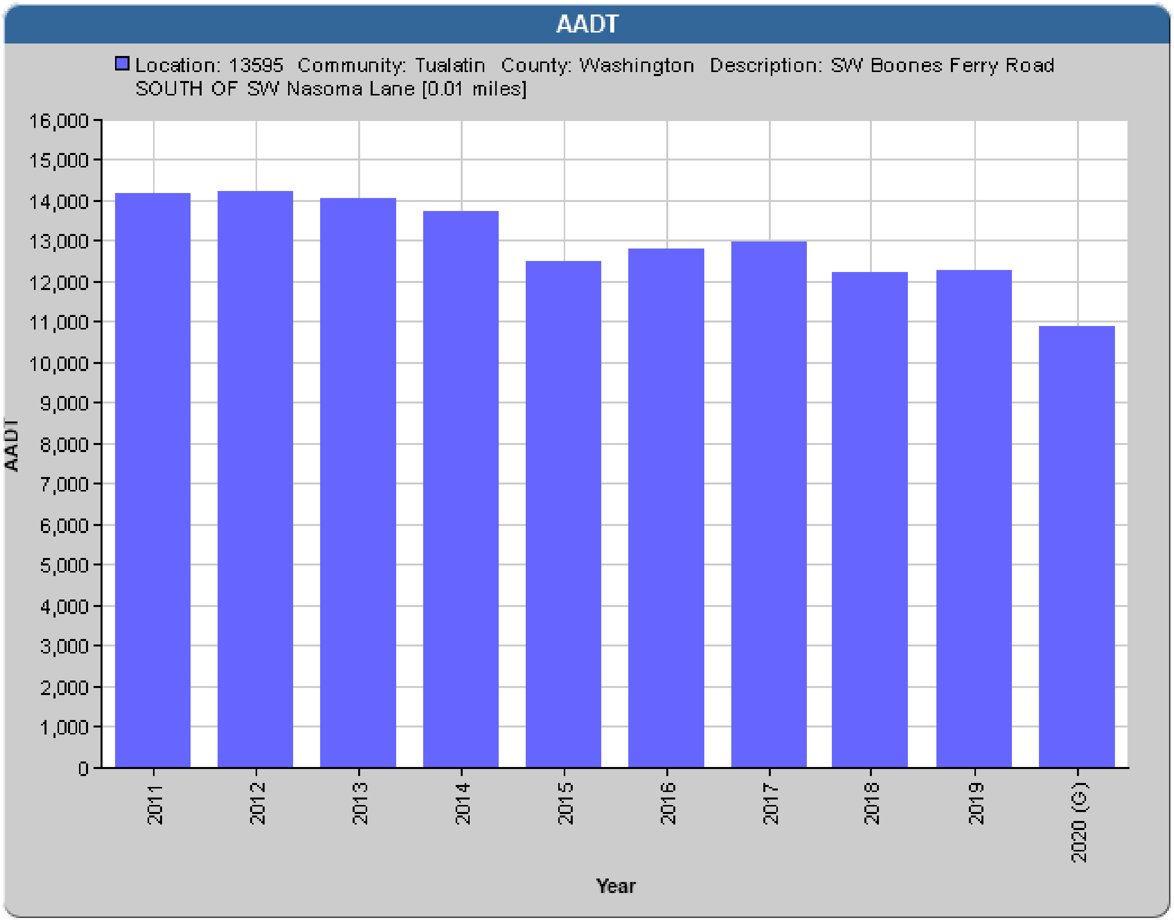
Count Data

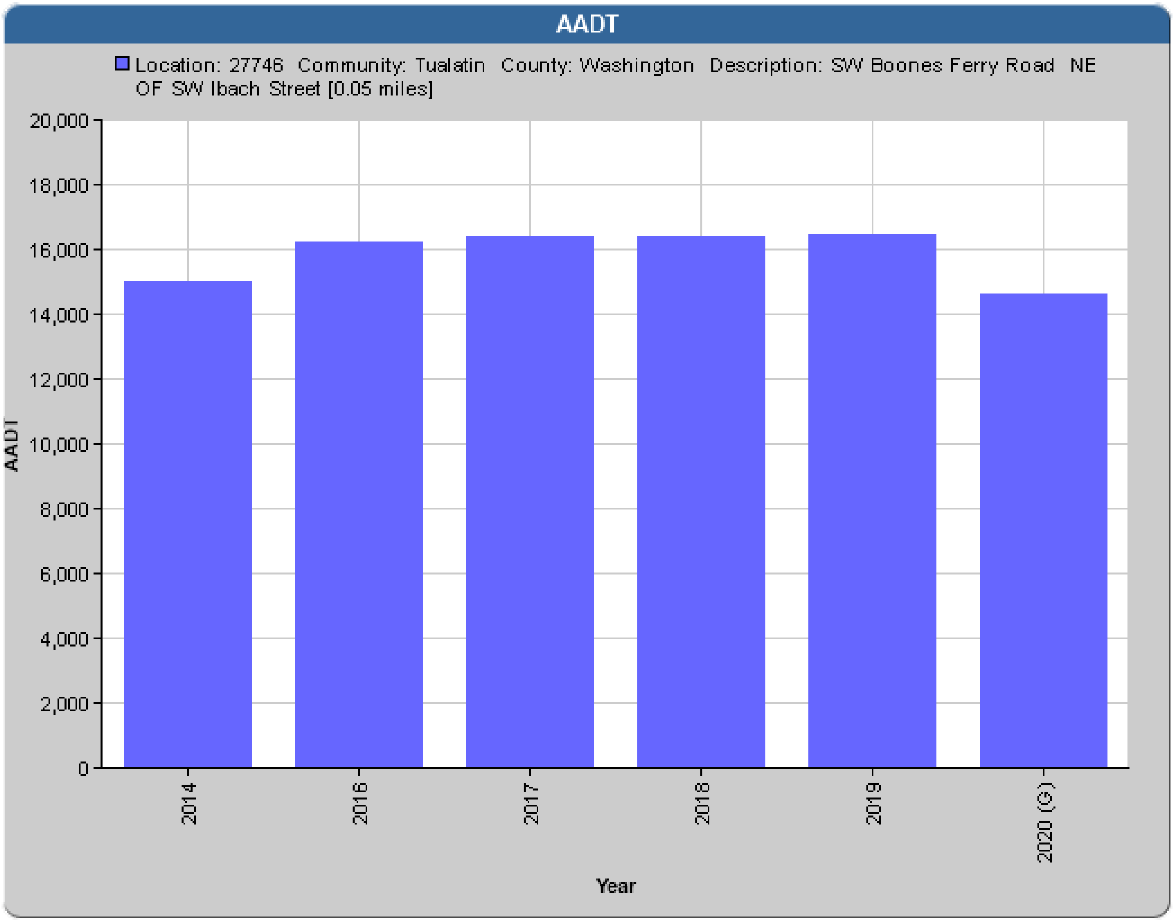
Start Date	4/4/2017
End Date	4/5/2017
Start Time	1:45 AM
End Time	1:45 AM
Direction	
Notes	
Count Source	
File Name	OR_Volume_Short_15_2017And2018
Weather	
Study	
Owner	LEGACY
QC Status	Accepted

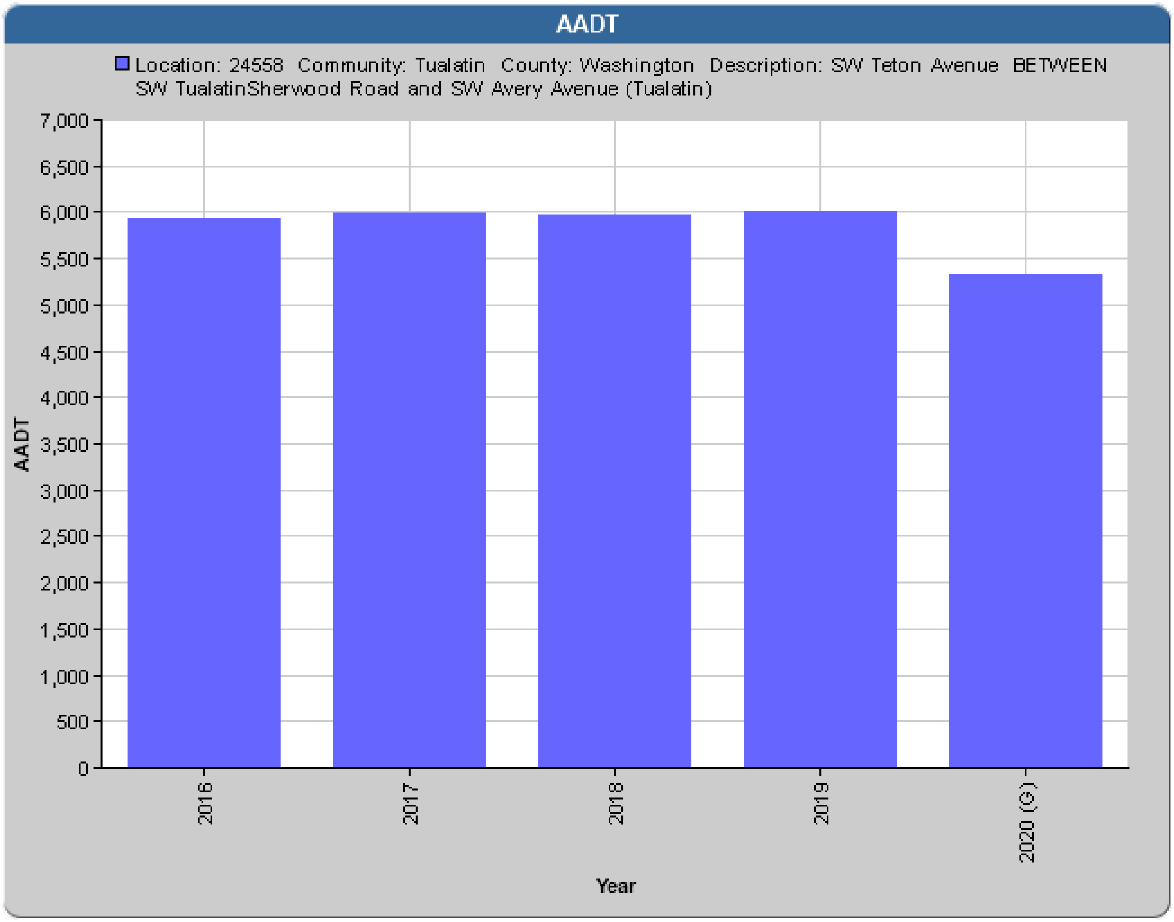
Interval: 15 mins

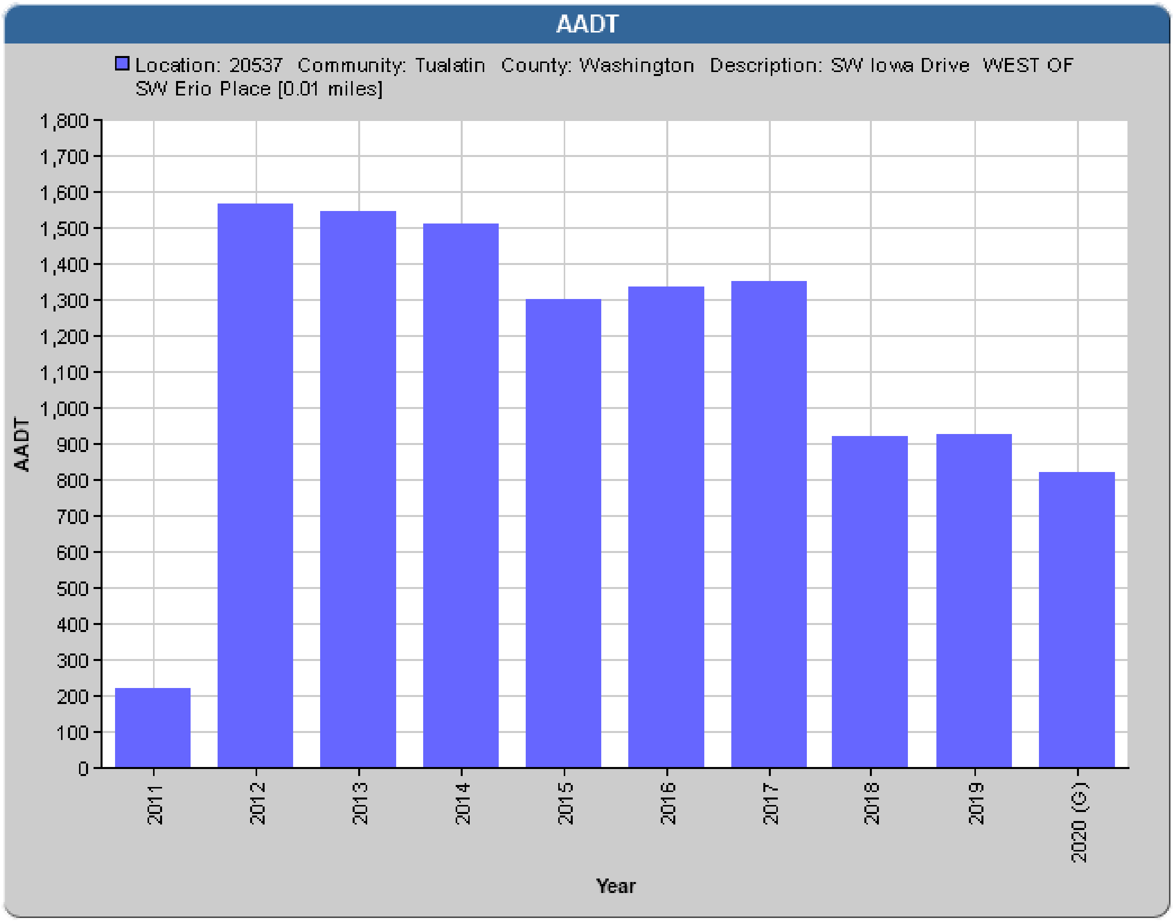
Time	15				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	8	16	10	5	39
01:00 - 02:00	13	16	12	7	48
02:00 - 03:00	9	11	9	11	40
03:00 - 04:00	30	25	26	33	114
04:00 - 05:00	29	42	57	85	213
05:00 - 06:00	85	127	138	131	481
06:00 - 07:00	150	150	165	151	616
07:00 - 08:00	152	130	139	135	556
08:00 - 09:00	147	126	134	132	539
09:00 - 10:00	132	127	122	127	508
10:00 - 11:00	124	133	141	141	539
11:00 - 12:00	178	120	118	106	522
12:00 - 13:00	132	111	130	155	528
13:00 - 14:00	137	145	164	179	625
14:00 - 15:00	184	150	190	138	662
15:00 - 16:00	189	149	230	166	734
16:00 - 17:00	197	179	128	133	637
17:00 - 18:00	132	113	82	72	399
18:00 - 19:00	59	53	75	55	242
19:00 - 20:00	39	36	32	34	141
20:00 - 21:00	73	33	31	26	163
21:00 - 22:00	30	24	30	11	95
22:00 - 23:00	28	12	22	24	86
23:00 - 24:00	12	14	10	15	51
TOTAL					8578


AADT
Location: 24559 Community: Tualatin County: Washington Description: SW Avery Stret BETWEEN SW Avery Court and SW 105th Avenue (Tualatin)
8,000
7,500
7,000
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
AADT
2016
2017
2018
2019
2020 (G)
Year


AADT
Location: 13595 Community: Tualatin County: Washington Description: SW Boones Ferry Road SOUTH OF SW Nasoma Lane [0.01 miles]
AADT
16,000
15,000
14,000
13,000
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020 (G)
Year


AADT
▢ Location: 27746 Community: Tualatin County: Washington Description: SW Boones Ferry Road NE OF SW Ibach Street [0.05 miles]
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
AADT
2014
2016
2017
2018
2019
2020 (G)
Year


AADT
Location: 24558 Community: Tualatin County: Washington Description: SW Teton Avenue BETWEEN SW TualatinSherwood Road and SW Avery Avenue (Tualatin)
7,000
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
AADT
2016
2017
2018
2019
2020 (G)
Year


AADT
Location: 20537 Community: Tualatin County: Washington Description: SW Iowa Drive WEST OF SW Erio Place [0.01 miles]
AADT
1,800
1,700
1,600
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020 (G)
Year

KEYNOTES/ LEGEND

① PICNIC/ GRILLING AREA
② PLAY STRUCTURE
③ OUTDOOR SPORT AREA
④ PLAZA AREA
⑤ COMMUNITY GARDEN
⑥ BIKE PARKING & REPAIR STATION
⑦ SITE ACCESS
⑧ MONUMENT SIGN
⑨ GARAGES/ CAR PORTS
⑩ TRASH ENCLOSURE
⑪ TRANSFORMER & SCREENING
⑫ LOADING ZONE

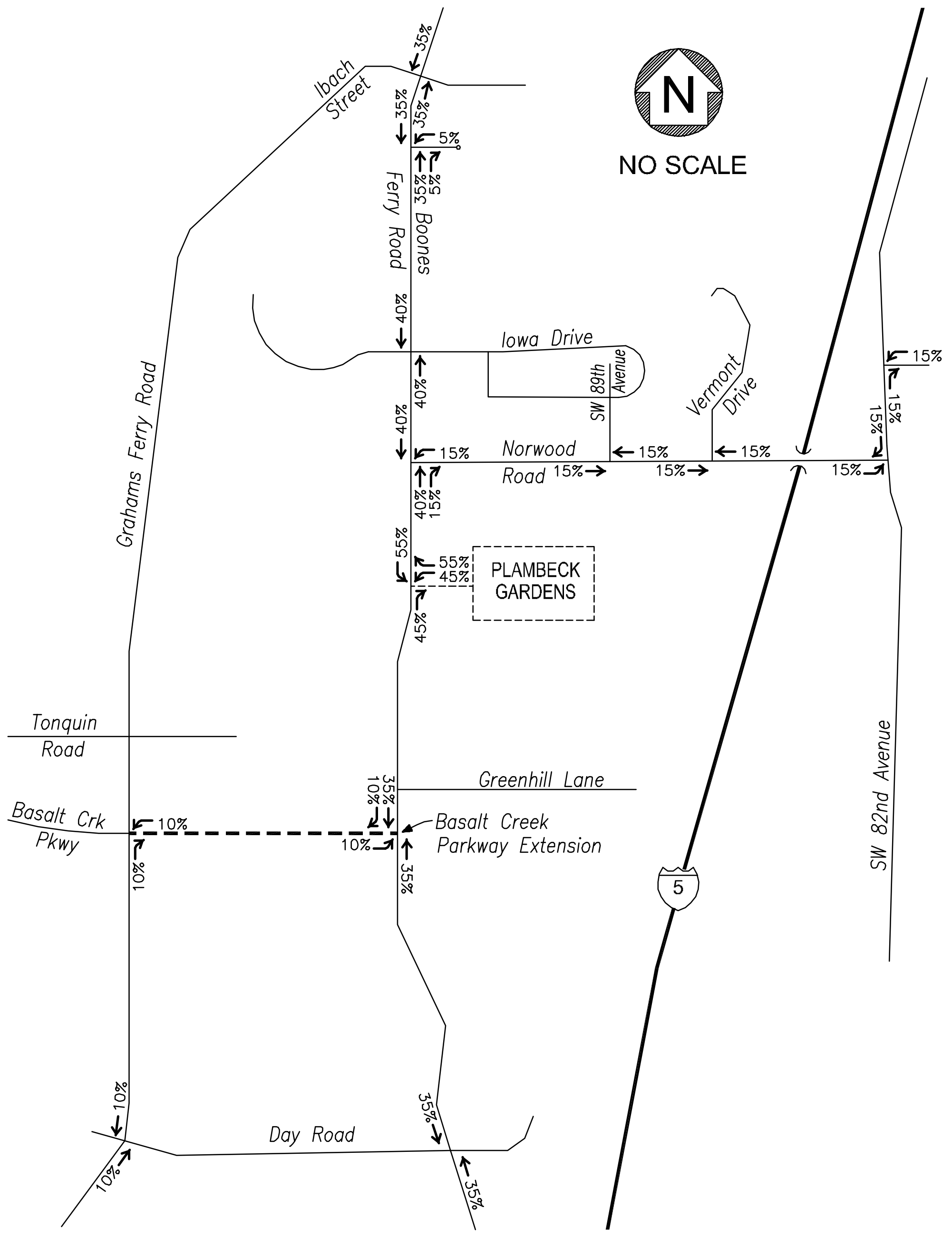
CARLETON HART
ARCHITECTURE

CPAH COMMUNITY PARTNERS FOR AFFORDABLE HOUSING

SITE PLAN
23500 & 23550 SW BOONES FERRY ROAD, TUALATIN, OR

01.29.21

PLOT DATE: 08.27.21 FILE: 2114flow2.dwg



CHARBONNEAU ENGINEERING LLC

PROJECT: 21-14

NOTES: Trip distribution is based on engineering judgment.

- - - Basalt Creek Pkwy Extension estimated completion is in Fall 2014.

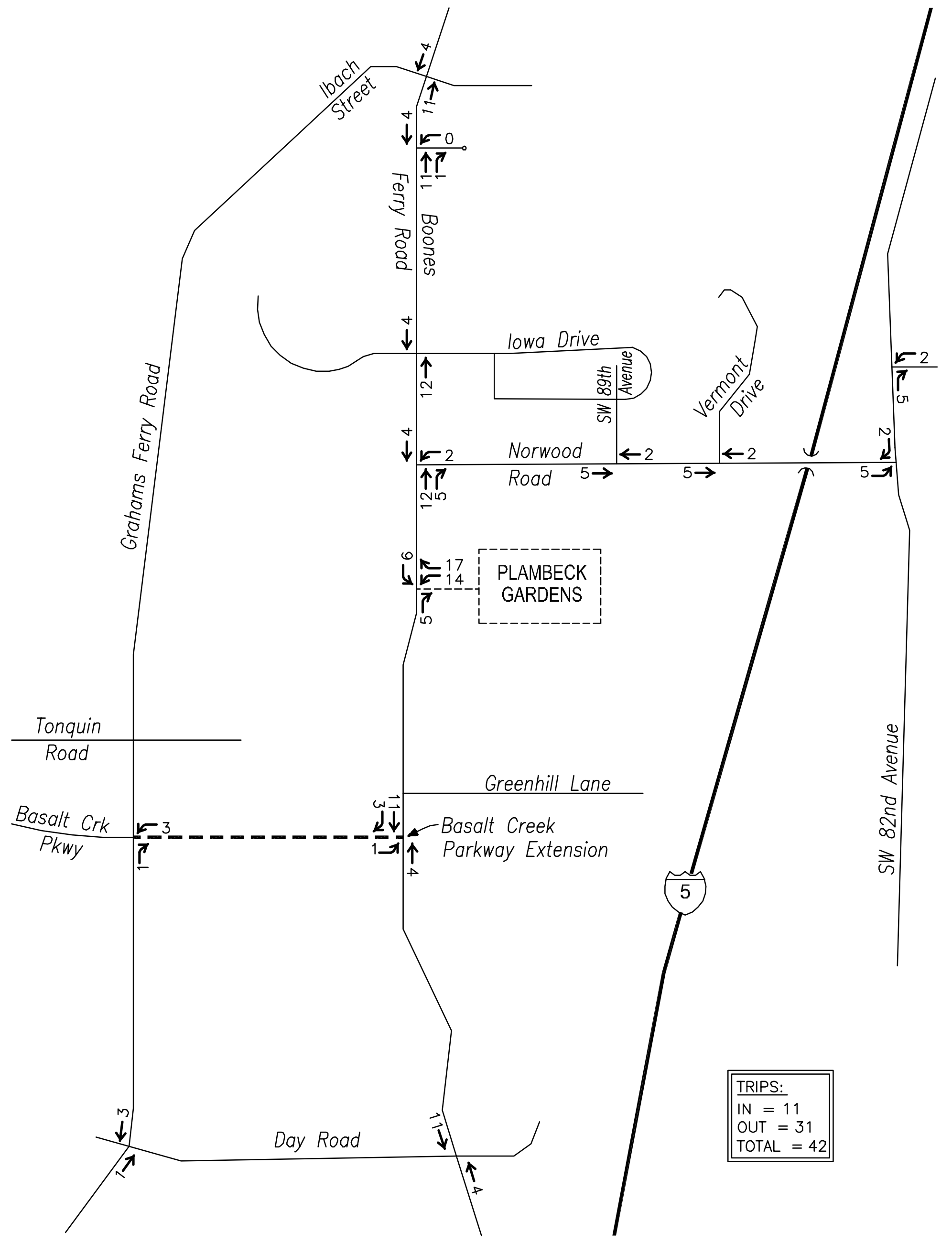
TRIP DISTRIBUTION
AM PEAK HOUR & PM PEAK HOUR
PLAMBECK GARDENS - CPAH

FIGURE

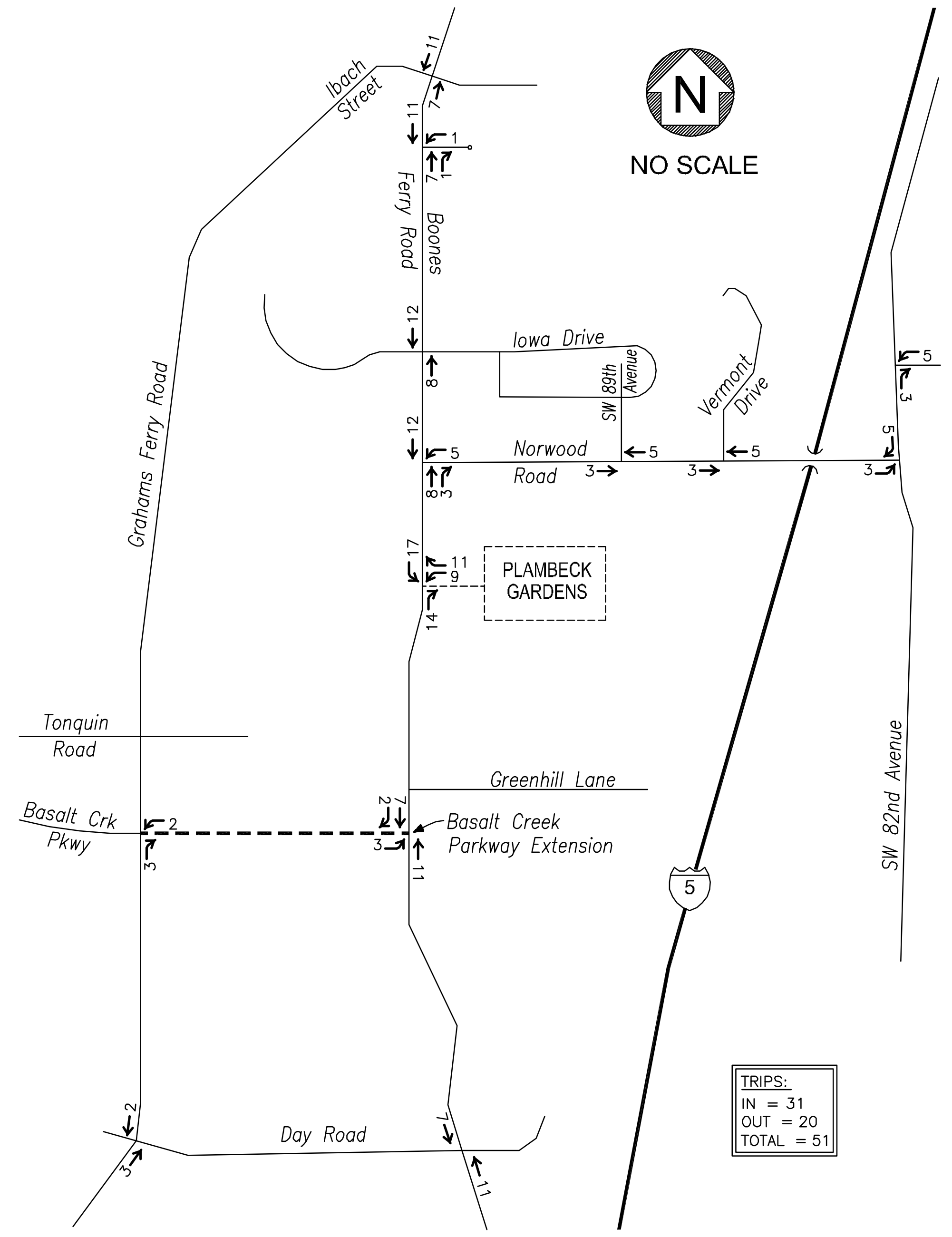
4

PLOT DATE: 08.30.21

FILE: 2114flow2.dwg



AM PEAK HOUR



PM PEAK HOUR

CHARBONNEAU ENGINEERING LLC

PROJECT: 21-14

NOTES: Site trip generation calculated with Mid-Rise Housing (ITE 221) trip rates.

- - - Basalt Creek Pkwy Extension estimated completion is in Fall 2014.

TRIP ASSIGNMENT
PLAMBECK GARDENS - CPAH

FIGURE

5

Appendix C – Safety

Crash Data

Sight Distance

Warrants (Left-Turn, Right-Turn, Preliminary Signal)

1. BFR & Sagert

CRASH_ID	INT_ID	SER_NO	INVSTG_AGY_SHORT_DESC	CRASH_SPEED_INVLV_FLG	ALCHL_INVLV_FLG	DRUG_INVLV_FLG	MJ_INVLV_FLG	SCHL_ZONE_IND	WRK_ZONE_IND	LANE RDWY DPRT CRASH FLG	UNLOCT FLG	CRASH_DT	CRASH_WK_DAY_CD	CRASH_HR_SHORT_DESC	CNTY_NM	CITY_SECT_NM	URB_AREA_SHORT_NM	HWY_NO	HWY_MED_NM	RDWY_NO	FC_CD	HWY_COMPNT_CD	HWY_COMPNT_SHORT_DESC	MLGE_TYP_CD	RD_CON_NO	LRS VAL
1639709	1	05417	CITY	0	0	0		0	0	N	FALSE	9/18/2015	6	5P	Washington	Tualatin	PORTLAND UA				16					
1639709	1	05417	CITY	0	0	0		0	0	N	FALSE	9/18/2015	6	5P	Washington	Tualatin	PORTLAND UA				16					
1662714	1	02177	CITY	0	0	0		0	0	N	FALSE	4/3/2016	1	6P	Washington	Tualatin	PORTLAND UA				16					
1662714	1	02177	CITY	0	0	0		0	0	N	FALSE	4/3/2016	1	6P	Washington	Tualatin	PORTLAND UA				16					
1662714	1	02177	CITY	0	0	0		0	0	N	FALSE	4/3/2016	1	6P	Washington	Tualatin	PORTLAND UA				16					
1674189	1	06080	NONE	0	0	0		0	0	N	FALSE	9/10/2016	7	2P	Washington	Tualatin	PORTLAND UA				16					
1674189	1	06080	NONE	0	0	0		0	0	N	FALSE	9/10/2016	7	2P	Washington	Tualatin	PORTLAND UA				16					
1674189	1	06080	NONE	0	0	0		0	0	N	FALSE	9/10/2016	7	2P	Washington	Tualatin	PORTLAND UA				16					
1674189	1	06080	NONE	0	0	0		0	0	N	FALSE	9/10/2016	7	2P	Washington	Tualatin	PORTLAND UA				16					
1632552	1	01458	NONE	0	0	0		0	0	N	FALSE	3/18/2015	4	3P	Washington	Tualatin	PORTLAND UA				16					
1632552	1	01458	NONE	0	0	0		0	0	N	FALSE	3/18/2015	4	3P	Washington	Tualatin	PORTLAND UA				16					
1632552	1	01458	NONE	0	0	0		0	0	N	FALSE	3/18/2015	4	3P	Washington	Tualatin	PORTLAND UA				16					
1682601	1	02161	CITY	0	0	0		0	0	N	FALSE	4/2/2016	7	12P	Washington	Tualatin	PORTLAND UA				16					
1682601	1	02161	CITY	0	0	0		0	0	N	FALSE	4/2/2016	7	12P	Washington	Tualatin	PORTLAND UA				16					
1682601	1	02161	CITY	0	0	0		0	0	N	FALSE	4/2/2016	7	12P	Washington	Tualatin	PORTLAND UA				16					
1747939	1	85470	NONE	0	0	0		0	0	N	FALSE	12/21/2017	5	5P	Washington	Tualatin	PORTLAND UA				16					
1747939	1	85470	NONE	0	0	0		0	0	N	FALSE	12/21/2017	5	5P	Washington	Tualatin	PORTLAND UA				16					
1859676	1	04055	NONE	0	0	0		0	0	N	FALSE	8/9/2019	6	4P	Washington	Tualatin	PORTLAND UA				16					
1859676	1	04055	NONE	0	0	0		0	0	N	FALSE	8/9/2019	6	4P	Washington	Tualatin	PORTLAND UA				16					
1612413	1	04396	CITY	0	0	0		0	0	N	FALSE	7/2/2015	5	4P	Washington	Tualatin	PORTLAND UA				16					
1612413	1	04396	CITY	0	0	0		0	0	N	FALSE	7/2/2015	5	4P	Washington	Tualatin	PORTLAND UA				16					
1728893	1	01979	CITY	0	0	0		0	0	N	FALSE	4/9/2017	1	2P	Washington	Tualatin	PORTLAND UA				16					
1728893	1	01979	CITY	0	0	0		0	0	N	FALSE	4/9/2017	1	2P	Washington	Tualatin	PORTLAND UA				16					
1728893	1	01979	CITY	0	0	0		0	0	N	FALSE	4/9/2017	1	2P	Washington	Tualatin	PORTLAND UA				16					
1728893	1	01979	CITY	0	0	0		0	0	N	FALSE	4/9/2017	1	2P	Washington	Tualatin	PORTLAND UA				16					
1728893	1	01979	CITY	0	0	0		0	0	N	FALSE	4/9/2017	1	2P	Washington	Tualatin	PORTLAND UA				16					
1738697	1	08232	CITY	0	1	0		0	0	N	FALSE	12/22/2017	6	3P	Washington	Tualatin	PORTLAND UA				16					
1738697	1	08232	CITY	0	1	0		0	0	N	FALSE	12/22/2017	6	3P	Washington	Tualatin	PORTLAND UA				16					
1738697	1	08232	CITY	0	1	0		0	0	N	FALSE	12/22/2017	6	3P	Washington	Tualatin	PORTLAND UA				16					
1738697	1	08232	CITY	0	1	0		0	0	N	FALSE	12/22/2017	6	3P	Washington	Tualatin	PORTLAND UA				16					
1861457	1	04949	CITY	0	0	0		0	0	N	FALSE	9/26/2019	5	3P	Washington	Tualatin	PORTLAND UA				16					
1861457	1	04949	CITY	0	0	0		0	0	N	FALSE	9/26/2019	5	3P	Washington	Tualatin	PORTLAND UA				16					
1822696	1	04824	NONE	0	0	0		0	0	N	FALSE	9/13/2018	5	6P	Washington	Tualatin	PORTLAND UA				16					
1822696	1	04824	NONE	0	0	0		0	0	N	FALSE	9/13/2018	5	6P	Washington	Tualatin	PORTLAND UA				16					
1695979	1	04901	CITY	0	0	0		0	0	N	FALSE	7/25/2016	2	1P	Washington	Tualatin	PORTLAND UA				16					
1695979	1	04901	CITY	0	0	0		0	0	N	FALSE	7/25/2016	2	1P	Washington	Tualatin	PORTLAND UA				16					
1662082	1	01878	CITY	0	0	0		0	0	N	FALSE	3/21/2016	2	4P	Washington	Tualatin	PORTLAND UA				16					
1662082	1	01878	CITY	0	0	0		0	0	N	FALSE	3/21/2016	2	4P	Washington	Tualatin	PORTLAND UA				16					
1793986	1	02871	CITY	0	0	0		0	0	N	FALSE	6/5/2018	3	1P	Washington	Tualatin	PORTLAND UA				16					
1793986	1	02871	CITY	0	0	0		0	0	N	FALSE	6/5/2018	3	1P	Washington	Tualatin	PORTLAND UA				16					
1820976	1	04209	CITY	0	0	0		0	0	N	FALSE	8/7/2018	3	11A	Washington	Tualatin	PORTLAND UA				16					
1820976	1	04209	CITY	0	0	0		0	0	N	FALSE	8/7/2018	3	11A	Washington	Tualatin	PORTLAND UA				16					
1823721	1	06922	NONE	0	0	0		0	0	N	FALSE	12/16/2018	1	4P	Washington	Tualatin	PORTLAND UA				16					
1823721	1	06922	NONE	0	0	0		0	0	N	FALSE	12/16/2018	1	4P	Washington	Tualatin	PORTLAND UA				16					
1839949	1	01467	CITY	0	0	0		0	0	N	FALSE	3/23/2019	7	10A	Washington	Tualatin	PORTLAND UA				16					
1839949	1	01467	CITY	0	0	0		0	0	N	FALSE	3/23/2019	7	10A	Washington	Tualatin	PORTLAND UA				16					

1. BFR & Sagert

MP_NO	ST_NO	ST_NM	ISECT_ST_NO	ISECT_ST_NM	RD_CHAR_CD	RD_CHAR_SHORT_DESC	CMPSS_DIR_CD	CMPSS_DIR_FROM_CD	CMPSS_DIR_SHORT_DESC	IMPCT_LOC_CD	ISECT_TYP_SHORT_DESC	MEDN_TYP_SHORT_DESC	TURNG_LEG_QTY	LN_QTY	ISECT_REL_FLG	TRAF_CNTL_DEVICE_SHORT_DESC	OFF_RDWY_FLG	RNDABT_FLG	DRVWY_REL_FLG	WTHR_COND_SHORT_DESC	RD_SURF_SHORT_DESC	LGT_COND_SHORT_DESC	CRASH_TYP_SHORT_DESC	COLLIS_TYP_SHORT_DESC	CRASH_SVRTY_SHORT_DESC
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	1		N	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	1		N	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	06		NONE		2	1	UNKNOWN	0	0	0	CLD	DRY	DUSK	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	06		NONE		2	1	UNKNOWN	0	0	0	CLD	DRY	DUSK	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	06		NONE		2	1	UNKNOWN	0	0	0	CLD	DRY	DUSK	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	06		NONE		2	1	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	06		NONE		2	1	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	06		NONE		2	1	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	06		NONE		2	1	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	07		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-STRGHT	REAR	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	07		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-STRGHT	REAR	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	07		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-STRGHT	REAR	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	08		NONE		2	1	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	08		NONE		2	1	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	08		NONE		2	1	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	08		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DUSK	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	08		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DUSK	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	08		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	1		N	08		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	3		E	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	BIKE	TURN	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	3	5	E	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	BIKE	TURN	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	3		E	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLD	DRY	DAY	ANGL-STP	TURN	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	3		E	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLD	DRY	DAY	ANGL-STP	TURN	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	3		E	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLD	DRY	DAY	ANGL-STP	TURN	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	3		E	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLD	DRY	DAY	ANGL-STP	TURN	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	3		E	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLD	DRY	DAY	ANGL-STP	TURN	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	3		E	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-STP	TURN	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	3		E	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-STP	TURN	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	3		E	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-STP	TURN	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	3		E	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-STP	TURN	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	3		E	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-STP	TURN	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	3		E	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-STP	TURN	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	5		S	07		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-STRGHT	REAR	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	3	STRGHT	5		S	07		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-STRGHT	REAR	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	9		CN	01	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	ANGL	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	9		CN	01	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	ANGL	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	9		CN	02	CROSS		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	ANGL-OTH	ANGL	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	9		CN	02	CROSS		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	ANGL-OTH	ANGL	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	9		CN	03	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	O-1 L-TURN	TURN	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	9		CN	03	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	O-1 L-TURN	TURN	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	9		CN	03	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	O-1 L-TURN	TURN	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	9		CN	03	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	O-1 L-TURN	TURN	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	9		CN	03	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DUSK	ANGL-OTH	ANGL	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	9		CN	03	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DUSK	ANGL-OTH	ANGL	PDO
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	9		CN	03	CROSS		0		0	TRF SIGNAL	0	0	0	CLD	DRY	DAY	O-1 L-TURN	TURN	INJ
	00201	SW BOONES FERRY RD	02201	SW SAGERT ST	1	INTER	9		CN	03	CROSS		0		0	TRF SIGNAL	0	0	0	CLD	DRY	DAY	O-1 L-TURN	TURN	INJ

1. BFR & Sagert

CRASH_EVNT_1_CD	CRASH_EVNT_2_CD	CRASH_EVNT_3_CD	CRASH_CAUSE_1_CD	CRASH_CAUSE_2_CD	CRASH_CAUSE_3_CD	LAT DEG NO	LAT MINUTE NO	LAT SEC NO	LAT	LONGTD DEG NO	LONGTD MINUTE NO	LONGTD SEC NO	LONG	VHCL_ID	STRIKG_VHCL_FLG	VHCL_CODED_SEQ_NO	VHCL_TYP_SHORT_DESC	VHCL_USE_SHORT_DESC	TRLR_QTY	VHCL_OWNSHP_SHORT_DESC	VHCL_MVMNT_SHORT_DESC	VHCL_CMPSS_DIR_FROM_SHORT_DESC	VHCL_CMPSS_DIR_TO_SHORT_DESC	VHCL_ACTN_CD	VHCL_EVNT_1_CD	VHCL_EVNT_2_CD	VHCL_EVNT_3_CD	VHCL_CAUSE_1_CD
			29			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3096490	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	N	S	000				00
			29			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3096491	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	N	S	011				00
			29			45	22	32.03	45.37556389	-122	46	2.41	-122.7673361	3139049	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	N	S	000				00
			29			45	22	32.03	45.37556389	-122	46	2.41	-122.7673361	3139050	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	N	S	011				00
			29			45	22	32.03	45.37556389	-122	46	2.41	-122.7673361	3139050	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	N	S	011				00
			29			45	22	32.06	45.37557222	-122	46	2.38	-122.7673278	3160762	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	N	S	000				00
			29			45	22	32.06	45.37557222	-122	46	2.38	-122.7673278	3160763	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	N	S	011				00
			29			45	22	32.06	45.37557222	-122	46	2.38	-122.7673278	3160763	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	N	S	011				00
			29			45	22	32.06	45.37557222	-122	46	2.38	-122.7673278	3160763	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	N	S	011				00
013			29			45	22	32.05	45.37556944	-122	46	2.39	-122.7673306	3083258	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	S	N	000				00
013			29			45	22	32.05	45.37556944	-122	46	2.39	-122.7673306	3083259	0	2	PSNGR CAR	NONE	0	PRVTE	STRGHT	S	N	006	013			00
013			29			45	22	32.05	45.37556944	-122	46	2.39	-122.7673306	3083260	0	3	PSNGR CAR	NONE	0	PRVTE	STRGHT	S	N	022				00
			07			45	22	32.47	45.37568611	-122	46	2.03	-122.7672306	3177053	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	N	S	000				00
			07			45	22	32.47	45.37568611	-122	46	2.03	-122.7672306	3177054	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	N	S	011				00
			07			45	22	32.47	45.37568611	-122	46	2.03	-122.7672306	3177054	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	N	S	011				00
			29			45	22	32.44	45.37567778	-122	46	2.06	-122.7672389	3297651	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	N	S	000				00
			29			45	22	32.44	45.37567778	-122	46	2.06	-122.7672389	3297652	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	N	S	011				00
			29			45	22	32.21	45.37561389	-122	46	2.25	-122.7672917	3502023	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	N	S	000				00
			29			45	22	32.21	45.37561389	-122	46	2.25	-122.7672917	3502024	0	2	PSNGR CAR	NONE	9	N/A	STOP	N	S	011				00
110			02			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3045190	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-R	E	N	000				00
110			02			45	22	31.14	45.37531667	-122	46	3.18	-122.76755		0													
			27	08	32	45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3261541	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-L	N	E	000				00
			27	08	32	45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3261542	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	E	W	012				00
			27	08	32	45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3261542	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	E	W	012				00
			27	08	32	45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3261542	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	E	W	012				00
			27	08	32	45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3261542	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	E	W	012				00
			08			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3280181	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-R	S	E	000				00
			08			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3280182	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	E	W	012				00
			08			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3280183	0	3	PSNGR CAR	NONE	0	PRVTE	STOP	E	W	022				00
			08			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3280183	0	3	PSNGR CAR	NONE	0	PRVTE	STOP	E	W	022				00
			08			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3505240	1	1	PSNGR CAR	NONE	9	N/A	TURN-L	N	E	000				00
			08			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3505241	0	2	PSNGR CAR	NONE	9	N/A	STOP	E	W	012				00
			29			45	22	29.97	45.37499167	-122	46	4.21	-122.7678361	3432944	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	N	S	000				00
			29			45	22	29.97	45.37499167	-122	46	4.21	-122.7678361	3432945	0	2	PSNGR CAR	NONE	9	N/A	STRGHT	N	S	000				00
			27	04		45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3201388	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	N	S	000				00
			27	04		45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3201389	0	2	PSNGR CAR	NONE	9	N/A	STRGHT	E	W	000				00
			04			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3137882	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	E	W	000				00
			04			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3137883	0	2	PSNGR CAR	NONE	0	PRVTE	STRGHT	S	N	000				00
			02			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3381367	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-L	E	S	000				00
			02			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3381368	0	2	PSNGR CAR	NONE	0	PRVTE	STRGHT	W	E	000				00
			02			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3429898	1	1	PSNGR CAR	NONE	9	N/A	TURN-L	E	S	000				00
			02			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3429899	0	2	PSNGR CAR	NONE	9	N/A	STRGHT	W	E	000				00
			04			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3434775	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	N	S	000				00
			04			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3434776	0	2	PSNGR CAR	NONE	9	N/A	STRGHT	W	E	000				00
			04			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3465408	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-L	E	S	000				00
			04			45	22	31.14	45.37531667	-122	46	3.18	-122.76755	3465409	0	2	PSNGR CAR	NONE	0	PRVTE	STRGHT	W	E	000				00

VHCL_CAUSE_2_CD	VHCL_CAUSE_3_CD	PARTIC_ID	STRIKG_PARTIC_FLG	PARTIC_VHCL_SEQ_NO	PARTIC_TYP_CD	PARTIC_TYP_SHORT_DESC	PARTIC_MVMNT_SHORT_DESC	PARTIC_CMPSS_DIR_FROM_SHORT_DESC	PARTIC_CMPSS_DIR_TO_SHORT_DESC	INJ_SVRTY_SHORT_DESC	AGE_VAL	SEX_CD	DRVR_LIC_STAT_SHORT_DESC	DRVR_RES_SHORT_DESC	PARTIC_ACTN_CD	NON_MOTRST_LOC_SHORT_DESC	PARTIC_ERR_1_CD	PARTIC_ERR_2_CD	PARTIC_ERR_3_CD	PARTIC_EVNT_1_CD	PARTIC_EVNT_2_CD	PARTIC_EVNT_3_CD	PARTIC_CAUSE_1_CD	PARTIC_CAUSE_2_CD	PARTIC_CAUSE_3_CD	TOTAL_CRASHES	TOTAL_ROWS
		3535529	0	1	1	DRVR				NONE	21	2	OR-Y	OR<25	000		026						29			293	674
		3535530	0	1	1	DRVR				NONE	34	1	OR-Y	OR>25	000		000						00			293	674
		3580923	0	1	1	DRVR				NONE	15	1	NONE	OR<25	000		026						29			293	674
		3580924	0	1	1	DRVR				INJC	43	2	OR-Y	OR<25	000		000						00			293	674
		3580925	0	2	2	PSNG				INJC	38	1			000		000						00			293	674
		3608187	0	1	1	DRVR				INJB	82	2	OR-Y	OR<25	000		026						29			293	674
		3608188	0	1	1	DRVR				INJC	35	2	OR-Y	OR<25	000		000						00			293	674
		3608189	0	2	2	PSNG				INJC	37	1			000		000						00			293	674
		3608190	0	3	2	PSNG				INJC	03	2			000		000						00			293	674
		3522419	0	1	1	DRVR				NONE	00	1	OR-Y	UNK	000		042						29			293	674
		3522420	0	1	1	DRVR				NONE	16	2	OR-Y	OR<25	000		000						00			293	674
		3522421	0	1	1	DRVR				NONE	00	2	OR-Y	UNK	000		000						00			293	674
		3628515	0	1	1	DRVR				NONE	21	2	OR-Y	OR<25	000		043						07			293	674
		3628516	0	1	1	DRVR				NONE	37	1	OR-Y	OR<25	000		000						00			293	674
		3628517	0	2	2	PSNG				INJC	03	2			000		000						00			293	674
		3763330	0	1	1	DRVR				NONE	28	2	OR-Y	OR<25	000		026						29			293	674
		3763331	0	1	1	DRVR				INJC	38	2	OR-Y	OR<25	000		000						00			293	674
		3989583	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3989584	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3475948	0	1	1	DRVR				NONE	34	1	OR-Y	OR<25	000		027						29			293	674
		3475949	0	1	6	BIKE	STRGHT	S	N	INJB	15	2			035	I XWLK	000			110			00			293	674
		3717907	0	1	1	DRVR				NONE	17	2	OR-Y	OR<25	038		016	002	052				27	08	32	293	674
		3717908	0	1	1	DRVR				NONE	32	1	OR-Y	OR<25	000		000						00			293	674
		3717909	0	2	2	PSNG				INJC	32	2			000		000						00			293	674
		3717910	0	3	2	PSNG				NO<5	03	1			000		000						00			293	674
		3717911	0	4	2	PSNG				NO<5	01	2			000		000						00			293	674
		3741305	0	1	1	DRVR				NONE	59	1	OR-Y	OR<25	000		001						08			293	674
		3741306	0	1	1	DRVR				NONE	65	2	OR-Y	OR<25	000		000						00			293	674
		3741307	0	1	1	DRVR				INJA	48	2	OR-Y	OR<25	000		000						00			293	674
		3741308	0	2	2	PSNG				INJA	43	1			000		000						00			293	674
		3992708	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3992709	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3910710	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3910711	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3654382	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3654383	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3579457	0	1	1	DRVR				INJC	32	1	OR-Y	OR<25	000		000						00			293	674
		3579458	0	1	1	DRVR				INJC	52	2	OR-Y	OR<25	000		020						04			293	674
		3855340	0	1	1	DRVR				INJB	21	2	OR-Y	OR<25	000		028	004					02			293	674
		3855341	0	1	1	DRVR				INJC	53	2	OR-Y	OR<25	000		000						00			293	674
		3907805	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3907806	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3912457	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3912458	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3947972	0	1	1	DRVR				NONE	22	2	OR-Y	OR<25	000		020						04			293	674
		3947973	0	1	1	DRVR				INJC	26	2	OR-Y	OR<25	000		000						00			293	674

CRASH_ID	INT_ID	SER_NO	INVSTG_AGY_SHORT_DESC	CRASH_SPEED_INVLV_FLG	ALCHL_INVLV_FLG	DRUG_INVLV_FLG	MJ_INVLV_FLG	SCHL_ZONE_IND	WRK_ZONE_IND	LANE RDWY DPRT CRASH FLG	UNLOCT FLG	CRASH_DT	CRASH_WK_DAY_CD	CRASH_HR_SHORT_DESC	CNTY_NM	CITY_SECT_NM	URB_AREA_SHORT_NM	HWY_NO	HWY_MED_NM	RDWY_NO	FC_CD	HWY_COMPNT_CD	HWY_COMPNT_SHORT_DESC	MLGE_TYP_CD	RD_CON_NO	LRS VAL
1698592	2	05574	NONE	0	0	0		0	0	N	FALSE	8/19/2016	6	3P	Washington	Tualatin	PORTLAND UA				16					
1698592	2	05574	NONE	0	0	0		0	0	N	FALSE	8/19/2016	6	3P	Washington	Tualatin	PORTLAND UA				16					
1699263	2	06240	CITY	0	1	0		0	0	N	FALSE	9/15/2016	5	8P	Washington	Tualatin	PORTLAND UA				16					
1699263	2	06240	CITY	0	1	0		0	0	N	FALSE	9/15/2016	5	8P	Washington	Tualatin	PORTLAND UA				16					
1750185	2	00055	NONE	0	0	0		0	0	N	FALSE	1/4/2017	4	7A	Washington	Tualatin	PORTLAND UA				16					
1750185	2	00055	NONE	0	0	0		0	0	N	FALSE	1/4/2017	4	7A	Washington	Tualatin	PORTLAND UA				16					
1845208	2	06175	NONE	0	0	0		0	0	N	FALSE	11/24/2019	1	1P	Washington	Tualatin	PORTLAND UA				16					
1845208	2	06175	NONE	0	0	0		0	0	N	FALSE	11/24/2019	1	1P	Washington	Tualatin	PORTLAND UA				16					
1845208	2	06175	NONE	0	0	0		0	0	N	FALSE	11/24/2019	1	1P	Washington	Tualatin	PORTLAND UA				16					
1845208	2	06175	NONE	0	0	0		0	0	N	FALSE	11/24/2019	1	1P	Washington	Tualatin	PORTLAND UA				16					
1845208	2	06175	NONE	0	0	0		0	0	N	FALSE	11/24/2019	1	1P	Washington	Tualatin	PORTLAND UA				16					
1815247	2	03056	NONE	0	0	0		0	0	N	FALSE	6/8/2018	6	4P	Washington	Tualatin	PORTLAND UA				16					
1789994	2	02282	NONE	0	0	0		0	0	N	FALSE	5/7/2018	2	7A	Washington	Tualatin	PORTLAND UA				16					
1789994	2	02282	NONE	0	0	0		0	0	N	FALSE	5/7/2018	2	7A	Washington	Tualatin	PORTLAND UA				16					
1633241	2	01899	UNK	1	0	0		0	0	N	FALSE	4/11/2015	7	12P	Washington	Tualatin	PORTLAND UA				16					
1656198	2	00174	CITY	0	0	0		0	0	N	FALSE	1/7/2016	5	2P	Washington	Tualatin	PORTLAND UA				16					
1656198	2	00174	CITY	0	0	0		0	0	N	FALSE	1/7/2016	5	2P	Washington	Tualatin	PORTLAND UA				16					
1660058	2	01270	CITY	0	0	0		0	0	N	FALSE	2/26/2016	6	12P	Washington	Tualatin	PORTLAND UA				16					
1660058	2	01270	CITY	0	0	0		0	0	N	FALSE	2/26/2016	6	12P	Washington	Tualatin	PORTLAND UA				16					
1754417	2	02365	CITY	0	0	0		0	0	N	FALSE	4/24/2017	2	11A	Washington	Tualatin	PORTLAND UA				16					
1754417	2	02365	CITY	0	0	0		0	0	N	FALSE	4/24/2017	2	11A	Washington	Tualatin	PORTLAND UA				16					
1823666	2	07217	CITY	0	0	0		0	0	N	FALSE	12/30/2018	1	10A	Washington	Tualatin	PORTLAND UA				16					
1823666	2	07217	CITY	0	0	0		0	0	N	FALSE	12/30/2018	1	10A	Washington	Tualatin	PORTLAND UA				16					
1700744	2	07436	CITY	0	0	0		0	0	N	FALSE	10/31/2016	2	7A	Washington	Tualatin	PORTLAND UA				16					
1700744	2	07436	CITY	0	0	0		0	0	N	FALSE	10/31/2016	2	7A	Washington	Tualatin	PORTLAND UA				16					
1793813	2	02793	CITY	0	0	0		0	0	N	FALSE	6/2/2018	7	7A	Washington	Tualatin	PORTLAND UA				16					
1793813	2	02793	CITY	0	0	0		0	0	N	FALSE	6/2/2018	7	7A	Washington	Tualatin	PORTLAND UA				16					
1631948	2	01007	NONE	0	0	0		0	0	N	FALSE	2/23/2015	2	6P	Washington	Tualatin	PORTLAND UA				16					
1631948	2	01007	NONE	0	0	0		0	0	N	FALSE	2/23/2015	2	6P	Washington	Tualatin	PORTLAND UA				16					
1731007	2	03073	CITY	0	1	0		0	0	N	FALSE	5/26/2017	6	6P	Washington	Tualatin	PORTLAND UA				16					
1731007	2	03073	CITY	0	1	0		0	0	N	FALSE	5/26/2017	6	6P	Washington	Tualatin	PORTLAND UA				16					
1754421	2	02392	NONE	0	0	0		0	0	N	FALSE	4/25/2017	3	4P	Washington	Tualatin	PORTLAND UA				16					
1754421	2	02392	NONE	0	0	0		0	0	N	FALSE	4/25/2017	3	4P	Washington	Tualatin	PORTLAND UA				16					
1691200	2	02162	CITY	1	0	0		0	0	N	FALSE	4/2/2016	7	3P	Washington	Tualatin	PORTLAND UA				16					
1691200	2	02162	CITY	1	0	0		0	0	N	FALSE	4/2/2016	7	3P	Washington	Tualatin	PORTLAND UA				16					
1672010	2	04989	CITY	0	0	0		0	0	N	FALSE	7/28/2016	5	4P	Washington	Tualatin	PORTLAND UA				16					
1672010	2	04989	CITY	0	0	0		0	0	N	FALSE	7/28/2016	5	4P	Washington	Tualatin	PORTLAND UA				16					
1672010	2	04989	CITY	0	0	0		0	0	N	FALSE	7/28/2016	5	4P	Washington	Tualatin	PORTLAND UA				16					
1692991	2	02879	NONE	0	0	0		0	0	N	FALSE	5/2/2016	2	10A	Washington	Tualatin	PORTLAND UA				16					
1692991	2	02879	NONE	0	0	0		0	0	N	FALSE	5/2/2016	2	10A	Washington	Tualatin	PORTLAND UA				16					
1786794	2	02007	CITY	0	0	0		0	0	N	FALSE	4/23/2018	2	4P	Washington	Tualatin	PORTLAND UA				16					
1786794	2	02007	CITY	0	0	0		0	0	N	FALSE	4/23/2018	2	4P	Washington	Tualatin	PORTLAND UA				16					
1786794	2	02007	CITY	0	0	0		0	0	N	FALSE	4/23/2018	2	4P	Washington	Tualatin	PORTLAND UA				16					
1786794	2	02007	CITY	0	0	0		0	0	N	FALSE	4/23/2018	2	4P	Washington	Tualatin	PORTLAND UA				16					
1786794	2	02007	CITY	0	0	0		0	0	N	FALSE	4/23/2018	2	4P	Washington	Tualatin	PORTLAND UA				16					
1801656	2	05417	CITY	0	0	0		0	0	N	FALSE	10/12/2018	6	2P	Washington	Tualatin	PORTLAND UA				16					
1801656	2	05417	CITY	0	0	0		0	0	N	FALSE	10/12/2018	6	2P	Washington	Tualatin	PORTLAND UA				16					
1801656	2	05417	CITY	0	0	0		0	0	N	FALSE	10/12/2018	6	2P	Washington	Tualatin	PORTLAND UA				16					
1639110	2	04940	CITY	0	0	0		0	0	N	FALSE	8/29/2015	7	4P	Washington	Tualatin	PORTLAND UA				16					
1639110	2	04940	CITY	0	0	0		0	0	N	FALSE	8/29/2015	7	4P	Washington	Tualatin	PORTLAND UA				16					
1754701	2	02680	NONE	0	0	0		0	0	N	FALSE	5/8/2017	2	3P	Washington	Tualatin	PORTLAND UA				16					
1754701	2	02680	NONE	0	0	0		0	0	N	FALSE	5/8/2017	2	3P	Washington	Tualatin	PORTLAND UA				16					

2. BFR & Avery

MP_NO	ST_NO	ST_NM	ISECT_ST_NO	ISECT_ST_NM	RD_CHAR_CD	RD_CHAR_SHORT_DESC	CMPSS_DIR_CD	CMPSS_DIR_FROM_CD	CMPSS_DIR_SHORT_DESC	IMPCT_LOC_CD	ISECT_TYP_SHORT_DESC	MEDN_TYP_SHORT_DESC	TURNG_LEG_QTY	LN_QTY	ISECT_REL_FLG	TRAF_CNTL_DEVICE_SHORT_DESC	OFF_RDWY_FLG	RNDABT_FLG	DRVWY_REL_FLG	WTHR_COND_SHORT_DESC	RD_SURF_SHORT_DESC	LGT_COND_SHORT_DESC	CRASH_TYP_SHORT_DESC	COLLIS_TYP_SHORT_DESC	CRASH_SVRTY_SHORT_DESC
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	2		NE	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	2		NE	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	2		NE	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DLIT	S-STRGHT	REAR	PDO
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	2		NE	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DLIT	S-STRGHT	REAR	PDO
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	2		NE	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAWN	S-1STOP	REAR	PDO
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	2		NE	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAWN	S-1STOP	REAR	PDO
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	2		NE	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	2		NE	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	2		NE	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	2		NE	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	2		NE	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	3		E	05	CROSS		0		0	TRF SIGNAL	1	0	0	UNK	UNK	DAY	FIX OBJ	FIX	PDO
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	3		E	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	3		E	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	6		SW	05	CROSS		0		0	TRF SIGNAL	1	0	0	CLR	DRY	DAY	FIX OBJ	FIX	PDO
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	6		SW	05	CROSS		0		0	UNKNOWN	0	0	0	CLD	DRY	DAY	S-1STOP	REAR	INJ
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	6		SW	05	CROSS		0		0	UNKNOWN	0	0	0	CLD	DRY	DAY	S-1STOP	REAR	INJ
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	6		SW	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLD	DRY	DAY	S-1STOP	REAR	INJ
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	6		SW	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLD	DRY	DAY	S-1STOP	REAR	INJ
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	6		SW	06	CROSS		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	S-1STOP	REAR	PDO
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	6		SW	06	CROSS		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	S-1STOP	REAR	PDO
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	6		SW	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	6		SW	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	9		CN	01	CROSS		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DLIT	ANGL-OTH	TURN	PDO
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	9		CN	01	CROSS		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DLIT	ANGL-OTH	TURN	PDO
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	9		CN	01	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	O-1 L-TURN	TURN	INJ
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	9		CN	01	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	O-1 L-TURN	TURN	INJ
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	9		CN	03	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DLIT	O-OTHER	TURN	PDO
	00101	SW AVERY ST	00201	SW BOONES FERRY RD	1	INTER	9		CN	03	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DLIT	O-OTHER	TURN	PDO
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	2		NE	06		NONE		2	0	NONE	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	2		NE	06		NONE		2	0	NONE	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	2		NE	06		NONE		2	0	UNKNOWN	0	0	0	RAIN	WET	DAY	S-1STOP	REAR	PDO
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	2		NE	06		NONE		2	0	UNKNOWN	0	0	0	RAIN	WET	DAY	S-1STOP	REAR	PDO
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	2		NE	08		NONE		2	0	NONE	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	2		NE	08		NONE		2	0	NONE	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	6		SW	07		NONE		2	1	NONE	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	6		SW	07		NONE		2	1	NONE	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	6		SW	07		NONE		2	1	NONE	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	2	ALLEY	6		SW	07		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	2	ALLEY	6		SW	07		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	6		SW	07		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	6		SW	07		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	6		SW	07		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	6		SW	07		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	6		SW	07		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	6		SW	07		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	6		SW	07		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	6		SW	07		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	6		SW	08		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	3	STRGHT	6		SW	08		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	2	ALLEY	6		SW	08		NONE		3	0	UNKNOWN	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	PDO
	00201	SW BOONES FERRY RD	00101	SW AVERY ST	2	ALLEY	6		SW	08		NONE		3	0	UNKNOWN	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	PDO

CRASH_EVNT_1_CD	CRASH_EVNT_2_CD	CRASH_EVNT_3_CD	CRASH_CAUSE_1_CD	CRASH_CAUSE_2_CD	CRASH_CAUSE_3_CD	LAT DEG NO	LAT MINUTE NO	LAT SEC NO	LAT	LONGTD DEG NO	LONGTD MINUTE NO	LONGTD SEC NO	LONG	VHCL_ID	STRIKG_VHCL_FLG	VHCL_CODED_SEQ_NO	VHCL_TYP_SHORT_DESC	VHCL_USE_SHORT_DESC	TRLR_QTY	VHCL_OWNSHP_SHORT_DESC	VHCL_MVMNT_SHORT_DESC	VHCL_CMPSS_DIR_FROM_SHORT_DESC	VHCL_CMPSS_DIR_TO_SHORT_DESC	VHCL_ACTN_CD	VHCL_EVNT_1_CD	VHCL_EVNT_2_CD	VHCL_EVNT_3_CD	VHCL_CAUSE_1_CD
			29			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3205929	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3205930	0	2	PSNGR CAR	NONE	9	N/A	STOP	NE	SW	011				00
			07	33		45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3207175	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			07	33		45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3207176	0	2	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3301581	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3301582	0	2	PSNGR CAR	NONE	9	N/A	STOP	NE	SW	011				00
			29			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3475505	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
			29			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3475506	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			29			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3475506	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			29			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3475506	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			29			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3475506	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
053			08			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3420144	1	1	SEMI TOW	NONE	9	N/A	TURN-R	SW	E	000				00
			29			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3373690	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	E	W	000				00
			29			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3373691	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	E	W	012				00
053			01			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3084569	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-L	E	SW	000	053			00
			29			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3126905	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
			29			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3126906	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			07			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3134022	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	SW	NE	000				00
			07			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3134023	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	SW	NE	011				00
			29	32		45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3308975	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	SW	NE	000				00
			29	32		45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3308976	0	2	SEMI TOW	NONE	9	N/A	STOP	SW	NE	011				00
			17	29		45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3434675	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	SW	NE	000				00
			17	29		45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3434676	0	2	PSNGR CAR	NONE	9	N/A	STOP	SW	NE	011				00
			02			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3209837	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			02			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3209838	0	2	PSNGR CAR	NONE	9	N/A	TURN-L	E	SW	000				00
			27	02		45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3381016	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-L	SW	W	000				00
			27	02		45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3381017	0	2	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
			02			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3082125	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-R	W	SW	000				00
			02			45	22	18.14	45.37170556	-122	46	14.61	-122.770725	3082126	0	2	PSNGR CAR	NONE	0	PRVTE	TURN-L	E	SW	000				00
			07			45	22	18.85	45.37190278	-122	46	13.99	-122.7705528	3265469	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
			07			45	22	18.85	45.37190278	-122	46	13.99	-122.7705528	3265470	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			29			45	22	18.86	45.37190556	-122	46	13.98	-122.77055	3308983	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	22	18.86	45.37190556	-122	46	13.98	-122.77055	3308984	0	2	PSNGR CAR	NONE	9	N/A	STOP	NE	SW	011				00
			27	01	29	45	22	19.27	45.37201944	-122	46	13.61	-122.7704472	3193075	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			27	01	29	45	22	19.27	45.37201944	-122	46	13.61	-122.7704472	3193076	0	2	PSNGR CAR	NONE	9	N/A	STOP	NE	SW	011				00
			07			45	22	16.01	45.37111389	-122	46	16.48	-122.7712444	3156619	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
			07			45	22	16.01	45.37111389	-122	46	16.48	-122.7712444	3156619	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
			07			45	22	16.01	45.37111389	-122	46	16.48	-122.7712444	3156620	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			29			45	22	16.43	45.37123056	-122	46	16.11	-122.7711417	3196181	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	22	16.43	45.37123056	-122	46	16.11	-122.7711417	3196182	0	2	PSNGR CAR	NONE	9	N/A	STOP	NE	SW	012				00
			17	29		45	22	16.8	45.37133333	-122	46	15.78	-122.77105	3367625	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
			17	29		45	22	16.8	45.37133333	-122	46	15.78	-122.77105	3367626	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			17	29		45	22	16.8	45.37133333	-122	46	15.78	-122.77105	3367626	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			17	29		45	22	16.8	45.37133333	-122	46	15.78	-122.77105	3367626	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			17	29		45	22	16.8	45.37133333	-122	46	15.78	-122.77105	3367626	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			27	29		45	22	16.9	45.37136111	-122	46	15.68	-122.7710222	3396042	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
			27	29		45	22	16.9	45.37136111	-122	46	15.68	-122.7710222	3396043	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			27	29		45	22	16.9	45.37136111	-122	46	15.68	-122.7710222	3396043	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			07			45	22	16.41	45.371225	-122	46	16.13	-122.7711472	3095364	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	SW	NE	000				00
			07			45	22	16.41	45.371225	-122	46	16.13	-122.7711472	3095365	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	SW	NE	011				00
			02			45	22	16.39	45.37121944	-122	46	16.15	-122.7711528	3309493	1	1	PSNGR CAR	NONE	9	N/A	TURN-L	E	SW	018				00
			02			45	22	16.39	45.37121944	-122	46	16.15	-122.7711528	3309494	0	2	PSNGR CAR	NONE	9	N/A	STRGHT	SW	NE	000				00

VHCL_CAUSE_2_CD	VHCL_CAUSE_3_CD	PARTIC_ID	STRIKG_PARTIC_FLG	PARTIC_VHCL_SEQ_NO	PARTIC_TYP_CD	PARTIC_TYP_SHORT_DESC	PARTIC_MVMNT_SHORT_DESC	PARTIC_CMPSS_DIR_FROM_SHORT_DESC	PARTIC_CMPSS_DIR_TO_SHORT_DESC	INJ_SVRTY_SHORT_DESC	AGE_VAL	SEX_CD	DRVR_LIC_STAT_SHORT_DESC	DRVR_RES_SHORT_DESC	PARTIC_ACTN_CD	NON_MOTRST_LOC_SHORT_DESC	PARTIC_ERR_1_CD	PARTIC_ERR_2_CD	PARTIC_ERR_3_CD	PARTIC_EVNT_1_CD	PARTIC_EVNT_2_CD	PARTIC_EVNT_3_CD	PARTIC_CAUSE_1_CD	PARTIC_CAUSE_2_CD	PARTIC_CAUSE_3_CD	TOTAL_CRASHES	TOTAL_ROWS
		3658813	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3658814	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3660026	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3660027	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3767363	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3767364	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3960069	0	1	1	DRVR				NONE	32	1	UNK	UNK	000		026						29			293	674
		3960070	0	1	1	DRVR				INJC	47	1	OR-Y	OR<25	000		000						00			293	674
		3960071	0	2	2	PSNG				INJC	47	2			000		000						00			293	674
		3960072	0	3	2	PSNG				INJC	07	1			000		000						00			293	674
		3960073	0	4	2	PSNG				INJC	12	2			000		000						00			293	674
		3898348	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3845746	0	1	1	DRVR				NONE	45	2	OR-Y	OR<25	000		026						29			293	674
		3845747	0	1	1	DRVR				INJC	27	1	OR-Y	OR<25	000		000						00			293	674
		3523716	0	1	1	DRVR				NONE	19	1	OR-Y	OR<25	000		047	080	081				01			293	674
		3565772	0	1	1	DRVR				NONE	51	1	OR-Y	OR<25	000		026						29			293	674
		3565773	0	1	1	DRVR				INJC	29	1	OR-Y	OR<25	000		000						00			293	674
		3574629	0	1	1	DRVR				NONE	17	1	OR-Y	OR<25	000		043						07			293	674
		3574630	0	1	1	DRVR				INJC	36	1	OR-Y	OR<25	000		000						00			293	674
		3774632	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3774633	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3912365	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3912366	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3662620	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3662621	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3854919	0	1	1	DRVR				NONE	58	1	OR-Y	OR<25	038		016	028	004				27	02		293	674
		3854920	0	1	1	DRVR				INJC	59	2	OR-Y	OR<25	000		000						00			293	674
		3521308	0	1	1	DRVR				NONE	17	2	OR-Y	OR<25	000		028						02			293	674
		3521309	0	1	1	DRVR				NONE	30	1	OR-Y	OR<25	000		000						00			293	674
		3722863	0	1	1	DRVR				NONE	49	1	SUSP	OR<25	000		043						07			293	674
		3722864	0	1	1	DRVR				INJC	29	1	OR-Y	OR<25	000		000						00			293	674
		3774640	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3774641	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3646310	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3646311	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3603072	0	1	1	DRVR				INJB	24	2	OR-Y	OR>25	000		043						07			293	674
		3603073	0	2	2	PSNG				INJC	29	1			000		000						00			293	674
		3603074	0	1	1	DRVR				INJC	45	2	OR-Y	OR<25	000		000						00			293	674
		3649312	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3649313	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3838049	0	1	1	DRVR				NONE	24	2	OR-Y	OR<25	028		026						17	29		293	674
		3838050	0	1	1	DRVR				INJC	41	2	OR-Y	OR<25	000		000						00			293	674
		3838051	0	2	2	PSNG				INJC	41	1			000		000						00			293	674
		3838052	0	3	2	PSNG				NONE	01	2			000		000						00			293	674
		3838053	0	4	2	PSNG				NONE	03	1			000		000						00			293	674
		3873895	0	1	1	DRVR				INJC	25	2	OR-Y	OR<25	038		016	026					27	29		293	674
		3873896	0	1	1	DRVR				NONE	60	2	OR-Y	OR<25	000		000						00			293	674
		3873897	0	2	2	PSNG				INJC	57	2			000		000						00			293	674
		3534399	0	1	1	DRVR				NONE	18	2	OR-Y	OR<25	000		043						07			293	674
		3534400	0	1	1	DRVR				NONE	49	1	OR-Y	OR<25	000		000						00			293	674
		3775135	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3775136	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674

CRASH_ID	INT_ID	SER_NO	INVSTG_AGY_SHORT_DESC	CRASH_SPEED_INVLV_FLG	ALCHL_INVLV_FLG	DRUG_INVLV_FLG	MJ_INVLV_FLG	SCHL_ZONE_IND	WRK_ZONE_IND	LANE RDWY DPRT CRASH FLG	UNLOCT FLG	CRASH_DT	CRASH_WK_DAY_CD	CRASH_HR_SHORT_DESC	CNTY_NM	CITY_SECT_NM	URB_AREA_SHORT_NM	HWY_NO	HWY_MED_NM	RDWY_NO	FC_CD	HWY_COMPNT_CD	HWY_COMPNT_SHORT_DESC	MLGE_TYP_CD	RD_CON_NO	LRS VAL
1729167	3	02244	CITY	0	0	0		0	0	N	FALSE	4/19/2017	4	11A	Washington	Tualatin	PORTLAND UA				16					
1729167	3	02244	CITY	0	0	0		0	0	N	FALSE	4/19/2017	4	11A	Washington	Tualatin	PORTLAND UA				16					
1729778	3	02506	CITY	0	0	0		0	0	N	FALSE	5/1/2017	2	3P	Washington	Tualatin	PORTLAND UA				16					
1729778	3	02506	CITY	0	0	0		0	0	N	FALSE	5/1/2017	2	3P	Washington	Tualatin	PORTLAND UA				16					
1700410	3	06988	CITY	0	0	0		0	0	N	FALSE	10/13/2016	5	7P	Washington	Tualatin	PORTLAND UA				16					
1700410	3	06988	CITY	0	0	0		0	0	N	FALSE	10/13/2016	5	7P	Washington	Tualatin	PORTLAND UA				16					
1679093	3	07632	CITY	1	0	0		0	0	N	FALSE	11/6/2016	1	12A	Washington	Tualatin	PORTLAND UA				16					
1799098	3	04369	CITY	0	0	0		0	0	N	FALSE	8/22/2018	4	8A	Washington	Tualatin	PORTLAND UA				16					
1799098	3	04369	CITY	0	0	0		0	0	N	FALSE	8/22/2018	4	8A	Washington	Tualatin	PORTLAND UA				16					
1735720	3	05938	CITY	0	0	0		0	0	N	FALSE	9/25/2017	2	7P	Washington	Tualatin	PORTLAND UA				16					
1735720	3	05938	CITY	0	0	0		0	0	N	FALSE	9/25/2017	2	7P	Washington	Tualatin	PORTLAND UA				16					

3. BFR & Ibach

MP_NO	ST_NO	ST_NM	ISECT_ST_NO	ISECT_ST_NM	RD_CHAR_CD	RD_CHAR_SHORT_DESC	CMPSS_DIR_CD	CMPSS_DIR_FROM_CD	CMPSS_DIR_SHORT_DESC	IMPCT_LOC_CD	ISECT_TYP_SHORT_DESC	MEDN_TYP_SHORT_DESC	TURNG_LEG_QTY	LN_QTY	ISECT_REL_FLG	TRAF_CNTL_DEVICE_SHORT_DESC	OFF_RDWY_FLG	RNDABT_FLG	DRVWY_REL_FLG	WTHR_COND_SHORT_DESC	RD_SURF_SHORT_DESC	LGT_COND_SHORT_DESC	CRASH_TYP_SHORT_DESC	COLLIS_TYP_SHORT_DESC	CRASH_SVRTY_SHORT_DESC
	00201	SW BOONES FERRY RD	01101	SW IBACH ST	1	INTER	1		N	06	CROSS		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	S-1TURN	REAR	INJ
	00201	SW BOONES FERRY RD	01101	SW IBACH ST	1	INTER	1		N	06	CROSS		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	S-1TURN	REAR	INJ
	00201	SW BOONES FERRY RD	01101	SW IBACH ST	3	STRGHT	1		N	06		NONE		2	0	TRF SIGNAL	0	0	0	CLD	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	01101	SW IBACH ST	3	STRGHT	1		N	06		NONE		2	0	TRF SIGNAL	0	0	0	CLD	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	01101	SW IBACH ST	1	INTER	5		S	05	CROSS		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DLIT	ANGL-OTH	TURN	PDO
	00201	SW BOONES FERRY RD	01101	SW IBACH ST	1	INTER	5		S	05	CROSS		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DLIT	ANGL-OTH	TURN	PDO
	00201	SW BOONES FERRY RD	01106	SW IBACH CT	1	INTER	5		S	05	CROSS		0		0	TRF SIGNAL	1	0	0	CLD	WET	DLIT	FIX OBJ	FIX	INJ
	00201	SW BOONES FERRY RD	01106	SW IBACH CT	1	INTER	5		S	06	CROSS		0		0	TRF SIGNAL	0	0	0	SMOK	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	01106	SW IBACH CT	1	INTER	5		S	06	CROSS		0		0	TRF SIGNAL	0	0	0	SMOK	DRY	DAY	S-1STOP	REAR	INJ
	00201	SW BOONES FERRY RD	01106	SW IBACH CT	1	INTER	7		W	05	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DUSK	PED	PED	INJ
	00201	SW BOONES FERRY RD	01106	SW IBACH CT	1	INTER	7	1	W	05	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DUSK	PED	PED	INJ

CRASH_EVNT_1_CD	CRASH_EVNT_2_CD	CRASH_EVNT_3_CD	CRASH_CAUSE_1_CD	CRASH_CAUSE_2_CD	CRASH_CAUSE_3_CD	LAT DEG NO	LAT MINUTE NO	LAT SEC NO	LAT	LONGTD DEG NO	LONGTD MINUTE NO	LONGTD SEC NO	LONG	VHCL_ID	STRIKG_VHCL_FLG	VHCL_CODED_SEQ_NO	VHCL_TYP_SHORT_DESC	VHCL_USE_SHORT_DESC	TRLR_QTY	VHCL_OWNSHP_SHORT_DESC	VHCL_MVMNT_SHORT_DESC	VHCL_CMPSS_DIR_FROM_SHORT_DESC	VHCL_CMPSS_DIR_TO_SHORT_DESC	VHCL_ACTN_CD	VHCL_EVNT_1_CD	VHCL_EVNT_2_CD	VHCL_EVNT_3_CD	VHCL_CAUSE_1_CD
			07			45	21	38.63	45.36073056	-122	46	28.26	-122.7745167	3262072	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	N	S	000				00
			07			45	21	38.63	45.36073056	-122	46	28.26	-122.7745167	3262073	0	2	PSNGR CAR	NONE	0	PRVTE	TURN-R	N	W	000				00
			27	29		45	21	39.38	45.36093889	-122	46	27.77	-122.7743806	3263196	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	N	S	000				00
			27	29		45	21	39.38	45.36093889	-122	46	27.77	-122.7743806	3263197	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	N	S	011				00
			02			45	21	38.63	45.36073056	-122	46	28.26	-122.7745167	3209234	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	N	S	000				00
			02			45	21	38.63	45.36073056	-122	46	28.26	-122.7745167	3209235	0	2	PSNGR CAR	NONE	9	N/A	TURN-R	W	S	000				00
054			08	30		45	21	38.63	45.36073056	-122	46	28.26	-122.7745167	3170253	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-L	E	S	000	054			00
			27	07		45	21	38.63	45.36073056	-122	46	28.26	-122.7745167	3391211	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	S	N	000				00
			27	07		45	21	38.63	45.36073056	-122	46	28.26	-122.7745167	3391212	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	S	N	011				00
			02			45	21	38.63	45.36073056	-122	46	28.26	-122.7745167	3274476	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-L	S	W	000				00
			02			45	21	38.63	45.36073056	-122	46	28.26	-122.7745167		0													

VHCL_CAUSE_2_CD	VHCL_CAUSE_3_CD	PARTIC_ID	STRIKG_PARTIC_FLG	PARTIC_VHCL_SEQ_NO	PARTIC_TYP_CD	PARTIC_TYP_SHORT_DESC	PARTIC_MVMNT_SHORT_DESC	PARTIC_CMPSS_DIR_FROM_SHORT_DESC	PARTIC_CMPSS_DIR_TO_SHORT_DESC	INJ_SVRTY_SHORT_DESC	AGE_VAL	SEX_CD	DRVR_LIC_STAT_SHORT_DESC	DRVR_RES_SHORT_DESC	PARTIC_ACTN_CD	NON_MOTRST_LOC_SHORT_DESC	PARTIC_ERR_1_CD	PARTIC_ERR_2_CD	PARTIC_ERR_3_CD	PARTIC_EVNT_1_CD	PARTIC_EVNT_2_CD	PARTIC_EVNT_3_CD	PARTIC_CAUSE_1_CD	PARTIC_CAUSE_2_CD	PARTIC_CAUSE_3_CD	TOTAL_CRASHES	TOTAL_ROWS
		3718561	0	1	1	DRVR				INJC	42	2	OR-Y	OR<25	000		043						07			293	674
		3718562	0	1	1	DRVR				INJC	58	1	OR-Y	OR<25	000		000						00			293	674
		3720002	0	1	1	DRVR				NONE	17	2	OR-Y	OR<25	038		016	026					27	29		293	674
		3720003	0	1	1	DRVR				INJC	32	2	OR-Y	OR<25	000		000						00			293	674
		3662027	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3662028	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3620028	0	1	1	DRVR				INJB	16	1	OR-Y	OR<25	000		001	050					08	30		293	674
		3867813	0	1	1	DRVR				NONE	20	2	OR-Y	OR<25	038		016	043					27	07		293	674
		3867814	0	1	1	DRVR				INJC	29	2	OR-Y	OR<25	000		000						00			293	674
		3734094	0	1	1	DRVR				NONE	18	1	OR-Y	OR<25	000		029						02			293	674
		3734095	0	1	3	PED	STRGHT	N	S	INJC	19	1			035	I XWLK	000						00			293	674

CRASH_ID	INT_ID	SER_NO	INVSTG_AGY_SHORT_DESC	CRASH_SPEED_INVLV_FLG	ALCHL_INVLV_FLG	DRUG_INVLV_FLG	MJ_INVLV_FLG	SCHL_ZONE_IND	WRK_ZONE_IND	LANE RDWY DPRT CRASH FLG	UNLOCT FLG	CRASH_DT	CRASH_WK_DAY_CD	CRASH_HR_SHORT_DESC	CNTY_NM	CITY_SECT_NM	URB_AREA_SHORT_NM	HWY_NO	HWY_MED_NM	RDWY_NO	FC_CD	HWY_COMPNT_CD	HWY_COMPNT_SHORT_DESC	MLGE_TYP_CD	RD_CON_NO	LRS VAL
1751825	4	01176	CITY	0	0	0		0	0	N	FALSE	3/1/2017	4	4P	Washington	Tualatin	PORTLAND UA				16					
1751825	4	01176	CITY	0	0	0		0	0	N	FALSE	3/1/2017	4	4P	Washington	Tualatin	PORTLAND UA				16					
1800734	4	05219	CITY	0	0	0		0	0	N	FALSE	10/3/2018	4	5P	Washington	Tualatin	PORTLAND UA				16					
1800734	4	05219	CITY	0	0	0		0	0	N	FALSE	10/3/2018	4	5P	Washington	Tualatin	PORTLAND UA				16					
1802662	4	05820	CITY	0	0	0		0	0	N	FALSE	10/29/2018	2	3P	Washington	Tualatin	PORTLAND UA				16					
1802662	4	05820	CITY	0	0	0		0	0	N	FALSE	10/29/2018	2	3P	Washington	Tualatin	PORTLAND UA				16					
1737732	4	07245	CITY	0	0	0		0	0	N	FALSE	11/15/2017	4	5P	Washington	Tualatin	PORTLAND UA				16					
1737732	4	07245	CITY	0	0	0		0	0	N	FALSE	11/15/2017	4	5P	Washington	Tualatin	PORTLAND UA				16					
1799386	4	04797	CITY	0	0	0		0	0	N	FALSE	9/12/2018	4	6P	Washington	Tualatin	PORTLAND UA				16					
1799386	4	04797	CITY	0	0	0		0	0	N	FALSE	9/12/2018	4	6P	Washington	Tualatin	PORTLAND UA				16					
1799386	4	04797	CITY	0	0	0		0	0	N	FALSE	9/12/2018	4	6P	Washington	Tualatin	PORTLAND UA				16					

4. BFR & Iowa

MP_NO	ST_NO	ST_NM	ISECT_ST_NO	ISECT_ST_NM	RD_CHAR_CD	RD_CHAR_SHORT_DESC	CMPSS_DIR_CD	CMPSS_DIR_FROM_CD	CMPSS_DIR_SHORT_DESC	IMPCT_LOC_CD	ISECT_TYP_SHORT_DESC	MEDN_TYP_SHORT_DESC	TURNG_LEG_QTY	LN_QTY	ISECT_REL_FLG	TRAF_CNTL_DEVICE_SHORT_DESC	OFF_RDWY_FLG	RNDABT_FLG	DRVWY_REL_FLG	WTHR_COND_SHORT_DESC	RD_SURF_SHORT_DESC	LGT_COND_SHORT_DESC	CRASH_TYP_SHORT_DESC	COLLIS_TYP_SHORT_DESC	CRASH_SVRTY_SHORT_DESC
	00201	SW BOONES FERRY RD	01104	SW IOWA DR	3	STRGHT	1		N	06		NONE		2	0	NONE	0	0	0	CLD	DRY	DAY	S-STRGHT	REAR	PDO
	00201	SW BOONES FERRY RD	01104	SW IOWA DR	3	STRGHT	1		N	06		NONE		2	0	NONE	0	0	0	CLD	DRY	DAY	S-STRGHT	REAR	PDO
	00201	SW BOONES FERRY RD	01104	SW IOWA DR	1	INTER	9		CN	01	CROSS		0		0	STOP SIGN	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	INJ
	00201	SW BOONES FERRY RD	01104	SW IOWA DR	1	INTER	9		CN	01	CROSS		0		0	STOP SIGN	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	INJ
	00201	SW BOONES FERRY RD	01104	SW IOWA DR	1	INTER	9		CN	03	CROSS		0		0	STOP SIGN	0	0	0	CLD	WET	DAY	ANGL-OTH	TURN	INJ
	00201	SW BOONES FERRY RD	01104	SW IOWA DR	1	INTER	9		CN	03	CROSS		0		0	STOP SIGN	0	0	0	CLD	WET	DAY	ANGL-OTH	TURN	INJ
	00201	SW BOONES FERRY RD	01104	SW IOWA DR	1	INTER	9		CN	04	CROSS		0		0	STOP SIGN	0	0	0	RAIN	WET	DLIT	BIKE	TURN	INJ
	00201	SW BOONES FERRY RD	01104	SW IOWA DR	1	INTER	9	5	CN	04	CROSS		0		0	STOP SIGN	0	0	0	RAIN	WET	DLIT	BIKE	TURN	INJ
	00201	SW BOONES FERRY RD	01104	SW IOWA DR	1	INTER	9		CN	04	CROSS		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	BIKE	TURN	INJ
	00201	SW BOONES FERRY RD	01104	SW IOWA DR	1	INTER	9		CN	04	CROSS		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	BIKE	TURN	INJ
	00201	SW BOONES FERRY RD	01104	SW IOWA DR	1	INTER	9	5	CN	04	CROSS		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	BIKE	TURN	INJ

4. BFR & Iowa

CRASH_EVNT_1_CD	CRASH_EVNT_2_CD	CRASH_EVNT_3_CD	CRASH_CAUSE_1_CD	CRASH_CAUSE_2_CD	CRASH_CAUSE_3_CD	LAT DEG NO	LAT MINUTE NO	LAT SEC NO	LAT	LONGTD DEG NO	LONGTD MINUTE NO	LONGTD SEC NO	LONG	VHCL_ID	STRIKG_VHCL_FLG	VHCL_CODED_SEQ_NO	VHCL_TYP_SHORT_DESC	VHCL_USE_SHORT_DESC	TRLR_QTY	VHCL_OWNSHP_SHORT_DESC	VHCL_MVMNT_SHORT_DESC	VHCL_CMPSS_DIR_FROM_SHORT_DESC	VHCL_CMPSS_DIR_TO_SHORT_DESC	VHCL_ACTN_CD	VHCL_EVNT_1_CD	VHCL_EVNT_2_CD	VHCL_EVNT_3_CD	VHCL_CAUSE_1_CD
			29			45	21	20.54	45.35570556	-122	46	29.14	-122.7747611	3304422	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	N	S	000				00
			29			45	21	20.54	45.35570556	-122	46	29.14	-122.7747611	3304423	0	2	PSNGR CAR	NONE	9	N/A	STOP	N	S	011				00
			02			45	21	19.82	45.35550556	-122	46	29.16	-122.7747667	3394337	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-L	E	S	000				00
			02			45	21	19.82	45.35550556	-122	46	29.16	-122.7747667	3394338	0	2	PSNGR CAR	NONE	0	PRVTE	TURN-L	N	E	000				00
			02	03		45	21	19.82	45.35550556	-122	46	29.16	-122.7747667	3397949	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	N	S	000				00
			02	03		45	21	19.82	45.35550556	-122	46	29.16	-122.7747667	3397950	0	2	PSNGR CAR	NONE	0	PRVTE	TURN-L	W	N	000				00
			02			45	21	19.82	45.35550556	-122	46	29.16	-122.7747667	3278309	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-R	S	E	000				00
			02			45	21	19.82	45.35550556	-122	46	29.16	-122.7747667		0													
			02			45	21	19.82	45.35550556	-122	46	29.14	-122.7747611	3391787	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-L	N	E	000				00
			02			45	21	19.82	45.35550556	-122	46	29.14	-122.7747611	3391787	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-L	N	E	000				00
			02			45	21	19.82	45.35550556	-122	46	29.14	-122.7747611		0													

VHCL_CAUSE_2_CD	VHCL_CAUSE_3_CD	PARTIC_ID	STRIKG_PARTIC_FLG	PARTIC_VHCL_SEQ_NO	PARTIC_TYP_CD	PARTIC_TYP_SHORT_DESC	PARTIC_MVMNT_SHORT_DESC	PARTIC_CMPSS_DIR_FROM_SHORT_DESC	PARTIC_CMPSS_DIR_TO_SHORT_DESC	INJ_SVRTY_SHORT_DESC	AGE_VAL	SEX_CD	DRVR_LIC_STAT_SHORT_DESC	DRVR_RES_SHORT_DESC	PARTIC_ACTN_CD	NON_MOTRST_LOC_SHORT_DESC	PARTIC_ERR_1_CD	PARTIC_ERR_2_CD	PARTIC_ERR_3_CD	PARTIC_EVNT_1_CD	PARTIC_EVNT_2_CD	PARTIC_EVNT_3_CD	PARTIC_CAUSE_1_CD	PARTIC_CAUSE_2_CD	PARTIC_CAUSE_3_CD	TOTAL_CRASHES	TOTAL_ROWS
		3770151	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3770152	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3871724	0	1	1	DRVR				INJC	43	2	OR-Y	OR<25	000		028						02			293	674
		3871725	0	1	1	DRVR				INJA	39	2	OR-Y	OR<25	000		000						00			293	674
		3876296	0	1	1	DRVR				INJC	44	2	NONE	OR>25	000		000						00			293	674
		3876297	0	1	1	DRVR				NONE	16	1	OR-Y	OR<25	000		028	004	021				02	03		293	674
		3738958	0	1	1	DRVR				NONE	37	2	OR-Y	OR<25	000		027						02			293	674
		3738959	0	1	6	BIKE	STRGHT	S	N	INJB	62	1			035	I-BIKE LN	000						00			293	674
		3868514	0	1	1	DRVR				NONE	52	1	OR-Y	OR<25	000		027						02			293	674
		3868515	0	2	2	PSNG				NONE	02	2			000		000						00			293	674
		3868516	0	1	6	BIKE	STRGHT	S	N	INJB	27	1			000	I INRD	000						00			293	674

CRASH_ID	INT_ID	SER_NO	INVSTG_AGY_SHORT_DESC	CRASH_SPEED_INVLV_FLG	ALCHL_INVLV_FLG	DRUG_INVLV_FLG	MJ_INVLV_FLG	SCHL_ZONE_IND	WRK_ZONE_IND	LANE RDWY DPRT CRASH FLG	UNLOCT FLG	CRASH_DT	CRASH_WK_DAY_CD	CRASH_HR_SHORT_DESC	CNTY_NM	CITY_SECT_NM	URB_AREA_SHORT_NM	HWY_NO	HWY_MED_NM	RDWY_NO	FC_CD	HWY_COMPNT_CD	HWY_COMPNT_SHORT_DESC	MLGE_TYP_CD	RD_CON_NO	LRS VAL
1823348	5	05839	NONE	0	0	0		0	0	N	FALSE	10/29/2018	2	3P	Washington	Tualatin	PORTLAND UA				16					
1823348	5	05839	NONE	0	0	0		0	0	N	FALSE	10/29/2018	2	3P	Washington	Tualatin	PORTLAND UA				16					
1704025	5	08636	NONE	0	0	0		0	0	N	FALSE	12/14/2016	4	6P	Washington	Tualatin	PORTLAND UA				16					
1704025	5	08636	NONE	0	0	0		0	0	N	FALSE	12/14/2016	4	6P	Washington	Tualatin	PORTLAND UA				16					
1748789	5	03180	CITY	1	0	0		0	0	N	FALSE	5/31/2017	4	3P	Washington	Tualatin	PORTLAND UA				16					
1696059	5	05132	CITY	1	0	0		0	0	N	FALSE	8/2/2016	3	12P	Washington	Tualatin	PORTLAND UA				16					
1696059	5	05132	CITY	1	0	0		0	0	N	FALSE	8/2/2016	3	12P	Washington	Tualatin	PORTLAND UA				16					
1618262	5	07146	CITY	0	0	0		0	0	N	FALSE	11/25/2015	4	2P	Washington	Tualatin	PORTLAND UA				16					
1618262	5	07146	CITY	0	0	0		0	0	N	FALSE	11/25/2015	4	2P	Washington	Tualatin	PORTLAND UA				16					
1618262	5	07146	CITY	0	0	0		0	0	N	FALSE	11/25/2015	4	2P	Washington	Tualatin	PORTLAND UA				16					

5. BFR & Norwood

MP_NO	ST_NO	ST_NM	ISECT_ST_NO	ISECT_ST_NM	RD_CHAR_CD	RD_CHAR_SHORT_DESC	CMPSS_DIR_CD	CMPSS_DIR_FROM_CD	CMPSS_DIR_SHORT_DESC	IMPCT_LOC_CD	ISECT_TYP_SHORT_DESC	MEDN_TYP_SHORT_DESC	TURNG_LEG_QTY	LN_QTY	ISECT_REL_FLG	TRAF_CNTL_DEVICE_SHORT_DESC	OFF_RDWY_FLG	RNDABT_FLG	DRVWY_REL_FLG	WTHR_COND_SHORT_DESC	RD_SURF_SHORT_DESC	LGT_COND_SHORT_DESC	CRASH_TYP_SHORT_DESC	COLLIS_TYP_SHORT_DESC	CRASH_SVRTY_SHORT_DESC
	00201	SW BOONES FERRY RD	01705	SW NORWOOD RD	3	STRGHT	1		N	08		NONE		2	0	UNKNOWN	0	0	0	CLD	WET	DAY	S-1STOP	REAR	PDO
	00201	SW BOONES FERRY RD	01705	SW NORWOOD RD	3	STRGHT	1		N	08		NONE		2	0	UNKNOWN	0	0	0	CLD	WET	DAY	S-1STOP	REAR	PDO
	00201	SW BOONES FERRY RD	01705	SW NORWOOD RD	1	INTER	3		E	05	3-LEG		0		0	STOP SIGN	0	0	0	SNOW	ICE	DLIT	O-OTHER	TURN	PDO
	00201	SW BOONES FERRY RD	01705	SW NORWOOD RD	1	INTER	3		E	05	3-LEG		0		0	STOP SIGN	0	0	0	SNOW	ICE	DLIT	O-OTHER	TURN	PDO
	00201	SW BOONES FERRY RD	01705	SW NORWOOD RD	1	INTER	3		E	05	3-LEG		0		0	STOP SIGN	1	0	0	CLD	DRY	DAY	FIX OBJ	FIX	PDO
	00201	SW BOONES FERRY RD	01705	SW NORWOOD RD	1	INTER	3		E	06	3-LEG		0		0	STOP SIGN	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	PDO
	00201	SW BOONES FERRY RD	01705	SW NORWOOD RD	1	INTER	3		E	06	3-LEG		0		0	STOP SIGN	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	PDO
	00201	SW BOONES FERRY RD	01705	SW NORWOOD RD	1	INTER	9		CN	02	3-LEG		0		0	STOP SIGN	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	INJ
	00201	SW BOONES FERRY RD	01705	SW NORWOOD RD	1	INTER	9		CN	02	3-LEG		0		0	STOP SIGN	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	INJ
	00201	SW BOONES FERRY RD	01705	SW NORWOOD RD	1	INTER	9		CN	02	3-LEG		0		0	STOP SIGN	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	INJ

CRASH_EVNT_1_CD	CRASH_EVNT_2_CD	CRASH_EVNT_3_CD	CRASH_CAUSE_1_CD	CRASH_CAUSE_2_CD	CRASH_CAUSE_3_CD	LAT DEG NO	LAT MINUTE NO	LAT SEC NO	LAT	LONGTD DEG NO	LONGTD MINUTE NO	LONGTD SEC NO	LONG	VHCL_ID	STRIKG_VHCL_FLG	VHCL_CODED_SEQ_NO	VHCL_TYP_SHORT_DESC	VHCL_USE_SHORT_DESC	TRLR_QTY	VHCL_OWNSHP_SHORT_DESC	VHCL_MVMNT_SHORT_DESC	VHCL_CMPSS_DIR_FROM_SHORT_DESC	VHCL_CMPSS_DIR_TO_SHORT_DESC	VHCL_ACTN_CD	VHCL_EVNT_1_CD	VHCL_EVNT_2_CD	VHCL_EVNT_3_CD	VHCL_CAUSE_1_CD
			29			45	21	14.61	45.35405833	-122	46	29.08	-122.7747444	3434113	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	N	S	000				00
			29			45	21	14.61	45.35405833	-122	46	29.08	-122.7747444	3434114	0	2	PSNGR CAR	NONE	9	N/A	STOP	N	S	011				00
124			02			45	21	13.25	45.35368056	-122	46	29.07	-122.7747417	3215905	1	1	PSNGR CAR	NONE	9	N/A	TURN-L	N	E	000				00
124			02			45	21	13.25	45.35368056	-122	46	29.07	-122.7747417	3215906	0	2	TRUCK	NONE	9	N/A	TURN-R	S	E	000				00
053			01			45	21	13.25	45.35368056	-122	46	29.07	-122.7747417	3299165	1	1	PSNGR CAR	NONE	9	N/A	TURN-L	N	E	000				00
			08	30		45	21	13.25	45.35368056	-122	46	29.07	-122.7747417	3201528	1	1	PSNGR CAR	NONE	9	N/A	TURN-R	S	E	000				00
			08	30		45	21	13.25	45.35368056	-122	46	29.07	-122.7747417	3201529	0	2	SEMI TOW	NONE	9	N/A	STRGHT	E	W	006				00
083			02	40		45	21	13.25	45.35368056	-122	46	29.07	-122.7747417	3056593	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	S	N	000				00
083			02	40		45	21	13.25	45.35368056	-122	46	29.07	-122.7747417	3056593	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	S	N	000				00
083			02	40		45	21	13.25	45.35368056	-122	46	29.07	-122.7747417	3056594	0	2	PSNGR CAR	NONE	0	PRVTE	TURN-L	E	S	015				00

VHCL_CAUSE_2_CD	VHCL_CAUSE_3_CD	PARTIC_ID	STRIKG_PARTIC_FLG	PARTIC_VHCL_SEQ_NO	PARTIC_TYP_CD	PARTIC_TYP_SHORT_DESC	PARTIC_MVMNT_SHORT_DESC	PARTIC_CMPSS_DIR_FROM_SHORT_DESC	PARTIC_CMPSS_DIR_TO_SHORT_DESC	INJ_SVRTY_SHORT_DESC	AGE_VAL	SEX_CD	DRVR_LIC_STAT_SHORT_DESC	DRVR_RES_SHORT_DESC	PARTIC_ACTN_CD	NON_MOTRST_LOC_SHORT_DESC	PARTIC_ERR_1_CD	PARTIC_ERR_2_CD	PARTIC_ERR_3_CD	PARTIC_EVNT_1_CD	PARTIC_EVNT_2_CD	PARTIC_EVNT_3_CD	PARTIC_CAUSE_1_CD	PARTIC_CAUSE_2_CD	PARTIC_CAUSE_3_CD	TOTAL_CRASHES	TOTAL_ROWS
		3911832	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3911833	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3668550	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3668551	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3765029	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3654516	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3654517	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			293	674
		3490131	0	1	1	DRVR				INJC	24	1	OR-Y	OR<25	000		000						00			293	674
		3490132	0	2	2	PSNG				INJC	21	2			000		000						00			293	674
		3490133	0	1	1	DRVR				INJC	29	2	OR-Y	OR<25	000		028			083			02	40		293	674

CRASH_ID	INT_ID	SER_NO	INVSTG_AGY_SHORT_DESC	CRASH_SPEED_INVLV_FLG	ALCHL_INVLV_FLG	DRUG_INVLV_FLG	MJ_INVLV_FLG	SCHL_ZONE_IND	WRK_ZONE_IND	LANE RDWY DPRT CRASH FLG	UNLOCT FLG	CRASH_DT	CRASH_WK_DAY_CD	CRASH_HR_SHORT_DESC	CNTY_NM	CITY_SECT_NM	URB_AREA_SHORT_NM	HWY_NO	HWY_MED_NM	RDWY_NO	FC_CD	HWY_COMPNT_CD	HWY_COMPNT_SHORT_DESC	MLGE_TYP_CD	RD_CON_NO	LRS VAL
1826379	8	80420	COUNTY	0	0	0		0	0	N	FALSE	2/4/2019	2	5A	Washington	Wilsonville	PORTLAND UA				16					
1819129	8	83471	NONE	0	0	0		0	0	N	FALSE	9/28/2018	6	4P	Washington	Wilsonville	PORTLAND UA				16					
1819129	8	83471	NONE	0	0	0		0	0	N	FALSE	9/28/2018	6	4P	Washington	Wilsonville	PORTLAND UA				16					
1872033	8	84151	NONE	0	0	0		0	0	N	FALSE	11/20/2019	4	1P	Washington	Wilsonville	PORTLAND UA				16					
1872033	8	84151	NONE	0	0	0		0	0	N	FALSE	11/20/2019	4	1P	Washington	Wilsonville	PORTLAND UA				16					
1633166	8	01858	NO RPT	0	0	0		0	0	N	FALSE	4/9/2015	5	3P	Washington	Wilsonville	PORTLAND UA				16					
1633166	8	01858	NO RPT	0	0	0		0	0	N	FALSE	4/9/2015	5	3P	Washington	Wilsonville	PORTLAND UA				16					
1633166	8	01858	NO RPT	0	0	0		0	0	N	FALSE	4/9/2015	5	3P	Washington	Wilsonville	PORTLAND UA				16					
1676642	8	06703	COUNTY	0	0	0		0	0	N	FALSE	10/4/2016	3	4P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	1	16	0	MN	0		014100100S00
1676642	8	06703	COUNTY	0	0	0		0	0	N	FALSE	10/4/2016	3	4P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	1	16	0	MN	0		014100100S00
1676642	8	06703	COUNTY	0	0	0		0	0	N	FALSE	10/4/2016	3	4P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	1	16	0	MN	0		014100100S00
1790953	8	82897	NO RPT	0	0	0		0	0	N	FALSE	8/19/2018	1	6P	Washington	Wilsonville	PORTLAND UA				16					
1790953	8	82897	NO RPT	0	0	0		0	0	N	FALSE	8/19/2018	1	6P	Washington	Wilsonville	PORTLAND UA				16					
1750508	8	00405	NONE	0	0	0		0	0	N	FALSE	1/16/2017	2	UNK	Washington	Wilsonville	PORTLAND UA				16					
1750508	8	00405	NONE	0	0	0		0	0	N	FALSE	1/16/2017	2	UNK	Washington	Wilsonville	PORTLAND UA				16					
1749182	8	80200	NONE	0	0	0		0	0	N	FALSE	1/14/2017	7	10A	Washington	Wilsonville	PORTLAND UA				16					
1749182	8	80200	NONE	0	0	0		0	0	N	FALSE	1/14/2017	7	10A	Washington	Wilsonville	PORTLAND UA				16					
1839313	8	82007	CITY	0	0	0		0	0	N	FALSE	2/21/2019	5	5P	Washington	Wilsonville	PORTLAND UA				16					
1839313	8	82007	CITY	0	0	0		0	0	N	FALSE	2/21/2019	5	5P	Washington	Wilsonville	PORTLAND UA				16					
1857981	8	02987	NONE	0	0	0		0	0	N	FALSE	6/12/2019	4	5P	Washington	Wilsonville	PORTLAND UA				16					
1857981	8	02987	NONE	0	0	0		0	0	N	FALSE	6/12/2019	4	5P	Washington	Wilsonville	PORTLAND UA				16					
1765656	8	84789	NONE	0	0	0		0	0	N	FALSE	11/14/2017	3	9P	Washington	Wilsonville	PORTLAND UA				16					
1765656	8	84789	NONE	0	0	0		0	0	N	FALSE	11/14/2017	3	9P	Washington	Wilsonville	PORTLAND UA				16					
1795035	8	84103	NONE	0	0	0		0	0	N	FALSE	11/9/2018	6	4P	Washington	Wilsonville	PORTLAND UA				16					
1795035	8	84103	NONE	0	0	0		0	0	N	FALSE	11/9/2018	6	4P	Washington	Wilsonville	PORTLAND UA				16					
1795035	8	84103	NONE	0	0	0		0	0	N	FALSE	11/9/2018	6	4P	Washington	Wilsonville	PORTLAND UA				16					

8. BFR & Day

MP_NO	ST_NO	ST_NM	ISECT_ST_NO	ISECT_ST_NM	RD_CHAR_CD	RD_CHAR_SHORT_DESC	CMPSS_DIR_CD	CMPSS_DIR_FROM_CD	CMPSS_DIR_SHORT_DESC	IMPCT_LOC_CD	ISECT_TYP_SHORT_DESC	MEDN_TYP_SHORT_DESC	TURNG_LEG_QTY	LN_QTY	ISECT_REL_FLG	TRAF_CNTL_DEVICE_SHORT_DESC	OFF_RDWY_FLG	RNDABT_FLG	DRVWY_REL_FLG	WTHR_COND_SHORT_DESC	RD_SURF_SHORT_DESC	LGT_COND_SHORT_DESC	CRASH_TYP_SHORT_DESC	COLLIS_TYP_SHORT_DESC	CRASH_SVRTY_SHORT_DESC
	00201	SW BEAV-TUALATIN HY	00601	SW DAY RD	1	INTER	3		E	05	3-LEG		0		0	TRF SIGNAL	1	0	0	RAIN	WET	DLIT	FIX OBJ	FIX	INJ
	00201	SW BEAV-TUALATIN HY	00601	SW DAY RD	1	INTER	5		S	06	3-LEG		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	SS-O	PDO
	00201	SW BEAV-TUALATIN HY	00601	SW DAY RD	1	INTER	5		S	06	3-LEG		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	SS-O	PDO
	00201	SW BEAV-TUALATIN HY	00601	SW DAY RD	1	INTER	5		S	06	3-LEG		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00201	SW BEAV-TUALATIN HY	00601	SW DAY RD	1	INTER	5		S	06	3-LEG		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00201	SW BEAV-TUALATIN HY	00601	SW DAY RD	1	INTER	7		W	06	3-LEG		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00201	SW BEAV-TUALATIN HY	00601	SW DAY RD	1	INTER	7		W	06	3-LEG		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00201	SW BEAV-TUALATIN HY	00601	SW DAY RD	1	INTER	7		W	06	3-LEG		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
12.47	00201	SW BEAV-TUALATIN HY	00601	SW DAY RD	1	INTER	5		S	06	3-LEG		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	O-STRGHT	HEAD	INJ
12.47	00201	SW BEAV-TUALATIN HY	00601	SW DAY RD	1	INTER	5		S	06	3-LEG		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	O-STRGHT	HEAD	INJ
12.47	00201	SW BEAV-TUALATIN HY	00601	SW DAY RD	1	INTER	5		S	06	3-LEG		0		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	O-STRGHT	HEAD	INJ
	00209	SW BOONES FERRY FR	00601	SW DAY RD	1	INTER	1		N	06	3-LEG		0		0	TRF SIGNAL	0	0	0	CLR	UNK	DAY	S-1STOP	REAR	INJ
	00209	SW BOONES FERRY FR	00601	SW DAY RD	1	INTER	1		N	06	3-LEG		0		0	TRF SIGNAL	0	0	0	CLR	UNK	DAY	S-1STOP	REAR	INJ
	00209	SW BOONES FERRY FR	00601	SW DAY RD	1	INTER	5		S	06	CROSS		0		0	TRF SIGNAL	0	0	0	SNOW	ICE	DAY	S-1STOP	REAR	PDO
	00209	SW BOONES FERRY FR	00601	SW DAY RD	1	INTER	5		S	06	CROSS		0		0	TRF SIGNAL	0	0	0	SNOW	ICE	DAY	S-1STOP	REAR	PDO
	00209	SW BOONES FERRY FR	00601	SW DAY RD	1	INTER	7		W	06	3-LEG		0		0	TRF SIGNAL	0	0	0	CLR	ICE	DAY	S-1STOP	REAR	PDO
	00209	SW BOONES FERRY FR	00601	SW DAY RD	1	INTER	7		W	06	3-LEG		0		0	TRF SIGNAL	0	0	0	CLR	ICE	DAY	S-1STOP	REAR	PDO
	00209	SW BOONES FERRY FR	00601	SW DAY RD	1	INTER	9		CN	03	CROSS		0		0	TRF SIGNAL	0	0	0	UNK	UNK	DUSK	ANGL-OTH	TURN	INJ
	00209	SW BOONES FERRY FR	00601	SW DAY RD	1	INTER	9		CN	03	CROSS		0		0	TRF SIGNAL	0	0	0	UNK	UNK	DUSK	ANGL-OTH	TURN	INJ
	00601	SW DAY RD	00209	SW BOONES FERRY FR	3	STRGHT	7		W	06		NONE		3	1	UNKNOWN	0	0	0	CLR	DRY	DAY	S-STRGHT	REAR	PDO
	00601	SW DAY RD	00209	SW BOONES FERRY FR	3	STRGHT	7		W	06		NONE		3	1	UNKNOWN	0	0	0	CLR	DRY	DAY	S-STRGHT	REAR	PDO
	00601	SW DAY RD	00209	SW BOONES FERRY FR	3	STRGHT	7		W	08		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DLIT	S-1TURN	TURN	PDO
	00601	SW DAY RD	00209	SW BOONES FERRY FR	3	STRGHT	7		W	08		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DLIT	S-1TURN	TURN	PDO
	00601	SW DAY RD	00209	SW BOONES FERRY FR	3	STRGHT	7		W	08		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DUSK	S-1STOP	REAR	INJ
	00601	SW DAY RD	00209	SW BOONES FERRY FR	3	STRGHT	7		W	08		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DUSK	S-1STOP	REAR	INJ
	00601	SW DAY RD	00209	SW BOONES FERRY FR	3	STRGHT	7		W	08		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DUSK	S-1STOP	REAR	INJ

CRASH_EVNT_1_CD	CRASH_EVNT_2_CD	CRASH_EVNT_3_CD	CRASH_CAUSE_1_CD	CRASH_CAUSE_2_CD	CRASH_CAUSE_3_CD	LAT DEG NO	LAT MINUTE NO	LAT SEC NO	LAT	LONGTD DEG NO	LONGTD MINUTE NO	LONGTD SEC NO	LONG	VHCL_ID	STRIKG_VHCL_FLG	VHCL_CODED_SEQ_NO	VHCL_TYP_SHORT_DESC	VHCL_USE_SHORT_DESC	TRLR_QTY	VHCL_OWNSHP_SHORT_DESC	VHCL_MVMNT_SHORT_DESC	VHCL_CMPSS_DIR_FROM_SHORT_DESC	VHCL_CMPSS_DIR_TO_SHORT_DESC	VHCL_ACTN_CD	VHCL_EVNT_1_CD	VHCL_EVNT_2_CD	VHCL_EVNT_3_CD	VHCL_CAUSE_1_CD
040	053	079	10			45	20	25.31	45.34036389	-122	46	24.9	-122.7735833	3439569	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	W	E	000	040	053	079	00
			10			45	20	25.31	45.34036389	-122	46	24.92	-122.7735889	3426617	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	S	N	000				00
			10			45	20	25.31	45.34036389	-122	46	24.92	-122.7735889	3426618	0	2	PSNGR CAR	NONE	9	N/A	STOP	S	N	011				00
			29			45	20	25.3	45.34036111	-122	46	24.91	-122.7735861	3523959	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	S	N	000				00
			29			45	20	25.3	45.34036111	-122	46	24.91	-122.7735861	3523960	0	2	PSNGR CAR	NONE	9	N/A	STOP	S	N	011				00
013			29			45	20	24.73	45.34020278	-122	46	24.67	-122.7735194	3084429	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	W	E	000				00
013			29			45	20	24.73	45.34020278	-122	46	24.67	-122.7735194	3084430	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	W	E	011	013			00
013			29			45	20	24.73	45.34020278	-122	46	24.67	-122.7735194	3084431	0	3	PSNGR CAR	NONE	0	PRVTE	STOP	W	E	022				00
			26			45	20	24.73	45.34020278	-122	46	24.67	-122.7735194	3165521	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	S	N	000				00
			26			45	20	24.73	45.34020278	-122	46	24.67	-122.7735194	3165521	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	S	N	000				00
			26			45	20	24.73	45.34020278	-122	46	24.67	-122.7735194	3165522	0	2	PSNGR CAR	NONE	0	PRVTE	STRGHT	N	S	007				00
			29			45	20	25.31	45.34036389	-122	46	24.9	-122.7735833	3375543	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	N	S	000				00
			29			45	20	25.31	45.34036389	-122	46	24.9	-122.7735833	3375544	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	N	S	011				00
124			29			45	20	25.3	45.34036111	-122	46	24.9	-122.7735833	3302153	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	S	N	000				00
124			29			45	20	25.3	45.34036111	-122	46	24.9	-122.7735833	3302154	0	2	PSNGR CAR	NONE	9	N/A	STOP	S	N	011				00
			29			45	20	25.3	45.34036111	-122	46	24.9	-122.7735833	3299852	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	W	E	000				00
			29			45	20	25.3	45.34036111	-122	46	24.9	-122.7735833	3299853	0	2	PSNGR CAR	NONE	9	N/A	STOP	W	E	011				00
			02			45	20	25.3	45.34036111	-122	46	24.92	-122.7735889	3464116	1	1	PSNGR CAR	NONE	0	UNKN	TURN-R	W	S	000				00
			02			45	20	25.3	45.34036111	-122	46	24.92	-122.7735889	3464117	0	2	PSNGR CAR	NONE	0	PRVTE	STRGHT	N	S	000				00
			29			45	20	25.3	45.34036111	-122	46	26.24	-122.7739556	3499035	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	W	E	000				00
			29			45	20	25.3	45.34036111	-122	46	26.24	-122.7739556	3499036	0	2	PSNGR CAR	NONE	9	N/A	STRGHT	W	E	006				00
			08			45	20	25.29	45.34035833	-122	46	27.7	-122.7743611	3329101	1	1	PSNGR CAR	NONE	9	N/A	U-TURN	E	E	000				00
			08			45	20	25.29	45.34035833	-122	46	27.7	-122.7743611	3329102	0	2	PSNGR CAR	NONE	9	N/A	STRGHT	E	W	000				00
013			29			45	20	25.3	45.34036111	-122	46	26.51	-122.7740306	3383360	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	W	E	000				00
013			29			45	20	25.3	45.34036111	-122	46	26.51	-122.7740306	3383361	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	W	E	011	013			00
013			29			45	20	25.3	45.34036111	-122	46	26.51	-122.7740306	3383362	0	3	PSNGR CAR	NONE	0	PRVTE	STOP	W	E	022				00

VHCL_CAUSE_2_CD	VHCL_CAUSE_3_CD	PARTIC_ID	STRIKG_PARTIC_FLG	PARTIC_VHCL_SEQ_NO	PARTIC_TYP_CD	PARTIC_TYP_SHORT_DESC	PARTIC_MVMNT_SHORT_DESC	PARTIC_CMPSS_DIR_FROM_SHORT_DESC	PARTIC_CMPSS_DIR_TO_SHORT_DESC	INJ_SVRTY_SHORT_DESC	AGE_VAL	SEX_CD	DRVR_LIC_STAT_SHORT_DESC	DRVR_RES_SHORT_DESC	PARTIC_ACTN_CD	NON_MOTRST_LOC_SHORT_DESC	PARTIC_ERR_1_CD	PARTIC_ERR_2_CD	PARTIC_ERR_3_CD	PARTIC_EVNT_1_CD	PARTIC_EVNT_2_CD	PARTIC_EVNT_3_CD	PARTIC_CAUSE_1_CD	PARTIC_CAUSE_2_CD	PARTIC_CAUSE_3_CD	TOTAL_CRASHES	TOTAL_ROWS
		3917232	0	1	1	DRVR				INJA	42	1	OR-Y	OR<25	000		081						10			23	50
		3904723	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			23	50
		3904724	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			23	50
		4010805	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			23	50
		4010806	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			23	50
		3523577	0	1	1	DRVR				NONE	18	2	OR-Y	OR<25	000		026						29			23	50
		3523578	0	1	1	DRVR				NONE	28	2	OR-Y	OR<25	000		000						00			23	50
		3523579	0	1	1	DRVR				NONE	41	2	OR-Y	UNK	000		000						00			23	50
		3614153	0	1	1	DRVR				INJC	55	1	OR-Y	OR<25	000		000						00			23	50
		3614154	0	2	2	PSNG				INJC	54	2			000		000						00			23	50
		3614155	0	1	1	DRVR				NONE	45	1	OR-Y	OR<25	000		000						26			23	50
		3848096	0	1	1	DRVR				NONE	18	1	OR-Y	OR<25	000		026						29			23	50
		3848097	0	1	1	DRVR				INJC	50	2	OR-Y	OR<25	000		000						00			23	50
		3767925	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			23	50
		3767926	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			23	50
		3765691	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			23	50
		3765692	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			23	50
		3946449	0	1	1	DRVR				NONE	22	2	UNK	UNK	000		028						02			23	50
		3946450	0	1	1	DRVR				INJC	19	1	OR-Y	OR>25	000		000						00			23	50
		3986700	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			23	50
		3986701	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			23	50
		3794285	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			23	50
		3794286	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			23	50
		3857845	0	1	1	DRVR				NONE	44	2	OR-Y	OR<25	000		026						29			23	50
		3857846	0	1	1	DRVR				NONE	24	1	OR-Y	OR<25	000		000						00			23	50
		3857847	0	1	1	DRVR				INJC	47	2	OR-Y	OR<25	000		000						00			23	50

9. BFR & 95th

CRASH_ID	INT_ID	SER_NO	INVSTG_AGY_SHORT_DESC	CRASH_SPEED_INVLV_FLG	ALCHL_INVLV_FLG	DRUG_INVLV_FLG	MJ_INVLV_FLG	SCHL_ZONE_IND	WRK_ZONE_IND	LANE RDWY DPRT CRASH FLG	UNLOCT FLG	CRASH_DT	CRASH_WK_DAY_CD	CRASH_HR_SHORT_DESC	CNTY_NM	CITY_SECT_NM	URB_AREA_SHORT_NM	HWY_NO	HWY_MED_NM	RDWY_NO	FC_CD	HWY_COMPNT_CD	HWY_COMPNT_SHORT_DESC	MLGE_TYP_CD	RD_CON_NO	LRS VAL
1707144	9	83541	NO RPT	0	0	0		0	0	N	FALSE	8/4/2016	5	3P	Washington	Wilsonville	PORTLAND UA				16					
1707144	9	83541	NO RPT	0	0	0		0	0	N	FALSE	8/4/2016	5	3P	Washington	Wilsonville	PORTLAND UA				16					
1782839	9	81492	NONE	0	0	0		0	0	N	FALSE	5/3/2018	5	4P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	1	16	0	MN	0		014100100S00
1782839	9	81492	NONE	0	0	0		0	0	N	FALSE	5/3/2018	5	4P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	1	16	0	MN	0		014100100S00
1751754	9	80913	STATE	0	0	0		0	0	N	FALSE	3/8/2017	4	4P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	1	16	0	MN	0		014100100S00
1751754	9	80913	STATE	0	0	0		0	0	N	FALSE	3/8/2017	4	4P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	1	16	0	MN	0		014100100S00
1651504	9	85729	NONE	0	0	0		0	0	N	FALSE	12/5/2015	7	10P	Washington	Wilsonville	PORTLAND UA				16					
1651504	9	85729	NONE	0	0	0		0	0	N	FALSE	12/5/2015	7	10P	Washington	Wilsonville	PORTLAND UA				16					
1875753	9	84631	CITY	0	1	0		0	0	Y	FALSE	12/21/2019	7	2A	Washington	Wilsonville	PORTLAND UA				16					

9. BFR & 95th

MP_NO	ST_NO	ST_NM	ISECT_ST_NO	ISECT_ST_NM	RD_CHAR_CD	RD_CHAR_SHORT_DESC	CMPSS_DIR_CD	CMPSS_DIR_FROM_CD	CMPSS_DIR_SHORT_DESC	IMPCT_LOC_CD	ISECT_TYP_SHORT_DESC	MEDN_TYP_SHORT_DESC	TURNG_LEG_QTY	LN_QTY	ISECT_REL_FLG	TRAF_CNTL_DEVICE_SHORT_DESC	OFF_RDWY_FLG	RNDABT_FLG	DRVWY_REL_FLG	WTHR_COND_SHORT_DESC	RD_SURF_SHORT_DESC	LGT_COND_SHORT_DESC	CRASH_TYP_SHORT_DESC	COLLIS_TYP_SHORT_DESC	CRASH_SVRTY_SHORT_DESC
	00201	SW BEAV-TUALATIN HY	05095	SW 95TH AVE	1	INTER	7		W	06	3-LEG		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	00201	SW BEAV-TUALATIN HY	05095	SW 95TH AVE	1	INTER	7		W	06	3-LEG		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
12.63	00201	SW BEAV-TUALATIN HY	05095	SW 95TH AVE	1	INTER	1		N	06	3-LEG		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
12.63	00201	SW BEAV-TUALATIN HY	05095	SW 95TH AVE	1	INTER	1		N	06	3-LEG		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
12.63	00201	SW BEAV-TUALATIN HY	05095	SW 95TH AVE	1	INTER	9		CN	01	3-LEG		1		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	O-1 L-TURN	TURN	PDO
12.63	00201	SW BEAV-TUALATIN HY	05095	SW 95TH AVE	1	INTER	9		CN	01	3-LEG		1		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	O-1 L-TURN	TURN	PDO
	00401	SW COMMERCE CIR	05095	SW 95TH AVE	1	INTER	5		S	06	3-LEG		1		0	STOP SIGN	0	0	0	CLR	WET	DLIT	S-1STOP	REAR	PDO
	00401	SW COMMERCE CIR	05095	SW 95TH AVE	1	INTER	5		S	06	3-LEG		1		0	STOP SIGN	0	0	0	CLR	WET	DLIT	S-1STOP	REAR	PDO
	05095	SW 95TH AVE	00401	SW COMMERCE CIR	5	CURVE	5		S	07		NONE		4	0	NONE	1	0	0	RAIN	WET	DLIT	FIX OBJ	FIX	PDO

9. BFR & 95th

CRASH_EVNT_1_CD	CRASH_EVNT_2_CD	CRASH_EVNT_3_CD	CRASH_CAUSE_1_CD	CRASH_CAUSE_2_CD	CRASH_CAUSE_3_CD	LAT DEG NO	LAT MINUTE NO	LAT SEC NO	LAT	LONGTD DEG NO	LONGTD MINUTE NO	LONGTD SEC NO	LONG	VHCL_ID	STRIKG_VHCL_FLG	VHCL_CODED_SEQ_NO	VHCL_TYP_SHORT_DESC	VHCL_USE_SHORT_DESC	TRLR_QTY	VHCL_OWNSHP_SHORT_DESC	VHCL_MVMNT_SHORT_DESC	VHCL_CMPSS_DIR_FROM_SHORT_DESC	VHCL_CMPSS_DIR_TO_SHORT_DESC	VHCL_ACTN_CD	VHCL_EVNT_1_CD	VHCL_EVNT_2_CD	VHCL_EVNT_3_CD	VHCL_CAUSE_1_CD
			27	29		45	20	16.41	45.33789167	-122	46	21.63	-122.772675	3221580	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	W	E	000				00
			27	29		45	20	16.41	45.33789167	-122	46	21.63	-122.772675	3221581	0	2	PSNGR CAR	NONE	9	N/A	STOP	W	E	011				00
			29			45	20	16.42	45.33789444	-122	46	21.64	-122.7726778	3360120	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	N	S	000				00
			29			45	20	16.42	45.33789444	-122	46	21.64	-122.7726778	3360121	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	N	S	011				00
			02			45	20	16.64	45.33795556	-122	46	21.77	-122.7727139	3304293	1	1	PSNGR CAR	NONE	9	N/A	TURN-L	S	W	000				00
			02			45	20	16.64	45.33795556	-122	46	21.77	-122.7727139	3304294	0	2	PSNGR CAR	NONE	9	N/A	STRGHT	N	S	000				00
			29			45	20	15.55	45.33765278	-122	46	23.78	-122.7732722	3118254	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	S	N	000				00
			29			45	20	15.55	45.33765278	-122	46	23.78	-122.7732722	3118255	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	S	N	011				00
040			10			45	20	15	45.3375	-122	46	24.07	-122.7733528	3530174	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	N	S	000				00

VHCL_CAUSE_2_CD	VHCL_CAUSE_3_CD	PARTIC_ID	STRIKG_PARTIC_FLG	PARTIC_VHCL_SEQ_NO	PARTIC_TYP_CD	PARTIC_TYP_SHORT_DESC	PARTIC_MVMNT_SHORT_DESC	PARTIC_CMPSS_DIR_FROM_SHORT_DESC	PARTIC_CMPSS_DIR_TO_SHORT_DESC	INJ_SVRTY_SHORT_DESC	AGE_VAL	SEX_CD	DRVR_LIC_STAT_SHORT_DESC	DRVR_RES_SHORT_DESC	PARTIC_ACTN_CD	NON_MOTRST_LOC_SHORT_DESC	PARTIC_ERR_1_CD	PARTIC_ERR_2_CD	PARTIC_ERR_3_CD	PARTIC_EVNT_1_CD	PARTIC_EVNT_2_CD	PARTIC_EVNT_3_CD	PARTIC_CAUSE_1_CD	PARTIC_CAUSE_2_CD	PARTIC_CAUSE_3_CD	TOTAL_CRASHES	TOTAL_ROWS
		3674057	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			28	54
		3674058	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			28	54
		3828637	0	1	1	DRVR				NONE	35	2	OR-Y	OR<25	000		026						29			28	54
		3828638	0	1	1	DRVR				INJC	19	1	OR-Y	OR<25	000		000						00			28	54
		3770027	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			28	54
		3770028	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			28	54
		3557115	0	1	1	DRVR				NONE	20	2	OR-Y	OR<25	000		026						29			28	54
		3557116	0	1	1	DRVR				NONE	00	1	UNK	UNK	000		000						00			28	54
		4016835	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			28	54

CRASH_ID	INT_ID	SER_NO	INVSTG_AGY_SHORT_DESC	CRASH_SPEED_INVLV_FLG	ALCHL_INVLV_FLG	DRUG_INVLV_FLG	MJ_INVLV_FLG	SCHL_ZONE_IND	WRK_ZONE_IND	LANE RDWY DPRT CRASH FLG	UNLOCT FLG	CRASH_DT	CRASH_WK_DAY_CD	CRASH_HR_SHORT_DESC	CNTY_NM	CITY_SECT_NM	URB_AREA_SHORT_NM	HWY_NO	HWY_MED_NM	RDWY_NO	FC_CD	HWY_COMPNT_CD	HWY_COMPNT_SHORT_DESC	MLGE_TYP_CD	RD_CON_NO	LRS VAL
1632481	10	01360	NONE	0	0	0		0	0	N	FALSE	2/17/2015	3	9A	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1632481	10	01360	NONE	0	0	0		0	0	N	FALSE	2/17/2015	3	9A	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1699409	10	82258	NONE	0	0	0		0	0	N	FALSE	5/13/2016	6	5P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1699409	10	82258	NONE	0	0	0		0	0	N	FALSE	5/13/2016	6	5P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1704885	10	83435	NONE	0	0	0		0	0	N	FALSE	7/28/2016	5	5P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1704885	10	83435	NONE	0	0	0		0	0	N	FALSE	7/28/2016	5	5P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1612188	10	04248	NONE	0	0	0		0	0	N	FALSE	7/28/2015	3	11A	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1612188	10	04248	NONE	0	0	0		0	0	N	FALSE	7/28/2015	3	11A	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1632453	10	80403	COUNTY	0	0	0		0	0	N	FALSE	2/1/2015	1	12P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1632453	10	80403	COUNTY	0	0	0		0	0	N	FALSE	2/1/2015	1	12P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1649015	10	83738	NONE	0	0	0		0	0	N	FALSE	9/12/2015	7	1P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	11	0	MN	0		014100200S00
1649015	10	83738	NONE	0	0	0		0	0	N	FALSE	9/12/2015	7	1P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	11	0	MN	0		014100200S00
1687096	10	86048	NONE	0	0	0		0	0	N	FALSE	12/26/2016	2	1P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1687096	10	86048	NONE	0	0	0		0	0	N	FALSE	12/26/2016	2	1P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1687096	10	86048	NONE	0	0	0		0	0	N	FALSE	12/26/2016	2	1P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1699410	10	82366	NONE	0	0	0		0	0	N	FALSE	5/3/2016	3	11A	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1699410	10	82366	NONE	0	0	0		0	0	N	FALSE	5/3/2016	3	11A	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1704530	10	93229	STATE	0	0	0		0	0	N	FALSE	7/17/2016	1	5P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1704530	10	93229	STATE	0	0	0		0	0	N	FALSE	7/17/2016	1	5P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1753150	10	81289	NONE	0	0	0		0	0	N	FALSE	4/6/2017	5	1P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1753150	10	81289	NONE	0	0	0		0	0	N	FALSE	4/6/2017	5	1P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1781967	10	81337	COUNTY	0	0	0		0	0	N	FALSE	4/21/2018	7	9A	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1781967	10	81337	COUNTY	0	0	0		0	0	N	FALSE	4/21/2018	7	9A	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1723717	10	82086	NO RPT	0	0	0		0	0	N	FALSE	5/28/2017	1	12P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1723717	10	82086	NO RPT	0	0	0		0	0	N	FALSE	5/28/2017	1	12P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1612720	10	04541	NONE	0	0	0		0	0	N	FALSE	8/10/2015	2	7P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1612720	10	04541	NONE	0	0	0		0	0	N	FALSE	8/10/2015	2	7P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1630443	10	80033	NONE	0	0	0		0	0	N	FALSE	1/4/2015	1	1P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1630443	10	80033	NONE	0	0	0		0	0	N	FALSE	1/4/2015	1	1P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1631865	10	00966	NONE	0	0	0		0	0	N	FALSE	2/17/2015	3	11A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1631865	10	00966	NONE	0	0	0		0	0	N	FALSE	2/17/2015	3	11A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1753557	10	02060	NONE	0	0	0		0	0	N	FALSE	4/11/2017	3	2P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1753557	10	02060	NONE	0	0	0		0	0	N	FALSE	4/11/2017	3	2P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1853575	10	83309	NONE	0	0	0		0	0	N	FALSE	9/25/2019	4	5P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1853575	10	83309	NONE	0	0	0		0	0	N	FALSE	9/25/2019	4	5P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1626094	10	84469	STATE	0	0	0		0	0	N	FALSE	10/29/2015	5	6A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1626094	10	84469	STATE	0	0	0		0	0	N	FALSE	10/29/2015	5	6A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1651205	10	84886	NONE	0	0	0		0	0	N	FALSE	11/18/2015	4	3P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1651205	10	84886	NONE	0	0	0		0	0	N	FALSE	11/18/2015	4	3P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1687203	10	86095	NONE	0	0	0		0	0	N	FALSE	12/26/2016	2	1P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1687203	10	86095	NONE	0	0	0		0	0	N	FALSE	12/26/2016	2	1P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1687203	10	86095	NONE	0	0	0		0	0	N	FALSE	12/26/2016	2	1P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1693176	10	03235	NONE	0	0	0		0	0	N	FALSE	5/17/2016	3	6P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1693176	10	03235	NONE	0	0	0		0	0	N	FALSE	5/17/2016	3	6P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1758535	10	04726	NONE	0	0	0		0	0	N	FALSE	8/2/2017	4	12P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1758535	10	04726	NONE	0	0	0		0	0	N	FALSE	8/2/2017	4	12P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1845329	10	81925	NO RPT	0	0	0		0	0	N	FALSE	6/1/2019	7	4P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1845329	10	81925	NO RPT	0	0	0		0	0	N	FALSE	6/1/2019	7	4P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1845329	10	81925	NO RPT	0	0	0		0	0	N	FALSE	6/1/2019	7	4P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1694438	10	04109	NONE	0	0	0		0	0	N	FALSE	6/6/2016	2	2P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1694438	10	04109	NONE	0	0	0		0	0	N	FALSE	6/6/2016	2	2P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1704886	10	83437	NONE	0	0	0		0	0	N	FALSE	7/28/2016	5	6P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1704886	10	83437	NONE	0	0	0		0	0	N	FALSE	7/28/2016	5	6P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1725344	10	83381	NONE	0	0	0		0	0	N	FALSE	8/17/2017	5	10A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1725344	10	83381	NONE	0	0	0		0	0	N	FALSE	8/17/2017	5	10A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1836587	10	82232	STATE	0	0	0		0	0	N	FALSE	7/2/2019	3	9A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1836587	10	82232	STATE	0	0	0		0	0	N	FALSE	7/2/2019	3	9A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1836774	10	81858	NONE	0	0	0		0	0	N	FALSE	6/5/2019	4	3P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1836774	10	81858	NONE	0	0	0		0	0	N	FALSE	6/5/2019	4	3P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1687046	10	82144	NONE	0	0	0		0	0	N	FALSE	5/12/2016	5	6P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1687046	10	82144	NONE	0	0	0		0	0	N	FALSE	5/12/2016	5	6P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1804748	10	80569	COUNTY	0	0	0		0	0	N	FALSE	2/16/2018	6	4P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1804748	10	80569	COUNTY	0	0	0		0	0	N	FALSE	2/16/2018	6	4P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1800560	10	05141	STATE	0	0	0		0	0	N	FALSE	9/20/2018	5	4P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1800560	10	05141	STATE	0	0	0		0	0	N	FALSE	9/20/2018	5	4P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1800560	10	05141	STATE	0	0	0		0	0	N	FALSE	9/20/2018	5	4P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1718531	10	00901	STATE	0	0	0		0	0	N	FALSE	2/16/2017	5	7A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1718531	10	00901	STATE	0	0	0		0	0	N	FALSE	2/16/2017	5	7A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00

10. I-5 SB Ramps & BFR

CRASH_ID	INT_ID	SER_NO	INVSTG_AGY_SHORT_DESC	CRASH_SPEED_INVLV_FLG	ALCHL_INVLV_FLG	DRUG_INVLV_FLG	MJ_INVLV_FLG	SCHL_ZONE_IND	WRK_ZONE_IND	LANE RDWY DPRT CRASH FLG	UNLOCT FLG	CRASH_DT	CRASH_WK_DAY_CD	CRASH_HR_SHORT_DESC	CNTY_NM	CITY_SECT_NM	URB_AREA_SHORT_NM	HWY_NO	HWY_MED_NM	RDWY_NO	FC_CD	HWY_COMPNT_CD	HWY_COMPNT_SHORT_DESC	MLGE_TYP_CD	RD_CON_NO	LRS VAL
1718531	10	00901	STATE	0	0	0		0	0	N	FALSE	2/16/2017	5	7A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1718531	10	00901	STATE	0	0	0		0	0	N	FALSE	2/16/2017	5	7A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1712831	10	85441	STATE	0	0	0		0	0	N	FALSE	11/23/2016	4	5P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1712831	10	85441	STATE	0	0	0		0	0	N	FALSE	11/23/2016	4	5P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1723806	10	81813	NONE	0	0	0		0	0	N	FALSE	5/10/2017	4	5P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1723806	10	81813	NONE	0	0	0		0	0	N	FALSE	5/10/2017	4	5P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1726389	10	84900	NONE	0	0	0		0	0	N	FALSE	11/20/2017	2	6A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1726389	10	84900	NONE	0	0	0		0	0	N	FALSE	11/20/2017	2	6A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1604708	10	00738	NONE	0	0	0		0	0	N	FALSE	2/9/2015	2	8P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1604708	10	00738	NONE	0	0	0		0	0	N	FALSE	2/9/2015	2	8P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1725342	10	83199	NONE	0	0	0		0	0	N	FALSE	8/5/2017	7	2P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1725342	10	83199	NONE	0	0	0		0	0	N	FALSE	8/5/2017	7	2P	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1721473	10	84379	NO RPT	0	0	0		0	0	N	FALSE	8/19/2017	7	9A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00
1721473	10	84379	NO RPT	0	0	0		0	0	N	FALSE	8/19/2017	7	9A	Washington	Wilsonville	PORTLAND UA	001	PACIFIC	1	11	6	CN	0	1	0001RH100S00

MP_NO	ST_NO	ST_NM	ISECT_ST_NO	ISECT_ST_NM	RD_CHAR_CD	RD_CHAR_SHORT_DESC	CMPSS_DIR_CD	CMPSS_DIR_FROM_CD	CMPSS_DIR_SHORT_DESC	IMPCT_LOC_CD	ISECT_TYP_SHORT_DESC	MEDN_TYP_SHORT_DESC	TURNG_LEG_QTY	LN_QTY	ISECT_REL_FLG	TRAF_CNTL_DEVICE_SHORT_DESC	OFF_RDWY_FLG	RNDABT_FLG	DRVWY_REL_FLG	WTHR_COND_SHORT_DESC	RD_SURF_SHORT_DESC	LGT_COND_SHORT_DESC	CRASH_TYP_SHORT_DESC	COLLIS_TYP_SHORT_DESC	CRASH_SVRTY_SHORT_DESC
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	1		N	09	CROSS		1		0	YIELD	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	1		N	09	CROSS		1		0	YIELD	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		1		0	STOP SIGN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		1		0	STOP SIGN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	4		SE	05	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-OTHER	TURN	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	4		SE	05	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-OTHER	TURN	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	4		SE	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	4		SE	06	CROSS		0		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	8		NW	05	CROSS		1		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	ANGL-OTH	TURN	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	8		NW	05	CROSS		1		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	ANGL-OTH	TURN	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	01	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	ANGL	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	01	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	ANGL	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	01	3-LEG		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-OTHER	REAR	INJ
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	01	3-LEG		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-OTHER	REAR	INJ
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	01	3-LEG		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-OTHER	REAR	INJ
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	01	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	01	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	01	CROSS		2		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	ANGL	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	01	CROSS		2		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	ANGL	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	01	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	01	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	PDO
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	01	3-LEG		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	INJ
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	01	3-LEG		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	INJ
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	02	CROSS		2		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	INJ
12.73	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	02	CROSS		2		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	INJ
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	1		N	09	CROSS		1		0	YIELD	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	1		N	09	CROSS		1		0	YIELD	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	1		N	09	3-LEG		1		0	YIELD	0	0	0	RAIN	WET	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	1		N	09	3-LEG		1		0	YIELD	0	0	0	RAIN	WET	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	1		N	09	CROSS		1		0	YIELD	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	1		N	09	CROSS		1		0	YIELD	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	1		N	09	CROSS		2		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	1		N	09	CROSS		2		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	1		N	09	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	1		N	09	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		1		0	TRF SIGNAL	0	0	0	RAIN	WET	DLIT	S-1STOP	REAR	INJ
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		1		0	TRF SIGNAL	0	0	0	RAIN	WET	DLIT	S-1STOP	REAR	INJ
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		1		0	R-GRN-SIG	0	0	0	CLR	WET	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		1		0	R-GRN-SIG	0	0	0	CLR	WET	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		2		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-STRGHT	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		2		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-STRGHT	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		2		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		2		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	06	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	09	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1TURN	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	09	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1TURN	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	09	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1TURN	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	09	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1TURN	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	09	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	2		NE	09	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	7		W	09	CROSS		2		0	TRF SIGNAL	0	0	0	CLD	DRY	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	7		W	09	CROSS		2		0	TRF SIGNAL	0	0	0	CLD	DRY	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	7		W	09	CROSS		2		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	7		W	09	CROSS		2		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	8		NW	09	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	8		NW	09	CROSS		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	03	CROSS		1		0	L-GRN-SIG	0	0	0	CLD	WET	DAY	S-OTHER	TURN	PDO
286.72	00201	SW BEAV-TUALATIN HY	09501	SB EX BEAV-TUAL C1	1	INTER	9		CN	03	CROSS		1		0	L-GRN-SIG	0	0	0	CLD	WET	DAY	S-OTHER	TURN	PDO
286.63	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	3	STRGHT	2		NE	03		NONE		1	0	ONE-WAY	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.63	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	3	STRGHT	2		NE	03		NONE		1	0	ONE-WAY	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.63	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	3	STRGHT	2		NE	03		NONE		1	0	ONE-WAY	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.66	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	7	GRADE	2		NE	04		DIVMD		3	0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	S-STRGHT	REAR	INJ
286.66	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	7	GRADE	2		NE	04		DIVMD		3	0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	S-STRGHT	REAR	INJ

10. I-5 SB Ramps & BFR

MP_NO	ST_NO	ST_NM	ISECT_ST_NO	ISECT_ST_NM	RD_CHAR_CD	RD_CHAR_SHORT_DESC	CMPSS_DIR_CD	CMPSS_DIR_FROM_CD	CMPSS_DIR_SHORT_DESC	IMPCT_LOC_CD	ISECT_TYP_SHORT_DESC	MEDN_TYP_SHORT_DESC	TURNG_LEG_QTY	LN_QTY	ISECT_REL_FLG	TRAF_CNTL_DEVICE_SHORT_DESC	OFF_RDWY_FLG	RNDABT_FLG	DRVWY_REL_FLG	WTHR_COND_SHORT_DESC	RD_SURF_SHORT_DESC	LGT_COND_SHORT_DESC	CRASH_TYP_SHORT_DESC	COLLIS_TYP_SHORT_DESC	CRASH_SVRTY_SHORT_DESC
286.66	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	7	GRADE	2		NE	04		DIVMD		3	0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	S-STRGHT	REAR	INJ
286.66	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	7	GRADE	2		NE	04		DIVMD		3	0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	S-STRGHT	REAR	INJ
286.69	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	7	GRADE	2		NE	04		NONE		3	0	UNKNOWN	0	0	0	RAIN	WET	DUSK	S-STRGHT	REAR	PDO
286.69	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	7	GRADE	2		NE	04		NONE		3	0	UNKNOWN	0	0	0	RAIN	WET	DUSK	S-STRGHT	REAR	PDO
286.69	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	3	STRGHT	2		NE	04		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
286.69	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	3	STRGHT	2		NE	04		NONE		2	0	UNKNOWN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
286.7	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	3	STRGHT	2		NE	04		NONE		2	0	UNKNOWN	0	0	0	RAIN	WET	DARK	S-1STOP	REAR	PDO
286.7	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	3	STRGHT	2		NE	04		NONE		2	0	UNKNOWN	0	0	0	RAIN	WET	DARK	S-1STOP	REAR	PDO
286.7	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	3	STRGHT	2		NE	05		NONE		6	0	TRF SIGNAL	0	0	0	RAIN	WET	DLIT	S-1STOP	REAR	INJ
286.7	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	3	STRGHT	2		NE	05		NONE		6	0	TRF SIGNAL	0	0	0	RAIN	WET	DLIT	S-1STOP	REAR	INJ
286.72	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	1	INTER	1		N	09	CROSS		2		0	TRF SIGNAL	0	0	0	UNK	UNK	DAY	S-1STOP	REAR	PDO
286.72	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	1	INTER	1		N	09	CROSS		2		0	TRF SIGNAL	0	0	0	UNK	UNK	DAY	S-1STOP	REAR	PDO
286.72	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	1	INTER	2		NE	06	3-LEG		2		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
286.72	09501	SB EX BEAV-TUAL C1	00201	SW BEAV-TUALATIN HY	1	INTER	2		NE	06	3-LEG		2		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ

10. I-5 SB Ramps & BFR

CRASH_EVNT_1_CD	CRASH_EVNT_2_CD	CRASH_EVNT_3_CD	CRASH_CAUSE_1_CD	CRASH_CAUSE_2_CD	CRASH_CAUSE_3_CD	LAT DEG NO	LAT MINUTE NO	LAT SEC NO	LAT	LONGTD DEG NO	LONGTD MINUTE NO	LONGTD SEC NO	LONG	VHCL_ID	STRIKG_VHCL_FLG	VHCL_CODED_SEQ_NO	VHCL_TYP_SHORT_DESC	VHCL_USE_SHORT_DESC	TRLR_QTY	VHCL_OWNSHP_SHORT_DESC	VHCL_MVMNT_SHORT_DESC	VHCL_CMPSS_DIR_FROM_SHORT_DESC	VHCL_CMPSS_DIR_TO_SHORT_DESC	VHCL_ACTN_CD	VHCL_EVNT_1_CD	VHCL_EVNT_2_CD	VHCL_EVNT_3_CD	VHCL_CAUSE_1_CD
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3083127	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-R	NE	NW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3083128	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	NW	013				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3207432	1	1	UNKNOWN	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3207433	0	2	PSNGR CAR	NONE	9	N/A	STOP	NE	SW	011				00
			08			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3217471	1	1	SEMI TOW	NONE	9	N/A	TURN-L	NE	SE	000				00
			08			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3217472	0	2	PSNGR CAR	NONE	9	N/A	TURN-L	NE	SE	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3044745	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	SE	NW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3044746	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	SE	NW	011				00
			02			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3083074	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	SE	NW	000				00
			02			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3083075	0	2	PSNGR CAR	NONE	0	PRVTE	TURN-R	NE	NW	000				00
			04			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3113596	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	SE	NW	000				00
			04			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3113597	0	2	PSNGR CAR	NONE	0	PRVTE	TURN-L	NE	SE	000				00
			27			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3185799	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-R	NE	NW	000				00
			27			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3185800	0	2	PSNGR CAR	NONE	0	PRVTE	TURN-R	NE	NW	000				00
			27			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3185800	0	2	PSNGR CAR	NONE	0	PRVTE	TURN-R	NE	NW	000				00
			04			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3207434	1	1	PSNGR CAR	NONE	9	N/A	TURN-L	NE	SE	000				00
			04			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3207435	0	2	PSNGR CAR	NONE	9	N/A	STRGHT	SE	NW	000				00
			04			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3216837	1	1	PSNGR CAR	NONE	9	N/A	TURN-L	NE	SE	000				00
			04			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3216838	0	2	PSNGR CAR	NONE	9	N/A	STRGHT	SE	NW	000				00
			02			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3306731	1	1	PSNGR CAR	NONE	9	N/A	TURN-R	NE	NW	000				00
			02			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3306732	0	2	PSNGR CAR	NONE	9	N/A	STRGHT	SE	NW	000				00
			04			45	20	12.47	45.33679722	-122	46	17.16	-122.7714333	3358501	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	SE	NW	000				00
			04			45	20	12.47	45.33679722	-122	46	17.16	-122.7714333	3358502	0	2	PSNGR CAR	NONE	0	PRVTE	TURN-L	NE	SE	000				00
			04			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3251867	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	SE	NW	000				00
			04			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3251868	0	2	PSNGR CAR	NONE	0	PRVTE	TURN-L	NE	SE	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3045786	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-R	NE	NW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3045787	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	NW	013				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3079325	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-R	NE	NW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3079326	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	NW	013				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3081966	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-R	NE	NW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3081967	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	NW	013				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3307445	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3307446	0	2	PSNGR CAR	NONE	9	N/A	STOP	NE	SW	011				00
			29			45	20	12.46	45.33679444	-122	46	17.16	-122.7714333	3491367	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	E	W	000				00
			29			45	20	12.46	45.33679444	-122	46	17.16	-122.7714333	3491368	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	E	W	011				00
			07			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3071378	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
			07			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3071379	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3117693	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3117694	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			27			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3185994	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
			27			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3185995	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			27			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3185995	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3196524	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3196525	0	2	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			27	29		45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3316389	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			27	29		45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3316390	0	2	PSNGR CAR	NONE	9	N/A	STOP	NE	SW	011				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3475744	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3475745	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3475745	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3198735	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3198736	0	2	PSNGR CAR	NONE	9	N/A	TURN-R	NE	NW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3217473	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3217474	0	2	PSNGR CAR	NONE	9	N/A	TURN-R	NE	NW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3254898	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3254899	0	2	PSNGR CAR	NONE	9	N/A	STOP	NE	SW	011				00
			27			45	20	12.45	45.33679167	-122	46	17.16	-122.7714333	3458847	1	1	PSNGR CAR	NONE	9	N/A	TURN-R	NE	NW	000				00
			27			45	20	12.45	45.33679167	-122	46	17.16	-122.7714333	3458848	0	2	PSNGR CAR	NONE	9	N/A	STOP	NE	NW	011				00
			29			45	20	12.43	45.33678611	-122	46	17.19	-122.7714417	3459201	1	1	PSNGR CAR	NONE	9	N/A	TURN-R	NE	NW	000				00
			29			45	20	12.43	45.33678611	-122	46	17.19	-122.7714417	3459202	0	2	PSNGR CAR	NONE	9	N/A	STOP	NE	NW	011				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3185701	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3185702	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			08			45	20	12.48	45.3368	-122	46	17.18	-122.7714389	3401809	1	1	PSNGR CAR	NONE	9	N/A	TURN-L	NE	SE	000				00
			08			45	20	12.48	45.3368	-122	46	17.18	-122.7714389	3401810	0	2	PSNGR CAR	NONE	9	N/A	TURN-L	NE	SE	000				00
013			07			45	20	16.15	45.33781944	-122	46	13.13	-122.7703139	3394015	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
013			07			45	20	16.15	45.33781944	-122	46	13.13	-122.7703139	3394016	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011	013			00
013			07			45	20	16.15	45.33781944	-122	46	13.13	-122.7703139	3394017	0	3	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
013			07			45	20	14.95	45.33748611	-122	46	14.55	-122.7707083	3241806	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
013			07			45	20	14.95	45.33748611	-122	46	14.55	-122.7707083	3241807	0	2	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	006	013			00

CRASH_EVNT_1_CD	CRASH_EVNT_2_CD	CRASH_EVNT_3_CD	CRASH_CAUSE_1_CD	CRASH_CAUSE_2_CD	CRASH_CAUSE_3_CD	LAT DEG NO	LAT MINUTE NO	LAT SEC NO	LAT	LONGTD DEG NO	LONGTD MINUTE NO	LONGTD SEC NO	LONG	VHCL_ID	STRIKG_VHCL_FLG	VHCL_CODED_SEQ_NO	VHCL_TYP_SHORT_DESC	VHCL_USE_SHORT_DESC	TRLR_QTY	VHCL_OWNSHP_SHORT_DESC	VHCL_MVMNT_SHORT_DESC	VHCL_CMPSS_DIR_FROM_SHORT_DESC	VHCL_CMPSS_DIR_TO_SHORT_DESC	VHCL_ACTN_CD	VHCL_EVNT_1_CD	VHCL_EVNT_2_CD	VHCL_EVNT_3_CD	VHCL_CAUSE_1_CD
013			07			45	20	14.95	45.33748611	-122	46	14.55	-122.7707083	3241808	0	3	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	022	013			00
013			07			45	20	14.95	45.33748611	-122	46	14.55	-122.7707083	3241809	0	4	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	022				00
			29			45	20	13.8	45.33716667	-122	46	16.04	-122.7711222	3231752	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	20	13.8	45.33716667	-122	46	16.04	-122.7711222	3231753	0	2	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	20	13.8	45.33716667	-122	46	16.04	-122.7711222	3252046	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	20	13.8	45.33716667	-122	46	16.04	-122.7711222	3252047	0	2	PSNGR CAR	NONE	9	N/A	STOP	NE	SW	011				00
			29			45	20	13.38	45.33705	-122	46	16.47	-122.7712417	3256871	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	20	13.38	45.33705	-122	46	16.47	-122.7712417	3256872	0	2	PSNGR CAR	NONE	9	N/A	STOP	NE	SW	011				00
			29			45	20	13.38	45.33705	-122	46	16.47	-122.7712417	3030152	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
			29			45	20	13.38	45.33705	-122	46	16.47	-122.7712417	3030153	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3254894	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	NE	SW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3254895	0	2	PSNGR CAR	NONE	9	N/A	STOP	NE	SW	011				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3247471	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	NE	SW	000				00
			29			45	20	12.46	45.33679444	-122	46	17.15	-122.7714306	3247472	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	NE	SW	011				00

VHCL_CAUSE_2_CD	VHCL_CAUSE_3_CD	PARTIC_ID	STRIKG_PARTIC_FLG	PARTIC_VHCL_SEQ_NO	PARTIC_TYP_CD	PARTIC_TYP_SHORT_DESC	PARTIC_MVMNT_SHORT_DESC	PARTIC_CMPSS_DIR_FROM_SHORT_DESC	PARTIC_CMPSS_DIR_TO_SHORT_DESC	INJ_SVRTY_SHORT_DESC	AGE_VAL	SEX_CD	DRVR_LIC_STAT_SHORT_DESC	DRVR_RES_SHORT_DESC	PARTIC_ACTN_CD	NON_MOTRST_LOC_SHORT_DESC	PARTIC_ERR_1_CD	PARTIC_ERR_2_CD	PARTIC_ERR_3_CD	PARTIC_EVNT_1_CD	PARTIC_EVNT_2_CD	PARTIC_EVNT_3_CD	PARTIC_CAUSE_1_CD	PARTIC_CAUSE_2_CD	PARTIC_CAUSE_3_CD	TOTAL_CRASHES	TOTAL_ROWS
		3522286	0	1	1	DRVR				NONE	00	1	UNK	UNK	000		026						29			38	82
		3522287	0	1	1	DRVR				NONE	37	1	OR-Y	OR>25	000		000						00			38	82
		3660279	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3660280	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3670063	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3670064	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3475379	0	1	1	DRVR				NONE	20	1	OR-Y	OR<25	000		026						29			38	82
		3475380	0	1	1	DRVR				INJC	55	1	OR-Y	OR<25	000		000						00			38	82
		3522232	0	1	1	DRVR				NONE	65	1	OR-Y	OR<25	000		000						00			38	82
		3522233	0	1	1	DRVR				NONE	75	2	OR-Y	OR<25	000		028						02			38	82
		3552539	0	1	1	DRVR				NONE	55	2	OTH-Y	N-RES	000		020						04			38	82
		3552540	0	1	1	DRVR				NONE	53	2	OR-Y	OR<25	000		000						00			38	82
		3639181	0	1	1	DRVR				NONE	41	2	OTH-Y	N-RES	038		042	016					27			38	82
		3639182	0	1	1	DRVR				INJC	30	2	OR-Y	OR<25	000		000						00			38	82
		3639183	0	2	2	PSNG				NO<5	01	2			000		000						00			38	82
		3660281	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3660282	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3669447	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3669448	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3772448	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3772449	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3826570	0	1	1	DRVR				NONE	17	2	OR-Y	OR<25	000		097						00			38	82
		3826571	0	1	1	DRVR				INJC	17	2	OR-Y	OR<25	000		097						00			38	82
		3706682	0	1	1	DRVR				NONE	37	2	OR-Y	OR<25	000		020						04			38	82
		3706683	0	1	1	DRVR				INJC	33	2	OR-Y	OR<25	000		000						00			38	82
		3476724	0	1	1	DRVR				NONE	00	1	UNK	UNK	000		026						29			38	82
		3476725	0	1	1	DRVR				INJC	30	2	OR-Y	OR<25	000		000						00			38	82
		3518531	0	1	1	DRVR				NONE	00	1	OTH-Y	N-RES	000		026						29			38	82
		3518532	0	1	1	DRVR				NONE	43	2	OR-Y	OR<25	000		000						00			38	82
		3521152	0	1	1	DRVR				NONE	45	1	OR-Y	OR<25	000		026						29			38	82
		3521153	0	1	1	DRVR				NONE	00	1	OR-Y	OR>25	000		000						00			38	82
		3773146	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3773147	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3979012	0	1	1	DRVR				NONE	37	2	OR-Y	OR<25	000		026						29			38	82
		3979013	0	1	1	DRVR				INJC	20	1	OR-Y	OR<25	000		000						00			38	82
		3508648	0	1	1	DRVR				NONE	47	1	NONE	OR<25	000		043						07			38	82
		3508649	0	1	1	DRVR				INJC	50	2	OR-Y	OR<25	000		000						00			38	82
		3556569	0	1	1	DRVR				NONE	68	2	OR-Y	OR<25	000		026						29			38	82
		3556570	0	1	1	DRVR				NONE	68	2	OR-Y	OR<25	000		000						00			38	82
		3639422	0	1	1	DRVR				NONE	41	2	OTH-Y	N-RES	000		026	016					27			38	82
		3639423	0	1	1	DRVR				INJC	30	2	OR-Y	OR<25	000		000						00			38	82
		3639424	0	2	2	PSNG				NO<5	01	2			000		000						00			38	82
		3649648	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3649649	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3781857	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3781858	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3960338	0	1	1	DRVR				NONE	49	2	OR-Y	OR<25	000		026						29			38	82
		3960339	0	1	1	DRVR				NONE	25	2	OR-Y	OR<25	000		000						00			38	82
		3960340	0	2	2	PSNG				INJC	23	2			000		000						00			38	82
		3651808	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3651809	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3670065	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3670066	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3710035	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3710036	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3940348	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3940349	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3940745	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3940746	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3639052	0	1	1	DRVR				NONE	19	1	OR-Y	OR<25	000		026						29			38	82
		3639053	0	1	1	DRVR				INJC	68	1	OR-Y	OR<25	000		000						00			38	82
		3880309	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3880310	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3871334	0	1	1	DRVR				NONE	20	1	OR-Y	OR<25	000		043	042					07			38	82
		3871335	0	1	1	DRVR				INJB	45	1	OR-Y	OR<25	022		000						00			38	82
		3871336	0	1	1	DRVR				NONE	42	1	OR-Y	OR<25	000		000						00			38	82
		3694486	0	1	1	DRVR				NONE	63	2	OR-Y	OR<25	000		043						07			38	82
		3694487	0	1	1	DRVR				INJC	48	1	OR-Y	OR<25	000		000						00			38	82

VHCL_CAUSE_2_CD	VHCL_CAUSE_3_CD	PARTIC_ID	STRIKG_PARTIC_FLG	PARTIC_VHCL_SEQ_NO	PARTIC_TYP_CD	PARTIC_TYP_SHORT_DESC	PARTIC_MVMNT_SHORT_DESC	PARTIC_CMPSS_DIR_FROM_SHORT_DESC	PARTIC_CMPSS_DIR_TO_SHORT_DESC	INJ_SVRTY_SHORT_DESC	AGE_VAL	SEX_CD	DRVR_LIC_STAT_SHORT_DESC	DRVR_RES_SHORT_DESC	PARTIC_ACTN_CD	NON_MOTRST_LOC_SHORT_DESC	PARTIC_ERR_1_CD	PARTIC_ERR_2_CD	PARTIC_ERR_3_CD	PARTIC_EVNT_1_CD	PARTIC_EVNT_2_CD	PARTIC_EVNT_3_CD	PARTIC_CAUSE_1_CD	PARTIC_CAUSE_2_CD	PARTIC_CAUSE_3_CD	TOTAL_CRASHES	TOTAL_ROWS
		3694488	0	1	1	DRVR				NONE	29	1	OTH-Y	N-RES	000		000						00			38	82
		3694489	0	1	1	DRVR				INJC	26	2	OR-Y	OR<25	000		000						00			38	82
		3683981	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3683982	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3706892	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3706893	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3712222	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3712223	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3457515	0	1	1	DRVR				NONE	18	1	OR-Y	OR<25	000		026						29			38	82
		3457516	0	1	1	DRVR				INJC	47	2	OR-Y	OR<25	000		000						00			38	82
		3710030	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3710031	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			38	82
		3701339	0	1	1	DRVR				NONE	53	1	OTH-Y	N-RES	000		026						29			38	82
		3701340	0	1	1	DRVR				INJC	58	1	OR-Y	OR<25	000		000						00			38	82

11. I-5 NB Ramps & Elligsen

CRASH_ID	INT_ID	SER_NO	INVSTG_AGY_SHORT_DESC	CRASH_SPEED_INVLV_FLG	ALCHL_INVLV_FLG	DRUG_INVLV_FLG	MJ_INVLV_FLG	SCHL_ZONE_IND	WRK_ZONE_IND	LANE RDWY DPRT CRASH FLG	UNLOCT FLG	CRASH_DT	CRASH_WK_DAY_CD	CRASH_HR_SHORT_DESC	CNTY_NM	CITY_SECT_NM	URB_AREA_SHORT_NM	HWY_NO	HWY_MED_NM	RDWY_NO	FC_CD	HWY_COMPNT_CD	HWY_COMPNT_SHORT_DESC	MLGE_TYP_CD	RD_CON_NO	LRS VAL
1621728	11	83819	NONE	0	0	0		0	0	N	FALSE	9/16/2015	4	12P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1621728	11	83819	NONE	0	0	0		0	0	N	FALSE	9/16/2015	4	12P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1684519	11	85119	COUNTY	0	0	0		0	0	N	FALSE	11/5/2016	7	1P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	1	11	6	CN	0	1	0141AB100S00
1684519	11	85119	COUNTY	0	0	0		0	0	N	FALSE	11/5/2016	7	1P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	1	11	6	CN	0	1	0141AB100S00
1684519	11	85119	COUNTY	0	0	0		0	0	N	FALSE	11/5/2016	7	1P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	1	11	6	CN	0	1	0141AB100S00
1793598	11	84057	NONE	0	0	0		0	0	N	FALSE	11/2/2018	6	12P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1793598	11	84057	NONE	0	0	0		0	0	N	FALSE	11/2/2018	6	12P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1629008	11	81046	NONE	0	0	0		0	0	N	FALSE	3/26/2015	5	3P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1629008	11	81046	NONE	0	0	0		0	0	N	FALSE	3/26/2015	5	3P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1863950	11	06260	NONE	0	0	0		0	0	N	FALSE	11/28/2019	5	9P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1863950	11	06260	NONE	0	0	0		0	0	N	FALSE	11/28/2019	5	9P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1775759	11	01502	NONE	0	0	0		0	0	N	FALSE	1/21/2018	1	2P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1775759	11	01502	NONE	0	0	0		0	0	N	FALSE	1/21/2018	1	2P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1649747	11	84235	NONE	0	0	0		0	0	N	FALSE	10/13/2015	3	4P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1649747	11	84235	NONE	0	0	0		0	0	N	FALSE	10/13/2015	3	4P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1609274	11	81822	CITY	0	0	0		0	1	N	FALSE	5/13/2015	4	12P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1609274	11	81822	CITY	0	0	0		0	1	N	FALSE	5/13/2015	4	12P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1693368	11	81446	NONE	0	0	0		0	0	N	FALSE	3/22/2016	3	12P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	1	16	6	CN	0	1	0141AB100S00
1693368	11	81446	NONE	0	0	0		0	0	N	FALSE	3/22/2016	3	12P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	1	16	6	CN	0	1	0141AB100S00
1725121	11	82347	NONE	0	0	0		0	0	N	FALSE	6/15/2017	5	6P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1725121	11	82347	NONE	0	0	0		0	0	N	FALSE	6/15/2017	5	6P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1851420	11	84425	COUNTY	0	0	0		0	0	N	FALSE	12/9/2019	2	12P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1851420	11	84425	COUNTY	0	0	0		0	0	N	FALSE	12/9/2019	2	12P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1695358	11	81136	COUNTY	0	0	0		0	0	N	FALSE	3/11/2016	6	1P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	1	11	6	CN	0	1	0141AB100S00
1695358	11	81136	COUNTY	0	0	0		0	0	N	FALSE	3/11/2016	6	1P	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	1	11	6	CN	0	1	0141AB100S00
1857159	11	80849	NONE	0	0	0		0	0	N	FALSE	2/28/2019	5	7A	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00
1857159	11	80849	NONE	0	0	0		0	0	N	FALSE	2/28/2019	5	7A	Washington	Wilsonville	PORTLAND UA	141	BEAVERTON-TUALATIN	2	16	0	MN	0		014100200S00

11. I-5 NB Ramps & Elligsen

MP_NO	ST_NO	ST_NM	ISECT_ST_NO	ISECT_ST_NM	RD_CHAR_CD	RD_CHAR_SHORT_DESC	CMPSS_DIR_CD	CMPSS_DIR_FROM_CD	CMPSS_DIR_SHORT_DESC	IMPCT_LOC_CD	ISECT_TYP_SHORT_DESC	MEDN_TYP_SHORT_DESC	TURNG_LEG_QTY	LN_QTY	ISECT_REL_FLG	TRAF_CNTL_DEVICE_SHORT_DESC	OFF_RDWY_FLG	RNDABT_FLG	DRVWY_REL_FLG	WTHR_COND_SHORT_DESC	RD_SURF_SHORT_DESC	LGT_COND_SHORT_DESC	CRASH_TYP_SHORT_DESC	COLLIS_TYP_SHORT_DESC	CRASH_SVRTY_SHORT_DESC
12.95	00201	SW BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	4		SE	09	CROSS		1		0	YIELD	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
12.95	00201	SW BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	4		SE	09	CROSS		1		0	YIELD	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
12.95	00201	SW BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	06	4-LEG		1		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	S-1STOP	REAR	INJ
12.95	00201	SW BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	06	4-LEG		1		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	S-1STOP	REAR	INJ
12.95	00201	SW BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	06	4-LEG		1		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	S-1STOP	REAR	INJ
12.95	00201	SW BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	06	CROSS		2		0	TRF SIGNAL	0	0	0	UNK	UNK	DAY	S-1STOP	REAR	INJ
12.95	00201	SW BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	06	CROSS		2		0	TRF SIGNAL	0	0	0	UNK	UNK	DAY	S-1STOP	REAR	INJ
12.95	00201	SW BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	09	4-LEG		1		0	YIELD	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
12.95	00201	SW BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	09	4-LEG		1		0	YIELD	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
12.95	00201	SW BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	9		CN	04	CROSS		2		0	TRF SIGNAL	0	0	0	CLR	WET	DLIT	S-OTHER	TURN	PDO
12.95	00201	SW BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	9		CN	04	CROSS		2		0	TRF SIGNAL	0	0	0	CLR	WET	DLIT	S-OTHER	TURN	PDO
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	4		SE	09	4-LEG		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	4		SE	09	4-LEG		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	06	3-LEG		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	06	3-LEG		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	09	4-LEG		2		0	YIELD	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	09	4-LEG		2		0	YIELD	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	INJ
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	09	4-LEG		1		0	YIELD	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	09	4-LEG		1		0	YIELD	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	09	CROSS		1		0	YIELD	0	0	0	RAIN	WET	DAY	S-1STOP	REAR	PDO
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	09	CROSS		1		0	YIELD	0	0	0	RAIN	WET	DAY	S-1STOP	REAR	PDO
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	09	4-LEG		1		0	TRF SIGNAL	0	0	0	CLD	DRY	DAY	S-1STOP	REAR	INJ
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	5		S	09	4-LEG		1		0	TRF SIGNAL	0	0	0	CLD	DRY	DAY	S-1STOP	REAR	INJ
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	7		W	06	4-LEG		1		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	S-1STOP	REAR	PDO
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	7		W	06	4-LEG		1		0	TRF SIGNAL	0	0	0	RAIN	WET	DAY	S-1STOP	REAR	PDO
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	9		CN	04	4-LEG		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	ANGL	PDO
12.95	00207	NB BEAV-TUALATIN HY	00701	ELLIGSEN RD	1	INTER	9		CN	04	4-LEG		1		0	TRF SIGNAL	0	0	0	CLR	DRY	DAY	ANGL-OTH	ANGL	PDO

11. I-5 NB Ramps & Elligsen

CRASH_EVNT_1_CD	CRASH_EVNT_2_CD	CRASH_EVNT_3_CD	CRASH_CAUSE_1_CD	CRASH_CAUSE_2_CD	CRASH_CAUSE_3_CD	LAT DEG NO	LAT MINUTE NO	LAT SEC NO	LAT	LONGTD DEG NO	LONGTD MINUTE NO	LONGTD SEC NO	LONG	VHCL_ID	STRIKG_VHCL_FLG	VHCL_CODED_SEQ_NO	VHCL_TYP_SHORT_DESC	VHCL_USE_SHORT_DESC	TRLR_QTY	VHCL_OWNSHP_SHORT_DESC	VHCL_MVMNT_SHORT_DESC	VHCL_CMPSS_DIR_FROM_SHORT_DESC	VHCL_CMPSS_DIR_TO_SHORT_DESC	VHCL_ACTN_CD	VHCL_EVNT_1_CD	VHCL_EVNT_2_CD	VHCL_EVNT_3_CD	VHCL_CAUSE_1_CD
			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3063306	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-R	S	E	000				00
			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3063307	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	S	E	013				00
124			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3180819	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	N	S	000	124			00
124			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3180820	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	N	S	011				00
124			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3180820	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	N	S	011				00
			29			45	20	8.19	45.33560833	-122	46	2.11	-122.7672528	3380614	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	S	N	000				00
			29			45	20	8.19	45.33560833	-122	46	2.11	-122.7672528	3380615	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	S	N	011				00
			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3076718	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-R	S	E	000				00
			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3076719	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	S	E	013				00
			14	08		45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3509704	1	1	PSNGR CAR	NONE	9	N/A	TURN-R	S	E	000				00
			14	08		45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3509705	0	2	PSNGR CAR	NONE	9	N/A	TURN-L	S	W	000				00
			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3346810	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-R	S	E	000				00
			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3346811	0	2	PSNGR CAR	NONE	0	UNKN	STOP	S	E	011				00
			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3114993	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	S	N	000				00
			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3114994	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	S	N	011				00
			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3039190	1	1	PSNGR CAR	NONE	0	PRVTE	TURN-R	S	E	000				00
			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3039191	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	S	E	013				00
			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3196879	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	S	N	000				00
			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3196880	0	2	PSNGR CAR	NONE	9	N/A	STOP	S	N	013				00
			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3254483	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	S	N	000				00
			29			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3254484	0	2	PSNGR CAR	NONE	9	N/A	STOP	S	N	011				00
			07			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3487309	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	S	N	000				00
			07			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3487310	0	2	PSNGR CAR	NONE	0	PRVTE	STOP	S	N	011				00
			07			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3200293	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	W	E	000				00
			07			45	20	8.18	45.33560556	-122	46	2.09	-122.7672472	3200294	0	2	PSNGR CAR	NONE	9	N/A	STOP	W	E	011				00
			04			45	20	8.16	45.3356	-122	46	2.12	-122.7672556	3497606	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	W	E	000				00
			04			45	20	8.16	45.3356	-122	46	2.12	-122.7672556	3497607	0	2	PSNGR CAR	NONE	9	N/A	STRGHT	S	N	000				00

VHCL_CAUSE_2_CD	VHCL_CAUSE_3_CD	PARTIC_ID	STRIKG_PARTIC_FLG	PARTIC_VHCL_SEQ_NO	PARTIC_TYP_CD	PARTIC_TYP_SHORT_DESC	PARTIC_MVMNT_SHORT_DESC	PARTIC_CMPSS_DIR_FROM_SHORT_DESC	PARTIC_CMPSS_DIR_TO_SHORT_DESC	INJ_SVRTY_SHORT_DESC	AGE_VAL	SEX_CD	DRVR_LIC_STAT_SHORT_DESC	DRVR_RES_SHORT_DESC	PARTIC_ACTN_CD	NON_MOTRST_LOC_SHORT_DESC	PARTIC_ERR_1_CD	PARTIC_ERR_2_CD	PARTIC_ERR_3_CD	PARTIC_EVNT_1_CD	PARTIC_EVNT_2_CD	PARTIC_EVNT_3_CD	PARTIC_CAUSE_1_CD	PARTIC_CAUSE_2_CD	PARTIC_CAUSE_3_CD	TOTAL_CRASHES	TOTAL_ROWS
		3498434	0	1	1	DRVR				NONE	24	1	OR-Y	OR<25	000		026						29			43	88
		3498435	0	1	1	DRVR				INJC	54	2	OR-Y	OR<25	000		000						00			43	88
		3633058	0	1	1	DRVR				NONE	26	2	OR-Y	OR>25	000		026						29			43	88
		3633059	0	1	1	DRVR				NONE	51	1	OR-Y	OR>25	000		000						00			43	88
		3633060	0	2	2	PSNG				INJC	55	2			000		000						00			43	88
		3854402	0	1	1	DRVR				NONE	69	2	OTH-Y	N-RES	000		026						29			43	88
		3854403	0	1	1	DRVR				INJC	33	2	OR-Y	OR<25	000		000						00			43	88
		3515359	0	1	1	DRVR				NONE	16	1	OR-Y	OR<25	000		026						29			43	88
		3515360	0	1	1	DRVR				INJC	59	2	OR-Y	OR<25	000		000						00			43	88
		3997022	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			43	88
		3997023	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			43	88
		3811817	0	1	1	DRVR				NONE	77	1	OR-Y	OR<25	000		026						29			43	88
		3811818	0	1	1	DRVR				INJC	49	2	OR-Y	OR<25	000		000						00			43	88
		3553916	0	1	1	DRVR				NONE	56	1	OR-Y	OR<25	000		026						29			43	88
		3553917	0	1	1	DRVR				NONE	49	1	OTH-Y	N-RES	000		000						00			43	88
		3468476	0	1	1	DRVR				NONE	45	2	OR-Y	OR<25	000		026	028					29			43	88
		3468477	0	1	1	DRVR				INJC	43	2	OR-Y	OR<25	000		000						00			43	88
		3649997	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			43	88
		3649998	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			43	88
		3709605	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			43	88
		3709606	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			43	88
		3974182	0	1	1	DRVR				NONE	39	1	OR-Y	OR<25	000		043						07			43	88
		3974183	0	1	1	DRVR				INJC	31	2	OTH-Y	N-RES	000		000						00			43	88
		3653325	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			43	88
		3653326	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			43	88
		3985308	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			43	88
		3985309	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			43	88

CRASH_ID	INT_ID	SER_NO	INVSTG_AGY_SHORT_DESC	CRASH_SPEED_INVLV_FLG	ALCHL_INVLV_FLG	DRUG_INVLV_FLG	MJ_INVLV_FLG	SCHL_ZONE_IND	WRK_ZONE_IND	LANE RDWY DPRT CRASH FLG	UNLOCT FLG	CRASH_DT	CRASH_WK_DAY_CD	CRASH_HR_SHORT_DESC	CNTY_NM	CITY_SECT_NM	URB_AREA_SHORT_NM	HWY_NO	HWY_MED_NM	RDWY_NO	FC_CD	HWY_COMPNT_CD	HWY_COMPNT_SHORT_DESC	MLGE_TYP_CD	RD_CON_NO	LRS VAL
1857960	15	02914	NONE	0	0	0		0	0	N	FALSE	6/7/2019	6	4P	Washington		PORTLAND UA				17					
1857960	15	02914	NONE	0	0	0		0	0	N	FALSE	6/7/2019	6	4P	Washington		PORTLAND UA				17					
1841608	15	03013	COUNTY	0	0	0		0	0	N	FALSE	6/13/2019	5	4P	Washington		PORTLAND UA				17					
1841608	15	03013	COUNTY	0	0	0		0	0	N	FALSE	6/13/2019	5	4P	Washington		PORTLAND UA				17					

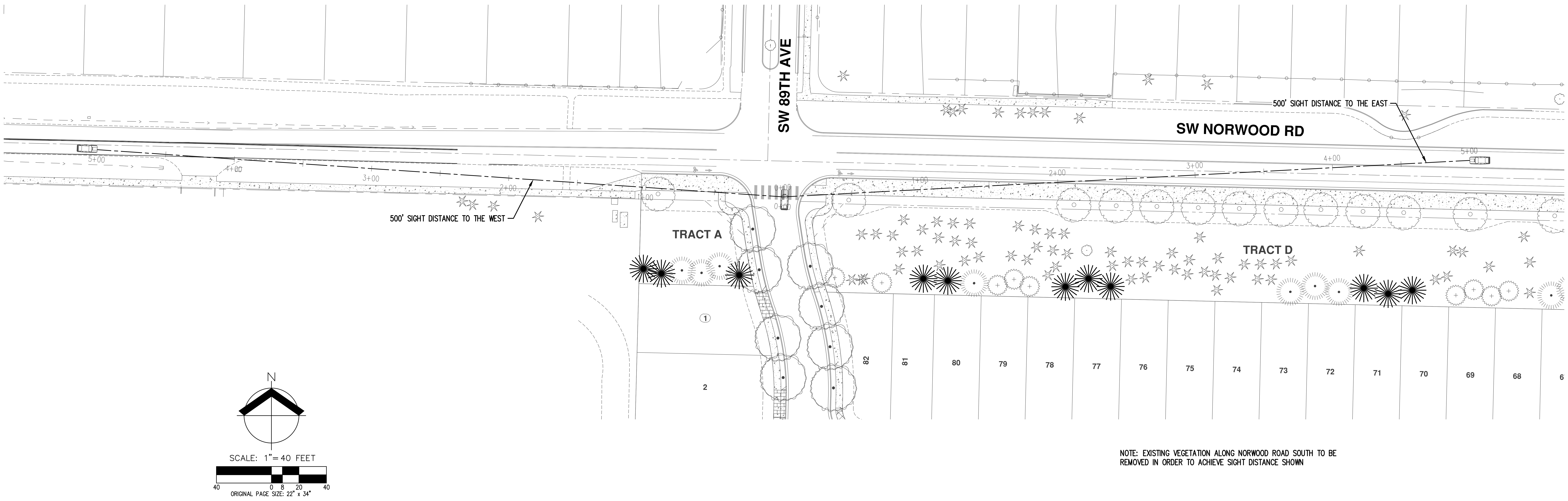
15. 65th & Norwood

MP_NO	ST_NO	ST_NM	ISECT_ST_NO	ISECT_ST_NM	RD_CHAR_CD	RD_CHAR_SHORT_DESC	CMPSS_DIR_CD	CMPSS_DIR_FROM_CD	CMPSS_DIR_SHORT_DESC	IMPCT_LOC_CD	ISECT_TYP_SHORT_DESC	MEDN_TYP_SHORT_DESC	TURNG_LEG_QTY	LN_QTY	ISECT_REL_FLG	TRAF_CNTL_DEVICE_SHORT_DESC	OFF_RDWY_FLG	RNDABT_FLG	DRVWY_REL_FLG	WTHR_COND_SHORT_DESC	RD_SURF_SHORT_DESC	LGT_COND_SHORT_DESC	CRASH_TYP_SHORT_DESC	COLLIS_TYP_SHORT_DESC	CRASH_SVRTY_SHORT_DESC
	01722	SW NORWOOD RD	05065	SW 65TH AVE	1	INTER	7		W	06	3-LEG		0		0	STOP SIGN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	01722	SW NORWOOD RD	05065	SW 65TH AVE	1	INTER	7		W	06	3-LEG		0		0	STOP SIGN	0	0	0	CLR	DRY	DAY	S-1STOP	REAR	PDO
	01722	SW NORWOOD RD	05065	SW 65TH AVE	1	INTER	9		CN	03	3-LEG		0		0	STOP SIGN	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	INJ
	01722	SW NORWOOD RD	05065	SW 65TH AVE	1	INTER	9		CN	03	3-LEG		0		0	STOP SIGN	0	0	0	CLR	DRY	DAY	ANGL-OTH	TURN	INJ

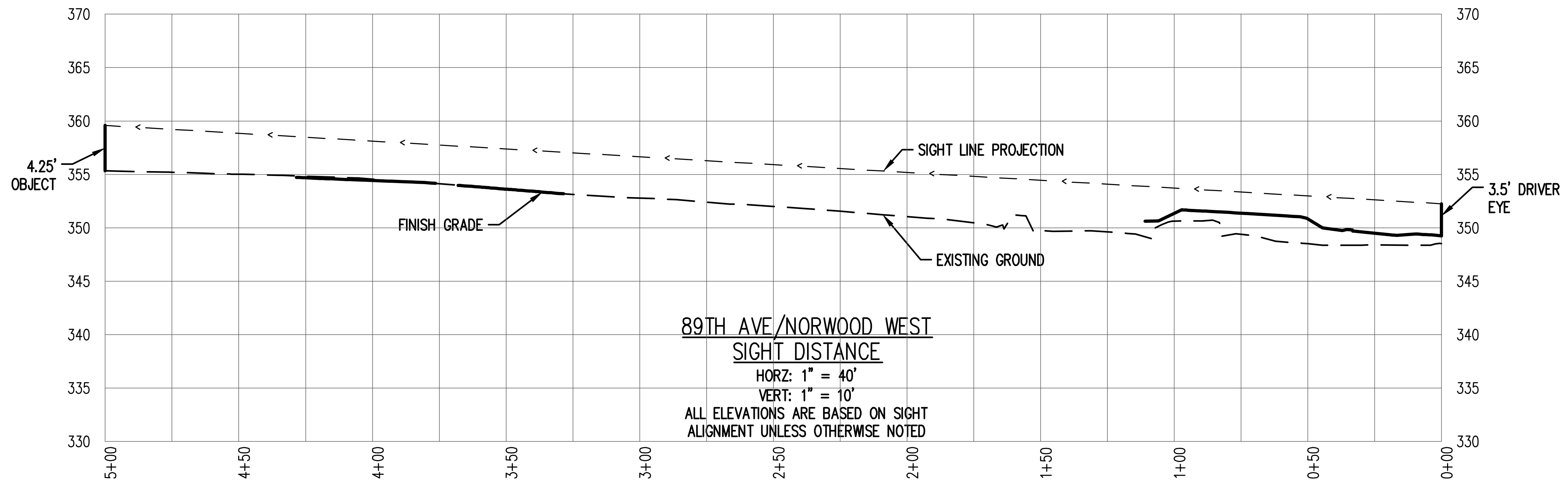
15. 65th & Norwood

CRASH_EVNT_1_CD	CRASH_EVNT_2_CD	CRASH_EVNT_3_CD	CRASH_CAUSE_1_CD	CRASH_CAUSE_2_CD	CRASH_CAUSE_3_CD	LAT DEG NO	LAT MINUTE NO	LAT SEC NO	LAT	LONGTD DEG NO	LONGTD MINUTE NO	LONGTD SEC NO	LONG	VHCL_ID	STRIKG_VHCL_FLG	VHCL_CODED_SEQ_NO	VHCL_TYP_SHORT_DESC	VHCL_USE_SHORT_DESC	TRLR_QTY	VHCL_OWNSHP_SHORT_DESC	VHCL_MVMNT_SHORT_DESC	VHCL_CMPSS_DIR_FROM_SHORT_DESC	VHCL_CMPSS_DIR_TO_SHORT_DESC	VHCL_ACTN_CD	VHCL_EVNT_1_CD	VHCL_EVNT_2_CD	VHCL_EVNT_3_CD	VHCL_CAUSE_1_CD
			29			45	21	21.04	45.35584444	-122	44	37.63	-122.7437861	3498998	1	1	PSNGR CAR	NONE	9	N/A	STRGHT	W	E	000				00
			29			45	21	21.04	45.35584444	-122	44	37.63	-122.7437861	3498999	0	2	PSNGR CAR	NONE	9	N/A	STOP	W	E	012				00
			03			45	21	21.04	45.35584444	-122	44	37.63	-122.7437861	3468578	1	1	PSNGR CAR	NONE	0	PRVTE	STRGHT	N	S	000				00
			03			45	21	21.04	45.35584444	-122	44	37.63	-122.7437861	3468579	0	2	PSNGR CAR	NONE	0	PRVTE	TURN-L	W	N	000				00

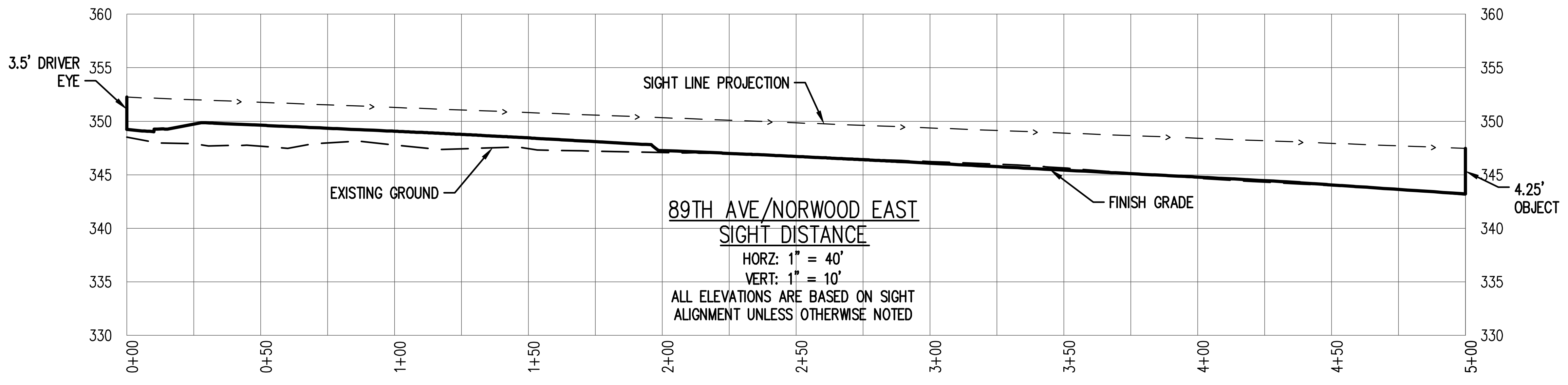
VHCL_CAUSE_2_CD	VHCL_CAUSE_3_CD	PARTIC_ID	STRIKG_PARTIC_FLG	PARTIC_VHCL_SEQ_NO	PARTIC_TYP_CD	PARTIC_TYP_SHORT_DESC	PARTIC_MVMNT_SHORT_DESC	PARTIC_CMPSS_DIR_FROM_SHORT_DESC	PARTIC_CMPSS_DIR_TO_SHORT_DESC	INJ_SVRTY_SHORT_DESC	AGE_VAL	SEX_CD	DRVR_LIC_STAT_SHORT_DESC	DRVR_RES_SHORT_DESC	PARTIC_ACTN_CD	NON_MOTRST_LOC_SHORT_DESC	PARTIC_ERR_1_CD	PARTIC_ERR_2_CD	PARTIC_ERR_3_CD	PARTIC_EVNT_1_CD	PARTIC_EVNT_2_CD	PARTIC_EVNT_3_CD	PARTIC_CAUSE_1_CD	PARTIC_CAUSE_2_CD	PARTIC_CAUSE_3_CD	TOTAL_CRASHES	TOTAL_ROWS
		3986663	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			17	39
		3986664	0	1	1	DRVR				NONE	00	9	UNK	UNK	000		000						00			17	39
		3951752	0	1	1	DRVR				INJB	30	2	OR-Y	OR>25	000		000						00			17	39
		3951753	0	1	1	DRVR				NONE	21	2	OR-Y	OR<25	000		021						03			17	39



NOTE: EXISTING VEGETATION ALONG NORWOOD ROAD SOUTH TO BE REMOVED IN ORDER TO ACHIEVE SIGHT DISTANCE SHOWN



89TH AVE/NORWOOD WEST
SIGHT DISTANCE
HORZ: 1" = 40'
VERT: 1" = 10'
ALL ELEVATIONS ARE BASED ON SIGHT ALIGNMENT UNLESS OTHERWISE NOTED



89TH AVE/NORWOOD EAST
SIGHT DISTANCE
HORZ: 1" = 40'
VERT: 1" = 10'
ALL ELEVATIONS ARE BASED ON SIGHT ALIGNMENT UNLESS OTHERWISE NOTED

AKS DRAWING FILE: 89TH AND NORWOOD.DWG | LAYOUT: LAYOUT1

LENNAR®

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
503.563.6151
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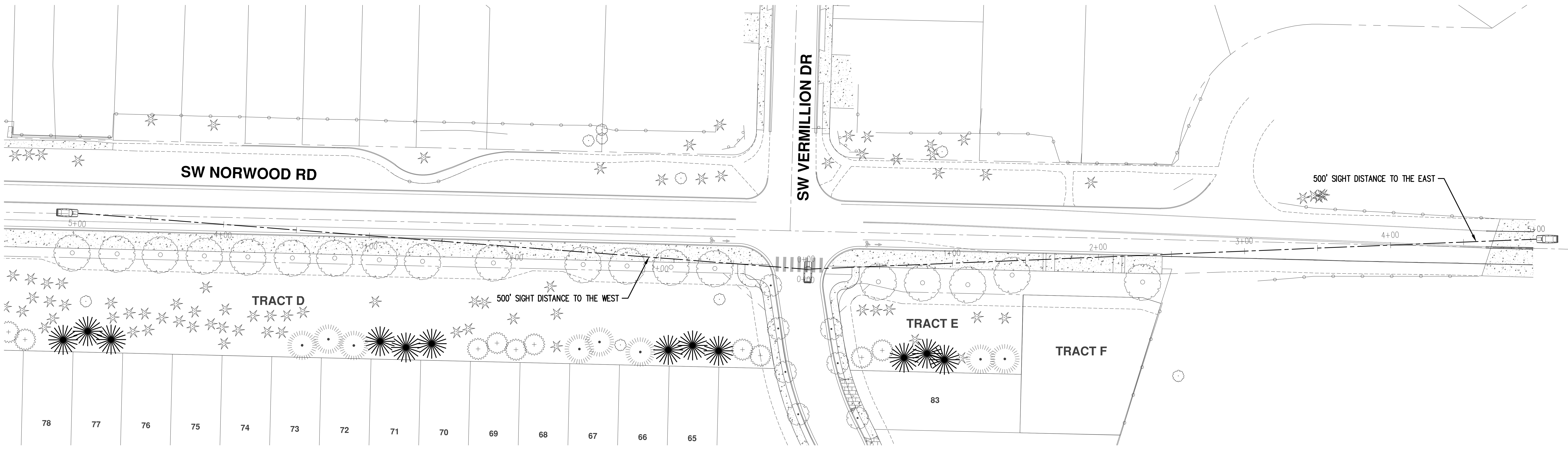
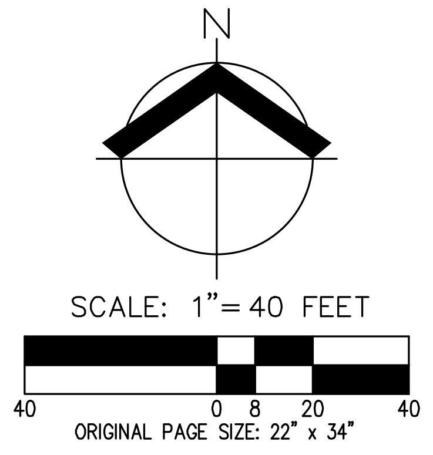
89TH AVENUE AND NORWOOD SIGHT DISTANCE
AUTUMN SUNRISE SUBDIVISON
LENNAR NORTHWEST, INC.
TUALATIN, OREGON

84806PE
JULY 12, 2016
DARKO SIMIC
RENEWAL DATE: 6/30/22
PRELIMINARY

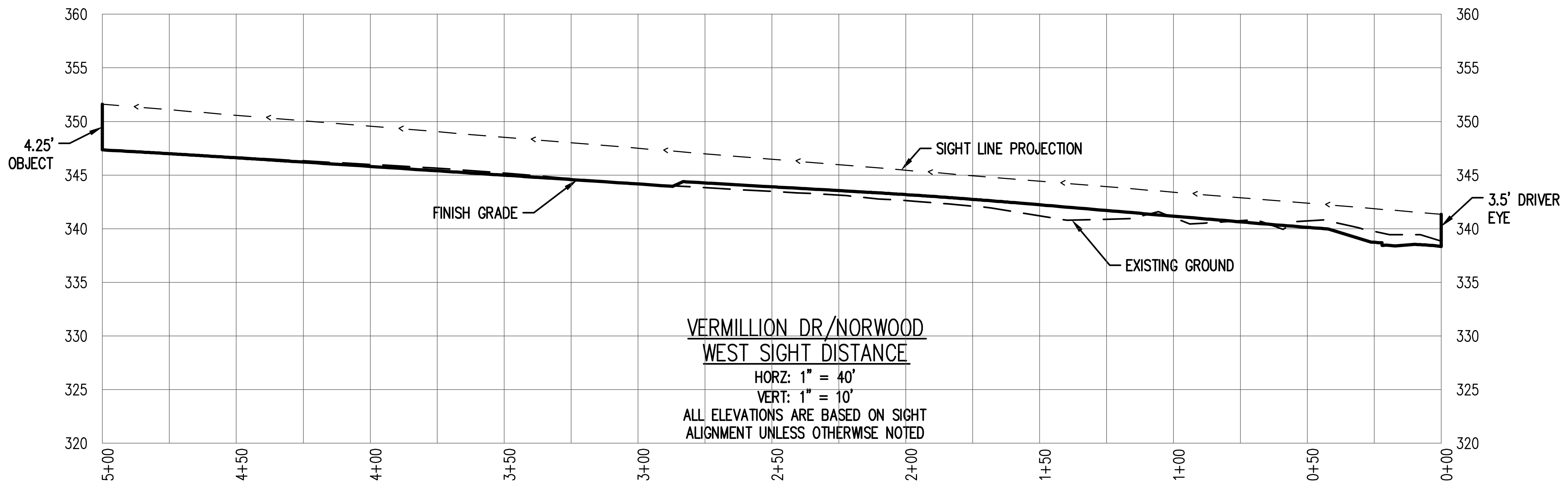
JOB NUMBER:	7454
DATE:	7/1/2021
DESIGNED BY:	JSM
DRAWN BY:	JSM
CHECKED BY:	DS

EX A

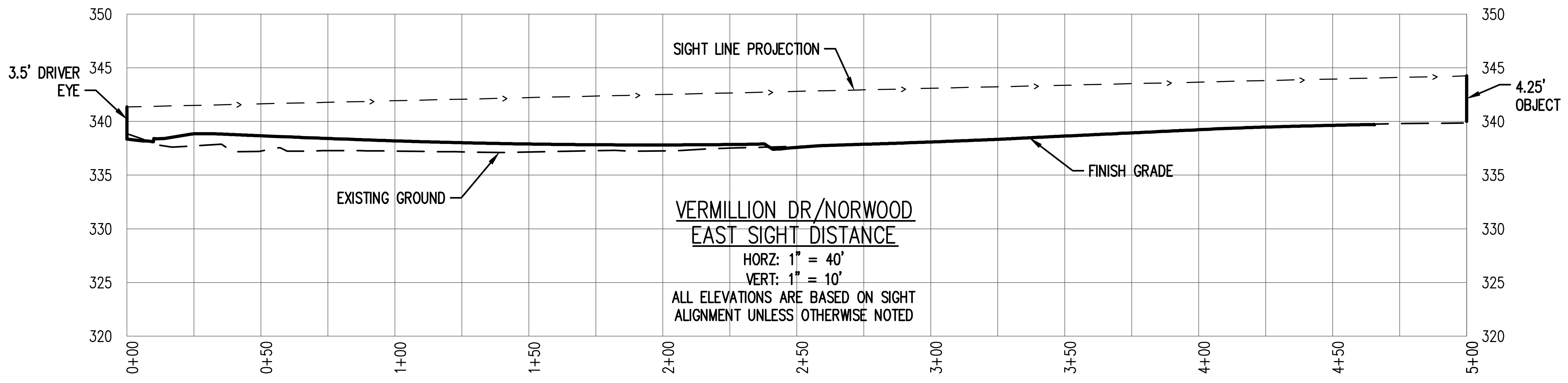




NOTE: EXISTING VEGETATION ALONG NORWOOD ROAD SOUTH TO BE REMOVED IN ORDER TO ACHIEVE SIGHT DISTANCE SHOWN



VERMILLION DR/NORWOOD
WEST SIGHT DISTANCE
HORZ: 1" = 40'
VERT: 1" = 10'
ALL ELEVATIONS ARE BASED ON SIGHT ALIGNMENT UNLESS OTHERWISE NOTED



VERMILLION DR/NORWOOD
EAST SIGHT DISTANCE
HORZ: 1" = 40'
VERT: 1" = 10'
ALL ELEVATIONS ARE BASED ON SIGHT ALIGNMENT UNLESS OTHERWISE NOTED

EAST 2

AKS DRAWING FILE: VERMILLION AND NORWOOD.DWG | LAYOUT: LAYOUT1

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VERMILLION AND NORWOOD SIGHT DISTANCE
AUTUMN SUNRISE SUBDIVISON
LENNAR NORTHWEST, INC.
TUALATIN, OREGON

84806PE
JULY 12, 2016
DARKO SIMIC
PRELIMINARY
RENEWAL DATE: 6/30/22

JOB NUMBER:	7454
DATE:	7/1/2021
DESIGNED BY:	JSM
DRAWN BY:	JSM
CHECKED BY:	DS

EX B

Preliminary Left-Turn Lane Warrant Summary

Intersection	Warrant Met?
SW 89th Ave/Site Access SW Norwood Road	
2026 Buildout - AM Peak Hour (EB)	No
2026 Buildout - AM Peak Hour (WB)	No
2026 Buildout - PM Peak Hour (EB)	No
2026 Buildout - PM Peak Hour (WB)	No
SW Vermillion Drive/Site Access SW Norwood Road	
2026 Buildout - AM Peak Hour (EB)	No
2026 Buildout - AM Peak Hour (WB)	No
2026 Buildout - PM Peak Hour (EB)	No
2026 Buildout - PM Peak Hour (WB)	No

Left-Turn Lane Warrant Analysis

Project: 21029 - Autumn Sunrise
Intersection: SW 89th Ave/Site Access SW Norwood Road
Date: 6/30/2021
Scenario: 2026 Buildout - AM Peak Hour (EB)

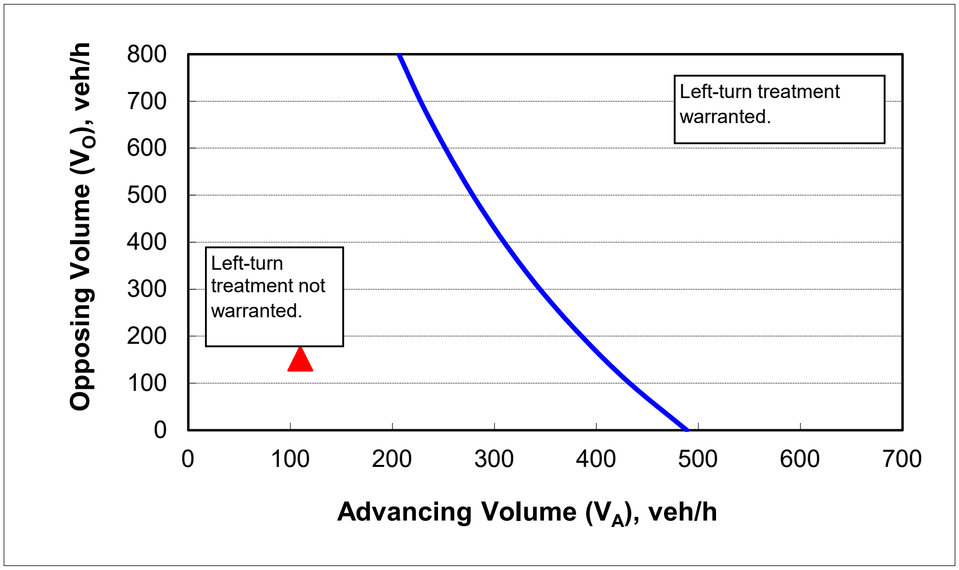
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	13%
Advancing volume (V_A), veh/h:	110
Opposing volume (V_O), veh/h:	152

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	407
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis

Project: 21029 - Autumn Sunrise
Intersection: SW 89th Ave/Site Access SW Norwood Road
Date: 6/30/2021
Scenario: 2026 Buildout - AM Peak Hour (WB)

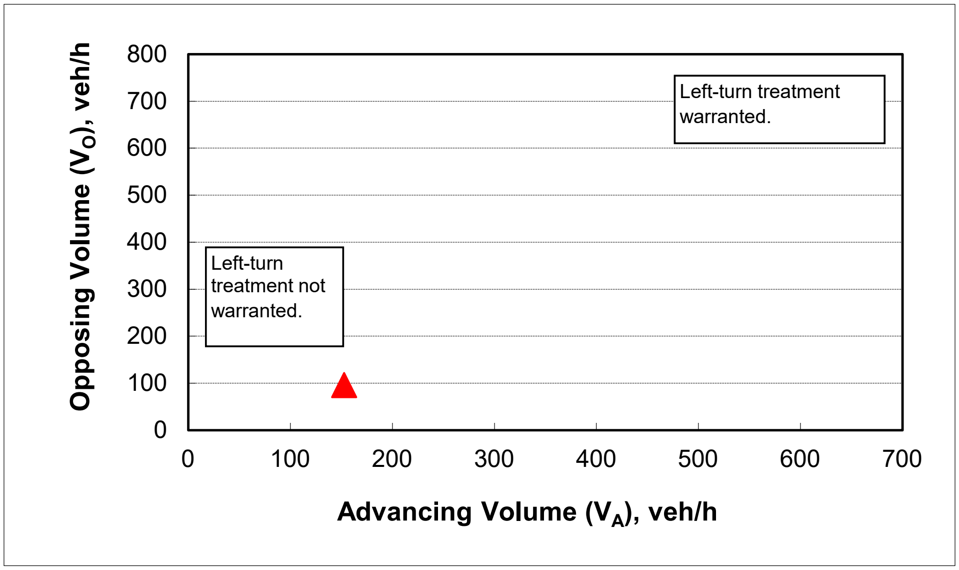
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	153
Opposing volume (V_O), veh/h:	96

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	1798
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis

Project:	21029 - Autumn Sunrise
Intersection:	SW 89th Ave/Site Access SW Norwood Road
Date:	6/30/2021
Scenario:	2026 Buildout - PM Peak Hour (EB)

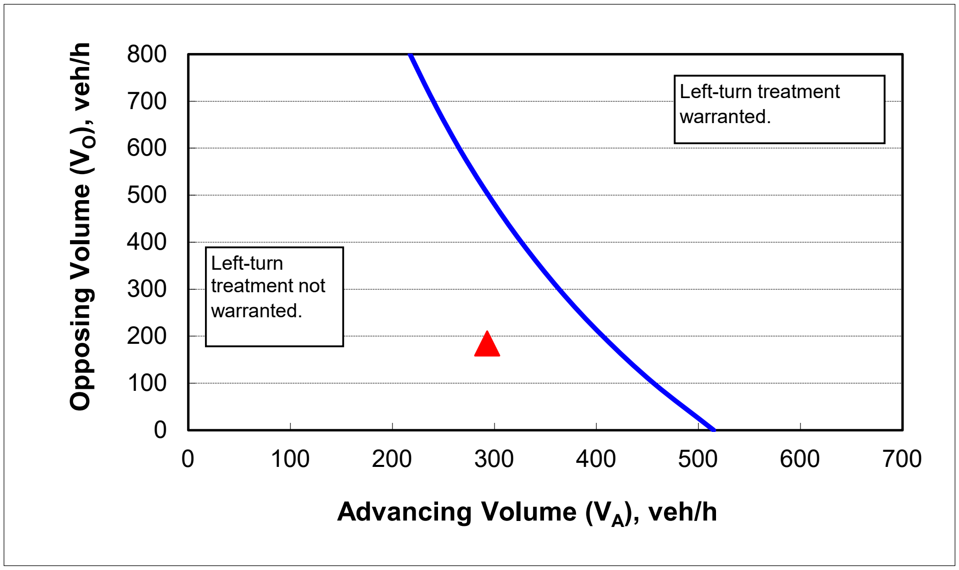
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	11%
Advancing volume (V_A), veh/h:	293
Opposing volume (V_O), veh/h:	184

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	414
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis

Project: 21029 - Autumn Sunrise
Intersection: SW 89th Ave/Site Access SW Norwood Road
Date: 6/30/2021
Scenario: 2026 Buildout - PM Peak Hour (WB)

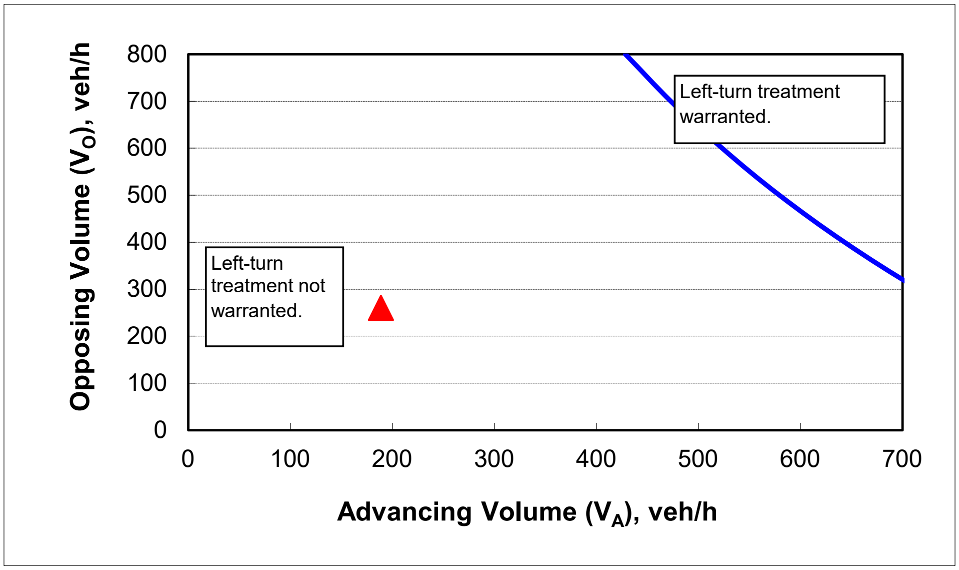
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	3%
Advancing volume (V_A), veh/h:	189
Opposing volume (V_O), veh/h:	260

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	748
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis

Project: 21029 - Autumn Sunrise
Intersection: SW Vermillion Drive/Site Access SW Norwood Road
Date: 6/30/2021
Scenario: 2026 Buildout - AM Peak Hour (EB)

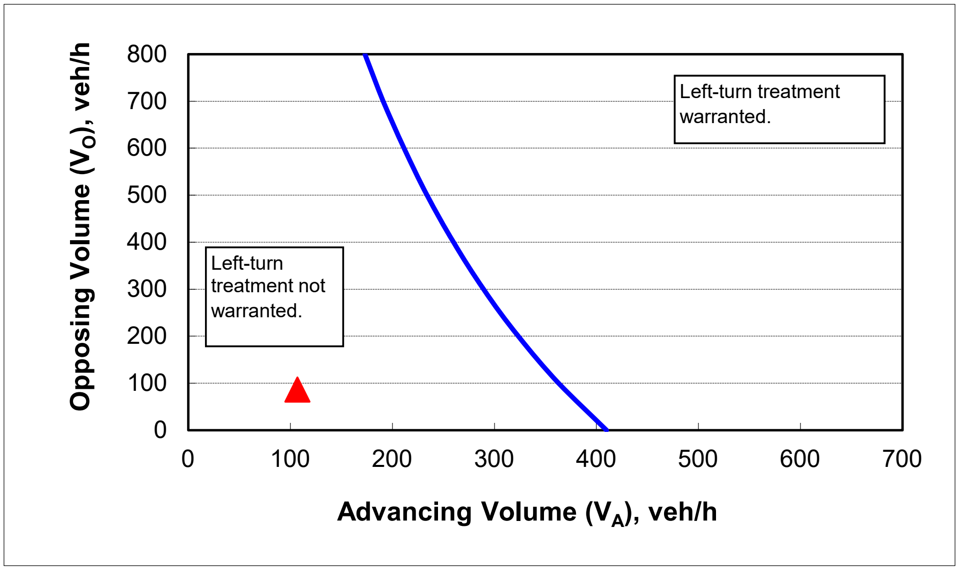
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	20%
Advancing volume (V_A), veh/h:	107
Opposing volume (V_O), veh/h:	86

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	369
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis

Project: 21029 - Autumn Sunrise
Intersection: SW Vermillion Drive/Site Access SW Norwood Road
Date: 6/30/2021
Scenario: 2026 Buildout - AM Peak Hour (WB)

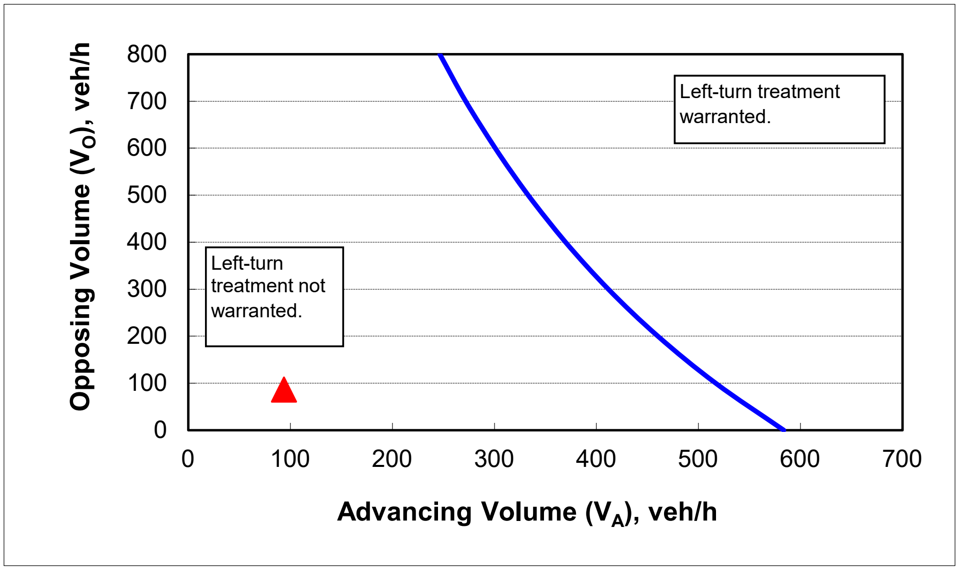
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	9%
Advancing volume (V_A), veh/h:	94
Opposing volume (V_O), veh/h:	86

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	525
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis

Project: 21029 - Autumn Sunrise
Intersection: SW Vermillion Drive/Site Access SW Norwood Road
Date: 6/30/2021
Scenario: 2026 Buildout - PM Peak Hour (EB)

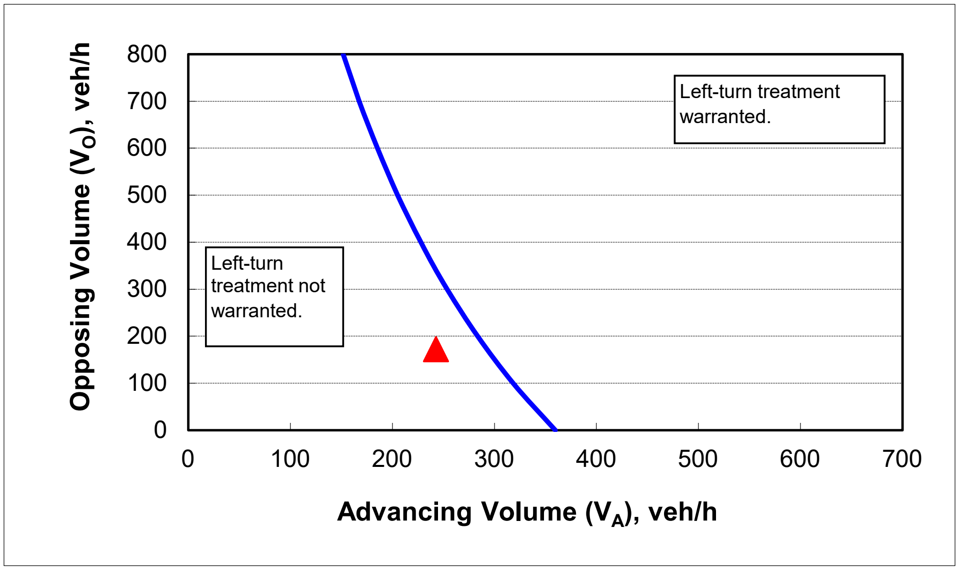
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	29%
Advancing volume (V_A), veh/h:	243
Opposing volume (V_O), veh/h:	172

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	293
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis

Project: 21029 - Autumn Sunrise
Intersection: SW Vermillion Drive/Site Access SW Norwood Road
Date: 6/30/2021
Scenario: 2026 Buildout - PM Peak Hour (WB)

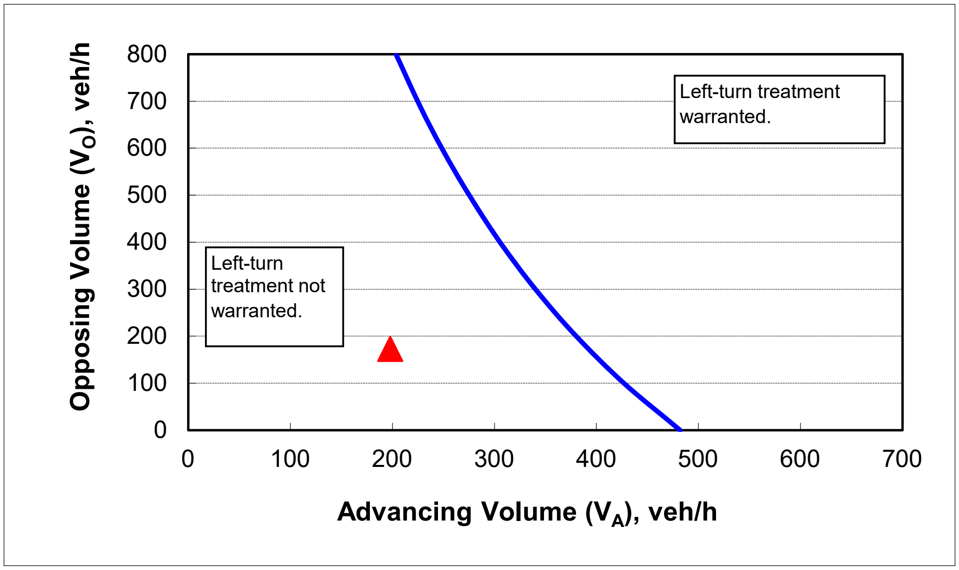
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	13%
Advancing volume (V_A), veh/h:	198
Opposing volume (V_O), veh/h:	173

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	392
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

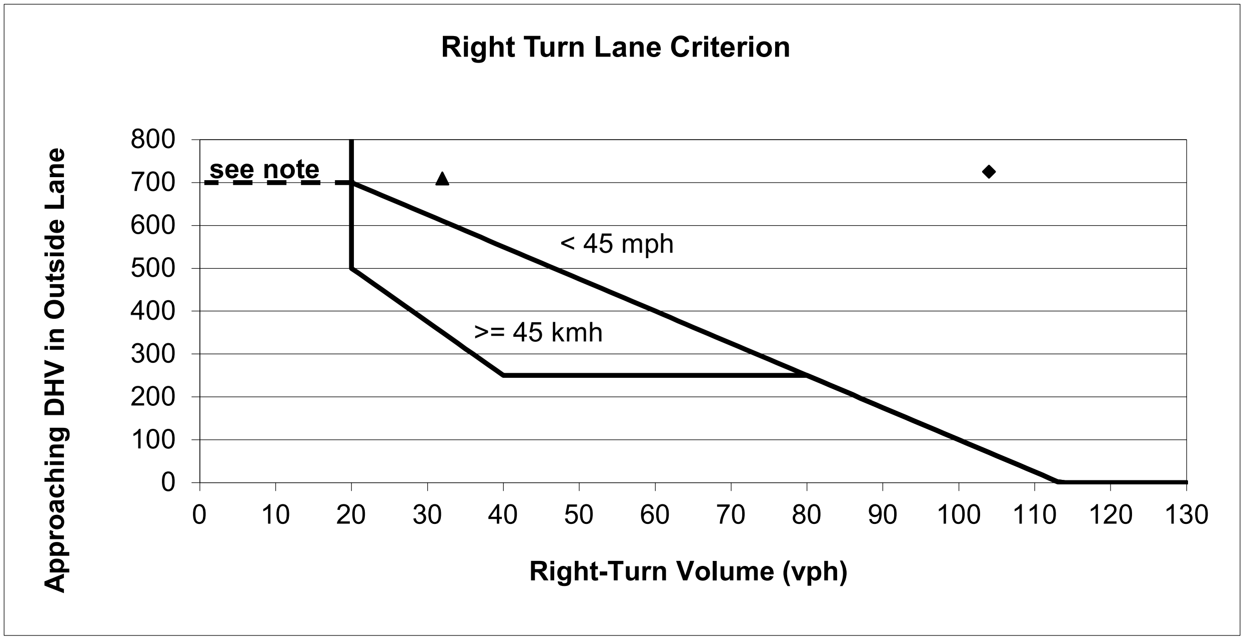
Preliminary Right-Turn Lane Warrant Summary

Intersection	Warrant Met?
SW Boones Ferry Road/Site Access - Northbound	
2026 Buildout - Phases 1-4 - AM Peak Hour	Yes
2026 Buildout - Phases 1-4 - PM Peak Hour	Yes
SW 89th Avenue/Site Access/SW Norwood Road - Eastbound	
2024 Buildout - Phases 1-2 - AM Peak Hour	No
2024 Buildout - Phases 1-2 - PM Peak Hour	Yes
2026 Buildout - Phases 1-4 - AM Peak Hour	No
2026 Buildout - Phases 1-4 - PM Peak Hour	No
SW Vermillion Drive/Site Access/SW Norwood Road - Eastbound	
2024 Buildout - Phases 1-2 - AM Peak Hour	No
2024 Buildout - Phases 1-2 - PM Peak Hour	No
2026 Buildout - Phases 1-4 - AM Peak Hour	No
2026 Buildout - Phases 1-4 - PM Peak Hour	No

Project:	21029 - Autumn Sunrise
Intersection:	SW Boones Ferry Road/Site Access - Northbound
Date:	6/30/2021
Scenario:	2026 Buildout - Phases 1-4

Speed? 45 mph 72 kmh

AM Peak Hour		PM Peak Hour	
Right-Turn Volume	32	Right-Turn Volume	104
Approaching DHV	709	Approaching DHV	725
Lane Needed?	Yes	Lane Needed?	Yes

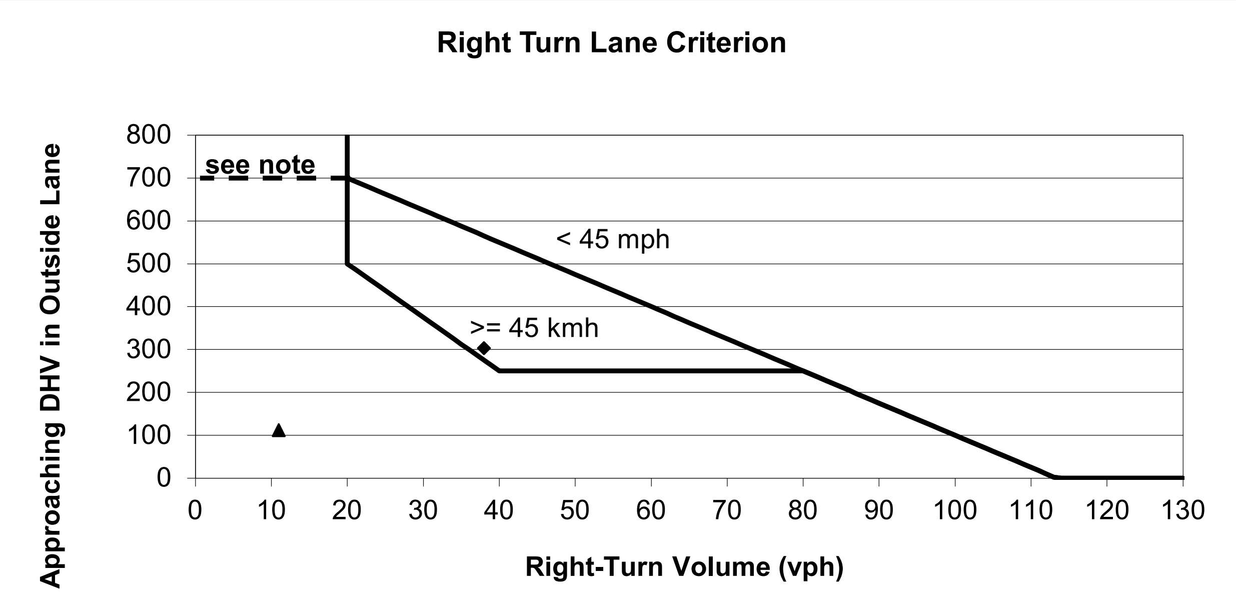


Note: If there is no right turn lane, a shoulder needs to be provided.
If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

Project:	21029 - Autumn Sunrise
Intersection:	SW 89th Avenue/Site Access/SW Norwood Road - Eastbound
Date:	6/30/2021
Scenario:	2024 Buildout - Phases 1-2

Speed? 45 mph 72 kmh

AM Peak Hour		PM Peak Hour	
Right-Turn Volume	11	Right-Turn Volume	38
Approaching DHV	112	Approaching DHV	303
Lane Needed?	No	Lane Needed?	Yes

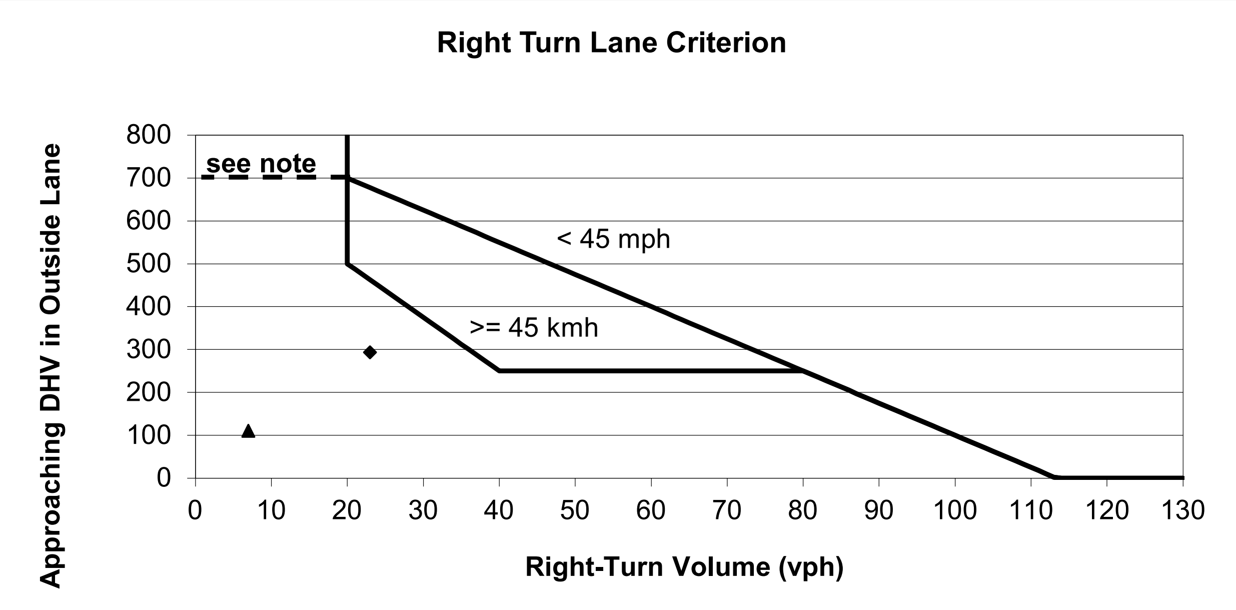


Note: If there is no right turn lane, a shoulder needs to be provided.
If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

Project: 21029 - Autumn Sunrise
Intersection: SW 89th Avenue/Site Access/SW Norwood Road - Eastbound
Date: 6/30/2021
Scenario: 2026 Buildout - Phases 1-4

Speed? 45 mph 72 kmh

AM Peak Hour		PM Peak Hour	
Right-Turn Volume	7	Right-Turn Volume	23
Approaching DHV	110	Approaching DHV	293
Lane Needed?	No	Lane Needed?	No

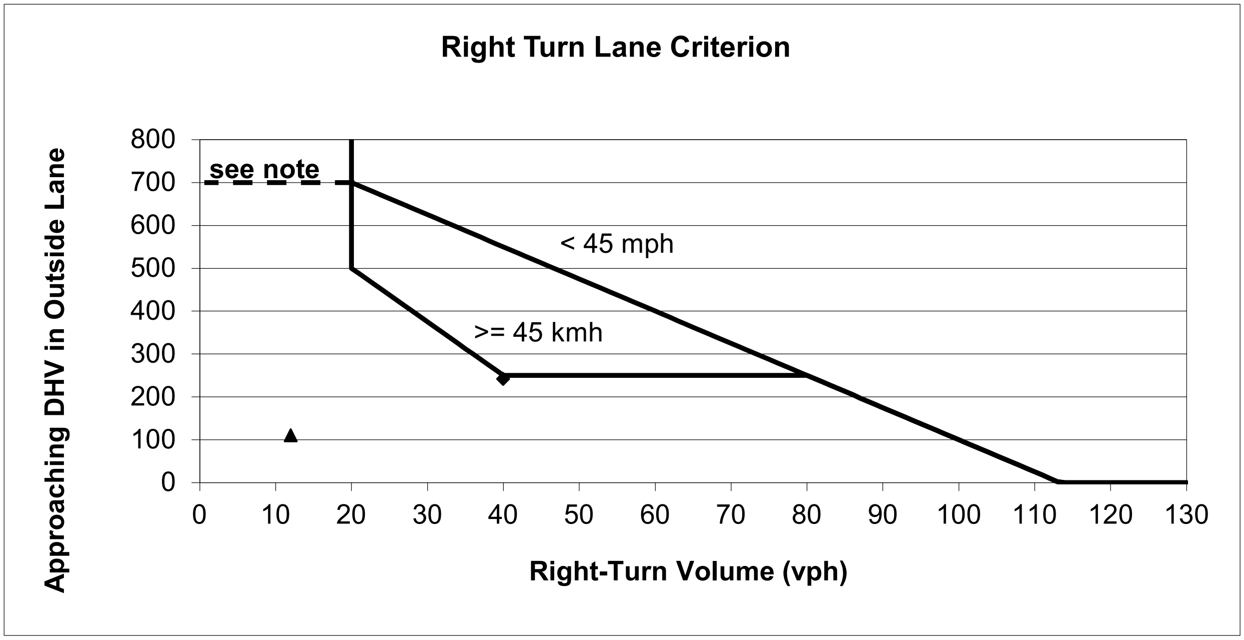

Right Turn Lane Criterion

Note: If there is no right turn lane, a shoulder needs to be provided.
If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

Project: 21029 - Autumn Sunrise
Intersection: SW Vermillion Drive/Site Access/SW Norwood Road - Eastbound
Date: 6/30/2021
Scenario: 2024 Buildout - Phases 1-2

Speed? 45 mph 72 kmh

AM Peak Hour		PM Peak Hour	
Right-Turn Volume	12	Right-Turn Volume	40
Approaching DHV	110	Approaching DHV	242
Lane Needed?	No	Lane Needed?	No

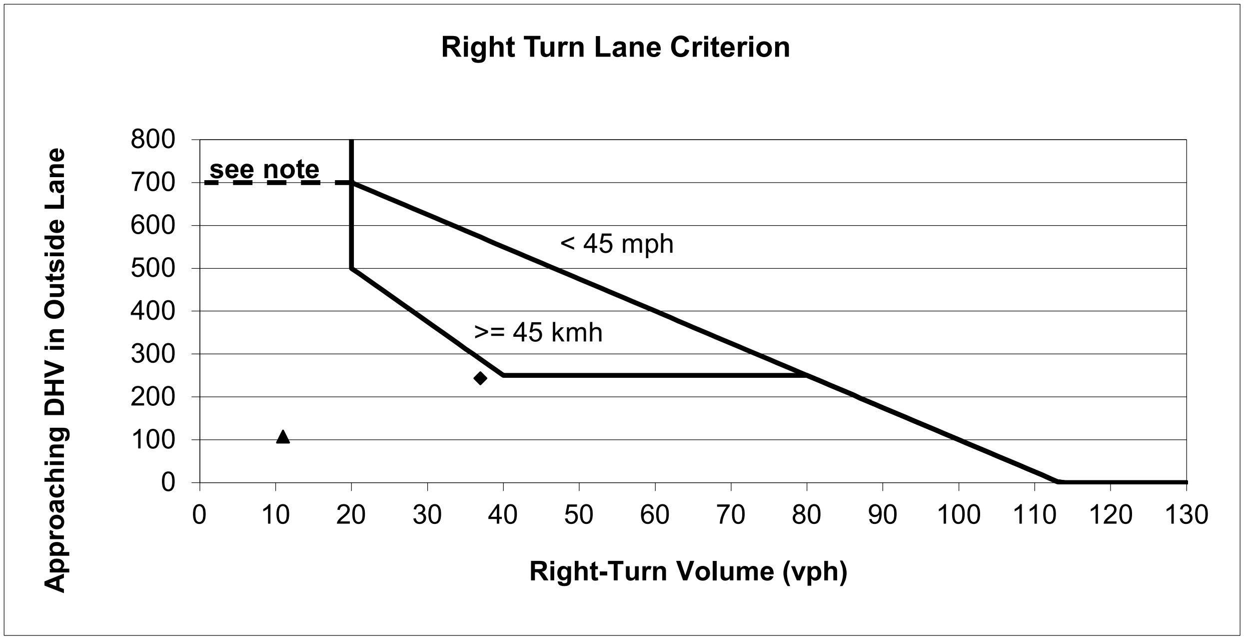


Note: If there is no right turn lane, a shoulder needs to be provided.
If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

Project: 21029 - Autumn Sunrise
Intersection: SW Vermillion Drive/Site Access/SW Norwood Road - Eastbound
Date: 6/30/2021
Scenario: 2026 Buildout - Phases 1-4

Speed? 45 mph 72 kmh

AM Peak Hour		PM Peak Hour	
Right-Turn Volume	11	Right-Turn Volume	37
Approaching DHV	107	Approaching DHV	243
Lane Needed?	No	Lane Needed?	No



Note: If there is no right turn lane, a shoulder needs to be provided.
If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

Preliminary Traffic Signal Warrant Summary

Intersection	Warrant Met?
SW Iowa Street at SW Boones Ferry Road	Based on AM
Year 2026 Phases 1-4 Conditions (Based on AM)	No
Year 2026 Phases 1-4 Conditions (Based on PM)	No
SW Norwood Road at SW Boones Ferry Road	
Year 2024 Phase 1-2 Conditions (Based on AM)	No
Year 2024 Phase 1-2 Conditions (Based on PM)	No
Year 2026 Phases 1-4 Conditions (Based on AM)	No
Year 2026 Phases 1-4 Conditions (Based on PM)	No
Site Access at SW Boones Ferry Road	
Year 2026 Phases 1-4 Conditions (Based on AM) w/ 2-lane Exit	No
Year 2026 Phases 1-4 Conditions (Based on PM) w/ 2-lane Exit	No
SW 89th Avenue/Site Access at SW Norwood Road	
Year 2024 Phase 1-2 Conditions (Based on AM)	No
Year 2024 Phase 1-2 Conditions (Based on PM)	No
Year 2026 Phases 1-4 Conditions (Based on AM)	No
Year 2026 Phases 1-4 Conditions (Based on PM)	No
SW Vermillion Drive/Site Access at SW Norwood Road	
Year 2024 Phase 1-2 Conditions (Based on AM)	No
Year 2024 Phase 1-2 Conditions (Based on PM)	No
Year 2026 Phases 1-4 Conditions (Based on AM)	No
Year 2026 Phases 1-4 Conditions (Based on PM)	No
SW 82nd Avenue at SW Norwood Road	
Year 2026 Phases 1-4 Conditions (Based on AM)	No
Year 2026 Phases 1-4 Conditions (Based on PM)	No
SW Norwood Road at SW 65th Avenue	
Year 2026 Phases 1-4 Conditions (Based on AM)	No
Year 2026 Phases 1-4 Conditions (Based on PM)	No

9/20/2021

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Phases 1-4 Conditions (Based on AM)

Major Street:	SW Boones Ferry Road	Minor Street:	SW Iowa Street	
Number of Lanes:	1	Number of Lanes:	1	
AM Peak Hour Volumes:	1312	AM Peak Hour Volumes:	109	Total
			56	Rights
			50%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

_____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	13,120	8,850	
Minor Street*	810	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	13,120	13,300	
Minor Street*	810	1,350	No
Combination Warrant			
Major Street	13,120	10,640	
Minor Street*	810	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Phases 1-4 Conditions (Based on PM)

Major Street:	SW Boones Ferry Road	Minor Street:	SW Iowa Street	
Number of Lanes:	1	Number of Lanes:	1	
PM Peak Hour Volumes:	1637	PM Peak Hour Volumes:	72	Total
			35	Rights
			50%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

_____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
<u>WARRANT 1, CONDITION A</u>		100%	70%	100%	70%
<u>Major St.</u>	<u>Minor St.</u>	<u>Warrants</u>	<u>Warrants</u>	<u>Warrants</u>	<u>Warrants</u>
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
<u>WARRANT 1, CONDITION B</u>					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	16,370	8,850	
Minor Street*	550	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	16,370	13,300	
Minor Street*	550	1,350	No
Combination Warrant			
Major Street	16,370	10,640	
Minor Street*	550	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2024 Phase 1-2 Conditions (Based on AM)

Major Street:	SW Boones Ferry Road	Minor Street:	SW Norwood Road		
Number of Lanes:	1	Number of Lanes:	1		
			205	Total	
AM Peak Hour Volumes:	1206	AM Peak Hour Volumes:	91	Rights	
			50%	RT Discount	

Warrant Used:

X 100 percent of standard warrants used

____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100% Warrants	70% Warrants	100% Warrants	70% Warrants
Major St.	Minor St.				
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	12,060	8,850	
Minor Street*	1,600	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	12,060	13,300	
Minor Street*	1,600	1,350	No
Combination Warrant			
Major Street	12,060	10,640	
Minor Street*	1,600	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2024 Phase 1-2 Conditions (Based on PM)

Major Street:	SW Boones Ferry Road	Minor Street:	SW Norwood Road	
Number of Lanes:	1	Number of Lanes:	1	
PM Peak Hour Volumes:	1500	PM Peak Hour Volumes:	166	Total
			98	Rights
			50%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

_____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	15,000	8,850	
Minor Street*	1,170	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	15,000	13,300	
Minor Street*	1,170	1,350	No
Combination Warrant			
Major Street	15,000	10,640	
Minor Street*	1,170	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Phases 1-4 Conditions (Based on AM)

Major Street:	SW Boones Ferry Road	Minor Street:	SW Norwood Road	
Number of Lanes:	1	Number of Lanes:	1	
AM Peak Hour Volumes:	1299	AM Peak Hour Volumes:	191	Total
			102	Rights
			50%	RT Discount

Warrant Used:

X 100 percent of standard warrants used
____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	12,990	8,850	
Minor Street*	1,400	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	12,990	13,300	
Minor Street*	1,400	1,350	No
Combination Warrant			
Major Street	12,990	10,640	
Minor Street*	1,400	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Phases 1-4 Conditions (Based on PM)

Major Street:	SW Boones Ferry Road	Minor Street:	SW Norwood Road
Number of Lanes:	1	Number of Lanes:	1
PM Peak Hour Volumes:	1607	PM Peak Hour Volumes:	158 Total 106 Rights 50% RT Discount

Warrant Used:

X 100 percent of standard warrants used

____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	16,070	8,850	
Minor Street*	1,050	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	16,070	13,300	
Minor Street*	1,050	1,350	No
Combination Warrant			
Major Street	16,070	10,640	
Minor Street*	1,050	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Phases 1-4 Conditions (Based on AM) w/ 2-lane Exit

Major Street:	SW Boones Ferry Road	Minor Street:	Site Access		
Number of Lanes:	1	Number of Lanes:	1		
AM Peak Hour Volumes:	1300	AM Peak Hour Volumes:	154	Total	
			58	Rights	
			100%	RT Discount	

Warrant Used:

X 100 percent of standard warrants used

______ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	13,000	8,850	
Minor Street*	960	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	13,000	13,300	
Minor Street*	960	1,350	No
Combination Warrant			
Major Street	13,000	10,640	
Minor Street*	960	2,120	No

* Minor street right-turning traffic volumes reduced by 100%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Phases 1-4 Conditions (Based on PM) w/ 2-lane Exit

Major Street:	SW Boones Ferry Road	Minor Street:	Site Access		
Number of Lanes:	1	Number of Lanes:	1		
PM Peak Hour Volumes:	1591	PM Peak Hour Volumes:	100	Total	
			38	Rights	
			100%	RT Discount	

Warrant Used:

X 100 percent of standard warrants used

___ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100% Warrants	70% Warrants	100% Warrants	70% Warrants
Major St.	Minor St.				
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	15,910	8,850	
Minor Street*	620	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	15,910	13,300	
Minor Street*	620	1,350	No
Combination Warrant			
Major Street	15,910	10,640	
Minor Street*	620	2,120	No

* Minor street right-turning traffic volumes reduced by 100%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2024 Phase 1-2 Conditions (Based on AM)

Major Street:	SW Norwood Road		Minor Street:	SW 89th Avenue/Site Access	
Number of Lanes:	1		Number of Lanes:	1	
				43	Total
AM Peak Hour Volumes:	329		AM Peak Hour Volumes:	25	Rights
				50%	RT Discount

Warrant Used:

X 100 percent of standard warrants used
___ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
<u>WARRANT 1, CONDITION A</u>		100%	70%	100%	70%
<u>Major St.</u>	<u>Minor St.</u>	<u>Warrants</u>	<u>Warrants</u>	<u>Warrants</u>	<u>Warrants</u>
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
<u>WARRANT 1, CONDITION B</u>					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	3,290	8,850	
Minor Street*	310	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	3,290	13,300	
Minor Street*	310	1,350	No
Combination Warrant			
Major Street	3,290	10,640	
Minor Street*	310	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2024 Phase 1-2 Conditions (Based on PM)

Major Street:	SW Norwood Road		Minor Street:	SW 89th Avenue/Site Access	
Number of Lanes:	1		Number of Lanes:	1	
PM Peak Hour Volumes:	495		PM Peak Hour Volumes:	27	Total
				5	Rights
				50%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

_____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	4,950	8,850	
Minor Street*	250	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	4,950	13,300	
Minor Street*	250	1,350	No
Combination Warrant			
Major Street	4,950	10,640	
Minor Street*	250	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Phases 1-4 Conditions (Based on AM)

Major Street:	SW Norwood Road	Minor Street:	SW 89th Avenue/Site Access	
Number of Lanes:	1	Number of Lanes:	1	
AM Peak Hour Volumes:	324	AM Peak Hour Volumes:	45	Total
			26	Rights
			50%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100% Warrants	70% Warrants	100% Warrants	70% Warrants
Major St.	Minor St.				
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	3,240	8,850	
Minor Street*	320	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	3,240	13,300	
Minor Street*	320	1,350	No
Combination Warrant			
Major Street	3,240	10,640	
Minor Street*	320	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project:	21029 - Autumn Sunrise
Date:	9/20/2021
Scenario:	Year 2026 Phases 1-4 Conditions (Based on PM)

Major Street:	SW Norwood Road	Minor Street:	SW 89th Avenue/Site Access	
Number of Lanes:	1	Number of Lanes:	1	
PM Peak Hour Volumes:	482	PM Peak Hour Volumes:	20	Total
			9	Rights
			50%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

___ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	4,820	8,850	
Minor Street*	160	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	4,820	13,300	
Minor Street*	160	1,350	No
Combination Warrant			
Major Street	4,820	10,640	
Minor Street*	160	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project:	21029 - Autumn Sunrise
Date:	9/20/2021
Scenario:	Year 2024 Phase 1-2 Conditions (Based on AM)

Major Street:	SW Norwood Road	Minor Street:	SW Vermillion Drive/Site Access	
Number of Lanes:	1	Number of Lanes:	1	
AM Peak Hour Volumes:	256	AM Peak Hour Volumes:	81	Total
			43	Rights
			50%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

_____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100% Warrants	70% Warrants	100% Warrants	70% Warrants
Major St.	Minor St.				
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	2,560	8,850	
Minor Street*	600	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	2,560	13,300	
Minor Street*	600	1,350	No
Combination Warrant			
Major Street	2,560	10,640	
Minor Street*	600	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2024 Phase 1-2 Conditions (Based on PM)

Major Street:	SW Norwood Road	Minor Street:	SW Vermillion Drive/Site Access
Number of Lanes:	1	Number of Lanes:	1
PM Peak Hour Volumes:	424	PM Peak Hour Volumes:	59 Total 36 Rights 50% RT Discount

Warrant Used:

X 100 percent of standard warrants used

______ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100% Warrants	70% Warrants	100% Warrants	70% Warrants
Major St.	Minor St.				
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	4,240	8,850	
Minor Street*	410	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	4,240	13,300	
Minor Street*	410	1,350	No
Combination Warrant			
Major Street	4,240	10,640	
Minor Street*	410	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Phases 1-4 Conditions (Based on AM)

Major Street:	SW Norwood Road	Minor Street:	SW Vermillion Drive/Site Access	
Number of Lanes:	1	Number of Lanes:	1	
AM Peak Hour Volumes:	264	AM Peak Hour Volumes:	85	Total
			43	Rights
			50%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

______ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	2,640	8,850	
Minor Street*	640	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	2,640	13,300	
Minor Street*	640	1,350	No
Combination Warrant			
Major Street	2,640	10,640	
Minor Street*	640	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Phases 1-4 Conditions (Based on PM)

Major Street: SW Norwood Road
Number of Lanes: 1
PM Peak Hour Volumes: 447

Minor Street: SW Vermillion Drive/Site Access
Number of Lanes: 1
PM Peak Hour Volumes: 61 Total
37 Rights
50% RT Discount

Warrant Used:

X 100 percent of standard warrants used
______ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	4,470	8,850	
Minor Street*	430	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	4,470	13,300	
Minor Street*	430	1,350	No
Combination Warrant			
Major Street	4,470	10,640	
Minor Street*	430	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Phases 1-4 Conditions (Based on AM)

Major Street:	SW Norwood Road	Minor Street:	SW 82nd Avenue	
Number of Lanes:	1	Number of Lanes:	1	
			84	Total
AM Peak Hour Volumes:	177	AM Peak Hour Volumes:	84	Rights
			50%	RT Discount

Warrant Used:

X ____ 100 percent of standard warrants used

______ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100% Warrants	70% Warrants	100% Warrants	70% Warrants
Major St.	Minor St.				
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	1,770	8,850	
Minor Street*	420	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	1,770	13,300	
Minor Street*	420	1,350	No
Combination Warrant			
Major Street	1,770	10,640	
Minor Street*	420	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Phases 1-4 Conditions (Based on PM)

Major Street:	SW Norwood Road	Minor Street:	SW 82nd Avenue	
Number of Lanes:	1	Number of Lanes:	1	
PM Peak Hour Volumes:	186	PM Peak Hour Volumes:	181	Total
			175	Rights
			50%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

______ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100% Warrants	70% Warrants	100% Warrants	70% Warrants
Major St.	Minor St.				
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	1,860	8,850	
Minor Street*	940	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	1,860	13,300	
Minor Street*	940	1,350	No
Combination Warrant			
Major Street	1,860	10,640	
Minor Street*	940	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Phases 1-4 Conditions (Based on AM)

Major Street:	SW 65th Avenue		Minor Street:	SW Norwood Road	
Number of Lanes:	1		Number of Lanes:	1	
				216	Total
AM Peak Hour Volumes:	706		AM Peak Hour Volumes:	62	Rights
				50%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

______ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100% Warrants	70% Warrants	100% Warrants	70% Warrants
Major St.	Minor St.				
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	7,060	8,850	
Minor Street*	1,850	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	7,060	13,300	
Minor Street*	1,850	1,350	No
Combination Warrant			
Major Street	7,060	10,640	
Minor Street*	1,850	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Phases 1-4 Conditions (Based on PM)

Major Street:	SW 65th Avenue	Minor Street:	SW Norwood Road	
Number of Lanes:	1	Number of Lanes:	1	
PM Peak Hour Volumes:	834	PM Peak Hour Volumes:	154	Total
			72	Rights
			50%	RT Discount

Warrant Used:

X 100 percent of standard warrants used
___ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100% Warrants	70% Warrants	100% Warrants	70% Warrants
Major St.	Minor St.				
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	8,340	8,850	
Minor Street*	1,180	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	8,340	13,300	
Minor Street*	1,180	1,350	No
Combination Warrant			
Major Street	8,340	10,640	
Minor Street*	1,180	2,120	No

* Minor street right-turning traffic volumes reduced by 50%.

Appendix D - Operations

Level of Service Definitions

Synchro Reports

HCM6 V/C Ratio Calculations

Queuing at Site Access

Level of Service Definitions

Level of service is used to describe the quality of traffic flow. Levels of service A to C are considered good, and rural roads are usually designed for level of service C. Urban streets and signalized intersections are typically designed for level of service D. Level of service E is considered to be the limit of acceptable delay. For unsignalized intersections, level of service E is generally considered acceptable. Here is a more complete description of levels of service:

- *Level of service A:* Very low delay at intersections, with all traffic signal cycles clearing and no vehicles waiting through more than one signal cycle. On highways, low volume and high speeds, with speeds not restricted by other vehicles.
- *Level of service B:* Operating speeds beginning to be affected by other traffic; short traffic delays at intersections. Higher average intersection delay than for level of service A resulting from more vehicles stopping.
- *Level of service C:* Operating speeds and maneuverability closely controlled by other traffic; higher delays at intersections than for level of service B due to a significant number of vehicles stopping. Not all signal cycles clear the waiting vehicles. This is the recommended design standard for rural highways.
- *Level of service D:* Tolerable operating speeds; long traffic delays occur at intersections. The influence of congestion is noticeable. At traffic signals many vehicles stop, and the proportion of vehicles not stopping declines. The number of signal cycle failures, for which vehicles must wait through more than one signal cycle, are noticeable. This is typically the design level for urban signalized intersections.
- *Level of service E:* Restricted speeds, very long traffic delays at traffic signals, and traffic volumes near capacity. Flow is unstable so that any interruption, no matter how minor, will cause queues to form and service to deteriorate to level of service F. Traffic signal cycle failures are frequent occurrences. For unsignalized intersections, level of service E or better is generally considered acceptable.
- *Level of service F:* Extreme delays, resulting in long queues which may interfere with other traffic movements. There may be stoppages of long duration, and speeds may drop to zero. There may be frequent signal cycle failures. Level of service F will typically result when vehicle arrival rates are greater than capacity. It is considered unacceptable by most drivers.

Level of Service Criteria
For Signalized Intersections

Level of Service (LOS)	Control Delay per Vehicle (Seconds)
A	<10
B	10-20
C	20-35
D	35-55
E	55-80
F	>80

Level of Service Criteria
For Unsignalized Intersections

Level of Service (LOS)	Control Delay per Vehicle (Seconds)
A	<10
B	10-15
C	15-25
D	25-35
E	35-50
F	>50

HCM 6th Signalized Intersection Summary
1: SW Boones Ferry Rd & SW Sagert St

06/24/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	66	73	11	166	93	57	7	554	261	48	253	44
Future Volume (veh/h)	66	73	11	166	93	57	7	554	261	48	253	44
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1885	1885	1885	1811	1811	1811
Adj Flow Rate, veh/h	73	80	7	182	102	41	8	609	271	53	278	32
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	0	0	0	1	1	1	6	6	6
Cap, veh/h	265	135	12	338	179	72	678	700	311	252	1091	904
Arrive On Green	0.06	0.08	0.07	0.12	0.14	0.13	0.02	0.57	0.56	0.05	0.60	0.60
Sat Flow, veh/h	1795	1708	149	1810	1287	517	1795	1226	546	1725	1811	1501
Grp Volume(v), veh/h	73	0	87	182	0	143	8	0	880	53	278	32
Grp Sat Flow(s),veh/h/ln	1795	0	1857	1810	0	1805	1795	0	1772	1725	1811	1501
Q Serve(g_s), s	3.1	0.0	3.9	7.5	0.0	6.3	0.2	0.0	36.3	1.0	6.2	0.7
Cycle Q Clear(g_c), s	3.1	0.0	3.9	7.5	0.0	6.3	0.2	0.0	36.3	1.0	6.2	0.7
Prop In Lane	1.00		0.08	1.00		0.29	1.00		0.31	1.00		1.00
Lane Grp Cap(c), veh/h	265	0	146	338	0	251	678	0	1011	252	1091	904
V/C Ratio(X)	0.28	0.00	0.59	0.54	0.00	0.57	0.01	0.00	0.87	0.21	0.25	0.04
Avail Cap(c_a), veh/h	396	0	348	362	0	338	880	0	1162	392	1187	984
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.4	0.0	38.0	29.3	0.0	34.5	7.6	0.0	15.8	15.1	8.0	6.9
Incr Delay (d2), s/veh	0.2	0.0	1.4	0.5	0.0	0.8	0.0	0.0	7.4	0.2	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	1.8	3.2	0.0	2.8	0.1	0.0	14.9	0.4	2.2	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.6	0.0	39.5	29.8	0.0	35.2	7.6	0.0	23.2	15.3	8.2	6.9
LnGrp LOS	C	A	D	C	A	D	A	A	C	B	A	A
Approach Vol, veh/h		160			325			888			363	
Approach Delay, s/veh		36.8			32.2			23.0			9.1	
Approach LOS		D			C			C			A	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.1	52.7	13.9	10.7	5.4	55.4	8.7	15.9
Change Period (Y+Rc), s	4.5	5.0	4.5	4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s	10.5	55.0	10.5	15.5	10.5	55.0	10.5	15.5
Max Q Clear Time (g_c+I1), s	3.0	38.3	9.5	5.9	2.2	8.2	5.1	8.3
Green Ext Time (p_c), s	0.0	9.5	0.0	0.1	0.0	3.4	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	23.1
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	162	64	133	28	97	14	236	646	38	6	279	145
Future Volume (veh/h)	162	64	133	28	97	14	236	646	38	6	279	145
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	0.99		0.96	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1841	1841	1841	1767	1767	1767	1841	1841	1841
Adj Flow Rate, veh/h	193	76	87	33	115	11	281	769	39	7	332	155
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	4	4	4	4	4	4	9	9	9	4	4	4
Cap, veh/h	346	155	177	270	192	18	464	914	46	204	526	246
Arrive On Green	0.12	0.20	0.19	0.03	0.12	0.10	0.11	0.55	0.53	0.01	0.44	0.44
Sat Flow, veh/h	1753	769	881	1753	1647	158	1682	1665	84	1753	1185	553
Grp Volume(v), veh/h	193	0	163	33	0	126	281	0	808	7	0	487
Grp Sat Flow(s),veh/h/ln	1753	0	1650	1753	0	1805	1682	0	1749	1753	0	1739
Q Serve(g_s), s	7.2	0.0	6.8	1.3	0.0	5.1	6.7	0.0	29.8	0.2	0.0	16.6
Cycle Q Clear(g_c), s	7.2	0.0	6.8	1.3	0.0	5.1	6.7	0.0	29.8	0.2	0.0	16.6
Prop In Lane	1.00		0.53	1.00		0.09	1.00		0.05	1.00		0.32
Lane Grp Cap(c), veh/h	346	0	332	270	0	210	464	0	960	204	0	772
V/C Ratio(X)	0.56	0.00	0.49	0.12	0.00	0.60	0.61	0.00	0.84	0.03	0.00	0.63
Avail Cap(c_a), veh/h	390	0	332	463	0	422	513	0	1272	324	0	1265
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.9	0.0	27.5	29.3	0.0	32.3	12.1	0.0	14.6	15.5	0.0	16.5
Incr Delay (d2), s/veh	0.5	0.0	0.4	0.1	0.0	1.0	1.0	0.0	4.6	0.0	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	0.0	2.6	0.5	0.0	2.2	2.3	0.0	11.4	0.1	0.0	6.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.4	0.0	27.9	29.3	0.0	33.4	13.1	0.0	19.2	15.5	0.0	17.7
LnGrp LOS	C	A	C	C	A	C	B	A	B	B	A	B
Approach Vol, veh/h		356			159			1089			494	
Approach Delay, s/veh		26.6			32.5			17.6			17.7	
Approach LOS		C			C			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.7	46.3	6.5	19.5	12.8	38.2	13.1	13.0
Change Period (Y+Rc), s	4.0	5.5	4.0	5.0	4.0	5.5	4.0	5.0
Max Green Setting (Gmax), s	6.0	54.5	11.0	12.0	11.0	54.5	11.0	17.0
Max Q Clear Time (g_c+I1), s	2.2	31.8	3.3	8.8	8.7	18.6	9.2	7.1
Green Ext Time (p_c), s	0.0	8.9	0.0	0.2	0.1	5.3	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	20.3
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: SW Boones Ferry Road & SW Ibach Street/SW Ibach Court

06/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	238	4	312	4	1	17	122	665	9	3	358	79
Future Volume (veh/h)	238	4	312	4	1	17	122	665	9	3	358	79
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.99	0.99		0.97	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1900	1900	1900	1796	1796	1796	1811	1811	1811
Adj Flow Rate, veh/h	274	5	198	5	1	14	140	764	10	3	411	51
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	3	3	3	0	0	0	7	7	7	6	6	6
Cap, veh/h	442	10	415	126	54	262	176	961	13	6	803	677
Arrive On Green	0.27	0.27	0.26	0.26	0.27	0.26	0.10	0.54	0.53	0.00	0.44	0.44
Sat Flow, veh/h	1353	39	1525	214	199	963	1711	1769	23	1725	1811	1526
Grp Volume(v), veh/h	274	0	203	20	0	0	140	0	774	3	411	51
Grp Sat Flow(s),veh/h/ln	1353	0	1564	1376	0	0	1711	0	1792	1725	1811	1526
Q Serve(g_s), s	7.1	0.0	7.2	0.0	0.0	0.0	5.3	0.0	23.0	0.1	10.8	1.3
Cycle Q Clear(g_c), s	14.4	0.0	7.2	7.2	0.0	0.0	5.3	0.0	23.0	0.1	10.8	1.3
Prop In Lane	1.00		0.98	0.25		0.70	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	442	0	426	432	0	0	176	0	973	6	803	677
V/C Ratio(X)	0.62	0.00	0.48	0.05	0.00	0.00	0.80	0.00	0.80	0.54	0.51	0.08
Avail Cap(c_a), veh/h	605	0	615	531	0	0	285	0	1517	287	1533	1292
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.2	0.0	20.4	17.9	0.0	0.0	29.0	0.0	12.2	32.9	13.2	10.6
Incr Delay (d2), s/veh	0.9	0.0	0.5	0.0	0.0	0.0	5.0	0.0	2.5	41.0	0.8	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	0.0	2.5	0.2	0.0	0.0	2.3	0.0	7.9	0.1	4.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.1	0.0	20.9	18.0	0.0	0.0	34.0	0.0	14.6	73.9	14.0	10.7
LnGrp LOS	C	A	C	B	A	A	C	A	B	E	B	B
Approach Vol, veh/h		477			20			914			465	
Approach Delay, s/veh		22.7			18.0			17.6			14.1	
Approach LOS		C			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.2	39.9		22.0	10.8	33.3		22.0				
Change Period (Y+Rc), s	4.0	5.0		4.5	4.0	5.0		4.5				
Max Green Setting (Gmax), s	11.0	55.0		25.5	11.0	55.0		22.0				
Max Q Clear Time (g_c+I1), s	2.1	25.0		16.4	7.3	12.8		9.2				
Green Ext Time (p_c), s	0.0	9.9		1.1	0.1	4.8		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			18.0
HCM 6th LOS			B

HCM 6th TWSC
4: SW Boones Ferry Road & SW Iowa Drive

06/24/2021

Intersection	
Int Delay, s/veh	6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Vol, veh/h	46	2	51	27	0	29	13	612	9	18	411	16
Future Vol, veh/h	46	2	51	27	0	29	13	612	9	18	411	16
Conflicting Peds, #/hr	13	0	5	1	0	9	5	0	1	9	0	13
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	95	-	-	105	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	0	0	0	0	0	0	7	7	7	6	6	6
Mvmt Flow	55	2	61	32	0	35	15	729	11	21	489	19

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1349	1333	517	1351	1337	757	521	0	0	749	0	0
Stage 1	554	554	-	774	774	-	-	-	-	-	-	-
Stage 2	795	779	-	577	563	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.17	-	-	4.16	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.263	-	-	2.254	-	-
Pot Cap-1 Maneuver	129	155	562	129	155	411	1020	-	-	842	-	-
Stage 1	520	517	-	394	411	-	-	-	-	-	-	-
Stage 2	384	409	-	506	512	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	112	146	552	108	146	402	1007	-	-	835	-	-
Mov Cap-2 Maneuver	112	146	-	108	146	-	-	-	-	-	-	-
Stage 1	506	498	-	385	401	-	-	-	-	-	-	-
Stage 2	342	399	-	435	493	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	49.7	38	0.2	0.4
HCM LOS	E	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1007	-	-	192	174	835	-	-
HCM Lane V/C Ratio	0.015	-	-	0.614	0.383	0.026	-	-
HCM Control Delay (s)	8.6	-	-	49.7	38	9.4	-	-
HCM Lane LOS	A	-	-	E	E	A	-	-
HCM 95th %tile Q(veh)	0	-	-	3.5	1.7	0.1	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↑	↱	↰	↑
Traffic Vol, veh/h	70	55	579	28	48	441
Future Vol, veh/h	70	55	579	28	48	441
Conflicting Peds, #/hr	4	4	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	65	290	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	2	2	6	6	5	5
Mvmt Flow	80	63	666	32	55	507

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1291	674	0	0	702	0
Stage 1	670	-	-	-	-	-
Stage 2	621	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.15	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.245	-
Pot Cap-1 Maneuver	180	455	-	-	882	-
Stage 1	509	-	-	-	-	-
Stage 2	536	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	167	452	-	-	879	-
Mov Cap-2 Maneuver	306	-	-	-	-	-
Stage 1	507	-	-	-	-	-
Stage 2	500	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21.7	0	0.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	357	879	-
HCM Lane V/C Ratio	-	-	0.402	0.063	-
HCM Control Delay (s)	-	-	21.7	9.4	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	1.9	0.2	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↑↱		↰	↑
Traffic Vol, veh/h	2	1	609	0	0	512
Future Vol, veh/h	2	1	609	0	0	512
Conflicting Peds, #/hr	4	4	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	0	6	6	5	5
Mvmt Flow	2	1	700	0	0	589

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1297	708	0	0	704	0
Stage 1	704	-	-	-	-	-
Stage 2	593	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.15	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.245	-
Pot Cap-1 Maneuver	180	438	-	-	880	-
Stage 1	494	-	-	-	-	-
Stage 2	556	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	179	435	-	-	877	-
Mov Cap-2 Maneuver	385	-	-	-	-	-
Stage 1	492	-	-	-	-	-
Stage 2	554	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	400	877	-
HCM Lane V/C Ratio	-	-	0.009	-	-
HCM Control Delay (s)	-	-	14.1	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✣		↰↰	↱		↰	↑↱	
Traffic Volume (veh/h)	162	0	528	0	0	0	584	447	0	0	465	47
Future Volume (veh/h)	162	0	528	0	0	0	584	447	0	0	465	47
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1693	1693	1693	1900	1900	1900	1693	1693	1693	1796	1796	1796
Adj Flow Rate, veh/h	180	0	537	0	0	0	649	497	0	0	517	46
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	14	14	14	0	0	0	14	14	14	7	7	7
Cap, veh/h	288	0	641	0	320	0	752	639	0	544	1336	119
Arrive On Green	0.16	0.00	0.17	0.00	0.00	0.00	0.09	0.12	0.00	0.00	0.42	0.41
Sat Flow, veh/h	1283	0	1434	0	1900	0	2740	1693	0	1711	3171	281
Grp Volume(v), veh/h	180	0	537	0	0	0	649	497	0	0	278	285
Grp Sat Flow(s),veh/h/ln	1283	0	1434	0	1900	0	1370	1693	0	1711	1706	1746
Q Serve(g_s), s	13.0	0.0	16.2	0.0	0.0	0.0	22.2	27.0	0.0	0.0	10.7	10.8
Cycle Q Clear(g_c), s	13.0	0.0	16.2	0.0	0.0	0.0	22.2	27.0	0.0	0.0	10.7	10.8
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		0.16
Lane Grp Cap(c), veh/h	285	0	641	0	320	0	752	639	0	544	719	735
V/C Ratio(X)	0.63	0.00	0.84	0.00	0.00	0.00	0.86	0.78	0.00	0.00	0.39	0.39
Avail Cap(c_a), veh/h	285	0	641	0	320	0	1041	1033	0	544	719	735
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	0.92	0.92	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	38.6	0.0	23.2	0.0	0.0	0.0	41.4	37.7	0.0	0.0	19.0	19.1
Incr Delay (d2), s/veh	4.0	0.0	9.3	0.0	0.0	0.0	4.5	8.4	0.0	0.0	1.6	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.3	0.0	11.3	0.0	0.0	0.0	8.6	13.6	0.0	0.0	4.2	4.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.6	0.0	32.5	0.0	0.0	0.0	45.9	46.1	0.0	0.0	20.6	20.6
LnGrp LOS	D	A	C	A	A	A	D	D	A	A	C	C
Approach Vol, veh/h		717			0			1146			563	
Approach Delay, s/veh		35.1			0.0			46.0			20.6	
Approach LOS		D						D			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	31.0	44.0		20.0	35.1	39.9		20.0
Change Period (Y+Rc), s	* 5.4	* 5.4		4.5	* 5.4	* 5.4		4.5
Max Green Setting (Gmax), s	* 36	* 29		15.5	* 8.5	* 57		15.5
Max Q Clear Time (g_c+I1), s	24.2	12.8		0.0	0.0	29.0		18.2
Green Ext Time (p_c), s	1.4	4.3		0.0	0.0	5.4		0.0

Intersection Summary	
HCM 6th Ctrl Delay	36.9
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱↱	↰	↱		↰↰	↑↱		↰	↑↑	↱
Traffic Volume (veh/h)	189	7	509	15	1	6	769	762	64	5	665	248
Future Volume (veh/h)	189	7	509	15	1	6	769	762	64	5	665	248
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1648	1648	1648	1737	1737	1737	1796	1796	1796	1737	1737	1737
Adj Flow Rate, veh/h	205	8	515	16	1	7	836	828	70	5	723	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	17	17	17	11	11	11	7	7	7	11	11	11
Cap, veh/h	297	9	1161	90	35	248	942	1114	94	501	1217	
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.47	0.58	0.58	0.10	0.12	0.00
Sat Flow, veh/h	1173	46	2445	816	187	1309	3319	3185	269	1654	3300	1472
Grp Volume(v), veh/h	213	0	515	16	0	8	836	444	454	5	723	0
Grp Sat Flow(s),veh/h/ln	1219	0	1223	816	0	1496	1659	1706	1747	1654	1650	1472
Q Serve(g_s), s	15.9	0.0	13.3	1.7	0.0	0.4	21.7	18.1	18.1	0.3	19.7	0.0
Cycle Q Clear(g_c), s	16.3	0.0	13.3	18.0	0.0	0.4	21.7	18.1	18.1	0.3	19.7	0.0
Prop In Lane	0.96		1.00	1.00		0.88	1.00		0.15	1.00		1.00
Lane Grp Cap(c), veh/h	305	0	1161	90	0	284	942	597	611	501	1217	
V/C Ratio(X)	0.70	0.00	0.44	0.18	0.00	0.03	0.89	0.74	0.74	0.01	0.59	
Avail Cap(c_a), veh/h	305	0	1161	90	0	284	1572	988	1012	501	1217	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.39	0.39	0.39	0.78	0.78	0.00
Uniform Delay (d), s/veh	38.0	0.0	16.7	46.8	0.0	31.4	23.6	16.6	16.6	29.9	35.0	0.0
Incr Delay (d2), s/veh	6.4	0.0	0.2	0.7	0.0	0.0	1.5	3.3	3.2	0.0	1.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.3	0.0	3.6	0.4	0.0	0.2	6.5	5.3	5.4	0.1	8.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.4	0.0	16.9	47.5	0.0	31.4	25.1	19.9	19.8	29.9	36.7	0.0
LnGrp LOS	D	A	B	D	A	C	C	B	B	C	D	
Approach Vol, veh/h		728			24			1734			728	A
Approach Delay, s/veh		24.9			42.1			22.4			36.6	
Approach LOS		C			D			C			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	32.0	40.0		23.0	33.8	38.2		23.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	45.0	17.0		18.0	7.0	55.0		18.0
Max Q Clear Time (g_c+I1), s	23.7	21.7		20.0	2.3	20.1		18.3
Green Ext Time (p_c), s	3.3	0.0		0.0	0.0	13.1		0.0

Intersection Summary	
HCM 6th Ctrl Delay	26.3
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM Signalized Intersection Capacity Analysis
10: I-5 SB Ramps & SW Elligsen Road

06/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰	↱
Traffic Volume (vph)	0	865	324	0	672	110	0	0	0	491	0	921
Future Volume (vph)	0	865	324	0	672	110	0	0	0	491	0	921
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frpb, ped/bikes		1.00	0.99		1.00	1.00				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3034	1340		3406	1524				1573	1573	1679
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3034	1340		3406	1524				1573	1573	1679
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	920	345	0	715	117	0	0	0	522	0	980
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	9
Lane Group Flow (vph)	0	920	345	0	715	117	0	0	0	261	261	971
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	19%	19%	19%	6%	6%	6%	0%	0%	0%	9%	9%	9%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		65.6	95.0		22.6	95.0				19.9	19.9	58.4
Effective Green, g (s)		66.6	95.0		23.6	95.0				20.4	20.4	59.4
Actuated g/C Ratio		0.70	1.00		0.25	1.00				0.21	0.21	0.63
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2126	1340		846	1524				337	337	1120
v/s Ratio Prot		0.30			c0.21					0.17	0.17	c0.36
v/s Ratio Perm			0.26			0.08						0.22
v/c Ratio		0.43	0.26		0.85	0.08				0.77	0.77	0.87
Uniform Delay, d1		6.1	0.0		34.0	0.0				35.1	35.1	14.6
Progression Factor		2.07	1.00		0.59	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.6	0.4		9.3	0.1				10.0	10.0	7.1
Delay (s)		13.2	0.4		29.3	0.1				45.1	45.1	21.7
Level of Service		B	A		C	A				D	D	C
Approach Delay (s)		9.7			25.2			0.0			29.8	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM 2000 Control Delay	21.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

V/C Ratio calculated using HCM worksheet with correct lost time

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑	↰↰	↱
Traffic Volume (veh/h)	692	665	0	304	477	241
Future Volume (veh/h)	692	665	0	304	477	241
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1707	1707	0	1796	1811	1811
Adj Flow Rate, veh/h	760	0	0	334	524	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	13	13	0	7	6	6
Cap, veh/h	2368		0	2491	622	
Arrive On Green	0.24	0.00	0.00	0.73	0.19	0.00
Sat Flow, veh/h	3329	1447	0	3593	3346	1535
Grp Volume(v), veh/h	760	0	0	334	524	0
Grp Sat Flow(s),veh/h/ln	1622	1447	0	1706	1673	1535
Q Serve(g_s), s	18.3	0.0	0.0	2.8	14.4	0.0
Cycle Q Clear(g_c), s	18.3	0.0	0.0	2.8	14.4	0.0
Prop In Lane		1.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2368		0	2491	622	
V/C Ratio(X)	0.32		0.00	0.13	0.84	
Avail Cap(c_a), veh/h	2368		0	2491	810	
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.85	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	16.7	0.0	0.0	3.8	37.3	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.1	5.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.9	0.0	0.0	0.8	6.3	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	17.0	0.0	0.0	4.0	42.9	0.0
LnGrp LOS	B		A	A	D	
Approach Vol, veh/h	760	A		334	524	A
Approach Delay, s/veh	17.0			4.0	42.9	
Approach LOS	B			A	D	

Timer - Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		73.3				73.3		21.7
Change Period (Y+Rc), s		5.0				5.0		4.5
Max Green Setting (Gmax), s		63.0				63.0		22.5
Max Q Clear Time (g_c+I1), s		20.3				4.8		16.4
Green Ext Time (p_c), s		9.2				3.5		0.8

Intersection Summary	
HCM 6th Ctrl Delay	22.7
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

12: SW Norwood Road & SW 89th Avenue

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	13	95	133	2	17	24
Future Vol, veh/h	13	95	133	2	17	24
Conflicting Peds, #/hr	1	0	0	2	2	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	0	0	2	2	0	0
Mvmt Flow	16	119	166	3	21	30

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	171	0	-	0	323	171
Stage 1	-	-	-	-	170	-
Stage 2	-	-	-	-	153	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1418	-	-	-	675	878
Stage 1	-	-	-	-	865	-
Stage 2	-	-	-	-	880	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1415	-	-	-	664	875
Mov Cap-2 Maneuver	-	-	-	-	664	-
Stage 1	-	-	-	-	853	-
Stage 2	-	-	-	-	878	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1415	-	-	-	773
HCM Lane V/C Ratio	0.011	-	-	-	0.066
HCM Control Delay (s)	7.6	0	-	-	10
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

HCM 6th TWSC
13: SW Norwood Road & SW Vermillion Drive

06/24/2021

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⋎	
Traffic Vol, veh/h	19	93	94	6	36	41
Future Vol, veh/h	19	93	94	6	36	41
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	0	0	3	3	0	0
Mvmt Flow	23	115	116	7	44	51

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	123	0	-	0	281	120
Stage 1	-	-	-	-	120	-
Stage 2	-	-	-	-	161	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1477	-	-	-	713	937
Stage 1	-	-	-	-	910	-
Stage 2	-	-	-	-	873	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1477	-	-	-	701	937
Mov Cap-2 Maneuver	-	-	-	-	701	-
Stage 1	-	-	-	-	895	-
Stage 2	-	-	-	-	873	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1477	-	-	-	810
HCM Lane V/C Ratio	0.016	-	-	-	0.117
HCM Control Delay (s)	7.5	0	-	-	10
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Intersection	
Int Delay, s/veh	7.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			↰	↱
Traffic Vol, veh/h	106	0	23	0	0	0	34	4	0	0	0	66
Future Vol, veh/h	106	0	23	0	0	0	34	4	0	0	0	66
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	-	-	-	-	-	-	15
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	0	0	0	6	6	6	10	10	10
Mvmt Flow	119	0	26	0	0	0	38	4	0	0	0	74

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	26	0	0	252	252	13	254	265	-
Stage 1	-	-	-	-	-	-	251	251	-	1	1	-
Stage 2	-	-	-	-	-	-	1	1	-	253	264	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.16	6.56	6.26	7.2	6.6	-
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.56	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.56	-	6.2	5.6	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.554	4.054	3.354	3.59	4.09	-
Pot Cap-1 Maneuver	1622	-	-	1601	-	-	693	644	1056	683	627	0
Stage 1	-	-	-	-	-	-	744	692	-	1002	879	0
Stage 2	-	-	-	-	-	-	1012	887	-	734	676	0
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1601	-	-	653	596	1056	640	580	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	653	596	-	640	580	-
Stage 1	-	-	-	-	-	-	688	640	-	927	879	-
Stage 2	-	-	-	-	-	-	1012	887	-	674	625	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	6.1	0	11	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	646	1622	-	-	1601	-	-	-	-
HCM Lane V/C Ratio	0.066	0.073	-	-	-	-	-	-	-
HCM Control Delay (s)	11	7.4	0	-	0	-	-	0	0
HCM Lane LOS	B	A	A	-	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	0.2	-	-	0	-	-	-	-

HCM 6th TWSC
15: SW 65th Avenue & SW Norwood Road

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	119	45	35	319	222	55
Future Vol, veh/h	119	45	35	319	222	55
Conflicting Peds, #/hr	2	2	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	6	6
Mvmt Flow	132	50	39	354	247	61

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	714	282	310	0	-	0
Stage 1	280	-	-	-	-	-
Stage 2	434	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	398	757	1250	-	-	-
Stage 1	767	-	-	-	-	-
Stage 2	653	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	381	754	1248	-	-	-
Mov Cap-2 Maneuver	381	-	-	-	-	-
Stage 1	736	-	-	-	-	-
Stage 2	652	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.8	0.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1248	-	441	-	-
HCM Lane V/C Ratio	0.031	-	0.413	-	-
HCM Control Delay (s)	8	0	18.8	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	2	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	51	157	9	203	89	39	20	348	275	82	602	55
Future Volume (veh/h)	51	157	9	203	89	39	20	348	275	82	602	55
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	56	173	10	223	98	43	22	382	280	90	662	60
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	0	0	0	1	1	1	1	1	1
Cap, veh/h	348	234	14	374	266	117	315	474	347	310	950	787
Arrive On Green	0.05	0.13	0.13	0.13	0.21	0.21	0.03	0.47	0.46	0.06	0.50	0.50
Sat Flow, veh/h	1795	1764	102	1810	1250	548	1795	1000	733	1795	1885	1560
Grp Volume(v), veh/h	56	0	183	223	0	141	22	0	662	90	662	60
Grp Sat Flow(s),veh/h/ln	1795	0	1866	1810	0	1798	1795	0	1732	1795	1885	1560
Q Serve(g_s), s	2.1	0.0	7.5	7.9	0.0	5.3	0.5	0.0	25.9	2.0	21.3	1.6
Cycle Q Clear(g_c), s	2.1	0.0	7.5	7.9	0.0	5.3	0.5	0.0	25.9	2.0	21.3	1.6
Prop In Lane	1.00		0.05	1.00		0.30	1.00		0.42	1.00		1.00
Lane Grp Cap(c), veh/h	348	0	248	374	0	382	315	0	821	310	950	787
V/C Ratio(X)	0.16	0.00	0.74	0.60	0.00	0.37	0.07	0.00	0.81	0.29	0.70	0.08
Avail Cap(c_a), veh/h	506	0	376	389	0	382	509	0	1223	450	1331	1102
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.3	0.0	33.1	23.6	0.0	26.7	12.4	0.0	18.0	14.0	15.0	10.1
Incr Delay (d2), s/veh	0.1	0.0	1.6	1.5	0.0	0.2	0.0	0.0	3.7	0.2	1.6	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	3.4	3.4	0.0	2.2	0.2	0.0	10.3	0.7	8.6	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.3	0.0	34.7	25.1	0.0	27.0	12.5	0.0	21.7	14.2	16.6	10.2
LnGrp LOS	C	A	C	C	A	C	B	A	C	B	B	B
Approach Vol, veh/h		239			364			684			812	
Approach Delay, s/veh		33.0			25.8			21.4			15.9	
Approach LOS		C			C			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.8	41.6	14.4	14.5	6.4	44.0	8.0	20.9
Change Period (Y+Rc), s	4.5	5.0	4.5	4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s	10.5	55.0	10.5	15.5	10.5	55.0	10.5	15.5
Max Q Clear Time (g_c+I1), s	4.0	27.9	9.9	9.5	2.5	23.3	4.1	7.3
Green Ext Time (p_c), s	0.0	8.7	0.0	0.3	0.0	9.3	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	21.3
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
2: SW Boones Ferry Rd & SW Avery St

06/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	234	119	248	48	41	8	106	401	40	13	705	96
Future Volume (veh/h)	234	119	248	48	41	8	106	401	40	13	705	96
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.99	1.00		0.98	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1870	1870	1870	1811	1811	1811	1870	1870	1870
Adj Flow Rate, veh/h	244	124	258	50	43	8	110	418	42	14	734	90
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	4	4	4	2	2	2	6	6	6	2	2	2
Cap, veh/h	464	131	273	143	236	44	211	873	88	438	829	102
Arrive On Green	0.13	0.25	0.24	0.04	0.15	0.14	0.05	0.54	0.53	0.02	0.51	0.51
Sat Flow, veh/h	1753	521	1084	1781	1531	285	1725	1615	162	1781	1629	200
Grp Volume(v), veh/h	244	0	382	50	0	51	110	0	460	14	0	824
Grp Sat Flow(s),veh/h/ln	1753	0	1605	1781	0	1816	1725	0	1777	1781	0	1828
Q Serve(g_s), s	11.7	0.0	24.2	2.4	0.0	2.5	3.1	0.0	16.6	0.4	0.0	41.6
Cycle Q Clear(g_c), s	11.7	0.0	24.2	2.4	0.0	2.5	3.1	0.0	16.6	0.4	0.0	41.6
Prop In Lane	1.00		0.68	1.00		0.16	1.00		0.09	1.00		0.11
Lane Grp Cap(c), veh/h	464	0	404	143	0	280	211	0	961	438	0	931
V/C Ratio(X)	0.53	0.00	0.95	0.35	0.00	0.18	0.52	0.00	0.48	0.03	0.00	0.89
Avail Cap(c_a), veh/h	585	0	404	181	0	280	229	0	1049	513	0	1079
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	29.7	0.0	38.3	36.6	0.0	38.1	21.7	0.0	14.8	13.3	0.0	22.7
Incr Delay (d2), s/veh	0.3	0.0	30.9	0.5	0.0	0.1	0.7	0.0	0.5	0.0	0.0	8.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	0.0	12.8	1.1	0.0	1.1	1.2	0.0	6.6	0.2	0.0	19.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.0	0.0	69.2	37.2	0.0	38.2	22.4	0.0	15.3	13.4	0.0	31.3
LnGrp LOS	C	A	E	D	A	D	C	A	B	B	A	C
Approach Vol, veh/h		626			101			570			838	
Approach Delay, s/veh		54.0			37.7			16.7			31.0	
Approach LOS		D			D			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.7	59.9	7.8	30.0	8.9	56.6	17.9	20.0
Change Period (Y+Rc), s	4.0	5.5	4.0	5.0	4.0	5.5	4.0	5.0
Max Green Setting (Gmax), s	6.0	59.5	6.0	25.0	6.0	59.5	21.0	10.0
Max Q Clear Time (g_c+I1), s	2.4	18.6	4.4	26.2	5.1	43.6	13.7	4.5
Green Ext Time (p_c), s	0.0	4.9	0.0	0.0	0.0	7.5	0.1	0.0

Intersection Summary	
HCM 6th Ctrl Delay	34.2
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: SW Boones Ferry Road & SW Ibach Street/SW Ibach Court

06/24/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	150	0	150	3	1	5	183	392	2	11	726	264
Future Volume (veh/h)	150	0	150	3	1	5	183	392	2	11	726	264
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.96		0.98	0.99		0.95	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1841	1841	1841	1870	1870	1870
Adj Flow Rate, veh/h	156	0	141	3	1	4	191	408	1	11	756	206
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	1	1	0	0	0	4	4	4	2	2	2
Cap, veh/h	325	0	267	116	53	101	231	1159	3	20	955	803
Arrive On Green	0.17	0.00	0.17	0.17	0.17	0.17	0.13	0.63	0.63	0.01	0.51	0.51
Sat Flow, veh/h	1369	0	1560	281	309	590	1753	1835	4	1781	1870	1573
Grp Volume(v), veh/h	156	0	141	8	0	0	191	0	409	11	756	206
Grp Sat Flow(s),veh/h/ln	1369	0	1560	1180	0	0	1753	0	1840	1781	1870	1573
Q Serve(g_s), s	2.3	0.0	6.0	0.0	0.0	0.0	7.7	0.0	7.6	0.4	24.1	5.3
Cycle Q Clear(g_c), s	8.3	0.0	6.0	6.0	0.0	0.0	7.7	0.0	7.6	0.4	24.1	5.3
Prop In Lane	1.00		1.00	0.37		0.50	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	325	0	267	271	0	0	231	0	1162	20	955	803
V/C Ratio(X)	0.48	0.00	0.53	0.03	0.00	0.00	0.83	0.00	0.35	0.56	0.79	0.26
Avail Cap(c_a), veh/h	572	0	549	531	0	0	266	0	1396	270	1419	1193
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.4	0.0	27.4	25.1	0.0	0.0	30.7	0.0	6.3	35.7	14.6	10.0
Incr Delay (d2), s/veh	0.7	0.0	1.0	0.0	0.0	0.0	15.9	0.0	0.3	14.6	2.7	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	0.0	2.2	0.1	0.0	0.0	4.1	0.0	2.4	0.3	9.3	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.1	0.0	28.3	25.1	0.0	0.0	46.6	0.0	6.6	50.3	17.2	10.2
LnGrp LOS	C	A	C	C	A	A	D	A	A	D	B	B
Approach Vol, veh/h		297			8			600			973	
Approach Delay, s/veh		28.7			25.1			19.3			16.1	
Approach LOS		C			C			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.8	50.8		16.9	13.5	42.0		16.9				
Change Period (Y+Rc), s	4.0	5.0		4.5	4.0	5.0		4.5				
Max Green Setting (Gmax), s	11.0	55.0		25.5	11.0	55.0		25.5				
Max Q Clear Time (g_c+I1), s	2.4	9.6		10.3	9.7	26.1		8.0				
Green Ext Time (p_c), s	0.0	4.5		0.8	0.0	11.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		19.2
HCM 6th LOS		B

4: SW Boones Ferry Road & SW Iowa Drive

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Vol, veh/h	34	0	32	12	1	35	31	481	27	33	719	46
Future Vol, veh/h	34	0	32	12	1	35	31	481	27	33	719	46
Conflicting Peds, #/hr	0	0	4	4	0	0	4	0	4	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	95	-	-	105	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	5	5	5	2	2	2	3	3	3	1	1	1
Mvmt Flow	36	0	34	13	1	37	33	512	29	35	765	49

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1476	1475	798	1478	1485	531	818	0	0	545	0	0
Stage 1	864	864	-	597	597	-	-	-	-	-	-	-
Stage 2	612	611	-	881	888	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.12	6.52	6.22	4.13	-	-	4.11	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.518	4.018	3.318	2.227	-	-	2.209	-	-
Pot Cap-1 Maneuver	103	124	381	104	125	548	806	-	-	1029	-	-
Stage 1	345	367	-	490	491	-	-	-	-	-	-	-
Stage 2	475	480	-	341	362	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	90	114	378	89	115	546	803	-	-	1025	-	-
Mov Cap-2 Maneuver	90	114	-	89	115	-	-	-	-	-	-	-
Stage 1	329	353	-	468	469	-	-	-	-	-	-	-
Stage 2	423	458	-	299	348	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	52.3	25	0.6	0.4
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	803	-	-	143	231	1025	-	-
HCM Lane V/C Ratio	0.041	-	-	0.491	0.221	0.034	-	-
HCM Control Delay (s)	9.7	-	-	52.3	25	8.6	-	-
HCM Lane LOS	A	-	-	F	D	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	2.3	0.8	0.1	-	-

HCM 6th TWSC
5: SW Boones Ferry Road & SW Norwood Road

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↑	↱	↰	↑
Traffic Vol, veh/h	37	72	467	90	84	679
Future Vol, veh/h	37	72	467	90	84	679
Conflicting Peds, #/hr	2	2	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	65	290	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	3	3	2	2
Mvmt Flow	39	76	492	95	88	715

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1387	496	0	0	589	0
Stage 1	494	-	-	-	-	-
Stage 2	893	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	158	574	-	-	986	-
Stage 1	613	-	-	-	-	-
Stage 2	400	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	143	572	-	-	984	-
Mov Cap-2 Maneuver	268	-	-	-	-	-
Stage 1	612	-	-	-	-	-
Stage 2	364	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17	0	1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	413	984	-
HCM Lane V/C Ratio	-	-	0.278	0.09	-
HCM Control Delay (s)	-	-	17	9	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	1.1	0.3	-

HCM 6th TWSC
7: SW Boones Ferry Road & SW Greenhill Lane

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖↗		↱		↰	↑
Traffic Vol, veh/h	0	0	552	2	1	728
Future Vol, veh/h	0	0	552	2	1	728
Conflicting Peds, #/hr	2	2	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	0	0	581	2	1	766

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1354	586	0	0	585	0
Stage 1	584	-	-	-	-	-
Stage 2	770	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.12	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	167	514	-	-	990	-
Stage 1	561	-	-	-	-	-
Stage 2	460	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	166	512	-	-	988	-
Mov Cap-2 Maneuver	369	-	-	-	-	-
Stage 1	560	-	-	-	-	-
Stage 2	459	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	988	-
HCM Lane V/C Ratio	-	-	-	0.001	-
HCM Control Delay (s)	-	-	0	8.6	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

HCM 6th Signalized Intersection Summary
8: SW Boones Ferry Road & SW Day Road

06/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰↰	↱		↰	↑↱	
Traffic Volume (veh/h)	3	0	737	0	0	0	604	549	0	0	664	64
Future Volume (veh/h)	3	0	737	0	0	0	604	549	0	0	664	64
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1900	1900	1900	1856	1856	1856	1885	1885	1885
Adj Flow Rate, veh/h	3	0	568	0	0	0	616	560	0	0	678	62
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	0	0	0	3	3	3	1	1	1
Cap, veh/h	271	0	632	0	271	0	699	650	0	672	1645	150
Arrive On Green	0.14	0.00	0.15	0.00	0.00	0.00	0.41	0.59	0.00	0.00	0.50	0.48
Sat Flow, veh/h	1417	0	1585	0	1900	0	2827	1856	0	1795	3318	303
Grp Volume(v), veh/h	3	0	568	0	0	0	616	560	0	0	366	374
Grp Sat Flow(s),veh/h/ln	1418	0	1585	0	1900	0	1414	1856	0	1795	1791	1831
Q Serve(g_s), s	0.2	0.0	15.9	0.0	0.0	0.0	21.1	26.5	0.0	0.0	13.6	13.7
Cycle Q Clear(g_c), s	0.2	0.0	15.9	0.0	0.0	0.0	21.1	26.5	0.0	0.0	13.6	13.7
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		0.17
Lane Grp Cap(c), veh/h	264	0	632	0	271	0	699	650	0	672	888	907
V/C Ratio(X)	0.01	0.00	0.90	0.00	0.00	0.00	0.88	0.86	0.00	0.00	0.41	0.41
Avail Cap(c_a), veh/h	264	0	632	0	271	0	1158	1219	0	672	888	907
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	0.92	0.92	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	38.9	0.0	29.6	0.0	0.0	0.0	29.4	19.7	0.0	0.0	16.8	16.9
Incr Delay (d2), s/veh	0.0	0.0	15.7	0.0	0.0	0.0	3.1	13.1	0.0	0.0	1.4	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	15.3	0.0	0.0	0.0	6.1	10.2	0.0	0.0	5.5	5.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.9	0.0	45.3	0.0	0.0	0.0	32.5	32.7	0.0	0.0	18.2	18.3
LnGrp LOS	D	A	D	A	A	A	C	C	A	A	B	B
Approach Vol, veh/h		571			0			1176			740	
Approach Delay, s/veh		45.2			0.0			32.6			18.2	
Approach LOS		D						C			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	30.0	56.0		19.0	45.2	40.8		19.0
Change Period (Y+Rc), s	* 5.4	* 5.4		4.5	* 5.4	* 5.4		4.5
Max Green Setting (Gmax), s	* 42	* 34		14.5	* 8.5	* 68		14.5
Max Q Clear Time (g_c+I1), s	23.1	15.7		0.0	0.0	28.5		17.9
Green Ext Time (p_c), s	1.4	6.2		0.0	0.0	6.9		0.0

Intersection Summary	
HCM 6th Ctrl Delay	31.2
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
9: SW Boones Ferry Road & SW 95th Avenue

06/24/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱↱	↰	↱		↰↰	↑↱		↰	↑↑	↱
Traffic Volume (veh/h)	219	1	758	45	16	6	550	840	11	3	1076	223
Future Volume (veh/h)	219	1	758	45	16	6	550	840	11	3	1076	223
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1826	1826	1870	1870	1870	1781	1781	1781	1856	1856	1856
Adj Flow Rate, veh/h	228	1	790	47	17	6	573	875	11	3	1121	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	5	5	2	2	2	8	8	8	3	3	3
Cap, veh/h	283	1	1008	75	226	80	673	1144	14	672	1798	
Arrive On Green	0.16	0.17	0.17	0.17	0.17	0.17	0.41	0.67	0.65	0.76	1.00	0.00
Sat Flow, veh/h	1254	6	2634	685	1318	465	3291	3423	43	1767	3526	1572
Grp Volume(v), veh/h	229	0	790	47	0	23	573	433	453	3	1121	0
Grp Sat Flow(s),veh/h/ln	1260	0	1317	685	0	1784	1646	1692	1773	1767	1763	1572
Q Serve(g_s), s	15.9	0.0	18.0	1.0	0.0	1.1	16.6	18.2	18.2	0.0	0.0	0.0
Cycle Q Clear(g_c), s	17.0	0.0	18.0	18.0	0.0	1.1	16.6	18.2	18.2	0.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.26	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	272	0	1008	75	0	306	673	566	593	672	1798	
V/C Ratio(X)	0.84	0.00	0.78	0.63	0.00	0.08	0.85	0.77	0.77	0.00	0.62	
Avail Cap(c_a), veh/h	272	0	1008	75	0	306	1066	1048	1098	672	1798	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.64	0.64	0.64	0.63	0.63	0.00
Uniform Delay (d), s/veh	45.0	0.0	29.2	52.4	0.0	36.5	29.6	14.6	14.6	7.8	0.0	0.0
Incr Delay (d2), s/veh	20.0	0.0	4.0	13.8	0.0	0.1	2.6	6.3	6.0	0.0	1.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.6	0.0	9.2	1.5	0.0	0.5	5.2	5.0	5.2	0.0	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	65.0	0.0	33.1	66.2	0.0	36.6	32.2	20.9	20.6	7.8	1.0	0.0
LnGrp LOS	E	A	C	E	A	D	C	C	C	A	A	
Approach Vol, veh/h		1019			70			1459			1124	A
Approach Delay, s/veh		40.3			56.5			25.2			1.1	
Approach LOS		D			E			C			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	25.5	57.5		22.0	43.9	39.1		22.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	33.0	40.0		17.0	9.0	64.0		17.0				
Max Q Clear Time (g_c+I1), s	18.6	2.0		20.0	2.0	20.2		20.0				
Green Ext Time (p_c), s	1.9	10.1		0.0	0.0	13.9		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			22.6									
HCM 6th LOS			C									

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM Signalized Intersection Capacity Analysis
10: I-5 SB Ramps & SW Boones Ferry Road/SW Elligsen Road

06/30/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰	↱
Traffic Volume (vph)	0	1026	853	0	643	354	0	0	0	543	83	757
Future Volume (vph)	0	1026	853	0	643	354	0	0	0	543	83	757
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	3.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (prot)		3505	1568		3505	1568				1603	1627	1711
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (perm)		3505	1568		3505	1568				1603	1627	1711
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1058	879	0	663	365	0	0	0	560	86	780
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	80
Lane Group Flow (vph)	0	1058	879	0	663	365	0	0	0	319	327	700
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	0%	0%	0%	7%	7%	7%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		69.5	105.0		52.4	105.0				26.0	26.0	38.6
Effective Green, g (s)		70.5	105.0		53.4	105.0				26.5	26.5	39.6
Actuated g/C Ratio		0.67	1.00		0.51	1.00				0.25	0.25	0.38
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2353	1568		1782	1568				404	410	710
v/s Ratio Prot		0.30			0.19					0.20	0.20	c0.12
v/s Ratio Perm			c0.56			0.23						0.29
v/c Ratio		0.45	0.56		0.37	0.23				0.79	0.80	0.99
Uniform Delay, d1		8.1	0.0		15.6	0.0				36.6	36.7	32.4
Progression Factor		0.97	1.00		1.05	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.5	1.1		0.6	0.3				9.4	9.9	29.8
Delay (s)		8.4	1.1		17.1	0.3				46.0	46.6	62.3
Level of Service		A	A		B	A				D	D	E
Approach Delay (s)		5.1			11.1			0.0			55.0	
Approach LOS		A			B			A			E	

Intersection Summary			
HCM 2000 Control Delay	22.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

V/C Ratio calculated using HCM worksheet with correct critical movements and lost time

HCM 6th Signalized Intersection Summary
11: I-5 NB Ramps & SW Elligsen Road

06/24/2021

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑	↰↰	↱
Traffic Volume (veh/h)	919	653	0	702	296	223
Future Volume (veh/h)	919	653	0	702	296	223
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1841	1841	0	1885	1841	1841
Adj Flow Rate, veh/h	1010	0	0	771	325	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	4	0	1	4	4
Cap, veh/h	2799		0	2867	420	
Arrive On Green	1.00	0.00	0.00	0.80	0.12	0.00
Sat Flow, veh/h	3589	1560	0	3770	3401	1560
Grp Volume(v), veh/h	1010	0	0	771	325	0
Grp Sat Flow(s),veh/h/ln	1749	1560	0	1791	1700	1560
Q Serve(g_s), s	0.0	0.0	0.0	5.8	9.7	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	5.8	9.7	0.0
Prop In Lane		1.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2799		0	2867	420	
V/C Ratio(X)	0.36		0.00	0.27	0.77	
Avail Cap(c_a), veh/h	2799		0	2867	1166	
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.84	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	2.7	44.6	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.2	1.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	1.4	4.2	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.3	0.0	0.0	2.9	46.5	0.0
LnGrp LOS	A		A	A	D	
Approach Vol, veh/h	1010	A		771	325	A
Approach Delay, s/veh	0.3			2.9	46.5	
Approach LOS	A			A	D	

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	88.0	88.0	17.0
Change Period (Y+Rc), s	5.0	5.0	4.5
Max Green Setting (Gmax), s	60.0	60.0	35.5
Max Q Clear Time (g_c+I1), s	2.0	7.8	11.7
Green Ext Time (p_c), s	14.4	9.6	0.7

Intersection Summary	
HCM 6th Ctrl Delay	8.4
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC
12: SW Norwood Road & SW 89th Avenue

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	30	179	132	13	10	8
Future Vol, veh/h	30	179	132	13	10	8
Conflicting Peds, #/hr	2	0	0	2	2	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	33	195	143	14	11	9

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	159	0	-	0	415	154
Stage 1	-	-	-	-	152	-
Stage 2	-	-	-	-	263	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1427	-	-	-	598	897
Stage 1	-	-	-	-	881	-
Stage 2	-	-	-	-	786	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1424	-	-	-	580	894
Mov Cap-2 Maneuver	-	-	-	-	580	-
Stage 1	-	-	-	-	856	-
Stage 2	-	-	-	-	784	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	10.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1424	-	-	-	687
HCM Lane V/C Ratio	0.023	-	-	-	0.028
HCM Control Delay (s)	7.6	0	-	-	10.4
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

HCM 6th TWSC
13: SW Norwood Road & SW Vermillion Drive

06/24/2021

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	64	125	111	35	22	34
Future Vol, veh/h	64	125	111	35	22	34
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	72	72	72	72	72	72
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	89	174	154	49	31	47

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	203	0	-	0	531	179
Stage 1	-	-	-	-	179	-
Stage 2	-	-	-	-	352	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1375	-	-	-	512	869
Stage 1	-	-	-	-	857	-
Stage 2	-	-	-	-	716	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1375	-	-	-	475	869
Mov Cap-2 Maneuver	-	-	-	-	475	-
Stage 1	-	-	-	-	795	-
Stage 2	-	-	-	-	716	-

Approach	EB	WB	SB
HCM Control Delay, s	2.6	0	11.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1375	-	-	-	655
HCM Lane V/C Ratio	0.065	-	-	-	0.119
HCM Control Delay (s)	7.8	0	-	-	11.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.4

HCM 6th TWSC
14: SW 82nd Avenue & SW Norwood Road/Driveway

06/24/2021

Intersection	
Int Delay, s/veh	6.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			↰	↱
Traffic Vol, veh/h	115	0	32	0	0	1	19	7	0	2	4	127
Future Vol, veh/h	115	0	32	0	0	1	19	7	0	2	4	127
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	-	-	-	-	-	-	15
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	139	0	39	0	0	1	23	8	0	2	5	153

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	39	0	0	301	299	20	303	318	-
Stage 1	-	-	-	-	-	-	298	298	-	1	1	-
Stage 2	-	-	-	-	-	-	3	1	-	302	317	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	-
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	-
Pot Cap-1 Maneuver	1635	-	-	1584	-	-	655	616	1064	653	602	0
Stage 1	-	-	-	-	-	-	715	671	-	1027	899	0
Stage 2	-	-	-	-	-	-	1025	899	-	712	658	0
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1635	-	-	1584	-	-	607	562	1064	603	550	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	607	562	-	603	550	-
Stage 1	-	-	-	-	-	-	653	613	-	938	899	-
Stage 2	-	-	-	-	-	-	1020	899	-	641	601	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	5.8	0	11.4	11.4
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	594	1635	-	-	1584	-	-	567	-
HCM Lane V/C Ratio	0.053	0.085	-	-	-	-	-	0.013	-
HCM Control Delay (s)	11.4	7.4	0	-	0	-	-	11.4	0
HCM Lane LOS	B	A	A	-	A	-	-	B	A
HCM 95th %tile Q(veh)	0.2	0.3	-	-	0	-	-	0	-

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	61	58	51	206	366	103
Future Vol, veh/h	61	58	51	206	366	103
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	0	2	2	0	0
Mvmt Flow	69	65	57	231	411	116

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	814	469	527	0	-	0
Stage 1	469	-	-	-	-	-
Stage 2	345	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.12	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	350	598	1040	-	-	-
Stage 1	634	-	-	-	-	-
Stage 2	722	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	328	598	1040	-	-	-
Mov Cap-2 Maneuver	328	-	-	-	-	-
Stage 1	594	-	-	-	-	-
Stage 2	722	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.5	1.7	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1040	-	421	-	-
HCM Lane V/C Ratio	0.055	-	0.318	-	-
HCM Control Delay (s)	8.7	0	17.5	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.2	-	1.3	-	-

HCM 6th Signalized Intersection Summary
1: SW Boones Ferry Rd & SW Sagert St

08/31/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	70	77	12	176	99	60	7	587	277	51	268	47
Future Volume (veh/h)	70	77	12	176	99	60	7	587	277	51	268	47
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1885	1885	1885	1811	1811	1811
Adj Flow Rate, veh/h	77	85	8	193	109	44	8	645	288	56	295	30
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	0	0	0	1	1	1	6	6	6
Cap, veh/h	260	136	13	337	182	74	668	708	316	220	1104	915
Arrive On Green	0.06	0.08	0.07	0.12	0.14	0.14	0.02	0.58	0.57	0.05	0.61	0.61
Sat Flow, veh/h	1795	1696	160	1810	1285	519	1795	1225	547	1725	1811	1501
Grp Volume(v), veh/h	77	0	93	193	0	153	8	0	933	56	295	30
Grp Sat Flow(s),veh/h/ln	1795	0	1855	1810	0	1804	1795	0	1772	1725	1811	1501
Q Serve(g_s), s	3.5	0.0	4.4	8.5	0.0	7.3	0.2	0.0	42.9	1.1	6.9	0.7
Cycle Q Clear(g_c), s	3.5	0.0	4.4	8.5	0.0	7.3	0.2	0.0	42.9	1.1	6.9	0.7
Prop In Lane	1.00		0.09	1.00		0.29	1.00		0.31	1.00		1.00
Lane Grp Cap(c), veh/h	260	0	149	337	0	256	668	0	1024	220	1104	915
V/C Ratio(X)	0.30	0.00	0.63	0.57	0.00	0.60	0.01	0.00	0.91	0.26	0.27	0.03
Avail Cap(c_a), veh/h	373	0	325	339	0	316	856	0	1088	346	1112	921
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.4	0.0	40.7	31.2	0.0	36.8	7.9	0.0	17.3	18.1	8.3	7.1
Incr Delay (d2), s/veh	0.2	0.0	1.6	1.5	0.0	0.8	0.0	0.0	11.5	0.2	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	2.1	3.8	0.0	3.2	0.1	0.0	18.8	0.6	2.5	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.7	0.0	42.3	32.7	0.0	37.6	7.9	0.0	28.8	18.3	8.5	7.1
LnGrp LOS	D	A	D	C	A	D	A	A	C	B	A	A
Approach Vol, veh/h		170			346			941			381	
Approach Delay, s/veh		39.3			34.9			28.6			9.9	
Approach LOS		D			C			C			A	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.3	56.7	14.9	11.3	5.4	59.6	9.3	16.9
Change Period (Y+Rc), s	4.5	5.0	4.5	4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s	10.5	55.0	10.5	15.5	10.5	55.0	10.5	15.5
Max Q Clear Time (g_c+I1), s	3.1	44.9	10.5	6.4	2.2	8.9	5.5	9.3
Green Ext Time (p_c), s	0.0	6.9	0.0	0.2	0.0	3.6	0.0	0.2

Intersection Summary			
HCM 6th Ctrl Delay			26.9
HCM 6th LOS			C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
2: SW Boones Ferry Rd & SW Avery St

08/31/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	172	68	141	30	103	15	250	685	40	6	296	154
Future Volume (veh/h)	172	68	141	30	103	15	250	685	40	6	296	154
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	0.99		0.96	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1841	1841	1841	1767	1767	1767	1841	1841	1841
Adj Flow Rate, veh/h	205	81	97	36	123	12	298	815	42	7	352	165
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	4	4	4	4	4	4	9	9	9	4	4	4
Cap, veh/h	331	149	179	248	179	17	442	953	49	191	607	285
Arrive On Green	0.12	0.20	0.19	0.03	0.11	0.10	0.07	0.57	0.56	0.01	0.51	0.51
Sat Flow, veh/h	1753	749	897	1753	1644	160	1682	1663	86	1753	1184	555
Grp Volume(v), veh/h	205	0	178	36	0	135	298	0	857	7	0	517
Grp Sat Flow(s),veh/h/ln	1753	0	1647	1753	0	1804	1682	0	1749	1753	0	1739
Q Serve(g_s), s	8.7	0.0	8.4	1.6	0.0	6.2	6.0	0.0	35.5	0.2	0.0	17.8
Cycle Q Clear(g_c), s	8.7	0.0	8.4	1.6	0.0	6.2	6.0	0.0	35.5	0.2	0.0	17.8
Prop In Lane	1.00		0.54	1.00		0.09	1.00		0.05	1.00		0.32
Lane Grp Cap(c), veh/h	331	0	328	248	0	197	442	0	1003	191	0	892
V/C Ratio(X)	0.62	0.00	0.54	0.15	0.00	0.69	0.67	0.00	0.85	0.04	0.00	0.58
Avail Cap(c_a), veh/h	540	0	495	311	0	229	442	0	1335	297	0	1327
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	28.4	0.0	31.3	33.4	0.0	37.2	15.3	0.0	15.5	16.0	0.0	14.6
Incr Delay (d2), s/veh	0.7	0.0	0.5	0.1	0.0	4.7	3.3	0.0	5.0	0.0	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	0.0	3.3	0.7	0.0	3.0	2.9	0.0	13.8	0.1	0.0	6.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.1	0.0	31.9	33.5	0.0	41.9	18.7	0.0	20.4	16.0	0.0	15.5
LnGrp LOS	C	A	C	C	A	D	B	A	C	B	A	B
Approach Vol, veh/h		383			171			1155			524	
Approach Delay, s/veh		30.4			40.1			20.0			15.5	
Approach LOS		C			D			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.8	53.6	6.9	21.2	10.0	48.4	14.7	13.4
Change Period (Y+Rc), s	4.0	5.5	4.0	5.0	4.0	5.5	4.0	5.0
Max Green Setting (Gmax), s	6.0	64.5	6.0	25.0	6.0	64.5	21.0	10.0
Max Q Clear Time (g_c+I1), s	2.2	37.5	3.6	10.4	8.0	19.8	10.7	8.2
Green Ext Time (p_c), s	0.0	10.6	0.0	0.6	0.0	6.0	0.1	0.1

Intersection Summary	
HCM 6th Ctrl Delay	22.2
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	252	4	331	4	1	18	129	705	10	3	379	84
Future Volume (veh/h)	252	4	331	4	1	18	129	705	10	3	379	84
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.99	1.00		0.97	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1900	1900	1900	1796	1796	1796	1811	1811	1811
Adj Flow Rate, veh/h	290	5	208	5	1	10	148	810	11	3	436	51
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	3	3	3	0	0	0	7	7	7	6	6	6
Cap, veh/h	436	10	432	138	52	211	183	977	13	6	813	685
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.11	0.55	0.54	0.00	0.45	0.45
Sat Flow, veh/h	1360	37	1527	263	184	746	1711	1768	24	1725	1811	1526
Grp Volume(v), veh/h	290	0	213	16	0	0	148	0	821	3	436	51
Grp Sat Flow(s),veh/h/ln	1360	0	1564	1193	0	0	1711	0	1792	1725	1811	1526
Q Serve(g_s), s	9.1	0.0	8.5	0.0	0.0	0.0	6.3	0.0	28.1	0.1	13.0	1.4
Cycle Q Clear(g_c), s	17.6	0.0	8.5	8.5	0.0	0.0	6.3	0.0	28.1	0.1	13.0	1.4
Prop In Lane	1.00		0.98	0.31		0.62	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	436	0	442	393	0	0	183	0	990	6	813	685
V/C Ratio(X)	0.67	0.00	0.48	0.04	0.00	0.00	0.81	0.00	0.83	0.54	0.54	0.07
Avail Cap(c_a), veh/h	527	0	547	489	0	0	253	0	1349	255	1363	1149
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.2	0.0	22.4	19.6	0.0	0.0	32.5	0.0	13.7	37.0	14.9	11.7
Incr Delay (d2), s/veh	1.8	0.0	0.5	0.0	0.0	0.0	10.4	0.0	4.1	41.4	0.9	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	0.0	3.0	0.2	0.0	0.0	3.0	0.0	10.4	0.1	4.9	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.9	0.0	22.9	19.6	0.0	0.0	42.8	0.0	17.8	78.4	15.7	11.8
LnGrp LOS	C	A	C	B	A	A	D	A	B	E	B	B
Approach Vol, veh/h		503			16			969			490	
Approach Delay, s/veh		25.8			19.6			21.6			15.7	
Approach LOS		C			B			C			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.2	45.1		25.0	12.0	37.4		25.0				
Change Period (Y+Rc), s	4.0	5.0		4.5	4.0	5.0		4.5				
Max Green Setting (Gmax), s	11.0	55.0		25.5	11.0	55.0		25.5				
Max Q Clear Time (g_c+I1), s	2.1	30.1		19.6	8.3	15.0		10.5				
Green Ext Time (p_c), s	0.0	10.0		0.9	0.1	5.2		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			21.2									
HCM 6th LOS			C									

4: SW Boones Ferry Road & SW Iowa Drive

Intersection	
Int Delay, s/veh	8.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Vol, veh/h	49	2	54	29	0	31	14	649	10	19	436	17
Future Vol, veh/h	49	2	54	29	0	31	14	649	10	19	436	17
Conflicting Peds, #/hr	13	0	5	1	0	9	5	0	1	9	0	13
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	95	-	-	105	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	0	0	0	0	0	0	7	7	7	6	6	6
Mvmt Flow	58	2	64	35	0	37	17	773	12	23	519	20

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1433	1416	547	1435	1420	801	552	0	0	794	0	0
Stage 1	588	588	-	822	822	-	-	-	-	-	-	-
Stage 2	845	828	-	613	598	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.17	-	-	4.16	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.263	-	-	2.254	-	-
Pot Cap-1 Maneuver	113	139	541	113	138	388	993	-	-	810	-	-
Stage 1	499	499	-	371	391	-	-	-	-	-	-	-
Stage 2	360	389	-	483	494	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	96	130	532	93	129	380	981	-	-	803	-	-
Mov Cap-2 Maneuver	96	130	-	93	129	-	-	-	-	-	-	-
Stage 1	485	479	-	361	381	-	-	-	-	-	-	-
Stage 2	315	379	-	408	474	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	72.3	47.6	0.2	0.4
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	981	-	-	167	153	803	-	-
HCM Lane V/C Ratio	0.017	-	-	0.749	0.467	0.028	-	-
HCM Control Delay (s)	8.7	-	-	72.3	47.6	9.6	-	-
HCM Lane LOS	A	-	-	F	E	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	4.7	2.2	0.1	-	-

Intersection	
Int Delay, s/veh	2.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↑	↱	↰	↑
Traffic Vol, veh/h	74	58	614	30	51	467
Future Vol, veh/h	74	58	614	30	51	467
Conflicting Peds, #/hr	4	4	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	65	290	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	2	2	6	6	5	5
Mvmt Flow	85	67	706	34	59	537

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1369	714	0	0	744	0
Stage 1	710	-	-	-	-	-
Stage 2	659	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.15	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.245	-
Pot Cap-1 Maneuver	162	431	-	-	850	-
Stage 1	487	-	-	-	-	-
Stage 2	515	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	150	428	-	-	847	-
Mov Cap-2 Maneuver	288	-	-	-	-	-
Stage 1	485	-	-	-	-	-
Stage 2	477	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	24.2		0		0.9	
HCM LOS	C					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	336	847	-
HCM Lane V/C Ratio	-	-	0.452	0.069	-
HCM Control Delay (s)	-	-	24.2	9.6	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	2.2	0.2	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↑↱		↰	↑
Traffic Vol, veh/h	2	1	646	0	0	543
Future Vol, veh/h	2	1	646	0	0	543
Conflicting Peds, #/hr	4	4	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	0	6	6	5	5
Mvmt Flow	2	1	743	0	0	624

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1375	751	0	0	747	0
Stage 1	747	-	-	-	-	-
Stage 2	628	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.15	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.245	-
Pot Cap-1 Maneuver	162	414	-	-	848	-
Stage 1	472	-	-	-	-	-
Stage 2	536	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	161	411	-	-	845	-
Mov Cap-2 Maneuver	366	-	-	-	-	-
Stage 1	470	-	-	-	-	-
Stage 2	534	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.6	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	380	845	-
HCM Lane V/C Ratio	-	-	0.009	-	-
HCM Control Delay (s)	-	-	14.6	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰↰	↱		↰	↑↱	
Traffic Volume (veh/h)	172	0	560	0	0	0	619	474	0	0	493	50
Future Volume (veh/h)	172	0	560	0	0	0	619	474	0	0	493	50
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1693	1693	1693	1900	1900	1900	1693	1693	1693	1796	1796	1796
Adj Flow Rate, veh/h	191	0	572	0	0	0	688	527	0	0	548	45
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	14	14	14	0	0	0	14	14	14	7	7	7
Cap, veh/h	288	0	662	0	320	0	791	673	0	510	1300	107
Arrive On Green	0.16	0.00	0.17	0.00	0.00	0.00	0.10	0.13	0.00	0.00	0.41	0.39
Sat Flow, veh/h	1283	0	1434	0	1900	0	2740	1693	0	1711	3194	262
Grp Volume(v), veh/h	191	0	572	0	0	0	688	527	0	0	292	301
Grp Sat Flow(s),veh/h/ln	1283	0	1434	0	1900	0	1370	1693	0	1711	1706	1749
Q Serve(g_s), s	13.9	0.0	16.2	0.0	0.0	0.0	23.5	28.6	0.0	0.0	11.6	11.7
Cycle Q Clear(g_c), s	13.9	0.0	16.2	0.0	0.0	0.0	23.5	28.6	0.0	0.0	11.6	11.7
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		0.15
Lane Grp Cap(c), veh/h	285	0	662	0	320	0	791	673	0	510	694	712
V/C Ratio(X)	0.67	0.00	0.86	0.00	0.00	0.00	0.87	0.78	0.00	0.00	0.42	0.42
Avail Cap(c_a), veh/h	285	0	662	0	320	0	1041	1033	0	510	694	712
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	0.90	0.90	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	39.0	0.0	22.9	0.0	0.0	0.0	41.2	37.3	0.0	0.0	20.2	20.3
Incr Delay (d2), s/veh	5.5	0.0	11.3	0.0	0.0	0.0	5.1	8.0	0.0	0.0	1.9	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	0.0	12.4	0.0	0.0	0.0	9.1	14.4	0.0	0.0	4.6	4.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.5	0.0	34.2	0.0	0.0	0.0	46.3	45.3	0.0	0.0	22.0	22.1
LnGrp LOS	D	A	C	A	A	A	D	D	A	A	C	C
Approach Vol, veh/h		763			0			1215			593	
Approach Delay, s/veh		36.8			0.0			45.9			22.1	
Approach LOS		D						D			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	32.3	42.7		20.0	33.2	41.8		20.0
Change Period (Y+Rc), s	* 5.4	* 5.4		4.5	* 5.4	* 5.4		4.5
Max Green Setting (Gmax), s	* 36	* 29		15.5	* 8.5	* 57		15.5
Max Q Clear Time (g_c+I1), s	25.5	13.7		0.0	0.0	30.6		18.2
Green Ext Time (p_c), s	1.4	4.4		0.0	0.0	5.7		0.0

Intersection Summary	
HCM 6th Ctrl Delay	37.7
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
9: SW Elligsen Road/SW Boones Ferry Road & SW 95th Avenue

08/31/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱↱	↰	↱		↰↰	↑↱		↰	↑↑	↱
Traffic Volume (veh/h)	200	7	540	16	1	6	815	808	68	5	705	263
Future Volume (veh/h)	200	7	540	16	1	6	815	808	68	5	705	263
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1648	1648	1648	1737	1737	1737	1796	1796	1796	1737	1737	1737
Adj Flow Rate, veh/h	217	8	549	17	1	7	886	878	74	5	766	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	17	17	17	11	11	11	7	7	7	11	11	11
Cap, veh/h	297	8	1198	80	35	248	992	1168	98	473	1168	
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.50	0.61	0.61	0.09	0.12	0.00
Sat Flow, veh/h	1175	43	2445	791	187	1309	3319	3185	268	1654	3300	1472
Grp Volume(v), veh/h	225	0	549	17	0	8	886	470	482	5	766	0
Grp Sat Flow(s),veh/h/ln	1219	0	1223	791	0	1496	1659	1706	1748	1654	1650	1472
Q Serve(g_s), s	17.0	0.0	14.1	0.5	0.0	0.4	22.9	18.8	18.8	0.3	21.1	0.0
Cycle Q Clear(g_c), s	17.5	0.0	14.1	18.0	0.0	0.4	22.9	18.8	18.8	0.3	21.1	0.0
Prop In Lane	0.96		1.00	1.00		0.88	1.00		0.15	1.00		1.00
Lane Grp Cap(c), veh/h	305	0	1198	80	0	284	992	625	641	473	1168	
V/C Ratio(X)	0.74	0.00	0.46	0.21	0.00	0.03	0.89	0.75	0.75	0.01	0.66	
Avail Cap(c_a), veh/h	305	0	1198	80	0	284	1572	988	1012	473	1168	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.28	0.28	0.28	0.74	0.74	0.00
Uniform Delay (d), s/veh	38.5	0.0	16.0	47.4	0.0	31.4	22.4	15.3	15.3	30.8	36.4	0.0
Incr Delay (d2), s/veh	8.6	0.0	0.2	1.0	0.0	0.0	1.3	2.4	2.3	0.0	2.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.8	0.0	3.8	0.4	0.0	0.2	6.6	5.1	5.2	0.1	9.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.1	0.0	16.2	48.4	0.0	31.4	23.7	17.7	17.7	30.8	38.6	0.0
LnGrp LOS	D	A	B	D	A	C	C	B	B	C	D	
Approach Vol, veh/h		774			25			1838			771	A
Approach Delay, s/veh		25.2			43.0			20.6			38.5	
Approach LOS		C			D			C			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	33.4	38.6		23.0	32.2	39.8		23.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	45.0	17.0		18.0	7.0	55.0		18.0
Max Q Clear Time (g_c+I1), s	24.9	23.1		20.0	2.3	20.8		19.5
Green Ext Time (p_c), s	3.5	0.0		0.0	0.0	14.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	25.9
HCM 6th LOS	C

Notes
User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

10: I-5 SB Ramps & SW Elligsen Road

08/31/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰↑	↱
Traffic Volume (vph)	0	917	343	0	712	117	0	0	0	520	0	976
Future Volume (vph)	0	917	343	0	712	117	0	0	0	520	0	976
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frpb, ped/bikes		1.00	0.99		1.00	1.00				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3034	1340		3406	1524				1573	1573	1679
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3034	1340		3406	1524				1573	1573	1679
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	976	365	0	757	124	0	0	0	553	0	1038
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	8
Lane Group Flow (vph)	0	976	365	0	757	124	0	0	0	276	277	1030
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	19%	19%	19%	6%	6%	6%	0%	0%	0%	9%	9%	9%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		64.9	95.0		22.0	95.0				20.6	20.6	59.0
Effective Green, g (s)		65.9	95.0		23.0	95.0				21.1	21.1	60.0
Actuated g/C Ratio		0.69	1.00		0.24	1.00				0.22	0.22	0.63
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2104	1340		824	1524				349	349	1131
v/s Ratio Prot		0.32			c0.22					0.18	0.18	c0.37
v/s Ratio Perm			0.27			0.08						0.24
v/c Ratio		0.46	0.27		0.92	0.08				0.79	0.79	0.91
Uniform Delay, d1		6.6	0.0		35.1	0.0				34.9	34.9	15.2
Progression Factor		2.18	1.00		0.61	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.6	0.4		15.5	0.1				11.1	11.2	10.8
Delay (s)		14.9	0.4		36.8	0.1				45.9	46.1	26.0
Level of Service		B	A		D	A				D	D	C
Approach Delay (s)		11.0			31.6			0.0			32.9	
Approach LOS		B			C			A			C	

Intersection Summary			
HCM 2000 Control Delay	24.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

V/C Ratio calculated using HCM worksheet with correct critical movements and lost time

HCM 6th Signalized Intersection Summary
11: I-5 NB Ramps & SW Elligsen Road

08/31/2021

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑	↰↰	↱
Traffic Volume (veh/h)	734	705	0	322	506	255
Future Volume (veh/h)	734	705	0	322	506	255
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1707	1707	0	1796	1811	1811
Adj Flow Rate, veh/h	807	0	0	354	556	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	13	13	0	7	6	6
Cap, veh/h	2338		0	2460	652	
Arrive On Green	0.24	0.00	0.00	0.72	0.19	0.00
Sat Flow, veh/h	3329	1447	0	3593	3346	1535
Grp Volume(v), veh/h	807	0	0	354	556	0
Grp Sat Flow(s),veh/h/ln	1622	1447	0	1706	1673	1535
Q Serve(g_s), s	19.6	0.0	0.0	3.1	15.2	0.0
Cycle Q Clear(g_c), s	19.6	0.0	0.0	3.1	15.2	0.0
Prop In Lane		1.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2338		0	2460	652	
V/C Ratio(X)	0.35		0.00	0.14	0.85	
Avail Cap(c_a), veh/h	2338		0	2460	810	
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.83	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	17.6	0.0	0.0	4.1	36.9	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.1	6.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.5	0.0	0.0	0.9	6.7	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	17.9	0.0	0.0	4.3	43.5	0.0
LnGrp LOS	B		A	A	D	
Approach Vol, veh/h	807	A		354	556	A
Approach Delay, s/veh	17.9			4.3	43.5	
Approach LOS	B			A	D	

Timer - Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		72.5				72.5		22.5
Change Period (Y+Rc), s		5.0				5.0		4.5
Max Green Setting (Gmax), s		63.0				63.0		22.5
Max Q Clear Time (g_c+I1), s		21.6				5.1		17.2
Green Ext Time (p_c), s		9.9				3.8		0.8

Intersection Summary	
HCM 6th Ctrl Delay	23.4
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	14	101	141	2	18	25
Future Vol, veh/h	14	101	141	2	18	25
Conflicting Peds, #/hr	1	0	0	2	2	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	0	0	2	2	0	0
Mvmt Flow	18	126	176	3	23	31

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	181	0	-	0	344	181
Stage 1	-	-	-	-	180	-
Stage 2	-	-	-	-	164	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1407	-	-	-	657	867
Stage 1	-	-	-	-	856	-
Stage 2	-	-	-	-	870	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1404	-	-	-	645	865
Mov Cap-2 Maneuver	-	-	-	-	645	-
Stage 1	-	-	-	-	842	-
Stage 2	-	-	-	-	868	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	10.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1404	-	-	-	757
HCM Lane V/C Ratio	0.012	-	-	-	0.071
HCM Control Delay (s)	7.6	0	-	-	10.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	20	99	100	6	38	43
Future Vol, veh/h	20	99	100	6	38	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	0	0	3	3	0	0
Mvmt Flow	25	122	123	7	47	53

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	130	0	-	0	299	127
Stage 1	-	-	-	-	127	-
Stage 2	-	-	-	-	172	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1468	-	-	-	697	929
Stage 1	-	-	-	-	904	-
Stage 2	-	-	-	-	863	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1468	-	-	-	684	929
Mov Cap-2 Maneuver	-	-	-	-	684	-
Stage 1	-	-	-	-	888	-
Stage 2	-	-	-	-	863	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1468	-	-	-	795
HCM Lane V/C Ratio	0.017	-	-	-	0.126
HCM Control Delay (s)	7.5	0	-	-	10.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.4

Intersection	
Int Delay, s/veh	7.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			↰	↱
Traffic Vol, veh/h	112	0	24	0	0	0	36	4	0	0	0	70
Future Vol, veh/h	112	0	24	0	0	0	36	4	0	0	0	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	-	-	-	-	-	-	15
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	0	0	0	6	6	6	10	10	10
Mvmt Flow	126	0	27	0	0	0	40	4	0	0	0	79

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	27	0	0	267	267	14	269	280	-
Stage 1	-	-	-	-	-	-	266	266	-	1	1	-
Stage 2	-	-	-	-	-	-	1	1	-	268	279	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.16	6.56	6.26	7.2	6.6	-
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.56	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.56	-	6.2	5.6	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.554	4.054	3.354	3.59	4.09	-
Pot Cap-1 Maneuver	1622	-	-	1600	-	-	678	632	1054	668	615	0
Stage 1	-	-	-	-	-	-	731	681	-	1002	879	0
Stage 2	-	-	-	-	-	-	1012	887	-	720	665	0
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1600	-	-	637	582	1054	624	566	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	637	582	-	624	566	-
Stage 1	-	-	-	-	-	-	673	627	-	923	879	-
Stage 2	-	-	-	-	-	-	1012	887	-	658	612	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	6.1	0	11.1	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	631	1622	-	-	1600	-	-	-	-
HCM Lane V/C Ratio	0.071	0.078	-	-	-	-	-	-	-
HCM Control Delay (s)	11.1	7.4	0	-	0	-	-	0	0
HCM Lane LOS	B	A	A	-	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	0.3	-	-	0	-	-	-	-

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	126	48	37	338	235	58
Future Vol, veh/h	126	48	37	338	235	58
Conflicting Peds, #/hr	2	2	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	6	6
Mvmt Flow	140	53	41	376	261	64

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	755	297	327	0	-	0
Stage 1	295	-	-	-	-	-
Stage 2	460	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	376	742	1233	-	-	-
Stage 1	755	-	-	-	-	-
Stage 2	636	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	359	739	1231	-	-	-
Mov Cap-2 Maneuver	359	-	-	-	-	-
Stage 1	722	-	-	-	-	-
Stage 2	635	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.8	0.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1231	-	418	-	-
HCM Lane V/C Ratio	0.033	-	0.463	-	-
HCM Control Delay (s)	8	0	20.8	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	2.4	-	-

HCM 6th Signalized Intersection Summary
1: SW Boones Ferry Rd & SW Sagert St

08/31/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑	↱
Traffic Volume (veh/h)	54	166	10	215	94	41	21	369	292	87	638	58
Future Volume (veh/h)	54	166	10	215	94	41	21	369	292	87	638	58
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	59	182	11	236	103	29	23	405	294	96	701	31
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	0	0	0	1	1	1	1	1	1
Cap, veh/h	346	238	14	363	306	86	302	489	355	291	971	804
Arrive On Green	0.05	0.14	0.13	0.13	0.22	0.21	0.03	0.49	0.48	0.06	0.52	0.52
Sat Flow, veh/h	1795	1759	106	1810	1424	401	1795	1004	729	1795	1885	1560
Grp Volume(v), veh/h	59	0	193	236	0	132	23	0	699	96	701	31
Grp Sat Flow(s),veh/h/ln	1795	0	1865	1810	0	1826	1795	0	1733	1795	1885	1560
Q Serve(g_s), s	2.3	0.0	8.4	9.0	0.0	5.2	0.5	0.0	29.4	2.2	24.3	0.8
Cycle Q Clear(g_c), s	2.3	0.0	8.4	9.0	0.0	5.2	0.5	0.0	29.4	2.2	24.3	0.8
Prop In Lane	1.00		0.06	1.00		0.22	1.00		0.42	1.00		1.00
Lane Grp Cap(c), veh/h	346	0	252	363	0	393	302	0	844	291	971	804
V/C Ratio(X)	0.17	0.00	0.76	0.65	0.00	0.34	0.08	0.00	0.83	0.33	0.72	0.04
Avail Cap(c_a), veh/h	489	0	353	363	0	393	481	0	1147	419	1247	1032
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.0	0.0	35.3	25.4	0.0	28.2	13.2	0.0	18.9	15.3	15.8	10.2
Incr Delay (d2), s/veh	0.1	0.0	3.8	3.2	0.0	0.2	0.0	0.0	4.9	0.2	2.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	4.0	4.1	0.0	2.2	0.2	0.0	12.0	0.8	10.1	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.1	0.0	39.1	28.6	0.0	28.3	13.2	0.0	23.8	15.5	18.0	10.2
LnGrp LOS	C	A	D	C	A	C	B	A	C	B	B	B
Approach Vol, veh/h		252			368			722			828	
Approach Delay, s/veh		36.7			28.5			23.5			17.4	
Approach LOS		D			C			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.0	45.2	15.0	15.5	6.6	47.6	8.3	22.2
Change Period (Y+Rc), s	4.5	5.0	4.5	4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s	10.5	55.0	10.5	15.5	10.5	55.0	10.5	15.5
Max Q Clear Time (g_c+I1), s	4.2	31.4	11.0	10.4	2.5	26.3	4.3	7.2
Green Ext Time (p_c), s	0.1	8.8	0.0	0.3	0.0	9.5	0.0	0.2

Intersection Summary			
HCM 6th Ctrl Delay			23.5
HCM 6th LOS			C

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	248	126	263	51	43	8	112	425	42	14	747	102
Future Volume (veh/h)	248	126	263	51	43	8	112	425	42	14	747	102
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	0.99		0.99	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1870	1870	1870	1811	1811	1811	1870	1870	1870
Adj Flow Rate, veh/h	258	131	201	53	45	3	117	443	39	15	778	96
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	4	4	4	2	2	2	6	6	6	2	2	2
Cap, veh/h	438	147	225	156	210	14	210	929	82	456	873	108
Arrive On Green	0.14	0.23	0.22	0.04	0.12	0.11	0.05	0.57	0.55	0.02	0.54	0.54
Sat Flow, veh/h	1753	641	984	1781	1732	115	1725	1637	144	1781	1627	201
Grp Volume(v), veh/h	258	0	332	53	0	48	117	0	482	15	0	874
Grp Sat Flow(s),veh/h/ln	1753	0	1626	1781	0	1848	1725	0	1781	1781	0	1828
Q Serve(g_s), s	13.4	0.0	21.2	2.8	0.0	2.5	3.2	0.0	17.2	0.4	0.0	45.3
Cycle Q Clear(g_c), s	13.4	0.0	21.2	2.8	0.0	2.5	3.2	0.0	17.2	0.4	0.0	45.3
Prop In Lane	1.00		0.61	1.00		0.06	1.00		0.08	1.00		0.11
Lane Grp Cap(c), veh/h	438	0	372	156	0	224	210	0	1011	456	0	981
V/C Ratio(X)	0.59	0.00	0.89	0.34	0.00	0.21	0.56	0.00	0.48	0.03	0.00	0.89
Avail Cap(c_a), veh/h	529	0	396	190	0	224	225	0	1101	526	0	1130
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	33.0	0.0	40.2	40.3	0.0	42.4	22.6	0.0	13.7	12.3	0.0	22.0
Incr Delay (d2), s/veh	0.5	0.0	20.0	0.5	0.0	0.2	1.3	0.0	0.5	0.0	0.0	8.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.7	0.0	10.5	1.2	0.0	1.2	1.5	0.0	6.7	0.2	0.0	20.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.5	0.0	60.2	40.8	0.0	42.6	23.8	0.0	14.2	12.4	0.0	30.7
LnGrp LOS	C	A	E	D	A	D	C	A	B	B	A	C
Approach Vol, veh/h		590			101			599			889	
Approach Delay, s/veh		48.5			41.6			16.1			30.4	
Approach LOS		D			D			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.8	64.6	8.0	28.4	9.1	61.3	19.5	16.9
Change Period (Y+Rc), s	4.0	5.5	4.0	5.0	4.0	5.5	4.0	5.0
Max Green Setting (Gmax), s	6.0	64.5	6.0	25.0	6.0	64.5	21.0	10.0
Max Q Clear Time (g_c+I1), s	2.4	19.2	4.8	23.2	5.2	47.3	15.4	4.5
Green Ext Time (p_c), s	0.0	5.3	0.0	0.3	0.0	8.5	0.1	0.0

Intersection Summary	
HCM 6th Ctrl Delay	31.9
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

3: SW Boones Ferry Road & SW Ibach Street/SW Ibach Court

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	159	0	159	3	1	5	194	416	2	12	770	280
Future Volume (veh/h)	159	0	159	3	1	5	194	416	2	12	770	280
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.98	0.98		0.95	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1841	1841	1841	1870	1870	1870
Adj Flow Rate, veh/h	166	0	62	3	1	5	202	433	2	12	802	235
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	1	1	0	0	0	4	4	4	2	2	2
Cap, veh/h	315	0	256	119	55	140	239	1192	6	21	984	828
Arrive On Green	0.16	0.00	0.16	0.16	0.16	0.16	0.14	0.65	0.65	0.01	0.53	0.53
Sat Flow, veh/h	1349	0	1559	352	333	856	1753	1831	8	1781	1870	1573
Grp Volume(v), veh/h	166	0	62	9	0	0	202	0	435	12	802	235
Grp Sat Flow(s),veh/h/ln	1349	0	1559	1541	0	0	1753	0	1839	1781	1870	1573
Q Serve(g_s), s	8.7	0.0	2.7	0.0	0.0	0.0	8.8	0.0	8.4	0.5	27.7	6.5
Cycle Q Clear(g_c), s	9.0	0.0	2.7	0.4	0.0	0.0	8.8	0.0	8.4	0.5	27.7	6.5
Prop In Lane	1.00		1.00	0.33		0.56	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	315	0	256	314	0	0	239	0	1197	21	984	828
V/C Ratio(X)	0.53	0.00	0.24	0.03	0.00	0.00	0.84	0.00	0.36	0.57	0.81	0.28
Avail Cap(c_a), veh/h	535	0	510	557	0	0	247	0	1297	251	1319	1109
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.0	0.0	28.4	27.4	0.0	0.0	32.9	0.0	6.2	38.3	15.3	10.3
Incr Delay (d2), s/veh	0.8	0.0	0.3	0.0	0.0	0.0	21.3	0.0	0.3	14.2	3.7	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	0.0	1.0	0.1	0.0	0.0	5.0	0.0	2.6	0.3	11.1	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.8	0.0	28.7	27.4	0.0	0.0	54.2	0.0	6.5	52.6	19.0	10.6
LnGrp LOS	C	A	C	C	A	A	D	A	A	D	B	B
Approach Vol, veh/h		228			9			637			1049	
Approach Delay, s/veh		31.0			27.4			21.6			17.5	
Approach LOS		C			C			C			B	

Timer - Assigned Phs	1	2	4	5	6	8
Phs Duration (G+Y+Rc), s	4.9	55.8	17.3	14.6	46.0	17.3
Change Period (Y+Rc), s	4.0	5.0	4.5	4.0	5.0	4.5
Max Green Setting (Gmax), s	11.0	55.0	25.5	11.0	55.0	25.5
Max Q Clear Time (g_c+I1), s	2.5	10.4	11.0	10.8	29.7	2.4
Green Ext Time (p_c), s	0.0	4.9	0.5	0.0	11.3	0.0

Intersection Summary	
HCM 6th Ctrl Delay	20.5
HCM 6th LOS	C

HCM 6th TWSC
4: SW Boones Ferry Road & SW Iowa Drive

08/31/2021

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Vol, veh/h	36	0	34	13	1	37	33	510	29	35	762	49
Future Vol, veh/h	36	0	34	13	1	37	33	510	29	35	762	49
Conflicting Peds, #/hr	0	0	4	4	0	0	4	0	4	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	95	-	-	105	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	5	5	5	2	2	2	3	3	3	1	1	1
Mvmt Flow	38	0	36	14	1	39	35	543	31	37	811	52

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1564	1563	845	1566	1574	563	867	0	0	578	0	0
Stage 1	915	915	-	633	633	-	-	-	-	-	-	-
Stage 2	649	648	-	933	941	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.12	6.52	6.22	4.13	-	-	4.11	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.518	4.018	3.318	2.227	-	-	2.209	-	-
Pot Cap-1 Maneuver	89	110	358	90	110	526	772	-	-	1001	-	-
Stage 1	323	348	-	468	473	-	-	-	-	-	-	-
Stage 2	454	461	-	319	342	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	76	100	355	75	100	524	769	-	-	997	-	-
Mov Cap-2 Maneuver	76	100	-	75	100	-	-	-	-	-	-	-
Stage 1	307	334	-	445	449	-	-	-	-	-	-	-
Stage 2	400	438	-	275	328	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	71.4	29.4	0.6	0.4
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	769	-	-	123	201	997	-	-
HCM Lane V/C Ratio	0.046	-	-	0.605	0.27	0.037	-	-
HCM Control Delay (s)	9.9	-	-	71.4	29.4	8.8	-	-
HCM Lane LOS	A	-	-	F	D	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	3.1	1	0.1	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↑	↱	↰	↑
Traffic Vol, veh/h	39	76	495	95	89	720
Future Vol, veh/h	39	76	495	95	89	720
Conflicting Peds, #/hr	2	2	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	65	290	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	3	3	2	2
Mvmt Flow	41	80	521	100	94	758

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1471	525	0	0	623	0
Stage 1	523	-	-	-	-	-
Stage 2	948	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	140	552	-	-	958	-
Stage 1	595	-	-	-	-	-
Stage 2	377	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	126	550	-	-	956	-
Mov Cap-2 Maneuver	249	-	-	-	-	-
Stage 1	594	-	-	-	-	-
Stage 2	339	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	18.3		0		1	
HCM LOS	C					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	390	956	-
HCM Lane V/C Ratio	-	-	0.31	0.098	-
HCM Control Delay (s)	-	-	18.3	9.2	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	1.3	0.3	-

7: SW Boones Ferry Road & SW Greenhill Lane

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱		↰	↑
Traffic Vol, veh/h	0	0	585	2	1	772
Future Vol, veh/h	0	0	585	2	1	772
Conflicting Peds, #/hr	2	2	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	0	0	616	2	1	813

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1436	621	0	0	620	0
Stage 1	619	-	-	-	-	-
Stage 2	817	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.12	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	149	491	-	-	960	-
Stage 1	541	-	-	-	-	-
Stage 2	438	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	148	489	-	-	958	-
Mov Cap-2 Maneuver	349	-	-	-	-	-
Stage 1	540	-	-	-	-	-
Stage 2	437	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	958	-
HCM Lane V/C Ratio	-	-	-	0.001	-
HCM Control Delay (s)	-	-	0	8.8	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

HCM 6th Signalized Intersection Summary
8: SW Boones Ferry Road & SW Day Road

08/31/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✣		↰↰	↱		↰	↑↱	
Traffic Volume (veh/h)	3	0	781	0	0	0	640	582	0	0	704	68
Future Volume (veh/h)	3	0	781	0	0	0	640	582	0	0	704	68
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1900	1900	1900	1856	1856	1856	1885	1885	1885
Adj Flow Rate, veh/h	3	0	695	0	0	0	653	594	0	0	718	64
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	0	0	0	3	3	3	1	1	1
Cap, veh/h	271	0	652	0	271	0	734	683	0	640	1607	143
Arrive On Green	0.14	0.00	0.15	0.00	0.00	0.00	0.43	0.61	0.00	0.00	0.48	0.47
Sat Flow, veh/h	1417	0	1585	0	1900	0	2827	1856	0	1795	3326	296
Grp Volume(v), veh/h	3	0	695	0	0	0	653	594	0	0	386	396
Grp Sat Flow(s),veh/h/ln	1418	0	1585	0	1900	0	1414	1856	0	1795	1791	1832
Q Serve(g_s), s	0.2	0.0	15.9	0.0	0.0	0.0	22.4	27.8	0.0	0.0	14.9	15.0
Cycle Q Clear(g_c), s	0.2	0.0	15.9	0.0	0.0	0.0	22.4	27.8	0.0	0.0	14.9	15.0
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		0.16
Lane Grp Cap(c), veh/h	264	0	652	0	271	0	734	683	0	640	865	885
V/C Ratio(X)	0.01	0.00	1.07	0.00	0.00	0.00	0.89	0.87	0.00	0.00	0.45	0.45
Avail Cap(c_a), veh/h	264	0	652	0	271	0	1158	1219	0	640	865	885
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	0.92	0.92	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	38.9	0.0	30.9	0.0	0.0	0.0	28.3	18.1	0.0	0.0	17.9	18.0
Incr Delay (d2), s/veh	0.0	0.0	54.3	0.0	0.0	0.0	4.1	13.2	0.0	0.0	1.7	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	25.1	0.0	0.0	0.0	6.4	10.2	0.0	0.0	6.1	6.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.9	0.0	85.2	0.0	0.0	0.0	32.4	31.4	0.0	0.0	19.6	19.6
LnGrp LOS	D	A	F	A	A	A	C	C	A	A	B	B
Approach Vol, veh/h		698			0			1247			782	
Approach Delay, s/veh		85.0			0.0			31.9			19.6	
Approach LOS		F						C			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	31.3	54.7		19.0	43.4	42.6		19.0				
Change Period (Y+Rc), s	* 5.4	* 5.4		4.5	* 5.4	* 5.4		4.5				
Max Green Setting (Gmax), s	* 42	* 34		14.5	* 8.5	* 68		14.5				
Max Q Clear Time (g_c+I1), s	24.4	17.0		0.0	0.0	29.8		17.9				
Green Ext Time (p_c), s	1.5	6.3		0.0	0.0	7.4		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			42.0
HCM 6th LOS			D

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

9: SW Boones Ferry Road & SW 95th Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱↱	↰	↱		↰↰	↑↱		↰	↑↑	↱
Traffic Volume (veh/h)	232	1	803	48	17	6	583	890	12	3	1141	236
Future Volume (veh/h)	232	1	803	48	17	6	583	890	12	3	1141	236
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1826	1826	1870	1870	1870	1781	1781	1781	1856	1856	1856
Adj Flow Rate, veh/h	242	1	836	50	18	6	607	927	12	3	1189	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	5	5	2	2	2	8	8	8	3	3	3
Cap, veh/h	283	1	1035	75	230	77	705	1196	15	645	1763	
Arrive On Green	0.16	0.17	0.17	0.17	0.17	0.17	0.43	0.70	0.68	0.73	1.00	0.00
Sat Flow, veh/h	1249	5	2634	656	1340	447	3291	3421	44	1767	3526	1572
Grp Volume(v), veh/h	243	0	836	50	0	24	607	459	480	3	1189	0
Grp Sat Flow(s),veh/h/ln	1255	0	1317	656	0	1787	1646	1692	1773	1767	1763	1572
Q Serve(g_s), s	15.8	0.0	18.0	1.0	0.0	1.2	17.5	18.7	18.7	0.0	0.0	0.0
Cycle Q Clear(g_c), s	17.0	0.0	18.0	18.0	0.0	1.2	17.5	18.7	18.7	0.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.25	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	272	0	1035	75	0	306	705	591	620	645	1763	
V/C Ratio(X)	0.89	0.00	0.81	0.67	0.00	0.08	0.86	0.78	0.78	0.00	0.67	
Avail Cap(c_a), veh/h	272	0	1035	75	0	306	1066	1048	1098	645	1763	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.61	0.61	0.61	0.58	0.58	0.00
Uniform Delay (d), s/veh	45.5	0.0	29.0	52.4	0.0	36.5	28.6	13.1	13.1	9.0	0.0	0.0
Incr Delay (d2), s/veh	28.8	0.0	4.7	19.0	0.0	0.1	3.0	6.0	5.8	0.0	1.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.6	0.0	9.8	1.7	0.0	0.5	5.3	4.8	5.0	0.0	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.3	0.0	33.6	71.5	0.0	36.6	31.6	19.1	18.9	9.0	1.2	0.0
LnGrp LOS	E	A	C	E	A	D	C	B	B	A	A	
Approach Vol, veh/h		1079			74			1546			1192	A
Approach Delay, s/veh		42.8			60.2			23.9			1.2	
Approach LOS		D			E			C			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	26.5	56.5		22.0	42.3	40.7		22.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	33.0	40.0		17.0	9.0	64.0		17.0
Max Q Clear Time (g_c+I1), s	19.5	2.0		20.0	2.0	20.7		20.0
Green Ext Time (p_c), s	2.0	11.0		0.0	0.0	15.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	22.9
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM Signalized Intersection Capacity Analysis
10: I-5 SB Ramps & SW Boones Ferry Road/SW Elligsen Road

08/31/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰	↱
Traffic Volume (vph)	0	1088	904	0	682	375	0	0	0	576	88	802
Future Volume (vph)	0	1088	904	0	682	375	0	0	0	576	88	802
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	3.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (prot)		3505	1568		3505	1568				1603	1627	1711
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (perm)		3505	1568		3505	1568				1603	1627	1711
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1122	932	0	703	387	0	0	0	594	91	827
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	66
Lane Group Flow (vph)	0	1122	932	0	703	387	0	0	0	339	346	761
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	0%	0%	0%	7%	7%	7%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		68.3	105.0		48.1	105.0				27.2	27.2	42.9
Effective Green, g (s)		69.3	105.0		49.1	105.0				27.7	27.7	43.9
Actuated g/C Ratio		0.66	1.00		0.47	1.00				0.26	0.26	0.42
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2313	1568		1639	1568				422	429	780
v/s Ratio Prot		0.32			0.20					0.21	0.21	c0.15
v/s Ratio Perm			c0.59			0.25						0.29
v/c Ratio		0.49	0.59		0.43	0.25				0.80	0.81	0.98
Uniform Delay, d1		8.9	0.0		18.6	0.0				36.1	36.1	30.0
Progression Factor		0.95	1.00		1.07	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.5	1.2		0.8	0.4				10.2	10.2	26.1
Delay (s)		9.0	1.2		20.7	0.4				46.3	46.4	56.1
Level of Service		A	A		C	A				D	D	E
Approach Delay (s)		5.5			13.5			0.0			51.7	
Approach LOS		A			B			A			D	

Intersection Summary			
HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

V/C Ratio calculated using HCM worksheet with correct critical movements and lost time

HCM 6th Signalized Intersection Summary
11: I-5 NB Ramps & SW Elligsen Road

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑	↰↰	↱
Traffic Volume (veh/h)	974	692	0	744	314	236
Future Volume (veh/h)	974	692	0	744	314	236
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1841	1841	0	1885	1841	1841
Adj Flow Rate, veh/h	1070	0	0	818	345	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	4	0	1	4	4
Cap, veh/h	2778		0	2845	441	
Arrive On Green	1.00	0.00	0.00	0.79	0.13	0.00
Sat Flow, veh/h	3589	1560	0	3770	3401	1560
Grp Volume(v), veh/h	1070	0	0	818	345	0
Grp Sat Flow(s),veh/h/ln	1749	1560	0	1791	1700	1560
Q Serve(g_s), s	0.0	0.0	0.0	6.4	10.3	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	6.4	10.3	0.0
Prop In Lane		1.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2778		0	2845	441	
V/C Ratio(X)	0.39		0.00	0.29	0.78	
Avail Cap(c_a), veh/h	2778		0	2845	1166	
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.81	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	2.9	44.3	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.3	1.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	1.6	4.4	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.3	0.0	0.0	3.1	46.2	0.0
LnGrp LOS	A		A	A	D	
Approach Vol, veh/h	1070	A		818	345	A
Approach Delay, s/veh	0.3			3.1	46.2	
Approach LOS	A			A	D	

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	87.4	87.4	17.6
Change Period (Y+Rc), s	5.0	5.0	4.5
Max Green Setting (Gmax), s	60.0	60.0	35.5
Max Q Clear Time (g_c+I1), s	2.0	8.4	12.3
Green Ext Time (p_c), s	15.8	10.4	0.8

Intersection Summary	
HCM 6th Ctrl Delay	8.4
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	32	190	140	14	11	8
Future Vol, veh/h	32	190	140	14	11	8
Conflicting Peds, #/hr	2	0	0	2	2	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	35	207	152	15	12	9

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	169	0	-	0	441	164
Stage 1	-	-	-	-	162	-
Stage 2	-	-	-	-	279	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1415	-	-	-	577	886
Stage 1	-	-	-	-	872	-
Stage 2	-	-	-	-	773	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1412	-	-	-	559	883
Mov Cap-2 Maneuver	-	-	-	-	559	-
Stage 1	-	-	-	-	846	-
Stage 2	-	-	-	-	771	-

Approach	EB		WB		SB
HCM Control Delay, s	1.1		0		10.6
HCM LOS					B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1412	-	-	-	661
HCM Lane V/C Ratio	0.025	-	-	-	0.031
HCM Control Delay (s)	7.6	0	-	-	10.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	68	133	118	37	23	36
Future Vol, veh/h	68	133	118	37	23	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	72	72	72	72	72	72
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	94	185	164	51	32	50

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	215	0	-	0	563	190
Stage 1	-	-	-	-	190	-
Stage 2	-	-	-	-	373	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1361	-	-	-	491	857
Stage 1	-	-	-	-	847	-
Stage 2	-	-	-	-	701	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1361	-	-	-	453	857
Mov Cap-2 Maneuver	-	-	-	-	453	-
Stage 1	-	-	-	-	782	-
Stage 2	-	-	-	-	701	-

Approach	EB		WB		SB
HCM Control Delay, s	2.7		0		11.5
HCM LOS					B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1361	-	-	-	636
HCM Lane V/C Ratio	0.069	-	-	-	0.129
HCM Control Delay (s)	7.8	0	-	-	11.5
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.4

HCM 6th TWSC
14: SW 82nd Avenue & SW Norwood Road/Driveway

08/31/2021

Intersection	
Int Delay, s/veh	6.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			↰	↱
Traffic Vol, veh/h	122	0	34	0	0	1	20	7	0	2	4	135
Future Vol, veh/h	122	0	34	0	0	1	20	7	0	2	4	135
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	-	-	-	-	-	-	15
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	147	0	41	0	0	1	24	8	0	2	5	163

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	41	0	0	318	316	21	320	336	-
Stage 1	-	-	-	-	-	-	315	315	-	1	1	-
Stage 2	-	-	-	-	-	-	3	1	-	319	335	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	-
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	-
Pot Cap-1 Maneuver	1635	-	-	1581	-	-	639	603	1062	637	588	0
Stage 1	-	-	-	-	-	-	700	659	-	1027	899	0
Stage 2	-	-	-	-	-	-	1025	899	-	697	646	0
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1635	-	-	1581	-	-	590	548	1062	585	534	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	590	548	-	585	534	-
Stage 1	-	-	-	-	-	-	636	598	-	933	899	-
Stage 2	-	-	-	-	-	-	1020	899	-	624	587	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	5.8	0	11.6	11.6
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	579	1635	-	-	1581	-	-	550	-
HCM Lane V/C Ratio	0.056	0.09	-	-	-	-	-	0.013	-
HCM Control Delay (s)	11.6	7.4	0	-	0	-	-	11.6	0
HCM Lane LOS	B	A	A	-	A	-	-	B	A
HCM 95th %tile Q(veh)	0.2	0.3	-	-	0	-	-	0	-

HCM 6th TWSC
15: SW 65th Avenue & SW Norwood Road

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	65	61	54	218	388	109
Future Vol, veh/h	65	61	54	218	388	109
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	0	2	2	0	0
Mvmt Flow	73	69	61	245	436	122

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	864	497	558	0	-	0
Stage 1	497	-	-	-	-	-
Stage 2	367	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.12	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	327	577	1013	-	-	-
Stage 1	615	-	-	-	-	-
Stage 2	705	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	304	577	1013	-	-	-
Mov Cap-2 Maneuver	304	-	-	-	-	-
Stage 1	572	-	-	-	-	-
Stage 2	705	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	19.2	1.7	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1013	-	394	-	-
HCM Lane V/C Ratio	0.06	-	0.359	-	-
HCM Control Delay (s)	8.8	0	19.2	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.2	-	1.6	-	-

HCM 6th Signalized Intersection Summary
1: SW Boones Ferry Rd & SW Sagert St

06/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	73	80	12	184	102	63	8	613	291	53	280	48
Future Volume (veh/h)	73	80	12	184	102	63	8	613	291	53	280	48
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1885	1885	1885	1811	1811	1811
Adj Flow Rate, veh/h	80	88	8	202	112	47	9	674	304	58	308	31
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	0	0	0	1	1	1	6	6	6
Cap, veh/h	251	138	13	329	176	74	663	714	322	195	1114	923
Arrive On Green	0.06	0.08	0.08	0.12	0.14	0.13	0.02	0.58	0.57	0.05	0.62	0.62
Sat Flow, veh/h	1795	1701	155	1810	1269	533	1795	1221	551	1725	1811	1501
Grp Volume(v), veh/h	80	0	96	202	0	159	9	0	978	58	308	31
Grp Sat Flow(s),veh/h/ln	1795	0	1856	1810	0	1802	1795	0	1771	1725	1811	1501
Q Serve(g_s), s	3.8	0.0	4.7	9.2	0.0	7.8	0.2	0.0	48.1	1.2	7.4	0.8
Cycle Q Clear(g_c), s	3.8	0.0	4.7	9.2	0.0	7.8	0.2	0.0	48.1	1.2	7.4	0.8
Prop In Lane	1.00		0.08	1.00		0.30	1.00		0.31	1.00		1.00
Lane Grp Cap(c), veh/h	251	0	150	329	0	250	663	0	1036	195	1114	923
V/C Ratio(X)	0.32	0.00	0.64	0.61	0.00	0.64	0.01	0.00	0.94	0.30	0.28	0.03
Avail Cap(c_a), veh/h	355	0	316	329	0	307	844	0	1057	316	1114	923
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.3	0.0	41.8	32.5	0.0	38.3	7.8	0.0	18.2	20.7	8.4	7.1
Incr Delay (d2), s/veh	0.3	0.0	1.7	2.5	0.0	1.4	0.0	0.0	16.2	0.3	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	0.0	2.2	4.2	0.0	3.5	0.1	0.0	22.1	0.7	2.7	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.6	0.0	43.5	35.0	0.0	39.7	7.8	0.0	34.5	21.0	8.6	7.1
LnGrp LOS	D	A	D	C	A	D	A	A	C	C	A	A
Approach Vol, veh/h		176			361			987			397	
Approach Delay, s/veh		40.4			37.0			34.2			10.3	
Approach LOS		D			D			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.4	58.9	15.0	11.6	5.5	61.7	9.6	17.0
Change Period (Y+Rc), s	4.5	5.0	4.5	4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s	10.5	55.0	10.5	15.5	10.5	55.0	10.5	15.5
Max Q Clear Time (g_c+I1), s	3.2	50.1	11.2	6.7	2.2	9.4	5.8	9.8
Green Ext Time (p_c), s	0.0	3.8	0.0	0.2	0.0	3.8	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	30.4
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
2: SW Boones Ferry Rd & SW Avery St

06/24/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	178	70	147	31	107	15	263	719	42	7	310	160
Future Volume (veh/h)	178	70	147	31	107	15	263	719	42	7	310	160
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	0.99		0.96	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1841	1841	1841	1767	1767	1767	1841	1841	1841
Adj Flow Rate, veh/h	212	83	98	37	127	12	313	856	44	8	369	172
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	4	4	4	4	4	4	9	9	9	4	4	4
Cap, veh/h	326	152	179	242	178	17	432	973	50	173	630	294
Arrive On Green	0.13	0.20	0.19	0.03	0.11	0.10	0.06	0.59	0.57	0.01	0.53	0.53
Sat Flow, veh/h	1753	756	892	1753	1649	156	1682	1663	85	1753	1186	553
Grp Volume(v), veh/h	212	0	181	37	0	139	313	0	900	8	0	541
Grp Sat Flow(s),veh/h/ln	1753	0	1648	1753	0	1805	1682	0	1749	1753	0	1739
Q Serve(g_s), s	9.7	0.0	9.3	1.8	0.0	7.0	6.0	0.0	41.2	0.2	0.0	19.8
Cycle Q Clear(g_c), s	9.7	0.0	9.3	1.8	0.0	7.0	6.0	0.0	41.2	0.2	0.0	19.8
Prop In Lane	1.00		0.54	1.00		0.09	1.00		0.05	1.00		0.32
Lane Grp Cap(c), veh/h	326	0	331	242	0	195	432	0	1023	173	0	924
V/C Ratio(X)	0.65	0.00	0.55	0.15	0.00	0.71	0.72	0.00	0.88	0.05	0.00	0.59
Avail Cap(c_a), veh/h	498	0	458	296	0	212	432	0	1233	268	0	1227
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	30.9	0.0	33.8	36.2	0.0	40.4	17.8	0.0	16.6	17.7	0.0	14.9
Incr Delay (d2), s/veh	0.8	0.0	0.5	0.1	0.0	8.0	5.2	0.0	7.1	0.0	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.1	0.0	3.7	0.8	0.0	3.5	3.8	0.0	16.7	0.1	0.0	7.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.7	0.0	34.3	36.3	0.0	48.4	22.9	0.0	23.7	17.7	0.0	15.8
LnGrp LOS	C	A	C	D	A	D	C	A	C	B	A	B
Approach Vol, veh/h		393			176			1213			549	
Approach Delay, s/veh		32.9			45.8			23.5			15.8	
Approach LOS		C			D			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.9	58.7	7.1	22.8	10.0	53.7	15.8	14.1
Change Period (Y+Rc), s	4.0	5.5	4.0	5.0	4.0	5.5	4.0	5.0
Max Green Setting (Gmax), s	6.0	64.5	6.0	25.0	6.0	64.5	21.0	10.0
Max Q Clear Time (g_c+I1), s	2.2	43.2	3.8	11.3	8.0	21.8	11.7	9.0
Green Ext Time (p_c), s	0.0	10.1	0.0	0.6	0.0	6.3	0.1	0.0

Intersection Summary	
HCM 6th Ctrl Delay	25.0
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: SW Boones Ferry Road & SW Ibach Street/SW Ibach Court

06/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	262	4	343	4	1	19	134	743	10	3	398	87
Future Volume (veh/h)	262	4	343	4	1	19	134	743	10	3	398	87
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.99	1.00		0.97	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1900	1900	1900	1796	1796	1796	1811	1811	1811
Adj Flow Rate, veh/h	301	5	222	5	1	5	154	854	11	3	457	54
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	3	3	3	0	0	0	7	7	7	6	6	6
Cap, veh/h	434	10	433	164	49	123	188	998	13	6	828	698
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.11	0.56	0.55	0.00	0.46	0.46
Sat Flow, veh/h	1367	34	1529	348	171	433	1711	1769	23	1725	1811	1526
Grp Volume(v), veh/h	301	0	227	11	0	0	154	0	865	3	457	54
Grp Sat Flow(s),veh/h/ln	1367	0	1564	953	0	0	1711	0	1792	1725	1811	1526
Q Serve(g_s), s	9.6	0.0	9.8	0.1	0.0	0.0	7.1	0.0	32.7	0.1	14.7	1.6
Cycle Q Clear(g_c), s	19.5	0.0	9.8	9.9	0.0	0.0	7.1	0.0	32.7	0.1	14.7	1.6
Prop In Lane	1.00		0.98	0.45		0.45	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	434	0	443	329	0	0	188	0	1011	6	828	698
V/C Ratio(X)	0.69	0.00	0.51	0.03	0.00	0.00	0.82	0.00	0.86	0.54	0.55	0.08
Avail Cap(c_a), veh/h	490	0	507	385	0	0	234	0	1250	236	1264	1065
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.3	0.0	24.3	21.3	0.0	0.0	34.9	0.0	14.7	39.9	15.8	12.2
Incr Delay (d2), s/veh	3.0	0.0	0.6	0.0	0.0	0.0	14.8	0.0	5.8	41.6	0.9	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.7	0.0	3.6	0.2	0.0	0.0	3.6	0.0	12.7	0.1	5.7	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.3	0.0	24.9	21.3	0.0	0.0	49.8	0.0	20.5	81.6	16.7	12.3
LnGrp LOS	C	A	C	C	A	A	D	A	C	F	B	B
Approach Vol, veh/h		528			11			1019			514	
Approach Delay, s/veh		28.6			21.3			24.9			16.6	
Approach LOS		C			C			C			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.3	49.3		26.7	12.8	40.7		26.7				
Change Period (Y+Rc), s	4.0	5.0		4.5	4.0	5.0		4.5				
Max Green Setting (Gmax), s	11.0	55.0		25.5	11.0	55.0		25.5				
Max Q Clear Time (g_c+I1), s	2.1	34.7		21.5	9.1	16.7		11.9				
Green Ext Time (p_c), s	0.0	9.6		0.7	0.0	5.4		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			23.8
HCM 6th LOS			C

Intersection	
Int Delay, s/veh	10.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↱		↰	↱	
Traffic Vol, veh/h	51	2	56	30	0	32	14	685	10	20	456	18
Future Vol, veh/h	51	2	56	30	0	32	14	685	10	20	456	18
Conflicting Peds, #/hr	13	0	5	1	0	9	5	0	1	9	0	13
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	95	-	-	105	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	0	0	0	0	0	0	7	7	7	6	6	6
Mvmt Flow	61	2	67	36	0	38	17	815	12	24	543	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1502	1485	572	1505	1489	843	577	0	0	836	0	0
Stage 1	615	615	-	864	864	-	-	-	-	-	-	-
Stage 2	887	870	-	641	625	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.17	-	-	4.16	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.263	-	-	2.254	-	-
Pot Cap-1 Maneuver	101	126	523	101	125	367	972	-	-	781	-	-
Stage 1	482	485	-	352	374	-	-	-	-	-	-	-
Stage 2	341	372	-	466	480	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	85	117	514	82	117	359	960	-	-	774	-	-
Mov Cap-2 Maneuver	85	117	-	82	117	-	-	-	-	-	-	-
Stage 1	468	464	-	343	364	-	-	-	-	-	-	-
Stage 2	296	362	-	389	459	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	100	59.2	0.2	0.4
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	960	-	-	150	136	774	-	-
HCM Lane V/C Ratio	0.017	-	-	0.865	0.543	0.031	-	-
HCM Control Delay (s)	8.8	-	-	100	59.2	9.8	-	-
HCM Lane LOS	A	-	-	F	F	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	5.8	2.7	0.1	-	-

Intersection	
Int Delay, s/veh	3.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↑	↱	↰	↑
Traffic Vol, veh/h	79	61	649	36	53	489
Future Vol, veh/h	79	61	649	36	53	489
Conflicting Peds, #/hr	4	4	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	65	290	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	2	2	6	6	5	5
Mvmt Flow	91	70	746	41	61	562

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1438	754	0	0	791	0
Stage 1	750	-	-	-	-	-
Stage 2	688	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.15	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.245	-
Pot Cap-1 Maneuver	147	409	-	-	816	-
Stage 1	467	-	-	-	-	-
Stage 2	499	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	135	406	-	-	813	-
Mov Cap-2 Maneuver	273	-	-	-	-	-
Stage 1	465	-	-	-	-	-
Stage 2	460	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	27.4	0	1
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	318	813	-
HCM Lane V/C Ratio	-	-	0.506	0.075	-
HCM Control Delay (s)	-	-	27.4	9.8	-
HCM Lane LOS	-	-	D	A	-
HCM 95th %tile Q(veh)	-	-	2.7	0.2	-

HCM 6th TWSC
7: SW Boones Ferry Road & SW Greenhill Lane

06/24/2021

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↑↱		↰	↑
Traffic Vol, veh/h	2	1	675	0	0	577
Future Vol, veh/h	2	1	675	0	0	577
Conflicting Peds, #/hr	4	4	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	0	6	6	5	5
Mvmt Flow	2	1	776	0	0	663

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1447	784	0	0	780	0
Stage 1	780	-	-	-	-	-
Stage 2	667	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.15	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.245	-
Pot Cap-1 Maneuver	146	396	-	-	824	-
Stage 1	455	-	-	-	-	-
Stage 2	514	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	145	393	-	-	821	-
Mov Cap-2 Maneuver	349	-	-	-	-	-
Stage 1	453	-	-	-	-	-
Stage 2	512	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	15		0		0	
HCM LOS	C					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	363	821	-
HCM Lane V/C Ratio	-	-	0.009	-	-
HCM Control Delay (s)	-	-	15	0	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

HCM 6th Signalized Intersection Summary
8: SW Boones Ferry Road & SW Day Road

06/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰↰	↱		↰	↑↱	
Traffic Volume (veh/h)	179	0	581	0	0	0	642	496	0	0	523	55
Future Volume (veh/h)	179	0	581	0	0	0	642	496	0	0	523	55
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1693	1693	1693	1900	1900	1900	1693	1693	1693	1796	1796	1796
Adj Flow Rate, veh/h	199	0	596	0	0	0	713	551	0	0	581	50
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	14	14	14	0	0	0	14	14	14	7	7	7
Cap, veh/h	288	0	675	0	320	0	816	700	0	483	1265	109
Arrive On Green	0.16	0.00	0.17	0.00	0.00	0.00	0.10	0.14	0.00	0.00	0.40	0.38
Sat Flow, veh/h	1283	0	1434	0	1900	0	2740	1693	0	1711	3180	273
Grp Volume(v), veh/h	199	0	596	0	0	0	713	551	0	0	311	320
Grp Sat Flow(s),veh/h/ln	1283	0	1434	0	1900	0	1370	1693	0	1711	1706	1747
Q Serve(g_s), s	14.6	0.0	16.2	0.0	0.0	0.0	24.4	29.9	0.0	0.0	12.8	12.8
Cycle Q Clear(g_c), s	14.6	0.0	16.2	0.0	0.0	0.0	24.4	29.9	0.0	0.0	12.8	12.8
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		0.16
Lane Grp Cap(c), veh/h	285	0	675	0	320	0	816	700	0	483	679	695
V/C Ratio(X)	0.70	0.00	0.88	0.00	0.00	0.00	0.87	0.79	0.00	0.00	0.46	0.46
Avail Cap(c_a), veh/h	285	0	675	0	320	0	1041	1033	0	483	679	695
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	0.90	0.90	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	39.3	0.0	22.8	0.0	0.0	0.0	41.1	37.0	0.0	0.0	21.1	21.2
Incr Delay (d2), s/veh	6.8	0.0	13.0	0.0	0.0	0.0	5.6	7.9	0.0	0.0	2.2	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	0.0	13.3	0.0	0.0	0.0	9.5	15.0	0.0	0.0	5.1	5.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.1	0.0	35.8	0.0	0.0	0.0	46.7	44.9	0.0	0.0	23.3	23.4
LnGrp LOS	D	A	D	A	A	A	D	D	A	A	C	C
Approach Vol, veh/h		795			0			1264			631	
Approach Delay, s/veh		38.4			0.0			45.9			23.3	
Approach LOS		D						D			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	33.2	41.8		20.0	31.7	43.3		20.0
Change Period (Y+Rc), s	* 5.4	* 5.4		4.5	* 5.4	* 5.4		4.5
Max Green Setting (Gmax), s	* 36	* 29		15.5	* 8.5	* 57		15.5
Max Q Clear Time (g_c+I1), s	26.4	14.8		0.0	0.0	31.9		18.2
Green Ext Time (p_c), s	1.4	4.5		0.0	0.0	6.0		0.0

Intersection Summary			
HCM 6th Ctrl Delay			38.4
HCM 6th LOS			D

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱↱	↰	↑↱		↰↰	↑↑↱		↰	↑↑	↱
Traffic Volume (veh/h)	208	8	560	17	1	7	846	842	70	6	743	273
Future Volume (veh/h)	208	8	560	17	1	7	846	842	70	6	743	273
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1648	1648	1648	1737	1737	1737	1796	1796	1796	1737	1737	1737
Adj Flow Rate, veh/h	226	9	571	18	1	8	920	915	76	7	808	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	17	17	17	11	11	11	7	7	7	11	11	11
Cap, veh/h	296	9	1222	76	31	251	1025	1206	100	454	1135	
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.52	0.63	0.63	0.09	0.11	0.00
Sat Flow, veh/h	1168	47	2445	775	166	1327	3319	3190	265	1654	3300	1472
Grp Volume(v), veh/h	235	0	571	18	0	9	920	490	501	7	808	0
Grp Sat Flow(s),veh/h/ln	1215	0	1223	775	0	1493	1659	1706	1748	1654	1650	1472
Q Serve(g_s), s	17.5	0.0	14.5	0.0	0.0	0.5	23.8	19.3	19.3	0.4	22.4	0.0
Cycle Q Clear(g_c), s	18.0	0.0	14.5	18.0	0.0	0.5	23.8	19.3	19.3	0.4	22.4	0.0
Prop In Lane	0.96		1.00	1.00		0.89	1.00		0.15	1.00		1.00
Lane Grp Cap(c), veh/h	304	0	1222	76	0	283	1025	645	661	454	1135	
V/C Ratio(X)	0.77	0.00	0.47	0.24	0.00	0.03	0.90	0.76	0.76	0.02	0.71	
Avail Cap(c_a), veh/h	304	0	1222	76	0	283	1572	988	1012	454	1135	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.20	0.20	0.20	0.70	0.70	0.00
Uniform Delay (d), s/veh	38.9	0.0	15.6	47.5	0.0	31.4	21.7	14.4	14.4	31.5	37.6	0.0
Incr Delay (d2), s/veh	11.1	0.0	0.2	1.2	0.0	0.0	1.1	1.7	1.7	0.0	2.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.3	0.0	3.9	0.4	0.0	0.2	6.7	5.0	5.1	0.1	10.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.0	0.0	15.8	48.7	0.0	31.4	22.7	16.2	16.1	31.5	40.3	0.0
LnGrp LOS	D	A	B	D	A	C	C	B	B	C	D	
Approach Vol, veh/h		806			27			1911			815	A
Approach Delay, s/veh		25.8			42.9			19.3			40.2	
Approach LOS		C			D			B			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	34.3	37.7		23.0	31.1	40.9		23.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	45.0	17.0		18.0	7.0	55.0		18.0				
Max Q Clear Time (g_c+I1), s	25.8	24.4		20.0	2.4	21.3		20.0				
Green Ext Time (p_c), s	3.6	0.0		0.0	0.0	14.7		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		25.7
HCM 6th LOS		C

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM Signalized Intersection Capacity Analysis
10: I-5 SB Ramps & SW Elligsen Road

06/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰	↱
Traffic Volume (vph)	0	960	359	0	741	121	0	0	0	540	0	1015
Future Volume (vph)	0	960	359	0	741	121	0	0	0	540	0	1015
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frpb, ped/bikes		1.00	0.99		1.00	1.00				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3034	1340		3406	1524				1573	1573	1679
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3034	1340		3406	1524				1573	1573	1679
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	1021	382	0	788	129	0	0	0	574	0	1080
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	8
Lane Group Flow (vph)	0	1021	382	0	788	129	0	0	0	287	287	1072
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	19%	19%	19%	6%	6%	6%	0%	0%	0%	9%	9%	9%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		64.5	95.0		21.7	95.0				21.0	21.0	59.3
Effective Green, g (s)		65.5	95.0		22.7	95.0				21.5	21.5	60.3
Actuated g/C Ratio		0.69	1.00		0.24	1.00				0.23	0.23	0.63
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2091	1340		813	1524				355	355	1136
v/s Ratio Prot		0.34			c0.23					0.18	0.18	c0.39
v/s Ratio Perm			0.29			0.08						0.25
v/c Ratio		0.49	0.29		0.97	0.08				0.81	0.81	0.94
Uniform Delay, d1		6.9	0.0		35.8	0.0				34.8	34.8	15.8
Progression Factor		2.26	1.00		0.62	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.6	0.4		23.2	0.1				12.2	12.2	14.9
Delay (s)		16.2	0.4		45.2	0.1				47.0	47.0	30.7
Level of Service		B	A		D	A				D	D	C
Approach Delay (s)		11.9			38.9			0.0			36.4	
Approach LOS		B			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	28.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

V/C Ratio calculated using HCM worksheet with correct lost time

HCM 6th Signalized Intersection Summary
11: I-5 NB Ramps & SW Elligsen Road

06/24/2021

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑	↰↰	↱
Traffic Volume (veh/h)	764	737	0	335	526	265
Future Volume (veh/h)	764	737	0	335	526	265
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1707	1707	0	1796	1811	1811
Adj Flow Rate, veh/h	840	0	0	368	578	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	13	13	0	7	6	6
Cap, veh/h	2319		0	2439	673	
Arrive On Green	0.24	0.00	0.00	0.71	0.20	0.00
Sat Flow, veh/h	3329	1447	0	3593	3346	1535
Grp Volume(v), veh/h	840	0	0	368	578	0
Grp Sat Flow(s),veh/h/ln	1622	1447	0	1706	1673	1535
Q Serve(g_s), s	20.6	0.0	0.0	3.3	15.8	0.0
Cycle Q Clear(g_c), s	20.6	0.0	0.0	3.3	15.8	0.0
Prop In Lane		1.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2319		0	2439	673	
V/C Ratio(X)	0.36		0.00	0.15	0.86	
Avail Cap(c_a), veh/h	2319		0	2439	810	
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.81	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.2	0.0	0.0	4.3	36.7	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.0	0.1	7.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.9	0.0	0.0	1.0	7.0	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	18.6	0.0	0.0	4.5	44.0	0.0
LnGrp LOS	B		A	A	D	
Approach Vol, veh/h	840	A		368	578	A
Approach Delay, s/veh	18.6			4.5	44.0	
Approach LOS	B			A	D	

Timer - Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		71.9				71.9		23.1
Change Period (Y+Rc), s		5.0				5.0		4.5
Max Green Setting (Gmax), s		63.0				63.0		22.5
Max Q Clear Time (g_c+I1), s		22.6				5.3		17.8
Green Ext Time (p_c), s		10.4				3.9		0.8

Intersection Summary		
HCM 6th Ctrl Delay		23.9
HCM 6th LOS		C

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	14	110	148	2	19	26
Future Vol, veh/h	14	110	148	2	19	26
Conflicting Peds, #/hr	1	0	0	2	2	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	0	0	2	2	0	0
Mvmt Flow	18	138	185	3	24	33

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	190	0	-	0	365	190
Stage 1	-	-	-	-	189	-
Stage 2	-	-	-	-	176	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1396	-	-	-	639	857
Stage 1	-	-	-	-	848	-
Stage 2	-	-	-	-	859	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1393	-	-	-	627	855
Mov Cap-2 Maneuver	-	-	-	-	627	-
Stage 1	-	-	-	-	834	-
Stage 2	-	-	-	-	857	-

Approach	EB		WB		SB
HCM Control Delay, s	0.9		0		10.3
HCM LOS					B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1393	-	-	-	741
HCM Lane V/C Ratio	0.013	-	-	-	0.076
HCM Control Delay (s)	7.6	0	-	-	10.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	21	107	105	7	40	45
Future Vol, veh/h	21	107	105	7	40	45
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	0	0	3	3	0	0
Mvmt Flow	26	132	130	9	49	56

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	139	0	-	0	319	135
Stage 1	-	-	-	-	135	-
Stage 2	-	-	-	-	184	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1457	-	-	-	678	919
Stage 1	-	-	-	-	896	-
Stage 2	-	-	-	-	852	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1457	-	-	-	665	919
Mov Cap-2 Maneuver	-	-	-	-	665	-
Stage 1	-	-	-	-	879	-
Stage 2	-	-	-	-	852	-

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	10.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1457	-	-	-	779
HCM Lane V/C Ratio	0.018	-	-	-	0.135
HCM Control Delay (s)	7.5	0	-	-	10.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.5

Intersection	
Int Delay, s/veh	7.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			↰	↱
Traffic Vol, veh/h	122	0	25	0	0	0	37	4	0	0	0	75
Future Vol, veh/h	122	0	25	0	0	0	37	4	0	0	0	75
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	-	-	-	-	-	-	15
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	0	0	0	6	6	6	10	10	10
Mvmt Flow	137	0	28	0	0	0	42	4	0	0	0	84

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	28	0	0	289	289	14	291	303	-
Stage 1	-	-	-	-	-	-	288	288	-	1	1	-
Stage 2	-	-	-	-	-	-	1	1	-	290	302	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.16	6.56	6.26	7.2	6.6	-
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.56	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.56	-	6.2	5.6	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.554	4.054	3.354	3.59	4.09	-
Pot Cap-1 Maneuver	1622	-	-	1599	-	-	655	614	1054	646	597	0
Stage 1	-	-	-	-	-	-	711	666	-	1002	879	0
Stage 2	-	-	-	-	-	-	1012	887	-	701	650	0
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1599	-	-	612	561	1054	600	546	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	612	561	-	600	546	-
Stage 1	-	-	-	-	-	-	650	609	-	916	879	-
Stage 2	-	-	-	-	-	-	1012	887	-	636	594	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	6.2	0	11.4	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	607	1622	-	-	1599	-	-	-	-
HCM Lane V/C Ratio	0.076	0.085	-	-	-	-	-	-	-
HCM Control Delay (s)	11.4	7.4	0	-	0	-	-	0	0
HCM Lane LOS	B	A	A	-	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	0.3	-	-	0	-	-	-	-

15: SW 65th Avenue & SW Norwood Road

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↱			↰↑	↑↱	
Traffic Vol, veh/h	134	52	40	351	244	62
Future Vol, veh/h	134	52	40	351	244	62
Conflicting Peds, #/hr	2	2	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	6	6
Mvmt Flow	149	58	44	390	271	69

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	788	310	342	0	-	0
Stage 1	308	-	-	-	-	-
Stage 2	480	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	360	730	1217	-	-	-
Stage 1	745	-	-	-	-	-
Stage 2	622	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	342	727	1215	-	-	-
Mov Cap-2 Maneuver	342	-	-	-	-	-
Stage 1	709	-	-	-	-	-
Stage 2	621	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	23.1	0.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1215	-	401	-	-
HCM Lane V/C Ratio	0.037	-	0.515	-	-
HCM Control Delay (s)	8.1	0	23.1	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	2.9	-	-

HCM 6th Signalized Intersection Summary
1: SW Boones Ferry Rd & SW Sagert St

06/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑	↱
Traffic Volume (veh/h)	56	173	10	227	98	43	22	386	305	90	666	61
Future Volume (veh/h)	56	173	10	227	98	43	22	386	305	90	666	61
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	62	190	11	249	108	31	24	424	308	99	732	29
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	0	0	0	1	1	1	1	1	1
Cap, veh/h	344	243	14	347	301	86	293	501	364	277	991	820
Arrive On Green	0.05	0.14	0.13	0.12	0.21	0.21	0.03	0.50	0.49	0.06	0.53	0.53
Sat Flow, veh/h	1795	1764	102	1810	1418	407	1795	1004	729	1795	1885	1560
Grp Volume(v), veh/h	62	0	201	249	0	139	24	0	732	99	732	29
Grp Sat Flow(s),veh/h/ln	1795	0	1866	1810	0	1824	1795	0	1733	1795	1885	1560
Q Serve(g_s), s	2.6	0.0	9.2	10.1	0.0	5.7	0.6	0.0	32.4	2.3	26.6	0.8
Cycle Q Clear(g_c), s	2.6	0.0	9.2	10.1	0.0	5.7	0.6	0.0	32.4	2.3	26.6	0.8
Prop In Lane	1.00		0.05	1.00		0.22	1.00		0.42	1.00		1.00
Lane Grp Cap(c), veh/h	344	0	257	347	0	387	293	0	865	277	991	820
V/C Ratio(X)	0.18	0.00	0.78	0.72	0.00	0.36	0.08	0.00	0.85	0.36	0.74	0.04
Avail Cap(c_a), veh/h	478	0	338	347	0	387	461	0	1099	398	1196	990
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.2	0.0	36.8	27.1	0.0	29.7	13.6	0.0	19.4	16.3	16.2	10.1
Incr Delay (d2), s/veh	0.1	0.0	6.0	6.0	0.0	0.2	0.0	0.0	6.1	0.3	2.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	4.5	4.8	0.0	2.5	0.2	0.0	13.5	0.9	11.2	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.3	0.0	42.8	33.1	0.0	29.9	13.6	0.0	25.4	16.6	18.8	10.1
LnGrp LOS	C	A	D	C	A	C	B	A	C	B	B	B
Approach Vol, veh/h		263			388			756			860	
Approach Delay, s/veh		39.9			32.0			25.1			18.3	
Approach LOS		D			C			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.1	48.1	15.0	16.2	6.7	50.4	8.4	22.7
Change Period (Y+Rc), s	4.5	5.0	4.5	4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s	10.5	55.0	10.5	15.5	10.5	55.0	10.5	15.5
Max Q Clear Time (g_c+I1), s	4.3	34.4	12.1	11.2	2.6	28.6	4.6	7.7
Green Ext Time (p_c), s	0.1	8.7	0.0	0.3	0.0	9.7	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	25.4
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
2: SW Boones Ferry Rd & SW Avery St

06/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	257	131	276	53	45	9	119	446	44	14	784	106
Future Volume (veh/h)	257	131	276	53	45	9	119	446	44	14	784	106
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	1.00		0.99	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1870	1870	1870	1811	1811	1811	1870	1870	1870
Adj Flow Rate, veh/h	268	136	215	55	47	4	124	465	41	15	817	100
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	4	4	4	2	2	2	6	6	6	2	2	2
Cap, veh/h	435	144	228	137	198	17	190	943	83	445	887	109
Arrive On Green	0.15	0.23	0.22	0.04	0.12	0.11	0.05	0.58	0.56	0.02	0.54	0.54
Sat Flow, veh/h	1753	629	994	1781	1697	144	1725	1637	144	1781	1629	199
Grp Volume(v), veh/h	268	0	351	55	0	51	124	0	506	15	0	917
Grp Sat Flow(s),veh/h/ln	1753	0	1623	1781	0	1842	1725	0	1781	1781	0	1829
Q Serve(g_s), s	14.8	0.0	24.1	3.1	0.0	2.9	3.6	0.0	19.1	0.4	0.0	52.0
Cycle Q Clear(g_c), s	14.8	0.0	24.1	3.1	0.0	2.9	3.6	0.0	19.1	0.4	0.0	52.0
Prop In Lane	1.00		0.61	1.00		0.08	1.00		0.08	1.00		0.11
Lane Grp Cap(c), veh/h	435	0	372	137	0	215	190	0	1026	445	0	996
V/C Ratio(X)	0.62	0.00	0.94	0.40	0.00	0.24	0.65	0.00	0.49	0.03	0.00	0.92
Avail Cap(c_a), veh/h	497	0	372	165	0	215	198	0	1036	510	0	1064
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	35.3	0.0	43.3	43.4	0.0	45.6	25.5	0.0	14.3	12.8	0.0	23.6
Incr Delay (d2), s/veh	1.0	0.0	32.1	0.7	0.0	0.2	5.4	0.0	0.5	0.0	0.0	12.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.4	0.0	12.9	1.4	0.0	1.3	2.1	0.0	7.6	0.2	0.0	24.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.3	0.0	75.4	44.1	0.0	45.8	30.9	0.0	14.8	12.8	0.0	36.1
LnGrp LOS	D	A	E	D	A	D	C	A	B	B	A	D
Approach Vol, veh/h		619			106			630			932	
Approach Delay, s/veh		58.5			44.9			18.0			35.8	
Approach LOS		E			D			B			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.9	69.4	8.2	30.0	9.5	65.8	21.0	17.2
Change Period (Y+Rc), s	4.0	5.5	4.0	5.0	4.0	5.5	4.0	5.0
Max Green Setting (Gmax), s	6.0	64.5	6.0	25.0	6.0	64.5	21.0	10.0
Max Q Clear Time (g_c+I1), s	2.4	21.1	5.1	26.1	5.6	54.0	16.8	4.9
Green Ext Time (p_c), s	0.0	5.6	0.0	0.0	0.0	6.3	0.1	0.0

Intersection Summary	
HCM 6th Ctrl Delay	37.4
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: SW Boones Ferry Road & SW Ibach Street/SW Ibach Court

06/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	165	0	165	3	1	6	201	438	2	12	810	290
Future Volume (veh/h)	165	0	165	3	1	6	201	438	2	12	810	290
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.98	0.98		0.95	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1841	1841	1841	1870	1870	1870
Adj Flow Rate, veh/h	172	0	68	3	1	6	209	456	2	12	844	245
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	1	1	0	0	0	4	4	4	2	2	2
Cap, veh/h	311	0	257	107	51	152	234	1209	5	21	1007	847
Arrive On Green	0.16	0.00	0.16	0.16	0.16	0.16	0.13	0.66	0.66	0.01	0.54	0.54
Sat Flow, veh/h	1348	0	1559	307	310	925	1753	1831	8	1781	1870	1573
Grp Volume(v), veh/h	172	0	68	10	0	0	209	0	458	12	844	245
Grp Sat Flow(s),veh/h/ln	1348	0	1559	1542	0	0	1753	0	1839	1781	1870	1573
Q Serve(g_s), s	9.5	0.0	3.1	0.0	0.0	0.0	9.7	0.0	9.3	0.6	31.3	7.0
Cycle Q Clear(g_c), s	10.0	0.0	3.1	0.4	0.0	0.0	9.7	0.0	9.3	0.6	31.3	7.0
Prop In Lane	1.00		1.00	0.30		0.60	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	311	0	257	311	0	0	234	0	1214	21	1007	847
V/C Ratio(X)	0.55	0.00	0.27	0.03	0.00	0.00	0.89	0.00	0.38	0.58	0.84	0.29
Avail Cap(c_a), veh/h	506	0	482	526	0	0	234	0	1226	237	1247	1049
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.9	0.0	30.1	29.0	0.0	0.0	35.2	0.0	6.3	40.6	16.0	10.4
Incr Delay (d2), s/veh	0.9	0.0	0.3	0.0	0.0	0.0	31.8	0.0	0.3	14.5	5.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	0.0	1.2	0.2	0.0	0.0	6.0	0.0	3.0	0.3	12.9	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.8	0.0	30.4	29.0	0.0	0.0	67.0	0.0	6.7	55.1	21.0	10.7
LnGrp LOS	C	A	C	C	A	A	E	A	A	E	C	B
Approach Vol, veh/h		240			10			667			1101	
Approach Delay, s/veh		32.9			29.0			25.6			19.1	
Approach LOS		C			C			C			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.0	59.5		18.1	15.0	49.4		18.1				
Change Period (Y+Rc), s	4.0	5.0		4.5	4.0	5.0		4.5				
Max Green Setting (Gmax), s	1.0	55.0		25.5	11.0	55.0		25.5				
Max Q Clear Time (g_c+I1), s	2.6	11.3		12.0	11.7	33.3		2.4				
Green Ext Time (p_c), s	0.0	5.2		0.5	0.0	11.1		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			22.9									
HCM 6th LOS			C									

4: SW Boones Ferry Road & SW Iowa Drive

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Vol, veh/h	37	0	35	13	1	39	34	537	30	36	803	51
Future Vol, veh/h	37	0	35	13	1	39	34	537	30	36	803	51
Conflicting Peds, #/hr	0	0	4	4	0	0	4	0	4	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	95	-	-	105	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	5	5	5	2	2	2	3	3	3	1	1	1
Mvmt Flow	39	0	37	14	1	41	36	571	32	38	854	54

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1641	1640	889	1643	1651	591	912	0	0	607	0	0
Stage 1	961	961	-	663	663	-	-	-	-	-	-	-
Stage 2	680	679	-	980	988	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.12	6.52	6.22	4.13	-	-	4.11	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.518	4.018	3.318	2.227	-	-	2.209	-	-
Pot Cap-1 Maneuver	79	99	338	80	99	507	743	-	-	976	-	-
Stage 1	304	331	-	450	459	-	-	-	-	-	-	-
Stage 2	436	447	-	301	325	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	67	90	335	66	90	505	740	-	-	972	-	-
Mov Cap-2 Maneuver	67	90	-	66	90	-	-	-	-	-	-	-
Stage 1	288	317	-	427	435	-	-	-	-	-	-	-
Stage 2	380	423	-	256	311	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	91.6	32.6	0.6	0.4
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	740	-	-	110	186	972	-	-
HCM Lane V/C Ratio	0.049	-	-	0.696	0.303	0.039	-	-
HCM Control Delay (s)	10.1	-	-	91.6	32.6	8.9	-	-
HCM Lane LOS	B	-	-	F	D	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	3.7	1.2	0.1	-	-

HCM 6th TWSC
5: SW Boones Ferry Road & SW Norwood Road

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↑	↱	↰	↑
Traffic Vol, veh/h	46	79	522	102	92	759
Future Vol, veh/h	46	79	522	102	92	759
Conflicting Peds, #/hr	2	2	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	65	290	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	3	3	2	2
Mvmt Flow	48	83	549	107	97	799

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1546	553	0	0	658	0
Stage 1	551	-	-	-	-	-
Stage 2	995	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	126	533	-	-	930	-
Stage 1	577	-	-	-	-	-
Stage 2	358	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	112	531	-	-	928	-
Mov Cap-2 Maneuver	233	-	-	-	-	-
Stage 1	576	-	-	-	-	-
Stage 2	320	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.6	0	1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	361	928	-
HCM Lane V/C Ratio	-	-	0.364	0.104	-
HCM Control Delay (s)	-	-	20.6	9.3	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	1.6	0.3	-

HCM 6th TWSC
7: SW Boones Ferry Road & SW Greenhill Lane

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱		↰	↑
Traffic Vol, veh/h	0	0	621	2	1	810
Future Vol, veh/h	0	0	621	2	1	810
Conflicting Peds, #/hr	2	2	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	0	0	654	2	1	853

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1514	659	0	0	658	0
Stage 1	657	-	-	-	-	-
Stage 2	857	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.12	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	133	467	-	-	930	-
Stage 1	519	-	-	-	-	-
Stage 2	419	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	132	465	-	-	928	-
Mov Cap-2 Maneuver	332	-	-	-	-	-
Stage 1	518	-	-	-	-	-
Stage 2	418	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	928	-
HCM Lane V/C Ratio	-	-	-	0.001	-
HCM Control Delay (s)	-	-	0	8.9	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

HCM 6th Signalized Intersection Summary
8: SW Boones Ferry Road & SW Day Road

06/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✢		↰↰	↱		↰	↑↱	
Traffic Volume (veh/h)	6	0	811	0	0	0	664	615	0	0	737	72
Future Volume (veh/h)	6	0	811	0	0	0	664	615	0	0	737	72
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1900	1900	1900	1856	1856	1856	1885	1885	1885
Adj Flow Rate, veh/h	6	0	777	0	0	0	678	628	0	0	752	68
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	0	0	0	3	3	3	1	1	1
Cap, veh/h	271	0	665	0	271	0	758	715	0	609	1577	143
Arrive On Green	0.14	0.00	0.15	0.00	0.00	0.00	0.45	0.64	0.00	0.00	0.47	0.46
Sat Flow, veh/h	1418	0	1585	0	1900	0	2827	1856	0	1795	3322	300
Grp Volume(v), veh/h	6	0	777	0	0	0	678	628	0	0	405	415
Grp Sat Flow(s),veh/h/ln	1418	0	1585	0	1900	0	1414	1856	0	1795	1791	1831
Q Serve(g_s), s	0.4	0.0	15.9	0.0	0.0	0.0	23.2	29.1	0.0	0.0	16.1	16.2
Cycle Q Clear(g_c), s	0.4	0.0	15.9	0.0	0.0	0.0	23.2	29.1	0.0	0.0	16.1	16.2
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		0.16
Lane Grp Cap(c), veh/h	264	0	665	0	271	0	758	715	0	609	850	869
V/C Ratio(X)	0.02	0.00	1.17	0.00	0.00	0.00	0.89	0.88	0.00	0.00	0.48	0.48
Avail Cap(c_a), veh/h	264	0	665	0	271	0	1158	1219	0	609	850	869
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	0.91	0.91	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	39.0	0.0	30.5	0.0	0.0	0.0	27.6	16.7	0.0	0.0	18.7	18.8
Incr Delay (d2), s/veh	0.0	0.0	91.3	0.0	0.0	0.0	4.7	13.3	0.0	0.0	1.9	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	32.4	0.0	0.0	0.0	6.7	10.1	0.0	0.0	6.6	6.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.0	0.0	121.8	0.0	0.0	0.0	32.3	29.9	0.0	0.0	20.6	20.7
LnGrp LOS	D	A	F	A	A	A	C	C	A	A	C	C
Approach Vol, veh/h		783			0			1306			820	
Approach Delay, s/veh		121.1			0.0			31.2			20.7	
Approach LOS		F						C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	32.2	53.8		19.0	41.5	44.5		19.0
Change Period (Y+Rc), s	* 5.4	* 5.4		4.5	* 5.4	* 5.4		4.5
Max Green Setting (Gmax), s	* 42	* 34		14.5	* 8.5	* 68		14.5
Max Q Clear Time (g_c+I1), s	25.2	18.2		0.0	0.0	31.1		17.9
Green Ext Time (p_c), s	1.6	6.4		0.0	0.0	8.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	52.4
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
9: SW Boones Ferry Road & SW 95th Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱↱	↰	↑↱		↰↰	↑↑↱		↰	↑↑	↱
Traffic Volume (veh/h)	241	1	834	50	18	7	605	935	12	3	1191	245
Future Volume (veh/h)	241	1	834	50	18	7	605	935	12	3	1191	245
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1826	1826	1870	1870	1870	1781	1781	1781	1856	1856	1856
Adj Flow Rate, veh/h	251	1	869	52	19	7	630	974	12	3	1241	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	5	5	2	2	2	8	8	8	3	3	3
Cap, veh/h	281	1	1053	75	223	82	727	1241	15	622	1740	
Arrive On Green	0.16	0.17	0.17	0.17	0.17	0.17	0.44	0.73	0.71	0.70	0.99	0.00
Sat Flow, veh/h	1239	5	2634	636	1302	480	3291	3424	42	1767	3526	1572
Grp Volume(v), veh/h	252	0	869	52	0	26	630	481	505	3	1241	0
Grp Sat Flow(s),veh/h/ln	1244	0	1317	636	0	1781	1646	1692	1774	1767	1763	1572
Q Serve(g_s), s	15.7	0.0	18.0	1.0	0.0	1.3	18.2	19.0	19.1	0.1	1.6	0.0
Cycle Q Clear(g_c), s	17.0	0.0	18.0	18.0	0.0	1.3	18.2	19.0	19.1	0.1	1.6	0.0
Prop In Lane	1.00		1.00	1.00		0.27	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	270	0	1053	75	0	305	727	614	643	622	1740	
V/C Ratio(X)	0.93	0.00	0.83	0.70	0.00	0.09	0.87	0.78	0.78	0.00	0.71	
Avail Cap(c_a), veh/h	270	0	1053	75	0	305	1066	1048	1098	622	1740	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.59	0.59	0.59	0.55	0.55	0.00
Uniform Delay (d), s/veh	45.8	0.0	28.9	52.4	0.0	36.6	27.9	11.8	11.8	10.1	0.4	0.0
Incr Delay (d2), s/veh	37.2	0.0	5.3	23.2	0.0	0.1	3.2	5.9	5.7	0.0	1.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.5	0.0	10.3	1.8	0.0	0.6	5.5	4.7	4.9	0.0	0.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	83.0	0.0	34.2	75.7	0.0	36.7	31.1	17.8	17.5	10.1	1.8	0.0
LnGrp LOS	F	A	C	E	A	D	C	B	B	B	A	
Approach Vol, veh/h		1121			78			1616			1244	A
Approach Delay, s/veh		45.2			62.7			22.9			1.8	
Approach LOS		D			E			C			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	27.2	55.8		22.0	40.9	42.1		22.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	33.0	40.0		17.0	9.0	64.0		17.0
Max Q Clear Time (g_c+I1), s	20.2	3.6		20.0	2.1	21.1		20.0
Green Ext Time (p_c), s	2.0	11.6		0.0	0.0	16.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	23.3
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM Signalized Intersection Capacity Analysis
10: I-5 SB Ramps & SW Boones Ferry Road/SW Elligsen Road

06/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰↑	↱
Traffic Volume (vph)	0	1134	940	0	713	389	0	0	0	597	91	838
Future Volume (vph)	0	1134	940	0	713	389	0	0	0	597	91	838
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	3.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (prot)		3505	1568		3505	1568				1603	1627	1711
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (perm)		3505	1568		3505	1568				1603	1627	1711
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1169	969	0	735	401	0	0	0	615	94	864
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	54
Lane Group Flow (vph)	0	1169	969	0	735	401	0	0	0	351	358	810
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	0%	0%	0%	7%	7%	7%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		67.6	105.0		43.4	105.0				27.9	27.9	47.6
Effective Green, g (s)		68.6	105.0		44.4	105.0				28.4	28.4	48.6
Actuated g/C Ratio		0.65	1.00		0.42	1.00				0.27	0.27	0.46
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2289	1568		1482	1568				433	440	857
v/s Ratio Prot		0.33			0.21					0.22	0.22	c0.18
v/s Ratio Perm			c0.62			0.26						0.29
v/c Ratio		0.51	0.62		0.50	0.26				0.81	0.81	0.94
Uniform Delay, d1		9.5	0.0		22.1	0.0				35.8	35.8	26.9
Progression Factor		0.90	1.00		1.07	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.5	1.2		1.1	0.4				10.6	10.6	18.5
Delay (s)		9.1	1.2		24.8	0.4				46.4	46.4	45.4
Level of Service		A	A		C	A				D	D	D
Approach Delay (s)		5.5			16.2			0.0			45.9	
Approach LOS		A			B			A			D	

Intersection Summary			
HCM 2000 Control Delay	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

V/C Ratio calculated using HCM worksheet with correct critical movements and lost time

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑	↰↰	↱
Traffic Volume (veh/h)	1013	721	0	775	329	245
Future Volume (veh/h)	1013	721	0	775	329	245
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1841	1841	0	1885	1841	1841
Adj Flow Rate, veh/h	1113	0	0	852	362	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	4	0	1	4	4
Cap, veh/h	2759		0	2826	458	
Arrive On Green	1.00	0.00	0.00	0.79	0.13	0.00
Sat Flow, veh/h	3589	1560	0	3770	3401	1560
Grp Volume(v), veh/h	1113	0	0	852	362	0
Grp Sat Flow(s),veh/h/ln	1749	1560	0	1791	1700	1560
Q Serve(g_s), s	0.0	0.0	0.0	6.9	10.8	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	6.9	10.8	0.0
Prop In Lane		1.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2759		0	2826	458	
V/C Ratio(X)	0.40		0.00	0.30	0.79	
Avail Cap(c_a), veh/h	2759		0	2826	1166	
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.79	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	3.1	44.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.3	1.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	1.8	4.6	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.3	0.0	0.0	3.3	45.9	0.0
LnGrp LOS	A		A	A	D	
Approach Vol, veh/h	1113	A		852	362	A
Approach Delay, s/veh	0.3			3.3	45.9	
Approach LOS	A			A	D	

Timer - Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		86.8				86.8		18.2
Change Period (Y+Rc), s		5.0				5.0		4.5
Max Green Setting (Gmax), s		60.0				60.0		35.5
Max Q Clear Time (g_c+I1), s		2.0				8.9		12.8
Green Ext Time (p_c), s		16.8				11.0		0.8

Intersection Summary	
HCM 6th Ctrl Delay	8.5
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⤧	
Traffic Vol, veh/h	33	200	150	14	11	9
Future Vol, veh/h	33	200	150	14	11	9
Conflicting Peds, #/hr	2	0	0	2	2	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	36	217	163	15	12	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	180	0	-	0	464	175
Stage 1	-	-	-	-	173	-
Stage 2	-	-	-	-	291	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1402	-	-	-	560	874
Stage 1	-	-	-	-	862	-
Stage 2	-	-	-	-	763	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1399	-	-	-	542	871
Mov Cap-2 Maneuver	-	-	-	-	542	-
Stage 1	-	-	-	-	835	-
Stage 2	-	-	-	-	761	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	10.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1399	-	-	-	653
HCM Lane V/C Ratio	0.026	-	-	-	0.033
HCM Control Delay (s)	7.6	0	-	-	10.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	70	141	127	39	24	37
Future Vol, veh/h	70	141	127	39	24	37
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	72	72	72	72	72	72
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	97	196	176	54	33	51

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	230	0	-	0	593	203
Stage 1	-	-	-	-	203	-
Stage 2	-	-	-	-	390	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1344	-	-	-	472	843
Stage 1	-	-	-	-	836	-
Stage 2	-	-	-	-	689	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1344	-	-	-	434	843
Mov Cap-2 Maneuver	-	-	-	-	434	-
Stage 1	-	-	-	-	768	-
Stage 2	-	-	-	-	689	-

Approach	EB	WB	SB
HCM Control Delay, s	2.6	0	11.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1344	-	-	-	615
HCM Lane V/C Ratio	0.072	-	-	-	0.138
HCM Control Delay (s)	7.9	0	-	-	11.8
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.5

Intersection	
Int Delay, s/veh	6.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			↰	↱
Traffic Vol, veh/h	130	0	35	0	0	1	21	8	0	2	4	145
Future Vol, veh/h	130	0	35	0	0	1	21	8	0	2	4	145
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	-	-	-	-	-	-	15
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	157	0	42	0	0	1	25	10	0	2	5	175

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	42	0	0	338	336	21	341	357	-
Stage 1	-	-	-	-	-	-	335	335	-	1	1	-
Stage 2	-	-	-	-	-	-	3	1	-	340	356	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	-
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	-
Pot Cap-1 Maneuver	1635	-	-	1580	-	-	620	588	1062	617	572	0
Stage 1	-	-	-	-	-	-	683	646	-	1027	899	0
Stage 2	-	-	-	-	-	-	1025	899	-	679	633	0
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1635	-	-	1580	-	-	569	530	1062	563	515	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	569	530	-	563	515	-
Stage 1	-	-	-	-	-	-	615	582	-	925	899	-
Stage 2	-	-	-	-	-	-	1020	899	-	602	570	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	5.9	0	11.9	11.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	558	1635	-	-	1580	-	-	530	-
HCM Lane V/C Ratio	0.063	0.096	-	-	-	-	-	0.014	-
HCM Control Delay (s)	11.9	7.4	0	-	0	-	-	11.9	0
HCM Lane LOS	B	A	A	-	A	-	-	B	A
HCM 95th %tile Q(veh)	0.2	0.3	-	-	0	-	-	0	-

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	69	65	58	227	403	116
Future Vol, veh/h	69	65	58	227	403	116
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	0	2	2	0	0
Mvmt Flow	78	73	65	255	453	130

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	903	518	583	0	-	0
Stage 1	518	-	-	-	-	-
Stage 2	385	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.12	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	310	562	991	-	-	-
Stage 1	602	-	-	-	-	-
Stage 2	692	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	286	562	991	-	-	-
Mov Cap-2 Maneuver	286	-	-	-	-	-
Stage 1	556	-	-	-	-	-
Stage 2	692	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.9	1.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	991	-	375	-	-
HCM Lane V/C Ratio	0.066	-	0.401	-	-
HCM Control Delay (s)	8.9	0	20.9	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.2	-	1.9	-	-

HCM 6th Signalized Intersection Summary
1: SW Boones Ferry Rd & SW Sagert St

08/31/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑	↱
Traffic Volume (veh/h)	70	77	12	179	99	60	7	596	285	51	271	47
Future Volume (veh/h)	70	77	12	179	99	60	7	596	285	51	271	47
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1885	1885	1885	1811	1811	1811
Adj Flow Rate, veh/h	77	85	8	197	109	44	8	655	297	56	298	30
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	0	0	0	1	1	1	6	6	6
Cap, veh/h	258	135	13	334	181	73	668	708	321	209	1110	919
Arrive On Green	0.06	0.08	0.07	0.12	0.14	0.14	0.02	0.58	0.57	0.05	0.61	0.61
Sat Flow, veh/h	1795	1696	160	1810	1285	519	1795	1218	552	1725	1811	1501
Grp Volume(v), veh/h	77	0	93	197	0	153	8	0	952	56	298	30
Grp Sat Flow(s),veh/h/ln	1795	0	1855	1810	0	1804	1795	0	1771	1725	1811	1501
Q Serve(g_s), s	3.6	0.0	4.5	8.8	0.0	7.4	0.2	0.0	45.0	1.1	7.1	0.7
Cycle Q Clear(g_c), s	3.6	0.0	4.5	8.8	0.0	7.4	0.2	0.0	45.0	1.1	7.1	0.7
Prop In Lane	1.00		0.09	1.00		0.29	1.00		0.31	1.00		1.00
Lane Grp Cap(c), veh/h	258	0	148	334	0	255	668	0	1030	209	1110	919
V/C Ratio(X)	0.30	0.00	0.63	0.59	0.00	0.60	0.01	0.00	0.92	0.27	0.27	0.03
Avail Cap(c_a), veh/h	368	0	321	334	0	312	854	0	1073	334	1110	919
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.9	0.0	41.2	31.8	0.0	37.3	7.8	0.0	17.7	19.1	8.3	7.1
Incr Delay (d2), s/veh	0.2	0.0	1.6	1.9	0.0	0.8	0.0	0.0	13.2	0.3	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	0.0	2.1	4.0	0.0	3.3	0.1	0.0	20.1	0.6	2.6	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.2	0.0	42.9	33.6	0.0	38.2	7.8	0.0	30.9	19.4	8.5	7.1
LnGrp LOS	D	A	D	C	A	D	A	A	C	B	A	A
Approach Vol, veh/h		170			350			960			384	
Approach Delay, s/veh		39.8			35.6			30.7			10.0	
Approach LOS		D			D			C			A	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.3	57.7	15.0	11.4	5.4	60.6	9.3	17.0
Change Period (Y+Rc), s	4.5	5.0	4.5	4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s	10.5	55.0	10.5	15.5	10.5	55.0	10.5	15.5
Max Q Clear Time (g_c+I1), s	3.1	47.0	10.8	6.5	2.2	9.1	5.6	9.4
Green Ext Time (p_c), s	0.0	5.7	0.0	0.2	0.0	3.6	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	28.2
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	172	68	144	30	103	15	258	702	40	6	302	154
Future Volume (veh/h)	172	68	144	30	103	15	258	702	40	6	302	154
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	0.99		0.96	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1841	1841	1841	1767	1767	1767	1841	1841	1841
Adj Flow Rate, veh/h	205	81	100	36	123	12	307	836	42	7	360	165
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	4	4	4	4	4	4	9	9	9	4	4	4
Cap, veh/h	327	146	180	241	177	17	442	967	49	184	623	286
Arrive On Green	0.12	0.20	0.19	0.03	0.11	0.10	0.07	0.58	0.56	0.01	0.52	0.52
Sat Flow, veh/h	1753	736	908	1753	1644	160	1682	1666	84	1753	1193	547
Grp Volume(v), veh/h	205	0	181	36	0	135	307	0	878	7	0	525
Grp Sat Flow(s),veh/h/ln	1753	0	1644	1753	0	1804	1682	0	1749	1753	0	1740
Q Serve(g_s), s	8.9	0.0	8.9	1.6	0.0	6.4	6.0	0.0	37.7	0.2	0.0	18.4
Cycle Q Clear(g_c), s	8.9	0.0	8.9	1.6	0.0	6.4	6.0	0.0	37.7	0.2	0.0	18.4
Prop In Lane	1.00		0.55	1.00		0.09	1.00		0.05	1.00		0.31
Lane Grp Cap(c), veh/h	327	0	326	241	0	194	442	0	1015	184	0	909
V/C Ratio(X)	0.63	0.00	0.56	0.15	0.00	0.69	0.70	0.00	0.86	0.04	0.00	0.58
Avail Cap(c_a), veh/h	524	0	479	301	0	223	442	0	1295	286	0	1288
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	29.5	0.0	32.5	34.5	0.0	38.4	16.2	0.0	15.8	16.6	0.0	14.6
Incr Delay (d2), s/veh	0.7	0.0	0.6	0.1	0.0	5.6	4.0	0.0	5.7	0.0	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	0.0	3.5	0.7	0.0	3.1	3.2	0.0	14.9	0.1	0.0	6.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.2	0.0	33.0	34.6	0.0	44.0	20.1	0.0	21.5	16.6	0.0	15.4
LnGrp LOS	C	A	C	C	A	D	C	A	C	B	A	B
Approach Vol, veh/h		386			171			1185			532	
Approach Delay, s/veh		31.5			42.0			21.2			15.4	
Approach LOS		C			D			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.8	55.8	7.0	21.7	10.0	50.6	15.0	13.6
Change Period (Y+Rc), s	4.0	5.5	4.0	5.0	4.0	5.5	4.0	5.0
Max Green Setting (Gmax), s	6.0	64.5	6.0	25.0	6.0	64.5	21.0	10.0
Max Q Clear Time (g_c+I1), s	2.2	39.7	3.6	10.9	8.0	20.4	10.9	8.4
Green Ext Time (p_c), s	0.0	10.5	0.0	0.6	0.0	6.1	0.1	0.1

Intersection Summary	
HCM 6th Ctrl Delay	23.2
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	252	4	332	4	1	18	133	732	10	3	388	84
Future Volume (veh/h)	252	4	332	4	1	18	133	732	10	3	388	84
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.99	1.00		0.97	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1900	1900	1900	1796	1796	1796	1811	1811	1811
Adj Flow Rate, veh/h	290	5	210	5	1	10	153	841	11	3	446	51
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	3	3	3	0	0	0	7	7	7	6	6	6
Cap, veh/h	426	10	432	134	50	207	187	992	13	6	824	694
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.11	0.56	0.55	0.00	0.45	0.45
Sat Flow, veh/h	1360	36	1528	262	177	732	1711	1769	23	1725	1811	1526
Grp Volume(v), veh/h	290	0	215	16	0	0	153	0	852	3	446	51
Grp Sat Flow(s),veh/h/ln	1360	0	1564	1170	0	0	1711	0	1792	1725	1811	1526
Q Serve(g_s), s	9.9	0.0	9.0	0.1	0.0	0.0	6.9	0.0	31.2	0.1	14.0	1.5
Cycle Q Clear(g_c), s	18.9	0.0	9.0	9.1	0.0	0.0	6.9	0.0	31.2	0.1	14.0	1.5
Prop In Lane	1.00		0.98	0.31		0.62	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	426	0	442	384	0	0	187	0	1005	6	824	694
V/C Ratio(X)	0.68	0.00	0.49	0.04	0.00	0.00	0.82	0.00	0.85	0.54	0.54	0.07
Avail Cap(c_a), veh/h	492	0	518	453	0	0	240	0	1278	242	1292	1089
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.8	0.0	23.6	20.7	0.0	0.0	34.2	0.0	14.4	39.1	15.5	12.1
Incr Delay (d2), s/veh	2.5	0.0	0.5	0.0	0.0	0.0	13.6	0.0	5.2	41.6	0.9	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.3	0.0	3.3	0.2	0.0	0.0	3.4	0.0	12.0	0.1	5.4	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.4	0.0	24.1	20.7	0.0	0.0	47.8	0.0	19.6	80.6	16.4	12.1
LnGrp LOS	C	A	C	C	A	A	D	A	B	F	B	B
Approach Vol, veh/h		505			16			1005			500	
Approach Delay, s/veh		27.7			20.7			23.9			16.3	
Approach LOS		C			C			C			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	4.3	48.0		26.2	12.6	39.7		26.2
Change Period (Y+Rc), s	4.0	5.0		4.5	4.0	5.0		4.5
Max Green Setting (Gmax), s	11.0	55.0		25.5	11.0	55.0		25.5
Max Q Clear Time (g_c+I1), s	2.1	33.2		20.9	8.9	16.0		11.1
Green Ext Time (p_c), s	0.0	9.8		0.8	0.1	5.3		0.0

Intersection Summary			
HCM 6th Ctrl Delay			23.0
HCM 6th LOS			C

Intersection	
Int Delay, s/veh	9.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Vol, veh/h	49	2	54	29	0	31	14	682	10	19	446	17
Future Vol, veh/h	49	2	54	29	0	31	14	682	10	19	446	17
Conflicting Peds, #/hr	13	0	5	1	0	9	5	0	1	9	0	13
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	95	-	-	105	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	0	0	0	0	0	0	7	7	7	6	6	6
Mvmt Flow	58	2	64	35	0	37	17	812	12	23	531	20

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1484	1467	559	1486	1471	840	564	0	0	833	0	0
Stage 1	600	600	-	861	861	-	-	-	-	-	-	-
Stage 2	884	867	-	625	610	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.17	-	-	4.16	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.263	-	-	2.254	-	-
Pot Cap-1 Maneuver	104	129	532	104	128	368	983	-	-	783	-	-
Stage 1	491	493	-	353	375	-	-	-	-	-	-	-
Stage 2	343	373	-	476	488	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	88	120	523	85	119	360	971	-	-	776	-	-
Mov Cap-2 Maneuver	88	120	-	85	119	-	-	-	-	-	-	-
Stage 1	476	472	-	344	365	-	-	-	-	-	-	-
Stage 2	299	363	-	401	468	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	86.3	54.9	0.2	0.4
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	971	-	-	155	140	776	-	-
HCM Lane V/C Ratio	0.017	-	-	0.806	0.51	0.029	-	-
HCM Control Delay (s)	8.8	-	-	86.3	54.9	9.8	-	-
HCM Lane LOS	A	-	-	F	F	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	5.2	2.4	0.1	-	-

Intersection	
Int Delay, s/veh	6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↑	↱	↰	↑
Traffic Vol, veh/h	112	91	614	43	61	467
Future Vol, veh/h	112	91	614	43	61	467
Conflicting Peds, #/hr	4	4	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	65	290	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	2	2	6	6	5	5
Mvmt Flow	129	105	706	49	70	537

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1391	714	0	0	759	0
Stage 1	710	-	-	-	-	-
Stage 2	681	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.15	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.245	-
Pot Cap-1 Maneuver	157	431	-	-	839	-
Stage 1	487	-	-	-	-	-
Stage 2	503	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	143	428	-	-	836	-
Mov Cap-2 Maneuver	280	-	-	-	-	-
Stage 1	485	-	-	-	-	-
Stage 2	459	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	38.1	0	1.1
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	331	836	-
HCM Lane V/C Ratio	-	-	0.705	0.084	-
HCM Control Delay (s)	-	-	38.1	9.7	-
HCM Lane LOS	-	-	E	A	-
HCM 95th %tile Q(veh)	-	-	5.1	0.3	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↑↱		↰	↑
Traffic Vol, veh/h	0	0	662	0	0	582
Future Vol, veh/h	0	0	662	0	0	582
Conflicting Peds, #/hr	4	4	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	0	6	6	5	5
Mvmt Flow	0	0	761	0	0	669

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1438	769	0	0	765	0
Stage 1	765	-	-	-	-	-
Stage 2	673	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.15	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.245	-
Pot Cap-1 Maneuver	148	404	-	-	835	-
Stage 1	463	-	-	-	-	-
Stage 2	511	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	147	401	-	-	832	-
Mov Cap-2 Maneuver	352	-	-	-	-	-
Stage 1	461	-	-	-	-	-
Stage 2	509	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	832	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱		↰	↑
Traffic Vol, veh/h	2	1	659	0	0	581
Future Vol, veh/h	2	1	659	0	0	581
Conflicting Peds, #/hr	4	4	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	0	6	6	5	5
Mvmt Flow	2	1	757	0	0	668

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1433	765	0	0	761	0
Stage 1	761	-	-	-	-	-
Stage 2	672	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.15	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.245	-
Pot Cap-1 Maneuver	149	406	-	-	838	-
Stage 1	465	-	-	-	-	-
Stage 2	511	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	148	403	-	-	835	-
Mov Cap-2 Maneuver	353	-	-	-	-	-
Stage 1	463	-	-	-	-	-
Stage 2	509	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	368	835	-
HCM Lane V/C Ratio	-	-	0.009	-	-
HCM Control Delay (s)	-	-	14.9	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

HCM 6th Signalized Intersection Summary
8: SW Boones Ferry Road & SW Day Road

08/31/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✣		↰↰	↱		↰	↑↱	
Traffic Volume (veh/h)	175	0	560	0	0	0	619	484	0	0	522	59
Future Volume (veh/h)	175	0	560	0	0	0	619	484	0	0	522	59
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1693	1693	1693	1900	1900	1900	1693	1693	1693	1796	1796	1796
Adj Flow Rate, veh/h	194	0	572	0	0	0	688	538	0	0	580	55
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	14	14	14	0	0	0	14	14	14	7	7	7
Cap, veh/h	285	0	653	0	316	0	792	686	0	497	1289	122
Arrive On Green	0.16	0.00	0.17	0.00	0.00	0.00	0.10	0.13	0.00	0.00	0.41	0.39
Sat Flow, veh/h	1283	0	1434	0	1900	0	2740	1693	0	1711	3151	298
Grp Volume(v), veh/h	194	0	572	0	0	0	688	538	0	0	314	321
Grp Sat Flow(s),veh/h/ln	1283	0	1434	0	1900	0	1370	1693	0	1711	1706	1743
Q Serve(g_s), s	14.2	0.0	15.8	0.0	0.0	0.0	23.5	29.2	0.0	0.0	12.6	12.7
Cycle Q Clear(g_c), s	14.2	0.0	15.8	0.0	0.0	0.0	23.5	29.2	0.0	0.0	12.6	12.7
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		0.17
Lane Grp Cap(c), veh/h	282	0	653	0	316	0	792	686	0	497	698	713
V/C Ratio(X)	0.69	0.00	0.88	0.00	0.00	0.00	0.87	0.78	0.00	0.00	0.45	0.45
Avail Cap(c_a), veh/h	282	0	653	0	320	0	1047	1033	0	497	698	713
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	0.90	0.90	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	39.3	0.0	23.4	0.0	0.0	0.0	41.2	37.1	0.0	0.0	20.3	20.4
Incr Delay (d2), s/veh	6.4	0.0	12.6	0.0	0.0	0.0	5.1	8.0	0.0	0.0	2.1	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.8	0.0	12.8	0.0	0.0	0.0	9.1	14.7	0.0	0.0	5.0	5.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	45.7	0.0	36.0	0.0	0.0	0.0	46.3	45.1	0.0	0.0	22.4	22.5
LnGrp LOS	D	A	D	A	A	A	D	D	A	A	C	C
Approach Vol, veh/h		766			0			1226			635	
Approach Delay, s/veh		38.5			0.0			45.7			22.5	
Approach LOS		D						D			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	32.1	42.9		20.0	32.5	42.5		20.0
Change Period (Y+Rc), s	5.2	* 5.4		* 4.7	* 5.4	* 5.4		* 4.7
Max Green Setting (Gmax), s	35.8	* 29		* 16	* 8.5	* 57		* 15
Max Q Clear Time (g_c+I1), s	25.5	14.7		0.0	0.0	31.2		17.8
Green Ext Time (p_c), s	1.4	4.6		0.0	0.0	5.9		0.0

Intersection Summary	
HCM 6th Ctrl Delay	38.0
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
9: SW Elligsen Road/SW Boones Ferry Road & SW 95th Avenue

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱↱	↰	↱		↰↰	↑↱		↰	↑↑	↱
Traffic Volume (veh/h)	200	7	540	16	1	6	815	818	68	5	734	263
Future Volume (veh/h)	200	7	540	16	1	6	815	818	68	5	734	263
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1648	1648	1648	1737	1737	1737	1796	1796	1796	1737	1737	1737
Adj Flow Rate, veh/h	217	8	587	17	1	7	886	889	74	5	798	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	17	17	17	11	11	11	7	7	7	11	11	11
Cap, veh/h	297	8	1198	80	35	248	992	1179	98	468	1168	
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.50	0.62	0.62	0.09	0.12	0.00
Sat Flow, veh/h	1175	43	2445	763	187	1309	3319	3189	265	1654	3300	1472
Grp Volume(v), veh/h	225	0	587	17	0	8	886	476	487	5	798	0
Grp Sat Flow(s),veh/h/ln	1219	0	1223	763	0	1496	1659	1706	1748	1654	1650	1472
Q Serve(g_s), s	17.0	0.0	15.4	0.5	0.0	0.4	22.9	18.9	18.9	0.3	22.0	0.0
Cycle Q Clear(g_c), s	17.5	0.0	15.4	18.0	0.0	0.4	22.9	18.9	18.9	0.3	22.0	0.0
Prop In Lane	0.96		1.00	1.00		0.88	1.00		0.15	1.00		1.00
Lane Grp Cap(c), veh/h	305	0	1198	80	0	284	992	631	646	468	1168	
V/C Ratio(X)	0.74	0.00	0.49	0.21	0.00	0.03	0.89	0.75	0.75	0.01	0.68	
Avail Cap(c_a), veh/h	305	0	1198	80	0	284	1572	988	1012	468	1168	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.27	0.27	0.27	0.72	0.72	0.00
Uniform Delay (d), s/veh	38.5	0.0	16.4	47.4	0.0	31.4	22.4	15.1	15.1	31.0	36.8	0.0
Incr Delay (d2), s/veh	8.6	0.0	0.2	1.0	0.0	0.0	1.3	2.3	2.3	0.0	2.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.8	0.0	4.1	0.4	0.0	0.2	6.6	5.1	5.2	0.1	10.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.1	0.0	16.6	48.4	0.0	31.4	23.7	17.4	17.3	31.0	39.2	0.0
LnGrp LOS	D	A	B	D	A	C	C	B	B	C	D	
Approach Vol, veh/h		812			25			1849			803	A
Approach Delay, s/veh		25.0			43.0			20.4			39.1	
Approach LOS		C			D			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.4	38.6		23.0	31.9	40.1		23.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	45.0	17.0		18.0	7.0	55.0		18.0				
Max Q Clear Time (g_c+I1), s	24.9	24.0		20.0	2.3	20.9		19.5				
Green Ext Time (p_c), s	3.5	0.0		0.0	0.0	14.2		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			26.0
HCM 6th LOS			C

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM Signalized Intersection Capacity Analysis
10: I-5 SB Ramps & SW Elligsen Road

08/31/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰↑	↱
Traffic Volume (vph)	0	938	351	0	718	117	0	0	0	520	0	980
Future Volume (vph)	0	938	351	0	718	117	0	0	0	520	0	980
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frpb, ped/bikes		1.00	0.99		1.00	1.00				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3034	1340		3406	1524				1573	1573	1679
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3034	1340		3406	1524				1573	1573	1679
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	998	373	0	764	124	0	0	0	553	0	1043
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	8
Lane Group Flow (vph)	0	998	373	0	764	124	0	0	0	276	277	1035
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	19%	19%	19%	6%	6%	6%	0%	0%	0%	9%	9%	9%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		64.9	95.0		22.0	95.0				20.6	20.6	59.0
Effective Green, g (s)		65.9	95.0		23.0	95.0				21.1	21.1	60.0
Actuated g/C Ratio		0.69	1.00		0.24	1.00				0.22	0.22	0.63
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2104	1340		824	1524				349	349	1131
v/s Ratio Prot		0.33			c0.22					0.18	0.18	c0.37
v/s Ratio Perm			0.28			0.08						0.24
v/c Ratio		0.47	0.28		0.93	0.08				0.79	0.79	0.91
Uniform Delay, d1		6.6	0.0		35.2	0.0				34.9	34.9	15.3
Progression Factor		2.22	1.00		0.60	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.6	0.4		16.5	0.1				11.1	11.2	11.2
Delay (s)		15.4	0.4		37.7	0.1				45.9	46.1	26.5
Level of Service		B	A		D	A				D	D	C
Approach Delay (s)		11.3			32.5			0.0			33.3	
Approach LOS		B			C			A			C	

Intersection Summary			
HCM 2000 Control Delay	25.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

V/C Ratio calculated using HCM worksheet with correct critical movements and lost time

HCM 6th Signalized Intersection Summary
11: I-5 NB Ramps & SW Elligsen Road

08/31/2021

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑	↰↰	↱
Traffic Volume (veh/h)	743	717	0	325	509	255
Future Volume (veh/h)	743	717	0	325	509	255
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1707	1707	0	1796	1811	1811
Adj Flow Rate, veh/h	816	0	0	357	559	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	13	13	0	7	6	6
Cap, veh/h	2336		0	2457	655	
Arrive On Green	0.24	0.00	0.00	0.72	0.20	0.00
Sat Flow, veh/h	3329	1447	0	3593	3346	1535
Grp Volume(v), veh/h	816	0	0	357	559	0
Grp Sat Flow(s),veh/h/ln	1622	1447	0	1706	1673	1535
Q Serve(g_s), s	19.9	0.0	0.0	3.1	15.3	0.0
Cycle Q Clear(g_c), s	19.9	0.0	0.0	3.1	15.3	0.0
Prop In Lane		1.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2336		0	2457	655	
V/C Ratio(X)	0.35		0.00	0.15	0.85	
Avail Cap(c_a), veh/h	2336		0	2457	810	
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.82	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	17.7	0.0	0.0	4.2	36.9	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.1	6.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.6	0.0	0.0	0.9	6.8	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	18.1	0.0	0.0	4.3	43.6	0.0
LnGrp LOS	B		A	A	D	
Approach Vol, veh/h	816	A		357	559	A
Approach Delay, s/veh	18.1			4.3	43.6	
Approach LOS	B			A	D	

Timer - Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		72.4				72.4		22.6
Change Period (Y+Rc), s		5.0				5.0		4.5
Max Green Setting (Gmax), s		63.0				63.0		22.5
Max Q Clear Time (g_c+I1), s		21.9				5.1		17.3
Green Ext Time (p_c), s		10.1				3.8		0.8

Intersection Summary	
HCM 6th Ctrl Delay	23.5
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	14	113	11	3	179	2	33	0	8	18	0	25
Future Vol, veh/h	14	113	11	3	179	2	33	0	8	18	0	25
Conflicting Peds, #/hr	1	0	0	0	0	2	0	0	0	2	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	0	0	2	2	2	2	2	2	2	0	2	0
Mvmt Flow	18	141	14	4	224	3	41	0	10	23	0	31

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	229	0	0	155	0	0	434	421	150	427	427	229
Stage 1	-	-	-	-	-	-	184	184	-	236	236	-
Stage 2	-	-	-	-	-	-	250	237	-	191	191	-
Critical Hdwy	4.1	-	-	4.12	-	-	7.12	6.52	6.22	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.2	-	-	2.218	-	-	3.518	4.018	3.318	3.5	4.018	3.3
Pot Cap-1 Maneuver	1351	-	-	1425	-	-	532	524	896	541	520	815
Stage 1	-	-	-	-	-	-	818	747	-	772	710	-
Stage 2	-	-	-	-	-	-	754	709	-	815	742	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1348	-	-	1425	-	-	504	514	894	526	510	813
Mov Cap-2 Maneuver	-	-	-	-	-	-	504	514	-	526	510	-
Stage 1	-	-	-	-	-	-	806	736	-	759	706	-
Stage 2	-	-	-	-	-	-	722	705	-	792	731	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	0.1	12.2	10.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	551	1348	-	-	1425	-	-	662
HCM Lane V/C Ratio	0.093	0.013	-	-	0.003	-	-	0.081
HCM Control Delay (s)	12.2	7.7	0	-	7.5	0	-	10.9
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.3

13: Site Access/SW Vermillion Drive & SW Norwood Road

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	20	107	12	1	103	6	38	0	4	38	0	43
Future Vol, veh/h	20	107	12	1	103	6	38	0	4	38	0	43
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	81	81	81	81	81	81	81	81	81	81	81	81
Heavy Vehicles, %	0	0	2	2	3	3	2	2	2	0	2	0
Mvmt Flow	25	132	15	1	127	7	47	0	5	47	0	53

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	134	0	0	147	0	0	349	326	140	325	330	131
Stage 1	-	-	-	-	-	-	190	190	-	133	133	-
Stage 2	-	-	-	-	-	-	159	136	-	192	197	-
Critical Hdwy	4.1	-	-	4.12	-	-	7.12	6.52	6.22	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.2	-	-	2.218	-	-	3.518	4.018	3.318	3.5	4.018	3.3
Pot Cap-1 Maneuver	1463	-	-	1435	-	-	606	592	908	632	589	924
Stage 1	-	-	-	-	-	-	812	743	-	875	786	-
Stage 2	-	-	-	-	-	-	843	784	-	814	738	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1463	-	-	1435	-	-	562	580	908	619	577	924
Mov Cap-2 Maneuver	-	-	-	-	-	-	562	580	-	619	577	-
Stage 1	-	-	-	-	-	-	797	729	-	858	785	-
Stage 2	-	-	-	-	-	-	794	783	-	794	724	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0.1	11.8	10.5
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	583	1463	-	-	1435	-	-	751
HCM Lane V/C Ratio	0.089	0.017	-	-	0.001	-	-	0.133
HCM Control Delay (s)	11.8	7.5	0	-	7.5	0	-	10.5
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0.1	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	7.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			↰	↱
Traffic Vol, veh/h	124	0	24	0	0	0	36	4	0	0	0	74
Future Vol, veh/h	124	0	24	0	0	0	36	4	0	0	0	74
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	-	-	-	-	-	-	15
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	0	0	0	6	6	6	10	10	10
Mvmt Flow	139	0	27	0	0	0	40	4	0	0	0	83

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	27	0	0	293	293	14	295	306	-
Stage 1	-	-	-	-	-	-	292	292	-	1	1	-
Stage 2	-	-	-	-	-	-	1	1	-	294	305	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.16	6.56	6.26	7.2	6.6	-
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.56	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.56	-	6.2	5.6	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.554	4.054	3.354	3.59	4.09	-
Pot Cap-1 Maneuver	1622	-	-	1600	-	-	651	611	1054	642	595	0
Stage 1	-	-	-	-	-	-	707	664	-	1002	879	0
Stage 2	-	-	-	-	-	-	1012	887	-	697	648	0
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1600	-	-	607	558	1054	596	543	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	607	558	-	596	543	-
Stage 1	-	-	-	-	-	-	645	606	-	915	879	-
Stage 2	-	-	-	-	-	-	1012	887	-	632	592	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	6.2	0	11.5	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	602	1622	-	-	1600	-	-	-	-
HCM Lane V/C Ratio	0.075	0.086	-	-	-	-	-	-	-
HCM Control Delay (s)	11.5	7.4	0	-	0	-	-	0	0
HCM Lane LOS	B	A	A	-	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	0.3	-	-	0	-	-	-	-

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	134	52	38	338	235	61
Future Vol, veh/h	134	52	38	338	235	61
Conflicting Peds, #/hr	2	2	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	6	6
Mvmt Flow	149	58	42	376	261	68

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	759	299	331	0	-	0
Stage 1	297	-	-	-	-	-
Stage 2	462	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	374	741	1228	-	-	-
Stage 1	754	-	-	-	-	-
Stage 2	634	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	356	738	1226	-	-	-
Mov Cap-2 Maneuver	356	-	-	-	-	-
Stage 1	720	-	-	-	-	-
Stage 2	633	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.9	0.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1226	-	416	-	-
HCM Lane V/C Ratio	0.034	-	0.497	-	-
HCM Control Delay (s)	8	0	21.9	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	2.7	-	-

HCM 6th Signalized Intersection Summary
1: SW Boones Ferry Rd & SW Sagert St

08/31/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	54	166	10	224	94	41	21	375	297	87	647	58
Future Volume (veh/h)	54	166	10	224	94	41	21	375	297	87	647	58
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	59	182	11	246	103	29	23	412	299	96	711	31
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	0	0	0	1	1	1	1	1	1
Cap, veh/h	343	237	14	358	304	86	300	494	359	287	980	811
Arrive On Green	0.05	0.13	0.13	0.13	0.21	0.21	0.03	0.49	0.48	0.06	0.52	0.52
Sat Flow, veh/h	1795	1759	106	1810	1424	401	1795	1004	729	1795	1885	1560
Grp Volume(v), veh/h	59	0	193	246	0	132	23	0	711	96	711	31
Grp Sat Flow(s),veh/h/ln	1795	0	1865	1810	0	1826	1795	0	1733	1795	1885	1560
Q Serve(g_s), s	2.4	0.0	8.6	9.6	0.0	5.3	0.5	0.0	30.4	2.2	24.9	0.8
Cycle Q Clear(g_c), s	2.4	0.0	8.6	9.6	0.0	5.3	0.5	0.0	30.4	2.2	24.9	0.8
Prop In Lane	1.00		0.06	1.00		0.22	1.00		0.42	1.00		1.00
Lane Grp Cap(c), veh/h	343	0	251	358	0	389	300	0	853	287	980	811
V/C Ratio(X)	0.17	0.00	0.77	0.69	0.00	0.34	0.08	0.00	0.83	0.33	0.73	0.04
Avail Cap(c_a), veh/h	484	0	348	358	0	389	476	0	1132	412	1232	1020
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.5	0.0	35.8	26.1	0.0	28.6	13.2	0.0	19.0	15.6	15.9	10.1
Incr Delay (d2), s/veh	0.1	0.0	4.1	4.5	0.0	0.2	0.0	0.0	5.3	0.3	2.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	4.1	4.5	0.0	2.3	0.2	0.0	12.4	0.8	10.4	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.5	0.0	39.9	30.6	0.0	28.8	13.2	0.0	24.2	15.8	18.1	10.1
LnGrp LOS	C	A	D	C	A	C	B	A	C	B	B	B
Approach Vol, veh/h		252			378			734			838	
Approach Delay, s/veh		37.5			30.0			23.9			17.5	
Approach LOS		D			C			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.0	46.2	15.0	15.6	6.6	48.5	8.3	22.3
Change Period (Y+Rc), s	4.5	5.0	4.5	4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s	10.5	55.0	10.5	15.5	10.5	55.0	10.5	15.5
Max Q Clear Time (g_c+I1), s	4.2	32.4	11.6	10.6	2.5	26.9	4.4	7.3
Green Ext Time (p_c), s	0.1	8.8	0.0	0.3	0.0	9.6	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	24.1
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	248	126	272	51	43	8	117	436	42	14	765	102
Future Volume (veh/h)	248	126	272	51	43	8	117	436	42	14	765	102
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	1.00		0.99	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1870	1870	1870	1811	1811	1811	1870	1870	1870
Adj Flow Rate, veh/h	258	131	210	53	45	3	122	454	39	15	797	96
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	4	4	4	2	2	2	6	6	6	2	2	2
Cap, veh/h	439	145	232	149	216	14	200	936	80	449	880	106
Arrive On Green	0.14	0.23	0.22	0.04	0.12	0.12	0.05	0.57	0.56	0.02	0.54	0.54
Sat Flow, veh/h	1753	623	999	1781	1732	115	1725	1641	141	1781	1632	197
Grp Volume(v), veh/h	258	0	341	53	0	48	122	0	493	15	0	893
Grp Sat Flow(s),veh/h/ln	1753	0	1622	1781	0	1848	1725	0	1782	1781	0	1829
Q Serve(g_s), s	13.8	0.0	22.7	2.9	0.0	2.6	3.5	0.0	18.2	0.4	0.0	48.8
Cycle Q Clear(g_c), s	13.8	0.0	22.7	2.9	0.0	2.6	3.5	0.0	18.2	0.4	0.0	48.8
Prop In Lane	1.00		0.62	1.00		0.06	1.00		0.08	1.00		0.11
Lane Grp Cap(c), veh/h	439	0	377	149	0	230	200	0	1017	449	0	986
V/C Ratio(X)	0.59	0.00	0.91	0.36	0.00	0.21	0.61	0.00	0.48	0.03	0.00	0.91
Avail Cap(c_a), veh/h	519	0	380	181	0	230	210	0	1061	516	0	1089
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	34.1	0.0	41.7	41.7	0.0	43.6	24.3	0.0	14.2	12.7	0.0	23.0
Incr Delay (d2), s/veh	0.5	0.0	23.8	0.5	0.0	0.2	3.2	0.0	0.5	0.0	0.0	10.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.9	0.0	11.5	1.3	0.0	1.2	1.9	0.0	7.2	0.2	0.0	22.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.5	0.0	65.5	42.2	0.0	43.8	27.4	0.0	14.7	12.7	0.0	33.6
LnGrp LOS	C	A	E	D	A	D	C	A	B	B	A	C
Approach Vol, veh/h		599			101			615			908	
Approach Delay, s/veh		52.2			43.0			17.2			33.2	
Approach LOS		D			D			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.8	67.3	8.0	29.7	9.4	63.8	19.9	17.8
Change Period (Y+Rc), s	4.0	5.5	4.0	5.0	4.0	5.5	4.0	5.0
Max Green Setting (Gmax), s	6.0	64.5	6.0	25.0	6.0	64.5	21.0	10.0
Max Q Clear Time (g_c+I1), s	2.4	20.2	4.9	24.7	5.5	50.8	15.8	4.6
Green Ext Time (p_c), s	0.0	5.4	0.0	0.1	0.0	7.5	0.1	0.0

Intersection Summary	
HCM 6th Ctrl Delay	34.3
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✣		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	159	0	164	3	1	5	197	433	2	12	799	280
Future Volume (veh/h)	159	0	164	3	1	5	197	433	2	12	799	280
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.98	0.98		0.95	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1841	1841	1841	1870	1870	1870
Adj Flow Rate, veh/h	166	0	67	3	1	5	205	451	2	12	832	235
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	1	1	0	0	0	4	4	4	2	2	2
Cap, veh/h	309	0	253	117	53	139	238	1207	5	21	1001	842
Arrive On Green	0.16	0.00	0.16	0.16	0.16	0.16	0.14	0.66	0.66	0.01	0.54	0.54
Sat Flow, veh/h	1348	0	1558	355	329	854	1753	1831	8	1781	1870	1573
Grp Volume(v), veh/h	166	0	67	9	0	0	205	0	453	12	832	235
Grp Sat Flow(s),veh/h/ln	1348	0	1558	1538	0	0	1753	0	1839	1781	1870	1573
Q Serve(g_s), s	9.1	0.0	3.0	0.0	0.0	0.0	9.3	0.0	9.0	0.5	30.2	6.6
Cycle Q Clear(g_c), s	9.4	0.0	3.0	0.4	0.0	0.0	9.3	0.0	9.0	0.5	30.2	6.6
Prop In Lane	1.00		1.00	0.33		0.56	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	309	0	253	309	0	0	238	0	1213	21	1001	842
V/C Ratio(X)	0.54	0.00	0.26	0.03	0.00	0.00	0.86	0.00	0.37	0.58	0.83	0.28
Avail Cap(c_a), veh/h	515	0	491	471	0	0	238	0	1249	242	1270	1068
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.3	0.0	29.7	28.6	0.0	0.0	34.3	0.0	6.2	39.8	15.8	10.3
Incr Delay (d2), s/veh	0.9	0.0	0.3	0.0	0.0	0.0	25.3	0.0	0.3	14.4	4.6	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.1	0.0	1.1	0.1	0.0	0.0	5.5	0.0	2.8	0.3	12.3	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.2	0.0	30.0	28.6	0.0	0.0	59.6	0.0	6.5	54.3	20.3	10.6
LnGrp LOS	C	A	C	C	A	A	E	A	A	D	C	B
Approach Vol, veh/h		233			9			658			1079	
Approach Delay, s/veh		32.3			28.6			23.1			18.6	
Approach LOS		C			C			C			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	4.9	58.4		17.6	15.0	48.4		17.6
Change Period (Y+Rc), s	4.0	5.0		4.5	4.0	5.0		4.5
Max Green Setting (Gmax), s	11.0	55.0		25.5	11.0	55.0		22.0
Max Q Clear Time (g_c+I1), s	2.5	11.0		11.4	11.3	32.2		2.4
Green Ext Time (p_c), s	0.0	5.1		0.5	0.0	11.2		0.0

Intersection Summary			
HCM 6th Ctrl Delay			21.7
HCM 6th LOS			C

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Vol, veh/h	36	0	34	13	1	37	33	532	29	35	799	49
Future Vol, veh/h	36	0	34	13	1	37	33	532	29	35	799	49
Conflicting Peds, #/hr	0	0	4	4	0	0	4	0	4	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	95	-	-	105	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	5	5	5	2	2	2	3	3	3	1	1	1
Mvmt Flow	38	0	36	14	1	39	35	566	31	37	850	52

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1626	1625	884	1628	1636	586	906	0	0	601	0	0
Stage 1	954	954	-	656	656	-	-	-	-	-	-	-
Stage 2	672	671	-	972	980	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.12	6.52	6.22	4.13	-	-	4.11	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.518	4.018	3.318	2.227	-	-	2.209	-	-
Pot Cap-1 Maneuver	81	101	340	82	101	510	747	-	-	981	-	-
Stage 1	307	333	-	454	462	-	-	-	-	-	-	-
Stage 2	440	450	-	304	328	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	69	92	337	68	92	508	744	-	-	977	-	-
Mov Cap-2 Maneuver	69	92	-	68	92	-	-	-	-	-	-	-
Stage 1	291	319	-	431	438	-	-	-	-	-	-	-
Stage 2	386	427	-	260	314	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	85.4	32.1	0.6	0.4
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	744	-	-	112	186	977	-	-
HCM Lane V/C Ratio	0.047	-	-	0.665	0.292	0.038	-	-
HCM Control Delay (s)	10.1	-	-	85.4	32.1	8.8	-	-
HCM Lane LOS	B	-	-	F	D	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	3.4	1.2	0.1	-	-

HCM 6th TWSC
5: SW Boones Ferry Road & SW Norwood Road

Intersection	
Int Delay, s/veh	3.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↑	↱	↰	↑
Traffic Vol, veh/h	63	98	495	136	126	720
Future Vol, veh/h	63	98	495	136	126	720
Conflicting Peds, #/hr	2	2	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	65	290	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	3	3	2	2
Mvmt Flow	66	103	521	143	133	758

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1549	525	0	0	666	0
Stage 1	523	-	-	-	-	-
Stage 2	1026	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	125	552	-	-	923	-
Stage 1	595	-	-	-	-	-
Stage 2	346	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	107	550	-	-	921	-
Mov Cap-2 Maneuver	221	-	-	-	-	-
Stage 1	594	-	-	-	-	-
Stage 2	295	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	24.8	0	1.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	348	921	-
HCM Lane V/C Ratio	-	-	0.487	0.144	-
HCM Control Delay (s)	-	-	24.8	9.6	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	2.6	0.5	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↱		↰	↑
Traffic Vol, veh/h	0	0	627	0	0	798
Future Vol, veh/h	0	0	627	0	0	798
Conflicting Peds, #/hr	2	2	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	-	-	150	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	0	0	660	0	0	840

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1504	664	0	0	662	0
Stage 1	662	-	-	-	-	-
Stage 2	842	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.12	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	135	464	-	-	927	-
Stage 1	517	-	-	-	-	-
Stage 2	426	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	134	462	-	-	925	-
Mov Cap-2 Maneuver	335	-	-	-	-	-
Stage 1	516	-	-	-	-	-
Stage 2	425	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	-	925	-
HCM Lane V/C Ratio	-	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	0	-
HCM Lane LOS	-	-	A	A	A	-
HCM 95th %tile Q(veh)	-	-	-	-	0	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖↗		↱		↰	↑
Traffic Vol, veh/h	0	0	626	2	1	796
Future Vol, veh/h	0	0	626	2	1	796
Conflicting Peds, #/hr	2	2	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	0	0	659	2	1	838

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1504	664	0	0	663	0
Stage 1	662	-	-	-	-	-
Stage 2	842	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.12	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	135	464	-	-	926	-
Stage 1	517	-	-	-	-	-
Stage 2	426	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	134	462	-	-	924	-
Mov Cap-2 Maneuver	335	-	-	-	-	-
Stage 1	516	-	-	-	-	-
Stage 2	425	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	924	-
HCM Lane V/C Ratio	-	-	-	0.001	-
HCM Control Delay (s)	-	-	0	8.9	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✣		↰↰	↱		↰	↑↱	
Traffic Volume (veh/h)	12	0	781	0	0	0	640	614	0	0	722	74
Future Volume (veh/h)	12	0	781	0	0	0	640	614	0	0	722	74
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1900	1900	1900	1856	1856	1856	1885	1885	1885
Adj Flow Rate, veh/h	12	0	746	0	0	0	653	627	0	0	737	71
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	0	0	0	3	3	3	1	1	1
Cap, veh/h	271	0	652	0	271	0	734	714	0	610	1595	154
Arrive On Green	0.14	0.00	0.15	0.00	0.00	0.00	0.43	0.64	0.00	0.00	0.48	0.47
Sat Flow, veh/h	1418	0	1585	0	1900	0	2827	1856	0	1795	3301	318
Grp Volume(v), veh/h	12	0	746	0	0	0	653	627	0	0	400	408
Grp Sat Flow(s),veh/h/ln	1418	0	1585	0	1900	0	1414	1856	0	1795	1791	1828
Q Serve(g_s), s	0.8	0.0	15.9	0.0	0.0	0.0	22.4	29.1	0.0	0.0	15.6	15.7
Cycle Q Clear(g_c), s	0.8	0.0	15.9	0.0	0.0	0.0	22.4	29.1	0.0	0.0	15.6	15.7
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		0.17
Lane Grp Cap(c), veh/h	264	0	652	0	271	0	734	714	0	610	865	883
V/C Ratio(X)	0.05	0.00	1.14	0.00	0.00	0.00	0.89	0.88	0.00	0.00	0.46	0.46
Avail Cap(c_a), veh/h	264	0	652	0	271	0	1158	1219	0	610	865	883
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	0.91	0.91	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	39.1	0.0	30.9	0.0	0.0	0.0	28.3	16.7	0.0	0.0	18.1	18.2
Incr Delay (d2), s/veh	0.1	0.0	82.4	0.0	0.0	0.0	4.0	13.3	0.0	0.0	1.8	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	30.2	0.0	0.0	0.0	6.4	10.1	0.0	0.0	6.4	6.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.2	0.0	113.3	0.0	0.0	0.0	32.4	30.0	0.0	0.0	19.8	19.9
LnGrp LOS	D	A	F	A	A	A	C	C	A	A	B	B
Approach Vol, veh/h		758			0			1280			808	
Approach Delay, s/veh		112.1			0.0			31.2			19.9	
Approach LOS		F						C			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	31.3	54.7		19.0	41.6	44.4		19.0				
Change Period (Y+Rc), s	* 5.4	* 5.4		4.5	* 5.4	* 5.4		4.5				
Max Green Setting (Gmax), s	* 42	* 34		14.5	* 8.5	* 68		14.5				
Max Q Clear Time (g_c+I1), s	24.4	17.7		0.0	0.0	31.1		17.9				
Green Ext Time (p_c), s	1.5	6.4		0.0	0.0	7.9		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			49.5
HCM 6th LOS			D

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
9: SW Boones Ferry Road & SW 95th Avenue

08/31/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱↱	↰	↱		↰↰	↑↱		↰	↑↑	↱
Traffic Volume (veh/h)	232	1	803	48	17	6	583	922	12	3	1159	236
Future Volume (veh/h)	232	1	803	48	17	6	583	922	12	3	1159	236
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1826	1826	1870	1870	1870	1781	1781	1781	1856	1856	1856
Adj Flow Rate, veh/h	242	1	836	50	18	6	607	960	12	3	1207	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	5	5	2	2	2	8	8	8	3	3	3
Cap, veh/h	283	1	1035	75	230	77	705	1228	15	628	1763	
Arrive On Green	0.16	0.17	0.17	0.17	0.17	0.17	0.43	0.72	0.70	0.71	1.00	0.00
Sat Flow, veh/h	1249	5	2634	656	1340	447	3291	3423	43	1767	3526	1572
Grp Volume(v), veh/h	243	0	836	50	0	24	607	475	497	3	1207	0
Grp Sat Flow(s),veh/h/ln	1255	0	1317	656	0	1787	1646	1692	1774	1767	1763	1572
Q Serve(g_s), s	15.8	0.0	18.0	1.0	0.0	1.2	17.5	18.9	19.0	0.1	0.0	0.0
Cycle Q Clear(g_c), s	17.0	0.0	18.0	18.0	0.0	1.2	17.5	18.9	19.0	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.25	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	272	0	1035	75	0	306	705	607	636	628	1763	
V/C Ratio(X)	0.89	0.00	0.81	0.67	0.00	0.08	0.86	0.78	0.78	0.00	0.68	
Avail Cap(c_a), veh/h	272	0	1035	75	0	306	1066	1048	1098	628	1763	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.60	0.60	0.60	0.58	0.58	0.00
Uniform Delay (d), s/veh	45.5	0.0	29.0	52.4	0.0	36.5	28.6	12.2	12.2	9.8	0.0	0.0
Incr Delay (d2), s/veh	28.8	0.0	4.7	19.0	0.0	0.1	2.9	6.0	5.7	0.0	1.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.6	0.0	9.8	1.7	0.0	0.5	5.3	4.7	4.9	0.0	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.3	0.0	33.6	71.5	0.0	36.6	31.5	18.2	18.0	9.8	1.3	0.0
LnGrp LOS	E	A	C	E	A	D	C	B	B	A	A	
Approach Vol, veh/h		1079			74			1579			1210	A
Approach Delay, s/veh		42.8			60.2			23.2			1.3	
Approach LOS		D			E			C			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	26.5	56.5		22.0	41.3	41.7		22.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	33.0	40.0		17.0	9.0	64.0		17.0
Max Q Clear Time (g_c+I1), s	19.5	2.0		20.0	2.1	21.0		20.0
Green Ext Time (p_c), s	2.0	11.2		0.0	0.0	15.7		0.0

Intersection Summary	
HCM 6th Ctrl Delay	22.6
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM Signalized Intersection Capacity Analysis
10: I-5 SB Ramps & SW Boones Ferry Road/SW Elligsen Road

08/31/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰↑	↱
Traffic Volume (vph)	0	1101	909	0	700	375	0	0	0	576	88	816
Future Volume (vph)	0	1101	909	0	700	375	0	0	0	576	88	816
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	3.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (prot)		3505	1568		3505	1568				1603	1627	1711
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (perm)		3505	1568		3505	1568				1603	1627	1711
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1135	937	0	722	387	0	0	0	594	91	841
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	60
Lane Group Flow (vph)	0	1135	937	0	722	387	0	0	0	339	346	781
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	0%	0%	0%	7%	7%	7%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		68.4	105.0		46.2	105.0				27.1	27.1	44.8
Effective Green, g (s)		69.4	105.0		47.2	105.0				27.6	27.6	45.8
Actuated g/C Ratio		0.66	1.00		0.45	1.00				0.26	0.26	0.44
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2316	1568		1575	1568				421	427	811
v/s Ratio Prot		0.32			0.21					0.21	0.21	c0.17
v/s Ratio Perm			c0.60			0.25						0.29
v/c Ratio		0.49	0.60		0.46	0.25				0.81	0.81	0.96
Uniform Delay, d1		8.9	0.0		20.0	0.0				36.2	36.2	28.8
Progression Factor		0.93	1.00		1.08	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.5	1.2		0.9	0.4				10.3	10.7	22.8
Delay (s)		8.8	1.2		22.5	0.4				46.5	47.0	51.6
Level of Service		A	A		C	A				D	D	D
Approach Delay (s)		5.4			14.8			0.0			49.4	
Approach LOS		A			B			A			D	

Intersection Summary			
HCM 2000 Control Delay	21.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

V/C Ratio calculated using HCM worksheet with correct critical movements and lost time

HCM 6th Signalized Intersection Summary
11: I-5 NB Ramps & SW Elligsen Road

08/31/2021

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑	↰↰	↱
Traffic Volume (veh/h)	979	700	0	753	323	236
Future Volume (veh/h)	979	700	0	753	323	236
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1841	1841	0	1885	1841	1841
Adj Flow Rate, veh/h	1076	0	0	827	355	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	4	0	1	4	4
Cap, veh/h	2767		0	2834	451	
Arrive On Green	1.00	0.00	0.00	0.79	0.13	0.00
Sat Flow, veh/h	3589	1560	0	3770	3401	1560
Grp Volume(v), veh/h	1076	0	0	827	355	0
Grp Sat Flow(s),veh/h/ln	1749	1560	0	1791	1700	1560
Q Serve(g_s), s	0.0	0.0	0.0	6.6	10.6	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	6.6	10.6	0.0
Prop In Lane		1.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2767		0	2834	451	
V/C Ratio(X)	0.39		0.00	0.29	0.79	
Avail Cap(c_a), veh/h	2767		0	2834	1166	
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.81	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	3.0	44.1	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.3	1.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	1.7	4.6	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.3	0.0	0.0	3.2	46.0	0.0
LnGrp LOS	A		A	A	D	
Approach Vol, veh/h	1076	A		827	355	A
Approach Delay, s/veh	0.3			3.2	46.0	
Approach LOS	A			A	D	

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	87.1	87.1	17.9
Change Period (Y+Rc), s	5.0	5.0	4.5
Max Green Setting (Gmax), s	60.0	60.0	35.5
Max Q Clear Time (g_c+I1), s	2.0	8.6	12.6
Green Ext Time (p_c), s	15.9	10.5	0.8

Intersection Summary	
HCM 6th Ctrl Delay	8.6
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	32	232	36	9	164	14	22	0	5	11	0	8
Future Vol, veh/h	32	232	36	9	164	14	22	0	5	11	0	8
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	2	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	1	1	2	2	0	0	2	2	2	0	2	0
Mvmt Flow	35	252	39	10	178	15	24	0	5	12	0	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	195	0	0	291	0	0	554	557	274	554	569	190
Stage 1	-	-	-	-	-	-	342	342	-	208	208	-
Stage 2	-	-	-	-	-	-	212	215	-	346	361	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.12	6.52	6.22	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.518	4.018	3.318	3.5	4.018	3.3
Pot Cap-1 Maneuver	1384	-	-	1271	-	-	443	439	765	446	432	857
Stage 1	-	-	-	-	-	-	673	638	-	799	730	-
Stage 2	-	-	-	-	-	-	790	725	-	674	626	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1381	-	-	1271	-	-	425	421	764	428	414	854
Mov Cap-2 Maneuver	-	-	-	-	-	-	425	421	-	428	414	-
Stage 1	-	-	-	-	-	-	653	619	-	773	722	-
Stage 2	-	-	-	-	-	-	773	717	-	648	607	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	0.4	13.3	11.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	463	1381	-	-	1271	-	-	542
HCM Lane V/C Ratio	0.063	0.025	-	-	0.008	-	-	0.038
HCM Control Delay (s)	13.3	7.7	0	-	7.9	0	-	11.9
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	68	138	42	4	127	37	24	0	3	23	0	36
Future Vol, veh/h	68	138	42	4	127	37	24	0	3	23	0	36
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	72	72	92	92	72	72	92	92	92	72	92	72
Heavy Vehicles, %	1	1	2	2	0	0	2	2	2	0	2	0
Mvmt Flow	94	192	46	4	176	51	26	0	3	32	0	50

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	227	0	0	238	0	0	638	638	215	615	636	202
Stage 1	-	-	-	-	-	-	403	403	-	210	210	-
Stage 2	-	-	-	-	-	-	235	235	-	405	426	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.12	6.52	6.22	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.518	4.018	3.318	3.5	4.018	3.3
Pot Cap-1 Maneuver	1347	-	-	1329	-	-	389	394	825	406	395	844
Stage 1	-	-	-	-	-	-	624	600	-	797	728	-
Stage 2	-	-	-	-	-	-	768	710	-	626	586	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1347	-	-	1329	-	-	342	361	825	378	362	844
Mov Cap-2 Maneuver	-	-	-	-	-	-	342	361	-	378	362	-
Stage 1	-	-	-	-	-	-	573	551	-	732	726	-
Stage 2	-	-	-	-	-	-	720	708	-	573	539	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.2	0.1	15.7	12.4
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	366	1347	-	-	1329	-	-	570
HCM Lane V/C Ratio	0.08	0.07	-	-	0.003	-	-	0.144
HCM Control Delay (s)	15.7	7.9	0	-	7.7	0	-	12.4
HCM Lane LOS	C	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0.2	-	-	0	-	-	0.5

HCM 6th TWSC
14: SW 82nd Avenue & SW Norwood Road/Driveway

08/31/2021

Intersection	
Int Delay, s/veh	6.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			↰	↱
Traffic Vol, veh/h	130	0	34	0	0	1	20	7	0	2	4	148
Future Vol, veh/h	130	0	34	0	0	1	20	7	0	2	4	148
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	-	-	-	-	-	-	15
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	157	0	41	0	0	1	24	8	0	2	5	178

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	41	0	0	338	336	21	340	356	-
Stage 1	-	-	-	-	-	-	335	335	-	1	1	-
Stage 2	-	-	-	-	-	-	3	1	-	339	355	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	-
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	-
Pot Cap-1 Maneuver	1635	-	-	1581	-	-	620	588	1062	618	573	0
Stage 1	-	-	-	-	-	-	683	646	-	1027	899	0
Stage 2	-	-	-	-	-	-	1025	899	-	680	633	0
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1635	-	-	1581	-	-	569	530	1062	564	516	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	569	530	-	564	516	-
Stage 1	-	-	-	-	-	-	615	582	-	925	899	-
Stage 2	-	-	-	-	-	-	1020	899	-	604	570	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	5.9	0	11.9	11.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	558	1635	-	-	1581	-	-	531	-
HCM Lane V/C Ratio	0.058	0.096	-	-	-	-	-	0.014	-
HCM Control Delay (s)	11.9	7.4	0	-	0	-	-	11.9	0
HCM Lane LOS	B	A	A	-	A	-	-	B	A
HCM 95th %tile Q(veh)	0.2	0.3	-	-	0	-	-	0	-

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	70	64	58	218	388	118
Future Vol, veh/h	70	64	58	218	388	118
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	0	2	2	0	0
Mvmt Flow	79	72	65	245	436	133

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	878	503	569	0	-	0
Stage 1	503	-	-	-	-	-
Stage 2	375	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.12	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	321	573	1003	-	-	-
Stage 1	612	-	-	-	-	-
Stage 2	699	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	297	573	1003	-	-	-
Mov Cap-2 Maneuver	297	-	-	-	-	-
Stage 1	566	-	-	-	-	-
Stage 2	699	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.2	1.9	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1003	-	386	-	-
HCM Lane V/C Ratio	0.065	-	0.39	-	-
HCM Control Delay (s)	8.8	0	20.2	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.2	-	1.8	-	-

HCM 6th Signalized Intersection Summary
1: SW Boones Ferry Rd & SW Sagert St

06/30/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	73	80	12	191	102	63	8	634	312	53	287	48
Future Volume (veh/h)	73	80	12	191	102	63	8	634	312	53	287	48
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1885	1885	1885	1811	1811	1811
Adj Flow Rate, veh/h	80	88	8	210	112	47	9	697	327	58	315	31
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	0	0	0	1	1	1	6	6	6
Cap, veh/h	248	137	12	325	174	73	661	709	333	166	1121	929
Arrive On Green	0.06	0.08	0.08	0.12	0.14	0.13	0.02	0.59	0.58	0.05	0.62	0.62
Sat Flow, veh/h	1795	1701	155	1810	1269	533	1795	1204	565	1725	1811	1501
Grp Volume(v), veh/h	80	0	96	210	0	159	9	0	1024	58	315	31
Grp Sat Flow(s),veh/h/ln	1795	0	1856	1810	0	1802	1795	0	1768	1725	1811	1501
Q Serve(g_s), s	3.8	0.0	4.8	9.8	0.0	7.9	0.2	0.0	53.8	1.2	7.6	0.8
Cycle Q Clear(g_c), s	3.8	0.0	4.8	9.8	0.0	7.9	0.2	0.0	53.8	1.2	7.6	0.8
Prop In Lane	1.00		0.08	1.00		0.30	1.00		0.32	1.00		1.00
Lane Grp Cap(c), veh/h	248	0	149	325	0	247	661	0	1042	166	1121	929
V/C Ratio(X)	0.32	0.00	0.64	0.65	0.00	0.64	0.01	0.00	0.98	0.35	0.28	0.03
Avail Cap(c_a), veh/h	349	0	312	325	0	303	840	0	1042	285	1121	929
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.9	0.0	42.4	33.2	0.0	38.9	7.8	0.0	19.2	23.0	8.3	7.0
Incr Delay (d2), s/veh	0.3	0.0	1.7	3.5	0.0	1.6	0.0	0.0	23.8	0.5	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.0	2.2	4.5	0.0	3.6	0.1	0.0	26.4	0.8	2.8	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.1	0.0	44.1	36.7	0.0	40.6	7.8	0.0	43.0	23.4	8.6	7.1
LnGrp LOS	D	A	D	D	A	D	A	A	D	C	A	A
Approach Vol, veh/h		176			369			1033			404	
Approach Delay, s/veh		40.9			38.4			42.7			10.6	
Approach LOS		D			D			D			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.4	60.0	15.0	11.7	5.6	62.9	9.6	17.0
Change Period (Y+Rc), s	4.5	5.0	4.5	4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s	10.5	55.0	10.5	15.5	10.5	55.0	10.5	15.5
Max Q Clear Time (g_c+I1), s	3.2	55.8	11.8	6.8	2.2	9.6	5.8	9.9
Green Ext Time (p_c), s	0.0	0.0	0.0	0.2	0.0	3.9	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	35.2
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	178	70	154	31	107	15	283	761	42	7	324	160
Future Volume (veh/h)	178	70	154	31	107	15	283	761	42	7	324	160
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	0.99		0.96	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1841	1841	1841	1767	1767	1767	1841	1841	1841
Adj Flow Rate, veh/h	212	83	106	37	127	12	337	906	44	8	386	172
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	4	4	4	4	4	4	9	9	9	4	4	4
Cap, veh/h	318	143	183	226	174	16	431	999	49	152	661	294
Arrive On Green	0.13	0.20	0.19	0.03	0.11	0.10	0.06	0.60	0.58	0.01	0.55	0.55
Sat Flow, veh/h	1753	721	921	1753	1649	156	1682	1669	81	1753	1205	537
Grp Volume(v), veh/h	212	0	189	37	0	139	337	0	950	8	0	558
Grp Sat Flow(s),veh/h/ln	1753	0	1642	1753	0	1805	1682	0	1750	1753	0	1742
Q Serve(g_s), s	10.4	0.0	10.4	1.9	0.0	7.4	6.0	0.0	47.5	0.2	0.0	21.2
Cycle Q Clear(g_c), s	10.4	0.0	10.4	1.9	0.0	7.4	6.0	0.0	47.5	0.2	0.0	21.2
Prop In Lane	1.00		0.56	1.00		0.09	1.00		0.05	1.00		0.31
Lane Grp Cap(c), veh/h	318	0	326	226	0	190	431	0	1047	152	0	955
V/C Ratio(X)	0.67	0.00	0.58	0.16	0.00	0.73	0.78	0.00	0.91	0.05	0.00	0.58
Avail Cap(c_a), veh/h	467	0	429	276	0	199	431	0	1160	240	0	1155
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	33.2	0.0	36.4	38.7	0.0	43.2	20.3	0.0	17.6	19.6	0.0	15.0
Incr Delay (d2), s/veh	0.9	0.0	0.6	0.1	0.0	10.4	8.2	0.0	10.1	0.1	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	0.0	4.2	0.8	0.0	3.8	5.4	0.0	20.1	0.1	0.0	8.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.1	0.0	37.0	38.9	0.0	53.7	28.5	0.0	27.7	19.7	0.0	15.8
LnGrp LOS	C	A	D	D	A	D	C	A	C	B	A	B
Approach Vol, veh/h		401			176			1287			566	
Approach Delay, s/veh		35.5			50.5			27.9			15.8	
Approach LOS		D			D			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.0	63.6	7.2	23.8	10.0	58.6	16.5	14.5
Change Period (Y+Rc), s	4.0	5.5	4.0	5.0	4.0	5.5	4.0	5.0
Max Green Setting (Gmax), s	6.0	64.5	6.0	25.0	6.0	64.5	21.0	10.0
Max Q Clear Time (g_c+I1), s	2.2	49.5	3.9	12.4	8.0	23.2	12.4	9.4
Green Ext Time (p_c), s	0.0	8.6	0.0	0.6	0.0	6.5	0.1	0.0

Intersection Summary	
HCM 6th Ctrl Delay	28.0
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary

3: SW Boones Ferry Road & SW Ibach Street/SW Ibach Court

06/30/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱			✥		↰	↑↱		↰	↑	↱
Traffic Volume (veh/h)	262	4	346	4	1	19	144	809	10	3	420	87
Future Volume (veh/h)	262	4	346	4	1	19	144	809	10	3	420	87
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.99	1.00		0.97	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1900	1900	1900	1796	1796	1796	1811	1811	1811
Adj Flow Rate, veh/h	301	5	226	5	1	5	166	930	11	3	483	54
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	3	3	3	0	0	0	7	7	7	6	6	6
Cap, veh/h	416	10	429	154	45	117	198	1029	12	6	848	715
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.12	0.58	0.57	0.00	0.47	0.47
Sat Flow, veh/h	1371	34	1530	339	161	417	1711	1771	21	1725	1811	1527
Grp Volume(v), veh/h	301	0	231	11	0	0	166	0	941	3	483	54
Grp Sat Flow(s),veh/h/ln	1371	0	1564	917	0	0	1711	0	1792	1725	1811	1527
Q Serve(g_s), s	10.9	0.0	11.1	0.1	0.0	0.0	8.4	0.0	41.1	0.2	17.1	1.7
Cycle Q Clear(g_c), s	22.1	0.0	11.1	11.2	0.0	0.0	8.4	0.0	41.1	0.2	17.1	1.7
Prop In Lane	1.00		0.98	0.45		0.45	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	416	0	439	311	0	0	198	0	1041	6	848	715
V/C Ratio(X)	0.72	0.00	0.53	0.04	0.00	0.00	0.84	0.00	0.90	0.54	0.57	0.08
Avail Cap(c_a), veh/h	433	0	459	329	0	0	212	0	1132	214	1144	965
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.8	0.0	27.1	23.7	0.0	0.0	38.4	0.0	16.4	44.1	17.1	13.0
Incr Delay (d2), s/veh	5.1	0.0	0.6	0.0	0.0	0.0	22.3	0.0	10.3	42.0	1.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.7	0.0	4.1	0.2	0.0	0.0	4.7	0.0	17.3	0.1	6.8	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.9	0.0	27.8	23.7	0.0	0.0	60.7	0.0	26.7	86.1	18.1	13.1
LnGrp LOS	D	A	C	C	A	A	E	A	C	F	B	B
Approach Vol, veh/h		532			11			1107			540	
Approach Delay, s/veh		32.9			23.7			31.8			17.9	
Approach LOS		C			C			C			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	4.3	55.5		28.9	14.3	45.5		28.9
Change Period (Y+Rc), s	4.0	5.0		4.5	4.0	5.0		4.5
Max Green Setting (Gmax), s	11.0	55.0		25.5	11.0	55.0		25.5
Max Q Clear Time (g_c+I1), s	2.2	43.1		24.1	10.4	19.1		13.2
Green Ext Time (p_c), s	0.0	7.4		0.3	0.0	5.8		0.0

Intersection Summary			
HCM 6th Ctrl Delay			28.6
HCM 6th LOS			C

HCM 6th TWSC
4: SW Boones Ferry Road & SW Iowa Drive

Intersection	
Int Delay, s/veh	16

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Vol, veh/h	51	2	56	30	0	32	14	767	10	20	483	18
Future Vol, veh/h	51	2	56	30	0	32	14	767	10	20	483	18
Conflicting Peds, #/hr	13	0	5	1	0	9	5	0	1	9	0	13
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	95	-	-	105	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	0	0	0	0	0	0	7	7	7	6	6	6
Mvmt Flow	61	2	67	36	0	38	17	913	12	24	575	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1632	1615	604	1635	1619	941	609	0	0	934	0	0
Stage 1	647	647	-	962	962	-	-	-	-	-	-	-
Stage 2	985	968	-	673	657	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.17	-	-	4.16	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.263	-	-	2.254	-	-
Pot Cap-1 Maneuver	82	105	502	82	104	322	946	-	-	717	-	-
Stage 1	463	470	-	310	337	-	-	-	-	-	-	-
Stage 2	301	335	-	448	465	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	68	98	493	66	97	315	934	-	-	711	-	-
Mov Cap-2 Maneuver	68	98	-	66	97	-	-	-	-	-	-	-
Stage 1	449	448	-	302	328	-	-	-	-	-	-	-
Stage 2	257	326	-	371	444	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	165.2	86.1	0.2	0.4
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	934	-	-	123	111	711	-	-
HCM Lane V/C Ratio	0.018	-	-	1.055	0.665	0.033	-	-
HCM Control Delay (s)	8.9	-	-	165.2	86.1	10.2	-	-
HCM Lane LOS	A	-	-	F	F	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	7.4	3.4	0.1	-	-

Intersection	
Int Delay, s/veh	5.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↑	↱	↰	↑
Traffic Vol, veh/h	89	102	690	40	67	502
Future Vol, veh/h	89	102	690	40	67	502
Conflicting Peds, #/hr	4	4	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	65	290	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	2	2	6	6	5	5
Mvmt Flow	102	117	793	46	77	577

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1532	801	0	0	843	0
Stage 1	797	-	-	-	-	-
Stage 2	735	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.15	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.245	-
Pot Cap-1 Maneuver	128	384	-	-	780	-
Stage 1	444	-	-	-	-	-
Stage 2	474	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	114	381	-	-	777	-
Mov Cap-2 Maneuver	250	-	-	-	-	-
Stage 1	442	-	-	-	-	-
Stage 2	426	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	41.7	0	1.2
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	306	777	-
HCM Lane V/C Ratio	-	-	0.717	0.099	-
HCM Control Delay (s)	-	-	41.7	10.1	-
HCM Lane LOS	-	-	E	B	-
HCM 95th %tile Q(veh)	-	-	5.2	0.3	-

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑	↱	↰	↑
Traffic Vol, veh/h	96	58	677	32	17	574
Future Vol, veh/h	96	58	677	32	17	574
Conflicting Peds, #/hr	4	4	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	-	150	150	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	0	6	6	5	5
Mvmt Flow	110	67	778	37	20	660

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1486	786	0	0	819	0
Stage 1	782	-	-	-	-	-
Stage 2	704	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.15	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.245	-
Pot Cap-1 Maneuver	139	395	-	-	797	-
Stage 1	454	-	-	-	-	-
Stage 2	494	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	134	392	-	-	794	-
Mov Cap-2 Maneuver	337	-	-	-	-	-
Stage 1	452	-	-	-	-	-
Stage 2	480	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	19		0		0.3
HCM LOS	C				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	337	392	794	-
HCM Lane V/C Ratio	-	-	0.327	0.17	0.025	-
HCM Control Delay (s)	-	-	20.8	16.1	9.6	-
HCM Lane LOS	-	-	C	C	A	-
HCM 95th %tile Q(veh)	-	-	1.4	0.6	0.1	-

7: SW Boones Ferry Road & SW Greenhill Lane

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱		↰	↑
Traffic Vol, veh/h	2	1	706	0	0	669
Future Vol, veh/h	2	1	706	0	0	669
Conflicting Peds, #/hr	4	4	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	0	6	6	5	5
Mvmt Flow	2	1	811	0	0	769

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1588	819	0	0	815	0
Stage 1	815	-	-	-	-	-
Stage 2	773	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.15	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.245	-
Pot Cap-1 Maneuver	120	379	-	-	799	-
Stage 1	439	-	-	-	-	-
Stage 2	459	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	119	376	-	-	796	-
Mov Cap-2 Maneuver	320	-	-	-	-	-
Stage 1	437	-	-	-	-	-
Stage 2	457	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.8	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	337	796	-
HCM Lane V/C Ratio	-	-	0.01	-	-
HCM Control Delay (s)	-	-	15.8	0	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

HCM 6th Signalized Intersection Summary
8: SW Boones Ferry Road & SW Day Road

06/30/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰↰	↱		↰	↑↱	
Traffic Volume (veh/h)	186	0	581	0	0	0	642	520	0	0	594	76
Future Volume (veh/h)	186	0	581	0	0	0	642	520	0	0	594	76
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1693	1693	1693	1900	1900	1900	1693	1693	1693	1796	1796	1796
Adj Flow Rate, veh/h	207	0	596	0	0	0	713	578	0	0	660	73
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	14	14	14	0	0	0	14	14	14	7	7	7
Cap, veh/h	285	0	661	0	316	0	807	712	0	471	1250	138
Arrive On Green	0.16	0.00	0.17	0.00	0.00	0.00	0.20	0.28	0.00	0.00	0.40	0.39
Sat Flow, veh/h	1283	0	1434	0	1900	0	2740	1693	0	1711	3099	342
Grp Volume(v), veh/h	207	0	596	0	0	0	713	578	0	0	363	370
Grp Sat Flow(s),veh/h/ln	1283	0	1434	0	1900	0	1370	1693	0	1711	1706	1735
Q Serve(g_s), s	15.3	0.0	15.8	0.0	0.0	0.0	24.0	30.2	0.0	0.0	15.3	15.4
Cycle Q Clear(g_c), s	15.3	0.0	15.8	0.0	0.0	0.0	24.0	30.2	0.0	0.0	15.3	15.4
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		0.20
Lane Grp Cap(c), veh/h	282	0	661	0	316	0	807	712	0	471	688	700
V/C Ratio(X)	0.73	0.00	0.90	0.00	0.00	0.00	0.88	0.81	0.00	0.00	0.53	0.53
Avail Cap(c_a), veh/h	282	0	661	0	320	0	1047	1033	0	471	688	700
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.67	0.67	0.67	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	0.89	0.89	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	39.8	0.0	23.6	0.0	0.0	0.0	36.5	30.6	0.0	0.0	21.5	21.6
Incr Delay (d2), s/veh	9.0	0.0	15.4	0.0	0.0	0.0	6.0	8.8	0.0	0.0	2.9	2.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.4	0.0	13.9	0.0	0.0	0.0	8.9	14.4	0.0	0.0	6.2	6.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	48.8	0.0	39.1	0.0	0.0	0.0	42.6	39.4	0.0	0.0	24.4	24.5
LnGrp LOS	D	A	D	A	A	A	D	D	A	A	C	C
Approach Vol, veh/h		803			0			1291			733	
Approach Delay, s/veh		41.6			0.0			41.2			24.4	
Approach LOS		D						D			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	32.7	42.3		20.0	31.1	43.9		20.0				
Change Period (Y+Rc), s	5.2	* 5.4		* 4.7	* 5.4	* 5.4		* 4.7				
Max Green Setting (Gmax), s	35.8	* 29		* 16	* 8.5	* 57		* 15				
Max Q Clear Time (g_c+I1), s	26.0	17.4		0.0	0.0	32.2		17.8				
Green Ext Time (p_c), s	1.5	4.7		0.0	0.0	6.3		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		36.9
HCM 6th LOS		D

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
9: SW Elligsen Road/SW Boones Ferry Road & SW 95th Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱↱	↰	↱		↰↰	↑↱		↰	↑↑	↱
Traffic Volume (veh/h)	208	8	560	17	1	7	846	866	70	6	814	273
Future Volume (veh/h)	208	8	560	17	1	7	846	866	70	6	814	273
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1648	1648	1648	1737	1737	1737	1796	1796	1796	1737	1737	1737
Adj Flow Rate, veh/h	226	9	571	18	1	8	920	941	76	7	885	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	17	17	17	11	11	11	7	7	7	11	11	11
Cap, veh/h	296	9	1222	76	31	251	1025	1233	100	442	1135	
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.52	0.64	0.64	0.09	0.11	0.00
Sat Flow, veh/h	1168	47	2445	775	166	1327	3319	3198	258	1654	3300	1472
Grp Volume(v), veh/h	235	0	571	18	0	9	920	502	515	7	885	0
Grp Sat Flow(s),veh/h/ln	1215	0	1223	775	0	1493	1659	1706	1749	1654	1650	1472
Q Serve(g_s), s	17.5	0.0	14.5	0.0	0.0	0.5	23.8	19.6	19.6	0.4	24.8	0.0
Cycle Q Clear(g_c), s	18.0	0.0	14.5	18.0	0.0	0.5	23.8	19.6	19.6	0.4	24.8	0.0
Prop In Lane	0.96		1.00	1.00		0.89	1.00		0.15	1.00		1.00
Lane Grp Cap(c), veh/h	304	0	1222	76	0	283	1025	658	675	442	1135	
V/C Ratio(X)	0.77	0.00	0.47	0.24	0.00	0.03	0.90	0.76	0.76	0.02	0.78	
Avail Cap(c_a), veh/h	304	0	1222	76	0	283	1572	988	1013	442	1135	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.19	0.19	0.19	0.64	0.64	0.00
Uniform Delay (d), s/veh	38.9	0.0	15.6	47.5	0.0	31.4	21.7	13.9	13.9	31.9	38.6	0.0
Incr Delay (d2), s/veh	11.1	0.0	0.2	1.2	0.0	0.0	1.0	1.6	1.6	0.0	3.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.3	0.0	3.9	0.4	0.0	0.2	6.6	4.9	5.0	0.1	11.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.0	0.0	15.8	48.7	0.0	31.4	22.7	15.5	15.5	31.9	42.1	0.0
LnGrp LOS	D	A	B	D	A	C	C	B	B	C	D	
Approach Vol, veh/h		806			27			1937			892	A
Approach Delay, s/veh		25.8			42.9			18.9			42.0	
Approach LOS		C			D			B			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	34.3	37.7		23.0	30.4	41.6		23.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	45.0	17.0		18.0	7.0	55.0		18.0
Max Q Clear Time (g_c+I1), s	25.8	26.8		20.0	2.4	21.6		20.0
Green Ext Time (p_c), s	3.6	0.0		0.0	0.0	15.1		0.0

Intersection Summary	
HCM 6th Ctrl Delay	26.2
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM Signalized Intersection Capacity Analysis
10: I-5 SB Ramps & SW Elligsen Road

06/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰↑	↱
Traffic Volume (vph)	0	1011	379	0	755	121	0	0	0	540	0	1025
Future Volume (vph)	0	1011	379	0	755	121	0	0	0	540	0	1025
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frpb, ped/bikes		1.00	0.99		1.00	1.00				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3034	1340		3406	1524				1573	1573	1679
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3034	1340		3406	1524				1573	1573	1679
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	1076	403	0	803	129	0	0	0	574	0	1090
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	9
Lane Group Flow (vph)	0	1076	403	0	803	129	0	0	0	287	287	1081
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	19%	19%	19%	6%	6%	6%	0%	0%	0%	9%	9%	9%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		65.1	95.0		22.7	95.0				20.4	20.4	58.3
Effective Green, g (s)		66.1	95.0		23.7	95.0				20.9	20.9	59.3
Actuated g/C Ratio		0.70	1.00		0.25	1.00				0.22	0.22	0.62
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2111	1340		849	1524				346	346	1118
v/s Ratio Prot		0.35			c0.24					0.18	0.18	c0.39
v/s Ratio Perm			0.30			0.08						0.25
v/c Ratio		0.51	0.30		0.95	0.08				0.83	0.83	0.97
Uniform Delay, d1		6.8	0.0		35.0	0.0				35.3	35.3	16.9
Progression Factor		2.36	1.00		0.62	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.6	0.4		18.6	0.1				14.6	14.6	19.2
Delay (s)		16.7	0.4		40.1	0.1				50.0	50.0	36.2
Level of Service		B	A		D	A				D	D	D
Approach Delay (s)		12.3			34.6			0.0			40.9	
Approach LOS		B			C			A			D	

Intersection Summary			
HCM 2000 Control Delay	29.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	91.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

V/C Ratio calculated using HCM worksheet with correct lost time

HCM 6th Signalized Intersection Summary
11: I-5 NB Ramps & SW Elligsen Road

06/30/2021

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑	↰↰	↱
Traffic Volume (veh/h)	784	768	0	342	533	265
Future Volume (veh/h)	784	768	0	342	533	265
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1707	1707	0	1796	1811	1811
Adj Flow Rate, veh/h	862	0	0	376	586	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	13	13	0	7	6	6
Cap, veh/h	2311		0	2432	680	
Arrive On Green	0.24	0.00	0.00	0.71	0.20	0.00
Sat Flow, veh/h	3329	1447	0	3593	3346	1535
Grp Volume(v), veh/h	862	0	0	376	586	0
Grp Sat Flow(s),veh/h/ln	1622	1447	0	1706	1673	1535
Q Serve(g_s), s	21.2	0.0	0.0	3.4	16.1	0.0
Cycle Q Clear(g_c), s	21.2	0.0	0.0	3.4	16.1	0.0
Prop In Lane		1.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2311		0	2432	680	
V/C Ratio(X)	0.37		0.00	0.15	0.86	
Avail Cap(c_a), veh/h	2311		0	2432	810	
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.79	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.5	0.0	0.0	4.4	36.6	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.0	0.1	7.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.2	0.0	0.0	1.0	7.2	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	18.9	0.0	0.0	4.5	44.2	0.0
LnGrp LOS	B		A	A	D	
Approach Vol, veh/h	862	A		376	586	A
Approach Delay, s/veh	18.9			4.5	44.2	
Approach LOS	B			A	D	

Timer - Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		71.7				71.7		23.3
Change Period (Y+Rc), s		5.0				5.0		4.5
Max Green Setting (Gmax), s		63.0				63.0		22.5
Max Q Clear Time (g_c+I1), s		23.2				5.4		18.1
Green Ext Time (p_c), s		10.7				4.0		0.7

Intersection Summary	
HCM 6th Ctrl Delay	24.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC
12: Site Access/SW 89th Avenue & SW Norwood Road

06/30/2021

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	14	121	7	1	179	2	20	0	4	19	0	26
Future Vol, veh/h	14	121	7	1	179	2	20	0	4	19	0	26
Conflicting Peds, #/hr	1	0	0	0	0	2	0	0	0	2	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	0	0	2	2	2	2	2	2	2	0	2	0
Mvmt Flow	18	151	9	1	224	3	25	0	5	24	0	33

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	229	0	0	160	0	0	437	423	158	426	426	229
Stage 1	-	-	-	-	-	-	192	192	-	230	230	-
Stage 2	-	-	-	-	-	-	245	231	-	196	196	-
Critical Hdwy	4.1	-	-	4.12	-	-	7.12	6.52	6.22	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.2	-	-	2.218	-	-	3.518	4.018	3.318	3.5	4.018	3.3
Pot Cap-1 Maneuver	1351	-	-	1419	-	-	530	522	887	542	520	815
Stage 1	-	-	-	-	-	-	810	742	-	777	714	-
Stage 2	-	-	-	-	-	-	759	713	-	810	739	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1348	-	-	1419	-	-	502	513	885	530	511	813
Mov Cap-2 Maneuver	-	-	-	-	-	-	502	513	-	530	511	-
Stage 1	-	-	-	-	-	-	798	731	-	764	712	-
Stage 2	-	-	-	-	-	-	727	711	-	792	728	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	0	12	10.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	541	1348	-	-	1419	-	-	663
HCM Lane V/C Ratio	0.055	0.013	-	-	0.001	-	-	0.085
HCM Control Delay (s)	12	7.7	0	-	7.5	0	-	10.9
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.3

13: Site Access/SW Vermillion Drive & SW Norwood Road

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	21	111	11	8	106	7	31	0	26	40	0	45
Future Vol, veh/h	21	111	11	8	106	7	31	0	26	40	0	45
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	81	81	81	81	81	81	81	81	81	81	81	81
Heavy Vehicles, %	0	0	2	2	3	3	2	2	2	0	2	0
Mvmt Flow	26	137	14	10	131	9	38	0	32	49	0	56

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	140	0	0	151	0	0	380	356	144	368	359	136
Stage 1	-	-	-	-	-	-	196	196	-	156	156	-
Stage 2	-	-	-	-	-	-	184	160	-	212	203	-
Critical Hdwy	4.1	-	-	4.12	-	-	7.12	6.52	6.22	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.2	-	-	2.218	-	-	3.518	4.018	3.318	3.5	4.018	3.3
Pot Cap-1 Maneuver	1456	-	-	1430	-	-	578	570	903	592	568	918
Stage 1	-	-	-	-	-	-	806	739	-	851	769	-
Stage 2	-	-	-	-	-	-	818	766	-	795	733	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1456	-	-	1430	-	-	532	554	903	559	552	918
Mov Cap-2 Maneuver	-	-	-	-	-	-	532	554	-	559	552	-
Stage 1	-	-	-	-	-	-	790	724	-	834	763	-
Stage 2	-	-	-	-	-	-	762	760	-	751	718	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0.5	11.2	11
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	655	1456	-	-	1430	-	-	705
HCM Lane V/C Ratio	0.107	0.018	-	-	0.007	-	-	0.149
HCM Control Delay (s)	11.2	7.5	0	-	7.5	0	-	11
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.4	0.1	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	7.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			↰	↱
Traffic Vol, veh/h	152	0	25	0	0	0	37	4	0	0	0	84
Future Vol, veh/h	152	0	25	0	0	0	37	4	0	0	0	84
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	-	-	-	-	-	-	15
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	0	0	0	6	6	6	10	10	10
Mvmt Flow	171	0	28	0	0	0	42	4	0	0	0	94

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	28	0	0	357	357	14	359	371	-
Stage 1	-	-	-	-	-	-	356	356	-	1	1	-
Stage 2	-	-	-	-	-	-	1	1	-	358	370	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.16	6.56	6.26	7.2	6.6	-
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.56	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.56	-	6.2	5.6	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.554	4.054	3.354	3.59	4.09	-
Pot Cap-1 Maneuver	1622	-	-	1599	-	-	591	563	1054	582	546	0
Stage 1	-	-	-	-	-	-	653	622	-	1002	879	0
Stage 2	-	-	-	-	-	-	1012	887	-	644	606	0
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1599	-	-	543	503	1054	531	488	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	543	503	-	531	488	-
Stage 1	-	-	-	-	-	-	583	555	-	895	879	-
Stage 2	-	-	-	-	-	-	1012	887	-	570	541	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	6.4	0	12.3	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	539	1622	-	-	1599	-	-	-	-
HCM Lane V/C Ratio	0.085	0.105	-	-	-	-	-	-	-
HCM Control Delay (s)	12.3	7.5	0	-	0	-	-	0	0
HCM Lane LOS	B	A	A	-	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	0.4	-	-	0	-	-	-	-

Intersection	
Int Delay, s/veh	6.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↱			↰	↱	
Traffic Vol, veh/h	154	62	42	351	244	69
Future Vol, veh/h	154	62	42	351	244	69
Conflicting Peds, #/hr	2	2	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	6	6
Mvmt Flow	171	69	47	390	271	77

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	798	314	350	0	-	0
Stage 1	312	-	-	-	-	-
Stage 2	486	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	355	726	1209	-	-	-
Stage 1	742	-	-	-	-	-
Stage 2	618	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	336	723	1207	-	-	-
Mov Cap-2 Maneuver	336	-	-	-	-	-
Stage 1	703	-	-	-	-	-
Stage 2	617	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	27	0.9	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1207	-	397	-	-
HCM Lane V/C Ratio	0.039	-	0.605	-	-
HCM Control Delay (s)	8.1	0	27	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0.1	-	3.8	-	-

HCM 6th Signalized Intersection Summary

1: SW Boones Ferry Rd & SW Sagert St

06/30/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑	↱
Traffic Volume (veh/h)	56	173	10	250	98	43	22	400	318	90	689	61
Future Volume (veh/h)	56	173	10	250	98	43	22	400	318	90	689	61
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	62	190	11	275	108	31	24	440	318	99	757	29
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	0	0	0	1	1	1	1	1	1
Cap, veh/h	339	241	14	338	296	85	285	512	370	267	1008	834
Arrive On Green	0.05	0.14	0.13	0.12	0.21	0.20	0.03	0.51	0.50	0.06	0.53	0.53
Sat Flow, veh/h	1795	1764	102	1810	1418	407	1795	1006	727	1795	1885	1561
Grp Volume(v), veh/h	62	0	201	275	0	139	24	0	758	99	757	29
Grp Sat Flow(s),veh/h/ln	1795	0	1866	1810	0	1824	1795	0	1734	1795	1885	1561
Q Serve(g_s), s	2.6	0.0	9.4	11.0	0.0	5.9	0.6	0.0	34.6	2.3	28.3	0.8
Cycle Q Clear(g_c), s	2.6	0.0	9.4	11.0	0.0	5.9	0.6	0.0	34.6	2.3	28.3	0.8
Prop In Lane	1.00		0.05	1.00		0.22	1.00		0.42	1.00		1.00
Lane Grp Cap(c), veh/h	339	0	255	338	0	381	285	0	882	267	1008	834
V/C Ratio(X)	0.18	0.00	0.79	0.81	0.00	0.36	0.08	0.00	0.86	0.37	0.75	0.03
Avail Cap(c_a), veh/h	469	0	330	338	0	381	448	0	1072	384	1166	965
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.1	0.0	37.8	29.2	0.0	30.7	13.8	0.0	19.6	17.0	16.4	10.0
Incr Delay (d2), s/veh	0.1	0.0	6.9	13.2	0.0	0.2	0.0	0.0	7.1	0.3	2.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	4.7	6.2	0.0	2.6	0.2	0.0	14.6	0.9	12.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.2	0.0	44.7	42.4	0.0	30.9	13.9	0.0	26.7	17.3	19.3	10.0
LnGrp LOS	C	A	D	D	A	C	B	A	C	B	B	B
Approach Vol, veh/h		263			414			782			885	
Approach Delay, s/veh		41.5			38.5			26.3			18.8	
Approach LOS		D			D			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.1	50.1	15.0	16.4	6.8	52.4	8.4	22.9
Change Period (Y+Rc), s	4.5	5.0	4.5	4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s	10.5	55.0	10.5	15.5	10.5	55.0	10.5	15.5
Max Q Clear Time (g_c+I1), s	4.3	36.6	13.0	11.4	2.6	30.3	4.6	7.9
Green Ext Time (p_c), s	0.1	8.5	0.0	0.2	0.0	9.8	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	27.3
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	257	131	299	53	45	9	132	473	44	14	830	106
Future Volume (veh/h)	257	131	299	53	45	9	132	473	44	14	830	106
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	1.00		0.99	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1870	1870	1870	1811	1811	1811	1870	1870	1870
Adj Flow Rate, veh/h	268	136	238	55	47	4	138	493	41	15	865	100
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	4	4	4	2	2	2	6	6	6	2	2	2
Cap, veh/h	424	130	228	128	185	16	173	967	80	437	908	105
Arrive On Green	0.15	0.22	0.21	0.04	0.11	0.10	0.05	0.59	0.57	0.02	0.55	0.55
Sat Flow, veh/h	1753	587	1028	1781	1697	144	1725	1646	137	1781	1641	190
Grp Volume(v), veh/h	268	0	374	55	0	51	138	0	534	15	0	965
Grp Sat Flow(s),veh/h/ln	1753	0	1616	1781	0	1842	1725	0	1783	1781	0	1831
Q Serve(g_s), s	15.5	0.0	26.0	3.2	0.0	3.0	4.0	0.0	20.7	0.4	0.0	58.3
Cycle Q Clear(g_c), s	15.5	0.0	26.0	3.2	0.0	3.0	4.0	0.0	20.7	0.4	0.0	58.3
Prop In Lane	1.00		0.64	1.00		0.08	1.00		0.08	1.00		0.10
Lane Grp Cap(c), veh/h	424	0	359	128	0	201	173	0	1048	437	0	1013
V/C Ratio(X)	0.63	0.00	1.04	0.43	0.00	0.25	0.80	0.00	0.51	0.03	0.00	0.95
Avail Cap(c_a), veh/h	475	0	359	153	0	201	174	0	1048	499	0	1032
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	37.2	0.0	45.9	45.5	0.0	47.8	27.5	0.0	14.2	12.8	0.0	24.7
Incr Delay (d2), s/veh	1.4	0.0	59.0	0.9	0.0	0.2	20.6	0.0	0.6	0.0	0.0	17.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.8	0.0	16.3	1.5	0.0	1.4	3.1	0.0	8.2	0.2	0.0	28.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.6	0.0	104.9	46.4	0.0	48.1	48.2	0.0	14.8	12.8	0.0	42.4
LnGrp LOS	D	A	F	D	A	D	D	A	B	B	A	D
Approach Vol, veh/h		642			106			672			980	
Approach Delay, s/veh		77.2			47.2			21.7			41.9	
Approach LOS		E			D			C			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.9	72.8	8.3	30.0	9.9	68.8	21.6	16.8
Change Period (Y+Rc), s	4.0	5.5	4.0	5.0	4.0	5.5	4.0	5.0
Max Green Setting (Gmax), s	6.0	64.5	6.0	25.0	6.0	64.5	21.0	10.0
Max Q Clear Time (g_c+I1), s	2.4	22.7	5.2	28.0	6.0	60.3	17.5	5.0
Green Ext Time (p_c), s	0.0	6.0	0.0	0.0	0.0	3.1	0.1	0.0

Intersection Summary	
HCM 6th Ctrl Delay	45.9
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: SW Boones Ferry Road & SW Ibach Street/SW Ibach Court

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✢		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	165	0	176	3	1	6	208	481	2	12	884	290
Future Volume (veh/h)	165	0	176	3	1	6	208	481	2	12	884	290
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.98	0.98		0.95	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1841	1841	1841	1870	1870	1870
Adj Flow Rate, veh/h	172	0	79	3	1	6	217	501	2	12	921	245
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	1	1	0	0	0	4	4	4	2	2	2
Cap, veh/h	301	0	252	103	49	149	219	1234	5	21	1048	881
Arrive On Green	0.16	0.00	0.16	0.16	0.16	0.16	0.13	0.67	0.67	0.01	0.56	0.56
Sat Flow, veh/h	1347	0	1558	310	304	921	1753	1832	7	1781	1870	1574
Grp Volume(v), veh/h	172	0	79	10	0	0	217	0	503	12	921	245
Grp Sat Flow(s),veh/h/ln	1347	0	1558	1536	0	0	1753	0	1839	1781	1870	1574
Q Serve(g_s), s	10.2	0.0	3.9	0.0	0.0	0.0	10.9	0.0	10.8	0.6	37.5	7.1
Cycle Q Clear(g_c), s	10.7	0.0	3.9	0.4	0.0	0.0	10.9	0.0	10.8	0.6	37.5	7.1
Prop In Lane	1.00		1.00	0.30		0.60	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	301	0	252	301	0	0	219	0	1239	21	1048	881
V/C Ratio(X)	0.57	0.00	0.31	0.03	0.00	0.00	0.99	0.00	0.41	0.58	0.88	0.28
Avail Cap(c_a), veh/h	474	0	452	433	0	0	219	0	1239	223	1169	984
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.3	0.0	32.6	31.1	0.0	0.0	38.4	0.0	6.5	43.3	16.8	10.1
Incr Delay (d2), s/veh	1.0	0.0	0.4	0.0	0.0	0.0	57.8	0.0	0.3	14.9	7.9	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	0.0	1.5	0.2	0.0	0.0	8.0	0.0	3.5	0.3	16.2	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.4	0.0	33.0	31.2	0.0	0.0	96.2	0.0	6.8	58.2	24.7	10.4
LnGrp LOS	D	A	C	C	A	A	F	A	A	E	C	B
Approach Vol, veh/h		251			10			720			1178	
Approach Delay, s/veh		35.3			31.2			33.7			22.0	
Approach LOS		D			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.0	64.3		18.7	15.0	54.3		18.7
Change Period (Y+Rc), s	4.0	5.0		4.5	4.0	5.0		4.5
Max Green Setting (Gmax), s	11.0	55.0		25.5	11.0	55.0		22.0
Max Q Clear Time (g_c+I1), s	2.6	12.8		12.7	12.9	39.5		2.4
Green Ext Time (p_c), s	0.0	5.8		0.5	0.0	9.7		0.0

Intersection Summary			
HCM 6th Ctrl Delay			27.5
HCM 6th LOS			C

HCM 6th TWSC
4: SW Boones Ferry Road & SW Iowa Drive

06/30/2021

Intersection	
Int Delay, s/veh	8.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Vol, veh/h	37	0	35	13	1	39	34	591	30	36	895	51
Future Vol, veh/h	37	0	35	13	1	39	34	591	30	36	895	51
Conflicting Peds, #/hr	0	0	4	4	0	0	4	0	4	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	95	-	-	105	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	5	5	5	2	2	2	3	3	3	1	1	1
Mvmt Flow	39	0	37	14	1	41	36	629	32	38	952	54

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1797	1796	987	1799	1807	649	1010	0	0	665	0	0
Stage 1	1059	1059	-	721	721	-	-	-	-	-	-	-
Stage 2	738	737	-	1078	1086	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.12	6.52	6.22	4.13	-	-	4.11	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.518	4.018	3.318	2.227	-	-	2.209	-	-
Pot Cap-1 Maneuver	61	79	296	62	79	470	682	-	-	929	-	-
Stage 1	268	297	-	419	432	-	-	-	-	-	-	-
Stage 2	405	420	-	265	292	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	51	71	294	50	71	468	679	-	-	925	-	-
Mov Cap-2 Maneuver	51	71	-	50	71	-	-	-	-	-	-	-
Stage 1	253	284	-	395	407	-	-	-	-	-	-	-
Stage 2	349	396	-	221	279	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	158	43.6	0.6	0.3
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	679	-	-	85	148	925	-	-
HCM Lane V/C Ratio	0.053	-	-	0.901	0.381	0.041	-	-
HCM Control Delay (s)	10.6	-	-	158	43.6	9.1	-	-
HCM Lane LOS	B	-	-	F	E	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	4.9	1.6	0.1	-	-

Intersection	
Int Delay, s/veh	3.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↑	↱	↰	↑
Traffic Vol, veh/h	52	106	549	115	139	804
Future Vol, veh/h	52	106	549	115	139	804
Conflicting Peds, #/hr	2	2	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	65	290	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	3	3	2	2
Mvmt Flow	55	112	578	121	146	846

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1720	582	0	0	701	0
Stage 1	580	-	-	-	-	-
Stage 2	1140	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	98	513	-	-	896	-
Stage 1	560	-	-	-	-	-
Stage 2	305	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	82	511	-	-	894	-
Mov Cap-2 Maneuver	191	-	-	-	-	-
Stage 1	559	-	-	-	-	-
Stage 2	255	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	26.6	0	1.4
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	329	894	-
HCM Lane V/C Ratio	-	-	0.506	0.164	-
HCM Control Delay (s)	-	-	26.6	9.8	-
HCM Lane LOS	-	-	D	A	-
HCM 95th %tile Q(veh)	-	-	2.7	0.6	-

Intersection	
Int Delay, s/veh	1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑	↱	↰	↑
Traffic Vol, veh/h	62	38	621	104	57	809
Future Vol, veh/h	62	38	621	104	57	809
Conflicting Peds, #/hr	2	2	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	-	150	150	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	65	40	654	109	60	852

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1630	658	0	0	765	0
Stage 1	656	-	-	-	-	-
Stage 2	974	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.12	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	113	468	-	-	848	-
Stage 1	520	-	-	-	-	-
Stage 2	369	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	105	466	-	-	846	-
Mov Cap-2 Maneuver	286	-	-	-	-	-
Stage 1	519	-	-	-	-	-
Stage 2	342	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.3	0	0.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	286	466	846	-
HCM Lane V/C Ratio	-	-	0.228	0.086	0.071	-
HCM Control Delay (s)	-	-	21.3	13.4	9.6	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.9	0.3	0.2	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↑↱		↰	↑
Traffic Vol, veh/h	0	0	724	2	1	869
Future Vol, veh/h	0	0	724	2	1	869
Conflicting Peds, #/hr	2	2	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	0	0	762	2	1	915

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1684	767	0	0	766	0
Stage 1	765	-	-	-	-	-
Stage 2	919	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.12	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	105	405	-	-	847	-
Stage 1	463	-	-	-	-	-
Stage 2	392	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	104	403	-	-	845	-
Mov Cap-2 Maneuver	299	-	-	-	-	-
Stage 1	462	-	-	-	-	-
Stage 2	391	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	845	-
HCM Lane V/C Ratio	-	-	-	0.001	-
HCM Control Delay (s)	-	-	0	9.3	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

HCM 6th Signalized Intersection Summary
8: SW Boones Ferry Road & SW Day Road

06/30/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✣		↰↰	↱		↰	↑↱	
Traffic Volume (veh/h)	29	0	811	0	0	0	664	695	0	0	783	85
Future Volume (veh/h)	29	0	811	0	0	0	664	695	0	0	783	85
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1900	1900	1900	1856	1856	1856	1885	1885	1885
Adj Flow Rate, veh/h	30	0	777	0	0	0	678	709	0	0	799	82
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	0	0	0	3	3	3	1	1	1
Cap, veh/h	271	0	659	0	271	0	748	783	0	543	1569	161
Arrive On Green	0.14	0.00	0.15	0.00	0.00	0.00	0.53	0.84	0.00	0.00	0.48	0.47
Sat Flow, veh/h	1418	0	1585	0	1900	0	2827	1856	0	1795	3279	336
Grp Volume(v), veh/h	30	0	777	0	0	0	678	709	0	0	436	445
Grp Sat Flow(s),veh/h/ln	1418	0	1585	0	1900	0	1414	1856	0	1795	1791	1825
Q Serve(g_s), s	2.0	0.0	15.9	0.0	0.0	0.0	22.8	26.5	0.0	0.0	17.6	17.7
Cycle Q Clear(g_c), s	2.0	0.0	15.9	0.0	0.0	0.0	22.8	26.5	0.0	0.0	17.6	17.7
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		0.18
Lane Grp Cap(c), veh/h	264	0	659	0	271	0	748	783	0	543	857	873
V/C Ratio(X)	0.11	0.00	1.18	0.00	0.00	0.00	0.91	0.91	0.00	0.00	0.51	0.51
Avail Cap(c_a), veh/h	264	0	659	0	271	0	1158	1219	0	543	857	873
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	0.89	0.89	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	39.6	0.0	30.7	0.0	0.0	0.0	23.6	6.8	0.0	0.0	18.9	19.0
Incr Delay (d2), s/veh	0.1	0.0	95.6	0.0	0.0	0.0	5.2	14.6	0.0	0.0	2.2	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	33.0	0.0	0.0	0.0	5.4	6.1	0.0	0.0	7.2	7.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.8	0.0	126.2	0.0	0.0	0.0	28.8	21.4	0.0	0.0	21.0	21.1
LnGrp LOS	D	A	F	A	A	A	C	C	A	A	C	C
Approach Vol, veh/h		807			0			1387			881	
Approach Delay, s/veh		123.0			0.0			25.0			21.1	
Approach LOS		F						C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	31.8	54.2		19.0	40.0	46.0		19.0				
Change Period (Y+Rc), s	* 5.4	* 5.4		4.5	* 5.4	* 5.4		4.5				
Max Green Setting (Gmax), s	* 42	* 34		14.5	* 8.5	* 68		14.5				
Max Q Clear Time (g_c+I1), s	24.8	19.7		0.0	0.0	28.5		17.9				
Green Ext Time (p_c), s	1.6	6.5		0.0	0.0	9.7		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			49.6
HCM 6th LOS			D

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
9: SW Boones Ferry Road & SW 95th Avenue

06/30/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱↱	↰	↱		↰↰	↑↱		↰	↑↑	↱
Traffic Volume (veh/h)	241	1	834	50	18	7	605	1015	12	3	1237	245
Future Volume (veh/h)	241	1	834	50	18	7	605	1015	12	3	1237	245
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1826	1826	1870	1870	1870	1781	1781	1781	1856	1856	1856
Adj Flow Rate, veh/h	251	1	869	52	19	7	630	1057	12	3	1289	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	5	5	2	2	2	8	8	8	3	3	3
Cap, veh/h	281	1	1053	75	223	82	727	1318	15	583	1740	
Arrive On Green	0.16	0.17	0.17	0.17	0.17	0.17	0.44	0.77	0.75	0.66	0.99	0.00
Sat Flow, veh/h	1239	5	2634	636	1302	480	3291	3428	39	1767	3526	1572
Grp Volume(v), veh/h	252	0	869	52	0	26	630	522	547	3	1289	0
Grp Sat Flow(s),veh/h/ln	1244	0	1317	636	0	1781	1646	1692	1774	1767	1763	1572
Q Serve(g_s), s	15.7	0.0	18.0	1.0	0.0	1.3	18.2	19.5	19.5	0.1	1.9	0.0
Cycle Q Clear(g_c), s	17.0	0.0	18.0	18.0	0.0	1.3	18.2	19.5	19.5	0.1	1.9	0.0
Prop In Lane	1.00		1.00	1.00		0.27	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	270	0	1053	75	0	305	727	651	682	583	1740	
V/C Ratio(X)	0.93	0.00	0.83	0.70	0.00	0.09	0.87	0.80	0.80	0.01	0.74	
Avail Cap(c_a), veh/h	270	0	1053	75	0	305	1066	1048	1098	583	1740	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.55	0.55	0.55	0.52	0.52	0.00
Uniform Delay (d), s/veh	45.8	0.0	28.9	52.4	0.0	36.6	27.9	9.7	9.7	12.0	0.4	0.0
Incr Delay (d2), s/veh	37.2	0.0	5.3	23.2	0.0	0.1	3.0	5.8	5.5	0.0	1.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.5	0.0	10.3	1.8	0.0	0.6	5.4	4.3	4.5	0.0	0.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	83.0	0.0	34.2	75.7	0.0	36.7	30.9	15.5	15.2	12.0	1.9	0.0
LnGrp LOS	F	A	C	E	A	D	C	B	B	B	A	
Approach Vol, veh/h		1121			78			1699			1292	A
Approach Delay, s/veh		45.2			62.7			21.1			1.9	
Approach LOS		D			E			C			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	27.2	55.8		22.0	38.6	44.4		22.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	33.0	40.0		17.0	9.0	64.0		17.0				
Max Q Clear Time (g_c+I1), s	20.2	3.9		20.0	2.1	21.5		20.0				
Green Ext Time (p_c), s	2.0	12.2		0.0	0.0	17.9		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			22.4									
HCM 6th LOS			C									

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM Signalized Intersection Capacity Analysis
10: I-5 SB Ramps & SW Boones Ferry Road/SW Elligsen Road

06/27/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰	↱
Traffic Volume (vph)	0	1167	953	0	759	389	0	0	0	597	91	872
Future Volume (vph)	0	1167	953	0	759	389	0	0	0	597	91	872
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	3.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (prot)		3505	1568		3505	1568				1603	1627	1711
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (perm)		3505	1568		3505	1568				1603	1627	1711
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1203	982	0	782	401	0	0	0	615	94	899
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	42
Lane Group Flow (vph)	0	1203	982	0	782	401	0	0	0	351	358	857
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	0%	0%	0%	7%	7%	7%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		67.8	105.0		38.3	105.0				27.7	27.7	52.7
Effective Green, g (s)		68.8	105.0		39.3	105.0				28.2	28.2	53.7
Actuated g/C Ratio		0.66	1.00		0.37	1.00				0.27	0.27	0.51
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2296	1568		1311	1568				430	436	940
v/s Ratio Prot		0.34			0.22					0.22	0.22	c0.22
v/s Ratio Perm			c0.63			0.26						0.28
v/c Ratio		0.52	0.63		0.60	0.26				0.82	0.82	0.91
Uniform Delay, d1		9.5	0.0		26.5	0.0				36.0	36.0	23.5
Progression Factor		0.85	1.00		1.09	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.5	1.2		1.9	0.4				11.0	11.4	12.7
Delay (s)		8.7	1.2		30.7	0.4				47.0	47.5	36.2
Level of Service		A	A		C	A				D	D	D
Approach Delay (s)		5.3			20.4			0.0			41.1	
Approach LOS		A			C			A			D	

Intersection Summary			
HCM 2000 Control Delay	20.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

V/C Ratio calculated using HCM worksheet with correct critical movements and lost time

HCM 6th Signalized Intersection Summary
11: I-5 NB Ramps & SW Elligsen Road

06/30/2021

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑	↰↰	↱
Traffic Volume (veh/h)	1026	741	0	798	352	245
Future Volume (veh/h)	1026	741	0	798	352	245
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1841	1841	0	1885	1841	1841
Adj Flow Rate, veh/h	1127	0	0	877	387	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	4	0	1	4	4
Cap, veh/h	2733		0	2799	484	
Arrive On Green	1.00	0.00	0.00	0.78	0.14	0.00
Sat Flow, veh/h	3589	1560	0	3770	3401	1560
Grp Volume(v), veh/h	1127	0	0	877	387	0
Grp Sat Flow(s),veh/h/ln	1749	1560	0	1791	1700	1560
Q Serve(g_s), s	0.0	0.0	0.0	7.4	11.6	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	7.4	11.6	0.0
Prop In Lane		1.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2733		0	2799	484	
V/C Ratio(X)	0.41		0.00	0.31	0.80	
Avail Cap(c_a), veh/h	2733		0	2799	1166	
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.78	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	3.3	43.6	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.0	0.3	1.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	2.0	5.0	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.4	0.0	0.0	3.6	45.5	0.0
LnGrp LOS	A		A	A	D	
Approach Vol, veh/h	1127	A		877	387	A
Approach Delay, s/veh	0.4			3.6	45.5	
Approach LOS	A			A	D	

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	86.0	86.0	19.0
Change Period (Y+Rc), s	5.0	5.0	4.5
Max Green Setting (Gmax), s	60.0	60.0	35.5
Max Q Clear Time (g_c+I1), s	2.0	9.4	13.6
Green Ext Time (p_c), s	17.2	11.4	0.9

Intersection Summary	
HCM 6th Ctrl Delay	8.9
HCM 6th LOS	A

Notes
Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC
12: SW Norwood Road & SW 89th Avenue

06/30/2021

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	33	237	23	5	170	14	13	0	3	11	0	9
Future Vol, veh/h	33	237	23	5	170	14	13	0	3	11	0	9
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	2	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	1	1	2	2	0	0	2	2	2	0	2	0
Mvmt Flow	36	258	25	5	185	15	14	0	3	12	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	202	0	0	283	0	0	553	555	273	551	560	197
Stage 1	-	-	-	-	-	-	343	343	-	205	205	-
Stage 2	-	-	-	-	-	-	210	212	-	346	355	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.12	6.52	6.22	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.518	4.018	3.318	3.5	4.018	3.3
Pot Cap-1 Maneuver	1376	-	-	1279	-	-	444	440	766	448	437	849
Stage 1	-	-	-	-	-	-	672	637	-	802	732	-
Stage 2	-	-	-	-	-	-	792	727	-	674	630	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1373	-	-	1279	-	-	426	424	765	433	421	846
Mov Cap-2 Maneuver	-	-	-	-	-	-	426	424	-	433	421	-
Stage 1	-	-	-	-	-	-	651	617	-	776	728	-
Stage 2	-	-	-	-	-	-	778	723	-	649	610	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0.2	13	11.8
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	465	1373	-	-	1279	-	-	555
HCM Lane V/C Ratio	0.037	0.026	-	-	0.004	-	-	0.039
HCM Control Delay (s)	13	7.7	0	-	7.8	0	-	11.8
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	70	144	37	25	132	39	20	0	17	24	0	37
Future Vol, veh/h	70	144	37	25	132	39	20	0	17	24	0	37
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	72	72	92	92	72	72	92	92	92	72	92	72
Heavy Vehicles, %	1	1	2	2	0	0	2	2	2	0	2	0
Mvmt Flow	97	200	40	27	183	54	22	0	18	33	0	51

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	237	0	0	240	0	0	704	705	220	687	698	210
Stage 1	-	-	-	-	-	-	414	414	-	264	264	-
Stage 2	-	-	-	-	-	-	290	291	-	423	434	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.12	6.52	6.22	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.518	4.018	3.318	3.5	4.018	3.3
Pot Cap-1 Maneuver	1336	-	-	1327	-	-	352	361	820	364	364	835
Stage 1	-	-	-	-	-	-	616	593	-	746	690	-
Stage 2	-	-	-	-	-	-	718	672	-	613	581	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1336	-	-	1327	-	-	303	323	820	327	325	835
Mov Cap-2 Maneuver	-	-	-	-	-	-	303	323	-	327	325	-
Stage 1	-	-	-	-	-	-	564	543	-	683	673	-
Stage 2	-	-	-	-	-	-	658	656	-	549	532	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.3	0.8	14.3	13.3
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	427	1336	-	-	1327	-	-	518
HCM Lane V/C Ratio	0.094	0.073	-	-	0.02	-	-	0.164
HCM Control Delay (s)	14.3	7.9	0	-	7.8	0	-	13.3
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0.2	-	-	0.1	-	-	0.6

14: SW 82nd Avenue & SW Norwood Road/Driveway

Intersection	
Int Delay, s/veh	7.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			↰	↱
Traffic Vol, veh/h	150	0	35	0	0	1	21	8	0	2	4	175
Future Vol, veh/h	150	0	35	0	0	1	21	8	0	2	4	175
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	-	-	-	-	-	-	15
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	181	0	42	0	0	1	25	10	0	2	5	211

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	42	0	0	386	384	21	389	405	-
Stage 1	-	-	-	-	-	-	383	383	-	1	1	-
Stage 2	-	-	-	-	-	-	3	1	-	388	404	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	-
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	-
Pot Cap-1 Maneuver	1635	-	-	1580	-	-	576	553	1062	574	538	0
Stage 1	-	-	-	-	-	-	644	616	-	1027	899	0
Stage 2	-	-	-	-	-	-	1025	899	-	640	603	0
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1635	-	-	1580	-	-	522	490	1062	516	477	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	522	490	-	516	477	-
Stage 1	-	-	-	-	-	-	571	546	-	910	899	-
Stage 2	-	-	-	-	-	-	1020	899	-	557	534	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	6.1	0	12.5	12.5
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	513	1635	-	-	1580	-	-	489	-
HCM Lane V/C Ratio	0.068	0.111	-	-	-	-	-	0.015	-
HCM Control Delay (s)	12.5	7.5	0	-	0	-	-	12.5	0
HCM Lane LOS	B	A	A	-	A	-	-	B	A
HCM 95th %tile Q(veh)	0.2	0.4	-	-	0	-	-	0	-

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	82	72	65	227	403	139
Future Vol, veh/h	82	72	65	227	403	139
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	0	2	2	0	0
Mvmt Flow	92	81	73	255	453	156

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	932	531	609	0	-	0
Stage 1	531	-	-	-	-	-
Stage 2	401	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.12	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	298	552	970	-	-	-
Stage 1	594	-	-	-	-	-
Stage 2	681	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	272	552	970	-	-	-
Mov Cap-2 Maneuver	272	-	-	-	-	-
Stage 1	542	-	-	-	-	-
Stage 2	681	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	24.2	2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	970	-	357	-	-
HCM Lane V/C Ratio	0.075	-	0.485	-	-
HCM Control Delay (s)	9	0	24.2	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.2	-	2.5	-	-

HCM 6th Signalized Intersection Summary
1: SW Boones Ferry Rd & SW Sagert St

06/30/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	73	80	12	191	102	63	8	634	312	53	287	48
Future Volume (veh/h)	73	80	12	191	102	63	8	634	312	53	287	48
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1885	1885	1885	1811	1811	1811
Adj Flow Rate, veh/h	80	88	8	210	112	47	9	697	327	58	315	31
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	0	0	0	1	1	1	6	6	6
Cap, veh/h	248	137	12	325	174	73	661	709	333	166	1121	929
Arrive On Green	0.06	0.08	0.08	0.12	0.14	0.13	0.02	0.59	0.58	0.05	0.62	0.62
Sat Flow, veh/h	1795	1701	155	1810	1269	533	1795	1204	565	1725	1811	1501
Grp Volume(v), veh/h	80	0	96	210	0	159	9	0	1024	58	315	31
Grp Sat Flow(s),veh/h/ln	1795	0	1856	1810	0	1802	1795	0	1768	1725	1811	1501
Q Serve(g_s), s	3.8	0.0	4.8	9.8	0.0	7.9	0.2	0.0	53.8	1.2	7.6	0.8
Cycle Q Clear(g_c), s	3.8	0.0	4.8	9.8	0.0	7.9	0.2	0.0	53.8	1.2	7.6	0.8
Prop In Lane	1.00		0.08	1.00		0.30	1.00		0.32	1.00		1.00
Lane Grp Cap(c), veh/h	248	0	149	325	0	247	661	0	1042	166	1121	929
V/C Ratio(X)	0.32	0.00	0.64	0.65	0.00	0.64	0.01	0.00	0.98	0.35	0.28	0.03
Avail Cap(c_a), veh/h	349	0	312	325	0	303	840	0	1042	285	1121	929
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.9	0.0	42.4	33.2	0.0	38.9	7.8	0.0	19.2	23.0	8.3	7.0
Incr Delay (d2), s/veh	0.3	0.0	1.7	3.5	0.0	1.6	0.0	0.0	23.8	0.5	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.0	2.2	4.5	0.0	3.6	0.1	0.0	26.4	0.8	2.8	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.1	0.0	44.1	36.7	0.0	40.6	7.8	0.0	43.0	23.4	8.6	7.1
LnGrp LOS	D	A	D	D	A	D	A	A	D	C	A	A
Approach Vol, veh/h		176			369			1033			404	
Approach Delay, s/veh		40.9			38.4			42.7			10.6	
Approach LOS		D			D			D			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.4	60.0	15.0	11.7	5.6	62.9	9.6	17.0
Change Period (Y+Rc), s	4.5	5.0	4.5	4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s	10.5	55.0	10.5	15.5	10.5	55.0	10.5	15.5
Max Q Clear Time (g_c+I1), s	3.2	55.8	11.8	6.8	2.2	9.6	5.8	9.9
Green Ext Time (p_c), s	0.0	0.0	0.0	0.2	0.0	3.9	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	35.2
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	178	70	150	31	107	15	273	761	42	7	324	160
Future Volume (veh/h)	178	70	150	31	107	15	273	761	42	7	324	160
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	0.99		0.96	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1841	1841	1841	1767	1767	1767	1841	1841	1841
Adj Flow Rate, veh/h	212	83	102	37	127	12	325	906	44	8	386	172
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	4	4	4	4	4	4	9	9	9	4	4	4
Cap, veh/h	318	147	180	230	174	16	431	999	49	152	661	294
Arrive On Green	0.13	0.20	0.19	0.03	0.11	0.10	0.06	0.60	0.58	0.01	0.55	0.55
Sat Flow, veh/h	1753	738	907	1753	1649	156	1682	1669	81	1753	1205	537
Grp Volume(v), veh/h	212	0	185	37	0	139	325	0	950	8	0	558
Grp Sat Flow(s),veh/h/ln	1753	0	1645	1753	0	1805	1682	0	1750	1753	0	1742
Q Serve(g_s), s	10.4	0.0	10.1	1.9	0.0	7.4	6.0	0.0	47.5	0.2	0.0	21.2
Cycle Q Clear(g_c), s	10.4	0.0	10.1	1.9	0.0	7.4	6.0	0.0	47.5	0.2	0.0	21.2
Prop In Lane	1.00		0.55	1.00		0.09	1.00		0.05	1.00		0.31
Lane Grp Cap(c), veh/h	318	0	327	230	0	190	431	0	1047	152	0	955
V/C Ratio(X)	0.67	0.00	0.57	0.16	0.00	0.73	0.75	0.00	0.91	0.05	0.00	0.58
Avail Cap(c_a), veh/h	467	0	429	279	0	199	431	0	1160	240	0	1155
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	33.2	0.0	36.3	38.7	0.0	43.2	19.4	0.0	17.6	19.6	0.0	15.0
Incr Delay (d2), s/veh	0.9	0.0	0.6	0.1	0.0	10.4	6.6	0.0	10.1	0.1	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	0.0	4.1	0.8	0.0	3.8	4.8	0.0	20.1	0.1	0.0	8.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.1	0.0	36.9	38.8	0.0	53.7	26.0	0.0	27.7	19.7	0.0	15.8
LnGrp LOS	C	A	D	D	A	D	C	A	C	B	A	B
Approach Vol, veh/h		397			176			1275			566	
Approach Delay, s/veh		35.4			50.5			27.3			15.8	
Approach LOS		D			D			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.0	63.6	7.2	23.8	10.0	58.6	16.5	14.5
Change Period (Y+Rc), s	4.0	5.5	4.0	5.0	4.0	5.5	4.0	5.0
Max Green Setting (Gmax), s	6.0	64.5	6.0	25.0	6.0	64.5	21.0	10.0
Max Q Clear Time (g_c+I1), s	2.2	49.5	3.9	12.1	8.0	23.2	12.4	9.4
Green Ext Time (p_c), s	0.0	8.6	0.0	0.5	0.0	6.5	0.1	0.0

Intersection Summary	
HCM 6th Ctrl Delay	27.6
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: SW Boones Ferry Road & SW Ibach Street/SW Ibach Court

06/30/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✣		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	262	4	345	4	1	19	140	799	10	3	416	87
Future Volume (veh/h)	262	4	345	4	1	19	140	799	10	3	416	87
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.99	1.00		0.97	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1900	1900	1900	1796	1796	1796	1811	1811	1811
Adj Flow Rate, veh/h	301	5	225	5	1	5	161	918	11	3	478	54
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	3	3	3	0	0	0	7	7	7	6	6	6
Cap, veh/h	419	10	430	156	46	118	193	1025	12	6	849	716
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.11	0.58	0.57	0.00	0.47	0.47
Sat Flow, veh/h	1370	34	1530	341	162	420	1711	1771	21	1725	1811	1527
Grp Volume(v), veh/h	301	0	230	11	0	0	161	0	929	3	478	54
Grp Sat Flow(s),veh/h/ln	1370	0	1564	923	0	0	1711	0	1792	1725	1811	1527
Q Serve(g_s), s	10.7	0.0	10.9	0.1	0.0	0.0	8.1	0.0	39.7	0.2	16.7	1.7
Cycle Q Clear(g_c), s	21.7	0.0	10.9	11.0	0.0	0.0	8.1	0.0	39.7	0.2	16.7	1.7
Prop In Lane	1.00		0.98	0.45		0.45	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	419	0	439	314	0	0	193	0	1037	6	849	716
V/C Ratio(X)	0.72	0.00	0.52	0.04	0.00	0.00	0.83	0.00	0.90	0.54	0.56	0.08
Avail Cap(c_a), veh/h	441	0	465	336	0	0	215	0	1148	217	1160	978
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.3	0.0	26.7	23.3	0.0	0.0	38.0	0.0	16.1	43.5	16.8	12.8
Incr Delay (d2), s/veh	4.8	0.0	0.6	0.0	0.0	0.0	20.5	0.0	9.3	42.0	0.9	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.5	0.0	4.0	0.2	0.0	0.0	4.4	0.0	16.4	0.1	6.6	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.0	0.0	27.3	23.4	0.0	0.0	58.5	0.0	25.5	85.5	17.7	12.9
LnGrp LOS	D	A	C	C	A	A	E	A	C	F	B	B
Approach Vol, veh/h		531			11			1090			535	
Approach Delay, s/veh		32.3			23.4			30.4			17.6	
Approach LOS		C			C			C			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.3	54.6		28.6	13.9	45.0		28.6				
Change Period (Y+Rc), s	4.0	5.0		4.5	4.0	5.0		4.5				
Max Green Setting (Gmax), s	11.0	55.0		25.5	11.0	55.0		25.5				
Max Q Clear Time (g_c+I1), s	2.2	41.7		23.7	10.1	18.7		13.0				
Green Ext Time (p_c), s	0.0	7.9		0.4	0.0	5.7		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			27.6
HCM 6th LOS			C

Intersection	
Int Delay, s/veh	14.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Vol, veh/h	51	2	56	30	0	32	14	753	10	20	478	18
Future Vol, veh/h	51	2	56	30	0	32	14	753	10	20	478	18
Conflicting Peds, #/hr	13	0	5	1	0	9	5	0	1	9	0	13
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	95	-	-	105	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	0	0	0	0	0	0	7	7	7	6	6	6
Mvmt Flow	61	2	67	36	0	38	17	896	12	24	569	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1609	1592	598	1612	1596	924	603	0	0	917	0	0
Stage 1	641	641	-	945	945	-	-	-	-	-	-	-
Stage 2	968	951	-	667	651	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.17	-	-	4.16	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.263	-	-	2.254	-	-
Pot Cap-1 Maneuver	85	108	506	85	108	329	951	-	-	728	-	-
Stage 1	466	473	-	317	343	-	-	-	-	-	-	-
Stage 2	308	341	-	451	468	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	70	100	497	69	100	322	939	-	-	722	-	-
Mov Cap-2 Maneuver	70	100	-	69	100	-	-	-	-	-	-	-
Stage 1	452	452	-	308	334	-	-	-	-	-	-	-
Stage 2	263	332	-	374	447	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	152.5	79	0.2	0.4
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	939	-	-	127	116	722	-	-
HCM Lane V/C Ratio	0.018	-	-	1.022	0.636	0.033	-	-
HCM Control Delay (s)	8.9	-	-	152.5	79	10.2	-	-
HCM Lane LOS	A	-	-	F	F	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	7.2	3.2	0.1	-	-

Intersection	
Int Delay, s/veh	5.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↑	↱	↰	↑
Traffic Vol, veh/h	93	94	684	41	64	500
Future Vol, veh/h	93	94	684	41	64	500
Conflicting Peds, #/hr	4	4	0	4	4	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	65	290	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	2	2	6	6	5	5
Mvmt Flow	107	108	786	47	74	575

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1517	794	0	0	837	0
Stage 1	790	-	-	-	-	-
Stage 2	727	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.15	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.245	-
Pot Cap-1 Maneuver	131	388	-	-	784	-
Stage 1	447	-	-	-	-	-
Stage 2	478	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	118	385	-	-	781	-
Mov Cap-2 Maneuver	254	-	-	-	-	-
Stage 1	445	-	-	-	-	-
Stage 2	431	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	40.4	0	1.1
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	306	781	-
HCM Lane V/C Ratio	-	-	0.702	0.094	-
HCM Control Delay (s)	-	-	40.4	10.1	-
HCM Lane LOS	-	-	E	B	-
HCM 95th %tile Q(veh)	-	-	4.9	0.3	-

6: SW Boones Ferry Road & Shared Driveway/Site Access

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↑	↱	↰	↱	
Traffic Vol, veh/h	1	0	2	106	0	52	1	678	35	15	578	0
Future Vol, veh/h	1	0	2	106	0	52	1	678	35	15	578	0
Conflicting Peds, #/hr	0	0	0	4	0	4	0	0	4	4	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	150	-	150	150	-	-
Veh in Median Storage, #	-	0	-	-	2	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	2	2	2	0	2	0	2	6	6	5	5	2
Mvmt Flow	1	0	2	122	0	60	1	779	40	17	664	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1533	1523	668	1488	1483	787	664	0	0	823	0	0
Stage 1	698	698	-	785	785	-	-	-	-	-	-	-
Stage 2	835	825	-	703	698	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.15	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.245	-	-
Pot Cap-1 Maneuver	95	118	458	~ 103	125	395	925	-	-	794	-	-
Stage 1	431	442	-	389	404	-	-	-	-	-	-	-
Stage 2	362	387	-	431	442	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	79	115	456	~ 100	122	392	925	-	-	791	-	-
Mov Cap-2 Maneuver	79	115	-	285	302	-	-	-	-	-	-	-
Stage 1	431	433	-	387	402	-	-	-	-	-	-	-
Stage 2	305	385	-	418	433	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	25.9	23.1	0	0.2
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	925	-	-	176	285	392	791	-	-
HCM Lane V/C Ratio	0.001	-	-	0.02	0.428	0.152	0.022	-	-
HCM Control Delay (s)	8.9	-	-	25.9	26.7	15.8	9.7	-	-
HCM Lane LOS	A	-	-	D	D	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	2	0.5	0.1	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↑	↱	
Traffic Volume (veh/h)	153	291	321	557	608	75
Future Volume (veh/h)	153	291	321	557	608	75
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1900	1900	1811	1811	1826	1826
Adj Flow Rate, veh/h	176	334	369	640	699	86
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	0	0	6	6	5	5
Cap, veh/h	305	627	381	1354	772	95
Arrive On Green	0.17	0.17	0.44	1.00	0.48	0.47
Sat Flow, veh/h	1810	1610	1725	1811	1594	196
Grp Volume(v), veh/h	176	334	369	640	0	785
Grp Sat Flow(s),veh/h/ln	1810	1610	1725	1811	0	1790
Q Serve(g_s), s	8.5	15.2	19.8	0.0	0.0	38.3
Cycle Q Clear(g_c), s	8.5	15.2	19.8	0.0	0.0	38.3
Prop In Lane	1.00	1.00	1.00			0.11
Lane Grp Cap(c), veh/h	305	627	381	1354	0	867
V/C Ratio(X)	0.58	0.53	0.97	0.47	0.00	0.91
Avail Cap(c_a), veh/h	305	627	381	1354	0	867
HCM Platoon Ratio	1.00	1.00	2.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.73	0.73	0.00	1.00
Uniform Delay (d), s/veh	36.4	22.3	26.2	0.0	0.0	22.6
Incr Delay (d2), s/veh	2.3	0.7	31.1	0.9	0.0	14.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	14.3	9.1	0.3	0.0	18.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	38.7	23.0	57.3	0.9	0.0	37.4
LnGrp LOS	D	C	E	A	A	D
Approach Vol, veh/h	510			1009	785	
Approach Delay, s/veh	28.4			21.5	37.4	
Approach LOS	C			C	D	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		75.0		20.0	25.0	50.0
Change Period (Y+Rc), s		* 5.4		4.5	4.5	* 5.4
Max Green Setting (Gmax), s		* 70		15.5	20.5	* 45
Max Q Clear Time (g_c+I1), s		2.0		17.2	21.8	40.3
Green Ext Time (p_c), s		9.4		0.0	0.0	2.7
Intersection Summary						
HCM 6th Ctrl Delay			28.5			
HCM 6th LOS			C			

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
8: SW Boones Ferry Road & SW Day Road

06/30/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰↰	↱		↰	↑↱	
Traffic Volume (veh/h)	37	0	290	0	0	0	321	841	0	0	885	15
Future Volume (veh/h)	37	0	290	0	0	0	321	841	0	0	885	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1693	1693	1693	1900	1900	1900	1693	1693	1693	1796	1796	1796
Adj Flow Rate, veh/h	41	0	272	0	0	0	357	934	0	0	983	6
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	14	14	14	0	0	0	14	14	14	7	7	7
Cap, veh/h	285	0	467	0	316	0	436	979	0	201	1874	11
Arrive On Green	0.16	0.00	0.17	0.00	0.00	0.00	0.21	0.77	0.00	0.00	1.00	1.00
Sat Flow, veh/h	1283	0	1434	0	1900	0	2740	1693	0	1711	3478	21
Grp Volume(v), veh/h	41	0	272	0	0	0	357	934	0	0	482	507
Grp Sat Flow(s),veh/h/ln	1283	0	1434	0	1900	0	1370	1693	0	1711	1706	1792
Q Serve(g_s), s	2.6	0.0	15.0	0.0	0.0	0.0	11.8	45.5	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.6	0.0	15.0	0.0	0.0	0.0	11.8	45.5	0.0	0.0	0.0	0.0
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		0.01
Lane Grp Cap(c), veh/h	282	0	467	0	316	0	436	979	0	201	919	966
V/C Ratio(X)	0.15	0.00	0.58	0.00	0.00	0.00	0.82	0.95	0.00	0.00	0.52	0.52
Avail Cap(c_a), veh/h	282	0	467	0	320	0	1047	1033	0	201	919	966
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	0.89	0.89	0.00	0.00	0.55	0.55
Uniform Delay (d), s/veh	34.5	0.0	26.7	0.0	0.0	0.0	36.1	9.9	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	1.6	0.0	0.0	0.0	2.1	18.2	0.0	0.0	1.2	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	5.1	0.0	0.0	0.0	3.8	11.8	0.0	0.0	0.3	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.6	0.0	28.3	0.0	0.0	0.0	38.3	28.1	0.0	0.0	1.2	1.1
LnGrp LOS	C	A	C	A	A	A	D	C	A	A	A	A
Approach Vol, veh/h		313			0			1291			989	
Approach Delay, s/veh		29.1			0.0			30.9			1.2	
Approach LOS		C						C			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	19.8	55.2		20.0	16.1	58.9		20.0				
Change Period (Y+Rc), s	5.2	* 5.4		* 4.7	* 5.4	* 5.4		* 4.7				
Max Green Setting (Gmax), s	35.8	* 29		* 16	* 8.5	* 57		* 15				
Max Q Clear Time (g_c+I1), s	13.8	2.0		0.0	0.0	47.5		17.0				
Green Ext Time (p_c), s	0.8	10.5		0.0	0.0	6.0		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			19.3
HCM 6th LOS			B

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
9: SW Elligsen Road/SW Boones Ferry Road & SW 95th Avenue

06/30/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱↱	↰	↱		↰↰	↑↱		↰	↑↑	↱
Traffic Volume (veh/h)	208	8	560	17	1	7	846	866	70	6	814	273
Future Volume (veh/h)	208	8	560	17	1	7	846	866	70	6	814	273
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1648	1648	1648	1737	1737	1737	1796	1796	1796	1737	1737	1737
Adj Flow Rate, veh/h	226	9	571	18	1	8	920	941	76	7	885	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	17	17	17	11	11	11	7	7	7	11	11	11
Cap, veh/h	296	9	1225	76	32	252	1025	1233	100	442	1135	
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.52	0.64	0.64	0.09	0.11	0.00
Sat Flow, veh/h	1172	47	2458	775	166	1331	3319	3198	258	1654	3300	1472
Grp Volume(v), veh/h	235	0	571	18	0	9	920	502	515	7	885	0
Grp Sat Flow(s),veh/h/ln	1218	0	1229	775	0	1497	1659	1706	1750	1654	1650	1472
Q Serve(g_s), s	17.5	0.0	14.4	0.0	0.0	0.5	23.8	19.6	19.6	0.4	24.8	0.0
Cycle Q Clear(g_c), s	18.0	0.0	14.4	18.0	0.0	0.5	23.8	19.6	19.6	0.4	24.8	0.0
Prop In Lane	0.96		1.00	1.00		0.89	1.00		0.15	1.00		1.00
Lane Grp Cap(c), veh/h	305	0	1225	76	0	284	1025	658	675	442	1135	
V/C Ratio(X)	0.77	0.00	0.47	0.24	0.00	0.03	0.90	0.76	0.76	0.02	0.78	
Avail Cap(c_a), veh/h	305	0	1225	76	0	284	1572	988	1013	442	1135	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.16	0.16	0.16	0.83	0.83	0.00
Uniform Delay (d), s/veh	38.9	0.0	15.6	47.5	0.0	31.4	21.7	13.9	13.9	31.9	38.6	0.0
Incr Delay (d2), s/veh	11.0	0.0	0.2	1.2	0.0	0.0	0.8	1.4	1.4	0.0	4.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.3	0.0	3.9	0.4	0.0	0.2	6.6	4.8	5.0	0.1	11.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	49.8	0.0	15.8	48.7	0.0	31.4	22.5	15.3	15.2	31.9	43.1	0.0
LnGrp LOS	D	A	B	D	A	C	C	B	B	C	D	
Approach Vol, veh/h		806			27			1937			892	A
Approach Delay, s/veh		25.7			42.9			18.7			43.0	
Approach LOS		C			D			B			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	34.3	37.7		23.0	30.4	41.6		23.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	45.0	17.0		18.0	7.0	55.0		18.0				
Max Q Clear Time (g_c+I1), s	25.8	26.8		20.0	2.4	21.6		20.0				
Green Ext Time (p_c), s	3.6	0.0		0.0	0.0	15.1		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		26.3
HCM 6th LOS		C

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰	↱
Traffic Volume (vph)	0	1011	379	0	755	121	0	0	0	540	0	1025
Future Volume (vph)	0	1011	379	0	755	121	0	0	0	540	0	1025
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frpb, ped/bikes		1.00	0.99		1.00	1.00				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3034	1340		3406	1524				1573	1573	1679
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3034	1340		3406	1524				1573	1573	1679
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	1076	403	0	803	129	0	0	0	574	0	1090
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	8
Lane Group Flow (vph)	0	1076	403	0	803	129	0	0	0	287	287	1082
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	19%	19%	19%	6%	6%	6%	0%	0%	0%	9%	9%	9%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		64.5	95.0		21.2	95.0				21.0	21.0	59.8
Effective Green, g (s)		65.5	95.0		22.2	95.0				21.5	21.5	60.8
Actuated g/C Ratio		0.69	1.00		0.23	1.00				0.23	0.23	0.64
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2091	1340		795	1524				355	355	1145
v/s Ratio Prot		0.35			c0.24					0.18	0.18	c0.39
v/s Ratio Perm			0.30			0.08						0.25
v/c Ratio		0.51	0.30		1.01	0.08				0.81	0.81	0.94
Uniform Delay, d1		7.1	0.0		36.4	0.0				34.8	34.8	15.6
Progression Factor		2.28	1.00		0.64	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.7	0.5		32.5	0.1				12.2	12.2	15.1
Delay (s)		16.9	0.5		55.8	0.1				47.0	47.0	30.6
Level of Service		B	A		E	A				D	D	C
Approach Delay (s)		12.4			48.1			0.0			36.3	
Approach LOS		B			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	30.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	91.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

V/C Ratio calculated using HCM worksheet with correct lost time

HCM 6th Signalized Intersection Summary
11: I-5 NB Ramps & SW Elligsen Road

06/30/2021

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑	↰↰	↱
Traffic Volume (veh/h)	784	768	0	342	533	265
Future Volume (veh/h)	784	768	0	342	533	265
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1707	1707	0	1796	1811	1811
Adj Flow Rate, veh/h	862	0	0	376	586	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	13	13	0	7	6	6
Cap, veh/h	2311		0	2432	680	
Arrive On Green	0.24	0.00	0.00	0.71	0.20	0.00
Sat Flow, veh/h	3329	1447	0	3593	3346	1535
Grp Volume(v), veh/h	862	0	0	376	586	0
Grp Sat Flow(s),veh/h/ln	1622	1447	0	1706	1673	1535
Q Serve(g_s), s	21.2	0.0	0.0	3.4	16.1	0.0
Cycle Q Clear(g_c), s	21.2	0.0	0.0	3.4	16.1	0.0
Prop In Lane		1.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2311		0	2432	680	
V/C Ratio(X)	0.37		0.00	0.15	0.86	
Avail Cap(c_a), veh/h	2311		0	2432	810	
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.79	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.5	0.0	0.0	4.4	36.6	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.0	0.1	7.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.2	0.0	0.0	1.0	7.2	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	18.9	0.0	0.0	4.5	44.2	0.0
LnGrp LOS	B		A	A	D	
Approach Vol, veh/h	862	A		376	586	A
Approach Delay, s/veh	18.9			4.5	44.2	
Approach LOS	B			A	D	

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	71.7	71.7	23.3
Change Period (Y+Rc), s	5.0	5.0	4.5
Max Green Setting (Gmax), s	63.0	63.0	22.5
Max Q Clear Time (g_c+I1), s	23.2	5.4	18.1
Green Ext Time (p_c), s	10.7	4.0	0.7

Intersection Summary	
HCM 6th Ctrl Delay	24.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC
12: Site Access/SW 89th Avenue & SW Norwood Road

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	14	120	6	1	177	2	18	0	4	19	0	26
Future Vol, veh/h	14	120	6	1	177	2	18	0	4	19	0	26
Conflicting Peds, #/hr	1	0	0	0	0	2	0	0	0	2	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	0	0	2	2	2	2	2	2	2	0	2	0
Mvmt Flow	18	150	8	1	221	3	23	0	5	24	0	33

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	226	0	0	158	0	0	432	418	156	422	421	226
Stage 1	-	-	-	-	-	-	190	190	-	227	227	-
Stage 2	-	-	-	-	-	-	242	228	-	195	194	-
Critical Hdwy	4.1	-	-	4.12	-	-	7.12	6.52	6.22	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.2	-	-	2.218	-	-	3.518	4.018	3.318	3.5	4.018	3.3
Pot Cap-1 Maneuver	1354	-	-	1422	-	-	534	526	890	546	524	818
Stage 1	-	-	-	-	-	-	812	743	-	780	716	-
Stage 2	-	-	-	-	-	-	762	715	-	811	740	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1351	-	-	1422	-	-	506	517	888	535	515	816
Mov Cap-2 Maneuver	-	-	-	-	-	-	506	517	-	535	515	-
Stage 1	-	-	-	-	-	-	800	732	-	767	714	-
Stage 2	-	-	-	-	-	-	730	713	-	793	729	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	0	11.9	10.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	549	1351	-	-	1422	-	-	668
HCM Lane V/C Ratio	0.05	0.013	-	-	0.001	-	-	0.084
HCM Control Delay (s)	11.9	7.7	0	-	7.5	0	-	10.9
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	21	111	10	9	106	7	29	0	26	40	0	45
Future Vol, veh/h	21	111	10	9	106	7	29	0	26	40	0	45
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	81	81	81	81	81	81	81	81	81	81	81	81
Heavy Vehicles, %	0	0	2	2	3	3	2	2	2	0	2	0
Mvmt Flow	26	137	12	11	131	9	36	0	32	49	0	56

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	140	0	0	149	0	0	381	357	143	369	359	136
Stage 1	-	-	-	-	-	-	195	195	-	158	158	-
Stage 2	-	-	-	-	-	-	186	162	-	211	201	-
Critical Hdwy	4.1	-	-	4.12	-	-	7.12	6.52	6.22	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.2	-	-	2.218	-	-	3.518	4.018	3.318	3.5	4.018	3.3
Pot Cap-1 Maneuver	1456	-	-	1432	-	-	577	569	905	591	568	918
Stage 1	-	-	-	-	-	-	807	739	-	849	767	-
Stage 2	-	-	-	-	-	-	816	764	-	796	735	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1456	-	-	1432	-	-	531	553	905	558	552	918
Mov Cap-2 Maneuver	-	-	-	-	-	-	531	553	-	558	552	-
Stage 1	-	-	-	-	-	-	791	724	-	832	761	-
Stage 2	-	-	-	-	-	-	760	758	-	752	720	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0.6	11.1	11
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	660	1456	-	-	1432	-	-	704
HCM Lane V/C Ratio	0.103	0.018	-	-	0.008	-	-	0.149
HCM Control Delay (s)	11.1	7.5	0	-	7.5	0	-	11
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0.1	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	7.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			↰	↱
Traffic Vol, veh/h	152	0	25	0	0	0	37	4	0	0	0	85
Future Vol, veh/h	152	0	25	0	0	0	37	4	0	0	0	85
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	-	-	-	-	-	-	15
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	0	0	0	6	6	6	10	10	10
Mvmt Flow	171	0	28	0	0	0	42	4	0	0	0	96

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	28	0	0	357	357	14	359	371	-
Stage 1	-	-	-	-	-	-	356	356	-	1	1	-
Stage 2	-	-	-	-	-	-	1	1	-	358	370	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.16	6.56	6.26	7.2	6.6	-
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.56	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.56	-	6.2	5.6	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.554	4.054	3.354	3.59	4.09	-
Pot Cap-1 Maneuver	1622	-	-	1599	-	-	591	563	1054	582	546	0
Stage 1	-	-	-	-	-	-	653	622	-	1002	879	0
Stage 2	-	-	-	-	-	-	1012	887	-	644	606	0
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1599	-	-	543	503	1054	531	488	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	543	503	-	531	488	-
Stage 1	-	-	-	-	-	-	583	555	-	895	879	-
Stage 2	-	-	-	-	-	-	1012	887	-	570	541	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	6.4	0	12.3	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	539	1622	-	-	1599	-	-	-	-
HCM Lane V/C Ratio	0.085	0.105	-	-	-	-	-	-	-
HCM Control Delay (s)	12.3	7.5	0	-	0	-	-	0	0
HCM Lane LOS	B	A	A	-	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	0.4	-	-	0	-	-	-	-

Intersection	
Int Delay, s/veh	6.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	154	62	43	351	244	69
Future Vol, veh/h	154	62	43	351	244	69
Conflicting Peds, #/hr	2	2	2	0	0	2
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	6	6
Mvmt Flow	171	69	48	390	271	77

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	800	314	350	0	-	0
Stage 1	312	-	-	-	-	-
Stage 2	488	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	354	726	1209	-	-	-
Stage 1	742	-	-	-	-	-
Stage 2	617	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	335	723	1207	-	-	-
Mov Cap-2 Maneuver	335	-	-	-	-	-
Stage 1	703	-	-	-	-	-
Stage 2	616	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	27.1	0.9	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1207	-	396	-	-
HCM Lane V/C Ratio	0.04	-	0.606	-	-
HCM Control Delay (s)	8.1	0	27.1	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0.1	-	3.9	-	-

HCM 6th Signalized Intersection Summary
1: SW Boones Ferry Rd & SW Sagert St

06/30/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑	↱
Traffic Volume (veh/h)	56	173	10	250	98	43	22	399	318	90	689	61
Future Volume (veh/h)	56	173	10	250	98	43	22	399	318	90	689	61
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	62	190	11	275	108	31	24	438	322	99	757	29
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	0	0	0	1	1	1	1	1	1
Cap, veh/h	338	241	14	337	296	85	286	509	374	266	1009	836
Arrive On Green	0.05	0.14	0.13	0.12	0.21	0.20	0.03	0.51	0.50	0.06	0.54	0.54
Sat Flow, veh/h	1795	1764	102	1810	1418	407	1795	998	734	1795	1885	1561
Grp Volume(v), veh/h	62	0	201	275	0	139	24	0	760	99	757	29
Grp Sat Flow(s),veh/h/ln	1795	0	1866	1810	0	1824	1795	0	1732	1795	1885	1561
Q Serve(g_s), s	2.6	0.0	9.5	11.0	0.0	5.9	0.6	0.0	34.9	2.3	28.3	0.8
Cycle Q Clear(g_c), s	2.6	0.0	9.5	11.0	0.0	5.9	0.6	0.0	34.9	2.3	28.3	0.8
Prop In Lane	1.00		0.05	1.00		0.22	1.00		0.42	1.00		1.00
Lane Grp Cap(c), veh/h	338	0	255	337	0	381	286	0	883	266	1009	836
V/C Ratio(X)	0.18	0.00	0.79	0.82	0.00	0.37	0.08	0.00	0.86	0.37	0.75	0.03
Avail Cap(c_a), veh/h	468	0	329	337	0	381	448	0	1069	383	1163	963
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.2	0.0	37.9	29.3	0.0	30.8	13.8	0.0	19.6	17.0	16.4	10.0
Incr Delay (d2), s/veh	0.1	0.0	7.0	13.4	0.0	0.2	0.0	0.0	7.2	0.3	2.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	4.8	6.2	0.0	2.6	0.2	0.0	14.7	0.9	12.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.3	0.0	44.9	42.7	0.0	31.0	13.8	0.0	26.8	17.4	19.3	10.0
LnGrp LOS	C	A	D	D	A	C	B	A	C	B	B	B
Approach Vol, veh/h		263			414			784			885	
Approach Delay, s/veh		41.7			38.8			26.4			18.8	
Approach LOS		D			D			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.1	50.3	15.0	16.4	6.8	52.6	8.5	22.9
Change Period (Y+Rc), s	4.5	5.0	4.5	4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s	10.5	55.0	10.5	15.5	10.5	55.0	10.5	15.5
Max Q Clear Time (g_c+I1), s	4.3	36.9	13.0	11.5	2.6	30.3	4.6	7.9
Green Ext Time (p_c), s	0.1	8.4	0.0	0.2	0.0	9.8	0.0	0.2

Intersection Summary			
HCM 6th Ctrl Delay			27.4
HCM 6th LOS			C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
2: SW Boones Ferry Rd & SW Avery St

06/30/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	257	131	287	53	45	9	126	472	44	14	830	106
Future Volume (veh/h)	257	131	287	53	45	9	126	472	44	14	830	106
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	1.00		0.99	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1870	1870	1870	1811	1811	1811	1870	1870	1870
Adj Flow Rate, veh/h	268	136	226	55	47	4	131	492	41	15	865	100
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	4	4	4	2	2	2	6	6	6	2	2	2
Cap, veh/h	425	135	225	128	186	16	171	965	80	437	910	105
Arrive On Green	0.15	0.22	0.21	0.04	0.11	0.10	0.05	0.59	0.57	0.02	0.55	0.55
Sat Flow, veh/h	1753	608	1011	1781	1697	144	1725	1645	137	1781	1641	190
Grp Volume(v), veh/h	268	0	362	55	0	51	131	0	533	15	0	965
Grp Sat Flow(s),veh/h/ln	1753	0	1619	1781	0	1842	1725	0	1782	1781	0	1831
Q Serve(g_s), s	15.4	0.0	26.0	3.2	0.0	3.0	3.8	0.0	20.6	0.4	0.0	58.0
Cycle Q Clear(g_c), s	15.4	0.0	26.0	3.2	0.0	3.0	3.8	0.0	20.6	0.4	0.0	58.0
Prop In Lane	1.00		0.62	1.00		0.08	1.00		0.08	1.00		0.10
Lane Grp Cap(c), veh/h	425	0	361	128	0	202	171	0	1046	437	0	1015
V/C Ratio(X)	0.63	0.00	1.00	0.43	0.00	0.25	0.77	0.00	0.51	0.03	0.00	0.95
Avail Cap(c_a), veh/h	477	0	361	153	0	202	175	0	1046	499	0	1035
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	37.0	0.0	45.7	45.3	0.0	47.6	27.4	0.0	14.3	12.7	0.0	24.5
Incr Delay (d2), s/veh	1.4	0.0	48.4	0.8	0.0	0.2	15.9	0.0	0.6	0.0	0.0	17.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.7	0.0	15.2	1.4	0.0	1.4	2.7	0.0	8.2	0.2	0.0	28.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.4	0.0	94.1	46.2	0.0	47.9	43.3	0.0	14.8	12.8	0.0	41.9
LnGrp LOS	D	A	F	D	A	D	D	A	B	B	A	D
Approach Vol, veh/h		630			106			664			980	
Approach Delay, s/veh		70.4			47.0			20.5			41.5	
Approach LOS		E			D			C			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.9	72.5	8.3	30.0	9.7	68.7	21.5	16.8
Change Period (Y+Rc), s	4.0	5.5	4.0	5.0	4.0	5.5	4.0	5.0
Max Green Setting (Gmax), s	6.0	64.5	6.0	25.0	6.0	64.5	21.0	10.0
Max Q Clear Time (g_c+I1), s	2.4	22.6	5.2	28.0	5.8	60.0	17.4	5.0
Green Ext Time (p_c), s	0.0	6.0	0.0	0.0	0.0	3.2	0.1	0.0

Intersection Summary	
HCM 6th Ctrl Delay	43.5
HCM 6th LOS	D

Notes
User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: SW Boones Ferry Road & SW Ibach Street/SW Ibach Court

06/30/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥		↰	↱		↰	↑	↱
Traffic Volume (veh/h)	165	0	172	3	1	6	205	474	2	12	872	290
Future Volume (veh/h)	165	0	172	3	1	6	205	474	2	12	872	290
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.98	0.98		0.95	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1900	1900	1900	1841	1841	1841	1870	1870	1870
Adj Flow Rate, veh/h	172	0	75	3	1	6	214	494	2	12	908	245
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	1	1	0	0	0	4	4	4	2	2	2
Cap, veh/h	303	0	252	104	49	149	221	1230	5	21	1042	876
Arrive On Green	0.16	0.00	0.16	0.16	0.16	0.16	0.13	0.67	0.67	0.01	0.56	0.56
Sat Flow, veh/h	1347	0	1558	310	305	922	1753	1832	7	1781	1870	1574
Grp Volume(v), veh/h	172	0	75	10	0	0	214	0	496	12	908	245
Grp Sat Flow(s),veh/h/ln	1347	0	1558	1537	0	0	1753	0	1839	1781	1870	1574
Q Serve(g_s), s	10.1	0.0	3.7	0.0	0.0	0.0	10.6	0.0	10.6	0.6	36.4	7.1
Cycle Q Clear(g_c), s	10.6	0.0	3.7	0.4	0.0	0.0	10.6	0.0	10.6	0.6	36.4	7.1
Prop In Lane	1.00		1.00	0.30		0.60	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	303	0	252	303	0	0	221	0	1235	21	1042	876
V/C Ratio(X)	0.57	0.00	0.30	0.03	0.00	0.00	0.97	0.00	0.40	0.58	0.87	0.28
Avail Cap(c_a), veh/h	479	0	456	497	0	0	221	0	1235	225	1181	994
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.0	0.0	32.1	30.8	0.0	0.0	37.9	0.0	6.4	42.8	16.6	10.1
Incr Delay (d2), s/veh	1.0	0.0	0.4	0.0	0.0	0.0	50.7	0.0	0.3	14.9	7.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	0.0	1.4	0.2	0.0	0.0	7.5	0.0	3.4	0.3	15.6	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.0	0.0	32.5	30.8	0.0	0.0	88.6	0.0	6.8	57.7	23.9	10.4
LnGrp LOS	D	A	C	C	A	A	F	A	A	E	C	B
Approach Vol, veh/h		247			10			710			1165	
Approach Delay, s/veh		34.9			30.8			31.4			21.4	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.0	63.5		18.6	15.0	53.5		18.6				
Change Period (Y+Rc), s	4.0	5.0		4.5	4.0	5.0		4.5				
Max Green Setting (Gmax), s	11.0	55.0		25.5	11.0	55.0		25.5				
Max Q Clear Time (g_c+I1), s	12.6	12.6		12.6	12.6	38.4		2.4				
Green Ext Time (p_c), s	0.0	5.7		0.5	0.0	10.1		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			26.4									
HCM 6th LOS			C									

HCM 6th TWSC
4: SW Boones Ferry Road & SW Iowa Drive

06/30/2021

Intersection	
Int Delay, s/veh	7.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Vol, veh/h	37	0	35	13	1	39	34	581	30	36	879	51
Future Vol, veh/h	37	0	35	13	1	39	34	581	30	36	879	51
Conflicting Peds, #/hr	0	0	4	4	0	0	4	0	4	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	95	-	-	105	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	5	5	5	2	2	2	3	3	3	1	1	1
Mvmt Flow	39	0	37	14	1	41	36	618	32	38	935	54

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1769	1768	970	1771	1779	638	993	0	0	654	0	0
Stage 1	1042	1042	-	710	710	-	-	-	-	-	-	-
Stage 2	727	726	-	1061	1069	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.12	6.52	6.22	4.13	-	-	4.11	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.518	4.018	3.318	2.227	-	-	2.209	-	-
Pot Cap-1 Maneuver	64	82	303	65	82	477	693	-	-	938	-	-
Stage 1	274	303	-	424	437	-	-	-	-	-	-	-
Stage 2	411	425	-	271	298	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	54	74	301	53	74	475	690	-	-	934	-	-
Mov Cap-2 Maneuver	54	74	-	53	74	-	-	-	-	-	-	-
Stage 1	259	289	-	400	413	-	-	-	-	-	-	-
Stage 2	355	401	-	227	285	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	139.7	40.9	0.6	0.3
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	690	-	-	90	155	934	-	-
HCM Lane V/C Ratio	0.052	-	-	0.851	0.364	0.041	-	-
HCM Control Delay (s)	10.5	-	-	139.7	40.9	9	-	-
HCM Lane LOS	B	-	-	F	E	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	4.6	1.5	0.1	-	-

Intersection	
Int Delay, s/veh	3.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↑	↱	↰	↑
Traffic Vol, veh/h	55	100	545	120	130	797
Future Vol, veh/h	55	100	545	120	130	797
Conflicting Peds, #/hr	2	2	0	2	2	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	65	290	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	3	3	2	2
Mvmt Flow	58	105	574	126	137	839

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1691	578	0	0	702	0
Stage 1	576	-	-	-	-	-
Stage 2	1115	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	103	516	-	-	895	-
Stage 1	562	-	-	-	-	-
Stage 2	314	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	87	514	-	-	893	-
Mov Cap-2 Maneuver	198	-	-	-	-	-
Stage 1	561	-	-	-	-	-
Stage 2	265	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	26.4	0	1.4
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	328	893	-
HCM Lane V/C Ratio	-	-	0.497	0.153	-
HCM Control Delay (s)	-	-	26.4	9.8	-
HCM Lane LOS	-	-	D	A	-
HCM 95th %tile Q(veh)	-	-	2.6	0.5	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↑	↱	↰	↱	
Traffic Vol, veh/h	1	0	1	69	0	34	2	626	115	51	812	0
Future Vol, veh/h	1	0	1	69	0	34	2	626	115	51	812	0
Conflicting Peds, #/hr	0	0	0	2	0	2	0	0	2	2	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	150	-	100	150	-	-
Veh in Median Storage, #	-	0	-	-	2	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	95	92	95	92	95	95	95	95	92
Heavy Vehicles, %	2	2	2	0	2	0	2	3	3	2	2	2
Mvmt Flow	1	0	1	73	0	36	2	659	121	54	855	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1707	1749	857	1631	1628	663	855	0	0	782	0	0
Stage 1	963	963	-	665	665	-	-	-	-	-	-	-
Stage 2	744	786	-	966	963	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	72	86	357	82	102	465	785	-	-	836	-	-
Stage 1	307	334	-	453	458	-	-	-	-	-	-	-
Stage 2	407	403	-	309	334	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	63	80	356	77	95	463	785	-	-	834	-	-
Mov Cap-2 Maneuver	63	80	-	238	257	-	-	-	-	-	-	-
Stage 1	306	312	-	451	456	-	-	-	-	-	-	-
Stage 2	374	401	-	288	312	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	39.3	22.2	0	0.6
HCM LOS	E	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	785	-	-	107	238	463	834	-	-
HCM Lane V/C Ratio	0.003	-	-	0.02	0.305	0.077	0.064	-	-
HCM Control Delay (s)	9.6	-	-	39.3	26.6	13.4	9.6	-	-
HCM Lane LOS	A	-	-	E	D	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.2	0.2	0.2	-	-

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↑	↱	
Traffic Volume (veh/h)	39	243	199	701	801	78
Future Volume (veh/h)	39	243	199	701	801	78
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1900	1900	1856	1856	1870	1870
Adj Flow Rate, veh/h	41	256	209	738	843	82
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	3	3	2	2
Cap, veh/h	267	454	238	1407	974	95
Arrive On Green	0.15	0.15	0.27	1.00	0.58	0.58
Sat Flow, veh/h	1810	1610	1767	1856	1677	163
Grp Volume(v), veh/h	41	256	209	738	0	925
Grp Sat Flow(s),veh/h/ln	1810	1610	1767	1856	0	1841
Q Serve(g_s), s	2.1	14.2	11.9	0.0	0.0	44.5
Cycle Q Clear(g_c), s	2.1	14.2	11.9	0.0	0.0	44.5
Prop In Lane	1.00	1.00	1.00			0.09
Lane Grp Cap(c), veh/h	267	454	238	1407	0	1069
V/C Ratio(X)	0.15	0.56	0.88	0.52	0.00	0.87
Avail Cap(c_a), veh/h	267	454	429	1407	0	1069
HCM Platoon Ratio	1.00	1.00	2.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.83	0.83	0.00	1.00
Uniform Delay (d), s/veh	39.0	32.2	37.5	0.0	0.0	18.6
Incr Delay (d2), s/veh	0.2	1.4	5.4	1.2	0.0	9.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	13.0	4.7	0.5	0.0	20.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	39.2	33.5	43.0	1.2	0.0	28.0
LnGrp LOS	D	C	D	A	A	C
Approach Vol, veh/h	297			947	925	
Approach Delay, s/veh	34.3			10.4	28.0	
Approach LOS	C			B	C	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		85.0		20.0	18.6	66.4
Change Period (Y+Rc), s		* 5.4		4.5	4.5	* 5.4
Max Green Setting (Gmax), s		* 80		15.5	25.5	* 50
Max Q Clear Time (g_c+I1), s		2.0		16.2	13.9	46.5
Green Ext Time (p_c), s		12.0		0.0	0.3	2.3

Intersection Summary			
HCM 6th Ctrl Delay			21.2
HCM 6th LOS			C

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰↰	↱		↰	↑↱	
Traffic Volume (veh/h)	6	0	568	0	0	0	465	894	0	0	1026	17
Future Volume (veh/h)	6	0	568	0	0	0	465	894	0	0	1026	17
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1900	1900	1900	1856	1856	1856	1885	1885	1885
Adj Flow Rate, veh/h	6	0	529	0	0	0	474	912	0	0	1047	14
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	0	0	0	3	3	3	1	1	1
Cap, veh/h	271	0	551	0	271	0	555	914	0	417	1979	26
Arrive On Green	0.14	0.00	0.15	0.00	0.00	0.00	0.39	0.99	0.00	0.00	0.37	0.36
Sat Flow, veh/h	1418	0	1585	0	1900	0	2827	1856	0	1795	3619	48
Grp Volume(v), veh/h	6	0	529	0	0	0	474	912	0	0	518	543
Grp Sat Flow(s),veh/h/ln	1418	0	1585	0	1900	0	1414	1856	0	1795	1791	1876
Q Serve(g_s), s	0.4	0.0	15.9	0.0	0.0	0.0	16.1	44.7	0.0	0.0	23.9	23.9
Cycle Q Clear(g_c), s	0.4	0.0	15.9	0.0	0.0	0.0	16.1	44.7	0.0	0.0	23.9	23.9
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		0.03
Lane Grp Cap(c), veh/h	264	0	551	0	271	0	555	914	0	417	979	1026
V/C Ratio(X)	0.02	0.00	0.96	0.00	0.00	0.00	0.85	1.00	0.00	0.00	0.53	0.53
Avail Cap(c_a), veh/h	264	0	551	0	271	0	1158	1219	0	417	979	1026
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	0.67	0.67	0.67
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	0.89	0.89	0.00	0.00	0.61	0.61
Uniform Delay (d), s/veh	39.0	0.0	33.5	0.0	0.0	0.0	30.5	0.7	0.0	0.0	22.6	22.7
Incr Delay (d2), s/veh	0.0	0.0	28.4	0.0	0.0	0.0	2.2	27.5	0.0	0.0	1.3	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	16.8	0.0	0.0	0.0	4.3	7.3	0.0	0.0	10.7	11.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.0	0.0	62.0	0.0	0.0	0.0	32.7	28.3	0.0	0.0	23.9	23.9
LnGrp LOS	D	A	E	A	A	A	C	C	A	A	C	C
Approach Vol, veh/h		535			0			1386			1061	
Approach Delay, s/veh		61.7			0.0			29.8			23.9	
Approach LOS		E						C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	24.6	61.4		19.0	26.7	59.3		19.0
Change Period (Y+Rc), s	* 5.4	* 5.4		4.5	* 5.4	* 5.4		4.5
Max Green Setting (Gmax), s	* 42	* 34		14.5	* 8.5	* 68		14.5
Max Q Clear Time (g_c+I1), s	18.1	25.9		0.0	0.0	46.7		17.9
Green Ext Time (p_c), s	1.1	5.0		0.0	0.0	10.7		0.0

Intersection Summary	
HCM 6th Ctrl Delay	33.4
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
9: SW Boones Ferry Road & SW 95th Avenue

06/30/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱↱	↰	↱		↰↰	↑↱		↰	↑↑	↱
Traffic Volume (veh/h)	241	1	834	50	18	7	605	1015	12	3	1237	245
Future Volume (veh/h)	241	1	834	50	18	7	605	1015	12	3	1237	245
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1826	1826	1870	1870	1870	1781	1781	1781	1856	1856	1856
Adj Flow Rate, veh/h	251	1	869	52	19	7	630	1057	12	3	1289	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	5	5	2	2	2	8	8	8	3	3	3
Cap, veh/h	281	1	1053	75	223	82	727	1318	15	583	1740	
Arrive On Green	0.16	0.17	0.17	0.17	0.17	0.17	0.44	0.77	0.75	0.66	0.99	0.00
Sat Flow, veh/h	1239	5	2634	636	1302	480	3291	3428	39	1767	3526	1572
Grp Volume(v), veh/h	252	0	869	52	0	26	630	522	547	3	1289	0
Grp Sat Flow(s),veh/h/ln	1244	0	1317	636	0	1781	1646	1692	1774	1767	1763	1572
Q Serve(g_s), s	15.7	0.0	18.0	1.0	0.0	1.3	18.2	19.5	19.5	0.1	1.9	0.0
Cycle Q Clear(g_c), s	17.0	0.0	18.0	18.0	0.0	1.3	18.2	19.5	19.5	0.1	1.9	0.0
Prop In Lane	1.00		1.00	1.00		0.27	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	270	0	1053	75	0	305	727	651	682	583	1740	
V/C Ratio(X)	0.93	0.00	0.83	0.70	0.00	0.09	0.87	0.80	0.80	0.01	0.74	
Avail Cap(c_a), veh/h	270	0	1053	75	0	305	1066	1048	1098	583	1740	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.55	0.55	0.55	0.69	0.69	0.00
Uniform Delay (d), s/veh	45.8	0.0	28.9	52.4	0.0	36.6	27.9	9.7	9.7	12.0	0.4	0.0
Incr Delay (d2), s/veh	37.2	0.0	5.3	23.2	0.0	0.1	3.0	5.8	5.5	0.0	2.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.5	0.0	10.3	1.8	0.0	0.6	5.4	4.3	4.5	0.0	0.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	83.0	0.0	34.2	75.7	0.0	36.7	30.9	15.5	15.2	12.0	2.4	0.0
LnGrp LOS	F	A	C	E	A	D	C	B	B	B	A	
Approach Vol, veh/h		1121			78			1699			1292	A
Approach Delay, s/veh		45.2			62.7			21.1			2.4	
Approach LOS		D			E			C			A	

Timer - Assigned Phs	1	2	4	5	6	8
Phs Duration (G+Y+Rc), s	27.2	55.8	22.0	38.6	44.4	22.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	33.0	40.0	17.0	9.0	64.0	17.0
Max Q Clear Time (g_c+I1), s	20.2	3.9	20.0	2.1	21.5	20.0
Green Ext Time (p_c), s	2.0	12.2	0.0	0.0	17.9	0.0

Intersection Summary	
HCM 6th Ctrl Delay	22.6
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

HCM Signalized Intersection Capacity Analysis
10: I-5 SB Ramps & SW Boones Ferry Road/SW Elligsen Road

06/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰	↱
Traffic Volume (vph)	0	1167	953	0	759	389	0	0	0	597	91	872
Future Volume (vph)	0	1167	953	0	759	389	0	0	0	597	91	872
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	3.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (prot)		3505	1568		3505	1568				1603	1627	1711
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (perm)		3505	1568		3505	1568				1603	1627	1711
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1203	982	0	782	401	0	0	0	615	94	899
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	42
Lane Group Flow (vph)	0	1203	982	0	782	401	0	0	0	351	358	857
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	0%	0%	0%	7%	7%	7%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		67.8	105.0		38.3	105.0				27.7	27.7	52.7
Effective Green, g (s)		68.8	105.0		39.3	105.0				28.2	28.2	53.7
Actuated g/C Ratio		0.66	1.00		0.37	1.00				0.27	0.27	0.51
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2296	1568		1311	1568				430	436	940
v/s Ratio Prot		0.34			0.22					0.22	0.22	c0.22
v/s Ratio Perm			c0.63			0.26						0.28
v/c Ratio		0.52	0.63		0.60	0.26				0.82	0.82	0.91
Uniform Delay, d1		9.5	0.0		26.5	0.0				36.0	36.0	23.5
Progression Factor		0.93	1.00		0.97	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.6	1.2		1.9	0.4				11.0	11.4	12.7
Delay (s)		9.4	1.2		27.5	0.4				47.0	47.5	36.2
Level of Service		A	A		C	A				D	D	D
Approach Delay (s)		5.7			18.3			0.0			41.1	
Approach LOS		A			B			A			D	

Intersection Summary			
HCM 2000 Control Delay	20.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

V/C Ratio calculated using HCM worksheet with correct critical movements and lost time

HCM 6th Signalized Intersection Summary
11: I-5 NB Ramps & SW Elligsen Road

06/30/2021

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱		↑↑	↰↰	↱
Traffic Volume (veh/h)	1026	741	0	798	352	245
Future Volume (veh/h)	1026	741	0	798	352	245
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1841	1841	0	1885	1841	1841
Adj Flow Rate, veh/h	1127	0	0	877	387	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	4	0	1	4	4
Cap, veh/h	2733		0	2799	484	
Arrive On Green	1.00	0.00	0.00	0.78	0.14	0.00
Sat Flow, veh/h	3589	1560	0	3770	3401	1560
Grp Volume(v), veh/h	1127	0	0	877	387	0
Grp Sat Flow(s),veh/h/ln	1749	1560	0	1791	1700	1560
Q Serve(g_s), s	0.0	0.0	0.0	7.4	11.6	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	7.4	11.6	0.0
Prop In Lane		1.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2733		0	2799	484	
V/C Ratio(X)	0.41		0.00	0.31	0.80	
Avail Cap(c_a), veh/h	2733		0	2799	1166	
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.78	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	3.3	43.6	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.0	0.3	1.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	2.0	5.0	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.4	0.0	0.0	3.6	45.5	0.0
LnGrp LOS	A		A	A	D	
Approach Vol, veh/h	1127	A		877	387	A
Approach Delay, s/veh	0.4			3.6	45.5	
Approach LOS	A			A	D	

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	86.0	86.0	19.0
Change Period (Y+Rc), s	5.0	5.0	4.5
Max Green Setting (Gmax), s	60.0	60.0	35.5
Max Q Clear Time (g_c+I1), s	2.0	9.4	13.6
Green Ext Time (p_c), s	17.2	11.4	0.9

Intersection Summary	
HCM 6th Ctrl Delay	8.9
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC
12: Site Access/SW 89th Avenue & SW Norwood Road

06/30/2021

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	33	236	20	5	168	14	12	0	3	11	0	9
Future Vol, veh/h	33	236	20	5	168	14	12	0	3	11	0	9
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	2	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	1	1	2	2	0	0	2	2	2	0	2	0
Mvmt Flow	36	257	22	5	183	15	13	0	3	12	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	200	0	0	279	0	0	548	550	270	547	554	195
Stage 1	-	-	-	-	-	-	340	340	-	203	203	-
Stage 2	-	-	-	-	-	-	208	210	-	344	351	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.12	6.52	6.22	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.518	4.018	3.318	3.5	4.018	3.3
Pot Cap-1 Maneuver	1378	-	-	1284	-	-	447	443	769	451	440	851
Stage 1	-	-	-	-	-	-	675	639	-	804	733	-
Stage 2	-	-	-	-	-	-	794	728	-	676	632	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1375	-	-	1284	-	-	429	427	768	436	424	848
Mov Cap-2 Maneuver	-	-	-	-	-	-	429	427	-	436	424	-
Stage 1	-	-	-	-	-	-	654	619	-	777	729	-
Stage 2	-	-	-	-	-	-	780	724	-	651	612	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0.2	12.9	11.7
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	471	1375	-	-	1284	-	-	558
HCM Lane V/C Ratio	0.035	0.026	-	-	0.004	-	-	0.039
HCM Control Delay (s)	12.9	7.7	0	-	7.8	0	-	11.7
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	70	144	36	25	132	39	18	0	17	24	0	37
Future Vol, veh/h	70	144	36	25	132	39	18	0	17	24	0	37
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	1	1	2	2	0	0	2	2	2	0	2	0
Mvmt Flow	88	180	45	31	165	49	23	0	21	30	0	46

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	214	0	0	225	0	0	654	655	203	641	653	190
Stage 1	-	-	-	-	-	-	379	379	-	252	252	-
Stage 2	-	-	-	-	-	-	275	276	-	389	401	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.12	6.52	6.22	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.518	4.018	3.318	3.5	4.018	3.3
Pot Cap-1 Maneuver	1362	-	-	1344	-	-	380	386	838	390	387	857
Stage 1	-	-	-	-	-	-	643	615	-	757	698	-
Stage 2	-	-	-	-	-	-	731	682	-	639	601	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1362	-	-	1344	-	-	333	348	838	351	349	857
Mov Cap-2 Maneuver	-	-	-	-	-	-	333	348	-	351	349	-
Stage 1	-	-	-	-	-	-	595	569	-	701	680	-
Stage 2	-	-	-	-	-	-	674	664	-	577	557	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.2	1	13.4	12.6
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	471	1362	-	-	1344	-	-	547
HCM Lane V/C Ratio	0.093	0.064	-	-	0.023	-	-	0.139
HCM Control Delay (s)	13.4	7.8	0	-	7.7	0	-	12.6
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0.2	-	-	0.1	-	-	0.5

HCM 6th TWSC
14: SW 82nd Avenue & SW Norwood Road/Driveway

06/30/2021

Intersection	
Int Delay, s/veh	7.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			↰	↱
Traffic Vol, veh/h	150	0	35	0	0	1	21	8	0	2	4	175
Future Vol, veh/h	150	0	35	0	0	1	21	8	0	2	4	175
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	-	-	-	-	-	-	15
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	181	0	42	0	0	1	25	10	0	2	5	211

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	42	0	0	386	384	21	389	405	-
Stage 1	-	-	-	-	-	-	383	383	-	1	1	-
Stage 2	-	-	-	-	-	-	3	1	-	388	404	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	-
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	-
Pot Cap-1 Maneuver	1635	-	-	1580	-	-	576	553	1062	574	538	0
Stage 1	-	-	-	-	-	-	644	616	-	1027	899	0
Stage 2	-	-	-	-	-	-	1025	899	-	640	603	0
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1635	-	-	1580	-	-	522	490	1062	516	477	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	522	490	-	516	477	-
Stage 1	-	-	-	-	-	-	571	546	-	910	899	-
Stage 2	-	-	-	-	-	-	1020	899	-	557	534	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	6.1	0	12.5	12.5
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	513	1635	-	-	1580	-	-	489	-
HCM Lane V/C Ratio	0.068	0.111	-	-	-	-	-	0.015	-
HCM Control Delay (s)	12.5	7.5	0	-	0	-	-	12.5	0
HCM Lane LOS	B	A	A	-	A	-	-	B	A
HCM 95th %tile Q(veh)	0.2	0.4	-	-	0	-	-	0	-

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↱			↰↑	↑↱	
Traffic Vol, veh/h	82	72	65	227	403	139
Future Vol, veh/h	82	72	65	227	403	139
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	0	2	2	0	0
Mvmt Flow	92	81	73	255	453	156

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	932	531	609	0	-	0
Stage 1	531	-	-	-	-	-
Stage 2	401	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.12	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	298	552	970	-	-	-
Stage 1	594	-	-	-	-	-
Stage 2	681	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	272	552	970	-	-	-
Mov Cap-2 Maneuver	272	-	-	-	-	-
Stage 1	542	-	-	-	-	-
Stage 2	681	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	24.2	2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	970	-	357	-	-
HCM Lane V/C Ratio	0.075	-	0.485	-	-
HCM Control Delay (s)	9	0	24.2	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.2	-	2.5	-	-

HCM Signalized Intersection Capacity Analysis
10: I-5 SB Ramps & SW Elligsen Road

08/31/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰↑	↱↱
Traffic Volume (vph)	0	960	359	0	741	121	0	0	0	540	0	1015
Future Volume (vph)	0	960	359	0	741	121	0	0	0	540	0	1015
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	0.88
Frpb, ped/bikes		1.00	0.99		1.00	1.00				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3034	1340		3406	1524				1573	1573	2955
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3034	1340		3406	1524				1573	1573	2955
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	1021	382	0	788	129	0	0	0	574	0	1080
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	56
Lane Group Flow (vph)	0	1021	382	0	788	129	0	0	0	287	287	1024
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	19%	19%	19%	6%	6%	6%	0%	0%	0%	9%	9%	9%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		64.1	95.0		44.4	95.0				21.4	21.4	36.6
Effective Green, g (s)		65.1	95.0		45.4	95.0				21.9	21.9	37.6
Actuated g/C Ratio		0.69	1.00		0.48	1.00				0.23	0.23	0.40
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2079	1340		1627	1524				362	362	1293
v/s Ratio Prot		c0.34			0.23					0.18	0.18	c0.13
v/s Ratio Perm			0.29			0.08						0.22
v/c Ratio		0.49	0.29		0.48	0.08				0.79	0.79	0.79
Uniform Delay, d1		7.1	0.0		16.8	0.0				34.4	34.4	25.3
Progression Factor		2.04	1.00		0.50	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.6	0.4		0.9	0.1				10.8	10.8	3.3
Delay (s)		15.1	0.4		9.3	0.1				45.2	45.2	28.5
Level of Service		B	A		A	A				D	D	C
Approach Delay (s)		11.1			8.0			0.0			34.3	
Approach LOS		B			A			A			C	

Intersection Summary			
HCM 2000 Control Delay	20.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

V/C Ratio calculated using HCM worksheet with correct critical movements and lost time

HCM Signalized Intersection Capacity Analysis
10: I-5 SB Ramps & SW Elligsen Road

08/31/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰↑	↱↱
Traffic Volume (vph)	0	1134	940	0	713	389	0	0	0	597	91	838
Future Volume (vph)	0	1134	940	0	713	389	0	0	0	597	91	838
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	3.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	0.88
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (prot)		3505	1568		3505	1568				1603	1627	3011
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (perm)		3505	1568		3505	1568				1603	1627	3011
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1169	969	0	735	401	0	0	0	615	94	864
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	78
Lane Group Flow (vph)	0	1169	969	0	735	401	0	0	0	351	358	786
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	0%	0%	0%	7%	7%	7%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		67.3	105.0		56.2	105.0				28.2	28.2	34.8
Effective Green, g (s)		68.3	105.0		57.2	105.0				28.7	28.7	35.8
Actuated g/C Ratio		0.65	1.00		0.54	1.00				0.27	0.27	0.34
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2279	1568		1909	1568				438	444	1141
v/s Ratio Prot		0.33			0.21					0.22	c0.22	0.05
v/s Ratio Perm			c0.62			0.26						0.21
v/c Ratio		0.51	0.62		0.39	0.26				0.80	0.81	0.69
Uniform Delay, d1		9.6	0.0		13.8	0.0				35.5	35.6	29.8
Progression Factor		0.92	1.00		0.88	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.5	1.2		0.6	0.4				9.7	9.9	1.5
Delay (s)		9.4	1.2		12.7	0.4				45.2	45.4	31.3
Level of Service		A	A		B	A				D	D	C
Approach Delay (s)		5.7			8.4			0.0			37.6	
Approach LOS		A			A			A			D	

Intersection Summary			
HCM 2000 Control Delay	16.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

V/C Ratio calculated using HCM worksheet with correct critical movements and lost time

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰↑	↱↱
Traffic Volume (vph)	0	1011	379	0	755	121	0	0	0	540	0	1025
Future Volume (vph)	0	1011	379	0	755	121	0	0	0	540	0	1025
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	0.88
Frpb, ped/bikes		1.00	0.99		1.00	1.00				1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00				1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		3034	1340		3406	1524				1573	1573	2955
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		3034	1340		3406	1524				1573	1573	2955
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	1076	403	0	803	129	0	0	0	574	0	1090
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	52
Lane Group Flow (vph)	0	1076	403	0	803	129	0	0	0	287	287	1038
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	19%	19%	19%	6%	6%	6%	0%	0%	0%	9%	9%	9%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		64.1	95.0		43.9	95.0				21.4	21.4	37.1
Effective Green, g (s)		65.1	95.0		44.9	95.0				21.9	21.9	38.1
Actuated g/C Ratio		0.69	1.00		0.47	1.00				0.23	0.23	0.40
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2079	1340		1609	1524				362	362	1309
v/s Ratio Prot		c0.35			0.24					0.18	0.18	c0.14
v/s Ratio Perm			0.30			0.08						0.22
v/c Ratio		0.52	0.30		0.50	0.08				0.79	0.79	0.79
Uniform Delay, d1		7.3	0.0		17.3	0.0				34.4	34.4	25.0
Progression Factor		2.11	1.00		0.52	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.7	0.4		1.0	0.1				10.8	10.8	3.2
Delay (s)		16.1	0.4		9.9	0.1				45.2	45.2	28.2
Level of Service		B	A		A	A				D	D	C
Approach Delay (s)		11.8			8.5			0.0			34.1	
Approach LOS		B			A			A			C	

Intersection Summary			
HCM 2000 Control Delay	20.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

V/C Ratio calculated using HCM worksheet with correct critical movements and lost time

HCM Signalized Intersection Capacity Analysis
10: I-5 SB Ramps & SW Elligsen Road

09/09/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑↑	↱				↰	↰	↱↱
Traffic Volume (vph)	0	1167	953	0	759	389	0	0	0	597	91	872
Future Volume (vph)	0	1167	953	0	759	389	0	0	0	597	91	872
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	16
Total Lost time (s)		4.0	4.0		4.0	3.0				4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		0.95	1.00				0.95	0.95	0.88
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (prot)		3505	1568		3505	1568				1603	1627	3011
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.96	1.00
Satd. Flow (perm)		3505	1568		3505	1568				1603	1627	3011
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1203	982	0	782	401	0	0	0	615	94	899
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	64
Lane Group Flow (vph)	0	1203	982	0	782	401	0	0	0	351	358	835
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	0%	0%	0%	7%	7%	7%
Turn Type		NA	Free		NA	Free				Split	NA	custom
Protected Phases		2			6					4	4	5
Permitted Phases			Free		6	Free						4
Actuated Green, G (s)		67.3	105.0		55.9	105.0				28.2	28.2	35.1
Effective Green, g (s)		68.3	105.0		56.9	105.0				28.7	28.7	36.1
Actuated g/C Ratio		0.65	1.00		0.54	1.00				0.27	0.27	0.34
Clearance Time (s)		5.0			5.0					4.5	4.5	4.5
Vehicle Extension (s)		4.1			4.1					2.3	2.3	2.3
Lane Grp Cap (vph)		2279	1568		1899	1568				438	444	1149
v/s Ratio Prot		0.34			0.22					0.22	c0.22	c0.05
v/s Ratio Perm			c0.63			0.26						0.23
v/c Ratio		0.53	0.63		0.41	0.26				0.80	0.81	0.73
Uniform Delay, d1		9.8	0.0		14.2	0.0				35.5	35.6	30.1
Progression Factor		0.90	1.00		0.90	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.6	1.2		0.6	0.4				9.7	9.9	2.1
Delay (s)		9.4	1.2		13.4	0.4				45.2	45.4	32.2
Level of Service		A	A		B	A				D	D	C
Approach Delay (s)		5.7			9.0			0.0			38.0	
Approach LOS		A			A			A			D	

Intersection Summary			
HCM 2000 Control Delay	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

V/C Ratio calculated using HCM worksheet with correct critical movements and lost time

Signalized Intersection V/C Calculation Summary

MORNING PEAK HOUR

Intersection 1: SW Sagert Street at SW Boones Ferry Road

2021 Existing	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing									
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBT	SBR	Sum of Critical Flow Ratios:	0.67	Critical Intersection V/C:	0.83
Adjusted Flow Rate:	73	87		182	143	8	880		53	278	32	Cycle Length (seconds):	85.4		
Saturated Flow:	1795	1857		1810	1805	1795	1772		1725	1811	1501	Lost Time per phase (seconds):	4		
Flow Ratio:	0.04	0.05		0.10	0.08	0.00	0.50		0.03	0.15	0.02	Number of Phases	4		
			0.15					0.53							

2024 Background	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing									
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBT	SBR	Sum of Critical Flow Ratios:	0.72	Critical Intersection V/C:	0.87
Adjusted Flow Rate:	77	93		193	153	8	942		56	295	30	Cycle Length (seconds):	91.2		
Saturated Flow:	1795	1855		1810	1804	1795	1771		1725	1811	1501	Lost Time per phase (seconds):	4		
Flow Ratio:	0.04	0.05		0.11	0.08	0.00	0.53		0.03	0.16	0.02	Number of Phases	4		
			0.16					0.56							

2026 Background	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing									
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBT	SBR	Sum of Critical Flow Ratios:	0.75	Critical Intersection V/C:	0.90
Adjusted Flow Rate:	80	96		202	159	9	978		58	308	31	Cycle Length (seconds):	93.9		
Saturated Flow:	1795	1856		1810	1802	1795	1771		1725	1811	1501	Lost Time per phase (seconds):	4		
Flow Ratio:	0.04	0.05		0.11	0.09	0.01	0.55		0.03	0.17	0.02	Number of Phases	4		
			0.16					0.59							

2024 Buildout	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing									
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBT	SBR	Sum of Critical Flow Ratios:	0.73	Critical Intersection V/C:	0.88
Adjusted Flow Rate:	77	93		197	153	8	952		56	298	30	Cycle Length (seconds):	92.4		
Saturated Flow:	1795	1855		1810	1804	1795	1770		1725	1811	1501	Lost Time per phase (seconds):	4		
Flow Ratio:	0.04	0.05		0.11	0.08	0.00	0.54		0.03	0.16	0.02	Number of Phases	4		
			0.16					0.57							

2026 Buildout	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing									
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBT	SBR	Sum of Critical Flow Ratios:	0.78	Critical Intersection V/C:	0.94
Adjusted Flow Rate:	80	96		210	159	9	1024		58	315	31	Cycle Length (seconds):	95.1		
Saturated Flow:	1795	1856		1810	1802	1795	1768		1725	1811	1501	Lost Time per phase (seconds):	4		
Flow Ratio:	0.04	0.05		0.12	0.09	0.01	0.58		0.03	0.17	0.02	Number of Phases	4		
			0.17					0.61							

2026 Buildout w/ BCE	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing									
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBT	SBR	Sum of Critical Flow Ratios:	0.78	Critical Intersection V/C:	0.94
Adjusted Flow Rate:	80	96		210	159	9	1024		58	315	31	Cycle Length (seconds):	95.1		
Saturated Flow:	1795	1856		1810	1802	1795	1768		1725	1811	1501	Lost Time per phase (seconds):	4		
Flow Ratio:	0.04	0.05		0.12	0.09	0.01	0.58		0.03	0.17	0.02	Number of Phases	4		
			0.17					0.61							

Notes:

Since EB and WB left-turn phases are protected, critical ring is either EBL+WBT or WBL+EBT - HCM6 does not show reductions for permitted left turns

Since NB and SB left-turn phases are protected, critical ring is either NBL+SBT or SBL+NBT - HCM6 does not show reductions for permitted left turns

Signalized Intersection V/C Calculation Summary

MORNING PEAK HOUR

Intersection 2: SW Avery Road at SW Boones Ferry Road

2021 Existing	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBTR	Sum of Critical Flow Ratios:	0.65	Critical Intersection V/C:	0.82
Adjusted Flow Rate:	193	163		33	126	281	808		7	487	Cycle Length (seconds):	77		
Saturated Flow:	1753	1650		1753	1805	1682	1749		1753	1739	Lost Time per phase (seconds):	4		
Flow Ratio:	0.11	0.10		0.02	0.07	0.17	0.46		0.00	0.28	Number of Phases	4		
			0.18					0.47						

2024 Background	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBTR	Sum of Critical Flow Ratios:	0.69	Critical Intersection V/C:	0.84
Adjusted Flow Rate:	205	178		36	135	298	857		7	517	Cycle Length (seconds):	86.5		
Saturated Flow:	1753	1646		1753	1804	1682	1749		1753	1740	Lost Time per phase (seconds):	4		
Flow Ratio:	0.12	0.11		0.02	0.07	0.18	0.49		0.00	0.30	Number of Phases	4		
			0.19					0.49						

2026 Background	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBTR	Sum of Critical Flow Ratios:	0.72	Critical Intersection V/C:	0.87
Adjusted Flow Rate:	212	181		37	139	313	900		8	541	Cycle Length (seconds):	93.5		
Saturated Flow:	1753	1648		1753	1805	1682	1749		1753	1739	Lost Time per phase (seconds):	4		
Flow Ratio:	0.12	0.11		0.02	0.08	0.19	0.51		0.00	0.31	Number of Phases	4		
			0.20					0.52						

2024 Buildout	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBTR	Sum of Critical Flow Ratios:	0.70	Critical Intersection V/C:	0.85
Adjusted Flow Rate:	205	181		36	135	307	878		7	525	Cycle Length (seconds):	89.3		
Saturated Flow:	1753	1643		1753	1804	1682	1749		1753	1741	Lost Time per phase (seconds):	4		
Flow Ratio:	0.12	0.11		0.02	0.07	0.18	0.50		0.00	0.30	Number of Phases	4		
			0.19					0.51						

2026 Buildout	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBTR	Sum of Critical Flow Ratios:	0.75	Critical Intersection V/C:	0.89
Adjusted Flow Rate:	212	189		37	139	337	950		8	558	Cycle Length (seconds):	99.6		
Saturated Flow:	1753	1642		1753	1805	1682	1750		1753	1742	Lost Time per phase (seconds):	4		
Flow Ratio:	0.12	0.12		0.02	0.08	0.20	0.54		0.00	0.32	Number of Phases	4		
			0.20					0.55						

2026 Buildout w/ BCE	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBTR	Sum of Critical Flow Ratios:	0.75	Critical Intersection V/C:	0.89
Adjusted Flow Rate:	212	185		37	139	325	950		8	558	Cycle Length (seconds):	100.1		
Saturated Flow:	1753	1645		1753	1805	1682	1750		1753	1742	Lost Time per phase (seconds):	4		
Flow Ratio:	0.12	0.11		0.02	0.08	0.19	0.54		0.00	0.32	Number of Phases	4		
			0.20					0.55						

Notes:

Since EB and WB left-turn phases are protected, critical ring is either EBL+WBT or WBL+EBT - HCM6 does not show reductions for permitted left turns

Since NB and SB left-turn phases are protected, critical ring is either NBL+SBT or SBL+NBT - HCM6 does not show reductions for permitted left turns

Signalized Intersection V/C Calculation Summary

MORNING PEAK HOUR

Intersection 3: SW Ibach Street at SW Boones Ferry Road

2021 Existing	Permitted Left-Turn Phasing			Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR	WBLTR	NBL	NBTR	SBL	SBT	SBR	Sum of Critical Flow Ratios:	0.64	Critical Intersection V/C:	0.78
Adjusted Flow Rate:	274	203	20	140	774	3	411	51	Cycle Length (seconds):	66.1		
Saturated Flow:	1353	1564	1376	1711	1792	1725	1811	1526	Lost Time per phase (seconds):	4		
Flow Ratio:	0.20	0.13	0.01	0.08	0.43	0.00	0.23	0.03	Number of Phases	3		
	0.20			0.43								

2024 Background	Permitted Left-Turn Phasing			Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR	WBLTR	NBL	NBTR	SBL	SBT	SBR	Sum of Critical Flow Ratios:	0.67	Critical Intersection V/C:	0.80
Adjusted Flow Rate:	290	213	16	148	821	3	436	51	Cycle Length (seconds):	74.3		
Saturated Flow:	1359	1564	1186	1711	1792	1725	1811	1526	Lost Time per phase (seconds):	4		
Flow Ratio:	0.21	0.14	0.01	0.09	0.46	0.00	0.24	0.03	Number of Phases	3		
	0.21			0.46								

2026 Background	Permitted Left-Turn Phasing			Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR	WBLTR	NBL	NBTR	SBL	SBT	SBR	Sum of Critical Flow Ratios:	0.70	Critical Intersection V/C:	0.83
Adjusted Flow Rate:	301	227	11	154	865	3	457	54	Cycle Length (seconds):	80.3		
Saturated Flow:	1367	1564	953	1711	1792	1725	1811	1526	Lost Time per phase (seconds):	4		
Flow Ratio:	0.22	0.15	0.01	0.09	0.48	0.00	0.25	0.04	Number of Phases	3		
	0.22			0.48								

2024 Buildout	Permitted Left-Turn Phasing			Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR	WBLTR	NBL	NBTR	SBL	SBT	SBR	Sum of Critical Flow Ratios:	0.69	Critical Intersection V/C:	0.80
Adjusted Flow Rate:	290	215	16	153	852	3	446	51	Cycle Length (seconds):	91.1		
Saturated Flow:	1360	1564	1164	1711	1792	1725	1811	1526	Lost Time per phase (seconds):	4		
Flow Ratio:	0.21	0.14	0.01	0.09	0.48	0.00	0.25	0.03	Number of Phases	3		
	0.21			0.48								

2026 Buildout	Permitted Left-Turn Phasing			Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR	WBLTR	NBL	NBTR	SBL	SBT	SBR	Sum of Critical Flow Ratios:	0.75	Critical Intersection V/C:	0.86
Adjusted Flow Rate:	301	231	11	166	941	3	483	54	Cycle Length (seconds):	88.7		
Saturated Flow:	1371	1564	917	1711	1792	1725	1811	1527	Lost Time per phase (seconds):	4		
Flow Ratio:	0.22	0.15	0.01	0.10	0.53	0.00	0.27	0.04	Number of Phases	3		
	0.22			0.53								

2026 Buildout w/ BCE	Permitted Left-Turn Phasing			Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR	WBLTR	NBL	NBTR	SBL	SBT	SBR	Sum of Critical Flow Ratios:	0.74	Critical Intersection V/C:	0.86
Adjusted Flow Rate:	301	230	11	161	929	3	478	54	Cycle Length (seconds):	87.5		
Saturated Flow:	1370	1564	923	1711	1792	1725	1811	1527	Lost Time per phase (seconds):	4		
Flow Ratio:	0.22	0.15	0.01	0.09	0.52	0.00	0.26	0.04	Number of Phases	3		
	0.22			0.52								

Notes:

Since EB and WB left-turn phases are permitted, critical ring is maximum of any lane group.

Since NB and SB left-turn phases are protected, critical ring is either EBL+WBT or WBL+EBT - HCM6 does not show reductions for permitted left turns

Signalized Intersection V/C Calculation Summary

MORNING PEAK HOUR

Intersection 8: SW Day Road at SW Boones Ferry Road

2021 Existing	Permited Left-Turn Phasing (w/ Right-Turn Overlap)			Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBLTR	NBL	NBTR	SBL	SBTR	Sum of Critical Flow Ratios:	0.54	Critical Intersection V/C:	0.62
Adjusted Flow Rate:	180	537	0	649	497	0	563	Cycle Length (seconds):	95		
Saturated Flow:	1283	1434	1900	2740	1693	1711	3452	Lost Time per phase (seconds):	4		
Flow Ratio:	0.14	0.37	0.00	0.24	0.29	0.00	0.16	Number of Phases	3		
		0.14				0.40					

2024 Background	Permited Left-Turn Phasing (w/ Right-Turn Overlap)			Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBLTR	NBL	NBTR	SBL	SBTR	Sum of Critical Flow Ratios:	0.57	Critical Intersection V/C:	0.65
Adjusted Flow Rate:	191	572	0	688	527	0	593	Cycle Length (seconds):	95		
Saturated Flow:	1283	1434	1900	2740	1693	1711	3456	Lost Time per phase (seconds):	4		
Flow Ratio:	0.15	0.40	0.00	0.25	0.31	0.00	0.17	Number of Phases	3		
		0.15				0.42					

2026 Background	Permited Left-Turn Phasing (w/ Right-Turn Overlap)			Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBLTR	NBL	NBTR	SBL	SBTR	Sum of Critical Flow Ratios:	0.60	Critical Intersection V/C:	0.65
Adjusted Flow Rate:	199	596	0	713	551	0	631	Cycle Length (seconds):	95		
Saturated Flow:	1283	1434	1900	2740	1693	1711	3453	Lost Time per phase (seconds):	4		
Flow Ratio:	0.16	0.42	0.00	0.26	0.33	0.00	0.18	Number of Phases	2		
		0.42				0.18					

2024 Buildout	Permited Left-Turn Phasing (w/ Right-Turn Overlap)			Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBLTR	NBL	NBTR	SBL	SBTR	Sum of Critical Flow Ratios:	0.59	Critical Intersection V/C:	0.67
Adjusted Flow Rate:	194	572	0	688	538	0	635	Cycle Length (seconds):	95		
Saturated Flow:	1283	1434	1900	2740	1693	1711	3449	Lost Time per phase (seconds):	4		
Flow Ratio:	0.15	0.40	0.00	0.25	0.32	0.00	0.18	Number of Phases	3		
		0.15				0.44					

2026 Buildout	Permited Left-Turn Phasing (w/ Right-Turn Overlap)			Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBLTR	NBL	NBTR	SBL	SBTR	Sum of Critical Flow Ratios:	0.63	Critical Intersection V/C:	0.73
Adjusted Flow Rate:	207	596	0	713	578	0	733	Cycle Length (seconds):	95		
Saturated Flow:	1283	1434	1900	2740	1693	1711	3441	Lost Time per phase (seconds):	4		
Flow Ratio:	0.16	0.42	0.00	0.26	0.34	0.00	0.21	Number of Phases	3		
		0.16				0.47					

2026 Buildout w/ BCE	Permited Left-Turn Phasing (w/ Right-Turn Overlap)			Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBLTR	NBL	NBTR	SBL	SBTR	Sum of Critical Flow Ratios:	0.47	Critical Intersection V/C:	0.52
Adjusted Flow Rate:	41	272	0	357	934	0	989	Cycle Length (seconds):	95		
Saturated Flow:	1283	1434	1900	2740	1693	1711	3499	Lost Time per phase (seconds):	4		
Flow Ratio:	0.03	0.19	0.00	0.13	0.55	0.00	0.28	Number of Phases	2		
		0.19				0.28					

Notes:

Since EB and WB left-turn phases are permitted, critical ring is maximum of any left or through lane group unless EBR > EBT+NBL or WBR > WBT+SBL.

Since NB and SB left-turn phases are protected, critical ring is either NBL+SBT or SBL+NBT unless EBR > EBT+NBL or WBR > WBT+SBL.

Signalized Intersection V/C Calculation Summary

MORNING PEAK HOUR

Intersection 9: SW 95th Avenue at SW Boones Ferry Road

2021 Existing	Permited Left-Turn Phasing (w/ Right-Turn Overlap)				Protected Left-Turn Phasing			
Critical Movement:	EBLT	EBR	WBL	WBTR	NBL	NBTR	SBL	SBT
Adjusted Flow Rate:	213	515	16	8	836	898	5	723
Saturated Flow:	1219	1223	816	1496	3319	3454	1654	3300
Flow Ratio:	0.17	0.42	0.02	0.01	0.25	0.26	0.00	0.22
	0.17				0.47			

Sum of Critical Flow Ratios:	0.65	Critical Intersection V/C:	0.74
Cycle Length (seconds):	95		
Lost Time per phase (seconds):	4		
Number of Phases	3		

2024 Background	Permited Left-Turn Phasing (w/ Right-Turn Overlap)				Protected Left-Turn Phasing			
Critical Movement:	EBLT	EBR	WBL	WBTR	NBL	NBTR	SBL	SBT
Adjusted Flow Rate:	225	549	17	8	886	952	5	766
Saturated Flow:	1219	1223	791	1496	3319	3454	1654	3300
Flow Ratio:	0.18	0.45	0.02	0.01	0.27	0.28	0.00	0.23
	0.18				0.50			

Sum of Critical Flow Ratios:	0.68	Critical Intersection V/C:	0.78
Cycle Length (seconds):	95		
Lost Time per phase (seconds):	4		
Number of Phases	3		

2026 Background	Permited Left-Turn Phasing (w/ Right-Turn Overlap)				Protected Left-Turn Phasing			
Critical Movement:	EBLT	EBR	WBL	WBTR	NBL	NBTR	SBL	SBT
Adjusted Flow Rate:	235	571	18	9	920	991	7	808
Saturated Flow:	1215	2445	775	1493	3319	3455	1654	3300
Flow Ratio:	0.19	0.23	0.02	0.01	0.28	0.29	0.00	0.24
	0.19				0.52			

Sum of Critical Flow Ratios:	0.72	Critical Intersection V/C:	0.82
Cycle Length (seconds):	95		
Lost Time per phase (seconds):	4		
Number of Phases	3		

2024 Buildout	Permited Left-Turn Phasing (w/ Right-Turn Overlap)				Protected Left-Turn Phasing			
Critical Movement:	EBLT	EBR	WBL	WBTR	NBL	NBTR	SBL	SBT
Adjusted Flow Rate:	225	587	17	8	886	963	5	798
Saturated Flow:	1219	1223	763	1496	3319	3454	1654	3300
Flow Ratio:	0.18	0.48	0.02	0.01	0.27	0.28	0.00	0.24
	0.48				0.24			

Sum of Critical Flow Ratios:	0.72	Critical Intersection V/C:	0.79
Cycle Length (seconds):	95		
Lost Time per phase (seconds):	4		
Number of Phases	2		

2026 Buildout	Permited Left-Turn Phasing (w/ Right-Turn Overlap)				Protected Left-Turn Phasing			
Critical Movement:	EBLT	EBR	WBL	WBTR	NBL	NBTR	SBL	SBT
Adjusted Flow Rate:	235	571	18	9	920	1017	7	885
Saturated Flow:	1215	1223	775	1493	3319	3456	1654	3300
Flow Ratio:	0.19	0.47	0.02	0.01	0.28	0.29	0.00	0.27
	0.19				0.55			

Sum of Critical Flow Ratios:	0.74	Critical Intersection V/C:	0.85
Cycle Length (seconds):	95		
Lost Time per phase (seconds):	4		
Number of Phases	3		

2026 Buildout w/ BCE	Permited Left-Turn Phasing (w/ Right-Turn Overlap)				Protected Left-Turn Phasing			
Critical Movement:	EBLT	EBR	WBL	WBTR	NBL	NBTR	SBL	SBT
Adjusted Flow Rate:	235	571	18	9	920	1017	7	885
Saturated Flow:	1215	1223	775	1493	3319	3456	1654	3300
Flow Ratio:	0.19	0.47	0.02	0.01	0.28	0.29	0.00	0.27
	0.19				0.55			

Sum of Critical Flow Ratios:	0.74	Critical Intersection V/C:	0.85
Cycle Length (seconds):	95		
Lost Time per phase (seconds):	4		
Number of Phases	3		

Notes:

Since EB and WB left-turn phases are permitted, critical ring is maximum of any left or through lane group unless EBR > EBT+NBL or WBR > WBT+SBL.

Since NB and SB left-turn phases are protected, critical ring is either NBL+SBT or SBL+NBT unless EBR > EBT+NBL or WBR > WBT+SBL.

Signalized Intersection V/C Calculation Summary

MORNING PEAK HOUR

Intersection 10: I-5 Southbound Ramps at SW Elligson Road

2021 Existing		Unique Phasing		Unique Overlap						
Critical Movement:	EBT		WBT		SBLT	SBR	Sum of Critical Flow Ratios:	0.79	Critical Intersection V/C:	0.86
Adjusted Flow Rate:	920		715		522	971	Cycle Length (seconds):	95		
Saturated Flow:	3034		3406		3146	1679	Lost Time per phase (seconds):	4		
Flow Ratio:	0.30		0.21		0.17	0.58	Number of Phases	2		
		0.21		0.58						

2024 Background		Unique Phasing		Unique Overlap						
Critical Movement:	EBT		WBT		SBLT	SBR	Sum of Critical Flow Ratios:	0.84	Critical Intersection V/C:	0.91
Adjusted Flow Rate:	976		757		553	1030	Cycle Length (seconds):	95		
Saturated Flow:	3034		3406		3146	1679	Lost Time per phase (seconds):	4		
Flow Ratio:	0.32		0.22		0.18	0.61	Number of Phases	2		
		0.22		0.61						

2026 Background		Unique Phasing		Unique Overlap						
Critical Movement:	EBT		WBT		SBLT	SBR	Sum of Critical Flow Ratios:	0.87	Critical Intersection V/C:	0.96
Adjusted Flow Rate:	1021		788		574	1080	Cycle Length (seconds):	95		
Saturated Flow:	3034		3406		3146	1679	Lost Time per phase (seconds):	4		
Flow Ratio:	0.34		0.23		0.18	0.64	Number of Phases	2		
		0.23		0.64						

2024 Buildout		Unique Phasing		Unique Overlap						
Critical Movement:	EBT		WBT		SBLT	SBR	Sum of Critical Flow Ratios:	0.85	Critical Intersection V/C:	0.92
Adjusted Flow Rate:	998		764		553	1043	Cycle Length (seconds):	95		
Saturated Flow:	3034		3406		3146	1679	Lost Time per phase (seconds):	4		
Flow Ratio:	0.33		0.22		0.18	0.62	Number of Phases	2		
		0.22		0.62						

2026 Buildout		Unique Phasing		Unique Overlap						
Critical Movement:	EBT		WBT		SBLT	SBR	Sum of Critical Flow Ratios:	0.88	Critical Intersection V/C:	0.96
Adjusted Flow Rate:	1076		803		574	1081	Cycle Length (seconds):	95		
Saturated Flow:	3034		3406		3146	1679	Lost Time per phase (seconds):	4		
Flow Ratio:	0.35		0.24		0.18	0.64	Number of Phases	2		
		0.24		0.64						

2026 Buildout w/ BCE		Unique Phasing		Unique Overlap						
Critical Movement:	EBT		WBT		SBLT	SBR	Sum of Critical Flow Ratios:	0.88	Critical Intersection V/C:	0.96
Adjusted Flow Rate:	1076		803		574	1082	Cycle Length (seconds):	95		
Saturated Flow:	3034		3406		3146	1679	Lost Time per phase (seconds):	4		
Flow Ratio:	0.35		0.24		0.18	0.64	Number of Phases	2		
		0.24		0.64						

Notes:

Since this intersection has unique phasing and overlap, the critical rings are either EBT+SBLT or WBT+SBR.

Signalized Intersection V/C Calculation Summary

MORNING PEAK HOUR

Intersection 11: I-5 Northbound Ramps at SW Elligsen Road

2021 Existing	Permitted Left-Turn Phasing		Single Approach				
Critical Movement:	EBT	WBT	NBL	Sum of Critical Flow Ratios:	0.38	Critical Intersection V/C:	0.42
Adjusted Flow Rate:	760	334	524	Cycle Length (seconds):	95		
Saturated Flow:	3329	3593	3346	Lost Time per phase (seconds):	4		
Flow Ratio:	0.23	0.09	0.16	Number of Phases	2		
	0.23		0.16				

2024 Background	Permitted Left-Turn Phasing		Single Approach				
Critical Movement:	EBT	WBT	NBL	Sum of Critical Flow Ratios:	0.41	Critical Intersection V/C:	0.45
Adjusted Flow Rate:	807	354	556	Cycle Length (seconds):	95		
Saturated Flow:	3329	3593	3346	Lost Time per phase (seconds):	4		
Flow Ratio:	0.24	0.10	0.17	Number of Phases	2		
	0.24		0.17				

2026 Background	Permitted Left-Turn Phasing		Single Approach				
Critical Movement:	EBT	WBT	NBL	Sum of Critical Flow Ratios:	0.43	Critical Intersection V/C:	0.46
Adjusted Flow Rate:	840	368	578	Cycle Length (seconds):	95		
Saturated Flow:	3329	3593	3346	Lost Time per phase (seconds):	4		
Flow Ratio:	0.25	0.10	0.17	Number of Phases	2		
	0.25		0.17				

2024 Buildout	Permitted Left-Turn Phasing		Single Approach				
Critical Movement:	EBT	WBT	NBL	Sum of Critical Flow Ratios:	0.41	Critical Intersection V/C:	0.45
Adjusted Flow Rate:	816	357	559	Cycle Length (seconds):	95		
Saturated Flow:	3329	3593	3346	Lost Time per phase (seconds):	4		
Flow Ratio:	0.25	0.10	0.17	Number of Phases	2		
	0.25		0.17				

2026 Buildout	Permitted Left-Turn Phasing		Single Approach				
Critical Movement:	EBT	WBT	NBL	Sum of Critical Flow Ratios:	0.43	Critical Intersection V/C:	0.47
Adjusted Flow Rate:	862	376	586	Cycle Length (seconds):	95		
Saturated Flow:	3329	3593	3346	Lost Time per phase (seconds):	4		
Flow Ratio:	0.26	0.10	0.18	Number of Phases	2		
	0.26		0.18				

2026 Buildout w/ BCE	Permitted Left-Turn Phasing		Single Approach				
Critical Movement:	EBT	WBT	NBL	Sum of Critical Flow Ratios:	0.43	Critical Intersection V/C:	0.47
Adjusted Flow Rate:	862	376	586	Cycle Length (seconds):	95		
Saturated Flow:	3329	2593	3346	Lost Time per phase (seconds):	4		
Flow Ratio:	0.26	0.15	0.18	Number of Phases	2		
	0.26		0.18				

Notes:

Since EB and WB left-turn phases are permitted, critical ring is maximum of any lane group.

Since only one approach exists, critical ring is max of NB lane groups or max of SB lane groups

Signalized Intersection V/C Calculation Summary

EVENING PEAK HOUR

Intersection 1: SW Sagert Street at SW Boones Ferry Road

2021 Existing	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing					
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBT	SBR
Adjusted Flow Rate:	56	183		223	141	22	662		90	662	60
Saturated Flow:	1795	1866		1810	1798	1795	1732		1795	1885	1560
Flow Ratio:	0.03	0.10		0.12	0.08	0.01	0.38		0.05	0.35	0.04
			0.22					0.43			

Sum of Critical Flow Ratios:	0.65	Critical Intersection V/C:	0.82
Cycle Length (seconds):	79.3		
Lost Time per phase (seconds):	4		
Number of Phases	4		

2024 Background	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing					
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBT	SBR
Adjusted Flow Rate:	59	193		236	132	23	699		96	701	31
Saturated Flow:	1795	1865		1810	1826	1795	1733		1795	1885	1560
Flow Ratio:	0.03	0.10		0.13	0.07	0.01	0.40		0.05	0.37	0.02
			0.23					0.46			

Sum of Critical Flow Ratios:	0.69	Critical Intersection V/C:	0.85
Cycle Length (seconds):	84.7		
Lost Time per phase (seconds):	4		
Number of Phases	4		

2026 Background	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing					
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBT	SBR
Adjusted Flow Rate:	62	201		249	139	24	732		99	732	29
Saturated Flow:	1795	1866		1810	1824	1795	1733		1795	1885	1560
Flow Ratio:	0.03	0.11		0.14	0.08	0.01	0.42		0.06	0.39	0.02
			0.25					0.48			

Sum of Critical Flow Ratios:	0.72	Critical Intersection V/C:	0.88
Cycle Length (seconds):	88.4		
Lost Time per phase (seconds):	4		
Number of Phases	4		

2024 Buildout	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing					
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBT	SBR
Adjusted Flow Rate:	59	193		246	132	23	711		96	711	31
Saturated Flow:	1795	1865		1810	1826	1795	1733		1795	1885	1560
Flow Ratio:	0.03	0.10		0.14	0.07	0.01	0.41		0.05	0.38	0.02
			0.24					0.46			

Sum of Critical Flow Ratios:	0.70	Critical Intersection V/C:	0.86
Cycle Length (seconds):	85.8		
Lost Time per phase (seconds):	4		
Number of Phases	4		

2026 Buildout	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing					
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBT	SBR
Adjusted Flow Rate:	62	201		275	139	24	758		99	757	29
Saturated Flow:	1795	1866		1810	1824	1795	1734		1795	1885	1561
Flow Ratio:	0.03	0.11		0.15	0.08	0.01	0.44		0.06	0.40	0.02
			0.26					0.49			

Sum of Critical Flow Ratios:	0.75	Critical Intersection V/C:	0.91
Cycle Length (seconds):	90.6		
Lost Time per phase (seconds):	4		
Number of Phases	4		

2026 Buildout w/ BCE	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing					
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBT	SBR
Adjusted Flow Rate:	62	201		275	139	24	760		99	757	29
Saturated Flow:	1795	1866		1810	1798	1795	1732		1795	1885	1561
Flow Ratio:	0.03	0.11		0.15	0.08	0.01	0.44		0.06	0.40	0.02
			0.26					0.49			

Sum of Critical Flow Ratios:	0.75	Critical Intersection V/C:	0.91
Cycle Length (seconds):	90.8		
Lost Time per phase (seconds):	4		
Number of Phases	4		

Notes:

Since EB and WB left-turn phases are protected, critical ring is either EBL+WBT or WBL+EBT - HCM6 does not show reductions for permitted left turns

Since NB and SB left-turn phases are protected, critical ring is either NBL+SBT or SBL+NBT - HCM6 does not show reductions for permitted left turns

Signalized Intersection V/C Calculation Summary

EVENING PEAK HOUR

Intersection 2: SW Avery Road at SW Boones Ferry Road

2021 Existing	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBTR	Sum of Critical Flow Ratios:	0.78	Critical Intersection V/C:	0.92
Adjusted Flow Rate:	244	382		50	51	110	460		14	824	Cycle Length (seconds):	103.4		
Saturated Flow:	1753	1605		1781	1816	1725	1777		1781	1828	Lost Time per phase (seconds):	4		
Flow Ratio:	0.14	0.24		0.03	0.03	0.06	0.26		0.01	0.45	Number of Phases	4		
			0.27					0.51						

2024 Background	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBTR	Sum of Critical Flow Ratios:	0.78	Critical Intersection V/C:	0.92
Adjusted Flow Rate:	258	332		53	48	117	482		15	874	Cycle Length (seconds):	106.8		
Saturated Flow:	1753	1624		1781	1848	1725	1781		1781	1829	Lost Time per phase (seconds):	4		
Flow Ratio:	0.15	0.20		0.03	0.03	0.07	0.27		0.01	0.48	Number of Phases	4		
			0.23					0.55						

2026 Background	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBTR	Sum of Critical Flow Ratios:	0.82	Critical Intersection V/C:	0.96
Adjusted Flow Rate:	268	351		55	51	124	506		15	917	Cycle Length (seconds):	113.5		
Saturated Flow:	1753	1623		1781	1842	1725	1781		1781	1829	Lost Time per phase (seconds):	4		
Flow Ratio:	0.15	0.22		0.03	0.03	0.07	0.28		0.01	0.50	Number of Phases	4		
			0.25					0.57						

2024 Buildout	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBTR	Sum of Critical Flow Ratios:	0.80	Critical Intersection V/C:	0.93
Adjusted Flow Rate:	258	341		53	48	122	493		15	893	Cycle Length (seconds):	110.8		
Saturated Flow:	1753	1621		1781	1848	1725	1782		1781	1829	Lost Time per phase (seconds):	4		
Flow Ratio:	0.15	0.21		0.03	0.03	0.07	0.28		0.01	0.49	Number of Phases	4		
			0.24					0.56						

2026 Buildout	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBTR	Sum of Critical Flow Ratios:	0.87	Critical Intersection V/C:	1.01
Adjusted Flow Rate:	268	374		55	51	138	534		15	965	Cycle Length (seconds):	117		
Saturated Flow:	1753	1616		1781	1842	1725	1783		1781	1831	Lost Time per phase (seconds):	4		
Flow Ratio:	0.15	0.23		0.03	0.03	0.08	0.30		0.01	0.53	Number of Phases	4		
			0.26					0.61						

2026 Buildout w/ BCE	Protected/Permitted Left-Turn Phasing					Protected/Permitted Left-Turn Phasing								
Critical Movement:	EBL	EBTR		WBL	WBTR	NBL	NBTR		SBL	SBTR	Sum of Critical Flow Ratios:	0.86	Critical Intersection V/C:	0.99
Adjusted Flow Rate:	268	362		55	51	131	533		15	965	Cycle Length (seconds):	116.7		
Saturated Flow:	1753	1619		1781	1841	1725	1782		1781	1831	Lost Time per phase (seconds):	4		
Flow Ratio:	0.15	0.22		0.03	0.03	0.08	0.30		0.01	0.53	Number of Phases	4		
			0.25					0.60						

Notes:

Since EB and WB left-turn phases are protected, critical ring is either EBL+WBT or WBL+EBT - HCM6 does not show reductions for permitted left turns

Since NB and SB left-turn phases are protected, critical ring is either NBL+SBT or SBL+NBT - HCM6 does not show reductions for permitted left turns

Signalized Intersection V/C Calculation Summary

EVENING PEAK HOUR

Intersection 3: SW Ibach Street at SW Boones Ferry Road

2021 Existing	Permitted Left-Turn Phasing				Protected/Permitted Left-Turn Phasing					
Critical Movement:	EBL	EBTR		WBLTR	NBL	NBTR		SBL	SBT	SBR
Adjusted Flow Rate:	156	141		8	191	409		11	756	206
Saturated Flow:	1369	1560		1180	1753	1840		1781	1870	1573
Flow Ratio:	0.11	0.09		0.01	0.11	0.22		0.01	0.40	0.13
			0.11				0.51			

Sum of Critical Flow Ratios:	0.63
Cycle Length (seconds):	72.5
Lost Time per phase (seconds):	4
Number of Phases	3
Critical Intersection V/C:	0.75

2024 Background	Permitted Left-Turn Phasing				Protected/Permitted Left-Turn Phasing					
Critical Movement:	EBL	EBTR		WBLTR	NBL	NBTR		SBL	SBT	SBR
Adjusted Flow Rate:	166	62		9	202	435		12	802	235
Saturated Flow:	1349	1558		1541	1753	1839		1781	1870	1573
Flow Ratio:	0.12	0.04		0.01	0.12	0.24		0.01	0.43	0.15
			0.12				0.54			

Sum of Critical Flow Ratios:	0.67
Cycle Length (seconds):	78
Lost Time per phase (seconds):	4
Number of Phases	3
Critical Intersection V/C:	0.79

2026 Background	Permitted Left-Turn Phasing				Protected/Permitted Left-Turn Phasing					
Critical Movement:	EBL	EBTR		WBLTR	NBL	NBTR		SBL	SBT	SBR
Adjusted Flow Rate:	172	68		10	209	458		12	844	245
Saturated Flow:	1348	1559		1542	1753	1839		1781	1870	1573
Flow Ratio:	0.13	0.04		0.01	0.12	0.25		0.01	0.45	0.16
			0.13				0.57			

Sum of Critical Flow Ratios:	0.70
Cycle Length (seconds):	82.6
Lost Time per phase (seconds):	4
Number of Phases	3
Critical Intersection V/C:	0.82

2024 Buildout	Permitted Left-Turn Phasing				Protected/Permitted Left-Turn Phasing					
Critical Movement:	EBL	EBTR		WBLTR	NBL	NBTR		SBL	SBT	SBR
Adjusted Flow Rate:	166	67		9	205	453		12	835	235
Saturated Flow:	1348	1558		1537	1753	1839		1781	1870	1573
Flow Ratio:	0.12	0.04		0.01	0.12	0.25		0.01	0.45	0.15
			0.12				0.56			

Sum of Critical Flow Ratios:	0.69
Cycle Length (seconds):	80.9
Lost Time per phase (seconds):	4
Number of Phases	3
Critical Intersection V/C:	0.81

2026 Buildout	Permitted Left-Turn Phasing				Protected/Permitted Left-Turn Phasing					
Critical Movement:	EBL	EBTR		WBLTR	NBL	NBTR		SBL	SBT	SBR
Adjusted Flow Rate:	172	79		10	217	53		12	921	245
Saturated Flow:	1347	1558		1536	1753	1839		1781	1870	1574
Flow Ratio:	0.13	0.05		0.01	0.12	0.03		0.01	0.49	0.16
			0.13				0.62			

Sum of Critical Flow Ratios:	0.74
Cycle Length (seconds):	88
Lost Time per phase (seconds):	4
Number of Phases	3
Critical Intersection V/C:	0.86

2026 Buildout w/ BCE	Permitted Left-Turn Phasing				Protected/Permitted Left-Turn Phasing					
Critical Movement:	EBL	EBTR		WBLTR	NBL	NBTR		SBL	SBT	SBR
Adjusted Flow Rate:	172	75		10	214	496		12	908	245
Saturated Flow:	1347	1558		1537	1753	1839		1781	1870	1574
Flow Ratio:	0.13	0.05		0.01	0.12	0.27		0.01	0.49	0.16
			0.13				0.61			

Sum of Critical Flow Ratios:	0.74
Cycle Length (seconds):	87.1
Lost Time per phase (seconds):	4
Number of Phases	3
Critical Intersection V/C:	0.85

Notes:

Since EB and WB left-turn phases are permitted, critical ring is maximum of any lane group.

Since NB and SB left-turn phases are protected, critical ring is either EBL+WBT or WBL+EBT - HCM6 does not show reductions for permitted left turns

Signalized Intersection V/C Calculation Summary

EVENING PEAK HOUR

Intersection 8: SW Day Road at SW Boones Ferry Road

2021 Existing	Permited Left-Turn Phasing (w/ Right-Turn Overlap)			Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBLTR	NBL	NBTR	SBL	SBTR	Sum of Critical Flow Ratios:	0.56	Critical Intersection V/C:	0.61
Adjusted Flow Rate:	3	568	0	616	560	0	740	Cycle Length (seconds):	105		
Saturated Flow:	1418	1585	1900	2827	1856	1795	3621	Lost Time per phase (seconds):	4		
Flow Ratio:	0.00	0.36	0.00	0.22	0.30	0.00	0.20	Number of Phases	2		
	0.36			0.20							

2024 Background	Permited Left-Turn Phasing (w/ Right-Turn Overlap)			Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBLTR	NBL	NBTR	SBL	SBTR	Sum of Critical Flow Ratios:	0.65	Critical Intersection V/C:	0.71
Adjusted Flow Rate:	3	695	0	653	594	0	782	Cycle Length (seconds):	105		
Saturated Flow:	1418	1585	1900	2827	1856	1795	3622	Lost Time per phase (seconds):	4		
Flow Ratio:	0.00	0.44	0.00	0.23	0.32	0.00	0.22	Number of Phases	2		
	0.44			0.22							

2026 Background	Permited Left-Turn Phasing (w/ Right-Turn Overlap)			Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBLTR	NBL	NBTR	SBL	SBTR	Sum of Critical Flow Ratios:	0.72	Critical Intersection V/C:	0.78
Adjusted Flow Rate:	6	777	0	678	628	0	820	Cycle Length (seconds):	105		
Saturated Flow:	1418	1585	1900	2827	1856	1795	3622	Lost Time per phase (seconds):	4		
Flow Ratio:	0.00	0.49	0.00	0.24	0.34	0.00	0.23	Number of Phases	2		
	0.49			0.23							

2024 Buildout	Permited Left-Turn Phasing (w/ Right-Turn Overlap)			Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBLTR	NBL	NBTR	SBL	SBTR	Sum of Critical Flow Ratios:	0.69	Critical Intersection V/C:	0.75
Adjusted Flow Rate:	12	746	0	653	627	0	808	Cycle Length (seconds):	105		
Saturated Flow:	1418	1585	1900	2827	1856	1795	3619	Lost Time per phase (seconds):	4		
Flow Ratio:	0.01	0.47	0.00	0.23	0.34	0.00	0.22	Number of Phases	2		
	0.47			0.22							

2026 Buildout	Permited Left-Turn Phasing (w/ Right-Turn Overlap)			Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBLTR	NBL	NBTR	SBL	SBTR	Sum of Critical Flow Ratios:	0.73	Critical Intersection V/C:	0.79
Adjusted Flow Rate:	30	777	0	678	709	0	881	Cycle Length (seconds):	105		
Saturated Flow:	1418	1585	1900	2827	1856	1795	3615	Lost Time per phase (seconds):	4		
Flow Ratio:	0.02	0.49	0.00	0.24	0.38	0.00	0.24	Number of Phases	2		
	0.49			0.24							

2026 Buildout w/ BCE	Permited Left-Turn Phasing (w/ Right-Turn Overlap)			Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBLTR	NBL	NBTR	SBL	SBTR	Sum of Critical Flow Ratios:	0.62	Critical Intersection V/C:	0.67
Adjusted Flow Rate:	6	529	0	474	912	0	1061	Cycle Length (seconds):	105		
Saturated Flow:	1418	1585	1900	2827	1856	1795	3667	Lost Time per phase (seconds):	4		
Flow Ratio:	0.00	0.33	0.00	0.17	0.49	0.00	0.29	Number of Phases	2		
	0.33			0.29							

Notes:

Since EB and WB left-turn phases are permitted, critical ring is maximum of any left or through lane group unless EBR > EBT+NBL or WBR > WBT+SBL.

Since NB and SB left-turn phases are protected, critical ring is either NBL+SBT or SBL+NBT unless EBR > EBT+NBL or WBR > WBT+SBL.

Signalized Intersection V/C Calculation Summary

EVENING PEAK HOUR

Intersection 9: SW 95th Avenue at SW Boones Ferry Road

2021 Existing	Permited Left-Turn Phasing (w/ Right-Turn Overlap)				Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBL	WBTR	NBL	NBTR	SBL	SBT	Sum of Critical Flow Ratios:	0.67	Critical Intersection V/C:	0.76
Adjusted Flow Rate:	229	790	47	23	573	886	3	1121	Cycle Length (seconds):	105		
Saturated Flow:	1260	2634	685	1784	3291	3466	1767	3526	Lost Time per phase (seconds):	4		
Flow Ratio:	0.18	0.30	0.07	0.01	0.17	0.26	0.00	0.32	Number of Phases	3		
		0.18				0.49						

2024 Background	Permited Left-Turn Phasing (w/ Right-Turn Overlap)				Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBL	WBTR	NBL	NBTR	SBL	SBT	Sum of Critical Flow Ratios:	0.72	Critical Intersection V/C:	0.81
Adjusted Flow Rate:	243	836	50	24	607	939	3	1189	Cycle Length (seconds):	105		
Saturated Flow:	1255	2634	656	1787	3291	3466	1767	3526	Lost Time per phase (seconds):	4		
Flow Ratio:	0.19	0.32	0.08	0.01	0.18	0.27	0.00	0.34	Number of Phases	3		
		0.19				0.52						

2026 Background	Permited Left-Turn Phasing (w/ Right-Turn Overlap)				Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBL	WBTR	NBL	NBTR	SBL	SBT	Sum of Critical Flow Ratios:	0.75	Critical Intersection V/C:	0.84
Adjusted Flow Rate:	252	869	52	26	630	986	3	1241	Cycle Length (seconds):	105		
Saturated Flow:	1244	2634	636	1782	3291	3466	1767	3526	Lost Time per phase (seconds):	4		
Flow Ratio:	0.20	0.33	0.08	0.01	0.19	0.28	0.00	0.35	Number of Phases	3		
		0.20				0.54						

2024 Buildout	Permited Left-Turn Phasing (w/ Right-Turn Overlap)				Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBL	WBTR	NBL	NBTR	SBL	SBT	Sum of Critical Flow Ratios:	0.72	Critical Intersection V/C:	0.81
Adjusted Flow Rate:	243	836	50	24	607	972	3	1207	Cycle Length (seconds):	105		
Saturated Flow:	1255	2634	656	1787	3291	3466	1767	3526	Lost Time per phase (seconds):	4		
Flow Ratio:	0.19	0.32	0.08	0.01	0.18	0.28	0.00	0.34	Number of Phases	3		
		0.19				0.53						

2026 Buildout	Permited Left-Turn Phasing (w/ Right-Turn Overlap)				Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBL	WBTR	NBL	NBTR	SBL	SBT	Sum of Critical Flow Ratios:	0.76	Critical Intersection V/C:	0.86
Adjusted Flow Rate:	252	869	52	26	630	1069	3	1289	Cycle Length (seconds):	105		
Saturated Flow:	1244	2634	636	1781	3291	3467	1767	3526	Lost Time per phase (seconds):	4		
Flow Ratio:	0.20	0.33	0.08	0.01	0.19	0.31	0.00	0.37	Number of Phases	3		
		0.20				0.56						

2026 Buildout w/ BCE	Permited Left-Turn Phasing (w/ Right-Turn Overlap)				Protected Left-Turn Phasing							
Critical Movement:	EBLT	EBR	WBL	WBTR	NBL	NBTR	SBL	SBT	Sum of Critical Flow Ratios:	0.76	Critical Intersection V/C:	0.86
Adjusted Flow Rate:	252	869	52	26	630	1069	3	1289	Cycle Length (seconds):	105		
Saturated Flow:	1251	2723	636	1781	3291	3467	1767	3526	Lost Time per phase (seconds):	4		
Flow Ratio:	0.20	0.32	0.08	0.01	0.19	0.31	0.00	0.37	Number of Phases	3		
		0.20				0.56						

Notes:

Since EB and WB left-turn phases are permitted, critical ring is maximum of any left or through lane group unless EBR > EBT+NBL or WBR > WBT+SBL.

Since NB and SB left-turn phases are protected, critical ring is either NBL+SBT or SBL+NBT unless EBR > EBT+NBL or WBR > WBT+SBL.

Signalized Intersection V/C Calculation Summary

EVENING PEAK HOUR

Intersection 10: I-5 Southbound Ramps at SW Elligson Road

2021 Existing	Unique Phasing		Unique Overlap					
Critical Movement:	EBT	WBT	SBLT	SBR	Sum of Critical Flow Ratios:	0.60	Critical Intersection V/C:	0.65
Adjusted Flow Rate:	1058	663	646	700	Cycle Length (seconds):	105		
Saturated Flow:	3505	3505	3230	1711	Lost Time per phase (seconds):	4		
Flow Ratio:	0.30	0.19	0.20	0.41	Number of Phases	2		
	0.19		0.41					

2024 Background	Unique Phasing		Unique Overlap					
Critical Movement:	EBT	WBT	SBLT	SBR	Sum of Critical Flow Ratios:	0.65	Critical Intersection V/C:	0.70
Adjusted Flow Rate:	1122	703	685	761	Cycle Length (seconds):	105		
Saturated Flow:	3505	3505	3230	1711	Lost Time per phase (seconds):	4		
Flow Ratio:	0.32	0.20	0.21	0.44	Number of Phases	2		
	0.20		0.44					

2026 Background	Unique Phasing		Unique Overlap					
Critical Movement:	EBT	WBT	SBLT	SBR	Sum of Critical Flow Ratios:	0.68	Critical Intersection V/C:	0.74
Adjusted Flow Rate:	1169	735	709	810	Cycle Length (seconds):	105		
Saturated Flow:	3505	3505	3230	1711	Lost Time per phase (seconds):	4		
Flow Ratio:	0.33	0.21	0.22	0.47	Number of Phases	2		
	0.21		0.47					

2024 Buildout	Unique Phasing		Unique Overlap					
Critical Movement:	EBT	WBT	SBLT	SBR	Sum of Critical Flow Ratios:	0.66	Critical Intersection V/C:	0.72
Adjusted Flow Rate:	1135	722	685	781	Cycle Length (seconds):	105		
Saturated Flow:	3505	3505	3230	1711	Lost Time per phase (seconds):	4		
Flow Ratio:	0.32	0.21	0.21	0.46	Number of Phases	2		
	0.21		0.46					

2026 Buildout	Unique Phasing		Unique Overlap					
Critical Movement:	EBT	WBT	SBLT	SBR	Sum of Critical Flow Ratios:	0.72	Critical Intersection V/C:	0.78
Adjusted Flow Rate:	1203	782	709	857	Cycle Length (seconds):	105		
Saturated Flow:	3505	3505	3230	1711	Lost Time per phase (seconds):	4		
Flow Ratio:	0.34	0.22	0.22	0.50	Number of Phases	2		
	0.22		0.50					

2026 Buildout w/ BCE	Unique Phasing		Unique Overlap					
Critical Movement:	EBT	WBT	SBLT	SBR	Sum of Critical Flow Ratios:	0.72	Critical Intersection V/C:	0.78
Adjusted Flow Rate:	1203	782	709	857	Cycle Length (seconds):	105		
Saturated Flow:	3505	3505	3230	1711	Lost Time per phase (seconds):	4		
Flow Ratio:	0.34	0.22	0.22	0.50	Number of Phases	2		
	0.22		0.50					

Notes:

Since this intersection has unique phasing and overlap, the critical rings are either EBT+SBLT or WBT+SBR.

Signalized Intersection V/C Calculation Summary

EVENING PEAK HOUR

Intersection 11: I-5 Northbound Ramps at SW Elligsen Road

2021 Existing	Permitted Left-Turn Phasing		Single Approach					
Critical Movement:	EBT	WBT	NBL		Sum of Critical Flow Ratios:	0.38	Critical Intersection V/C:	0.41
Adjusted Flow Rate:	1010	771	325		Cycle Length (seconds):	105		
Saturated Flow:	3589	3770	3401		Lost Time per phase (seconds):	4		
Flow Ratio:	0.28	0.20	0.10		Number of Phases	2		
	0.28		0.10					

2024 Background	Permitted Left-Turn Phasing		Single Approach					
Critical Movement:	EBT	WBT	NBL		Sum of Critical Flow Ratios:	0.40	Critical Intersection V/C:	0.43
Adjusted Flow Rate:	1070	818	345		Cycle Length (seconds):	105		
Saturated Flow:	3589	3770	3401		Lost Time per phase (seconds):	4		
Flow Ratio:	0.30	0.22	0.10		Number of Phases	2		
	0.30		0.10					

2026 Background	Permitted Left-Turn Phasing		Single Approach					
Critical Movement:	EBT	WBT	NBL		Sum of Critical Flow Ratios:	0.42	Critical Intersection V/C:	0.45
Adjusted Flow Rate:	1113	852	362		Cycle Length (seconds):	105		
Saturated Flow:	3589	3770	3401		Lost Time per phase (seconds):	4		
Flow Ratio:	0.31	0.23	0.11		Number of Phases	2		
	0.31		0.11					

2024 Buildout	Permitted Left-Turn Phasing		Single Approach					
Critical Movement:	EBT	WBT	NBL		Sum of Critical Flow Ratios:	0.40	Critical Intersection V/C:	0.44
Adjusted Flow Rate:	1076	827	355		Cycle Length (seconds):	105		
Saturated Flow:	3589	3770	3401		Lost Time per phase (seconds):	4		
Flow Ratio:	0.30	0.22	0.10		Number of Phases	2		
	0.30		0.10					

2026 Buildout	Permitted Left-Turn Phasing		Single Approach					
Critical Movement:	EBT	WBT	NBL		Sum of Critical Flow Ratios:	0.43	Critical Intersection V/C:	0.46
Adjusted Flow Rate:	1127	877	387		Cycle Length (seconds):	105		
Saturated Flow:	3589	3770	3401		Lost Time per phase (seconds):	4		
Flow Ratio:	0.31	0.23	0.11		Number of Phases	2		
	0.31		0.11					

2026 Buildout w/ BCE	Permitted Left-Turn Phasing		Single Approach					
Critical Movement:	EBT	WBT	NBL		Sum of Critical Flow Ratios:	0.43	Critical Intersection V/C:	0.46
Adjusted Flow Rate:	1127	877	387		Cycle Length (seconds):	105		
Saturated Flow:	3589	3770	3401		Lost Time per phase (seconds):	4		
Flow Ratio:	0.31	0.23	0.11		Number of Phases	2		
	0.31		0.11					

Notes:

Since EB and WB left-turn phases are permitted, critical ring is maximum of any lane group.

Since only one approach exists, critical ring is max of NB lane groups or max of SB lane groups

Signalized Intersection V/C Calculation Summary

MORNING PEAK HOUR

Intersection 7: SW Basalt Creek Parkway at SW Boones Ferry Road

2026 Buildout w/ BCE	Permited Left-Turn Phasing (w/ Right-Turn Overlap)		Protected Left-Turn Phasing		
Critical Movement:	EBLT	EBR	NBL	NBTR	SBTR
Adjusted Flow Rate:	176	334	369	640	785
Saturated Flow:	1810	1610	1725	1811	1790
Flow Ratio:	0.10	0.21	0.21	0.35	0.44
	0.10		0.65		

Sum of Critical Flow Ratios:	0.75	Critical Intersection V/C:	0.86
Cycle Length (seconds):	95		
Lost Time per phase (seconds):	4		
Number of Phases	3		

EVENING PEAK HOUR

Intersection 7: SW Basalt Creek Parkway at SW Boones Ferry Road

2026 Buildout w/ BCE	Permited Left-Turn Phasing (w/ Right-Turn Overlap)		Protected Left-Turn Phasing		
Critical Movement:	EBLT	EBR	NBL	NBTR	SBTR
Adjusted Flow Rate:	41	256	209	738	925
Saturated Flow:	1810	1610	1767	1856	1841
Flow Ratio:	0.02	0.16	0.12	0.40	0.50
	0.16		0.50		

Sum of Critical Flow Ratios:	0.66	Critical Intersection V/C:	0.72
Cycle Length (seconds):	105		
Lost Time per phase (seconds):	4		
Number of Phases	2		

Notes:

Since EB and WB left-turn phases are permitted, critical ring is maximum of any left or through lane group unless EBR > EBT+NBL or WBR > WBT+SBL.

Since NB and SB left-turn phases are protected, critical ring is either NBL+SBT or SBL+NBT unless EBR > EBT+NBL or WBR > WBT+SBL.

Signalized Intersection V/C Calculation Summary

EVENING PEAK HOUR

Intersection 10: I-5 Southbound Ramps at SW Elligson Road + RTP Ramp Project #11489

2026 Background AM	Unique Phasing		Unique Overlap					
Critical Movement:	EBT	WBT	SBLT	SBR	Sum of Critical Flow Ratios:	0.58	Critical Intersection V/C:	0.63
Adjusted Flow Rate:	1021	788	574	1024	Cycle Length (seconds):	95		
Saturated Flow:	3034	3406	3146	2955	Lost Time per phase (seconds):	4		
Flow Ratio:	0.34	0.23	0.18	0.35	Number of Phases	2		
	0.23		0.35					

2026 Buildout AM	Unique Phasing		Unique Overlap					
Critical Movement:	EBT	WBT	SBLT	SBR	Sum of Critical Flow Ratios:	0.60	Critical Intersection V/C:	0.66
Adjusted Flow Rate:	1076	803	574	1090	Cycle Length (seconds):	95		
Saturated Flow:	3034	3406	3146	2955	Lost Time per phase (seconds):	4		
Flow Ratio:	0.35	0.24	0.18	0.37	Number of Phases	2		
	0.24		0.37					

2026 Background PM	Unique Phasing		Unique Overlap					
Critical Movement:	EBT	WBT	SBLT	SBR	Sum of Critical Flow Ratios:	0.55	Critical Intersection V/C:	0.60
Adjusted Flow Rate:	1169	735	709	786	Cycle Length (seconds):	105		
Saturated Flow:	3505	3505	3230	3011	Lost Time per phase (seconds):	4		
Flow Ratio:	0.33	0.21	0.22	0.26	Number of Phases	2		
	0.33		0.22					

2026 Buildout PM	Unique Phasing		Unique Overlap					
Critical Movement:	EBT	WBT	SBLT	SBR	Sum of Critical Flow Ratios:	0.56	Critical Intersection V/C:	0.61
Adjusted Flow Rate:	1203	782	709	835	Cycle Length (seconds):	105		
Saturated Flow:	3505	3505	3230	3011	Lost Time per phase (seconds):	4		
Flow Ratio:	0.34	0.22	0.22	0.28	Number of Phases	2		
	0.34		0.22					

Notes:

Since this intersection has unique phasing and overlap, the critical rings are either EBT+SBLT or WBT+SBR.

Intersection: 6: SW Boones Ferry Road & Site Access

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	TR
Maximum Queue (ft)	31	187	128	6	72	10	44	32
Average Queue (ft)	4	65	24	0	6	0	9	2
95th Queue (ft)	19	136	60	4	35	6	32	15
Link Distance (ft)	318	1445			601			1805
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			150	150		150	150	
Storage Blk Time (%)		4						
Queuing Penalty (veh)		2						

Network Summary

Network wide Queuing Penalty: 2

Queuing and Blocking Report

09/20/2021

Intersection: 6: SW Boones Ferry Road & Site Access

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	TR
Maximum Queue (ft)	18	109	29	30	22	26	55	38
Average Queue (ft)	2	40	13	1	1	1	19	2
95th Queue (ft)	13	84	29	10	10	13	44	17
Link Distance (ft)	318	1810			670			1804
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			150	150		150	150	
Storage Blk Time (%)		0						
Queuing Penalty (veh)		0						

Appendix E – Commercial Scenarios

Memorandum: Supplement to Autumn Subdivision TIS
Evaluation of Potential Commercial

lancaster
mobley

321 SW 4th Ave., Suite 400
Portland, OR 97204
503.248.0313
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Memorandum

To: **Mike McCarthy, City of Tualatin**

Copy: **David Force, Lennar Northwest**
Mimi Doukas, AKS Engineering & Forestry, LLC

From: **Jennifer Danziger, PE,**

Date: **September 20, 2021**

Subject: **Supplement to Autumn Subdivision TIS – Evaluation of Potential Commercial**

REGISTERED PROFESSIONAL ENGINEER
16168
Jennifer E. Danziger
OREGON
SEPT. 15, 1992
JENNIFER ELISE DANZIGER
RENEWS: 12.31.21

Introduction

This memorandum supplements the proposed Autumn Sunrise Subdivision Transportation Impact Study (TIS) with three development alternatives on the commercially-zoned parcels abutting SW Boones Ferry Road. These parcels are not part of the subdivision; the specific timing and type of development that could occur on these parcels is unknown.

Commercial Development Concepts

The Neighborhood Commercial (CN) zoning abutting SW Boones Ferry Road will be divided into two parcels to accommodate the proposed Autumn Sunrise site access at SW Boones Ferry Road. The attached site plan shows how the area could potentially be developed. In addition to the proposed stormwater facility, the parcel could accommodate a 3,600-square-foot (SF) building with parking north of the site access and a 10,000-SF building with parking to the south. Both parking lots would take access from the proposed site access approximately 100 feet east of SW Boones Ferry Road.

Tualatin Development Code (TDC) Chapter 51 establishes the standards for the CN zone. According to the TDC, "the primary uses are intended to include professional offices, services, and retail oriented to the day-to-day needs of adjacent neighborhoods." Commercial uses in the CN zone are extremely limited. With that in mind, and considering community feedback a public meetings, two potential concepts were developed for the two buildings:

1. 13,600 SF of general retail in the two buildings
2. 5,000 SF of day care center in one building plus 8,600 of general retail in the remaining space

Trip Generation

To estimate trips generated by the three potential development concepts, trip rates from the *Trip Generation Manual*[1] were used. Within the general retail, permitted uses under TDC Chapter 51 are limited to general

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[1] Institute of Transportation Engineers (ITE), *Trip Generation Manual*, 10th Edition, 2017.

merchandise or variety stores such as small food stores (<4,000 SF), drug stores, laundry and dry cleaning, beauty and barber shops, and shoe repair. Trip generation rates for many of these uses are non-existent or very limited; therefore, Land Use 820 – *Shopping Center* was applied for the general retail components of the concepts. Land Use 565 – *Day Care Center* was applied for the other concept. All trip generation is based on gross floor area. Table 1 presents a comparison of trip generation for the three development concepts.

Table 1: Trip Generation Summary

Description (ITE Code)	Intensity (DU)	Morning Peak Hour			Evening Peak Hour			Daily Trips
		In	Out	Total	In	Out	Total	
Concept 1								
Shopping Center (820)	13.6 KSF	8	5	13	25	27	52	514
Internal with Autumn Sunrise		*-1*	*-1*	*-2*	*-3*	*-7*	*-10*	*NA*
Total External		7	4	11	22	20	42	NA
Concept 2								
Day Care Center (565)	5 KSF	29	26	55	26	30	56	119
Shopping Center (820)	8.6 KSF	5	3	8	16	17	33	324
Subtotal		34	29	63	42	47	89	443
Internal with Autumn Sunrise		*-2*	*-1*	*-3*	*-4*	*-12*	*-16*	*NA*
Total External		32	28	60	38	35	73	NA

Although some of the uses may attract pass-by trips, the analysis was performed assuming all trips associated with the commercial development would pass through the site access intersection with SW Boones Ferry Road. However, trips that could be internal with the proposed Autumn Sunrise subdivision were accounted for based on the Transportation Research Board report, *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*.[2]

Trip Distribution

The directional distribution of potential commercial trips was assumed to be:

- Approximately 50 percent of traveling to/from the north on SW Boones Ferry Road
- Approximately 50 percent of traveling to/from the south on SW Boones Ferry Road

Trip Assignment

The resulting trip assignment is shown in Figure 1 for the site access intersection with SW Boones Ferry. Note, the intersection is shown as having four legs to account for the future configuration with a frontage road connection that will be opened with construction of the Basalt Creek Parkway Extension (BCPE).

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[2] Transportation Research Board, National Cooperative Highway Research Program Report 684, *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*, 2006.

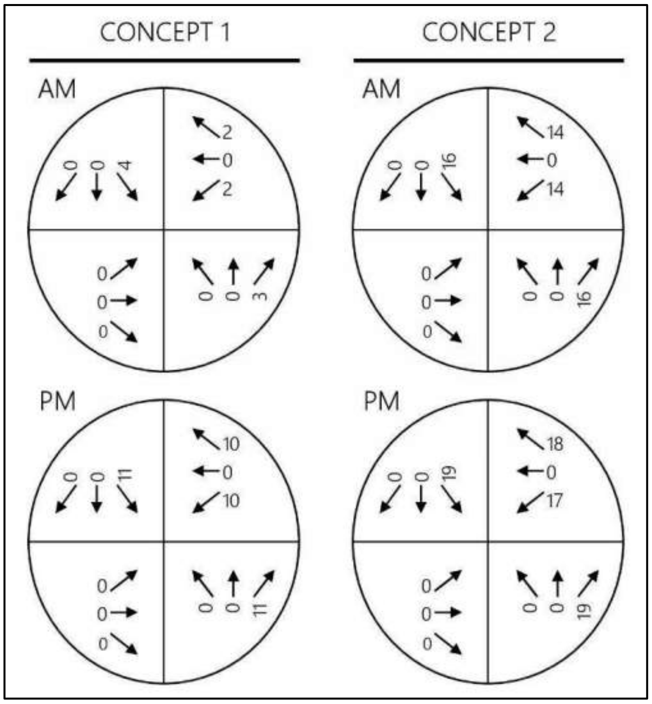


Figure 1: Potential Commercial Development Trip Assignment

Total Traffic – 2026 Buildout with BCPE

The potential commercial traffic for each concept was added to the year 2026 buildout forecast with the BSCE that was shown for Intersection 6 in Figure 6C of the Autumn Sunrise Subdivision TIS. The resulting volumes are shown in Figure 2.

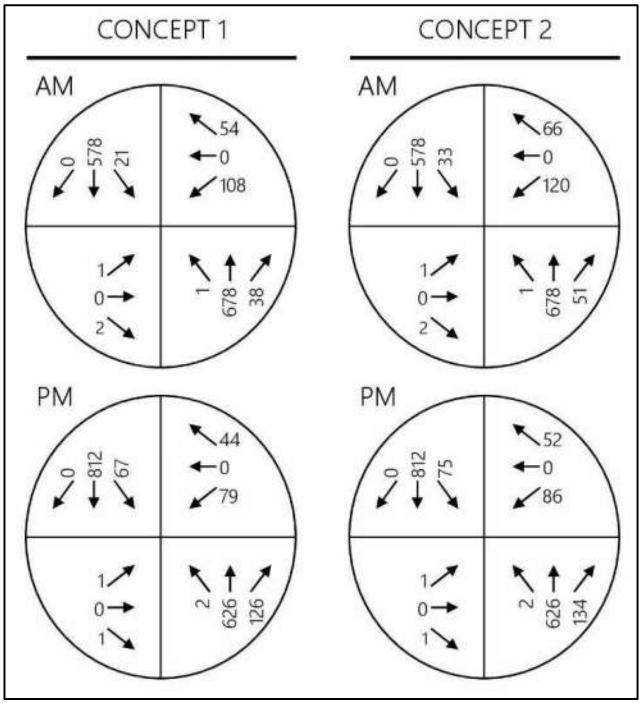


Figure 2: 2026 Buildout with BCPE and Potential Commercial Development

Warrant Analysis

Turn lane warrants and preliminary traffic signal warrants were examined for the study intersections where such treatments would be applicable.

Left-Turn Lane Warrants

SW Boones Ferry Road already has a center refuge lane that would be serve as a left-turn lane for the site access at that location; warrants were not evaluated.

Right-Turn Lane Warrants

Right-turn lane warrants were examined at the SW Boones Ferry Road site access under the Year 2026 buildout conditions. Table 9 of the TIS shows that northbound right-turn lane warrants are met at the proposed site access on SW Boones Ferry Road under the 2026 buildout scenario for both analysis periods. Given the 45-mph posted speed and higher traffic volumes, a northbound turn lane is recommended at this access.

Traffic Signal Warrants

Preliminary traffic signal warrants were examined at the site access intersection to determine whether the installation of a new traffic signal will be warranted with any of the potential commercial development concepts. The preliminary warrants are typically calculated based on the evening peak hour volumes assuming the daily demand is 10 times the evening peak hour. Because the volumes were higher in the morning under some of the scenarios, the warrants were also evaluated considering a daily demand that is 10 times the morning peak hour., which is a less likely scenario. The results are summarized in Table 2 for Year 2026 conditions with full buildout of the proposed development and the BCPE plus the two commercial concepts. A two-lane (left-through and right) approach for the site access is assumed. Detailed information on the warrant analysis is attached.

Table 2: Preliminary Traffic Signal Warrants at the Site Access on SW Boones Ferry Road with BCPE

Scenario	Warrant Met?	
	Based on Morning Peak	Based on Evening Peak
Year 2026 Conditions	No	No
Year 2026 Conditions + Commercial Concept 1	No	No
Year 2026 Conditions + Commercial Concept 2	No	No

As shown in Table 2, preliminary traffic signal warrants are not met with the commercial concepts.

Operations Analysis

An operations analysis was conducted for site access intersection with SW Boones Ferry Road per the signalized and unsignalized intersection analysis methodologies in the *Highway Capacity Manual* (HCM)[3]. Intersections are generally evaluated based on the average control delay experienced by vehicles and are assigned a grade according to their operation. The level of service (LOS) of an intersection can range from LOS A, which indicates very little, or no delay experienced by vehicles, to LOS F, which indicates a high degree of congestion and delay.

---

[3] Transportation Research Board, *Highway Capacity Manual 6th Edition*, 2016.

The volume-to-capacity (v/c) ratio is a measure that compares the traffic volumes (demand) against the available capacity of an intersection.

Performance Standards

The following agency performance standards are applicable to the intersection:

- The **City of Tualatin** requires intersections to operate at a minimum D and E for signalized and unsignalized intersections, respectively.
- **Washington County** requires intersections to operate with a v/c ratio of 0.99 or less.

Delay & Capacity Analysis

The LOS, delay, and v/c results of the capacity analysis are shown in Table 3 for Year 2026 conditions with full buildout of the proposed development and the BCPE plus the two commercial concepts. A two-lane (left-through and right) approach for the site access is assumed. The northbound left is assumed to be striped as a two-way, left-turn lane for the unsignalized scenarios to allow for a two-stage left-turn movement from the site access. Detailed calculations are attached.

Table 3: Capacity Analysis Summary at the Site Access on SW Boones Ferry Road with BCPE

Intersection & Scenario	Morning Peak Hour			Evening Peak Hour		
	LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
Year 2026 Conditions with BCPE*	D	25	0.40	D	27	0.31
Year 2026 Conditions + Commercial Concept 1	D	26	0.41	D	30	0.37
Year 2026 Conditions + Commercial Concept 2	D	28	0.47	D	32	0.41

** The results of the analysis without the concepts differs slightly from those presented in the TIS because the evaluation in this table does not account for the influence of upstream traffic signals.*

As shown in Table 3, the intersection would meet performance standards with both commercial concepts with a two-lane approach for the site access.

Queuing

An analysis of queuing was conducted for the site access to identify how development of the commercial land could affect storage requirements for the site access intersection at SW Boones Ferry Road. The analysis was conducted based on the results of a SimTraffic simulation. Five (5) simulations were conducted, averaged, and the 95th percentile queue estimates were rounded up to the nearest 25 feet, or the approximate length of one vehicle to estimate the queue lengths.

Table 4 reports the 95th percentile queue estimates for the southbound left-turn, northbound left-turn, and the westbound left-through lanes. The northbound left is assumed to be striped as a two-way, left-turn lane to allow for a two-stage left-turn movement from the site access. However, SimTraffic cannot simulate this two-stage movement; therefore, the westbound left-turn queue estimates are conservatively long.

Table 4: Queue Lengths at the Site Access on SW Boones Ferry Road with BCPE

Intersection & Scenario	Morning Peak Hour			Evening Peak Hour		
	SB Left	NB Left	WB Left	SB Left	NB Left	WB Left
Year 2026 Conditions with BCPE	50 ft	<25 ft	150 ft	50 ft	<25 ft	100 ft
Year 2026 Conditions + Commercial Concept 2	50 ft	<25 ft	125 ft	50 ft	<25 ft	150 ft
Year 2026 Conditions + Commercial Concept 3	50 ft	<25 ft	200 ft	50 ft	<25 ft	175 ft

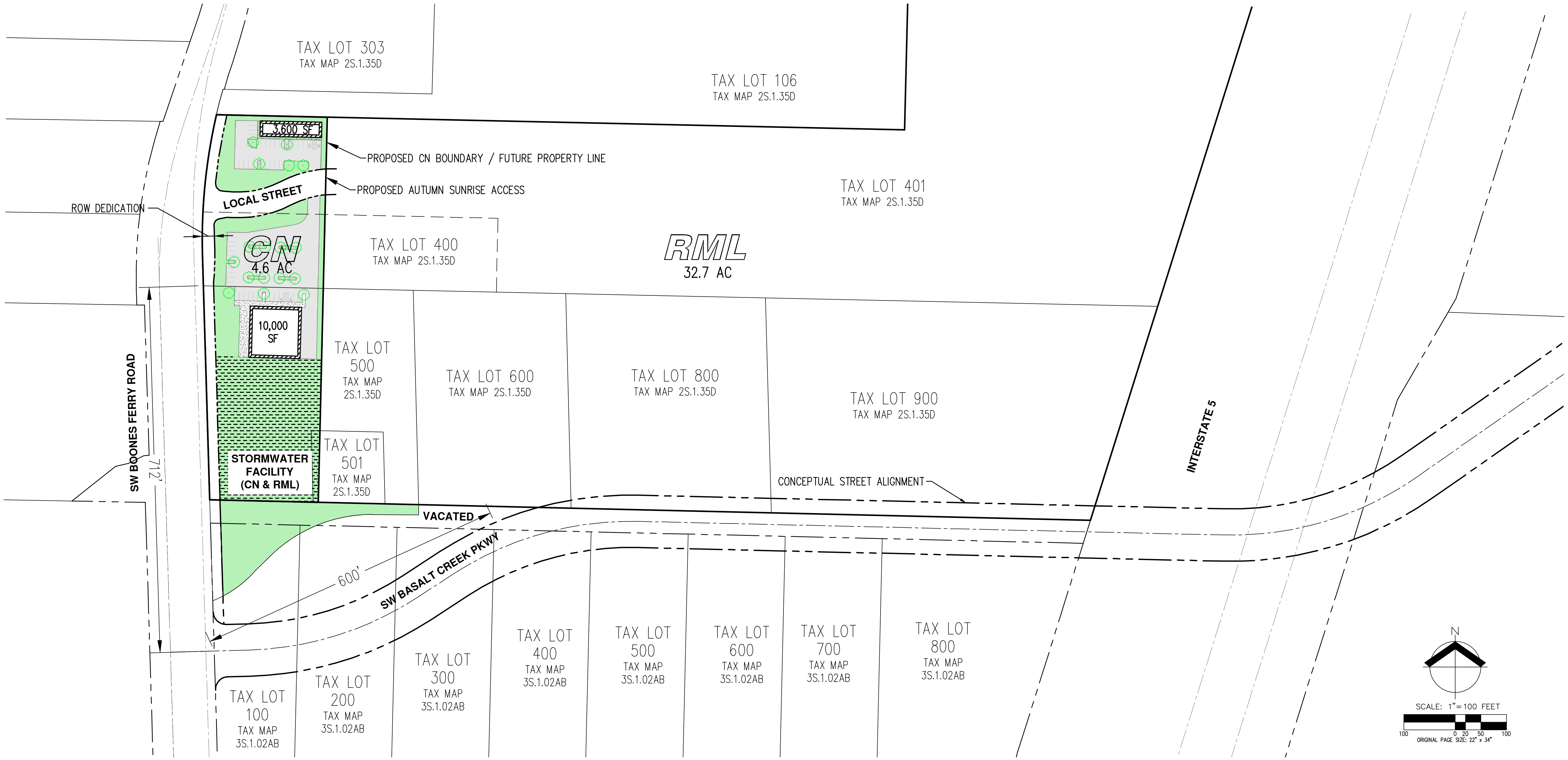
As shown in Table 4, under the most intensive concept, the maximum southbound storage requirement was estimated at:

- Two vehicles or 50 feet for the southbound left, which can easily be accommodated in the existing center refuge lane
- An occasional single vehicle or 25 feet for the northbound left, which can easily be accommodated in the existing center refuge lane
- Eight vehicles or 200 feet for the westbound left, which could be accommodated on the site access road without affecting the closest public street connection ("M" Street) to the east.

Conclusions

The conclusions below were developed as an exercise to understand how development of the commercially-zoned parcels abutting SW Boones Ferry Road could affect the configuration and traffic control at the site access ("H" Street) intersection. These parcels are not part of the subdivision; the specific timing and type of development that could occur on these parcels is unknown. Findings include:

- SW Boones Ferry Road already has a center refuge lane that would be serve as a left-turn lane for the site access at that location; warrants were not evaluated.
- The TIS recommends a northbound right-turn lane on SW Boones Ferry Road at the site access, no other conditions were evaluated.
- Preliminary traffic signal warrants would not be met with the commercial concepts and the two-lane (left-through and right) approach planned for the site access.
- The intersection at SW Boones Ferry Road would meet performance standards with both commercial concepts with a two-lane approach for the site access.
- Maximum queues were estimated at two vehicles or 50 feet for the southbound left, which can easily be accommodated in the existing center refuge lane
- Maximum queues were estimated at one vehicle or 25 feet for the northbound left, which can easily be accommodated in the existing center refuge lane
- Maximum queues were estimated at eight vehicles or 200 feet for a separate westbound left, which could be accommodated on the site access road without affecting the closest public street connection ("M" Street) to the east.



DATE: 08/30/2021 AKS JOB: 7454

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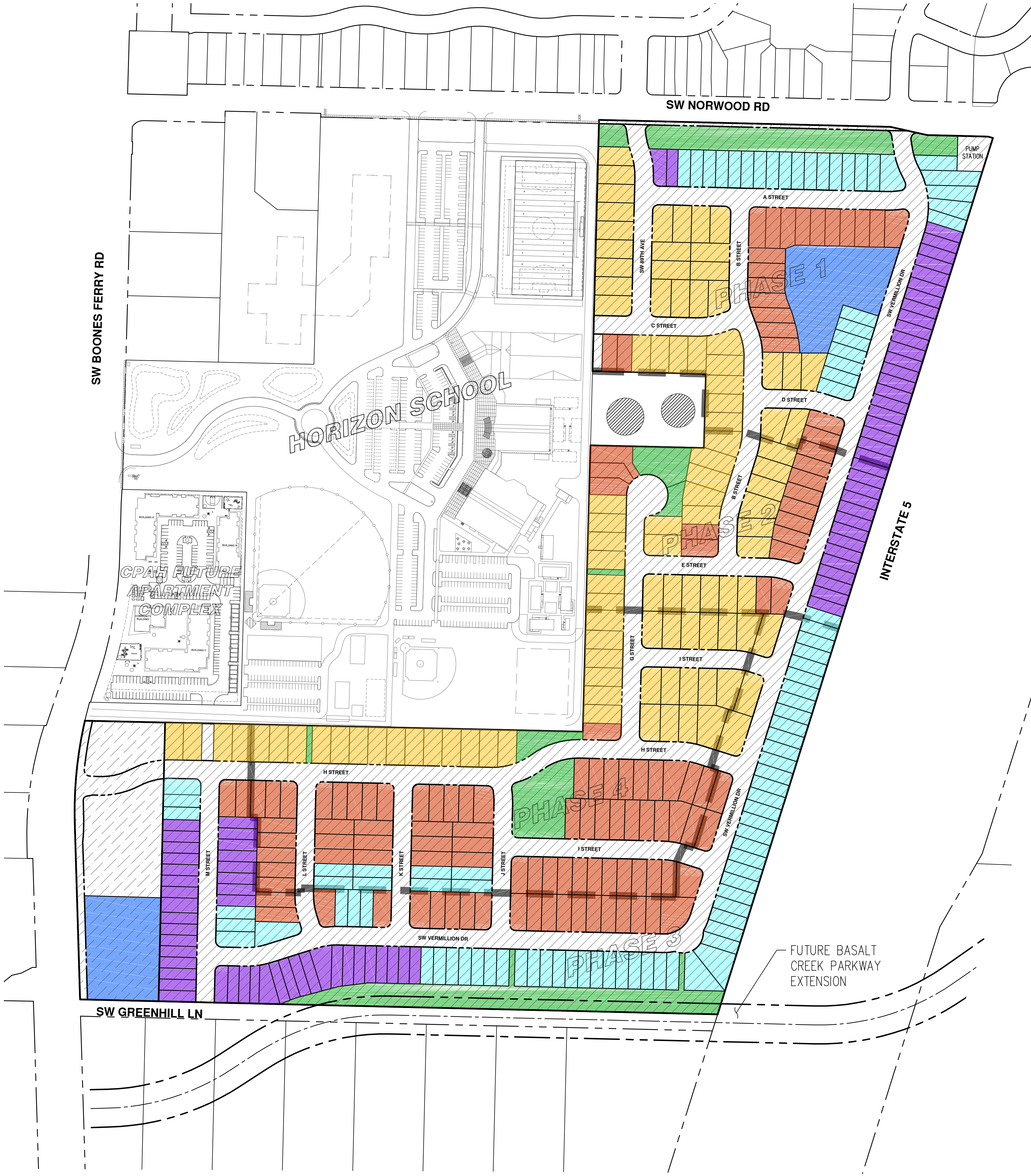
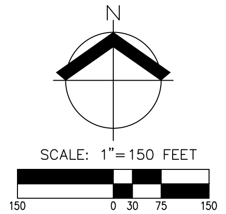
CONCEPTUAL COMMERCIAL LAYOUT
AUTUMN SUNRISE





▨ – CH ZONING

▨ – RML ZONING

DENSITY CALCULATIONS

RML ZONE	SQ. FT.	ACRES
GROSS SITE AREA:	± 2,688,206	± 61.71
PUBLIC R.O.W. DEDICATION AREA:	± 629,282	± 14.45
CITY RESERVIOR DEDICATION OPEN SPACE AREA:	± 12,879	± 0.30
PRIVATE STREET/ACCESS AREA:	± 5,718	± 0.13
STORMWATER FACILITY AREA:	± 155,691	± 3.57
COMMERCIAL AREA:	± 87,960	± 2.02
PUMP STATION DEDICATION AREA:	± 7,709	± 0.18
NET DEVELOPABLE:	± 1,788,967	± 41.07
AUTUMN SUNRISE SUBDIVISION		
MAXIMUM DENSITY (10 DU PER ACRE)	411	LOTS
MINIMUM DENSITY (7 DU PER ACRE)	287	LOTS

REQUIRED OPEN SPACE AREA (5% GROSS):	± 134,410	SQ. FT.
OPEN SPACE PROVIDED:	± 168,629	SQ. FT.

PLANNED DENSITY:	400	LOTS
AVERAGE LOT AREA (ALL DU):	± 4,151	SQ. FT.
AVERAGE LOT AREA FOR SF DETACHED DU	± 4,411	SQ. FT.
AVERAGE LOT AREA FOR SF ATTACHED DU	± 3,109	SQ. FT.

MAXIMUM LOT SIZE	± 7,731	SQ. FT.
MINIMUM LOT SIZE	± 2,546	SQ. FT.

LOT DIMENSION	HOUSE TYPE	PH-1	PH-2	PH-3	PH-4	TOTAL UNITS
🟨 50'x100'	Detached	35	25	7	35	102
🟥 40'x100'	Detached	21	15	25	60	121
🟦 34'x100'	Detached	29	1	59	8	97
🟪 29'x100'	Attached	24	14	42	-	80
	TOTAL UNITS	109	55	133	103	400

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LENNAR

PRODUCT DISTRIBUTION PLAN
AUTUMN SUNRISE SUBDIVISON
LENNAR NORTHWEST, INC.
TUALATIN, OREGON

PRELIMINARY
84806PE
DARKO SIMIC
RENEWAL DATE: 6/30/22

JOB NUMBER: 7454
DATE: 06/23/2021
DESIGNED BY: JSM
DRAWN BY: JSM
CHECKED BY: DS

PO-04

AKS DRAWING FILE: 7454 PRODUCT DIST.DWG | LAYOUT: PP-00

Shopping Center	820	13.6 KSF	8	5	13	25	27	52	514

Day Care Center	565	5 KSF	29	26	55	26	30	56	119
Shopping Center	820	8.6 KSF	5	3	8	16	17	33	324
Total Primary Trips			34	29	63	42	47	89	443

Option 1 - Basic Shopping Center (13.6 KSF)

	AM Peak			Internal % Initial		Internal Initial		Internal Balanced		External	
	In	Out	Total	In	Out	In	Out	In	Out	In	Out
Residential	67	204	271	2%	1%	1	2	1	1	66	203
Commercial 1	8	5	13	17%	14%	1	1	1	1	7	4

Option 2 - Day Care (5 KSF) + Basic Shopping Center (8.6 KSF)

	AM Peak			Internal % Initial		Internal Initial		Internal Balanced		External	
	In	Out	Total	In	Out	In	Out	In	Out	In	Out
Residential	67	207	274	2%	1%	1	2	1	2	66	205
Commercial 1	34	29	63	17%	14%	6	4	2	1	32	28

Option 1 - Basic Shopping Center (13.6 KSF)

	PM Peak			Internal % Initial		Internal Initial		Internal Balanced		External	
	In	Out	Total	In	Out	In	Out	In	Out	In	Out
Residential	225	133	358	46%	42%	104	56	7	3	218	130
Commercial 1	25	27	52	10%	26%	3	7	3	7	22	20

Option 2 - Day Care (5 KSF) + Basic Shopping Center (8.6 KSF)

	PM Peak			Internal % Initial		Internal Initial		Internal Balanced		External	
	In	Out	Total	In	Out	In	Out	In	Out	In	Out
Residential	225	133	358	46%	42%	104	56	12	4	213	129
Commercial 1	42	47	89	10%	26%	4	12	4	12	38	35

TRIP GENERATION CALCULATIONS

Land Use: Day Care Center
Land Use Code: 565
Setting/Location: General Urban/Suburban
Variable: 1,000 Sq Ft Gross Floor Area
Variable Value: 5

AM PEAK HOUR

Trip Rate: 11.00

	Enter	Exit	Total
Directional Distribution	53%	47%	
Trip Ends	29	26	55

PM PEAK HOUR

Trip Rate: 11.12

	Enter	Exit	Total
Directional Distribution	47%	53%	
Trip Ends	26	30	56

WEEKDAY

Trip Rate: 47.62

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	119	119	238

SATURDAY

Trip Rate: 6.22

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	16	16	32

Source: TRIP GENERATION, Tenth Edition

TRIP GENERATION CALCULATIONS

Land Use: Shopping Center
Land Use Code: 820
Setting/Location General Urban/Suburban
Variable: 1,000 Sq. Ft. GFA
Variable Value: 13.6

AM PEAK HOUR

Trip Rate: 0.94

	Enter	Exit	Total
Directional Distribution	62%	38%	
Trip Ends	8	5	13

PM PEAK HOUR

Trip Rate: 3.81

	Enter	Exit	Total
Directional Distribution	48%	52%	
Trip Ends	25	27	52

WEEKDAY

Trip Rate: 37.75

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	257	257	514

SATURDAY

Trip Rate: 46.12

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	314	314	628

Source: Trip Generation Manual, Tenth Edition

TRIP GENERATION CALCULATIONS

Land Use: Shopping Center
Land Use Code: 820
Setting/Location General Urban/Suburban
Variable: 1,000 Sq. Ft. GFA
Variable Value: 8.6

AM PEAK HOUR

Trip Rate: 0.94

	Enter	Exit	Total
Directional Distribution	62%	38%	
Trip Ends	5	3	8

PM PEAK HOUR

Trip Rate: 3.81

	Enter	Exit	Total
Directional Distribution	48%	52%	
Trip Ends	16	17	33

WEEKDAY

Trip Rate: 37.75

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	162	162	324

SATURDAY

Trip Rate: 46.12

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	198	198	396

Source: Trip Generation Manual, Tenth Edition

Preliminary Traffic Signal Warrant Summary

Intersection	Warrant Met?
Site Access at SW Boones Ferry Road	
Year 2026 Conditions (Based on AM) w/ 2-lane Exit	No
Year 2026 Conditions (Based on PM) w/ 2-lane Exit	No
Year 2026 Conditions (Based on AM) + Basic Shopping Center (13.6 KSF) w/ 2-lane Exit	No
Year 2026 Conditions (Based on PM) + Basic Shopping Center (13.6 KSF) w/ 2-lane Exit	No
Year 2026 Conditions (Based on AM) + Day Care (5 KSF) + Basic Shopping Center (8.6 KSF) w/ 2-lane Exit	No
Year 2026 Conditions (Based on PM) + Day Care (5 KSF) + Basic Shopping Center (8.6 KSF) w/ 2-lane Exit	No

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Conditions (Based on AM) w/ 2-lane Exit

Major Street:	SW Boones Ferry Road	Minor Street:	Site Access		
Number of Lanes:	1	Number of Lanes:	1		
AM Peak Hour Volumes:	1302	AM Peak Hour Volumes:	154	Total
			58	Rights
			100%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	13,020	8,850	
Minor Street*	960	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	13,020	13,300	
Minor Street*	960	1,350	No
Combination Warrant			
Major Street	13,020	10,640	
Minor Street*	960	2,120	No

* Minor street right-turning traffic volumes reduced by 100%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Conditions (Based on PM) w/ 2-lane Exit

Major Street:	SW Boones Ferry Road		Minor Street:	Site Access	
Number of Lanes:	1		Number of Lanes:	1	
PM Peak Hour Volumes:	1596		PM Peak Hour Volumes:	100	Total
				38	Rights
				100%	RT Discount

Warrant Used:

X 100 percent of standard warrants used
____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100% Warrants	70% Warrants	100% Warrants	70% Warrants
Major St.	Minor St.				
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	15,960	8,850	
Minor Street*	620	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	15,960	13,300	
Minor Street*	620	1,350	No
Combination Warrant			
Major Street	15,960	10,640	
Minor Street*	620	2,120	No

* Minor street right-turning traffic volumes reduced by 100%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Conditions (Based on AM) + Basic Shopping Center (13.6 KSF) w/ 2-lane Exit

Major Street:	SW Boones Ferry Road	Minor Street:	Site Access	
Number of Lanes:	1	Number of Lanes:	1	
PM Peak Hour Volumes:	1309	PM Peak Hour Volumes:	158	Total
			60	Rights
			100%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

______ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
<u>WARRANT 1, CONDITION A</u>		100%	70%	100%	70%
<u>Major St.</u>	<u>Minor St.</u>	<u>Warrants</u>	<u>Warrants</u>	<u>Warrants</u>	<u>Warrants</u>
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
<u>WARRANT 1, CONDITION B</u>					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	13,090	8,850	
Minor Street*	980	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	13,090	13,300	
Minor Street*	980	1,350	No
Combination Warrant			
Major Street	13,090	10,640	
Minor Street*	980	2,120	No

* Minor street right-turning traffic volumes reduced by 100%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Conditions (Based on PM) + Basic Shopping Center (13.6 KSF) w/ 2-lane Exit

Major Street:	SW Boones Ferry Road	Minor Street:	Site Access	
Number of Lanes:	1	Number of Lanes:	1	
PM Peak Hour Volumes:	1618	PM Peak Hour Volumes:	120	Total
			48	Rights
			100%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100% Warrants	70% Warrants	100% Warrants	70% Warrants
Major St.	Minor St.				
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	16,180	8,850	
Minor Street*	720	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	16,180	13,300	
Minor Street*	720	1,350	No
Combination Warrant			
Major Street	16,180	10,640	
Minor Street*	720	2,120	No

* Minor street right-turning traffic volumes reduced by 100%.

Preliminary Traffic Signal Warrant Analysis

Project:	21029 - Autumn Sunrise
Date:	9/20/2021
Scenario:	Year 2026 Conditions (Based on AM) + Day Care (5 KSF) + Basic Shopping Center (8.6 KSF) w/ 2-lane

Major Street:	SW Boones Ferry Road	Minor Street:	Site Access		
Number of Lanes:	1	Number of Lanes:	1		
PM Peak Hour Volumes:	1334	PM Peak Hour Volumes:	182	Total	
			72	Rights	
			100%	RT Discount	

Warrant Used:

X 100 percent of standard warrants used

______ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	13,340	8,850	
Minor Street*	1,100	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	13,340	13,300	
Minor Street*	1,100	1,350	No
Combination Warrant			
Major Street	13,340	10,640	
Minor Street*	1,100	2,120	No

* Minor street right-turning traffic volumes reduced by 100%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Conditions (Based on PM) + Day Care (5 KSF) + Basic Shopping Center (8.6 KSF) w/ 2-lane

Major Street:	SW Boones Ferry Road	Minor Street:	Site Access	
Number of Lanes:	1	Number of Lanes:	1	
PM Peak Hour Volumes:	1634	PM Peak Hour Volumes:	135	Total
			56	Rights
			100%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

_____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100% Warrants	70% Warrants	100% Warrants	70% Warrants
Major St.	Minor St.				
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

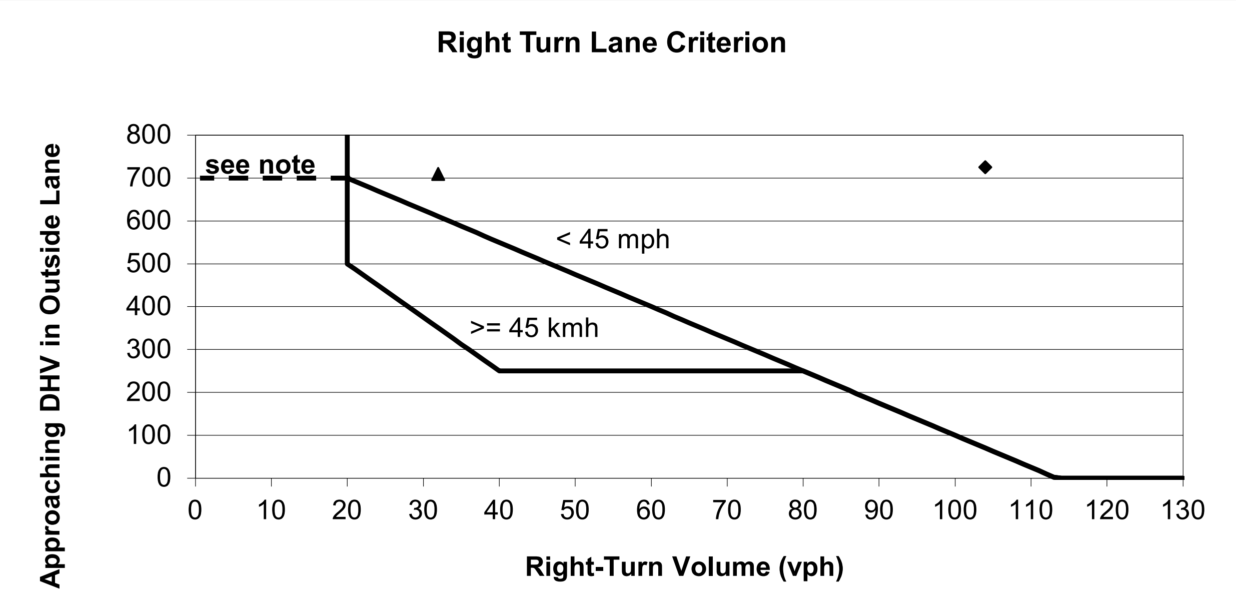
	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	16,340	8,850	
Minor Street*	790	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	16,340	13,300	
Minor Street*	790	1,350	No
Combination Warrant			
Major Street	16,340	10,640	
Minor Street*	790	2,120	No

* Minor street right-turning traffic volumes reduced by 100%.

Project: 21029 - Autumn Sunrise
Intersection: SW Boones Ferry Road/Site Access - Northbound
Date: 6/30/2021
Scenario: 2026 Buildout - Phases 1-4

Speed? 45 mph 72 kmh

AM Peak Hour		PM Peak Hour	
Right-Turn Volume	32	Right-Turn Volume	104
Approaching DHV	709	Approaching DHV	725
Lane Needed?	Yes	Lane Needed?	Yes



Note: If there is no right turn lane, a shoulder needs to be provided.
If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↑	↱	↰	↱	
Traffic Vol, veh/h	1	0	2	106	0	52	1	678	35	17	578	0
Future Vol, veh/h	1	0	2	106	0	52	1	678	35	17	578	0
Conflicting Peds, #/hr	0	0	0	4	0	4	0	0	4	4	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	150	-	150	150	-	-
Veh in Median Storage, #	-	0	-	-	2	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	0	2	0	2	6	6	5	5	2
Mvmt Flow	1	0	2	118	0	58	1	753	39	19	642	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1488	1478	646	1444	1439	761	642	0	0	796	0	0
Stage 1	680	680	-	759	759	-	-	-	-	-	-	-
Stage 2	808	798	-	685	680	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.15	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.245	-	-
Pot Cap-1 Maneuver	102	126	472	~ 111	133	409	943	-	-	813	-	-
Stage 1	441	451	-	402	415	-	-	-	-	-	-	-
Stage 2	375	398	-	441	451	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	85	122	470	~ 108	129	406	943	-	-	810	-	-
Mov Cap-2 Maneuver	85	122	-	295	310	-	-	-	-	-	-	-
Stage 1	441	441	-	400	413	-	-	-	-	-	-	-
Stage 2	320	396	-	427	441	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.6	21.9	0	0.3
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	943	-	-	187	295	406	810	-	-
HCM Lane V/C Ratio	0.001	-	-	0.018	0.399	0.142	0.023	-	-
HCM Control Delay (s)	8.8	-	-	24.6	25.1	15.3	9.6	-	-
HCM Lane LOS	A	-	-	C	D	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.8	0.5	0.1	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC

6: SW Boones Ferry Road & Site Access

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↑	↱	↰	↱	
Traffic Vol, veh/h	1	0	1	69	0	34	2	626	115	56	812	0
Future Vol, veh/h	1	0	1	69	0	34	2	626	115	56	812	0
Conflicting Peds, #/hr	0	0	0	2	0	2	0	0	2	2	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	150	-	150	150	-	-
Veh in Median Storage, #	-	0	-	-	2	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	95	92	95	92	95	95	95	95	92
Heavy Vehicles, %	2	2	2	0	2	0	2	3	3	2	2	2
Mvmt Flow	1	0	1	73	0	36	2	659	121	59	855	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1717	1759	857	1641	1638	663	855	0	0	782	0	0
Stage 1	973	973	-	665	665	-	-	-	-	-	-	-
Stage 2	744	786	-	976	973	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	71	85	357	81	100	465	785	-	-	836	-	-
Stage 1	303	330	-	453	458	-	-	-	-	-	-	-
Stage 2	407	403	-	305	330	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	62	79	356	76	92	463	785	-	-	834	-	-
Mov Cap-2 Maneuver	62	79	-	235	254	-	-	-	-	-	-	-
Stage 1	302	307	-	451	456	-	-	-	-	-	-	-
Stage 2	374	401	-	282	307	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	39.7	22.5	0	0.6
HCM LOS	E	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	785	-	-	106	235	463	834	-	-
HCM Lane V/C Ratio	0.003	-	-	0.021	0.309	0.077	0.071	-	-
HCM Control Delay (s)	9.6	-	-	39.7	27	13.4	9.6	-	-
HCM Lane LOS	A	-	-	E	D	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.3	0.2	0.2	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↑	↱	↰	↱	
Traffic Vol, veh/h	1	0	2	108	0	54	1	678	38	21	578	0
Future Vol, veh/h	1	0	2	108	0	54	1	678	38	21	578	0
Conflicting Peds, #/hr	0	0	0	4	0	4	0	0	4	4	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	150	-	150	150	-	-
Veh in Median Storage, #	-	0	-	-	2	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	0	2	0	2	6	6	5	5	2
Mvmt Flow	1	0	2	120	0	60	1	753	42	23	642	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1498	1489	646	1452	1447	761	642	0	0	799	0	0
Stage 1	688	688	-	759	759	-	-	-	-	-	-	-
Stage 2	810	801	-	693	688	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.15	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.245	-	-
Pot Cap-1 Maneuver	101	124	472	~ 110	131	409	943	-	-	811	-	-
Stage 1	436	447	-	402	415	-	-	-	-	-	-	-
Stage 2	374	397	-	437	447	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	84	120	470	~ 106	127	406	943	-	-	808	-	-
Mov Cap-2 Maneuver	84	120	-	293	308	-	-	-	-	-	-	-
Stage 1	436	434	-	400	413	-	-	-	-	-	-	-
Stage 2	317	395	-	421	434	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.7	22.2	0	0.3
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	943	-	-	186	293	406	808	-	-
HCM Lane V/C Ratio	0.001	-	-	0.018	0.41	0.148	0.029	-	-
HCM Control Delay (s)	8.8	-	-	24.7	25.6	15.4	9.6	-	-
HCM Lane LOS	A	-	-	C	D	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.9	0.5	0.1	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↑	↱	↰	↱	
Traffic Vol, veh/h	1	0	1	79	0	44	2	626	126	67	812	0
Future Vol, veh/h	1	0	1	79	0	44	2	626	126	67	812	0
Conflicting Peds, #/hr	0	0	0	2	0	2	0	0	2	2	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	150	-	150	150	-	-
Veh in Median Storage, #	-	0	-	-	2	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	95	92	95	92	95	95	95	95	92
Heavy Vehicles, %	2	2	2	0	2	0	2	3	3	2	2	2
Mvmt Flow	1	0	1	83	0	46	2	659	133	71	855	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1752	1795	857	1665	1662	663	855	0	0	794	0	0
Stage 1	997	997	-	665	665	-	-	-	-	-	-	-
Stage 2	755	798	-	1000	997	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	67	80	357	~ 78	97	465	785	-	-	827	-	-
Stage 1	294	322	-	453	458	-	-	-	-	-	-	-
Stage 2	401	398	-	295	322	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	56	73	356	~ 72	88	463	785	-	-	825	-	-
Mov Cap-2 Maneuver	56	73	-	225	245	-	-	-	-	-	-	-
Stage 1	293	294	-	451	456	-	-	-	-	-	-	-
Stage 2	359	396	-	268	294	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	43	24.2	0	0.7
HCM LOS	E	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	785	-	-	97	225	463	825	-	-
HCM Lane V/C Ratio	0.003	-	-	0.022	0.37	0.1	0.085	-	-
HCM Control Delay (s)	9.6	-	-	43	30.1	13.6	9.8	-	-
HCM Lane LOS	A	-	-	E	D	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.6	0.3	0.3	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			↰	↱	↰	↑	↱	↰	↱	
Traffic Vol, veh/h	1	0	2	120	0	66	1	678	51	33	578	0
Future Vol, veh/h	1	0	2	120	0	66	1	678	51	33	578	0
Conflicting Peds, #/hr	0	0	0	4	0	4	0	0	4	4	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	150	-	150	150	-	-
Veh in Median Storage, #	-	0	-	-	2	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	0	2	0	2	6	6	5	5	2
Mvmt Flow	1	0	2	133	0	73	1	753	57	37	642	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1540	1532	646	1480	1475	761	642	0	0	814	0	0
Stage 1	716	716	-	759	759	-	-	-	-	-	-	-
Stage 2	824	816	-	721	716	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.15	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.245	-	-
Pot Cap-1 Maneuver	94	117	472	~ 105	126	409	943	-	-	800	-	-
Stage 1	421	434	-	402	415	-	-	-	-	-	-	-
Stage 2	367	391	-	422	434	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	74	111	470	~ 100	120	406	943	-	-	797	-	-
Mov Cap-2 Maneuver	74	111	-	284	299	-	-	-	-	-	-	-
Stage 1	421	414	-	400	413	-	-	-	-	-	-	-
Stage 2	299	389	-	399	414	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	26.7	23.9	0	0.5
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	943	-	-	169	284	406	797	-	-
HCM Lane V/C Ratio	0.001	-	-	0.02	0.469	0.181	0.046	-	-
HCM Control Delay (s)	8.8	-	-	26.7	28.4	15.8	9.7	-	-
HCM Lane LOS	A	-	-	D	D	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	2.4	0.7	0.1	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			↰	↱	↰	↑	↱	↰	↱	
Traffic Vol, veh/h	1	0	1	86	0	52	2	626	134	75	812	0
Future Vol, veh/h	1	0	1	86	0	52	2	626	134	75	812	0
Conflicting Peds, #/hr	0	0	0	2	0	2	0	0	2	2	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	150	-	150	150	-	-
Veh in Median Storage, #	-	0	-	-	2	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	95	92	95	92	95	95	95	95	92
Heavy Vehicles, %	2	2	2	0	2	0	2	3	3	2	2	2
Mvmt Flow	1	0	1	91	0	55	2	659	141	79	855	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1776	1819	857	1681	1678	663	855	0	0	802	0	0
Stage 1	1013	1013	-	665	665	-	-	-	-	-	-	-
Stage 2	763	806	-	1016	1013	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	64	78	357	~ 76	95	465	785	-	-	822	-	-
Stage 1	288	316	-	453	458	-	-	-	-	-	-	-
Stage 2	397	395	-	289	316	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	52	70	356	~ 70	85	463	785	-	-	820	-	-
Mov Cap-2 Maneuver	52	70	-	220	240	-	-	-	-	-	-	-
Stage 1	287	286	-	451	456	-	-	-	-	-	-	-
Stage 2	349	393	-	260	286	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	45.5	25.3	0	0.8
HCM LOS	E	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	785	-	-	91	220	463	820	-	-
HCM Lane V/C Ratio	0.003	-	-	0.024	0.411	0.118	0.096	-	-
HCM Control Delay (s)	9.6	-	-	45.5	32.3	13.8	9.9	-	-
HCM Lane LOS	A	-	-	E	D	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.9	0.4	0.3	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection: 6: SW Boones Ferry Road & Site Access

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	TR
Maximum Queue (ft)	31	187	128	6	72	10	44	32
Average Queue (ft)	4	65	24	0	6	0	9	2
95th Queue (ft)	19	136	60	4	35	6	32	15
Link Distance (ft)	318	1445			601			1805
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			150	150		150	150	
Storage Blk Time (%)		4						
Queuing Penalty (veh)		2						

Network Summary

Network wide Queuing Penalty: 2

Intersection: 6: SW Boones Ferry Road & Site Access

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	TR
Maximum Queue (ft)	18	109	29	30	22	26	55	38
Average Queue (ft)	2	40	13	1	1	1	19	2
95th Queue (ft)	13	84	29	10	10	13	44	17
Link Distance (ft)	318	1810			670			1804
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			150	150		150	150	
Storage Blk Time (%)		0						
Queuing Penalty (veh)		0						

Intersection: 6: SW Boones Ferry Road & Site Access

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	TR
Maximum Queue (ft)	30	140	48	12	88	10	32	28
Average Queue (ft)	3	59	22	0	5	0	8	2
95th Queue (ft)	17	124	42	6	42	5	28	13
Link Distance (ft)	318	1445			601			1805
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			150	150		150	150	
Storage Blk Time (%)		2			0			
Queuing Penalty (veh)		1			0			

Network Summary

Network wide Queuing Penalty: 1

Intersection: 6: SW Boones Ferry Road & Site Access

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	TR
Maximum Queue (ft)	30	163	47	29	33	27	61	9
Average Queue (ft)	3	65	18	1	2	2	25	0
95th Queue (ft)	17	131	38	10	16	11	51	5
Link Distance (ft)	318	1810			670			1804
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			150	150		150	150	
Storage Blk Time (%)		2						
Queuing Penalty (veh)		1						

Intersection: 6: SW Boones Ferry Road & Site Access

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	TR
Maximum Queue (ft)	35	224	171	5	76	32	54	46
Average Queue (ft)	3	85	33	0	6	2	16	3
95th Queue (ft)	17	185	99	3	37	13	42	21
Link Distance (ft)	318	1445			601			1805
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			150	150		150	150	
Storage Blk Time (%)		8						
Queuing Penalty (veh)		5						

Network Summary

Network wide Queuing Penalty: 5

Intersection: 6: SW Boones Ferry Road & Site Access

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	TR
Maximum Queue (ft)	35	193	130	6	46	41	65	59
Average Queue (ft)	3	82	22	0	2	3	25	3
95th Queue (ft)	19	174	72	6	19	20	51	26
Link Distance (ft)	318	1810			670			1804
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			150	150		150	150	
Storage Blk Time (%)		7						0
Queuing Penalty (veh)		4						0

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Memorandum

To: **Mike McCarthy, City of Tualatin**

Copy: **David Force, Lennar Northwest**
Mimi Doukas, AKS Engineering & Forestry, LLC

From: **Jennifer Danziger, PE,**

Date: **September 20, 2021**

Subject: **Supplement to Autumn Subdivision TIS – Evaluation of Potential Commercial**

REGISTERED PROFESSIONAL ENGINEER
16168
Jennifer E Danziger
OREGON
SEPT. 15, 1992
JENNIFER ELISE DANZIGER
RENEWS: 12.31.21

Introduction

This memorandum supplements the proposed Autumn Sunrise Subdivision Transportation Impact Study (TIS) with three development alternatives on the commercially-zoned parcels abutting SW Boones Ferry Road. These parcels are not part of the subdivision; the specific timing and type of development that could occur on these parcels is unknown.

Commercial Development Concepts

The Neighborhood Commercial (CN) zoning abutting SW Boones Ferry Road will be divided into two parcels to accommodate the proposed Autumn Sunrise site access at SW Boones Ferry Road. The attached site plan shows how the area could potentially be developed. In addition to the proposed stormwater facility, the parcel could accommodate a 3,600-square-foot (SF) building with parking north of the site access and a 10,000-SF building with parking to the south. Both parking lots would take access from the proposed site access approximately 100 feet east of SW Boones Ferry Road.

Tualatin Development Code (TDC) Chapter 51 establishes the standards for the CN zone. According to the TDC, "the primary uses are intended to include professional offices, services, and retail oriented to the day-to-day needs of adjacent neighborhoods." Commercial uses in the CN zone are extremely limited. With that in mind, and considering community feedback a public meetings, two potential concepts were developed for the two buildings:

1. 13,600 SF of general retail in the two buildings
2. 5,000 SF of day care center in one building plus 8,600 of general retail in the remaining space

Trip Generation

To estimate trips generated by the three potential development concepts, trip rates from the *Trip Generation Manual*[1] were used. Within the general retail, permitted uses under TDC Chapter 51 are limited to general

---

[1] Institute of Transportation Engineers (ITE), *Trip Generation Manual*, 10th Edition, 2017.

merchandise or variety stores such as small food stores (<4,000 SF), drug stores, laundry and dry cleaning, beauty and barber shops, and shoe repair. Trip generation rates for many of these uses are non-existent or very limited; therefore, Land Use 820 – *Shopping Center* was applied for the general retail components of the concepts. Land Use 565 – *Day Care Center* was applied for the other concept. All trip generation is based on gross floor area. Table 1 presents a comparison of trip generation for the three development concepts.

Table 1: Trip Generation Summary

Description (ITE Code)	Intensity (DU)	Morning Peak Hour			Evening Peak Hour			Daily Trips
		In	Out	Total	In	Out	Total	
Concept 1								
Shopping Center (820)	13.6 KSF	8	5	13	25	27	52	514
Internal with Autumn Sunrise		*-1*	*-1*	*-2*	*-3*	*-7*	*-10*	*NA*
Total External		7	4	11	22	20	42	NA
Concept 2								
Day Care Center (565)	5 KSF	29	26	55	26	30	56	119
Shopping Center (820)	8.6 KSF	5	3	8	16	17	33	324
Subtotal		34	29	63	42	47	89	443
Internal with Autumn Sunrise		*-2*	*-1*	*-3*	*-4*	*-12*	*-16*	*NA*
Total External		32	28	60	38	35	73	NA

Although some of the uses may attract pass-by trips, the analysis was performed assuming all trips associated with the commercial development would pass through the site access intersection with SW Boones Ferry Road. However, trips that could be internal with the proposed Autumn Sunrise subdivision were accounted for based on the Transportation Research Board report, *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*.[2]

Trip Distribution

The directional distribution of potential commercial trips was assumed to be:

- Approximately 50 percent of traveling to/from the north on SW Boones Ferry Road
- Approximately 50 percent of traveling to/from the south on SW Boones Ferry Road

Trip Assignment

The resulting trip assignment is shown in Figure 1 for the site access intersection with SW Boones Ferry. Note, the intersection is shown as having four legs to account for the future configuration with a frontage road connection that will be opened with construction of the Basalt Creek Parkway Extension (BCPE).

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[2] Transportation Research Board, National Cooperative Highway Research Program Report 684, *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*, 2006.

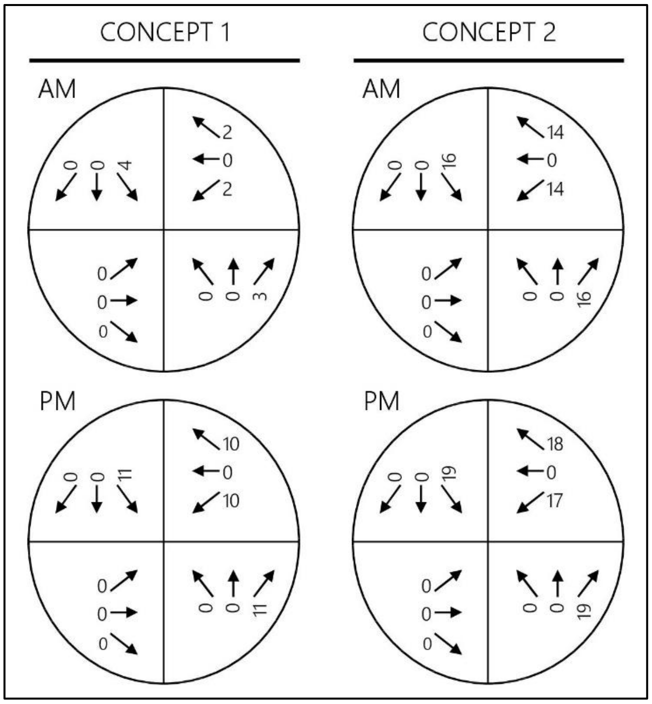


Figure 1: Potential Commercial Development Trip Assignment

Total Traffic – 2026 Buildout with BCPE

The potential commercial traffic for each concept was added to the year 2026 buildout forecast with the BSCE that was shown for Intersection 6 in Figure 6C of the Autumn Sunrise Subdivision TIS. The resulting volumes are shown in Figure 2.

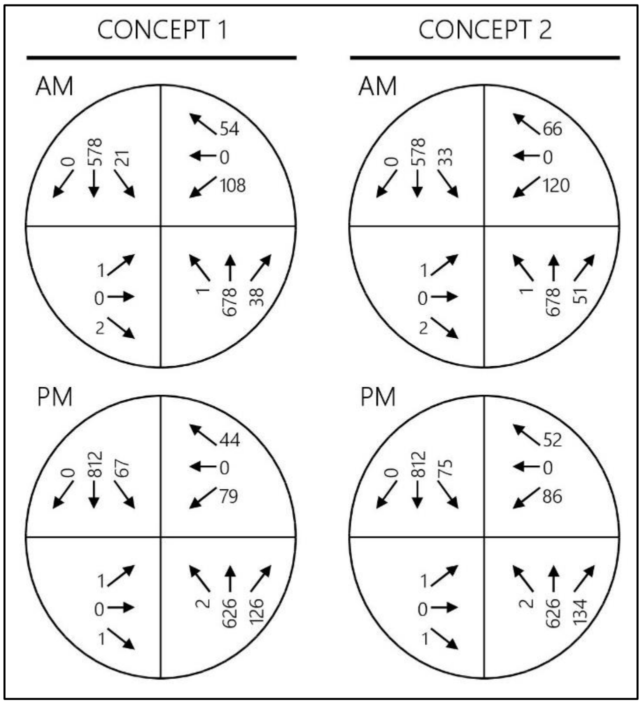


Figure 2: 2026 Buildout with BCPE and Potential Commercial Development

Warrant Analysis

Turn lane warrants and preliminary traffic signal warrants were examined for the study intersections where such treatments would be applicable.

Left-Turn Lane Warrants

SW Boones Ferry Road already has a center refuge lane that would be serve as a left-turn lane for the site access at that location; warrants were not evaluated.

Right-Turn Lane Warrants

Right-turn lane warrants were examined at the SW Boones Ferry Road site access under the Year 2026 buildout conditions. Table 9 of the TIS shows that northbound right-turn lane warrants are met at the proposed site access on SW Boones Ferry Road under the 2026 buildout scenario for both analysis periods. Given the 45-mph posted speed and higher traffic volumes, a northbound turn lane is recommended at this access.

Traffic Signal Warrants

Preliminary traffic signal warrants were examined at the site access intersection to determine whether the installation of a new traffic signal will be warranted with any of the potential commercial development concepts. The preliminary warrants are typically calculated based on the evening peak hour volumes assuming the daily demand is 10 times the evening peak hour. Because the volumes were higher in the morning under some of the scenarios, the warrants were also evaluated considering a daily demand that is 10 times the morning peak hour., which is a less likely scenario. The results are summarized in Table 2 for Year 2026 conditions with full buildout of the proposed development and the BCPE plus the two commercial concepts. A two-lane (left-through and right) approach for the site access is assumed. Detailed information on the warrant analysis is attached.

Table 2: Preliminary Traffic Signal Warrants at the Site Access on SW Boones Ferry Road with BCPE

Scenario	Warrant Met?	
	Based on Morning Peak	Based on Evening Peak
Year 2026 Conditions	No	No
Year 2026 Conditions + Commercial Concept 1	No	No
Year 2026 Conditions + Commercial Concept 2	No	No

As shown in Table 2, preliminary traffic signal warrants are not met with the commercial concepts.

Operations Analysis

An operations analysis was conducted for site access intersection with SW Boones Ferry Road per the signalized and unsignalized intersection analysis methodologies in the *Highway Capacity Manual* (HCM)[3]. Intersections are generally evaluated based on the average control delay experienced by vehicles and are assigned a grade according to their operation. The level of service (LOS) of an intersection can range from LOS A, which indicates very little, or no delay experienced by vehicles, to LOS F, which indicates a high degree of congestion and delay.

---

[3] Transportation Research Board, *Highway Capacity Manual 6th Edition*, 2016.

The volume-to-capacity (v/c) ratio is a measure that compares the traffic volumes (demand) against the available capacity of an intersection.

Performance Standards

The following agency performance standards are applicable to the intersection:

- The **City of Tualatin** requires intersections to operate at a minimum D and E for signalized and unsignalized intersections, respectively.
- **Washington County** requires intersections to operate with a v/c ratio of 0.99 or less.

Delay & Capacity Analysis

The LOS, delay, and v/c results of the capacity analysis are shown in Table 3 for Year 2026 conditions with full buildout of the proposed development and the BCPE plus the two commercial concepts. A two-lane (left-through and right) approach for the site access is assumed. The northbound left is assumed to be striped as a two-way, left-turn lane for the unsignalized scenarios to allow for a two-stage left-turn movement from the site access. Detailed calculations are attached.

Table 3: Capacity Analysis Summary at the Site Access on SW Boones Ferry Road with BCPE

Intersection & Scenario	Morning Peak Hour			Evening Peak Hour		
	LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
Year 2026 Conditions with BCPE*	D	25	0.40	D	27	0.31
Year 2026 Conditions + Commercial Concept 1	D	26	0.41	D	30	0.37
Year 2026 Conditions + Commercial Concept 2	D	28	0.47	D	32	0.41

** The results of the analysis without the concepts differs slightly from those presented in the TIS because the evaluation in this table does not account for the influence of upstream traffic signals.*

As shown in Table 3, the intersection would meet performance standards with both commercial concepts with a two-lane approach for the site access.

Queuing

An analysis of queuing was conducted for the site access to identify how development of the commercial land could affect storage requirements for the site access intersection at SW Boones Ferry Road. The analysis was conducted based on the results of a SimTraffic simulation. Five (5) simulations were conducted, averaged, and the 95th percentile queue estimates were rounded up to the nearest 25 feet, or the approximate length of one vehicle to estimate the queue lengths.

Table 4 reports the 95th percentile queue estimates for the southbound left-turn, northbound left-turn, and the westbound left-through lanes. The northbound left is assumed to be striped as a two-way, left-turn lane to allow for a two-stage left-turn movement from the site access. However, SimTraffic cannot simulate this two-stage movement; therefore, the westbound left-turn queue estimates are conservatively long.

Table 4: Queue Lengths at the Site Access on SW Boones Ferry Road with BCPE

Intersection & Scenario	Morning Peak Hour			Evening Peak Hour		
	SB Left	NB Left	WB Left	SB Left	NB Left	WB Left
Year 2026 Conditions with BCPE	50 ft	<25 ft	150 ft	50 ft	<25 ft	100 ft
Year 2026 Conditions + Commercial Concept 2	50 ft	<25 ft	125 ft	50 ft	<25 ft	150 ft
Year 2026 Conditions + Commercial Concept 3	50 ft	<25 ft	200 ft	50 ft	<25 ft	175 ft

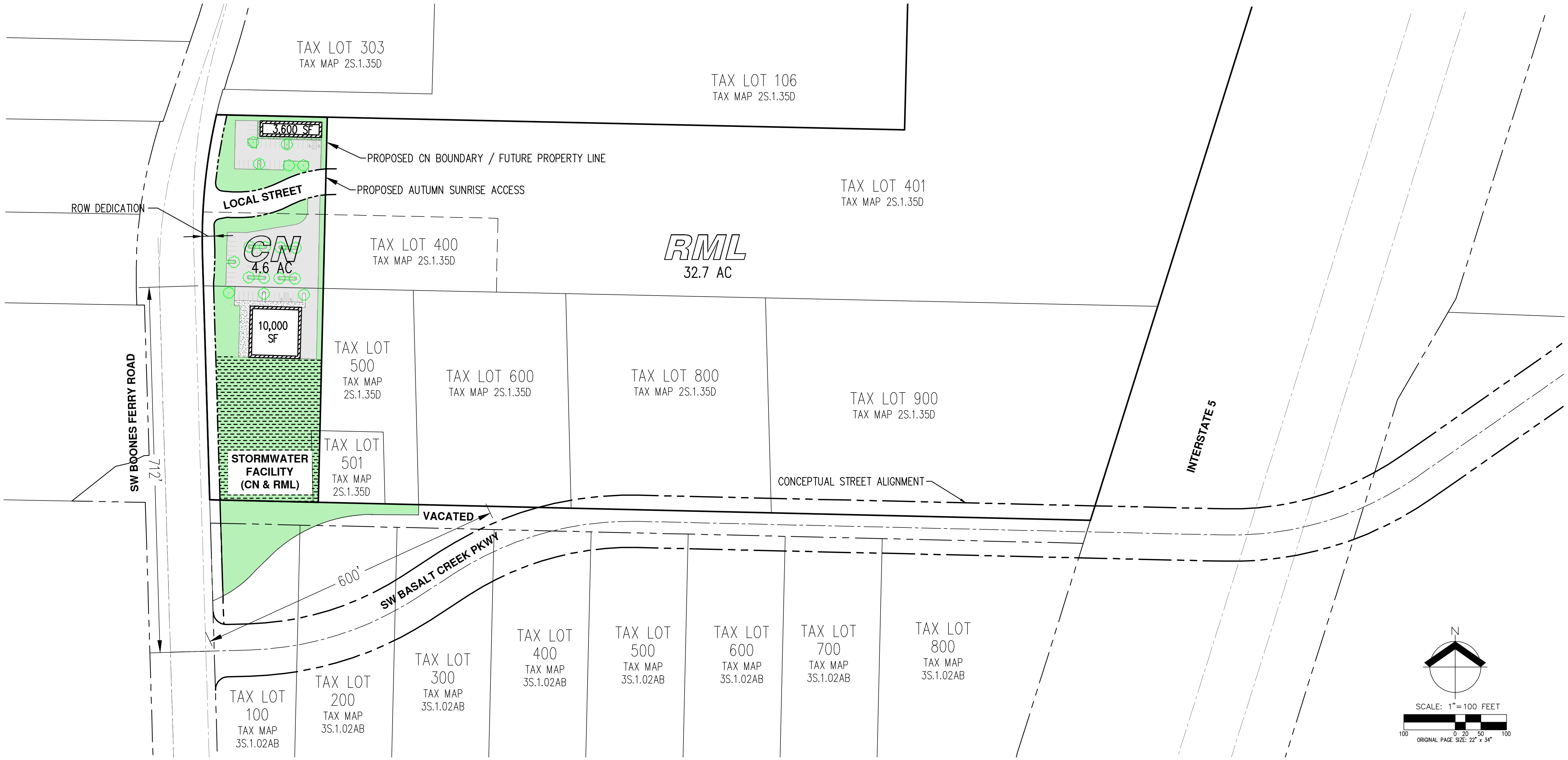
As shown in Table 4, under the most intensive concept, the maximum southbound storage requirement was estimated at:

- Two vehicles or 50 feet for the southbound left, which can easily be accommodated in the existing center refuge lane
- An occasional single vehicle or 25 feet for the northbound left, which can easily be accommodated in the existing center refuge lane
- Eight vehicles or 200 feet for the westbound left, which could be accommodated on the site access road without affecting the closest public street connection ("M" Street) to the east.

Conclusions

The conclusions below were developed as an exercise to understand how development of the commercially-zoned parcels abutting SW Boones Ferry Road could affect the configuration and traffic control at the site access ("H" Street) intersection. These parcels are not part of the subdivision; the specific timing and type of development that could occur on these parcels is unknown. Findings include:

- SW Boones Ferry Road already has a center refuge lane that would be serve as a left-turn lane for the site access at that location; warrants were not evaluated.
- The TIS recommends a northbound right-turn lane on SW Boones Ferry Road at the site access, no other conditions were evaluated.
- Preliminary traffic signal warrants would not be met with the commercial concepts and the two-lane (left-through and right) approach planned for the site access.
- The intersection at SW Boones Ferry Road would meet performance standards with both commercial concepts with a two-lane approach for the site access.
- Maximum queues were estimated at two vehicles or 50 feet for the southbound left, which can easily be accommodated in the existing center refuge lane
- Maximum queues were estimated at one vehicle or 25 feet for the northbound left, which can easily be accommodated in the existing center refuge lane
- Maximum queues were estimated at eight vehicles or 200 feet for a separate westbound left, which could be accommodated on the site access road without affecting the closest public street connection ("M" Street) to the east.



DATE: 08/30/2021 AKS JOB: 7454

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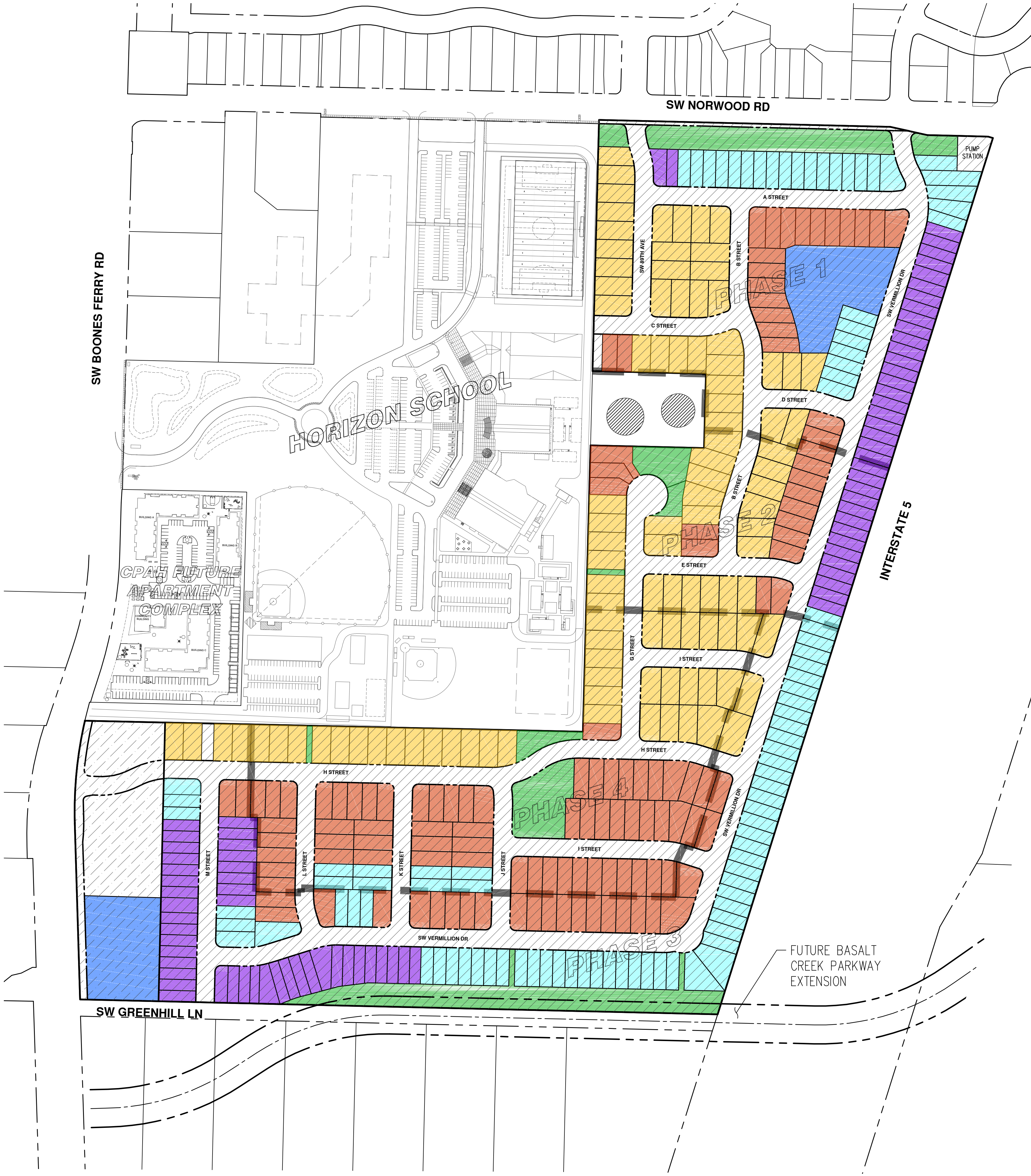
CONCEPTUAL COMMERCIAL LAYOUT

AUTUMN SUNRISE



N

SCALE: 1"= 150 FEET

150 0 30 75 150

▨ - CH ZONING

▨ - RML ZONING

DENSITY CALCULATIONS

RML ZONE	SQ. FT.	ACRES
GROSS SITE AREA:	± 2,688,206	± 61.71
PUBLIC R.O.W. DEDICATION AREA:	± 629,282	± 14.45
CITY RESERVIOR DEDICATION OPEN SPACE AREA:	± 12,879	± 0.30
PRIVATE STREET/ACCESS AREA:	± 5,718	± 0.13
STORMWATER FACILITY AREA:	± 155,691	± 3.57
COMMERCIAL AREA:	± 87,960	± 2.02
PUMP STATION DEDICATION AREA:	± 7,709	± 0.18
NET DEVELOPABLE:	± 1,788,967	± 41.07
AUTUMN SUNRISE SUBDIVISION		
MAXIMUM DENSITY (10 DU PER ACRE)	411	LOTS
MINIMUM DENSITY (7 DU PER ACRE)	287	LOTS

REQUIRED OPEN SPACE AREA (5% GROSS):	± 134,410	SQ. FT.
OPEN SPACE PROVIDED:	± 168,629	SQ. FT.

PLANNED DENSITY:	400	LOTS
AVERAGE LOT AREA (ALL DU):	± 4,151	SQ. FT.
AVERAGE LOT AREA FOR SF DETACHED DU	± 4,411	SQ. FT.
AVERAGE LOT AREA FOR SF ATTACHED DU	± 3,109	SQ. FT.

MAXIMUM LOT SIZE	± 7,731	SQ. FT.
MINIMUM LOT SIZE	± 2,546	SQ. FT.

LOT DIMENSION	HOUSE TYPE	PH-1	PH-2	PH-3	PH-4	TOTAL UNITS
50'x100'	Detached	35	25	7	35	102
40'x100'	Detached	21	15	25	60	121
34'x100'	Detached	29	1	59	8	97
29'x100'	Attached	24	14	42	-	80
	TOTAL UNITS	109	55	133	103	400

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DATE:	06/23/2021
DESIGNED BY:	JSM
DRAWN BY:	JSM
CHECKED BY:	DS

PO-04

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Shopping Center	820	13.6 KSF	8	5	13	25	27	52	514

Day Care Center	565	5 KSF	29	26	55	26	30	56	119
Shopping Center	820	8.6 KSF	5	3	8	16	17	33	324
Total Primary Trips			34	29	63	42	47	89	443

Option 1 - Basic Shopping Center (13.6 KSF)

	AM Peak			Internal % Initial		Internal Initial		Internal Balanced		External	
	In	Out	Total	In	Out	In	Out	In	Out	In	Out
Residential	67	204	271	2%	1%	1	2	1	1	66	203
Commercial 1	8	5	13	17%	14%	1	1	1	1	7	4

Option 2 - Day Care (5 KSF) + Basic Shopping Center (8.6 KSF)

	AM Peak			Internal % Initial		Internal Initial		Internal Balanced		External	
	In	Out	Total	In	Out	In	Out	In	Out	In	Out
Residential	67	207	274	2%	1%	1	2	1	2	66	205
Commercial 1	34	29	63	17%	14%	6	4	2	1	32	28

Option 1 - Basic Shopping Center (13.6 KSF)

	PM Peak			Internal % Initial		Internal Initial		Internal Balanced		External	
	In	Out	Total	In	Out	In	Out	In	Out	In	Out
Residential	225	133	358	46%	42%	104	56	7	3	218	130
Commercial 1	25	27	52	10%	26%	3	7	3	7	22	20

Option 2 - Day Care (5 KSF) + Basic Shopping Center (8.6 KSF)

	PM Peak			Internal % Initial		Internal Initial		Internal Balanced		External	
	In	Out	Total	In	Out	In	Out	In	Out	In	Out
Residential	225	133	358	46%	42%	104	56	12	4	213	129
Commercial 1	42	47	89	10%	26%	4	12	4	12	38	35

TRIP GENERATION CALCULATIONS

Land Use: Day Care Center
Land Use Code: 565
Setting/Location: General Urban/Suburban
Variable: 1,000 Sq Ft Gross Floor Area
Variable Value: 5

AM PEAK HOUR

Trip Rate: 11.00

	Enter	Exit	Total
Directional Distribution	53%	47%	
Trip Ends	29	26	55

PM PEAK HOUR

Trip Rate: 11.12

	Enter	Exit	Total
Directional Distribution	47%	53%	
Trip Ends	26	30	56

WEEKDAY

Trip Rate: 47.62

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	119	119	238

SATURDAY

Trip Rate: 6.22

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	16	16	32

Source: TRIP GENERATION, Tenth Edition

TRIP GENERATION CALCULATIONS

Land Use: Shopping Center
Land Use Code: 820
Setting/Location General Urban/Suburban
Variable: 1,000 Sq. Ft. GFA
Variable Value: 13.6

AM PEAK HOUR

Trip Rate: 0.94

	Enter	Exit	Total
Directional Distribution	62%	38%	
Trip Ends	8	5	13

PM PEAK HOUR

Trip Rate: 3.81

	Enter	Exit	Total
Directional Distribution	48%	52%	
Trip Ends	25	27	52

WEEKDAY

Trip Rate: 37.75

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	257	257	514

SATURDAY

Trip Rate: 46.12

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	314	314	628

Source: Trip Generation Manual, Tenth Edition

TRIP GENERATION CALCULATIONS

Land Use: Shopping Center
Land Use Code: 820
Setting/Location General Urban/Suburban
Variable: 1,000 Sq. Ft. GFA
Variable Value: 8.6

AM PEAK HOUR

Trip Rate: 0.94

	Enter	Exit	Total
Directional Distribution	62%	38%	
Trip Ends	5	3	8

PM PEAK HOUR

Trip Rate: 3.81

	Enter	Exit	Total
Directional Distribution	48%	52%	
Trip Ends	16	17	33

WEEKDAY

Trip Rate: 37.75

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	162	162	324

SATURDAY

Trip Rate: 46.12

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	198	198	396

Source: Trip Generation Manual, Tenth Edition

Preliminary Traffic Signal Warrant Summary

Intersection	Warrant Met?
Site Access at SW Boones Ferry Road	
Year 2026 Conditions (Based on AM) w/ 2-lane Exit	No
Year 2026 Conditions (Based on PM) w/ 2-lane Exit	No
Year 2026 Conditions (Based on AM) + Basic Shopping Center (13.6 KSF) w/ 2-lane Exit	No
Year 2026 Conditions (Based on PM) + Basic Shopping Center (13.6 KSF) w/ 2-lane Exit	No
Year 2026 Conditions (Based on AM) + Day Care (5 KSF) + Basic Shopping Center (8.6 KSF) w/ 2-lane Exit	No
Year 2026 Conditions (Based on PM) + Day Care (5 KSF) + Basic Shopping Center (8.6 KSF) w/ 2-lane Exit	No

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Conditions (Based on AM) w/ 2-lane Exit

Major Street:	SW Boones Ferry Road	Minor Street:	Site Access		
Number of Lanes:	1	Number of Lanes:	1		
AM Peak Hour Volumes:	1302	AM Peak Hour Volumes:	154	Total	
			58	Rights	
			100%	RT Discount	

Warrant Used:

X 100 percent of standard warrants used

70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	13,020	8,850	
Minor Street*	960	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	13,020	13,300	
Minor Street*	960	1,350	No
Combination Warrant			
Major Street	13,020	10,640	
Minor Street*	960	2,120	No

* Minor street right-turning traffic volumes reduced by 100%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Conditions (Based on PM) w/ 2-lane Exit

Major Street:	SW Boones Ferry Road	Minor Street:	Site Access	
Number of Lanes:	1	Number of Lanes:	1	
PM Peak Hour Volumes:	1596	PM Peak Hour Volumes:	100	Total
			38	Rights
			100%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

_____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	15,960	8,850	
Minor Street*	620	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	15,960	13,300	
Minor Street*	620	1,350	No
Combination Warrant			
Major Street	15,960	10,640	
Minor Street*	620	2,120	No

* Minor street right-turning traffic volumes reduced by 100%.

Preliminary Traffic Signal Warrant Analysis

Project:	21029 - Autumn Sunrise
Date:	9/20/2021
Scenario:	Year 2026 Conditions (Based on AM) + Basic Shopping Center (13.6 KSF) w/ 2-lane Exit

Major Street:	SW Boones Ferry Road	Minor Street:	Site Access	
Number of Lanes:	1	Number of Lanes:	1	
			158	Total
PM Peak Hour Volumes:	1309	PM Peak Hour Volumes:	60	Rights
			100%	RT Discount

Warrant Used:

X	100 percent of standard warrants used
	70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	13,090	8,850	
Minor Street*	980	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	13,090	13,300	
Minor Street*	980	1,350	No
Combination Warrant			
Major Street	13,090	10,640	
Minor Street*	980	2,120	No

* Minor street right-turning traffic volumes reduced by 100%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Conditions (Based on PM) + Basic Shopping Center (13.6 KSF) w/ 2-lane Exit

Major Street:	SW Boones Ferry Road	Minor Street:	Site Access	
Number of Lanes:	1	Number of Lanes:	1	
PM Peak Hour Volumes:	1618	PM Peak Hour Volumes:	120	Total
			48	Rights
			100%	RT Discount

Warrant Used:

X 100 percent of standard warrants used

☐ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	16,180	8,850	
Minor Street*	720	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	16,180	13,300	
Minor Street*	720	1,350	No
Combination Warrant			
Major Street	16,180	10,640	
Minor Street*	720	2,120	No

* Minor street right-turning traffic volumes reduced by 100%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Conditions (Based on AM) + Day Care (5 KSF) + Basic Shopping Center (8.6 KSF) w/ 2-lan

Major Street: SW Boones Ferry Road
Number of Lanes: 1
PM Peak Hour Volumes: 1334

Minor Street: Site Access
Number of Lanes: 1
PM Peak Hour Volumes: 182 Total
72 Rights
100% RT Discount

Warrant Used:
X 100 percent of standard warrants used
____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
<u>WARRANT 1, CONDITION A</u>		100%	70%	100%	70%
<u>Major St.</u>	<u>Minor St.</u>	<u>Warrants</u>	<u>Warrants</u>	<u>Warrants</u>	<u>Warrants</u>
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
<u>WARRANT 1, CONDITION B</u>					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	13,340	8,850	
Minor Street*	1,100	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	13,340	13,300	
Minor Street*	1,100	1,350	No
Combination Warrant			
Major Street	13,340	10,640	
Minor Street*	1,100	2,120	No

* Minor street right-turning traffic volumes reduced by 100%.

Preliminary Traffic Signal Warrant Analysis

Project: 21029 - Autumn Sunrise
Date: 9/20/2021
Scenario: Year 2026 Conditions (Based on PM) + Day Care (5 KSF) + Basic Shopping Center (8.6 KSF) w/ 2-lane

Major Street:	SW Boones Ferry Road	Minor Street:	Site Access	
Number of Lanes:	1	Number of Lanes:	1	
PM Peak Hour Volumes:	1634	PM Peak Hour Volumes:	135	Total
			56	Rights
			100%	RT Discount

Warrant Used:

X 100 percent of standard warrants used
____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100% Warrants	70% Warrants	100% Warrants	70% Warrants
Major St.	Minor St.				
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

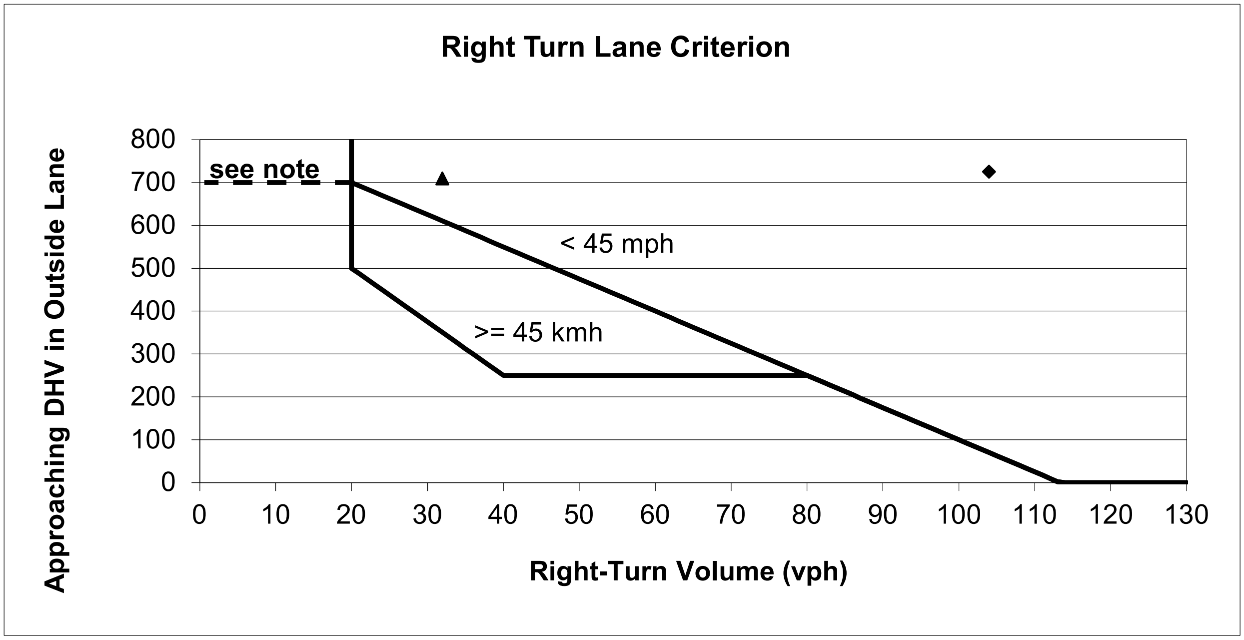
	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	16,340	8,850	
Minor Street*	790	2,650	No
Condition B: Interruption of Continuous Traffic			
Major Street	16,340	13,300	
Minor Street*	790	1,350	No
Combination Warrant			
Major Street	16,340	10,640	
Minor Street*	790	2,120	No

* Minor street right-turning traffic volumes reduced by 100%.

Project:	21029 - Autumn Sunrise
Intersection:	SW Boones Ferry Road/Site Access - Northbound
Date:	6/30/2021
Scenario:	2026 Buildout - Phases 1-4

Speed? 45 mph 72 kmh

AM Peak Hour		PM Peak Hour	
Right-Turn Volume	32	Right-Turn Volume	104
Approaching DHV	709	Approaching DHV	725
Lane Needed?	Yes	Lane Needed?	Yes



Note: If there is no right turn lane, a shoulder needs to be provided.
If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↑	↱	↰	↱	
Traffic Vol, veh/h	1	0	2	106	0	52	1	678	35	17	578	0
Future Vol, veh/h	1	0	2	106	0	52	1	678	35	17	578	0
Conflicting Peds, #/hr	0	0	0	4	0	4	0	0	4	4	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	150	-	150	150	-	-
Veh in Median Storage, #	-	0	-	-	2	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	0	2	0	2	6	6	5	5	2
Mvmt Flow	1	0	2	118	0	58	1	753	39	19	642	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1488	1478	646	1444	1439	761	642	0	0	796	0	0
Stage 1	680	680	-	759	759	-	-	-	-	-	-	-
Stage 2	808	798	-	685	680	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.15	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.245	-	-
Pot Cap-1 Maneuver	102	126	472	~ 111	133	409	943	-	-	813	-	-
Stage 1	441	451	-	402	415	-	-	-	-	-	-	-
Stage 2	375	398	-	441	451	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	85	122	470	~ 108	129	406	943	-	-	810	-	-
Mov Cap-2 Maneuver	85	122	-	295	310	-	-	-	-	-	-	-
Stage 1	441	441	-	400	413	-	-	-	-	-	-	-
Stage 2	320	396	-	427	441	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.6	21.9	0	0.3
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	943	-	-	187	295	406	810	-	-
HCM Lane V/C Ratio	0.001	-	-	0.018	0.399	0.142	0.023	-	-
HCM Control Delay (s)	8.8	-	-	24.6	25.1	15.3	9.6	-	-
HCM Lane LOS	A	-	-	C	D	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.8	0.5	0.1	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↑	↱	↰	↱	
Traffic Vol, veh/h	1	0	1	69	0	34	2	626	115	56	812	0
Future Vol, veh/h	1	0	1	69	0	34	2	626	115	56	812	0
Conflicting Peds, #/hr	0	0	0	2	0	2	0	0	2	2	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	150	-	150	150	-	-
Veh in Median Storage, #	-	0	-	-	2	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	95	92	95	92	95	95	95	95	92
Heavy Vehicles, %	2	2	2	0	2	0	2	3	3	2	2	2
Mvmt Flow	1	0	1	73	0	36	2	659	121	59	855	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1717	1759	857	1641	1638	663	855	0	0	782	0	0
Stage 1	973	973	-	665	665	-	-	-	-	-	-	-
Stage 2	744	786	-	976	973	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	71	85	357	81	100	465	785	-	-	836	-	-
Stage 1	303	330	-	453	458	-	-	-	-	-	-	-
Stage 2	407	403	-	305	330	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	62	79	356	76	92	463	785	-	-	834	-	-
Mov Cap-2 Maneuver	62	79	-	235	254	-	-	-	-	-	-	-
Stage 1	302	307	-	451	456	-	-	-	-	-	-	-
Stage 2	374	401	-	282	307	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	39.7	22.5	0	0.6
HCM LOS	E	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	785	-	-	106	235	463	834	-	-
HCM Lane V/C Ratio	0.003	-	-	0.021	0.309	0.077	0.071	-	-
HCM Control Delay (s)	9.6	-	-	39.7	27	13.4	9.6	-	-
HCM Lane LOS	A	-	-	E	D	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.3	0.2	0.2	-	-

HCM 6th TWSC
6: SW Boones Ferry Road & Site Access

09/20/2021

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↑	↱	↰	↱	
Traffic Vol, veh/h	1	0	2	108	0	54	1	678	38	21	578	0
Future Vol, veh/h	1	0	2	108	0	54	1	678	38	21	578	0
Conflicting Peds, #/hr	0	0	0	4	0	4	0	0	4	4	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	150	-	150	150	-	-
Veh in Median Storage, #	-	0	-	-	2	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	0	2	0	2	6	6	5	5	2
Mvmt Flow	1	0	2	120	0	60	1	753	42	23	642	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1498	1489	646	1452	1447	761	642	0	0	799	0	0
Stage 1	688	688	-	759	759	-	-	-	-	-	-	-
Stage 2	810	801	-	693	688	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.15	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.245	-	-
Pot Cap-1 Maneuver	101	124	472	~ 110	131	409	943	-	-	811	-	-
Stage 1	436	447	-	402	415	-	-	-	-	-	-	-
Stage 2	374	397	-	437	447	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	84	120	470	~ 106	127	406	943	-	-	808	-	-
Mov Cap-2 Maneuver	84	120	-	293	308	-	-	-	-	-	-	-
Stage 1	436	434	-	400	413	-	-	-	-	-	-	-
Stage 2	317	395	-	421	434	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.7	22.2	0	0.3
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	943	-	-	186	293	406	808	-	-
HCM Lane V/C Ratio	0.001	-	-	0.018	0.41	0.148	0.029	-	-
HCM Control Delay (s)	8.8	-	-	24.7	25.6	15.4	9.6	-	-
HCM Lane LOS	A	-	-	C	D	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.9	0.5	0.1	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

HCM 6th TWSC
6: SW Boones Ferry Road & Site Access

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↑	↱	↰	↱	
Traffic Vol, veh/h	1	0	1	79	0	44	2	626	126	67	812	0
Future Vol, veh/h	1	0	1	79	0	44	2	626	126	67	812	0
Conflicting Peds, #/hr	0	0	0	2	0	2	0	0	2	2	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	150	-	150	150	-	-
Veh in Median Storage, #	-	0	-	-	2	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	95	92	95	92	95	95	95	95	92
Heavy Vehicles, %	2	2	2	0	2	0	2	3	3	2	2	2
Mvmt Flow	1	0	1	83	0	46	2	659	133	71	855	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1752	1795	857	1665	1662	663	855	0	0	794	0	0
Stage 1	997	997	-	665	665	-	-	-	-	-	-	-
Stage 2	755	798	-	1000	997	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	67	80	357	~ 78	97	465	785	-	-	827	-	-
Stage 1	294	322	-	453	458	-	-	-	-	-	-	-
Stage 2	401	398	-	295	322	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	56	73	356	~ 72	88	463	785	-	-	825	-	-
Mov Cap-2 Maneuver	56	73	-	225	245	-	-	-	-	-	-	-
Stage 1	293	294	-	451	456	-	-	-	-	-	-	-
Stage 2	359	396	-	268	294	-	-	-	-	-	-	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	43			24.2			0			0.7		
HCM LOS	E			C								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	785	-	-	97	225	463	825	-	-
HCM Lane V/C Ratio	0.003	-	-	0.022	0.37	0.1	0.085	-	-
HCM Control Delay (s)	9.6	-	-	43	30.1	13.6	9.8	-	-
HCM Lane LOS	A	-	-	E	D	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.6	0.3	0.3	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
6: SW Boones Ferry Road & Site Access

09/20/2021

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↑	↱	↰	↱	
Traffic Vol, veh/h	1	0	2	120	0	66	1	678	51	33	578	0
Future Vol, veh/h	1	0	2	120	0	66	1	678	51	33	578	0
Conflicting Peds, #/hr	0	0	0	4	0	4	0	0	4	4	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	150	-	150	150	-	-
Veh in Median Storage, #	-	0	-	-	2	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	0	2	0	2	6	6	5	5	2
Mvmt Flow	1	0	2	133	0	73	1	753	57	37	642	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1540	1532	646	1480	1475	761	642	0	0	814	0	0
Stage 1	716	716	-	759	759	-	-	-	-	-	-	-
Stage 2	824	816	-	721	716	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.15	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.245	-	-
Pot Cap-1 Maneuver	94	117	472	~ 105	126	409	943	-	-	800	-	-
Stage 1	421	434	-	402	415	-	-	-	-	-	-	-
Stage 2	367	391	-	422	434	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	74	111	470	~ 100	120	406	943	-	-	797	-	-
Mov Cap-2 Maneuver	74	111	-	284	299	-	-	-	-	-	-	-
Stage 1	421	414	-	400	413	-	-	-	-	-	-	-
Stage 2	299	389	-	399	414	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	26.7	23.9	0	0.5
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	943	-	-	169	284	406	797	-	-
HCM Lane V/C Ratio	0.001	-	-	0.02	0.469	0.181	0.046	-	-
HCM Control Delay (s)	8.8	-	-	26.7	28.4	15.8	9.7	-	-
HCM Lane LOS	A	-	-	D	D	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	2.4	0.7	0.1	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↗	↖	↑	↗	↖	↱	
Traffic Vol, veh/h	1	0	1	86	0	52	2	626	134	75	812	0
Future Vol, veh/h	1	0	1	86	0	52	2	626	134	75	812	0
Conflicting Peds, #/hr	0	0	0	2	0	2	0	0	2	2	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	150	-	150	150	-	-
Veh in Median Storage, #	-	0	-	-	2	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	95	92	95	92	95	95	95	95	92
Heavy Vehicles, %	2	2	2	0	2	0	2	3	3	2	2	2
Mvmt Flow	1	0	1	91	0	55	2	659	141	79	855	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1776	1819	857	1681	1678	663	855	0	0	802	0	0
Stage 1	1013	1013	-	665	665	-	-	-	-	-	-	-
Stage 2	763	806	-	1016	1013	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.3	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	64	78	357	~ 76	95	465	785	-	-	822	-	-
Stage 1	288	316	-	453	458	-	-	-	-	-	-	-
Stage 2	397	395	-	289	316	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	52	70	356	~ 70	85	463	785	-	-	820	-	-
Mov Cap-2 Maneuver	52	70	-	220	240	-	-	-	-	-	-	-
Stage 1	287	286	-	451	456	-	-	-	-	-	-	-
Stage 2	349	393	-	260	286	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	45.5	25.3	0	0.8
HCM LOS	E	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	785	-	-	91	220	463	820	-	-
HCM Lane V/C Ratio	0.003	-	-	0.024	0.411	0.118	0.096	-	-
HCM Control Delay (s)	9.6	-	-	45.5	32.3	13.8	9.9	-	-
HCM Lane LOS	A	-	-	E	D	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.9	0.4	0.3	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection: 6: SW Boones Ferry Road & Site Access

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	TR
Maximum Queue (ft)	31	187	128	6	72	10	44	32
Average Queue (ft)	4	65	24	0	6	0	9	2
95th Queue (ft)	19	136	60	4	35	6	32	15
Link Distance (ft)	318	1445			601			1805
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			150	150		150	150	
Storage Blk Time (%)		4						
Queuing Penalty (veh)		2						

Network Summary

Network wide Queuing Penalty: 2

Intersection: 6: SW Boones Ferry Road & Site Access

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	TR
Maximum Queue (ft)	18	109	29	30	22	26	55	38
Average Queue (ft)	2	40	13	1	1	1	19	2
95th Queue (ft)	13	84	29	10	10	13	44	17
Link Distance (ft)	318	1810			670			1804
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			150	150		150	150	
Storage Blk Time (%)		0						
Queuing Penalty (veh)		0						

Queuing and Blocking Report

09/20/2021

Intersection: 6: SW Boones Ferry Road & Site Access

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	TR
Maximum Queue (ft)	30	140	48	12	88	10	32	28
Average Queue (ft)	3	59	22	0	5	0	8	2
95th Queue (ft)	17	124	42	6	42	5	28	13
Link Distance (ft)	318	1445			601			1805
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			150	150		150	150	
Storage Blk Time (%)		2			0			
Queuing Penalty (veh)		1			0			

Network Summary

Network wide Queuing Penalty: 1

Intersection: 6: SW Boones Ferry Road & Site Access

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	TR
Maximum Queue (ft)	30	163	47	29	33	27	61	9
Average Queue (ft)	3	65	18	1	2	2	25	0
95th Queue (ft)	17	131	38	10	16	11	51	5
Link Distance (ft)	318	1810			670			1804
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			150	150		150	150	
Storage Blk Time (%)		2						
Queuing Penalty (veh)		1						

Intersection: 6: SW Boones Ferry Road & Site Access

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	TR
Maximum Queue (ft)	35	224	171	5	76	32	54	46
Average Queue (ft)	3	85	33	0	6	2	16	3
95th Queue (ft)	17	185	99	3	37	13	42	21
Link Distance (ft)	318	1445			601			1805
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			150	150		150	150	
Storage Blk Time (%)		8						
Queuing Penalty (veh)		5						

Network Summary

Network wide Queuing Penalty: 5

Intersection: 6: SW Boones Ferry Road & Site Access

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	TR
Maximum Queue (ft)	35	193	130	6	46	41	65	59
Average Queue (ft)	3	82	22	0	2	3	25	3
95th Queue (ft)	19	174	72	6	19	20	51	26
Link Distance (ft)	318	1810			670			1804
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			150	150		150	150	
Storage Blk Time (%)		7						0
Queuing Penalty (veh)		4						0

lancaster mobley

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Memorandum

To: **Jinde Zhu, PE, Washington County**

Copy: **David Force, Lennar Northwest**
Mimi Doukas, AKS Engineering & Forestry, LLC

From: **Jennifer Danziger, PE**

Date: **November 12, 2021**

Subject: **Supplement 2 to Autumn Sunrise Subdivision TIS**
Detailed Evaluation of Site Access Signal Warrants

16168
SEPT. 15, 1992
JENNIFER ELISE DANZIGER
RENEWS: 12/31/2021

Introduction

This memorandum supplements the proposed Autumn Sunrise Subdivision Transportation Impact Study (TIS) with a peak hour assessment of traffic signal warrant at the proposed site access intersection with SW Boones Ferry Road. It also presents the operations and queuing analysis with the signal in place with one- and two-lane cross-sections on the site access road. The assessment addresses three development scenarios:

- Year 2025 Buildout with Phases 1-3 completed
- Year 2026 Buildout with Phases 1-4 completed (i.e., full residential development)
- Year 2026 Buildout with Phases 1-4 plus development of the commercially-zone parcels abutting SW Boones Ferry Road – Concept 2 from the memorandum dated September 20, 2021

Note the commercial parcels are not part of the subdivision; the specific timing and type of development that could occur on these parcels is unknown.

Peak Hour Signal Warrant Assessment

Warrant 3, the Peak Hour Vehicular Volume, from the MUTCD[1] were evaluated for the morning and evening peak hours. The evaluation was based on the following assumptions:

- The posted speed on this section of SW Boones Ferry Road is 45 mph; therefore, the 70 percent thresholds were used for the assessment.
- The westbound right-turn movement will experience very low delays; therefore, the right-turn movement was not included in the westbound approach volumes.
- Both morning (AM) and evening (PM) peak hour volumes were assessed.
- All scenarios assume the completed Basalt Creek Parkway Extension (BCPE) to SW Boones Ferry Road.

---

[1] Federal Highway Administration *Manual on Uniform Traffic Control Devices, 2009 Edition with Revisions 1 and 2*, May 2012

The results are summarized in Table 1 and detailed calculations are attached.

Table 1: Peak Hour Traffic Signal Warrants at the Site Access on SW Boones Ferry Road with BCPE

Scenario	Peak Hour Warrant Met?	
	Morning Peak Hour	Evening Peak Hour
Year 2025 Conditions (Phases 1-3)	Yes	No
Year 2026 Conditions (Phases 1-4)	Yes	No
Year 2026 Conditions (Phases 1-4) + Commercial (Concept 2)	Yes	Yes

The assessment shows that the morning peak hour traffic volumes would meet the warrant in year 2025 with completion of Phase 3. The evening peak hour traffic volumes would not meet with warrant with the proposed Autumn Sunrise Subdivision but would meet the warrant when the commercial parcels are eventually developed under a separate application.

Operations and Queuing with a Traffic Signal

The operations of the site access intersection with SW Boones Ferry Road were evaluated with a traffic signal and one or two westbound approach lanes. The analysis was based on the following assumptions:

- The traffic signal was assumed to be coordinated with the signal at the BCPE intersection, which was assumed to be coordinated with system that currently extends from SW Day Road through the I-5 Interchange.
- The northbound right-turn lane on SW Boones Ferry Road would not be warranted with a traffic signal.
- A two-lane westbound approach would be striped as a left-through and a right-turn movement to maintain the alignment with the frontage road connection across the street.
- North-south phasing was assumed to have protected/permitted left turns while east-west phasing was assumed to be permitted.

The capacity analysis results are summarized in Table 2 and the queuing results are summarized in Table 3. Detailed calculations are attached.

Table 2: Capacity Analysis Summary at the Site Access on SW Boones Ferry Road with BCPE

Intersection & Scenario	Morning Peak Hour			Evening Peak Hour		
	LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
One Shared Westbound Left-Through-Right Lane						
Year 2026 Conditions (Phases 1-4)	A	9	0.62	A	7	0.56
Year 2026 Conditions (Phases 1-4) + Commercial	A	10	0.64	A	9	0.59
Shared Westbound Left-Through Lane + Right-Turn Lane						
Year 2026 Conditions (Phases 1-4)	A	10	0.64	A	6	0.58
Year 2026 Conditions (Phases 1-4) + Commercial	B	11	0.65	A	8	0.60

Table 3: Queue Lengths at the Site Access on SW Boones Ferry Road with BCPE

Intersection & Scenario	95th Percentile Queue - Morning/Evening Peak Hour (feet)					
	NB L	SB L	EB LTR	WB LTR	WB LT	WB R
One Shared Westbound Left-Through-Right Lane						
Year 2026 Conditions (Phases 1-4)	25/25	50/50	25/25	150/100	-	-
Year 2026 Conditions (Phases 1-4) + Commercial	50/50	75/100	25/25	200/150	-	-
Shared Westbound Left-Through Lane + Right-Turn Lane						
Year 2026 Conditions (Phases 1-4)	25/25	25/50	25/25	-	125/100	50/50
Year 2026 Conditions (Phases 1-4) + Commercial	25/25	75/75	25/25	-	125/100	50/75

The intersection would operate well-below Washington County performance thresholds with either a one-lane or two-lane westbound approach for the site access.

Based on the traffic simulations with a single lane and the completed residential development, the 95th percentile queues are estimated at 150 feet. With the eventual development of the commercial parcels, the 95th percentile queues are estimated at 200 feet. The approximate distance from the crosswalk to the first residential driveway is estimated at 250 feet and the distance to the first intersection is estimated at 320 feet. The 95th percentile queues could be accommodated with a single lane without affecting the driveway or intersection.

If a two-lane approach is required as part of conditions of approval, the 95th percentile queues are estimated at 125 feet for the left-through lane and 75 feet for the right-turn lane.

The site access road would be 32 feet wide with a one-lane approach allowing for equal 16-foot travel lanes, one entering and one exiting the site. This width is likely too narrow to stripe a three-lane cross-section. If a three-lane section is required, widening the site access road to 36 feet would likely be necessary.

Conclusions

Key findings of this assessment include:

- The proposed subdivision will meet the peak hour signal warrant during the morning with the completion of Phase 3 but would not meet the peak hour signal warrant during the evening, even with completion of Phase 4. With development of the commercial parcels under another application, the evening peak hour volumes would also meet the warrant.
- With the installation of a traffic signal at the site access, a northbound right-turn lane on SW Boones Ferry Road is not necessary to meet Washington County operational thresholds.
- Operations would meet thresholds with a one- or two-lane westbound approach for the site access.
- Queues with a single approach lane would not affect the residential driveway or closest intersection with completion of the residential development.
- Providing a two-lane westbound approach would shorten queues slightly but would require widening the site access road. The recommended lane configuration for a two-lane approach is a shared left-through lane and a right-turn to best maintain lane alignment the eastbound frontage road approach.

TRAFFIC SIGNAL WARRANTS - BASED ON 2009 MUTCD

11/12/2021

INTERSECTION INFORMATION

City:	Tualatin	Condition:	2025 Phases 1-3 - Separate Left & Right-Turn Exit Lanes w/ Basalt Creek Extension
Population:	25000		
Intersection Location: (Rural/Urban)	Urban		
Major Street Name:	Boones Ferry Road	Minor Street Name:	AS Site Access
Number of Moving Lanes for Each	1	Number of Moving Lanes for Each	1
Speed:	45 mph	Speed:	25 mph
Street Width:	48 ft	Street Width:	32 ft

Direction:	NB	SB	Direction:	EB	WB		
Hour Beginning:			Hour Beginning:				
12:00 AM			12:00 AM				
1:00 AM			1:00 AM				
2:00 AM			2:00 AM				
3:00 AM			3:00 AM				
4:00 AM			4:00 AM				
5:00 AM			5:00 AM				
6:00 AM			6:00 AM			WB LT	WB RT
7:00 AM	695	578	7:00 AM	3	81	81	42
8:00 AM			8:00 AM				
9:00 AM			9:00 AM				
10:00 AM			10:00 AM				
11:00 AM			11:00 AM				
12:00 PM			12:00 PM				
1:00 PM			1:00 PM				
2:00 PM			2:00 PM				
3:00 PM			3:00 PM				
4:00 PM			4:00 PM			WB LT	WB RT
5:00 PM	696	841	5:00 PM	2	52	52	27
6:00 PM			6:00 PM				
7:00 PM			7:00 PM				
8:00 PM			8:00 PM				
9:00 PM			9:00 PM				
10:00 PM			10:00 PM				
11:00 PM			11:00 PM				
24-hour Total	1,391	1,419	24-hour Total	5	133		

WARRANT 3, PEAK HOUR VEHICULAR VOLUME

	MAJOR			MINOR			Calculated		
	NB	SB	Total	EB	WB	Max	Threshold (B	A-2&3	B
5:00 PM	696	841	1,537	2	52	52	75	N	N
7:00 AM	695	578	1,273	3	81	81	75	N	Y
11:00 PM	0	0	0	0	0	0	610	N	N
10:00 PM	0	0	0	0	0	0	610	N	N

Note: The major street has a speed which exceeds 40 mph, therefore these minimum volumes are 70 percent of the regular requirements

Warrant Requirements:
Major Street Lanes: 1
Minor Street Lanes: 1

CONDITION A-1 - Stopped Delay
Cannot be evaluated based on volumes alone. Condition met if traffic on one minor-street approach (one direction only) controlled by STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach.

CONDITION A-2 - Minor Street Volume
Minimum Volume on Higher Minor Street Approach: 100

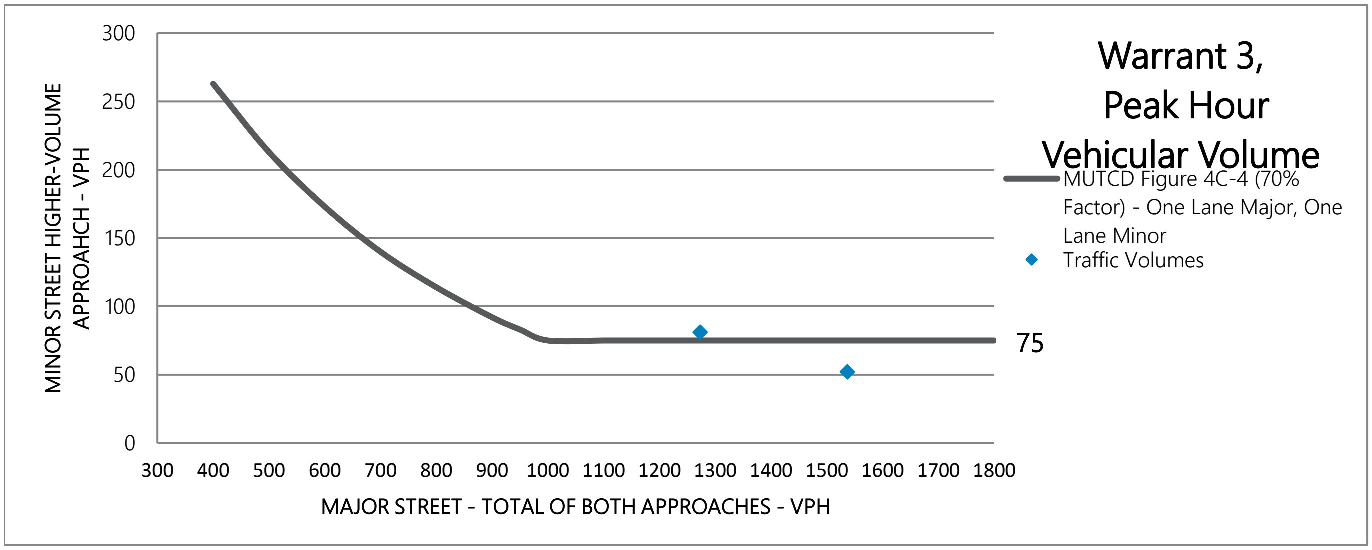
CONDITION A-3 - Total Approach Volume
Minimum Volume of Total Approaches: 800

CONDITION B - Plot of Minor Street Volume (high vol approach) vs. Major Street Volume (Both approaches)

ARE CONDITIONS A-2 AND A-3 OF SIGNAL WARRANT 3 MET? NO
Note: All 3 subsections of Condition A must be met to warrant signal.

IS CONDITION B OF SIGNAL WARRANT 3 MET? YES

Note: Signal Warrant 3 is met if either Condition A or Condition B is met.



TRAFFIC SIGNAL WARRANTS - BASED ON 2009 MUTCD

INTERSECTION INFORMATION

City:	Tualatin	Condition:	2026 Phases 1-4 - Separate Left & Right-Turn Exit Lanes w/ Basalt Creek Extension
Population:	25000		
Intersection Location: (Rural/Urban)	Urban		
Major Street Name:	Boones Ferry Road	Minor Street Name:	AS Site Access
Number of Moving Lanes for Each	1	Number of Moving Lanes for Each	1
Speed:	45 mph	Speed:	25 mph
Street Width:	48 ft	Street Width:	32 ft

Direction:	NB	SB	Direction:	EB	WB		
Hour Beginning:			Hour Beginning:				
12:00 AM			12:00 AM				
1:00 AM			1:00 AM				
2:00 AM			2:00 AM				
3:00 AM			3:00 AM				
4:00 AM			4:00 AM				
5:00 AM			5:00 AM				
6:00 AM			6:00 AM			WB LT	WB RT
7:00 AM	714	595	7:00 AM	3	106	106	52
8:00 AM			8:00 AM				
9:00 AM			9:00 AM				
10:00 AM			10:00 AM				
11:00 AM			11:00 AM				
12:00 PM			12:00 PM				
1:00 PM			1:00 PM				
2:00 PM			2:00 PM				
3:00 PM			3:00 PM				
4:00 PM			4:00 PM			WB LT	WB RT
5:00 PM	743	868	5:00 PM	2	69	69	34
6:00 PM			6:00 PM				
7:00 PM			7:00 PM				
8:00 PM			8:00 PM				
9:00 PM			9:00 PM				
10:00 PM			10:00 PM				
11:00 PM			11:00 PM				
24-hour Total	1,457	1,463	24-hour Total	5	175		

WARRANT 3, PEAK HOUR VEHICULAR VOLUME

	MAJOR			MINOR			Calculated		
	NB	SB	Total	EB	WB	Max	Threshold (B	A-2&3	B
5:00 PM	743	868	1,611	2	69	69	75	N	N
7:00 AM	714	595	1,309	3	106	106	75	Y	Y
11:00 PM	0	0	0	0	0	0	610	N	N
10:00 PM	0	0	0	0	0	0	610	N	N

Note: The major street has a speed which exceeds 40 mph, therefore these minimum volumes are 70 percent of the regular requirements

Warrant Requirements:
Major Street Lanes: 1
Minor Street Lanes: 1

CONDITION A-1 - Stopped Delay
Cannot be evaluated based on volumes alone. Condition met if traffic on one minor-street approach (one direction only) controlled by STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach.

CONDITION A-2 - Minor Street Volume
Minimum Volume on Higher Minor Street Approach: 100

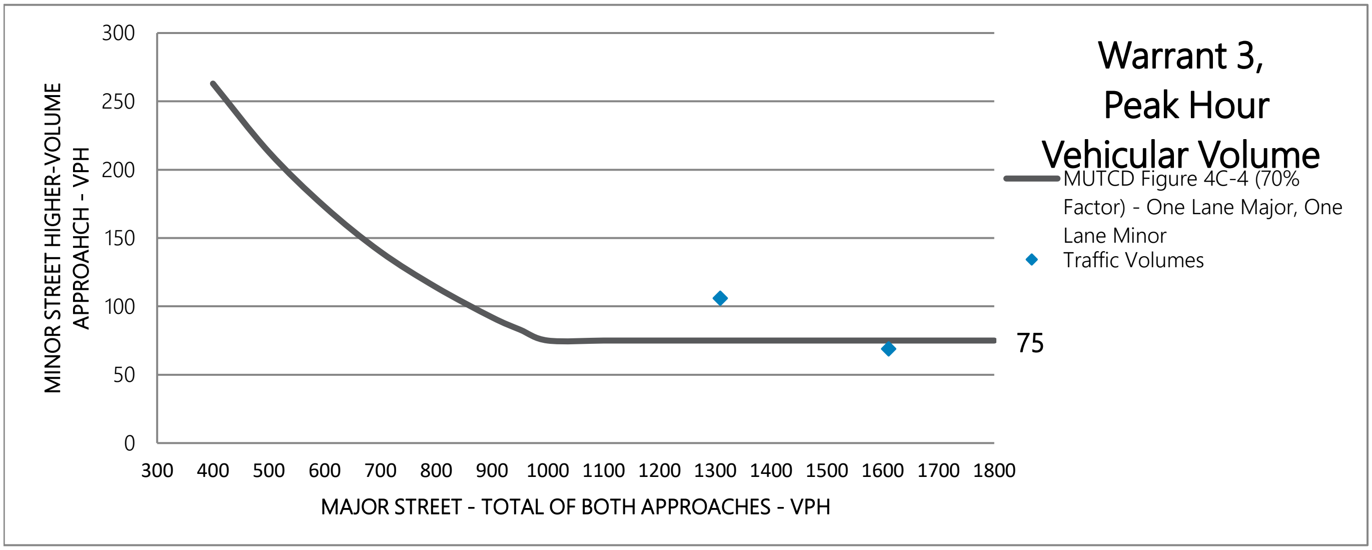
CONDITION A-3 - Total Approach Volume
Minimum Volume of Total Approaches: 800

CONDITION B - Plot of Minor Street Volume (high vol approach) vs. Major Street Volume (Both approaches)

ARE CONDITIONS A-2 AND A-3 OF SIGNAL WARRANT 3 MET? YES *Stopped Delay Needs to be Checked*
Note: All 3 subsections of Condition A must be met to warrant signal.

IS CONDITION B OF SIGNAL WARRANT 3 MET? YES

Note: Signal Warrant 3 is met if either Condition A or Condition B is met.



TRAFFIC SIGNAL WARRANTS - BASED ON 2009 MUTCD

11/12/2021

INTERSECTION INFORMATION

City:	Tualatin	Condition:	2026 Phases 1-4 - Separate Left & Right-Turn Exit Lanes w/ Future Commerical Development Option 2 w/ Basalt Creek Extension
Population:	25000		
Intersection Location: (Rural/Urban)	Urban		
Major Street Name:	Boones Ferry Road	Minor Street Name:	AS Site Access
Number of Moving Lanes for Each	1	Number of Moving Lanes for Each	1
Speed:	45 mph	Speed:	25 mph
Street Width:	48 ft	Street Width:	32 ft

Direction:	NB	SB	Direction:	EB	WB		
Hour Beginning:			Hour Beginning:				
12:00 AM			12:00 AM				
1:00 AM			1:00 AM				
2:00 AM			2:00 AM				
3:00 AM			3:00 AM				
4:00 AM			4:00 AM				
5:00 AM			5:00 AM				
6:00 AM			6:00 AM			WB LT	WB RT
7:00 AM	730	611	7:00 AM	3	120	120	66
8:00 AM			8:00 AM				
9:00 AM			9:00 AM				
10:00 AM			10:00 AM				
11:00 AM			11:00 AM				
12:00 PM			12:00 PM				
1:00 PM			1:00 PM				
2:00 PM			2:00 PM				
3:00 PM			3:00 PM				
4:00 PM			4:00 PM			WB LT	WB RT
5:00 PM	762	887	5:00 PM	2	86	86	82
6:00 PM			6:00 PM				
7:00 PM			7:00 PM				
8:00 PM			8:00 PM				
9:00 PM			9:00 PM				
10:00 PM			10:00 PM				
11:00 PM			11:00 PM				
24-hour Total	1,492	1,498	24-hour Total	5	206		

WARRANT 3, PEAK HOUR VEHICULAR VOLUME

	MAJOR			MINOR			Calculated		
	NB	SB	Total	EB	WB	Max	Threshold (B	A-2&3	B
5:00 PM	762	887	1,649	2	86	86	75	N	Y
7:00 AM	730	611	1,341	3	120	120	75	Y	Y
11:00 PM	0	0	0	0	0	0	610	N	N
10:00 PM	0	0	0	0	0	0	610	N	N

Note: The major street has a speed which exceeds 40 mph, therefore these minimum volumes are 70 percent of the regular requirements

Warrant Requirements:
Major Street Lanes: 1
Minor Street Lanes: 1

CONDITION A-1 - Stopped Delay
Cannot be evaluated based on volumes alone. Condition met if traffic on one minor-street approach (one direction only) controlled by STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach.

CONDITION A-2 - Minor Street Volume
Minimum Volume on Higher Minor Street Approach: 100

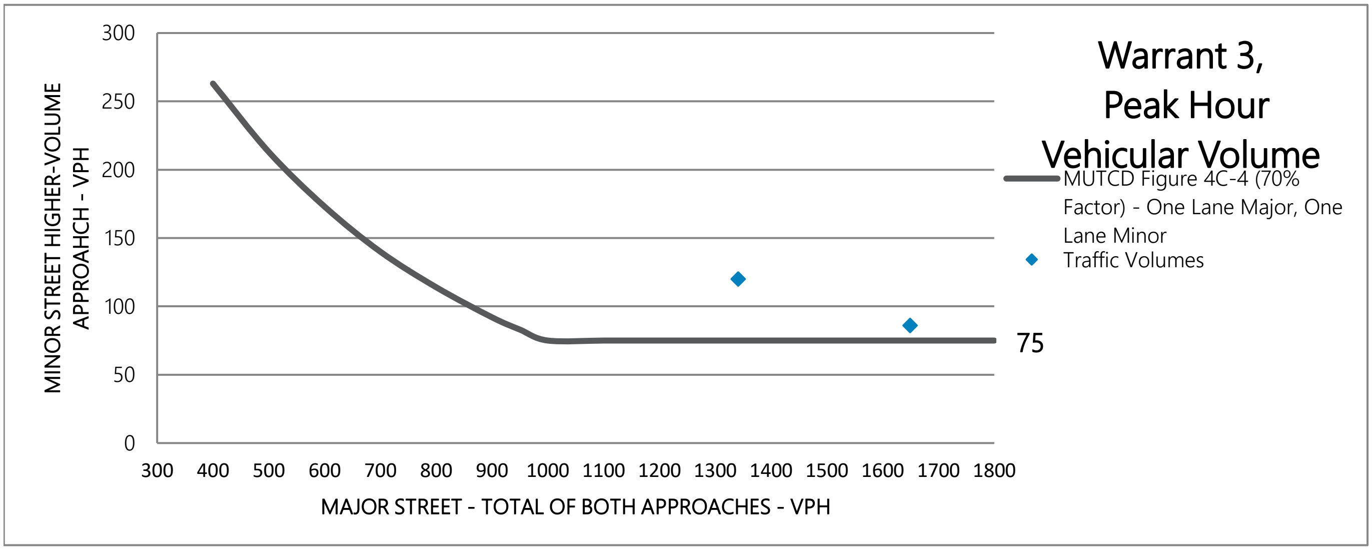
CONDITION A-3 - Total Approach Volume
Minimum Volume of Total Approaches: 800

CONDITION B - Plot of Minor Street Volume (high vol approach) vs. Major Street Volume (Both approaches)

ARE CONDITIONS A-2 AND A-3 OF SIGNAL WARRANT 3 MET? YES *Stopped Delay Needs to be Checked*
Note: All 3 subsections of Condition A must be met to warrant signal.

IS CONDITION B OF SIGNAL WARRANT 3 MET? YES

Note: Signal Warrant 3 is met if either Condition A or Condition B is met.



HCM Signalized Intersection Capacity Analysis
6: SW Boones Ferry Road & Shared Driveway/Site Access

11/12/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Volume (vph)	1	0	2	106	0	52	1	678	35	15	578	0
Future Volume (vph)	1	0	2	106	0	52	1	678	35	15	578	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			0.99		1.00	1.00		1.00	1.00	
Frt		0.91			0.96		1.00	0.99		1.00	1.00	
Flt Protected		0.98			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1667			1727		1770	1777		1719	1810	
Flt Permitted		0.95			0.80		0.34	1.00		0.24	1.00	
Satd. Flow (perm)		1603			1423		642	1777		440	1810	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	1	0	2	122	0	60	1	779	40	17	664	0
RTOR Reduction (vph)	0	3	0	0	69	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	113	0	1	818	0	17	664	0
Confl. Peds. (#/hr)				4		4			4	4		
Heavy Vehicles (%)	2%	2%	2%	0%	2%	0%	2%	6%	6%	5%	5%	2%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		12.6			12.6		66.1	65.0		68.7	66.3	
Effective Green, g (s)		13.6			13.6		68.1	66.0		70.7	67.3	
Actuated g/C Ratio		0.14			0.14		0.72	0.69		0.74	0.71	
Clearance Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		229			203		485	1234		373	1282	
v/s Ratio Prot							0.00	c0.46		c0.00	0.37	
v/s Ratio Perm		0.00			c0.08		0.00			0.03		
v/c Ratio		0.00			0.56		0.00	0.66		0.05	0.52	
Uniform Delay, d1		34.9			37.9		4.4	8.2		5.6	6.4	
Progression Factor		1.00			1.00		0.98	1.07		1.00	1.00	
Incremental Delay, d2		0.0			3.3		0.0	2.5		0.1	1.5	
Delay (s)		34.9			41.2		4.3	11.2		5.7	7.9	
Level of Service		C			D		A	B		A	A	
Approach Delay (s)		34.9			41.2			11.2			7.8	
Approach LOS		C			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
6: SW Boones Ferry Road & Shared Driveway/Site Access

11/12/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Volume (veh/h)	1	0	2	106	0	52	1	678	35	15	578	0
Future Volume (veh/h)	1	0	2	106	0	52	1	678	35	15	578	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1900	1870	1900	1870	1811	1811	1826	1826	1870
Adj Flow Rate, veh/h	1	0	2	122	0	60	1	779	40	17	664	0
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	0	2	0	2	6	6	5	5	2
Cap, veh/h	116	24	178	219	5	79	503	1162	60	571	1275	0
Arrive On Green	0.15	0.00	0.15	0.15	0.00	0.15	0.02	1.00	1.00	0.03	0.70	0.00
Sat Flow, veh/h	399	145	1088	951	34	484	1781	1707	88	1739	1826	0
Grp Volume(v), veh/h	3	0	0	182	0	0	1	0	819	17	664	0
Grp Sat Flow(s),veh/h/ln	1632	0	0	1469	0	0	1781	0	1795	1739	1826	0
Q Serve(g_s), s	0.0	0.0	0.0	10.9	0.0	0.0	0.0	0.0	0.0	0.3	16.4	0.0
Cycle Q Clear(g_c), s	0.1	0.0	0.0	11.4	0.0	0.0	0.0	0.0	0.0	0.3	16.4	0.0
Prop In Lane	0.33		0.67	0.67		0.33	1.00		0.05	1.00		0.00
Lane Grp Cap(c), veh/h	300	0	0	288	0	0	503	0	1222	571	1275	0
V/C Ratio(X)	0.01	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.67	0.03	0.52	0.00
Avail Cap(c_a), veh/h	464	0	0	449	0	0	594	0	1222	629	1275	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	0.84	0.00	0.84	1.00	1.00	0.00
Uniform Delay (d), s/veh	33.7	0.0	0.0	38.4	0.0	0.0	5.6	0.0	0.0	4.0	6.8	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	2.5	0.0	1.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	4.3	0.0	0.0	0.0	0.0	0.8	0.1	5.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.7	0.0	0.0	40.7	0.0	0.0	5.6	0.0	2.5	4.0	8.3	0.0
LnGrp LOS	C	A	A	D	A	A	A	A	A	A	A	A
Approach Vol, veh/h		3			182			820			681	
Approach Delay, s/veh		33.7			40.7			2.5			8.2	
Approach LOS		C			D			A			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.8	68.7		19.5	5.1	70.4		19.5				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	50.0		25.0	5.0	50.0		25.0				
Max Q Clear Time (g_c+I1), s	2.3	2.0		2.1	2.0	18.4		13.4				
Green Ext Time (p_c), s	0.0	7.8		0.0	0.0	5.2		1.1				
Intersection Summary												
HCM 6th Ctrl Delay			9.0									
HCM 6th LOS			A									

HCM Signalized Intersection Capacity Analysis
6: SW Boones Ferry Road & Shared Driveway/Site Access

11/12/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Volume (vph)	1	0	2	120	0	66	1	678	51	33	578	0
Future Volume (vph)	1	0	2	120	0	66	1	678	51	33	578	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			0.99		1.00	1.00		1.00	1.00	
Frt		0.91			0.95		1.00	0.99		1.00	1.00	
Flt Protected		0.98			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1667			1722		1770	1770		1719	1810	
Flt Permitted		0.95			0.80		0.36	1.00		0.22	1.00	
Satd. Flow (perm)		1606			1428		667	1770		403	1810	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1	0	2	133	0	73	1	753	57	37	642	0
RTOR Reduction (vph)	0	3	0	0	67	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	139	0	1	808	0	37	642	0
Confl. Peds. (#/hr)				4		4			4	4		
Heavy Vehicles (%)	2%	2%	2%	0%	2%	0%	2%	6%	6%	5%	5%	2%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		14.2			14.2		63.0	61.9		68.6	64.7	
Effective Green, g (s)		15.2			15.2		65.0	62.9		70.6	65.7	
Actuated g/C Ratio		0.16			0.16		0.68	0.66		0.74	0.69	
Clearance Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		256			228		480	1171		367	1251	
v/s Ratio Prot							0.00	c0.46		c0.01	c0.35	
v/s Ratio Perm		0.00			c0.10		0.00			0.07		
v/c Ratio		0.00			0.61		0.00	0.69		0.10	0.51	
Uniform Delay, d1		33.5			37.1		5.2	10.0		6.7	7.0	
Progression Factor		1.00			1.00		1.04	1.09		1.00	1.00	
Incremental Delay, d2		0.0			4.6		0.0	2.9		0.1	1.5	
Delay (s)		33.5			41.7		5.4	13.8		6.8	8.5	
Level of Service		C			D		A	B		A	A	
Approach Delay (s)		33.5			41.7			13.8			8.4	
Approach LOS		C			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
6: SW Boones Ferry Road & Shared Driveway/Site Access

11/12/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Volume (veh/h)	1	0	2	120	0	66	1	678	51	33	578	0
Future Volume (veh/h)	1	0	2	120	0	66	1	678	51	33	578	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1900	1870	1900	1870	1811	1811	1826	1826	1870
Adj Flow Rate, veh/h	1	0	2	133	0	73	1	753	57	37	642	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	0	2	0	2	6	6	5	5	2
Cap, veh/h	123	24	192	228	5	94	499	1082	82	579	1246	0
Arrive On Green	0.17	0.00	0.17	0.17	0.00	0.17	0.02	1.00	1.00	0.04	0.68	0.00
Sat Flow, veh/h	403	134	1074	922	29	522	1781	1662	126	1739	1826	0
Grp Volume(v), veh/h	3	0	0	206	0	0	1	0	810	37	642	0
Grp Sat Flow(s),veh/h/ln	1611	0	0	1472	0	0	1781	0	1788	1739	1826	0
Q Serve(g_s), s	0.0	0.0	0.0	12.4	0.0	0.0	0.0	0.0	0.0	0.6	16.4	0.0
Cycle Q Clear(g_c), s	0.1	0.0	0.0	12.8	0.0	0.0	0.0	0.0	0.0	0.6	16.4	0.0
Prop In Lane	0.33		0.67	0.65		0.35	1.00		0.07	1.00		0.00
Lane Grp Cap(c), veh/h	322	0	0	311	0	0	499	0	1164	579	1246	0
V/C Ratio(X)	0.01	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.70	0.06	0.52	0.00
Avail Cap(c_a), veh/h	463	0	0	449	0	0	590	0	1164	613	1246	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	0.84	0.00	0.84	1.00	1.00	0.00
Uniform Delay (d), s/veh	32.5	0.0	0.0	37.7	0.0	0.0	6.3	0.0	0.0	4.2	7.4	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	2.9	0.0	1.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	4.8	0.0	0.0	0.0	0.0	0.9	0.2	6.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.5	0.0	0.0	40.1	0.0	0.0	6.3	0.0	2.9	4.3	8.9	0.0
LnGrp LOS	C	A	A	D	A	A	A	A	A	A	A	A
Approach Vol, veh/h		3			206			811			679	
Approach Delay, s/veh		32.5			40.1			2.9			8.7	
Approach LOS		C			D			A			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.1	65.9		21.0	5.1	68.8		21.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	50.0		25.0	5.0	50.0		25.0				
Max Q Clear Time (g_c+I1), s	2.6	2.0		2.1	2.0	18.4		14.8				
Green Ext Time (p_c), s	0.0	7.7		0.0	0.0	5.0		1.2				

Intersection Summary			
HCM 6th Ctrl Delay			9.8
HCM 6th LOS			A

HCM Signalized Intersection Capacity Analysis
6: SW Boones Ferry Road & Shared Driveway/Site Access

11/12/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↱		↰	↱	
Traffic Volume (vph)	1	0	2	106	0	52	1	678	35	15	578	0
Future Volume (vph)	1	0	2	106	0	52	1	678	35	15	578	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	6.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			0.99	1.00	1.00	1.00		1.00	1.00	
Frt		0.91			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.98			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1667			1786	1566	1770	1777		1719	1810	
Flt Permitted		0.93			0.76	1.00	0.34	1.00		0.24	1.00	
Satd. Flow (perm)		1579			1421	1566	636	1777		439	1810	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	1	0	2	122	0	60	1	779	40	17	664	0
RTOR Reduction (vph)	0	3	0	0	0	51	0	2	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	122	9	1	817	0	17	664	0
Confl. Peds. (#/hr)				4		4			4	4		
Heavy Vehicles (%)	2%	2%	2%	0%	2%	0%	2%	6%	6%	5%	5%	2%
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		13.2			13.2	13.2	65.6	64.6		68.0	65.8	
Effective Green, g (s)		14.2			14.2	14.2	67.6	63.6		70.0	66.8	
Actuated g/C Ratio		0.15			0.15	0.15	0.71	0.67		0.74	0.70	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		236			212	234	476	1189		366	1272	
v/s Ratio Prot							0.00	c0.46		c0.00	0.37	
v/s Ratio Perm		0.00			c0.09	0.01	0.00			0.03		
v/c Ratio		0.00			0.58	0.04	0.00	0.69		0.05	0.52	
Uniform Delay, d1		34.4			37.6	34.6	4.6	9.6		5.8	6.6	
Progression Factor		1.00			1.00	1.00	1.08	1.06		1.00	1.00	
Incremental Delay, d2		0.0			3.7	0.1	0.0	2.8		0.1	1.5	
Delay (s)		34.4			41.3	34.6	5.0	13.1		5.9	8.1	
Level of Service		C			D	C	A	B		A	A	
Approach Delay (s)		34.4			39.1			13.1			8.1	
Approach LOS		C			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↱		↰	↱	
Traffic Volume (veh/h)	1	0	2	106	0	52	1	678	35	15	578	0
Future Volume (veh/h)	1	0	2	106	0	52	1	678	35	15	578	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1900	1870	1900	1870	1811	1811	1826	1826	1870
Adj Flow Rate, veh/h	1	0	2	122	0	60	1	779	40	17	664	0
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	0	2	0	2	6	6	5	5	2
Cap, veh/h	62	24	71	235	0	298	474	1086	56	555	1232	0
Arrive On Green	0.18	0.00	0.19	0.18	0.00	0.19	0.02	1.00	1.00	0.03	0.67	0.00
Sat Flow, veh/h	61	128	378	848	0	1593	1781	1707	88	1739	1826	0
Grp Volume(v), veh/h	3	0	0	122	0	60	1	0	819	17	664	0
Grp Sat Flow(s),veh/h/ln	567	0	0	848	0	1593	1781	0	1795	1739	1826	0
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.3	17.7	0.0
Cycle Q Clear(g_c), s	14.8	0.0	0.0	14.7	0.0	3.0	0.0	0.0	0.0	0.3	17.7	0.0
Prop In Lane	0.33		0.67	1.00		1.00	1.00		0.05	1.00		0.00
Lane Grp Cap(c), veh/h	151	0	0	226	0	298	474	0	1141	555	1232	0
V/C Ratio(X)	0.02	0.00	0.00	0.54	0.00	0.20	0.00	0.00	0.72	0.03	0.54	0.00
Avail Cap(c_a), veh/h	170	0	0	244	0	319	565	0	1141	613	1232	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	0.84	0.00	0.84	1.00	1.00	0.00
Uniform Delay (d), s/veh	32.2	0.0	0.0	37.9	0.0	32.6	6.5	0.0	0.0	4.7	7.9	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	2.0	0.0	0.3	0.0	0.0	3.3	0.0	1.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	2.9	0.0	1.2	0.0	0.0	1.0	0.1	6.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.3	0.0	0.0	39.9	0.0	32.9	6.5	0.0	3.3	4.7	9.6	0.0
LnGrp LOS	C	A	A	D	A	C	A	A	A	A	A	A
Approach Vol, veh/h		3			182			820			681	
Approach Delay, s/veh		32.3			37.6			3.3			9.5	
Approach LOS		C			D			A			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.8	66.4		21.8	5.1	68.1		21.8
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	5.0	57.0		18.0	5.0	57.0		18.0
Max Q Clear Time (g_c+I1), s	2.3	2.0		16.8	2.0	19.7		16.7
Green Ext Time (p_c), s	0.0	7.9		0.0	0.0	5.4		0.1

Intersection Summary	
HCM 6th Ctrl Delay	9.5
HCM 6th LOS	A

HCM Signalized Intersection Capacity Analysis
6: SW Boones Ferry Road & Shared Driveway/Site Access

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			↰	↱	↰	↱		↰	↱	
Traffic Volume (vph)	1	0	2	120	0	66	1	678	51	33	578	0
Future Volume (vph)	1	0	2	120	0	66	1	678	51	33	578	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	6.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			0.99	1.00	1.00	1.00		1.00	1.00	
Frt		0.91			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.98			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1667			1786	1566	1770	1770		1719	1810	
Flt Permitted		0.93			0.76	1.00	0.36	1.00		0.23	1.00	
Satd. Flow (perm)		1580			1421	1566	669	1770		419	1810	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1	0	2	133	0	73	1	753	57	37	642	0
RTOR Reduction (vph)	0	3	0	0	0	62	0	2	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	133	11	1	808	0	37	642	0
Confl. Peds. (#/hr)				4		4			4	4		
Heavy Vehicles (%)	2%	2%	2%	0%	2%	0%	2%	6%	6%	5%	5%	2%
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		13.7			13.7	13.7	63.8	62.8		68.8	65.3	
Effective Green, g (s)		14.7			14.7	14.7	65.8	61.8		70.8	66.3	
Actuated g/C Ratio		0.15			0.15	0.15	0.69	0.65		0.75	0.70	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		244			219	242	486	1151		373	1263	
v/s Ratio Prot							0.00	c0.46		c0.00	0.35	
v/s Ratio Perm		0.00			c0.09	0.01	0.00			0.07		
v/c Ratio		0.00			0.61	0.05	0.00	0.70		0.10	0.51	
Uniform Delay, d1		33.9			37.5	34.2	5.0	10.7		6.3	6.7	
Progression Factor		1.00			1.00	1.00	1.10	1.09		1.00	1.00	
Incremental Delay, d2		0.0			4.7	0.1	0.0	3.1		0.1	1.5	
Delay (s)		34.0			42.2	34.3	5.5	14.7		6.4	8.2	
Level of Service		C			D	C	A	B		A	A	
Approach Delay (s)		34.0			39.4			14.7			8.1	
Approach LOS		C			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
6: SW Boones Ferry Road & Shared Driveway/Site Access

11/12/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↱		↰	↱	
Traffic Volume (veh/h)	1	0	2	120	0	66	1	678	51	33	578	0
Future Volume (veh/h)	1	0	2	120	0	66	1	678	51	33	578	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1900	1870	1900	1870	1811	1811	1826	1826	1870
Adj Flow Rate, veh/h	1	0	2	133	0	73	1	753	57	37	642	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	0	2	0	2	6	6	5	5	2
Cap, veh/h	56	24	60	231	0	319	474	1013	77	565	1208	0
Arrive On Green	0.19	0.00	0.20	0.19	0.00	0.20	0.02	1.00	1.00	0.04	0.66	0.00
Sat Flow, veh/h	29	121	299	774	0	1594	1781	1662	126	1739	1826	0
Grp Volume(v), veh/h	3	0	0	133	0	73	1	0	810	37	642	0
Grp Sat Flow(s),veh/h/ln	449	0	0	774	0	1594	1781	0	1788	1739	1826	0
Q Serve(g_s), s	0.0	0.0	0.0	0.1	0.0	3.6	0.0	0.0	0.0	0.7	17.4	0.0
Cycle Q Clear(g_c), s	17.0	0.0	0.0	17.0	0.0	3.6	0.0	0.0	0.0	0.7	17.4	0.0
Prop In Lane	0.33		0.67	1.00		1.00	1.00		0.07	1.00		0.00
Lane Grp Cap(c), veh/h	136	0	0	222	0	319	474	0	1089	565	1208	0
V/C Ratio(X)	0.02	0.00	0.00	0.60	0.00	0.23	0.00	0.00	0.74	0.07	0.53	0.00
Avail Cap(c_a), veh/h	136	0	0	222	0	319	565	0	1089	600	1208	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	0.84	0.00	0.84	1.00	1.00	0.00
Uniform Delay (d), s/veh	31.5	0.0	0.0	37.7	0.0	31.9	7.1	0.0	0.0	4.8	8.4	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	4.3	0.0	0.4	0.0	0.0	3.9	0.0	1.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	3.3	0.0	1.4	0.0	0.0	1.2	0.2	6.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.6	0.0	0.0	42.1	0.0	32.2	7.1	0.0	3.9	4.9	10.1	0.0
LnGrp LOS	C	A	A	D	A	C	A	A	A	A	B	A
Approach Vol, veh/h		3			206			811			679	
Approach Delay, s/veh		31.6			38.6			3.9			9.8	
Approach LOS		C			D			A			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.1	63.9		23.0	5.1	66.9		23.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	57.0		18.0	5.0	57.0		18.0				
Max Q Clear Time (g_c+I1), s	2.7	2.0		19.0	2.0	19.4		19.0				
Green Ext Time (p_c), s	0.0	7.8		0.0	0.0	5.1		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			10.5									
HCM 6th LOS			B									

HCM Signalized Intersection Capacity Analysis
6: SW Boones Ferry Road & Shared Driveway/Site Access

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Volume (vph)	1	0	1	69	0	34	2	626	115	51	812	0
Future Volume (vph)	1	0	1	69	0	34	2	626	115	51	812	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.93			0.96		1.00	0.98		1.00	1.00	
Flt Protected		0.98			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1695			1735		1770	1795		1770	1863	
Flt Permitted		0.91			0.80		0.28	1.00		0.27	1.00	
Satd. Flow (perm)		1584			1431		529	1795		510	1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.92	0.95	0.92	0.95	0.95	0.95	0.95	0.92
Adj. Flow (vph)	1	0	1	73	0	36	2	659	121	54	855	0
RTOR Reduction (vph)	0	2	0	0	66	0	0	5	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	43	0	2	775	0	54	855	0
Confl. Peds. (#/hr)				2		2			2	2		
Heavy Vehicles (%)	2%	2%	2%	0%	2%	0%	2%	3%	3%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.8			8.8		77.3	76.2		85.1	80.1	
Effective Green, g (s)		9.8			9.8		79.3	77.2		87.1	81.1	
Actuated g/C Ratio		0.09			0.09		0.76	0.74		0.83	0.77	
Clearance Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		147			133		424	1319		495	1438	
v/s Ratio Prot							0.00	0.43		c0.01	c0.46	
v/s Ratio Perm		0.00			c0.03		0.00			0.08		
v/c Ratio		0.00			0.32		0.00	0.59		0.11	0.59	
Uniform Delay, d1		43.2			44.5		4.0	6.5		3.9	5.0	
Progression Factor		1.00			1.00		0.76	0.76		1.00	1.00	
Incremental Delay, d2		0.0			1.4		0.0	1.8		0.1	1.8	
Delay (s)		43.2			45.9		3.1	6.7		4.0	6.8	
Level of Service		D			D		A	A		A	A	
Approach Delay (s)		43.2			45.9			6.7			6.7	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
6: SW Boones Ferry Road & Shared Driveway/Site Access

11/12/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Volume (veh/h)	1	0	1	69	0	34	2	626	115	51	812	0
Future Volume (veh/h)	1	0	1	69	0	34	2	626	115	51	812	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1900	1870	1900	1870	1856	1856	1870	1870	1870
Adj Flow Rate, veh/h	1	0	1	73	0	36	2	659	121	54	855	0
Peak Hour Factor	0.92	0.92	0.92	0.95	0.92	0.95	0.92	0.95	0.95	0.95	0.95	0.92
Percent Heavy Veh, %	2	2	2	0	2	0	2	3	3	2	2	2
Cap, veh/h	118	17	84	153	6	50	463	1121	206	662	1441	0
Arrive On Green	0.09	0.00	0.10	0.09	0.00	0.09	0.02	1.00	1.00	0.05	0.77	0.00
Sat Flow, veh/h	648	169	817	934	55	488	1781	1525	280	1781	1870	0
Grp Volume(v), veh/h	2	0	0	109	0	0	2	0	780	54	855	0
Grp Sat Flow(s),veh/h/ln	1634	0	0	1477	0	0	1781	0	1805	1781	1870	0
Q Serve(g_s), s	0.0	0.0	0.0	7.1	0.0	0.0	0.0	0.0	0.0	0.7	20.3	0.0
Cycle Q Clear(g_c), s	0.1	0.0	0.0	7.6	0.0	0.0	0.0	0.0	0.0	0.7	20.3	0.0
Prop In Lane	0.50		0.50	0.67		0.33	1.00		0.16	1.00		0.00
Lane Grp Cap(c), veh/h	204	0	0	195	0	0	463	0	1327	662	1441	0
V/C Ratio(X)	0.01	0.00	0.00	0.56	0.00	0.00	0.00	0.00	0.59	0.08	0.59	0.00
Avail Cap(c_a), veh/h	318	0	0	309	0	0	543	0	1327	679	1441	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	0.90	0.00	0.90	1.00	1.00	0.00
Uniform Delay (d), s/veh	42.5	0.0	0.0	46.1	0.0	0.0	4.6	0.0	0.0	2.2	5.1	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	1.7	0.1	1.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.6	0.2	6.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.5	0.0	0.0	48.6	0.0	0.0	4.6	0.0	1.7	2.3	6.9	0.0
LnGrp LOS	D	A	A	D	A	A	A	A	A	A	A	A
Approach Vol, veh/h		2			109			782			909	
Approach Delay, s/veh		42.5			48.6			1.7			6.6	
Approach LOS		D			D			A			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.0	81.2		14.8	5.3	84.9		14.8
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	5.0	67.0		18.0	5.0	67.0		18.0
Max Q Clear Time (g_c+I1), s	2.7	2.0		2.1	2.0	22.3		9.6
Green Ext Time (p_c), s	0.0	11.8		0.0	0.0	12.8		0.4

Intersection Summary	
HCM 6th Ctrl Delay	7.1
HCM 6th LOS	A

HCM Signalized Intersection Capacity Analysis
6: SW Boones Ferry Road & Shared Driveway/Site Access

11/12/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱		↰	↱	
Traffic Volume (vph)	1	0	1	86	0	52	2	626	134	75	812	0
Future Volume (vph)	1	0	1	86	0	52	2	626	134	75	812	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.93			0.95		1.00	0.97		1.00	1.00	
Flt Protected		0.98			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1695			1726		1770	1788		1770	1863	
Flt Permitted		0.92			0.81		0.27	1.00		0.25	1.00	
Satd. Flow (perm)		1595			1440		509	1788		466	1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.92	0.95	0.92	0.95	0.95	0.95	0.95	0.92
Adj. Flow (vph)	1	0	1	91	0	55	2	659	141	79	855	0
RTOR Reduction (vph)	0	2	0	0	65	0	0	6	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	81	0	2	794	0	79	855	0
Confl. Peds. (#/hr)				2		2			2	2		
Heavy Vehicles (%)	2%	2%	2%	0%	2%	0%	2%	3%	3%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		11.2			11.2		74.5	73.4		83.1	77.7	
Effective Green, g (s)		12.2			12.2		76.5	74.4		84.8	78.7	
Actuated g/C Ratio		0.12			0.12		0.73	0.71		0.81	0.75	
Clearance Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		185			167		396	1266		455	1396	
v/s Ratio Prot							0.00	0.44		c0.01	c0.46	
v/s Ratio Perm		0.00			c0.06		0.00			0.13		
v/c Ratio		0.00			0.49		0.01	0.63		0.17	0.61	
Uniform Delay, d1		41.0			43.5		5.0	8.0		5.3	6.1	
Progression Factor		1.00			1.00		0.63	0.82		1.00	1.00	
Incremental Delay, d2		0.0			2.2		0.0	2.2		0.2	2.0	
Delay (s)		41.0			45.7		3.2	8.8		5.4	8.1	
Level of Service		D			D		A	A		A	A	
Approach Delay (s)		41.0			45.7			8.8			7.9	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
6: SW Boones Ferry Road & Shared Driveway/Site Access

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↱		↰	↱	
Traffic Volume (veh/h)	1	0	1	86	0	52	2	626	134	75	812	0
Future Volume (veh/h)	1	0	1	86	0	52	2	626	134	75	812	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1900	1870	1900	1870	1856	1856	1870	1870	1870
Adj Flow Rate, veh/h	1	0	1	91	0	55	2	659	141	79	855	0
Peak Hour Factor	0.92	0.92	0.92	0.95	0.92	0.95	0.92	0.95	0.95	0.95	0.95	0.92
Percent Heavy Veh, %	2	2	2	0	2	0	2	3	3	2	2	2
Cap, veh/h	134	17	100	168	6	72	432	1043	223	641	1393	0
Arrive On Green	0.12	0.00	0.13	0.12	0.00	0.12	0.02	1.00	1.00	0.05	0.74	0.00
Sat Flow, veh/h	639	135	775	876	48	559	1781	1481	317	1781	1870	0
Grp Volume(v), veh/h	2	0	0	146	0	0	2	0	800	79	855	0
Grp Sat Flow(s),veh/h/ln	1549	0	0	1483	0	0	1781	0	1798	1781	1870	0
Q Serve(g_s), s	0.0	0.0	0.0	9.5	0.0	0.0	0.0	0.0	0.0	1.1	22.6	0.0
Cycle Q Clear(g_c), s	0.1	0.0	0.0	10.1	0.0	0.0	0.0	0.0	0.0	1.1	22.6	0.0
Prop In Lane	0.50		0.50	0.62		0.38	1.00		0.18	1.00		0.00
Lane Grp Cap(c), veh/h	236	0	0	233	0	0	432	0	1267	641	1393	0
V/C Ratio(X)	0.01	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.63	0.12	0.61	0.00
Avail Cap(c_a), veh/h	312	0	0	309	0	0	512	0	1267	649	1393	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	0.90	0.00	0.90	1.00	1.00	0.00
Uniform Delay (d), s/veh	40.1	0.0	0.0	44.7	0.0	0.0	5.8	0.0	0.0	2.8	6.3	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0	2.2	0.1	2.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	3.9	0.0	0.0	0.0	0.0	0.8	0.3	8.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.1	0.0	0.0	47.4	0.0	0.0	5.8	0.0	2.2	2.9	8.3	0.0
LnGrp LOS	D	A	A	D	A	A	A	A	A	A	A	A
Approach Vol, veh/h		2			146			802			934	
Approach Delay, s/veh		40.1			47.4			2.2			7.9	
Approach LOS		D			D			A			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.5	78.0		17.5	5.3	82.2		17.5				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	67.0		18.0	5.0	67.0		18.0				
Max Q Clear Time (g_c+I1), s	3.1	2.0		2.1	2.0	24.6		12.1				
Green Ext Time (p_c), s	0.1	12.4		0.0	0.0	12.6		0.4				

Intersection Summary				
HCM 6th Ctrl Delay			8.5	
HCM 6th LOS			A	

HCM Signalized Intersection Capacity Analysis
6: SW Boones Ferry Road & Shared Driveway/Site Access

11/12/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↱		↰	↱	
Traffic Volume (vph)	1	0	1	69	0	34	2	626	115	51	812	0
Future Volume (vph)	1	0	1	69	0	34	2	626	115	51	812	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	5.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			0.99	1.00	1.00	1.00		1.00	1.00	
Frt		0.93			1.00	0.85	1.00	0.98		1.00	1.00	
Flt Protected		0.98			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1695			1795	1573	1770	1795		1770	1863	
Flt Permitted		0.89			0.76	1.00	0.28	1.00		0.27	1.00	
Satd. Flow (perm)		1548			1429	1573	523	1795		502	1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.92	0.95	0.92	0.95	0.95	0.95	0.95	0.92
Adj. Flow (vph)	1	0	1	73	0	36	2	659	121	54	855	0
RTOR Reduction (vph)	0	2	0	0	0	33	0	5	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	73	3	2	775	0	54	855	0
Confl. Peds. (#/hr)				2		2			2	2		
Heavy Vehicles (%)	2%	2%	2%	0%	2%	0%	2%	3%	3%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		9.5			9.5	9.5	76.5	75.4		84.5	79.4	
Effective Green, g (s)		10.5			10.5	9.5	78.5	76.4		86.5	80.4	
Actuated g/C Ratio		0.10			0.10	0.09	0.75	0.73		0.82	0.77	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		154			142	142	415	1306		487	1426	
v/s Ratio Prot							0.00	0.43		c0.01	c0.46	
v/s Ratio Perm		0.00			c0.05	0.00	0.00			0.08		
v/c Ratio		0.00			0.51	0.02	0.00	0.59		0.11	0.60	
Uniform Delay, d1		42.5			44.8	43.5	4.3	6.9		4.2	5.3	
Progression Factor		1.00			1.00	1.00	0.74	0.78		1.00	1.00	
Incremental Delay, d2		0.0			3.1	0.1	0.0	1.8		0.1	1.9	
Delay (s)		42.5			48.0	43.6	3.2	7.2		4.3	7.2	
Level of Service		D			D	D	A	A		A	A	
Approach Delay (s)		42.5			46.5			7.2			7.0	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↱		↰	↱	
Traffic Volume (veh/h)	1	0	1	69	0	34	2	626	115	51	812	0
Future Volume (veh/h)	1	0	1	69	0	34	2	626	115	51	812	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1900	1870	1900	1870	1856	1856	1870	1870	1870
Adj Flow Rate, veh/h	1	0	1	73	0	36	2	659	121	54	855	0
Peak Hour Factor	0.92	0.92	0.92	0.95	0.92	0.95	0.92	0.95	0.95	0.95	0.95	0.92
Percent Heavy Veh, %	2	2	2	0	2	0	2	3	3	2	2	2
Cap, veh/h	71	17	36	187	0	110	492	1158	213	679	1486	0
Arrive On Green	0.07	0.00	0.08	0.07	0.00	0.07	0.02	1.00	1.00	0.05	0.79	0.00
Sat Flow, veh/h	242	217	458	1495	0	1587	1781	1525	280	1781	1870	0
Grp Volume(v), veh/h	2	0	0	73	0	36	2	0	780	54	855	0
Grp Sat Flow(s),veh/h/ln	916	0	0	1495	0	1587	1781	0	1805	1781	1870	0
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.6	18.2	0.0
Cycle Q Clear(g_c), s	4.9	0.0	0.0	4.9	0.0	2.3	0.0	0.0	0.0	0.6	18.2	0.0
Prop In Lane	0.50		0.50	1.00		1.00	1.00		0.16	1.00		0.00
Lane Grp Cap(c), veh/h	115	0	0	172	0	110	492	0	1371	679	1486	0
V/C Ratio(X)	0.02	0.00	0.00	0.42	0.00	0.33	0.00	0.00	0.57	0.08	0.58	0.00
Avail Cap(c_a), veh/h	264	0	0	317	0	272	572	0	1371	696	1486	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	0.90	0.00	0.90	1.00	1.00	0.00
Uniform Delay (d), s/veh	44.9	0.0	0.0	47.3	0.0	46.5	3.7	0.0	0.0	1.7	4.1	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	1.6	0.0	1.7	0.0	0.0	1.5	0.0	1.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	2.0	0.0	0.9	0.0	0.0	0.6	0.1	5.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.9	0.0	0.0	48.9	0.0	48.2	3.7	0.0	1.5	1.8	5.7	0.0
LnGrp LOS	D	A	A	D	A	D	A	A	A	A	A	A
Approach Vol, veh/h		2			109			782			909	
Approach Delay, s/veh		44.9			48.7			1.6			5.5	
Approach LOS		D			D			A			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.0	83.7		12.3	5.3	87.4		12.3				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	67.0		18.0	5.0	67.0		18.0				
Max Q Clear Time (g_c+I1), s	2.6	2.0		6.9	2.0	20.2		6.9				
Green Ext Time (p_c), s	0.0	11.8		0.0	0.0	12.9		0.4				

Intersection Summary			
HCM 6th Ctrl Delay			6.4
HCM 6th LOS			A

HCM Signalized Intersection Capacity Analysis
6: SW Boones Ferry Road & Shared Driveway/Site Access

11/12/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↱		↰	↱	
Traffic Volume (vph)	1	0	1	86	0	52	2	626	134	75	812	0
Future Volume (vph)	1	0	1	86	0	52	2	626	134	75	812	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	5.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			0.99	1.00	1.00	1.00		1.00	1.00	
Frt		0.93			1.00	0.85	1.00	0.97		1.00	1.00	
Flt Protected		0.98			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1695			1795	1573	1770	1788		1770	1863	
Flt Permitted		0.90			0.76	1.00	0.28	1.00		0.25	1.00	
Satd. Flow (perm)		1555			1429	1573	515	1788		471	1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.92	0.95	0.92	0.95	0.95	0.95	0.95	0.92
Adj. Flow (vph)	1	0	1	91	0	55	2	659	141	79	855	0
RTOR Reduction (vph)	0	2	0	0	0	49	0	6	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	91	6	2	794	0	79	855	0
Confl. Peds. (#/hr)				2		2			2	2		
Heavy Vehicles (%)	2%	2%	2%	0%	2%	0%	2%	3%	3%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		10.6			10.6	10.6	75.1	74.0		83.7	78.3	
Effective Green, g (s)		11.6			11.6	10.6	77.1	75.0		85.4	79.3	
Actuated g/C Ratio		0.11			0.11	0.10	0.73	0.71		0.81	0.76	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		171			157	158	403	1277		462	1407	
v/s Ratio Prot							0.00	0.44		c0.01	c0.46	
v/s Ratio Perm		0.00			c0.06	0.00	0.00			0.13		
v/c Ratio		0.00			0.58	0.04	0.00	0.62		0.17	0.61	
Uniform Delay, d1		41.5			44.4	42.6	4.8	7.7		5.0	5.8	
Progression Factor		1.00			1.00	1.00	0.66	0.82		1.00	1.00	
Incremental Delay, d2		0.0			5.1	0.1	0.0	2.1		0.2	2.0	
Delay (s)		41.5			49.5	42.7	3.2	8.4		5.2	7.8	
Level of Service		D			D	D	A	A		A	A	
Approach Delay (s)		41.5			46.9			8.4			7.6	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
6: SW Boones Ferry Road & Shared Driveway/Site Access

11/12/2021

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↱		↰	↱	
Traffic Volume (veh/h)	1	0	1	86	0	52	2	626	134	75	812	0
Future Volume (veh/h)	1	0	1	86	0	52	2	626	134	75	812	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1900	1870	1900	1870	1856	1856	1870	1870	1870
Adj Flow Rate, veh/h	1	0	1	91	0	55	2	659	141	79	855	0
Peak Hour Factor	0.92	0.92	0.92	0.95	0.92	0.95	0.92	0.95	0.95	0.95	0.95	0.92
Percent Heavy Veh, %	2	2	2	0	2	0	2	3	3	2	2	2
Cap, veh/h	71	17	37	203	0	156	458	1076	230	655	1433	0
Arrive On Green	0.10	0.00	0.11	0.10	0.00	0.10	0.02	1.00	1.00	0.05	0.77	0.00
Sat Flow, veh/h	179	163	342	1259	0	1594	1781	1481	317	1781	1870	0
Grp Volume(v), veh/h	2	0	0	91	0	55	2	0	800	79	855	0
Grp Sat Flow(s),veh/h/ln	684	0	0	1259	0	1594	1781	0	1798	1781	1870	0
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0	0.0	1.0	20.7	0.0
Cycle Q Clear(g_c), s	7.7	0.0	0.0	7.7	0.0	3.4	0.0	0.0	0.0	1.0	20.7	0.0
Prop In Lane	0.50		0.50	1.00		1.00	1.00		0.18	1.00		0.00
Lane Grp Cap(c), veh/h	118	0	0	191	0	156	458	0	1306	655	1433	0
V/C Ratio(X)	0.02	0.00	0.00	0.48	0.00	0.35	0.00	0.00	0.61	0.12	0.60	0.00
Avail Cap(c_a), veh/h	225	0	0	296	0	273	538	0	1306	664	1433	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	0.90	0.00	0.90	1.00	1.00	0.00
Uniform Delay (d), s/veh	42.3	0.0	0.0	45.8	0.0	44.3	4.8	0.0	0.0	2.3	5.3	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	1.8	0.0	1.4	0.0	0.0	1.9	0.1	1.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	2.4	0.0	1.4	0.0	0.0	0.7	0.3	6.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.4	0.0	0.0	47.6	0.0	45.6	4.8	0.0	1.9	2.4	7.1	0.0
LnGrp LOS	D	A	A	D	A	D	A	A	A	A	A	A
Approach Vol, veh/h		2			146			802			934	
Approach Delay, s/veh		42.4			46.9			1.9			6.7	
Approach LOS		D			D			A			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.5	80.2		15.2	5.3	84.5		15.2				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	67.0		18.0	5.0	67.0		18.0				
Max Q Clear Time (g_c+I1), s	3.0	2.0		9.7	2.0	22.7		9.7				
Green Ext Time (p_c), s	0.1	12.4		0.0	0.0	12.7		0.4				
Intersection Summary												
HCM 6th Ctrl Delay			7.8									
HCM 6th LOS			A									

Intersection: 6: SW Boones Ferry Road & Shared Driveway/Site Access

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	31	156	6	313	43	220
Average Queue (ft)	3	79	0	117	8	99
95th Queue (ft)	17	142	4	240	32	193
Link Distance (ft)	313	459		624		1818
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			150		150	
Storage Blk Time (%)				3		2
Queuing Penalty (veh)				0		0

Intersection: 6: SW Boones Ferry Road & Shared Driveway/Site Access

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	30	238	50	388	97	303
Average Queue (ft)	3	100	2	150	19	112
95th Queue (ft)	18	187	36	298	61	225
Link Distance (ft)	313	459		624		1818
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			150		150	
Storage Blk Time (%)				5		3
Queuing Penalty (veh)				0		1

Intersection: 6: SW Boones Ferry Road & Shared Driveway/Site Access

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	TR	L	TR
Maximum Queue (ft)	29	129	60	18	304	34	271
Average Queue (ft)	2	59	24	0	112	6	94
95th Queue (ft)	14	115	54	6	232	24	200
Link Distance (ft)	313	460			624		1805
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			150	150		150	
Storage Blk Time (%)		0			3		2
Queuing Penalty (veh)		0			0		0

Intersection: 6: SW Boones Ferry Road & Shared Driveway/Site Access

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	TR	L	TR
Maximum Queue (ft)	24	146	61	6	261	103	245
Average Queue (ft)	2	67	29	0	124	19	87
95th Queue (ft)	16	124	54	5	234	63	191
Link Distance (ft)	313	460			624		1805
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			150	150		150	
Storage Blk Time (%)		1			3		2
Queuing Penalty (veh)		0			0		1

Intersection: 6: SW Boones Ferry Road & Shared Driveway/Site Access

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	23	137	24	228	59	246
Average Queue (ft)	2	49	2	102	22	104
95th Queue (ft)	13	96	13	205	54	204
Link Distance (ft)	318	459		634		1813
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			150		150	
Storage Blk Time (%)				2		2
Queuing Penalty (veh)				0		1

Intersection: 6: SW Boones Ferry Road & Shared Driveway/Site Access

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	29	201	75	304	159	381
Average Queue (ft)	2	80	3	148	42	137
95th Queue (ft)	13	154	39	277	104	270
Link Distance (ft)	318	459		634		1813
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			150		150	
Storage Blk Time (%)				6		4
Queuing Penalty (veh)				0		3

Intersection: 6: SW Boones Ferry Road & Shared Driveway/Site Access

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	TR	L	TR
Maximum Queue (ft)	18	116	54	23	288	93	291
Average Queue (ft)	2	44	19	2	112	23	98
95th Queue (ft)	15	90	45	13	233	49	205
Link Distance (ft)	318	459			634		1804
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			150	150		150	
Storage Blk Time (%)		0			3		2
Queuing Penalty (veh)		0			0		1

Intersection: 6: SW Boones Ferry Road & Shared Driveway/Site Access

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	TR	L	TR
Maximum Queue (ft)	23	123	83	18	352	112	266
Average Queue (ft)	2	57	27	1	137	35	104
95th Queue (ft)	13	102	60	9	265	77	207
Link Distance (ft)	318	459			634		1804
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			150	150		150	
Storage Blk Time (%)		0			5		2
Queuing Penalty (veh)		0			0		2

Exhibit I: Preliminary Stormwater Report

Autumn Sunrise Subdivision
Tualatin, Oregon

Preliminary Stormwater Report

Date:	July 2021
Client:	Lennar Northwest, INC. 11807 NE 99th Street, Suite 1170 Vancouver, WA 98682
Engineering Contact:	Darko Simic, PE DarkoS@aks-eng.com
Engineering Firm:	AKS Engineering & Forestry, LLC
AKS Job Number:	7454

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Preliminary Stormwater Report

AUTUMN SUNRISE SUBDIVISION
TUALATIN, OREGON

1.0 Purpose of Report

This report analyzes the effects of the proposed development with respect to the existing and proposed stormwater conveyance system. Evaluation of the stormwater system includes documentation of regulatory criteria, methodology, and informational sources used to design/evaluate the stormwater system. The results of the preliminary hydraulic analysis are presented.

2.0 Project Location/Description

The proposed residential subdivision will be located southeast of the SW Norwood Road and SW Lower Boones Ferry Road intersection in Tualatin, Oregon. The project site is approximately 61.7 acres in size and consists of various tax lots (Washington County Tax Lots 100, 400, 401, 500, 501, 600, 800, and 900 – Tax Map 2S 1 35D). A portion of the subject site, approximately 3.9 acres, is reserved for future development as commercial.

The Autumn Sunrise subdivision will include the creation of a 400-lot residential subdivision for single-family attached and detached homes. The project will include frontage street improvements to SW Lower Boones Ferry Road and SW Norwood Road along with construction of new interior local streets and all applicable utilities. Two onsite stormwater facilities, located in the southwest corner of property and the middle of the northern portion of the site, will be constructed releasing flows into the Lower Boones Ferry drainage located to the west and ODOT right of way located to the east. The stormwater facilities will manage proposed developed site stormwater runoff. For purposes of this report, the site stormwater facilities drainage locations will be referred to as western and eastern basins.

3.0 Regulatory Design Criteria

3.1 STORMWATER QUANTITY

Per *Clean Water Services (CWS) Design and Construction Standards Manual for Sanitary Sewer and Surface Water Management (R&O 19-05), Section 4.02, Quantity Control Requirements for Conveyance Capacity;* on-site detention for conveyance capacity (25-year storm event) is required when any of the following conditions exist:

1. *There is an identified downstream deficiency and the District or City determines that detention rather than conveyance system enlargement is the more effective solution.*
2. *There is an identified regional detention site within the boundary of the development.*
3. *Water quantity facilities are required by District-adopted watershed management plans or adopted subbasin master plans.*

Per City standards, the stormwater facilities must be designed to detain the subject site's post-developed 25-year storm event peak flow to the site pre-developed 25-year storm event peak flow.

Per ODOT hydraulic manual standards, the eastern stormwater facility must provide site post-developed 50-year storm event peak flow to the site pre-developed 50-year storm event peak flow.

3.2 STORMWATER HYDROMODIFICATION

Per *CWS R&O 19-05, Section 4.03, Hydromodification Approach Requirements;* stormwater hydromodification is required unless the project meets any of the following criteria:

1. *The project results in the addition and/or modification of less than 12,000 square feet of impervious surface.*

2. *The project is located in an area with a District approved subbasin strategy with an identified regional stormwater management approach for hydromodification.*

Per listed criteria in the Hydromodification Approach Project Category Table 4-2, the subject project is identified as Category 3. Therefore, the subject project will meet CWS hydromodification requirements by providing peak-flow matching detention, using the design criteria established within CWS Section 4.08.6.

3.3 STORMWATER QUALITY

The proposed project must meet CWS and ODOT stormwater quality standards, providing stormwater treatment to all impervious surface's runoff. Comparing the two jurisdictional standards, it has been determined CWS has the stricter design and construction policy. Therefore, the proposed project will be designed per CWS standards. Stormwater quality management for this project will be provided by extended dry detention basins. The stormwater facilities have been designed per CWS standards as established in section 4.04.

4.0 Design Methodology

The Santa Barbara Urban Hydrograph (SBUH) Method was used to analyze stormwater runoff from the site. This method utilizes the SCS Type 1A 24-hour design storm. HydroCAD 10.0 computer software aided in the analysis. Representative CN numbers were obtained from the USDA-NCRS Technical Release 55 (TR-55) and are included in Appendix E.

5.0 Design Parameters

5.1 DESIGN STORMS

Per CWS and ODOT requirements, the following rainfall intensities and durations were used in analyzing the existing and proposed hydrologic site conditions:

Table 5-1: Rainfall Intensities

Recurrence Interval (Years)	Storm Period (hours)	Total Precipitation Depth (Inches)
WQ	4	0.36
2	24	2.50
5	24	3.10
10	24	3.45
25	24	3.90
50	24	4.40

5.2 PRE-DEVELOPED SITE CONDITIONS

5.2.1 Site Topography

Existing on-site grades vary from ±1% to ±30%, with a high point of ±355 feet along the northern and western property line and a low point of ±309 feet near the northeast property corner. The northern portion of the site slopes from west to east and the southern portion slopes from north to south.

5.2.2 Existing Land Use

The existing sites consists of commercial and residential zones with native forest and two single-family detached homes with associated buildings and vacant land, partially used for agricultural purposes.

5.3 SOIL TYPE

The soils beneath the project site and the associated drainage basins consist of silty clay residual soils with abundant rock fragments underlain by weathered basalt bedrock. Per the site geotechnical observations and report the soils underlying the site classify as Hydrologic Soil Group C. Further information regarding site geology can be found in Appendix D of this report.

5.4 POST-DEVELOPED SITE CONDITIONS

5.4.1 Site Topography

The onsite slopes will be modified with cuts and fills to accommodate the construction of the streets and residential lots. The proposed site grading will change the existing site topography within the southeast portion of the site.

5.4.2 Proposed Land Use

The site land-use will consist of single-family residential with the construction of a new 400-lot subdivision, two commercial lots, streets, and utilities.

5.4.3 Post-Developed Input Parameters

Appendices A and B provide the HydroCAD reports and input parameters that were generated for the analyzed storm events with respect to the drainage basins contributing to the subdivision. These reports include all the parameters (e.g., impervious/pervious areas, time of concentration, etc.) used to model the site hydrology.

5.4.4 Description of Off-Site Contributing Basins

Adjacent to the subject site is Horizon School, Interstate 5, and Washington County owned streets. A portion of the existing streets, City owned reservoir property, and adjacent property frontage will be routed and managed through the proposed development.

6.0 Stormwater Analyses

6.1 PROPOSED STORMWATER CONDUIT SIZING AND INLET SPACING

The proposed on-site curb inlets will be spaced per City and CWS requirements to properly convey stormwater runoff. The proposed storm pipes will be sized to meet City and CWS sizing requirements using Manning's equation to convey the peak flows from the 25-year storm event.

6.2 PROPOSED STORMWATER QUALITY MANAGEMENT

Stormwater quality for the proposed project will be provided via two extended dry basins, designed per CWS Design and Construction Standards. The extended dry basins have been sized to treat impervious area runoff created by the proposed project and future commercial lot development. For design purposes, the commercial lots were assumed to be 85 percent impervious.

The water quality volume will be routed through the proposed extended dry basins which will provide water quality treatment per CWS standards. Detailed calculations and checks against CWS criteria are included in the Appendices.

6.3 STORMWATER HYDROMODIFICATION MANAGEMENT

The proposed project will generate approximately 41.3 acres of impervious area, thus classifying as a Large Project. Per CWS Hydromod Planning Tool, the subject site is located within an expansion area and drains into a high-risk level exiting stream. Based on these parameters and CWS Table 4-2, the subject project is within Category 3 Hydromodification Approach.

Per CWS Category 3, the subject site will provide peak-flow matching detention, using design criteria in CWS Section 4.08.6. Specifically, the subject site post-developed 2-year storm event runoff flows will not exceed the site pre-developed 50% of 2-year storm event runoff flows and will match the 5-year and 10-year flows.

Table 6-1: Total Pre and Post Developed Flows

Recurrence Interval (Years)	Peak Pre-Development Flows (cfs)	Peak Post-Development Flows (cfs)	Peak Flow Increase or (Decrease) – (cfs)
2	*5.03	4.86	(0.17)
5	14.27	8.15	(6.12)
10	17.69	11.41	(6.28)

*Peak pre-developed flow for 2-year storm event is calculated by subtracting 50% of the subject site (Basins 10S, 20S, 30S, 40S, 50S, 60S, 70S, and 110S) peak flow from the total pre-developed peak flow.

6.4 STORMWATER QUANTITY CONTROL FACILITY DESIGN

The proposed project provides stormwater quantity management by utilizing extended dry basins designed per CWS, City, and ODOT standards (ODOT standards only applicable to east facility). The following tables outline the results of the extended dry basin outflow which limits the post-development peak flows to less than the allowable pre-development peak flows for each storm event, as outlined within CWS and ODOT stormwater detention management requirements. The peak flows were computed by analyzing flows at the western and eastern release points (i.e. western and eastern basins).

Table 6-2: West Facility Pre and Post Developed Flows

Recurrence Interval (Years)	Peak Pre-Development Flows (cfs)	Peak Post-Development Flows (cfs)	Peak Flow Increase or (Decrease) – (cfs)
2	6.45	3.65	(2.80)
10	11.77	9.42	(2.35)
25	14.45	14.17	(0.28)

The extended dry basin has been designed per CWS requirements with at least 1-foot of freeboard, during the 25-year storm event, and a permanent pool storage depth of 0.2 feet.

Table 6-3: East Facility Pre and Post Developed Flows			
Recurrence Interval (Years)	Peak Pre-Development Flows (cfs)	Peak Post-Development Flows (cfs)	Peak Flow Increase or (Decrease) – (cfs)
2	2.51	1.91	(0.60)
10	5.94	4.59	(1.35)
25	7.89	6.87	(1.02)
50	10.23	10.18	(0.05)

The extended dry basin has been designed per CWS and ODOT requirements with at least 1-foot of freeboard, during the 50-year storm event, and a permanent pool storage depth of 0.2 feet.

The proposed extended dry basins have sufficient capacity to detain the required post-developed site flows to less than or equal to the allowable pre-developed site flows, for each respective basin, and meets the requirements established by Clean Water Service's *Design and Construction for Sanitary Sewer and Surface Water Management Manual* (R&O 19-05) and ODOT Hydraulics Manual.

6.5 DOWNSTREAM ANALYSIS

6.5.1 Western Basin

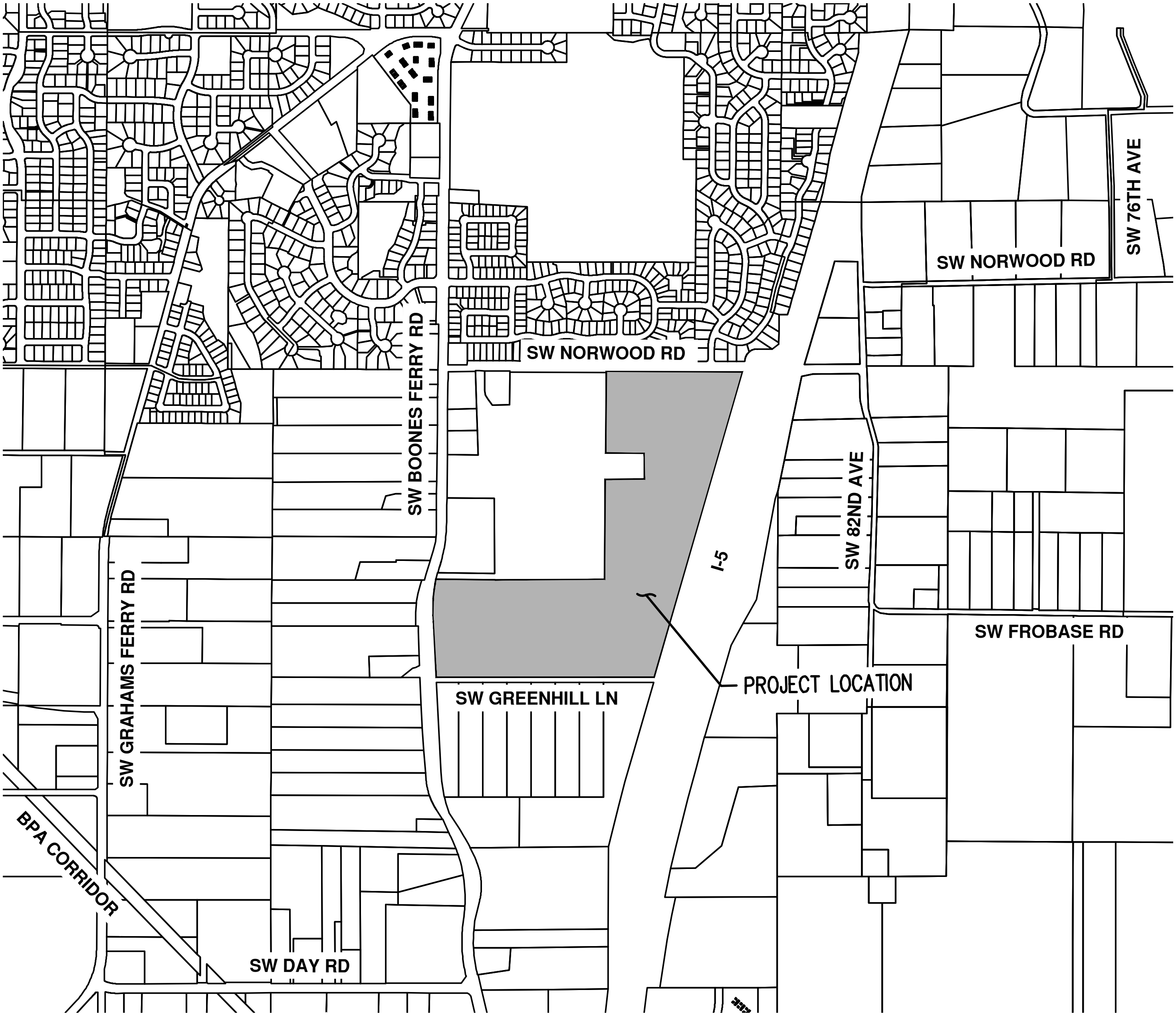
Stormwater runoff from the project site will be conveyed and directed into the existing Lower Boones Ferry Road stormwater system. The proposed western stormwater facility will release flows into an existing 24" pipe, located within Boones Ferry Road in the southwest corner of subject site. From there, runoff is directed westerly into an existing drainage way, flowing towards the south.

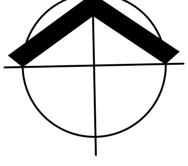
A quarter mile downstream visual investigation of the storm system was performed, and no obstructions were found.

6.5.2 Eastern Basin

Stormwater runoff from the project site will be conveyed and directed into the existing Interstate 5 drainage channel. The proposed eastern stormwater facility will release flows into a proposed 24" pipe, discharging into an existing ODOT I-5 channel. From there, runoff is conveyed to the south along I-5 roadway.

A quarter mile downstream visual investigation of the storm system was performed, and no obstructions were found.





SCALE: 1"=1200 FEET

ORIGINAL PAGE SIZE: 11" x 8.5"

DATE: 07/01/2021

SITE VICINITY MAP AUTUMN SUNRISE

FIGURE
1

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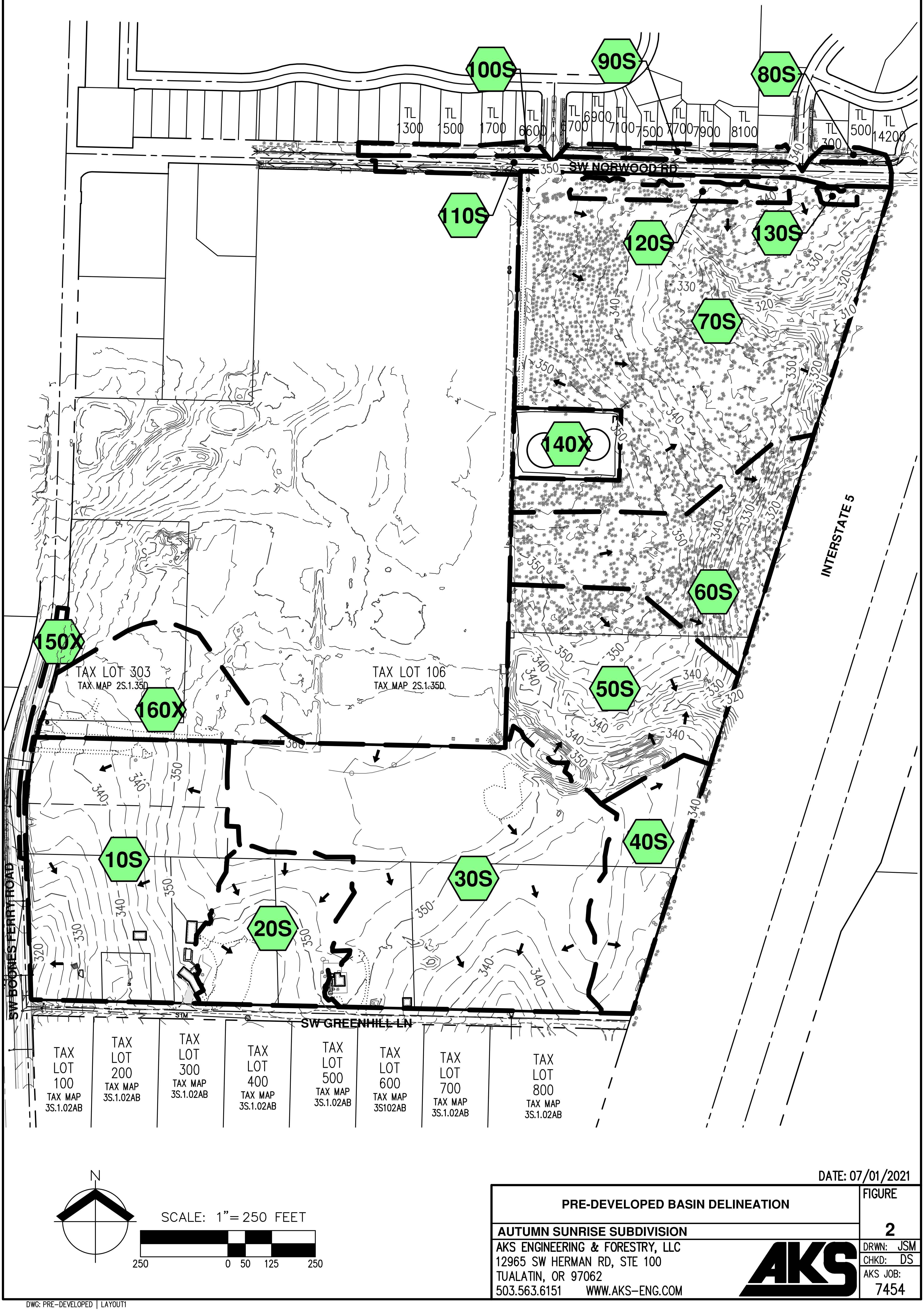
AKS

DRWN: JSM
CHKD: DS
AKS JOB:
7454

DWG: VICINITY MAP | LAYOUT1



DATE: 07/01/2021

PRE-DEVELOPED BASIN DELINEATION

FIGURE

2

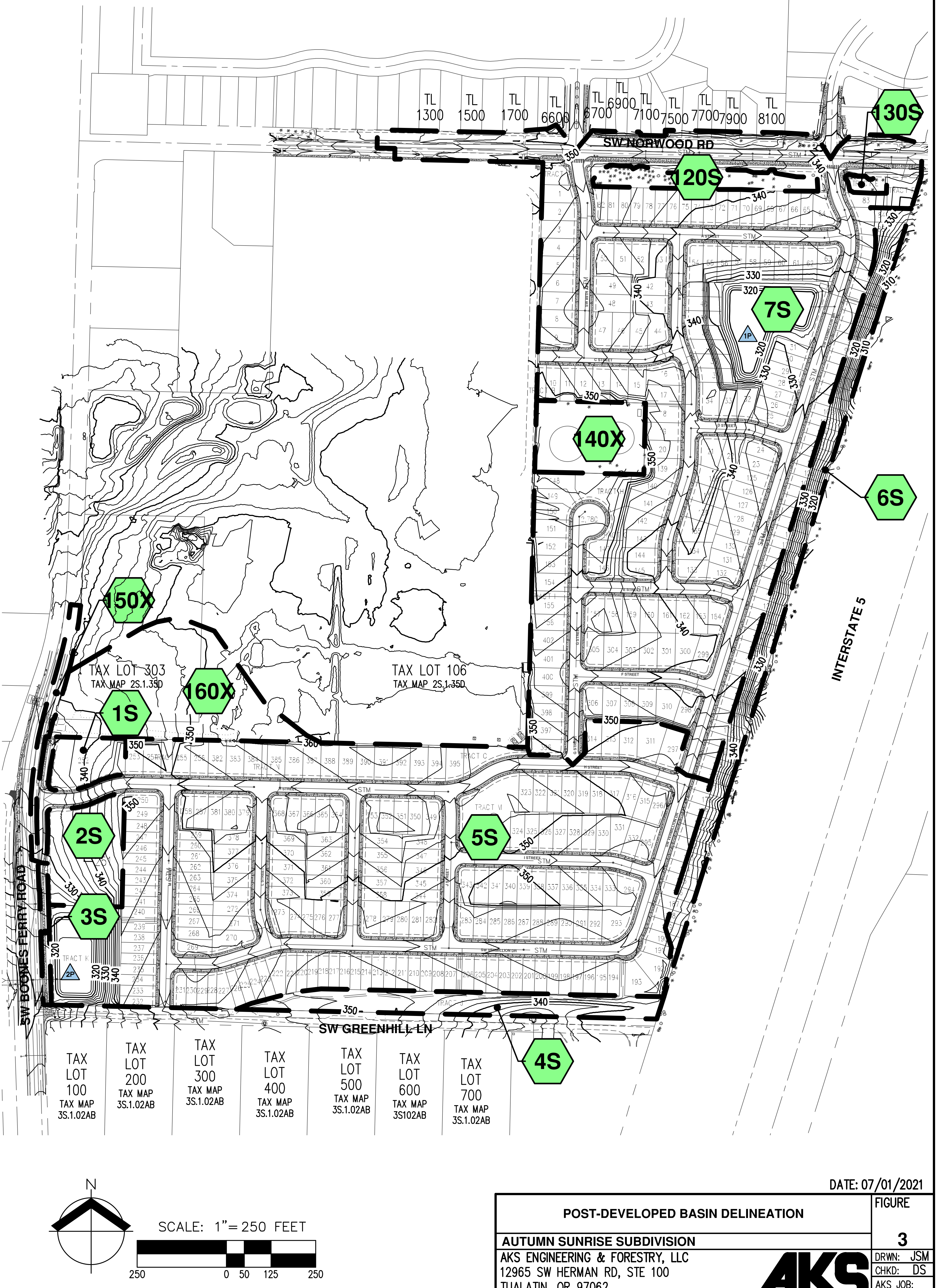
AUTUMN SUNRISE SUBDIVISION

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
503.563.6151 WWW.AKS-ENG.COM

AKS

DRWN: JSM
CHKD: DS
AKS JOB:
7454

DWG: PRE-DEVELOPED | LAYOUT1



DATE: 07/01/2021

FIGURE

3

POST-DEVELOPED BASIN DELINEATION

AUTUMN SUNRISE SUBDIVISION

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
503.563.6151 WWW.AKS-ENG.COM

DRWN: JSM
CHKD: DS
AKS JOB: 7454

POST-DEVELOPED IMPERVIOUS AREA TABLE

PROPOSED IMPERVIOUS AREA RECEIVING TREATMENT	1,643,470 SF
PROPOSED COMMERCIAL (LOTS 251 AND 252) IMPERVIOUS AREA RECEIVING TREATMENT	74,761
PROPOSED UNTREATABLE IMPERVIOUS AREA	8,091 SF
EXISTING UNTREATED IMPERVIOUS AREA RECEIVING TREATMENT WITHIN PROPOSED FACILIES	70,669 SF
REQUIRED IMPERVIOUS AREA TO TREAT	1,726,322 SF
IMPERVIOUS AREA TREATMENT PROVIDED	1,788,900 SF
NET TOTAL	+62,578 SF

▭	— INDICATES PROPOSED IMPERVIOUS AREA RECEIVING TREATMENT 2,640 SQ. FT. ASSUMED FOR ALL LOTS 74,761 SQ. FT. (85% OF NET) ASSUMED FOR FUTURE LOTS 251 AND 252 – COMMERCIAL AREAS
▦	— INDICATES PROPOSED IMPERVIOUS AREA UNABLE TO BE TREATED
▨	— INDICATES EXISTING UNTREATED IMPERVIOUS AREA TO BE TREATED WITHIN THE PROPOSED FACILITY

SCALE: 1"=250 FEET

250 0 50 125 250

N

DATE: 07/01/2021

WATER QUALITY TREATMENT MAP

FIGURE 4

AUTUMN SUNRISE SUBDIVISION

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
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DRWN: JSM
CHKD: DS
AKS JOB: 7454

DWG: TREATMENT MAP | SP-00

Appendix A: HydroCAD Reports for Pre-Developed Condition Storm Events

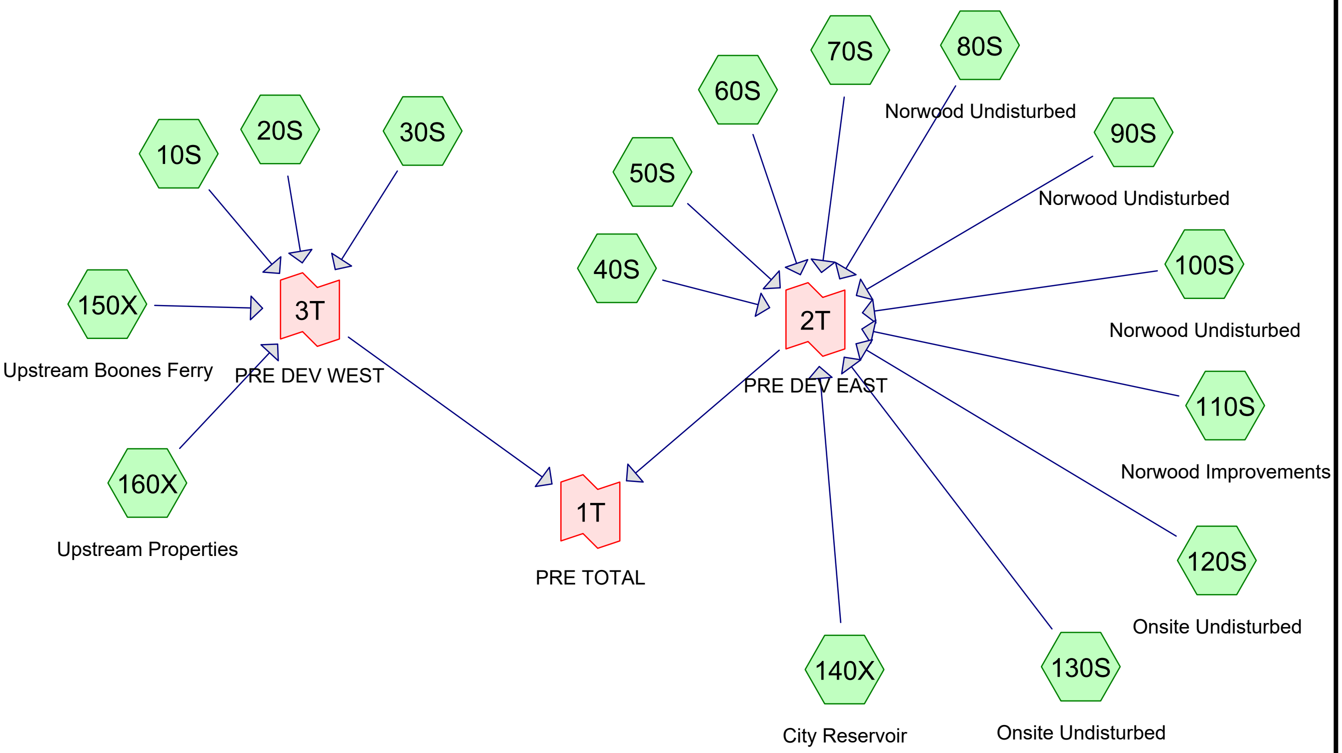
(25-Year Storm Event Analysis)

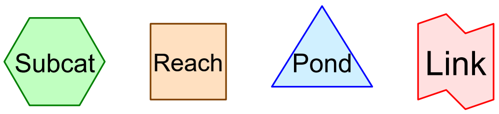
(50-Year Storm Event Summary)

(10-Year Storm Event Summary)

(5-Year Storm Event Summary)

(2-Year Storm Event Summary)





Routing Diagram for 7454 Pre-Developed
Prepared by AKS Engineering, Printed 6/29/2021
HydroCAD® 10.00-22 s/n 05095 © 2018 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
199,375	79	50-75% Grass cover, Fair, HSG C (80S, 90S, 100S, 110S, 160X)
46,914	86	<50% Grass cover, Poor, HSG C (140X)
8,685	74	>75% Grass cover, Good, HSG C (150X)
168,971	87	Dirt roads, HSG C (10S, 20S, 30S)
123,564	82	Farmsteads, HSG C (10S)
2,000	89	Gravel roads, HSG C (30S)
18,835	96	Gravel surface, HSG C (10S, 160X)
81,956	98	Impervious Area (80S, 90S, 100S, 110S, 150X, 160X)
1,920	98	Paved parking, HSG C (20S, 30S)
14,216	98	Paved roads w/curbs & sewers, HSG C (140X)
1,044,944	85	Row crops, straight row, Good, HSG C (10S, 20S, 30S, 40S)
7,483	98	Unconnected roofs, HSG C (10S, 30S)
123,094	73	Woods, Fair, HSG C (50S)
1,042,216	70	Woods, Good, HSG C (60S, 70S, 120S, 130S)
171,927	82	Woods/grass comb., Poor, HSG C (50S)
3,056,100	**79**	**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Runoff Area=407,524 sf 1.28% Impervious Runoff Depth>2.28"
Flow Length=650' Tc=17.2 min CN=84/98 Runoff=4.45 cfs 77,497 cf

Subcatchment20S: Runoff Area=166,164 sf 0.80% Impervious Runoff Depth>2.44"
Flow Length=465' Tc=23.3 min CN=86/98 Runoff=1.82 cfs 33,774 cf

Subcatchment30S: Runoff Area=643,684 sf 0.45% Impervious Runoff Depth>2.34"
Flow Length=624' Tc=26.9 min CN=85/98 Runoff=6.36 cfs 125,741 cf

Subcatchment40S: Runoff Area=137,415 sf 0.00% Impervious Runoff Depth>2.36"
Flow Length=280' Tc=11.5 min CN=85/0 Runoff=1.72 cfs 26,979 cf

Subcatchment50S: Runoff Area=295,021 sf 0.00% Impervious Runoff Depth>1.78"
Flow Length=1,575' Tc=29.0 min CN=78/0 Runoff=1.90 cfs 43,727 cf

Subcatchment60S: Runoff Area=250,731 sf 0.00% Impervious Runoff Depth>1.22"
Flow Length=1,650' Tc=46.2 min CN=70/0 Runoff=0.71 cfs 25,581 cf

Subcatchment70S: Runoff Area=754,638 sf 0.00% Impervious Runoff Depth>1.22"
Flow Length=2,810' Tc=51.0 min CN=70/0 Runoff=2.05 cfs 76,724 cf

Subcatchment80S: Norwood Undisturbed Runoff Area=7,546 sf 15.66% Impervious Runoff Depth>2.16"
Tc=5.0 min CN=79/98 Runoff=0.09 cfs 1,356 cf

Subcatchment90S: Norwood Undisturbed Runoff Area=26,839 sf 13.26% Impervious Runoff Depth>2.11"
Tc=5.0 min CN=79/98 Runoff=0.31 cfs 4,728 cf

Subcatchment100S: Norwood Runoff Area=18,245 sf 17.23% Impervious Runoff Depth>2.18"
Tc=5.0 min CN=79/98 Runoff=0.22 cfs 3,321 cf

Subcatchment110S: Norwood Runoff Area=73,346 sf 56.47% Impervious Runoff Depth>2.83"
Tc=51.0 min CN=79/98 Runoff=0.69 cfs 17,289 cf

Subcatchment120S: Onsite Undisturbed Runoff Area=31,991 sf 0.00% Impervious Runoff Depth>1.22"
Flow Length=2,810' Tc=51.0 min CN=70/0 Runoff=0.09 cfs 3,253 cf

Subcatchment130S: Onsite Undisturbed Runoff Area=4,856 sf 0.00% Impervious Runoff Depth>1.22"
Flow Length=2,810' Tc=51.0 min CN=70/0 Runoff=0.01 cfs 494 cf

Subcatchment140X: City Reservoir Runoff Area=61,130 sf 23.26% Impervious Runoff Depth>2.66"
Flow Length=2,860' Tc=59.4 min CN=86/98 Runoff=0.51 cfs 13,576 cf

Subcatchment150X: Upstream Boones Runoff Area=17,970 sf 51.67% Impervious Runoff Depth>2.62"
Tc=5.0 min CN=74/98 Runoff=0.26 cfs 3,931 cf

Subcatchment160X: Upstream Properties Runoff Area=159,000 sf 14.70% Impervious Runoff Depth>2.26"
Flow Length=300' Slope=0.0400 '/' Tc=20.2 min CN=81/98 Runoff=1.60 cfs 29,881 cf

Link 1T: PRE TOTAL
Inflow=22.33 cfs 487,850 cf
Primary=22.33 cfs 487,850 cf

Link 2T: PRE DEV EAST
Inflow=7.89 cfs 217,026 cf
Primary=7.89 cfs 217,026 cf

Link 3T: PRE DEV WEST
Inflow=14.45 cfs 270,824 cf
Primary=14.45 cfs 270,824 cf

Total Runoff Area = 3,056,100 sf Runoff Volume = 487,850 cf Average Runoff Depth = 1.92"
96.55% Pervious = 2,950,525 sf 3.45% Impervious = 105,575 sf

Summary for Subcatchment 10S:

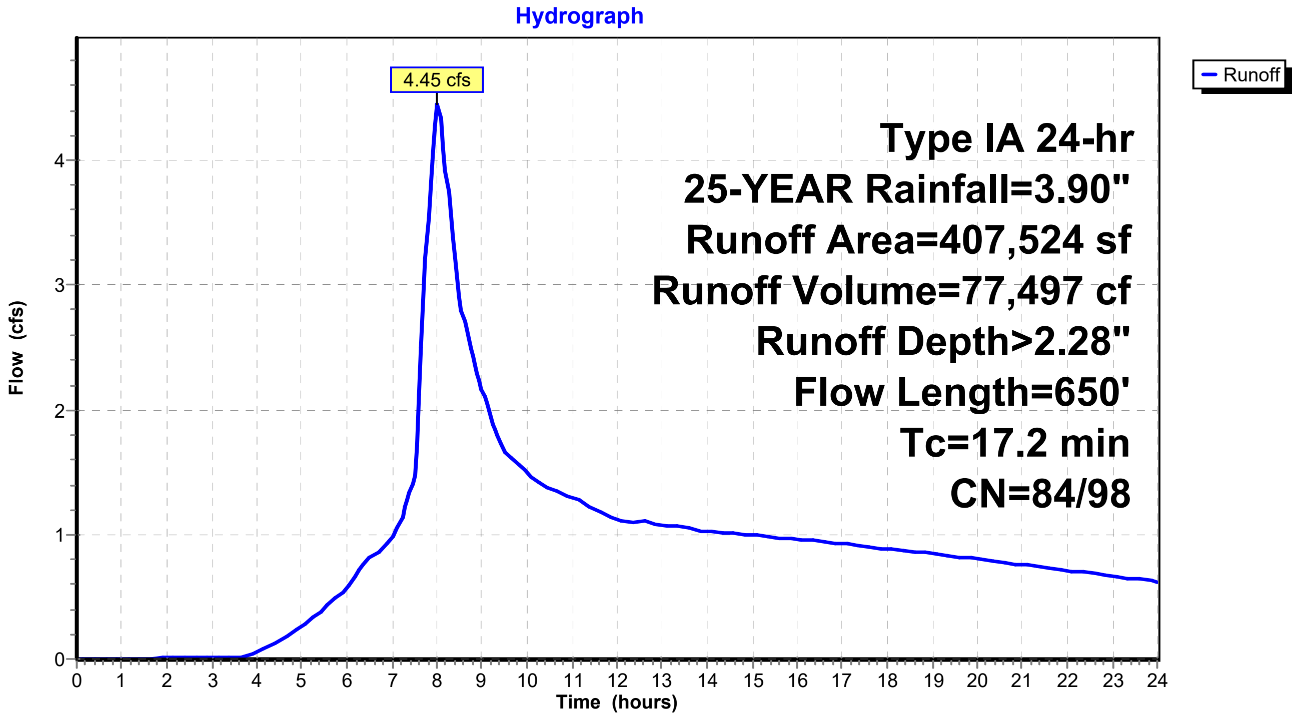
Runoff = 4.45 cfs @ 8.02 hrs, Volume= 77,497 cf, Depth> 2.28"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
123,564	82	Farmsteads, HSG C
256,474	85	Row crops, straight row, Good, HSG C
5,905	96	Gravel surface, HSG C
5,200	98	Unconnected roofs, HSG C
16,381	87	Dirt roads, HSG C
407,524	84	Weighted Average
402,324	84	98.72% Pervious Area
5,200	98	1.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	200	0.0500	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.50"
3.7	450	0.0400	2.00		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
17.2	650	Total			

Subcatchment 10S:



Summary for Subcatchment 20S:

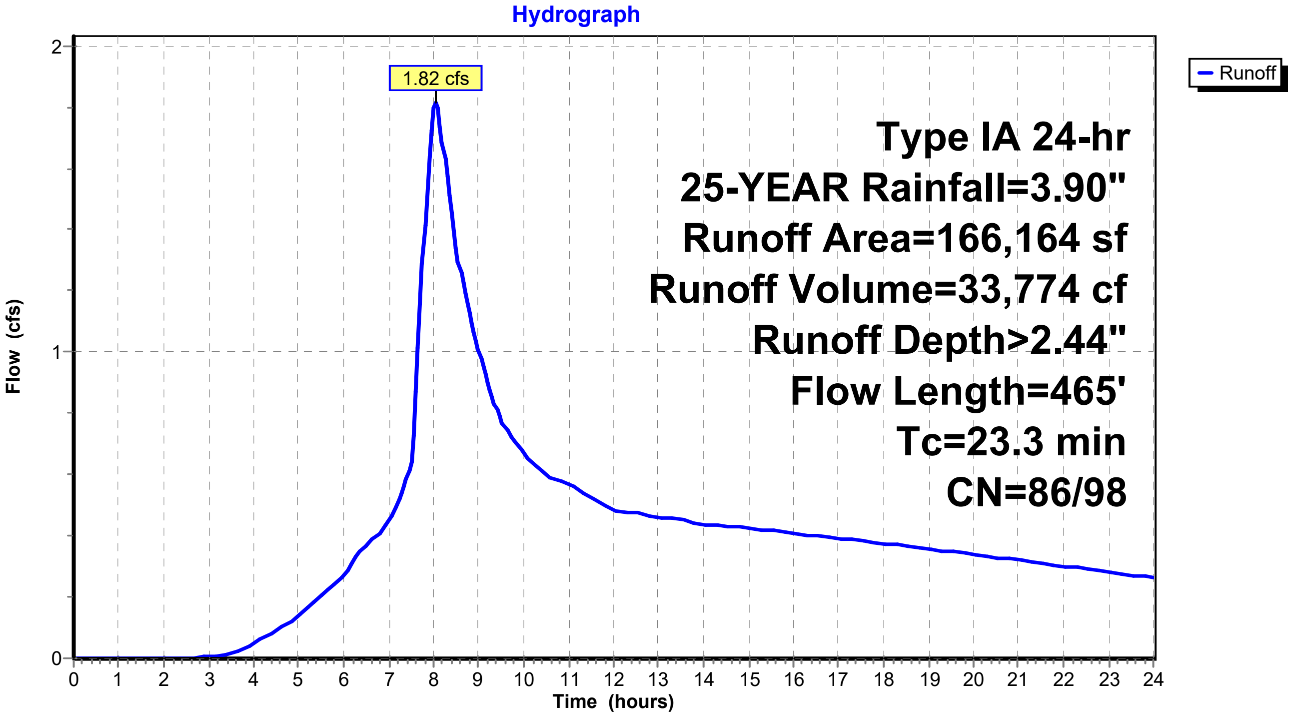
Runoff = 1.82 cfs @ 8.04 hrs, Volume= 33,774 cf, Depth> 2.44"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
93,934	87	Dirt roads, HSG C
70,900	85	Row crops, straight row, Good, HSG C
1,330	98	Paved parking, HSG C
166,164	86	Weighted Average
164,834	86	99.20% Pervious Area
1,330	98	0.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.4	230	0.0260	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.50"
3.9	235	0.0100	1.00		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
23.3	465	Total			

Subcatchment 20S:



Summary for Subcatchment 30S:

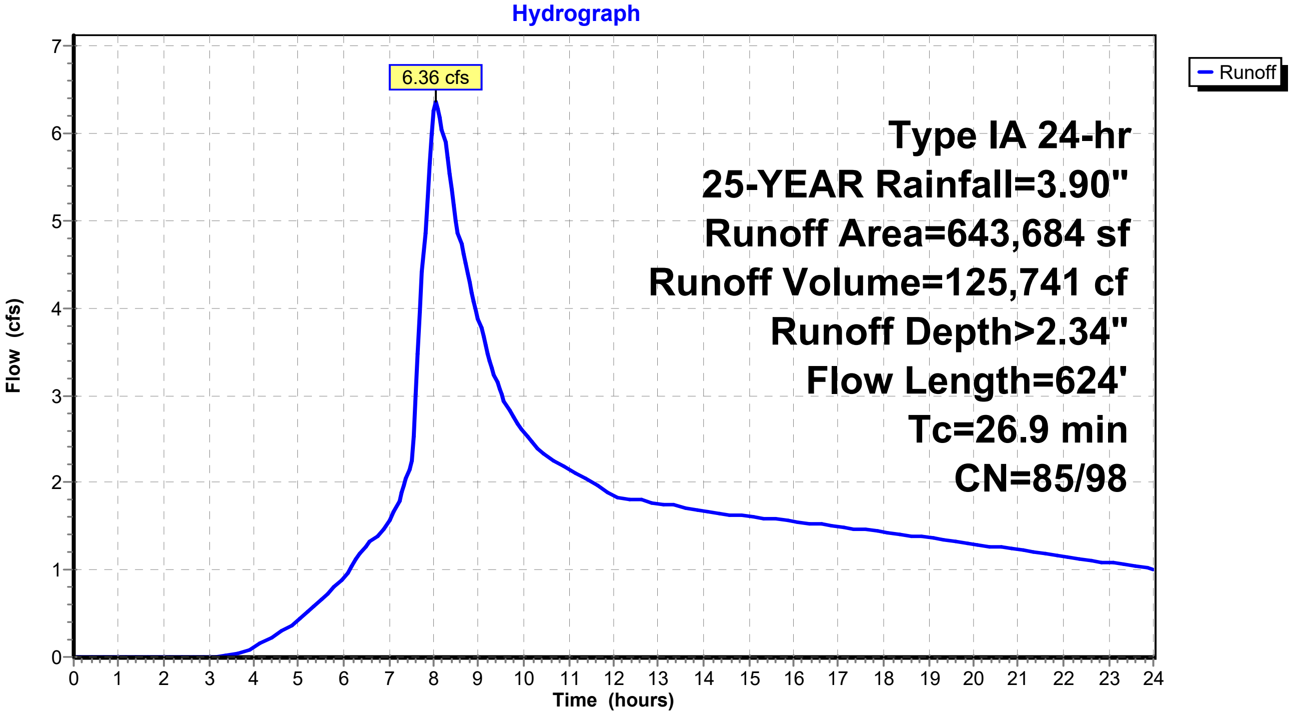
Runoff = 6.36 cfs @ 8.05 hrs, Volume= 125,741 cf, Depth> 2.34"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
58,656	87	Dirt roads, HSG C
2,000	89	Gravel roads, HSG C
2,283	98	Unconnected roofs, HSG C
590	98	Paved parking, HSG C
580,155	85	Row crops, straight row, Good, HSG C
643,684	85	Weighted Average
640,811	85	99.55% Pervious Area
2,873	98	0.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	300	0.0260	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.50"
2.9	324	0.0350	1.87		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
26.9	624	Total			

Subcatchment 30S:



Summary for Subcatchment 40S:

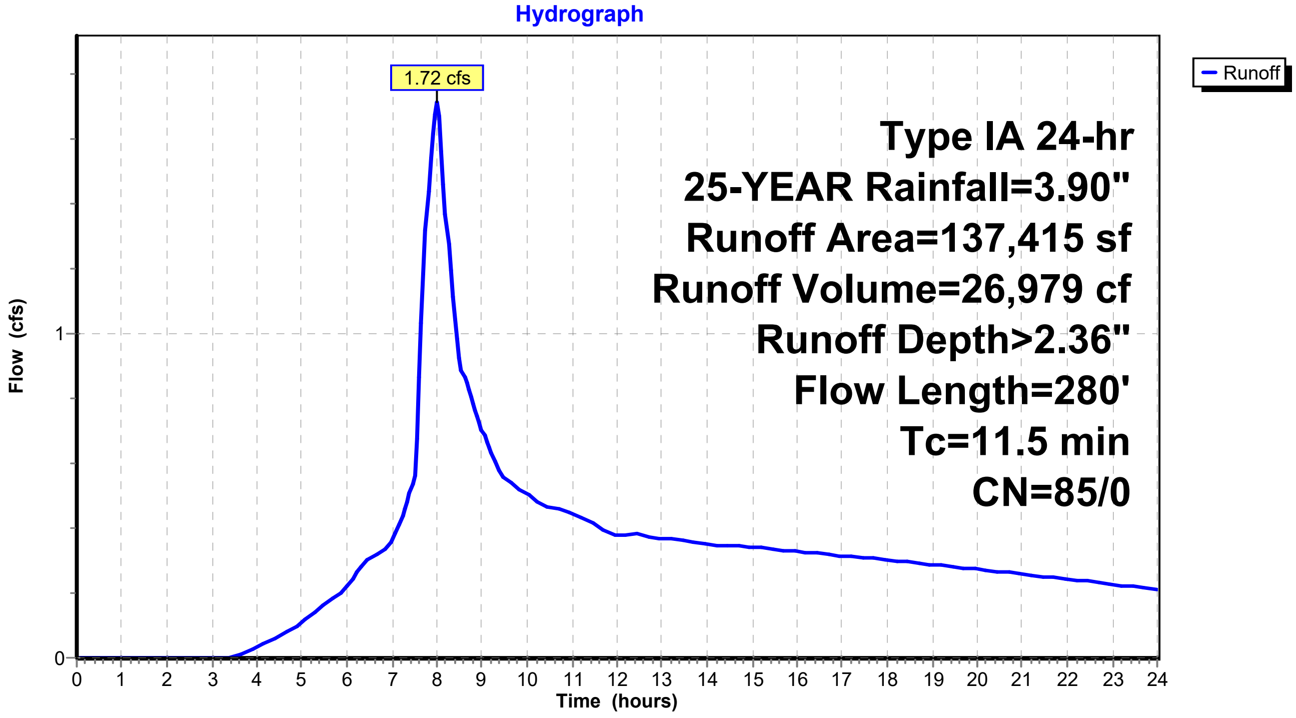
Runoff = 1.72 cfs @ 8.00 hrs, Volume= 26,979 cf, Depth> 2.36"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
137,415	85	Row crops, straight row, Good, HSG C
137,415	85	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	150	0.0420	0.25		**Sheet Flow,** Range n= 0.130 P2= 2.50"
1.3	130	0.0300	1.73		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
11.5	280	Total			

Subcatchment 40S:



Summary for Subcatchment 50S:

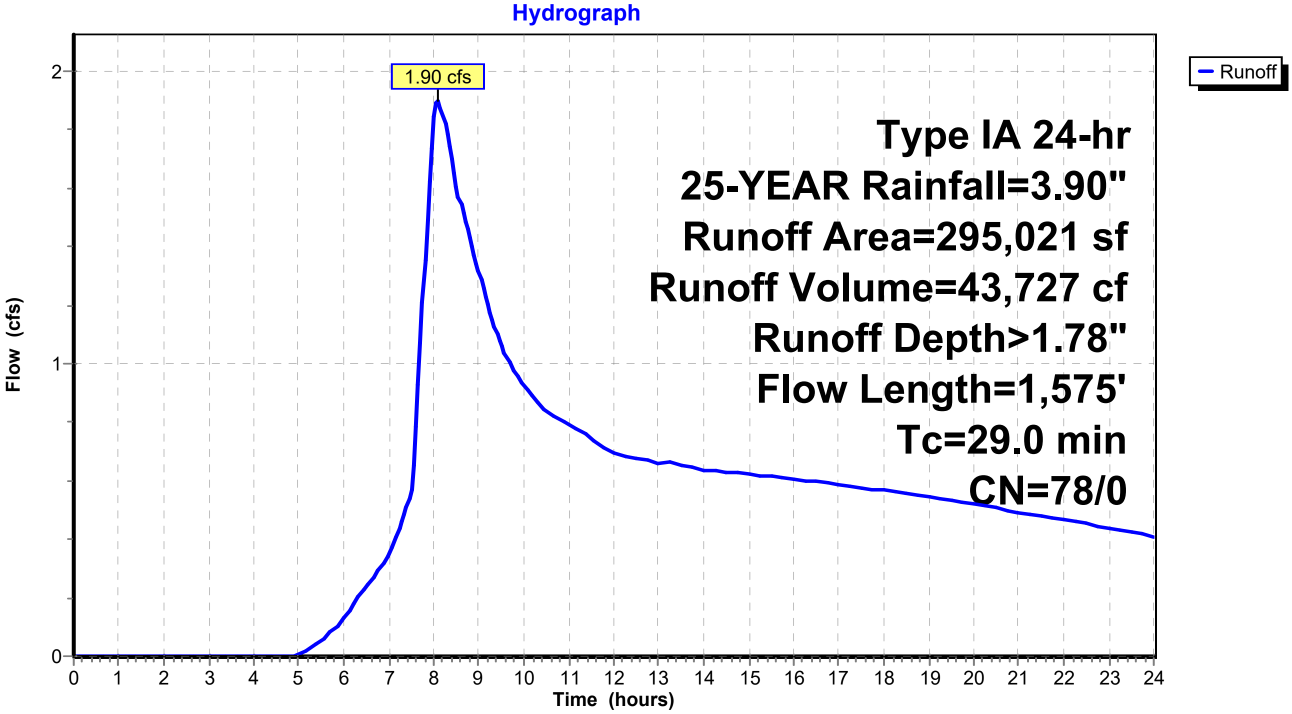
Runoff = 1.90 cfs @ 8.07 hrs, Volume= 43,727 cf, Depth> 1.78"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
171,927	82	Woods/grass comb., Poor, HSG C
123,094	73	Woods, Fair, HSG C
295,021	78	Weighted Average
295,021	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	100	0.0650	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
8.4	535	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.4	940	0.0100	2.93	11.71	**Channel Flow,** Area= 4.0 sf Perim= 8.8' r= 0.45' n= 0.030 Earth, grassed & winding
29.0	1,575	Total			

Subcatchment 50S:



Summary for Subcatchment 60S:

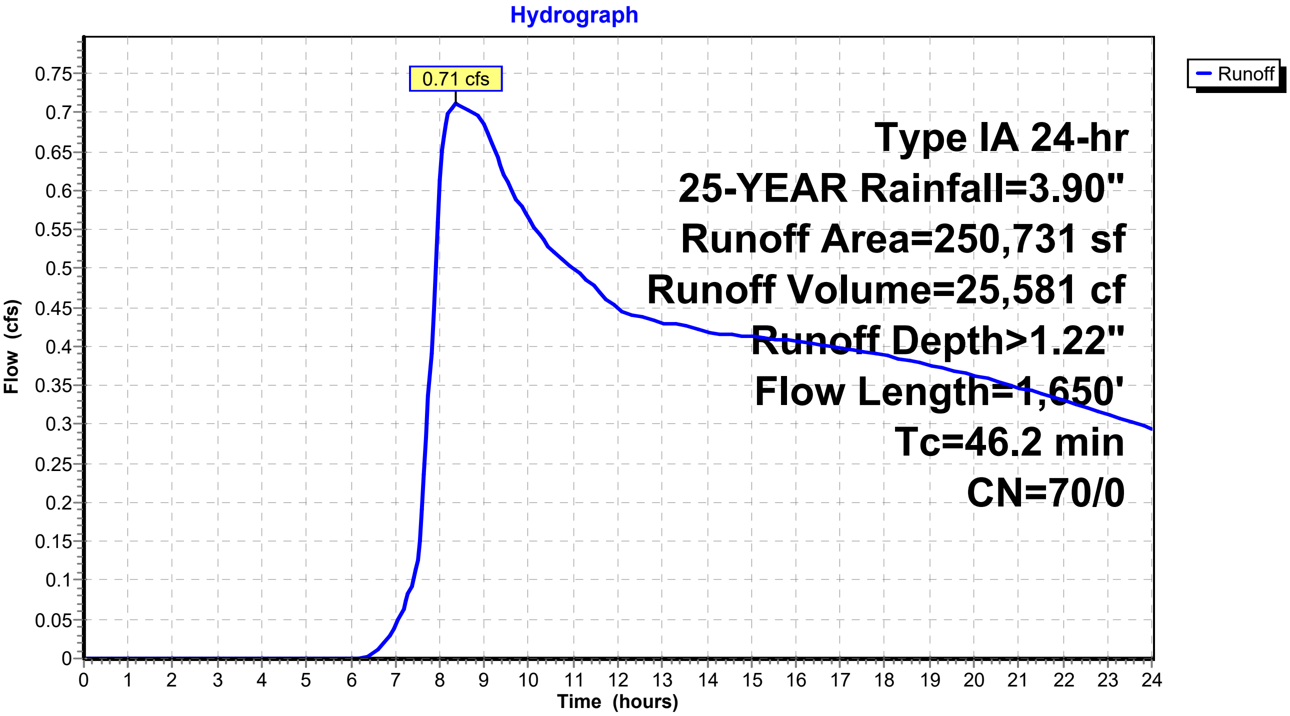
Runoff = 0.71 cfs @ 8.36 hrs, Volume= 25,581 cf, Depth> 1.22"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
250,731	70	Woods, Good, HSG C
250,731	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.7	150	0.0150	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
8.5	1,500	0.0100	2.93	11.71	**Channel Flow,** Area= 4.0 sf Perim= 8.8' r= 0.45' n= 0.030 Earth, grassed & winding
46.2	1,650	Total			

Subcatchment 60S:



Summary for Subcatchment 70S:

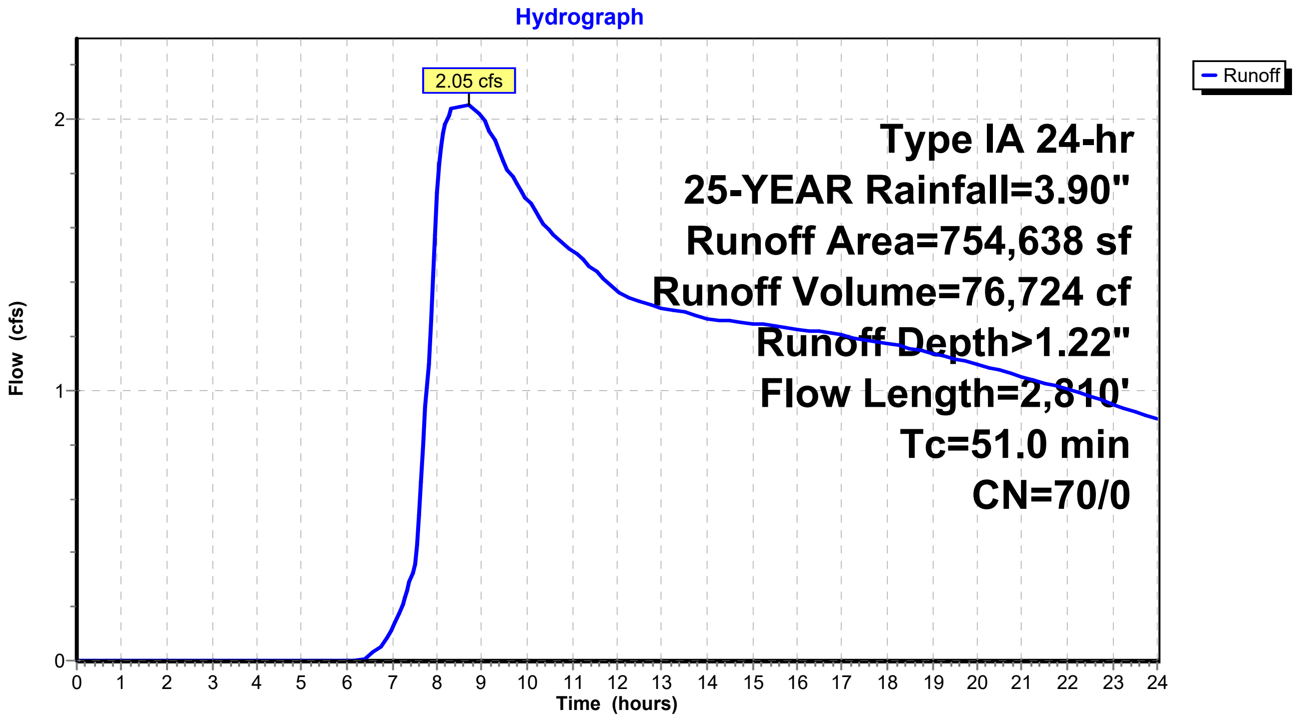
Runoff = 2.05 cfs @ 8.70 hrs, Volume= 76,724 cf, Depth> 1.22"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
754,638	70	Woods, Good, HSG C
754,638	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.9	200	0.0440	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
8.1	500	0.0420	1.02		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.0	2,110	0.0100	2.93	11.71	**Channel Flow,** Area= 4.0 sf Perim= 8.8' r= 0.45' n= 0.030 Earth, grassed & winding
51.0	2,810	Total			

Subcatchment 70S:



Summary for Subcatchment 80S: Norwood Undisturbed

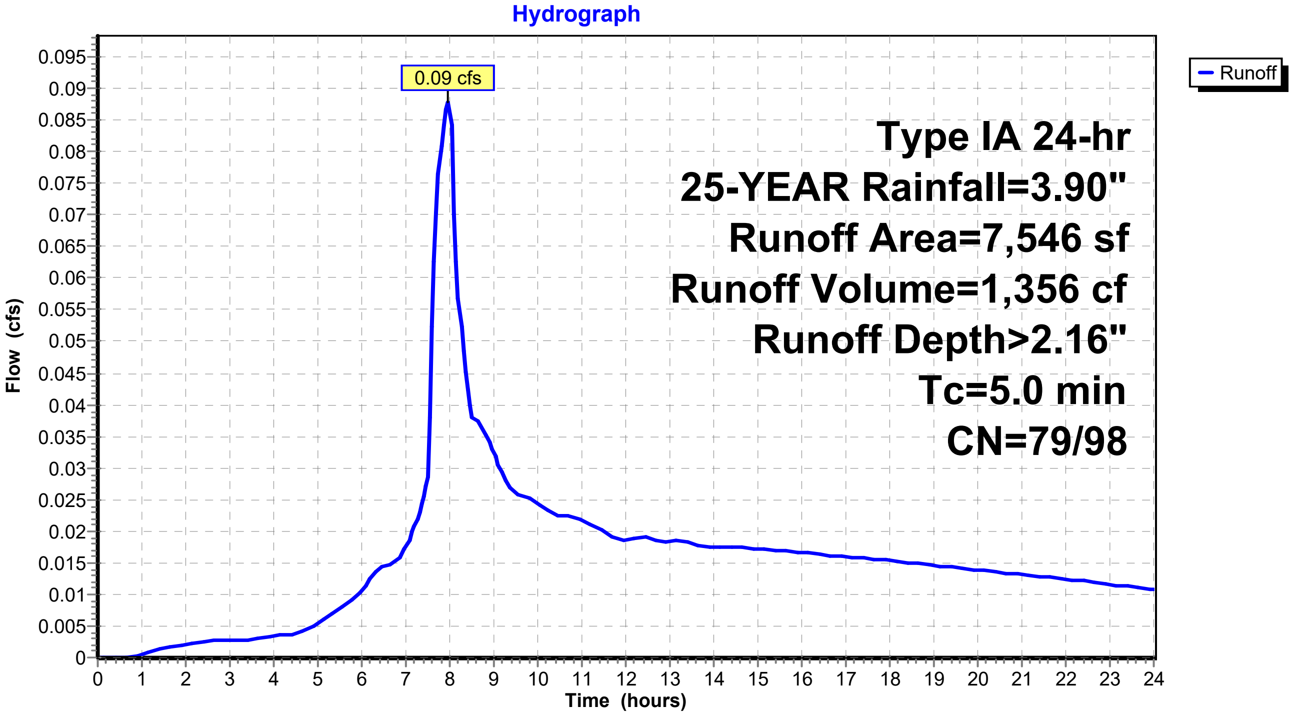
Runoff = 0.09 cfs @ 7.97 hrs, Volume= 1,356 cf, Depth> 2.16"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

	Area (sf)	CN	Description
*	1,182	98	Impervious Area
	6,364	79	50-75% Grass cover, Fair, HSG C
	7,546	82	Weighted Average
	6,364	79	84.34% Pervious Area
	1,182	98	15.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 80S: Norwood Undisturbed



Summary for Subcatchment 90S: Norwood Undisturbed

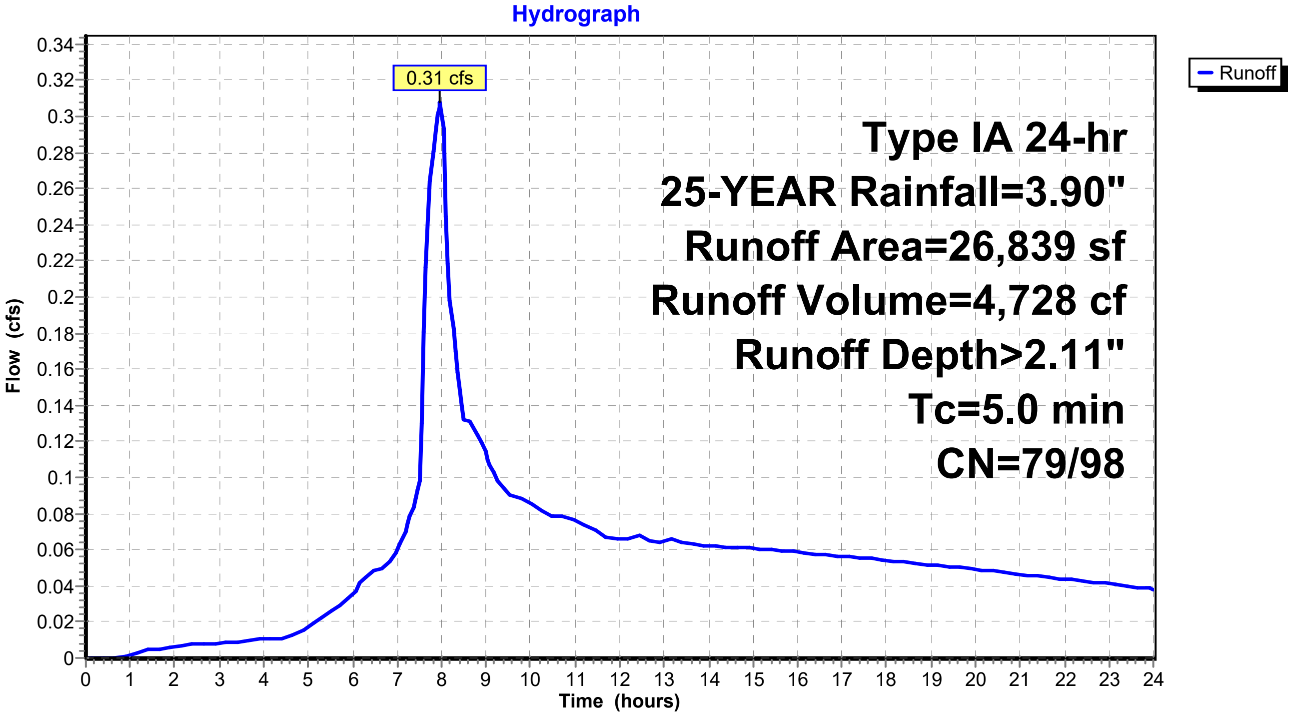
Runoff = 0.31 cfs @ 7.98 hrs, Volume= 4,728 cf, Depth> 2.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

	Area (sf)	CN	Description
*	3,558	98	Impervious Area
	23,281	79	50-75% Grass cover, Fair, HSG C
	26,839	82	Weighted Average
	23,281	79	86.74% Pervious Area
	3,558	98	13.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 90S: Norwood Undisturbed



Summary for Subcatchment 100S: Norwood Undisturbed

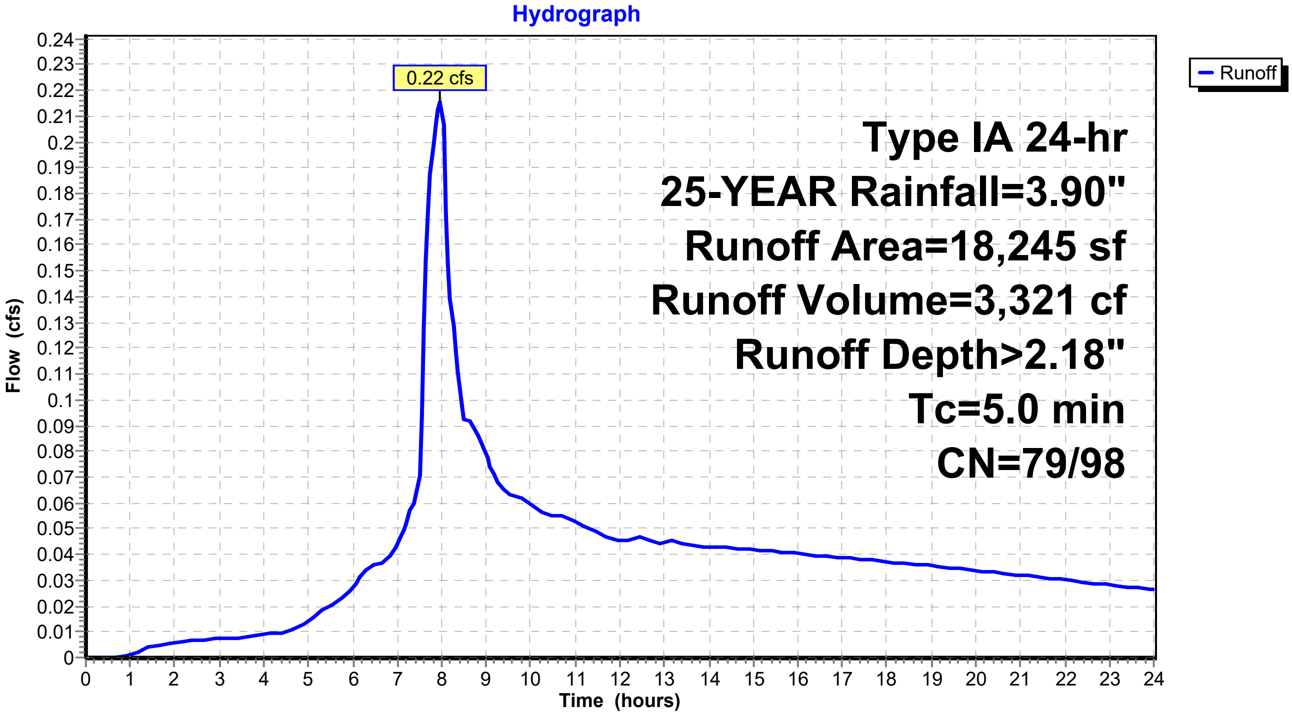
Runoff = 0.22 cfs @ 7.97 hrs, Volume= 3,321 cf, Depth> 2.18"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

	Area (sf)	CN	Description
*	3,143	98	Impervious Area
	15,102	79	50-75% Grass cover, Fair, HSG C
	18,245	82	Weighted Average
	15,102	79	82.77% Pervious Area
	3,143	98	17.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 100S: Norwood Undisturbed



Summary for Subcatchment 110S: Norwood Improvements

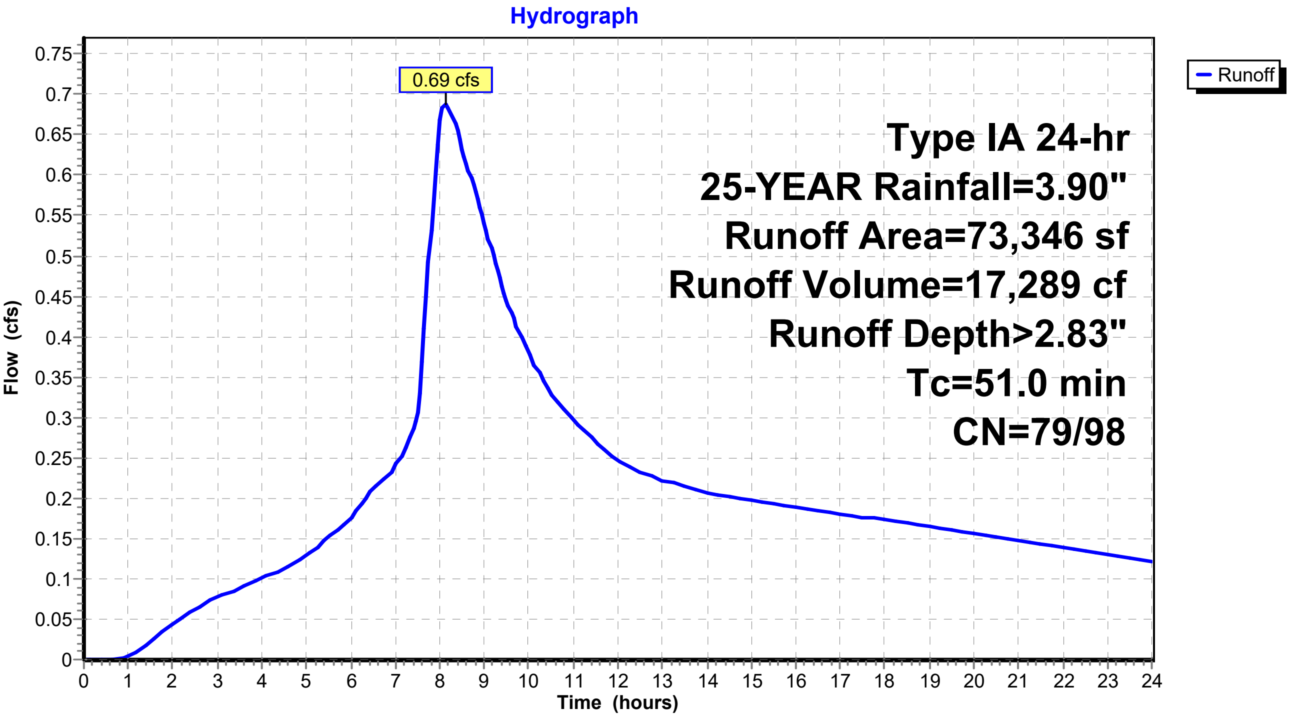
Runoff = 0.69 cfs @ 8.13 hrs, Volume= 17,289 cf, Depth> 2.83"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

	Area (sf)	CN	Description
*	41,417	98	Impervious Area
	31,929	79	50-75% Grass cover, Fair, HSG C
	73,346	90	Weighted Average
	31,929	79	43.53% Pervious Area
	41,417	98	56.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
51.0					**Direct Entry, Tc through Site (Basin 70S)**

Subcatchment 110S: Norwood Improvements



Summary for Subcatchment 120S: Onsite Undisturbed

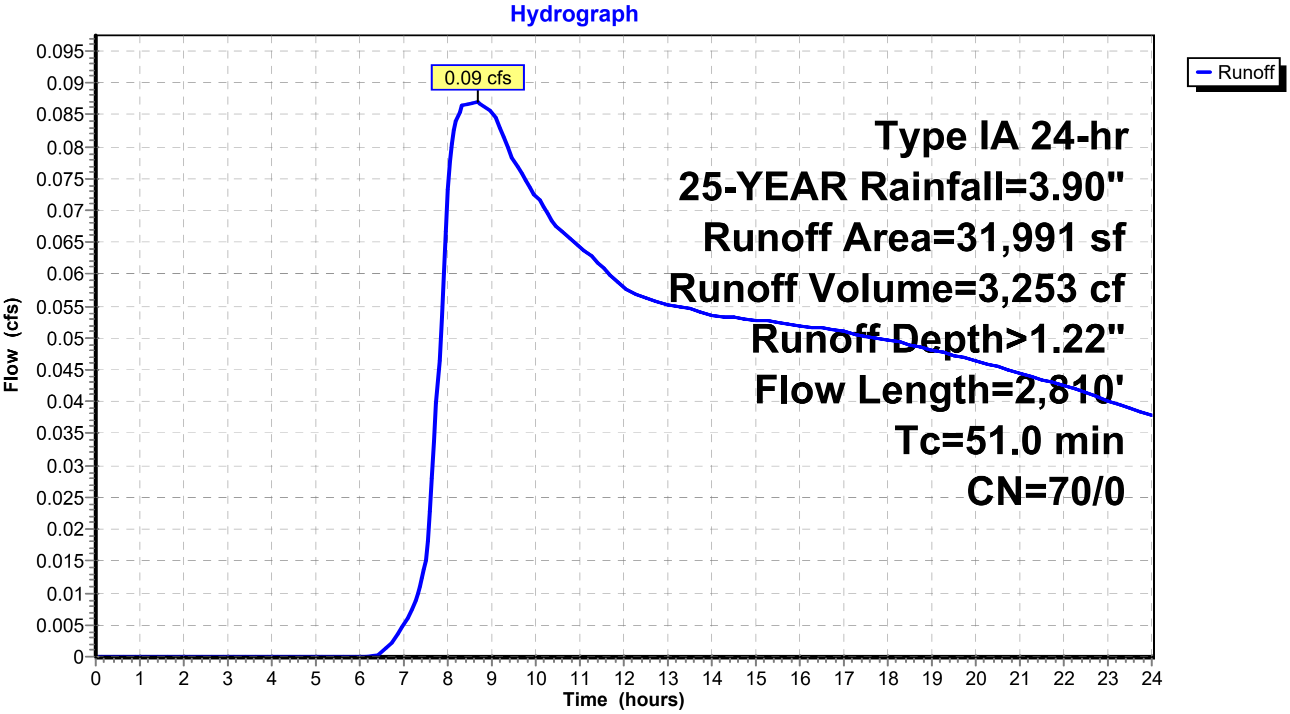
Runoff = 0.09 cfs @ 8.70 hrs, Volume= 3,253 cf, Depth> 1.22"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
31,991	70	Woods, Good, HSG C
31,991	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.9	200	0.0440	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
8.1	500	0.0420	1.02		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.0	2,110	0.0100	2.93	11.71	**Channel Flow,** Area= 4.0 sf Perim= 8.8' r= 0.45' n= 0.030 Earth, grassed & winding
51.0	2,810	Total			

Subcatchment 120S: Onsite Undisturbed



Summary for Subcatchment 130S: Onsite Undisturbed

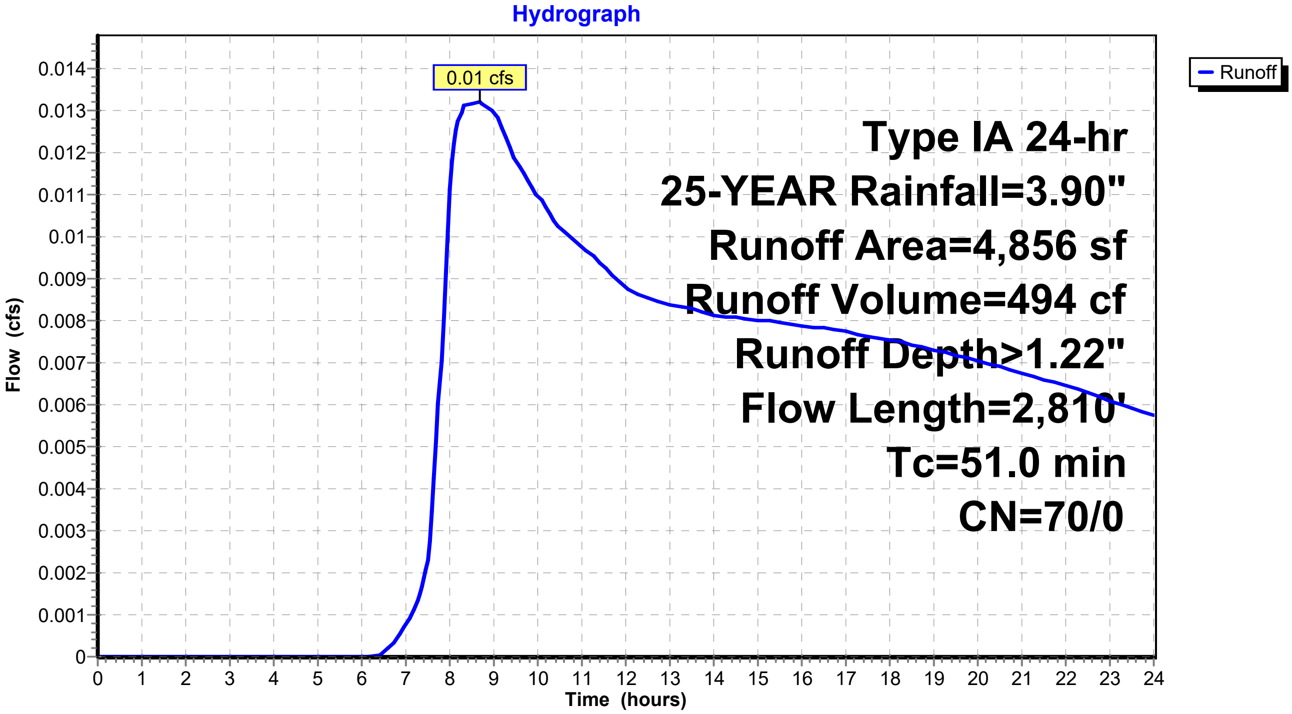
Runoff = 0.01 cfs @ 8.70 hrs, Volume= 494 cf, Depth> 1.22"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
4,856	70	Woods, Good, HSG C
4,856	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.9	200	0.0440	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
8.1	500	0.0420	1.02		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.0	2,110	0.0100	2.93	11.71	**Channel Flow,** Area= 4.0 sf Perim= 8.8' r= 0.45' n= 0.030 Earth, grassed & winding
51.0	2,810	Total			

Subcatchment 130S: Onsite Undisturbed



Summary for Subcatchment 140X: City Reservoir

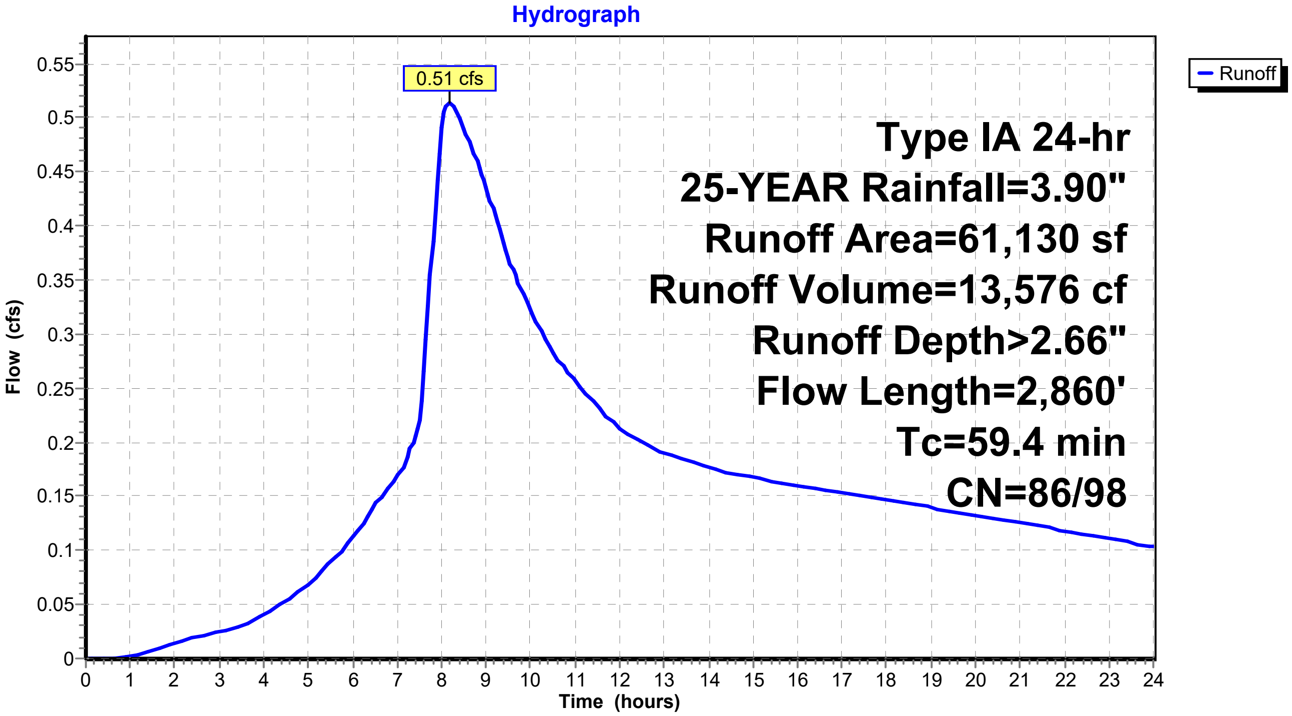
Runoff = 0.51 cfs @ 8.20 hrs, Volume= 13,576 cf, Depth> 2.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
14,216	98	Paved roads w/curbs & sewers, HSG C
46,914	86	<50% Grass cover, Poor, HSG C
61,130	89	Weighted Average
46,914	86	76.74% Pervious Area
14,216	98	23.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.50"
30.9	200	0.0440	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
8.1	500	0.0420	1.02		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.0	2,110	0.0100	2.93	11.71	**Channel Flow,** Area= 4.0 sf Perim= 8.8' r= 0.45' n= 0.030 Earth, grassed & winding
59.4	2,860	Total			

Subcatchment 140X: City Reservoir



Summary for Subcatchment 150X: Upstream Boones Ferry

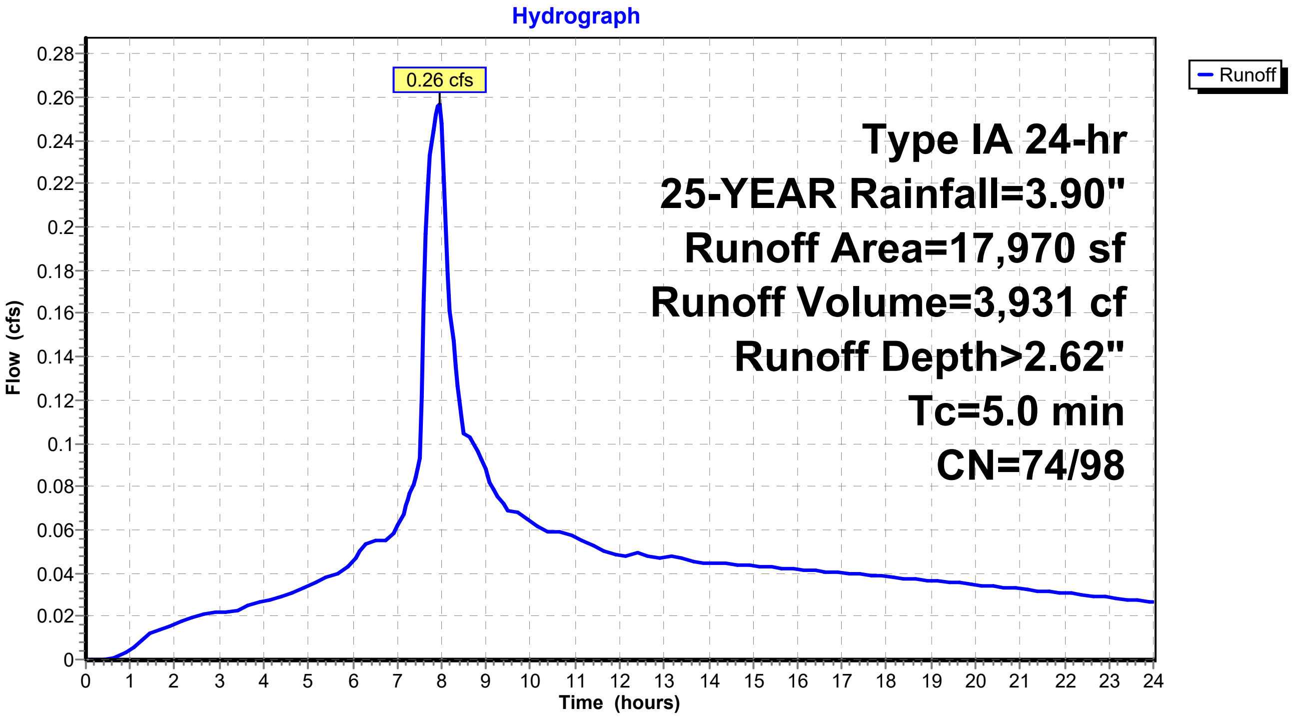
Runoff = 0.26 cfs @ 7.93 hrs, Volume= 3,931 cf, Depth> 2.62"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

	Area (sf)	CN	Description
*	9,285	98	Impervious Area
	8,685	74	>75% Grass cover, Good, HSG C
	17,970	86	Weighted Average
	8,685	74	48.33% Pervious Area
	9,285	98	51.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 150X: Upstream Boones Ferry



Summary for Subcatchment 160X: Upstream Properties

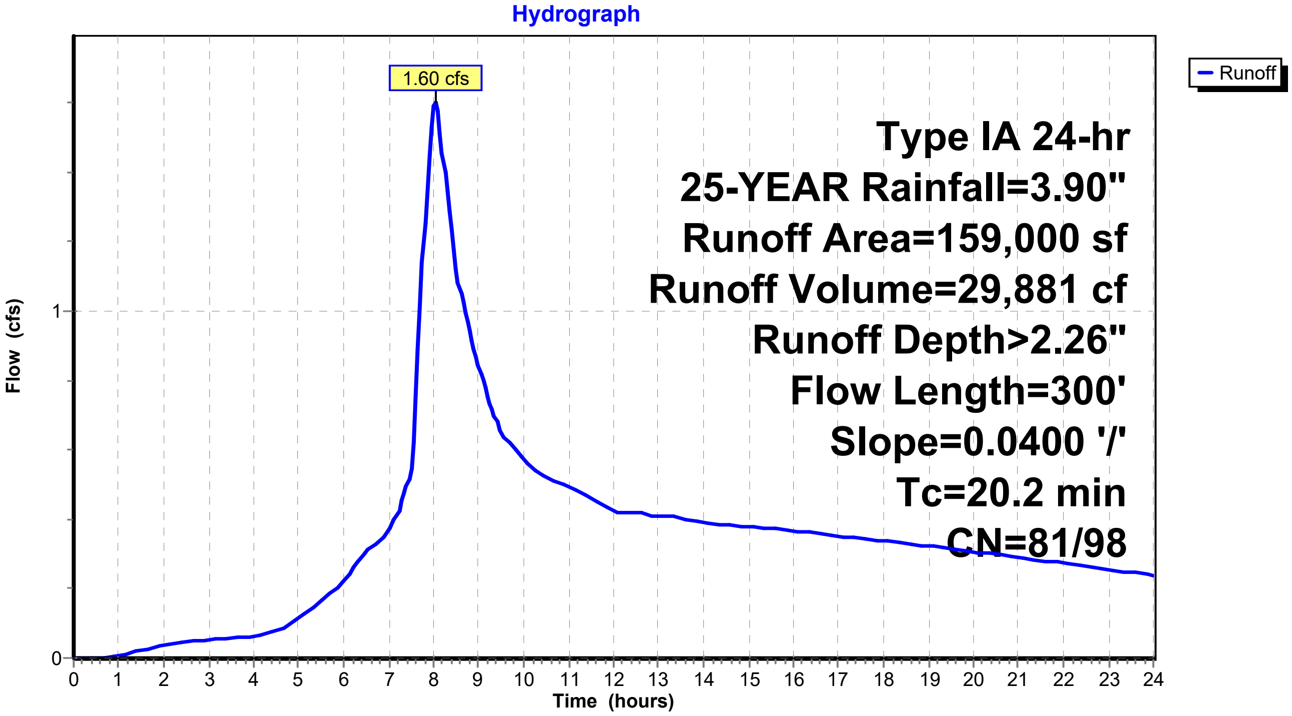
Runoff = 1.60 cfs @ 8.03 hrs, Volume= 29,881 cf, Depth> 2.26"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

	Area (sf)	CN	Description
*	23,371	98	Impervious Area
	12,930	96	Gravel surface, HSG C
	122,699	79	50-75% Grass cover, Fair, HSG C
	159,000	83	Weighted Average
	135,629	81	85.30% Pervious Area
	23,371	98	14.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	300	0.0400	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.50"

Subcatchment 160X: Upstream Properties

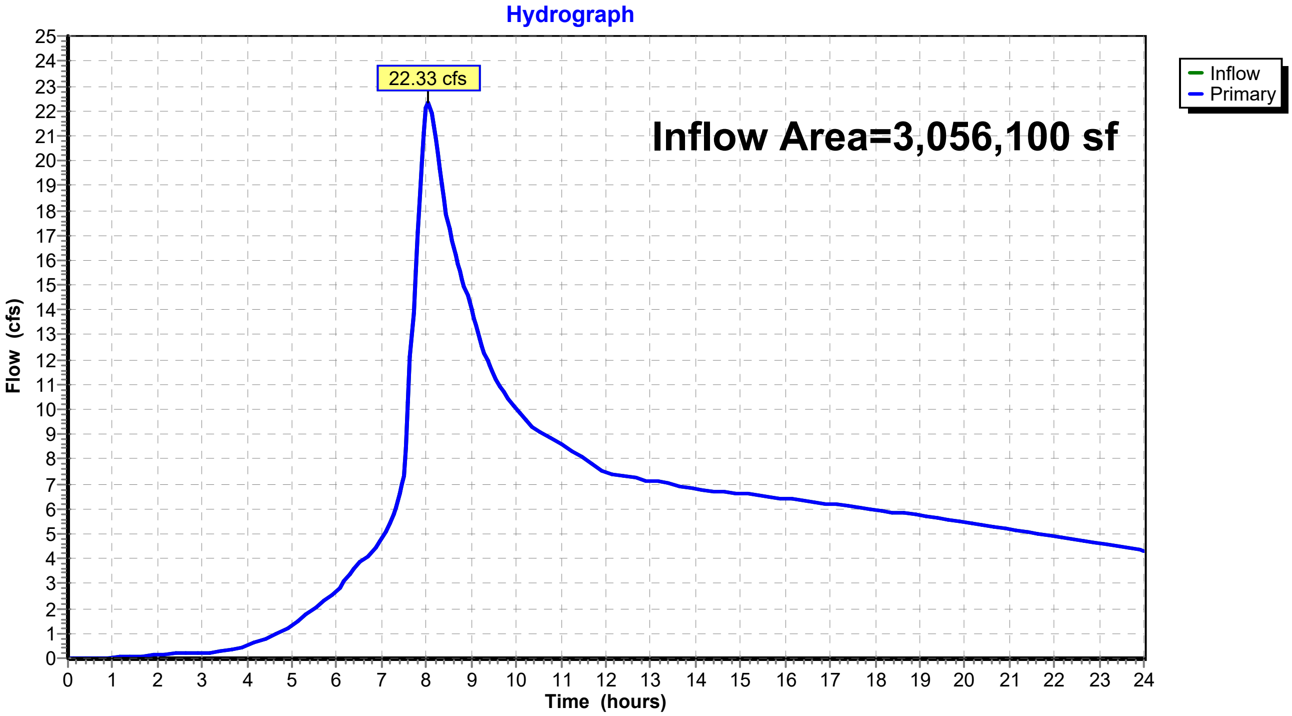


Summary for Link 1T: PRE TOTAL

Inflow Area = 3,056,100 sf, 3.45% Impervious, Inflow Depth > 1.92" for 25-YEAR event
Inflow = 22.33 cfs @ 8.04 hrs, Volume= 487,850 cf
Primary = 22.33 cfs @ 8.04 hrs, Volume= 487,850 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link 1T: PRE TOTAL

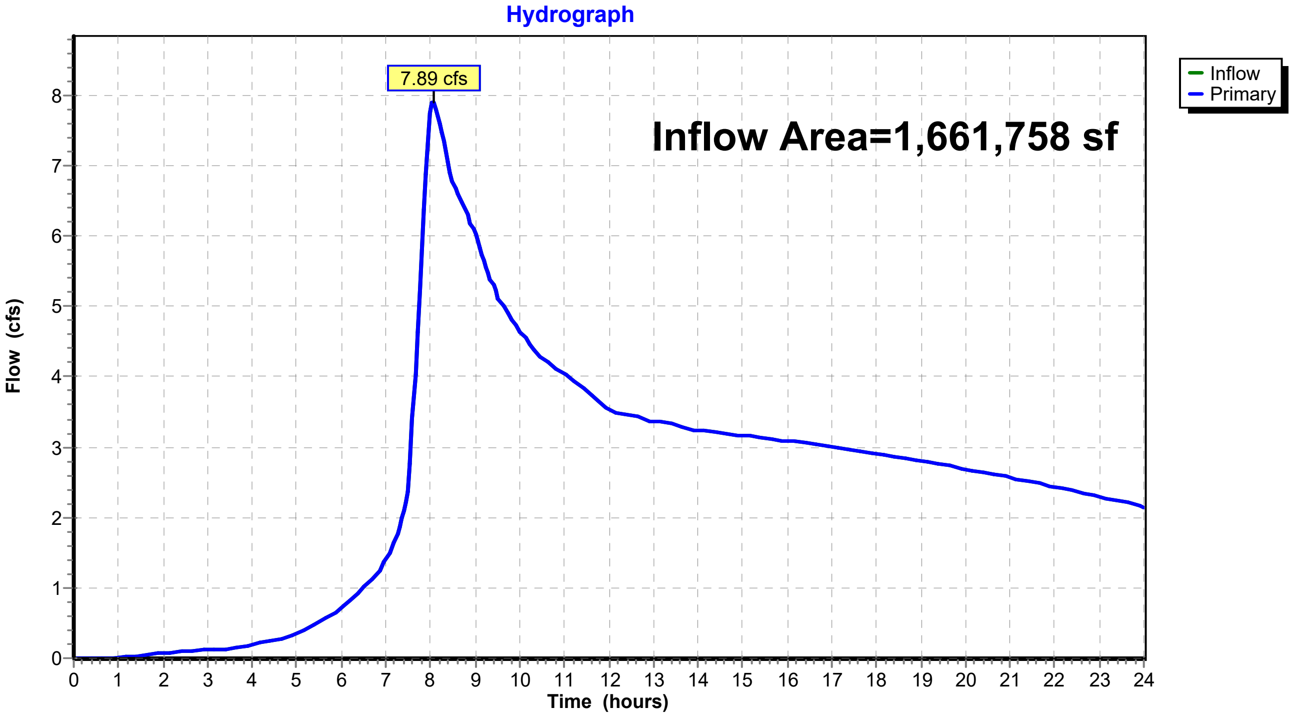


Summary for Link 2T: PRE DEV EAST

Inflow Area = 1,661,758 sf, 3.82% Impervious, Inflow Depth > 1.57" for 25-YEAR event
Inflow = 7.89 cfs @ 8.06 hrs, Volume= 217,026 cf
Primary = 7.89 cfs @ 8.06 hrs, Volume= 217,026 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link 2T: PRE DEV EAST

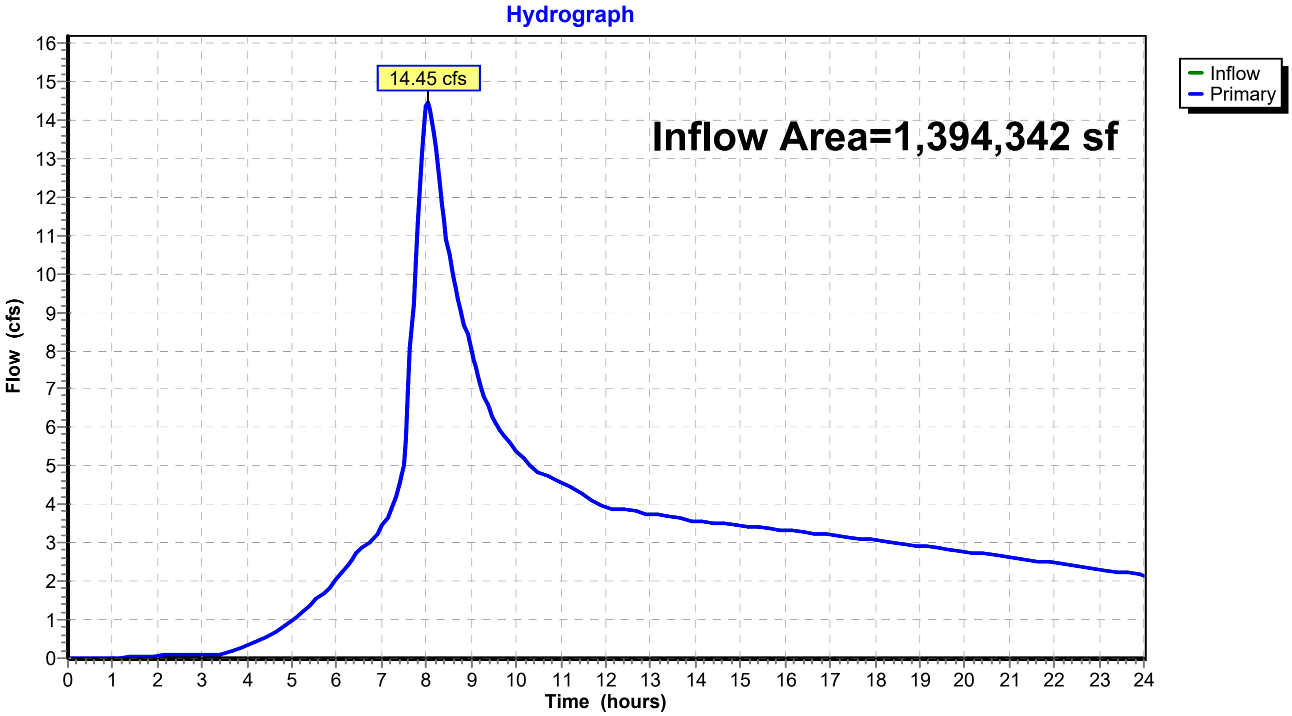


Summary for Link 3T: PRE DEV WEST

Inflow Area =	1,394,342 sf,	3.02% Impervious,	Inflow Depth > 2.33"	for 25-YEAR event		
Inflow =	14.45 cfs @	8.04 hrs,	Volume=	270,824 cf		
Primary =	14.45 cfs @	8.04 hrs,	Volume=	270,824 cf,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link 3T: PRE DEV WEST



```
                     Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
                        Runoff by SBUH method, Split Pervious/Imperv.
       Reach routing by Dyn-Stor-Ind method  -  Pond routing by Dyn-Stor-Ind method

Subcatchment10S:                         Runoff Area=407,524 sf   1.28% Impervious   Runoff Depth>2.72"
                                 Flow Length=650'   Tc=17.2 min   CN=84/98   Runoff=5.41 cfs  92,485 cf

Subcatchment20S:                         Runoff Area=166,164 sf   0.80% Impervious   Runoff Depth>2.89"
                                 Flow Length=465'   Tc=23.3 min   CN=86/98   Runoff=2.18 cfs  40,030 cf

Subcatchment30S:                         Runoff Area=643,684 sf   0.45% Impervious   Runoff Depth>2.79"
                                Flow Length=624'   Tc=26.9 min   CN=85/98   Runoff=7.71 cfs  149,622 cf

Subcatchment40S:                         Runoff Area=137,415 sf   0.00% Impervious   Runoff Depth>2.80"
                                   Flow Length=280'   Tc=11.5 min   CN=85/0   Runoff=2.07 cfs  32,105 cf

Subcatchment50S:                         Runoff Area=295,021 sf   0.00% Impervious   Runoff Depth>2.18"
                                 Flow Length=1,575'   Tc=29.0 min   CN=78/0   Runoff=2.43 cfs  53,510 cf

Subcatchment60S:                         Runoff Area=250,731 sf   0.00% Impervious   Runoff Depth>1.56"
                                 Flow Length=1,650'   Tc=46.2 min   CN=70/0   Runoff=1.00 cfs  32,519 cf

Subcatchment70S:                         Runoff Area=754,638 sf   0.00% Impervious   Runoff Depth>1.55"
                                 Flow Length=2,810'   Tc=51.0 min   CN=70/0   Runoff=2.86 cfs  97,549 cf

Subcatchment80S: Norwood Undisturbed      Runoff Area=7,546 sf   15.66% Impervious   Runoff Depth>2.58"
                                                  Tc=5.0 min   CN=79/98   Runoff=0.11 cfs  1,622 cf

Subcatchment90S: Norwood Undisturbed     Runoff Area=26,839 sf   13.26% Impervious   Runoff Depth>2.53"
                                                  Tc=5.0 min   CN=79/98   Runoff=0.37 cfs  5,670 cf

Subcatchment100S: Norwood                Runoff Area=18,245 sf   17.23% Impervious   Runoff Depth>2.61"
                                                  Tc=5.0 min   CN=79/98   Runoff=0.26 cfs  3,967 cf

Subcatchment110S: Norwood                Runoff Area=73,346 sf   56.47% Impervious   Runoff Depth>3.28"
                                                Tc=51.0 min   CN=79/98   Runoff=0.80 cfs  20,048 cf

Subcatchment120S: Onsite Undisturbed      Runoff Area=31,991 sf   0.00% Impervious   Runoff Depth>1.55"
                                  Flow Length=2,810'   Tc=51.0 min   CN=70/0   Runoff=0.12 cfs  4,135 cf

Subcatchment130S: Onsite Undisturbed       Runoff Area=4,856 sf   0.00% Impervious   Runoff Depth>1.55"
                                    Flow Length=2,810'   Tc=51.0 min   CN=70/0   Runoff=0.02 cfs  628 cf

Subcatchment140X: City Reservoir         Runoff Area=61,130 sf   23.26% Impervious   Runoff Depth>3.12"
                                Flow Length=2,860'   Tc=59.4 min   CN=86/98   Runoff=0.61 cfs  15,894 cf

Subcatchment150X: Upstream Boones        Runoff Area=17,970 sf   51.67% Impervious   Runoff Depth>3.06"
                                                  Tc=5.0 min   CN=74/98   Runoff=0.30 cfs  4,585 cf

Subcatchment160X: Upstream PropertiesRunoff Area=159,000 sf   14.70% Impervious   Runoff Depth>2.69"
                 Flow Length=300'   Slope=0.0400 '/'   Tc=20.2 min   CN=81/98   Runoff=1.94 cfs  35,601 cf
```

Link 1T: PRE TOTAL Inflow=27.72 cfs 589,969 cf
Primary=27.72 cfs 589,969 cf

Link 2T: PRE DEV EAST Inflow=10.23 cfs 267,646 cf
Primary=10.23 cfs 267,646 cf

Link 3T: PRE DEV WEST Inflow=17.51 cfs 322,323 cf
Primary=17.51 cfs 322,323 cf

Total Runoff Area = 3,056,100 sf Runoff Volume = 589,969 cf Average Runoff Depth = 2.32"
96.55% Pervious = 2,950,525 sf 3.45% Impervious = 105,575 sf

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Runoff Area=407,524 sf 1.28% Impervious Runoff Depth>1.89"
Flow Length=650' Tc=17.2 min CN=84/98 Runoff=3.61 cfs 64,333 cf

Subcatchment20S: Runoff Area=166,164 sf 0.80% Impervious Runoff Depth>2.04"
Flow Length=465' Tc=23.3 min CN=86/98 Runoff=1.49 cfs 28,255 cf

Subcatchment30S: Runoff Area=643,684 sf 0.45% Impervious Runoff Depth>1.95"
Flow Length=624' Tc=26.9 min CN=85/98 Runoff=5.18 cfs 104,723 cf

Subcatchment40S: Runoff Area=137,415 sf 0.00% Impervious Runoff Depth>1.96"
Flow Length=280' Tc=11.5 min CN=85/0 Runoff=1.40 cfs 22,467 cf

Subcatchment50S: Runoff Area=295,021 sf 0.00% Impervious Runoff Depth>1.43"
Flow Length=1,575' Tc=29.0 min CN=78/0 Runoff=1.45 cfs 35,279 cf

Subcatchment60S: Runoff Area=250,731 sf 0.00% Impervious Runoff Depth>0.95"
Flow Length=1,650' Tc=46.2 min CN=70/0 Runoff=0.49 cfs 19,750 cf

Subcatchment70S: Runoff Area=754,638 sf 0.00% Impervious Runoff Depth>0.94"
Flow Length=2,810' Tc=51.0 min CN=70/0 Runoff=1.44 cfs 59,224 cf

Subcatchment80S: Norwood Undisturbed Runoff Area=7,546 sf 15.66% Impervious Runoff Depth>1.79"
Tc=5.0 min CN=79/98 Runoff=0.07 cfs 1,124 cf

Subcatchment90S: Norwood Undisturbed Runoff Area=26,839 sf 13.26% Impervious Runoff Depth>1.75"
Tc=5.0 min CN=79/98 Runoff=0.25 cfs 3,907 cf

Subcatchment100S: Norwood Runoff Area=18,245 sf 17.23% Impervious Runoff Depth>1.81"
Tc=5.0 min CN=79/98 Runoff=0.18 cfs 2,758 cf

Subcatchment110S: Norwood Runoff Area=73,346 sf 56.47% Impervious Runoff Depth>2.43"
Tc=51.0 min CN=79/98 Runoff=0.59 cfs 14,843 cf

Subcatchment120S: Onsite Undisturbed Runoff Area=31,991 sf 0.00% Impervious Runoff Depth>0.94"
Flow Length=2,810' Tc=51.0 min CN=70/0 Runoff=0.06 cfs 2,511 cf

Subcatchment130S: Onsite Undisturbed Runoff Area=4,856 sf 0.00% Impervious Runoff Depth>0.94"
Flow Length=2,810' Tc=51.0 min CN=70/0 Runoff=0.01 cfs 381 cf

Subcatchment140X: City Reservoir Runoff Area=61,130 sf 23.26% Impervious Runoff Depth>2.26"
Flow Length=2,860' Tc=59.4 min CN=86/98 Runoff=0.43 cfs 11,521 cf

Subcatchment150X: Upstream Boones Runoff Area=17,970 sf 51.67% Impervious Runoff Depth>2.24"
Tc=5.0 min CN=74/98 Runoff=0.22 cfs 3,354 cf

Subcatchment160X: Upstream Properties Runoff Area=159,000 sf 14.70% Impervious Runoff Depth>1.88"
Flow Length=300' Slope=0.0400 '/' Tc=20.2 min CN=81/98 Runoff=1.30 cfs 24,871 cf

Link 1T: PRE TOTAL	Inflow=17.69 cfs 399,301 cf Primary=17.69 cfs 399,301 cf
Link 2T: PRE DEV EAST	Inflow=5.94 cfs 173,764 cf Primary=5.94 cfs 173,764 cf
Link 3T: PRE DEV WEST	Inflow=11.77 cfs 225,538 cf Primary=11.77 cfs 225,538 cf

Total Runoff Area = 3,056,100 sf Runoff Volume = 399,301 cf Average Runoff Depth = 1.57"
96.55% Pervious = 2,950,525 sf 3.45% Impervious = 105,575 sf

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Runoff Area=407,524 sf 1.28% Impervious Runoff Depth>1.60"
Flow Length=650' Tc=17.2 min CN=84/98 Runoff=2.98 cfs 54,368 cf

Subcatchment20S: Runoff Area=166,164 sf 0.80% Impervious Runoff Depth>1.74"
Flow Length=465' Tc=23.3 min CN=86/98 Runoff=1.24 cfs 24,056 cf

Subcatchment30S: Runoff Area=643,684 sf 0.45% Impervious Runoff Depth>1.66"
Flow Length=624' Tc=26.9 min CN=85/98 Runoff=4.28 cfs 88,776 cf

Subcatchment40S: Runoff Area=137,415 sf 0.00% Impervious Runoff Depth>1.66"
Flow Length=280' Tc=11.5 min CN=85/0 Runoff=1.16 cfs 19,043 cf

Subcatchment50S: Runoff Area=295,021 sf 0.00% Impervious Runoff Depth>1.18"
Flow Length=1,575' Tc=29.0 min CN=78/0 Runoff=1.12 cfs 28,998 cf

Subcatchment60S: Runoff Area=250,731 sf 0.00% Impervious Runoff Depth>0.74"
Flow Length=1,650' Tc=46.2 min CN=70/0 Runoff=0.35 cfs 15,540 cf

Subcatchment70S: Runoff Area=754,638 sf 0.00% Impervious Runoff Depth>0.74"
Flow Length=2,810' Tc=51.0 min CN=70/0 Runoff=1.02 cfs 46,586 cf

Subcatchment80S: Norwood Undisturbed Runoff Area=7,546 sf 15.66% Impervious Runoff Depth>1.51"
Tc=5.0 min CN=79/98 Runoff=0.06 cfs 949 cf

Subcatchment90S: Norwood Undisturbed Runoff Area=26,839 sf 13.26% Impervious Runoff Depth>1.47"
Tc=5.0 min CN=79/98 Runoff=0.20 cfs 3,290 cf

Subcatchment100S: Norwood Runoff Area=18,245 sf 17.23% Impervious Runoff Depth>1.53"
Tc=5.0 min CN=79/98 Runoff=0.15 cfs 2,334 cf

Subcatchment110S: Norwood Runoff Area=73,346 sf 56.47% Impervious Runoff Depth>2.12"
Tc=51.0 min CN=79/98 Runoff=0.51 cfs 12,971 cf

Subcatchment120S: Onsite Undisturbed Runoff Area=31,991 sf 0.00% Impervious Runoff Depth>0.74"
Flow Length=2,810' Tc=51.0 min CN=70/0 Runoff=0.04 cfs 1,975 cf

Subcatchment130S: Onsite Undisturbed Runoff Area=4,856 sf 0.00% Impervious Runoff Depth>0.74"
Flow Length=2,810' Tc=51.0 min CN=70/0 Runoff=0.01 cfs 300 cf

Subcatchment140X: City Reservoir Runoff Area=61,130 sf 23.26% Impervious Runoff Depth>1.95"
Flow Length=2,860' Tc=59.4 min CN=86/98 Runoff=0.37 cfs 9,950 cf

Subcatchment150X: Upstream Boones Runoff Area=17,970 sf 51.67% Impervious Runoff Depth>1.95"
Tc=5.0 min CN=74/98 Runoff=0.19 cfs 2,917 cf

Subcatchment160X: Upstream Properties Runoff Area=159,000 sf 14.70% Impervious Runoff Depth>1.59"
Flow Length=300' Slope=0.0400 '/' Tc=20.2 min CN=81/98 Runoff=1.07 cfs 21,089 cf

Link 1T: PRE TOTAL	Inflow=14.27 cfs	333,143 cf
	Primary=14.27 cfs	333,143 cf
Link 2T: PRE DEV EAST	Inflow=4.54 cfs	141,937 cf
	Primary=4.54 cfs	141,937 cf
Link 3T: PRE DEV WEST	Inflow=9.74 cfs	191,206 cf
	Primary=9.74 cfs	191,206 cf

Total Runoff Area = 3,056,100 sf Runoff Volume = 333,143 cf Average Runoff Depth = 1.31"
96.55% Pervious = 2,950,525 sf 3.45% Impervious = 105,575 sf

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Runoff Area=407,524 sf 1.28% Impervious Runoff Depth>1.12"
Flow Length=650' Tc=17.2 min CN=84/98 Runoff=1.95 cfs 38,035 cf

Subcatchment20S: Runoff Area=166,164 sf 0.80% Impervious Runoff Depth>1.24"
Flow Length=465' Tc=23.3 min CN=86/98 Runoff=0.84 cfs 17,119 cf

Subcatchment30S: Runoff Area=643,684 sf 0.45% Impervious Runoff Depth>1.17"
Flow Length=624' Tc=26.9 min CN=85/98 Runoff=2.83 cfs 62,543 cf

Subcatchment40S: Runoff Area=137,415 sf 0.00% Impervious Runoff Depth>1.17"
Flow Length=280' Tc=11.5 min CN=85/0 Runoff=0.77 cfs 13,412 cf

Subcatchment50S: Runoff Area=295,021 sf 0.00% Impervious Runoff Depth>0.77"
Flow Length=1,575' Tc=29.0 min CN=78/0 Runoff=0.62 cfs 18,997 cf

Subcatchment60S: Runoff Area=250,731 sf 0.00% Impervious Runoff Depth>0.44"
Flow Length=1,650' Tc=46.2 min CN=70/0 Runoff=0.17 cfs 9,135 cf

Subcatchment70S: Runoff Area=754,638 sf 0.00% Impervious Runoff Depth>0.44"
Flow Length=2,810' Tc=51.0 min CN=70/0 Runoff=0.51 cfs 27,369 cf

Subcatchment80S: Norwood Undisturbed Runoff Area=7,546 sf 15.66% Impervious Runoff Depth>1.06"
Tc=5.0 min CN=79/98 Runoff=0.04 cfs 666 cf

Subcatchment90S: Norwood Undisturbed Runoff Area=26,839 sf 13.26% Impervious Runoff Depth>1.02"
Tc=5.0 min CN=79/98 Runoff=0.13 cfs 2,292 cf

Subcatchment100S: Norwood Runoff Area=18,245 sf 17.23% Impervious Runoff Depth>1.08"
Tc=5.0 min CN=79/98 Runoff=0.10 cfs 1,644 cf

Subcatchment110S: Norwood Runoff Area=73,346 sf 56.47% Impervious Runoff Depth>1.61"
Tc=51.0 min CN=79/98 Runoff=0.38 cfs 9,844 cf

Subcatchment120S: Onsite Undisturbed Runoff Area=31,991 sf 0.00% Impervious Runoff Depth>0.44"
Flow Length=2,810' Tc=51.0 min CN=70/0 Runoff=0.02 cfs 1,160 cf

Subcatchment130S: Onsite Undisturbed Runoff Area=4,856 sf 0.00% Impervious Runoff Depth>0.44"
Flow Length=2,810' Tc=51.0 min CN=70/0 Runoff=0.00 cfs 176 cf

Subcatchment140X: City Reservoir Runoff Area=61,130 sf 23.26% Impervious Runoff Depth>1.44"
Flow Length=2,860' Tc=59.4 min CN=86/98 Runoff=0.26 cfs 7,333 cf

Subcatchment150X: Upstream Boones Runoff Area=17,970 sf 51.67% Impervious Runoff Depth>1.46"
Tc=5.0 min CN=74/98 Runoff=0.14 cfs 2,193 cf

Subcatchment160X: Upstream Properties Runoff Area=159,000 sf 14.70% Impervious Runoff Depth>1.13"
Flow Length=300' Slope=0.0400 '/' Tc=20.2 min CN=81/98 Runoff=0.71 cfs 14,912 cf

Link 1T: PRE TOTAL

Inflow=8.95 cfs 226,829 cf
Primary=8.95 cfs 226,829 cf

Link 2T: PRE DEV EAST

Inflow=2.51 cfs 92,027 cf
Primary=2.51 cfs 92,027 cf

Link 3T: PRE DEV WEST

Inflow=6.45 cfs 134,802 cf
Primary=6.45 cfs 134,802 cf

Total Runoff Area = 3,056,100 sf Runoff Volume = 226,829 cf Average Runoff Depth = 0.89"
96.55% Pervious = 2,950,525 sf 3.45% Impervious = 105,575 sf

Appendix B: HydroCAD Reports for Post-Developed Condition Storm Events

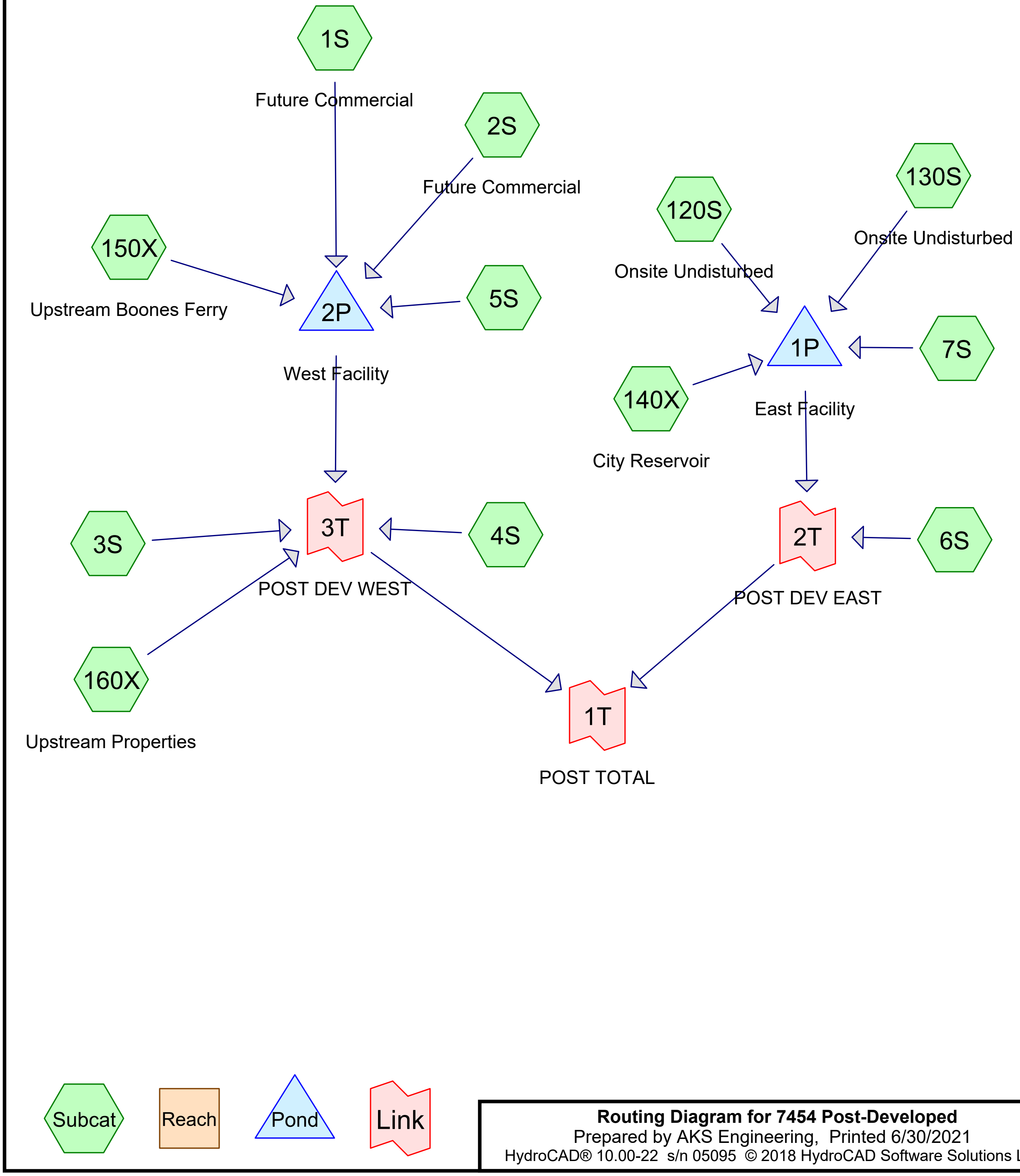
(25-Year Storm Event Analysis)

(50-Year Storm Event Summary)

(10-Year Storm Event Summary)

(5-Year Storm Event Summary)

(2-Year Storm Event Summary)



Routing Diagram for 7454 Post-Developed
Prepared by AKS Engineering, Printed 6/30/2021
HydroCAD® 10.00-22 s/n 05095 © 2018 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
122,699	79	50-75% Grass cover, Fair, HSG C (160X)
74,761	98	85% Impervious - Future Commercial (1S, 2S)
46,914	86	<50% Grass cover, Poor, HSG C (140X)
1,024,439	74	>75% Grass cover, Good, HSG C (1S, 2S, 3S, 4S, 5S, 6S, 7S, 150X)
12,930	96	Gravel surface, HSG C (160X)
32,656	98	Impervious Area (150X, 160X)
1,056,000	98	Impervious Area on Lots (2,640 sq.ft. per lot) (5S, 7S)
648,854	98	Paved roads w/curbs & sewers, HSG C (3S, 4S, 5S, 7S, 140X)
36,847	70	Woods, Good, HSG C (120S, 130S)
3,056,100	**89**	**TOTAL AREA**

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Future Commercial Runoff Area=26,911 sf 85.00% Impervious Runoff Depth=3.34"
Tc=5.0 min CN=74/98 Runoff=0.51 cfs 7,499 cf

Subcatchment2S: Future Commercial Runoff Area=61,043 sf 85.00% Impervious Runoff Depth=3.34"
Tc=5.0 min CN=74/98 Runoff=1.16 cfs 17,011 cf

Subcatchment3S: Runoff Area=68,508 sf 7.88% Impervious Runoff Depth=1.69"
Tc=5.0 min CN=74/98 Runoff=0.58 cfs 9,660 cf

Subcatchment4S: Runoff Area=9,392 sf 28.66% Impervious Runoff Depth=2.14"
Tc=5.0 min CN=74/98 Runoff=0.10 cfs 1,673 cf

Subcatchment5S: Runoff Area=1,198,943 sf 68.42% Impervious Runoff Depth=2.99"
Tc=5.0 min CN=74/98 Runoff=19.91 cfs 298,621 cf

Subcatchment6S: Runoff Area=121,306 sf 0.00% Impervious Runoff Depth=1.52"
Tc=5.0 min CN=74/0 Runoff=0.89 cfs 15,399 cf

Subcatchment7S: Runoff Area=1,295,050 sf 66.58% Impervious Runoff Depth=2.95"
Tc=5.0 min CN=74/98 Runoff=21.18 cfs 318,314 cf

Subcatchment120S: Onsite Undisturbed Runoff Area=31,991 sf 0.00% Impervious Runoff Depth=1.26"
Flow Length=100' Slope=0.0440 '/' Tc=22.7 min CN=70/0 Runoff=0.12 cfs 3,368 cf

Subcatchment130S: Onsite Undisturbed Runoff Area=4,856 sf 0.00% Impervious Runoff Depth=1.26"
Flow Length=50' Slope=0.0440 '/' Tc=15.2 min CN=70/0 Runoff=0.02 cfs 511 cf

Subcatchment140X: City Reservoir Runoff Area=61,130 sf 23.26% Impervious Runoff Depth=2.74"
Flow Length=50' Slope=0.0100 '/' Tc=13.4 min CN=86/98 Runoff=0.87 cfs 13,944 cf

Subcatchment150X: Upstream Boones Runoff Area=17,970 sf 51.67% Impervious Runoff Depth=2.63"
Tc=5.0 min CN=74/98 Runoff=0.26 cfs 3,939 cf

Subcatchment160X: Upstream Properties Runoff Area=159,000 sf 14.70% Impervious Runoff Depth=2.28"
Flow Length=300' Slope=0.0400 '/' Tc=20.2 min CN=81/98 Runoff=1.60 cfs 30,169 cf

Pond 1P: East Facility Peak Elev=323.62' Storage=124,280 cf Inflow=22.13 cfs 336,137 cf
Outflow=6.53 cfs 322,788 cf

Pond 2P: West Facility Peak Elev=319.55' Storage=91,804 cf Inflow=21.83 cfs 327,069 cf
Outflow=12.32 cfs 321,718 cf

Link 1T: POST TOTAL Inflow=17.81 cfs 701,408 cf
Primary=17.81 cfs 701,408 cf

Link 2T: POST DEV EAST Inflow=6.87 cfs 338,187 cf
Primary=6.87 cfs 338,187 cf

Link 3T: POST DEV WEST

Inflow=14.17 cfs 363,221 cf
Primary=14.17 cfs 363,221 cf

Total Runoff Area = 3,056,100 sf Runoff Volume = 720,108 cf Average Runoff Depth = 2.83"
40.70% Pervious = 1,243,829 sf 59.30% Impervious = 1,812,271 sf

Summary for Subcatchment 1S: Future Commercial

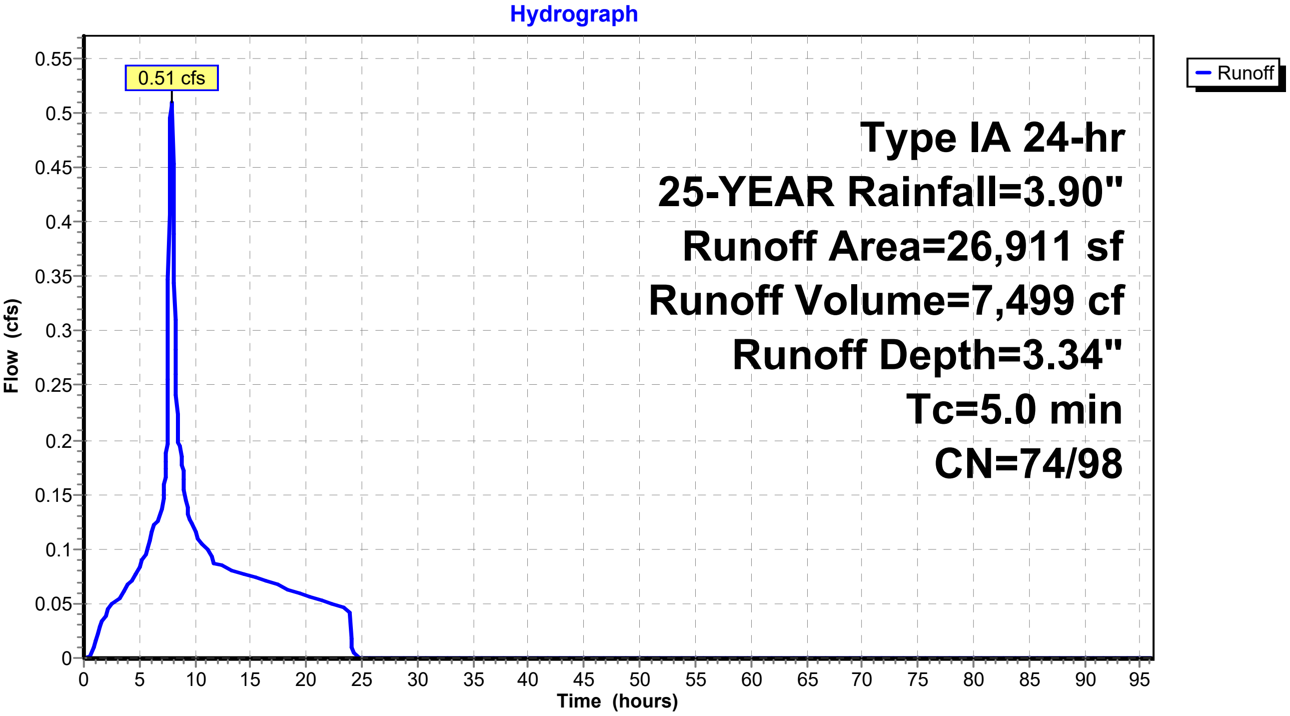
Runoff = 0.51 cfs @ 7.91 hrs, Volume= 7,499 cf, Depth= 3.34"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

	Area (sf)	CN	Description
*	22,874	98	85% Impervious - Future Commercial
	4,037	74	>75% Grass cover, Good, HSG C
	26,911	94	Weighted Average
	4,037	74	15.00% Pervious Area
	22,874	98	85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: Future Commercial



Summary for Subcatchment 2S: Future Commercial

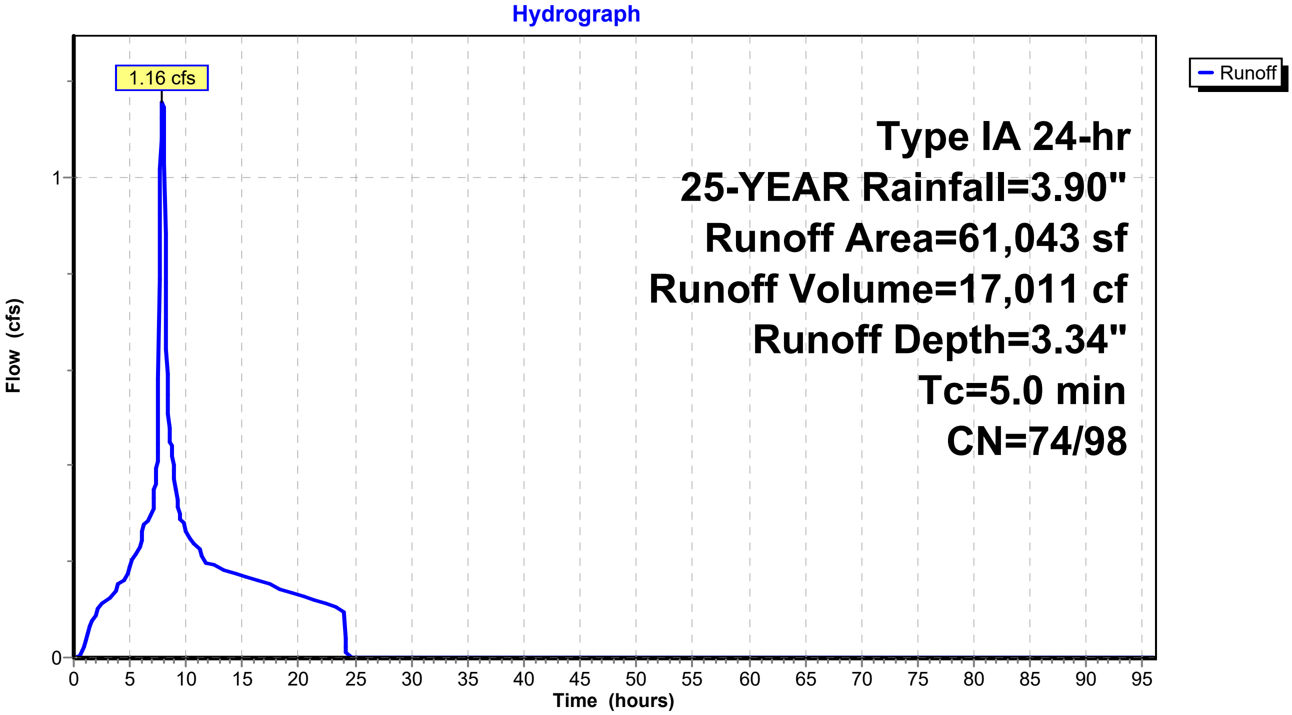
Runoff = 1.16 cfs @ 7.91 hrs, Volume= 17,011 cf, Depth= 3.34"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

	Area (sf)	CN	Description
*	51,887	98	85% Impervious - Future Commercial
	9,156	74	>75% Grass cover, Good, HSG C
	61,043	94	Weighted Average
	9,156	74	15.00% Pervious Area
	51,887	98	85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2S: Future Commercial



Summary for Subcatchment 3S:

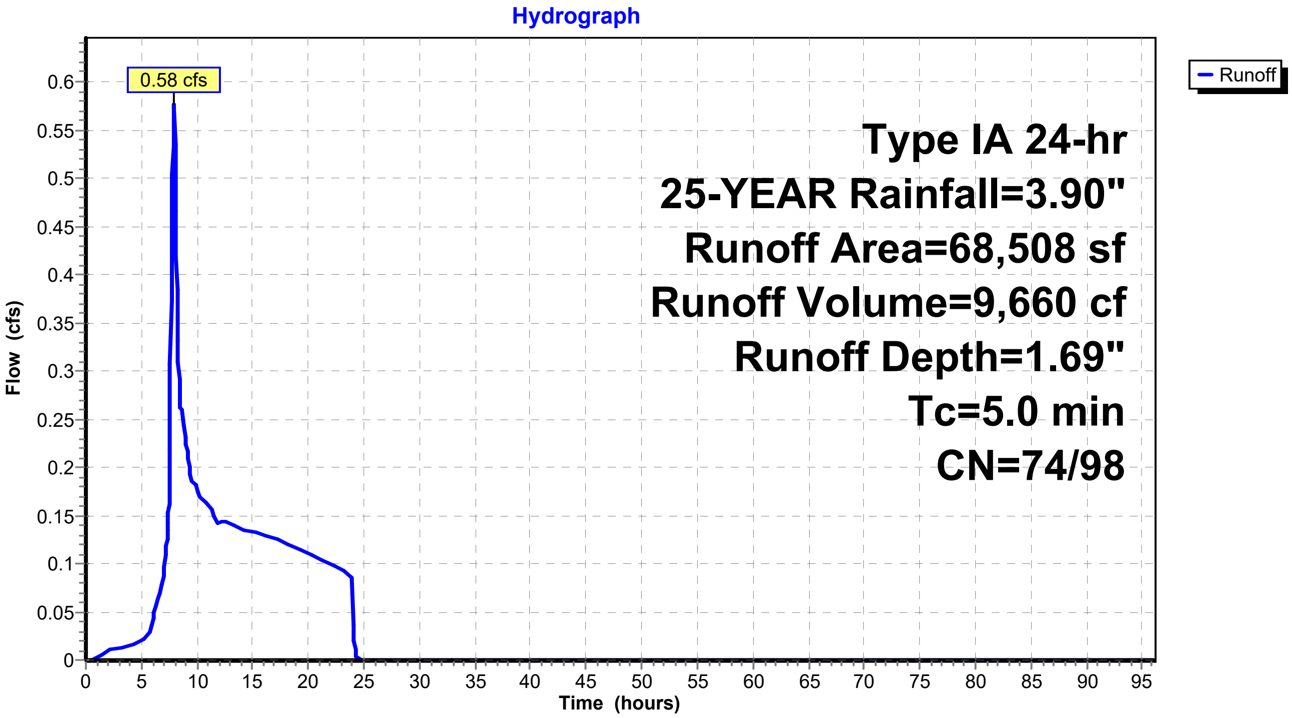
Runoff = 0.58 cfs @ 7.98 hrs, Volume= 9,660 cf, Depth= 1.69"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
5,399	98	Paved roads w/curbs & sewers, HSG C
63,109	74	>75% Grass cover, Good, HSG C
68,508	76	Weighted Average
63,109	74	92.12% Pervious Area
5,399	98	7.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S:



Summary for Subcatchment 4S:

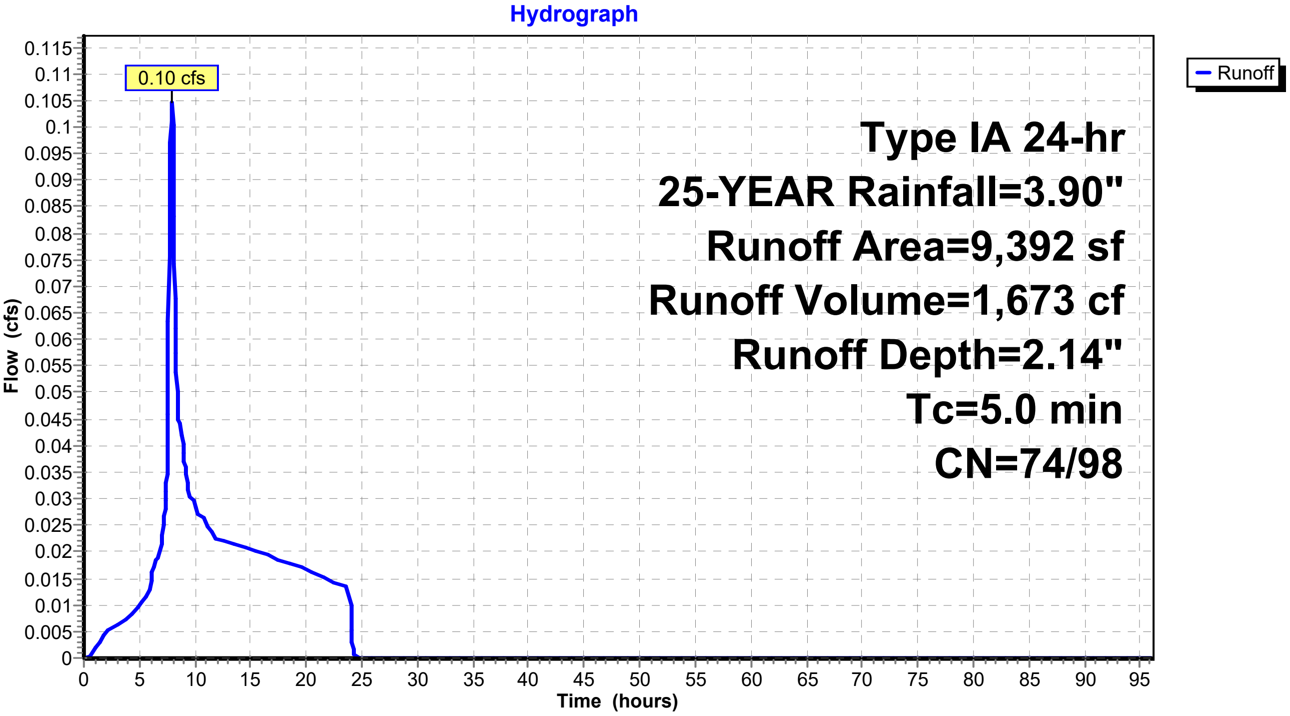
Runoff = 0.10 cfs @ 7.97 hrs, Volume= 1,673 cf, Depth= 2.14"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
2,692	98	Paved roads w/curbs & sewers, HSG C
6,700	74	>75% Grass cover, Good, HSG C
9,392	81	Weighted Average
6,700	74	71.34% Pervious Area
2,692	98	28.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4S:



Summary for Subcatchment 5S:

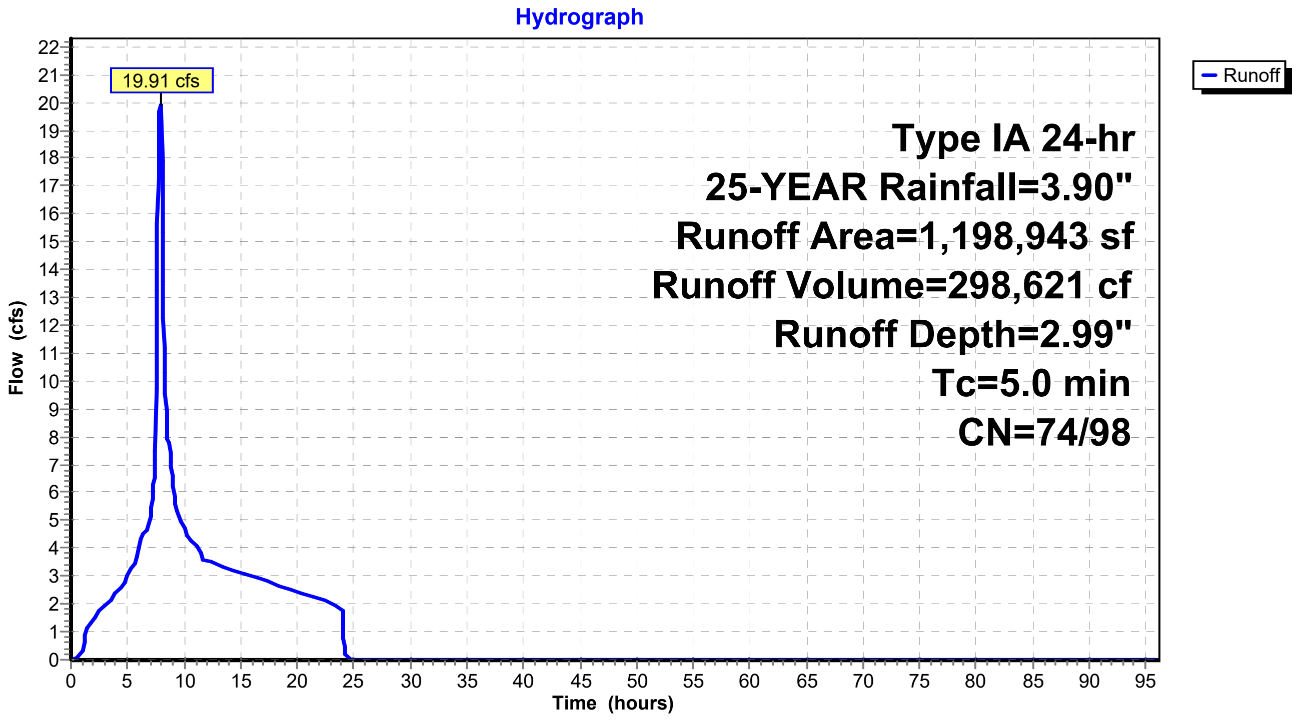
Runoff = 19.91 cfs @ 7.92 hrs, Volume= 298,621 cf, Depth= 2.99"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

	Area (sf)	CN	Description
	281,723	98	Paved roads w/curbs & sewers, HSG C
	378,660	74	>75% Grass cover, Good, HSG C
*	538,560	98	Impervious Area on Lots (2,640 sq.ft. per lot)
	1,198,943	90	Weighted Average
	378,660	74	31.58% Pervious Area
	820,283	98	68.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5S:



Summary for Subcatchment 6S:

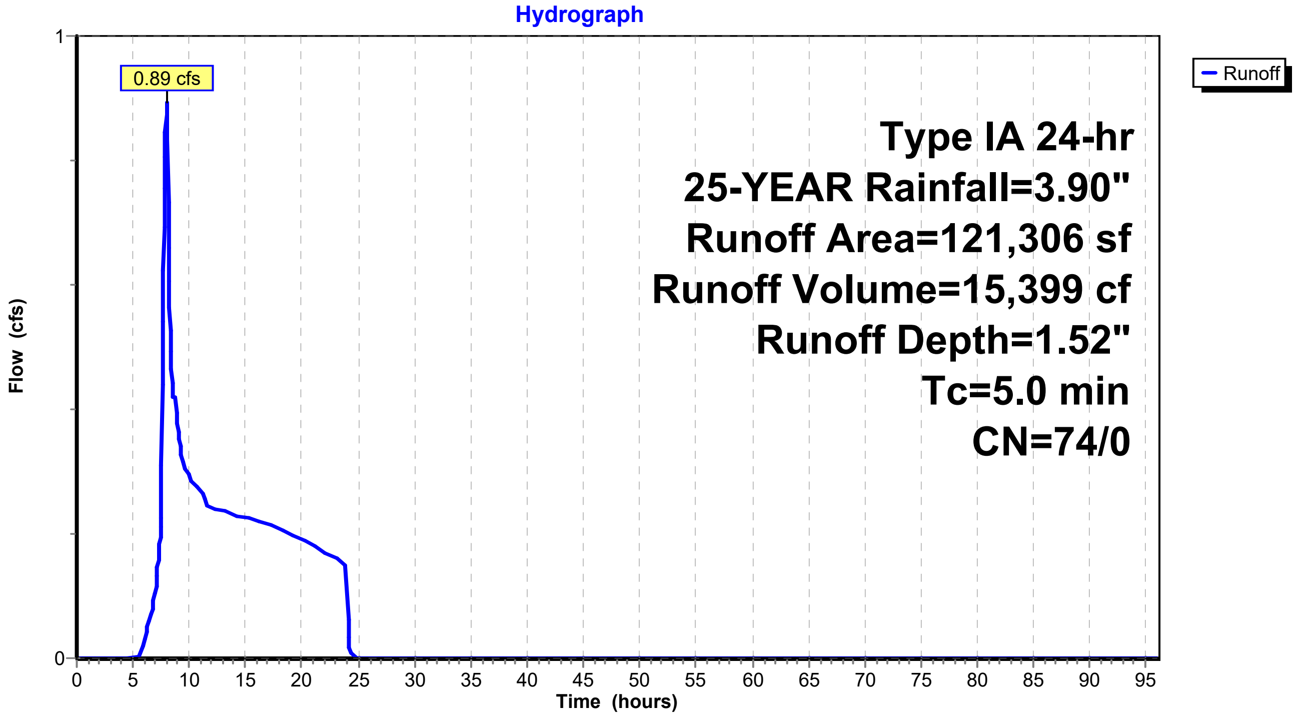
Runoff = 0.89 cfs @ 7.99 hrs, Volume= 15,399 cf, Depth= 1.52"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
121,306	74	>75% Grass cover, Good, HSG C
121,306	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6S:



Summary for Subcatchment 7S:

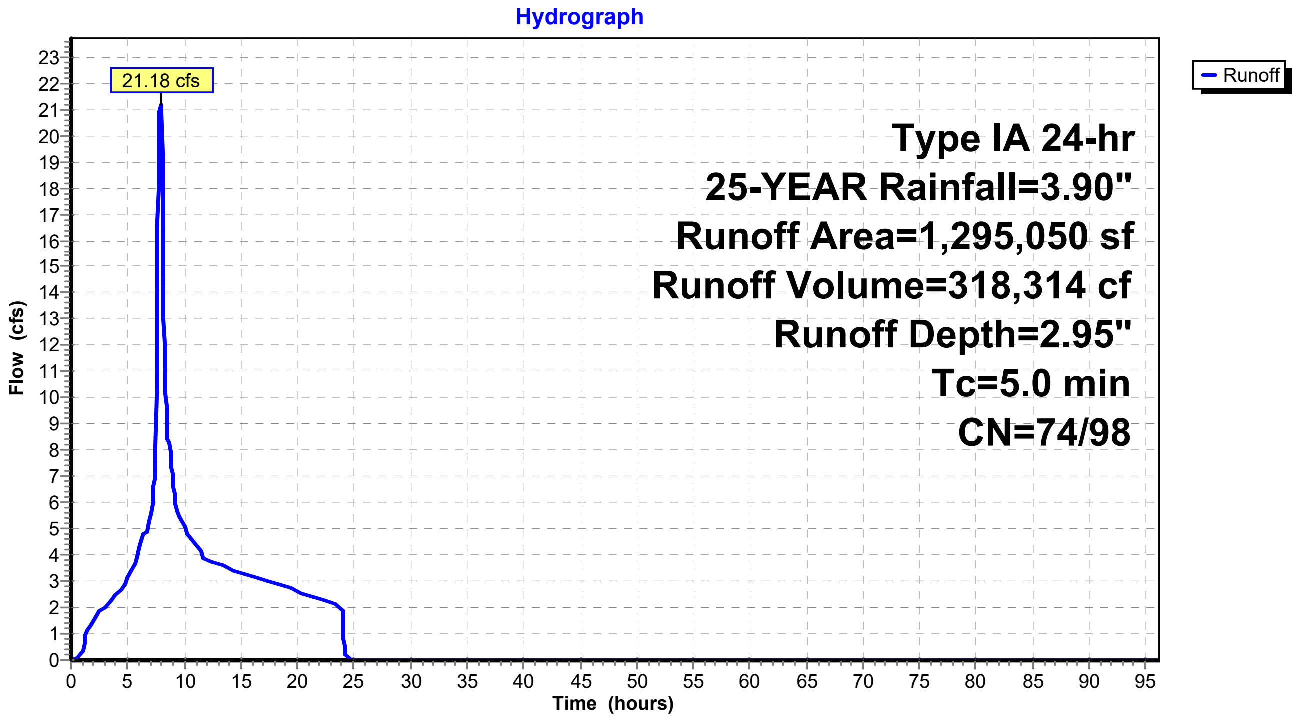
Runoff = 21.18 cfs @ 7.92 hrs, Volume= 318,314 cf, Depth= 2.95"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

	Area (sf)	CN	Description
	344,824	98	Paved roads w/curbs & sewers, HSG C
	432,786	74	>75% Grass cover, Good, HSG C
*	517,440	98	Impervious Area on Lots (2,640 sq.ft. per lot)
	1,295,050	90	Weighted Average
	432,786	74	33.42% Pervious Area
	862,264	98	66.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 7S:



Summary for Subcatchment 120S: Onsite Undisturbed

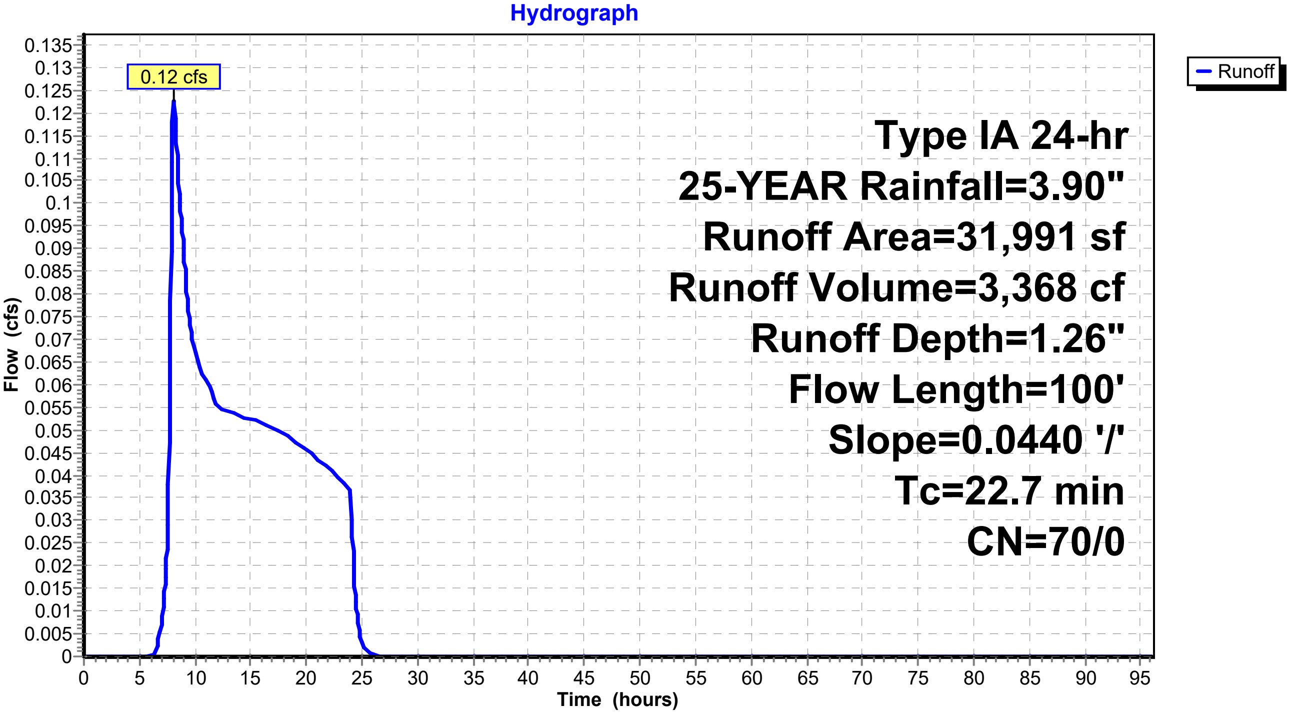
Runoff = 0.12 cfs @ 8.08 hrs, Volume= 3,368 cf, Depth= 1.26"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
31,991	70	Woods, Good, HSG C
31,991	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	100	0.0440	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
5.0					**Direct Entry,**
22.7	100	Total			

Subcatchment 120S: Onsite Undisturbed



Summary for Subcatchment 130S: Onsite Undisturbed

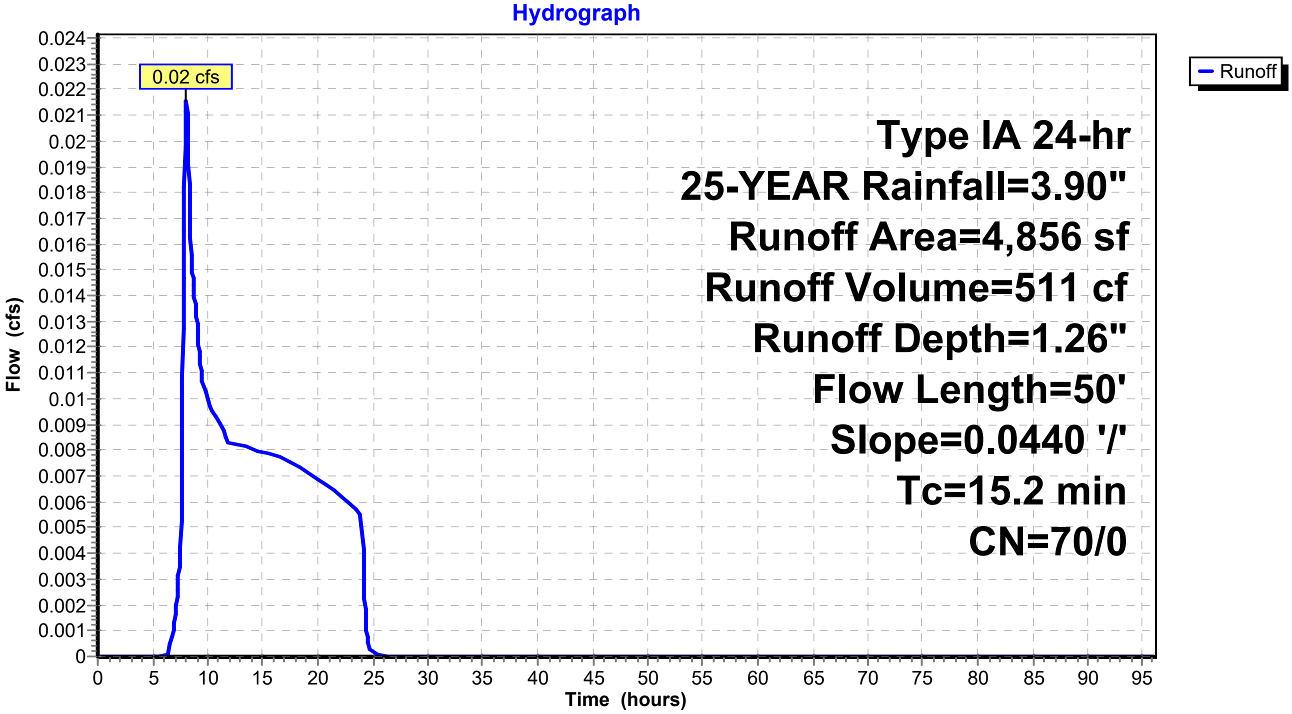
Runoff = 0.02 cfs @ 8.05 hrs, Volume= 511 cf, Depth= 1.26"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
4,856	70	Woods, Good, HSG C
4,856	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0440	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
5.0					**Direct Entry,**
15.2	50	Total			

Subcatchment 130S: Onsite Undisturbed



Summary for Subcatchment 140X: City Reservoir

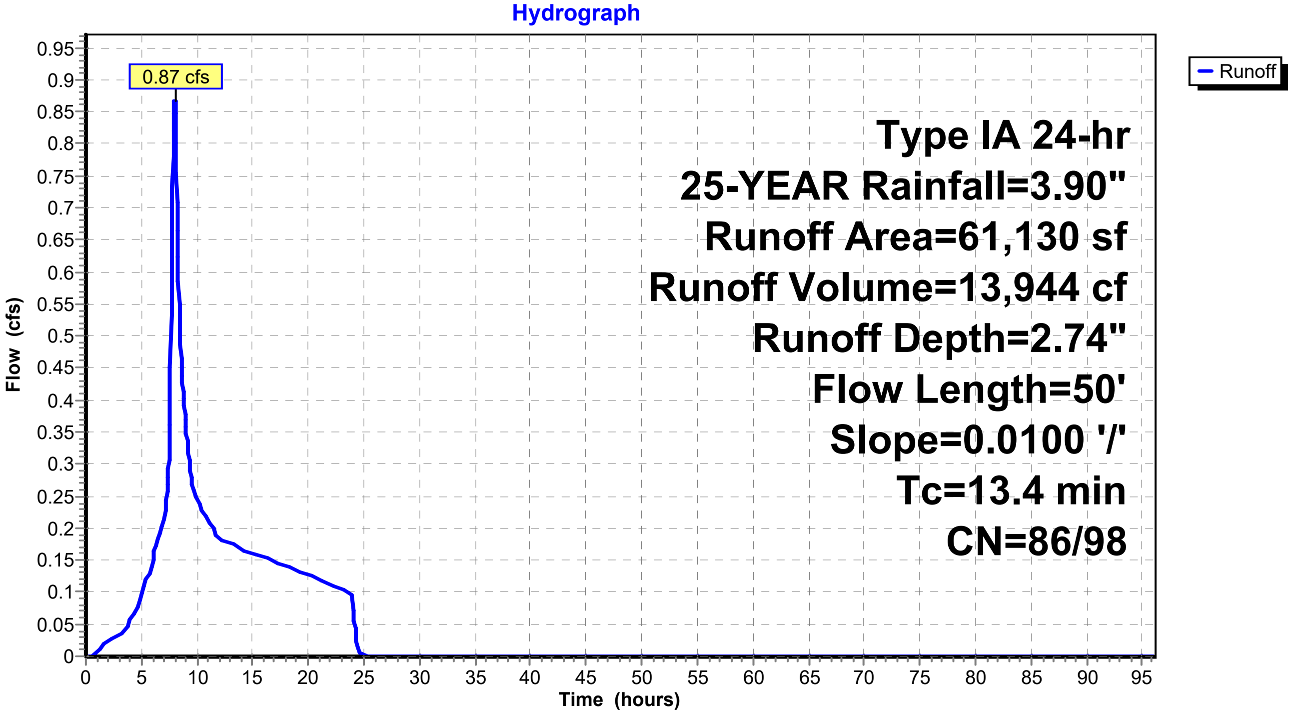
Runoff = 0.87 cfs @ 8.00 hrs, Volume= 13,944 cf, Depth= 2.74"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

Area (sf)	CN	Description
14,216	98	Paved roads w/curbs & sewers, HSG C
46,914	86	<50% Grass cover, Poor, HSG C
61,130	89	Weighted Average
46,914	86	76.74% Pervious Area
14,216	98	23.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.50"
5.0					**Direct Entry,**
13.4	50	Total			

Subcatchment 140X: City Reservoir



Summary for Subcatchment 150X: Upstream Boones Ferry

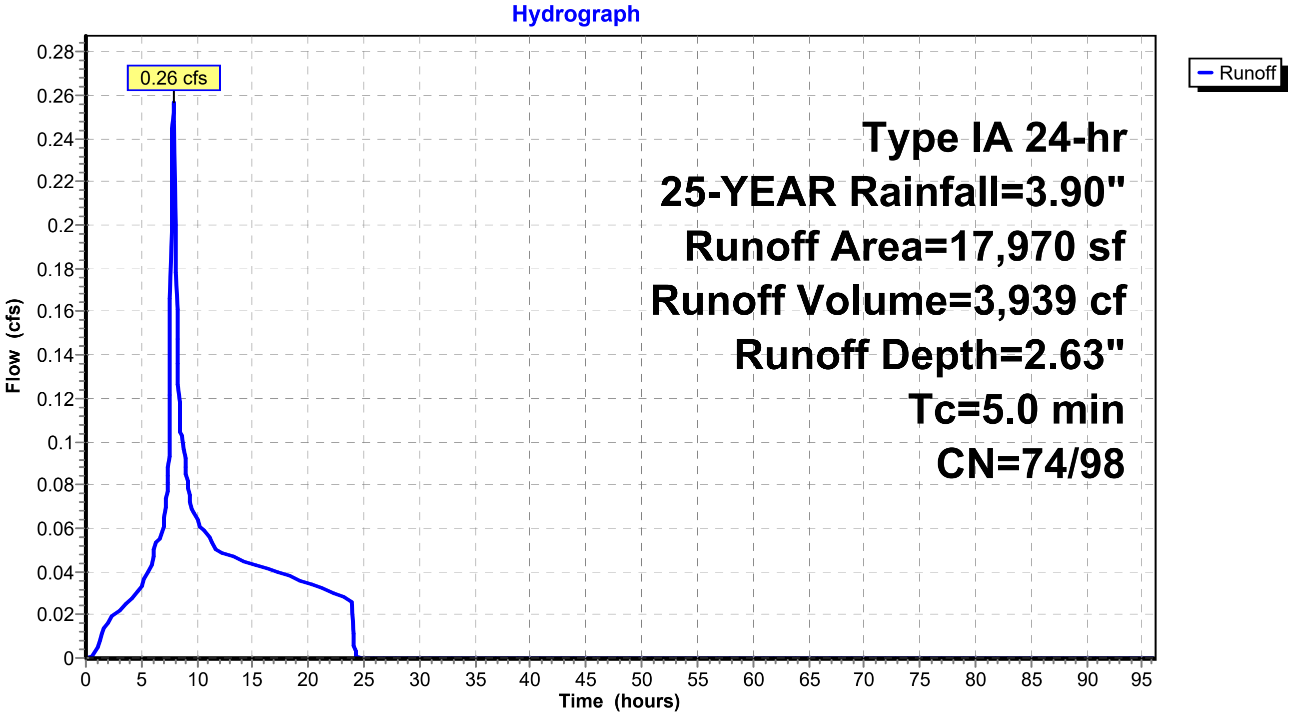
Runoff = 0.26 cfs @ 7.93 hrs, Volume= 3,939 cf, Depth= 2.63"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

	Area (sf)	CN	Description
*	9,285	98	Impervious Area
	8,685	74	>75% Grass cover, Good, HSG C
	17,970	86	Weighted Average
	8,685	74	48.33% Pervious Area
	9,285	98	51.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 150X: Upstream Boones Ferry



Summary for Subcatchment 160X: Upstream Properties

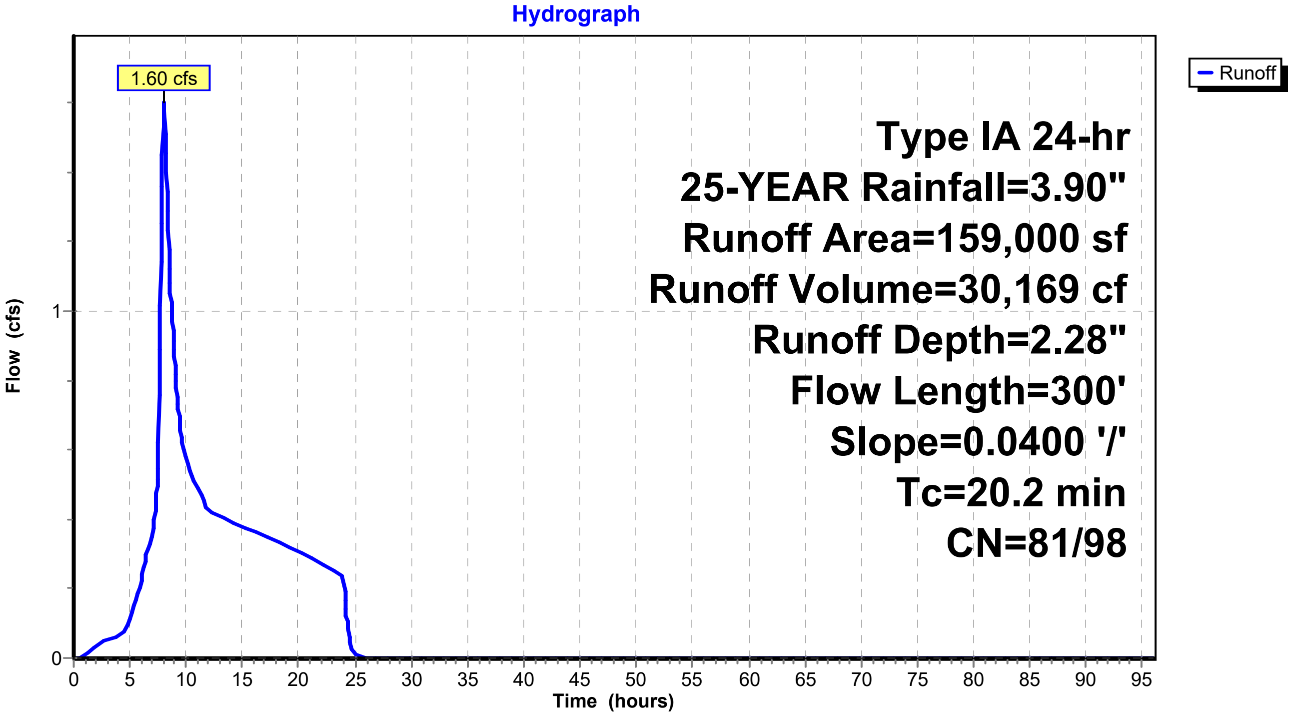
Runoff = 1.60 cfs @ 8.03 hrs, Volume= 30,169 cf, Depth= 2.28"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YEAR Rainfall=3.90"

	Area (sf)	CN	Description
*	23,371	98	Impervious Area
	12,930	96	Gravel surface, HSG C
	122,699	79	50-75% Grass cover, Fair, HSG C
	159,000	83	Weighted Average
	135,629	81	85.30% Pervious Area
	23,371	98	14.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	300	0.0400	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.50"

Subcatchment 160X: Upstream Properties



Summary for Pond 1P: East Facility

Inflow Area = 1,393,027 sf, 62.92% Impervious, Inflow Depth = 2.90" for 25-YEAR event
Inflow = 22.13 cfs @ 7.93 hrs, Volume= 336,137 cf
Outflow = 6.53 cfs @ 9.22 hrs, Volume= 322,788 cf, Atten= 70%, Lag= 77.5 min
Primary = 6.53 cfs @ 9.22 hrs, Volume= 322,788 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 323.62' @ 9.22 hrs Surf.Area= 39,100 sf Storage= 124,280 cf
Flood Elev= 324.00' Surf.Area= 40,147 sf Storage= 139,316 cf

Plug-Flow detention time= 756.8 min calculated for 322,788 cf (96% of inflow)
Center-of-Mass det. time= 727.8 min (1,423.9 - 696.1)

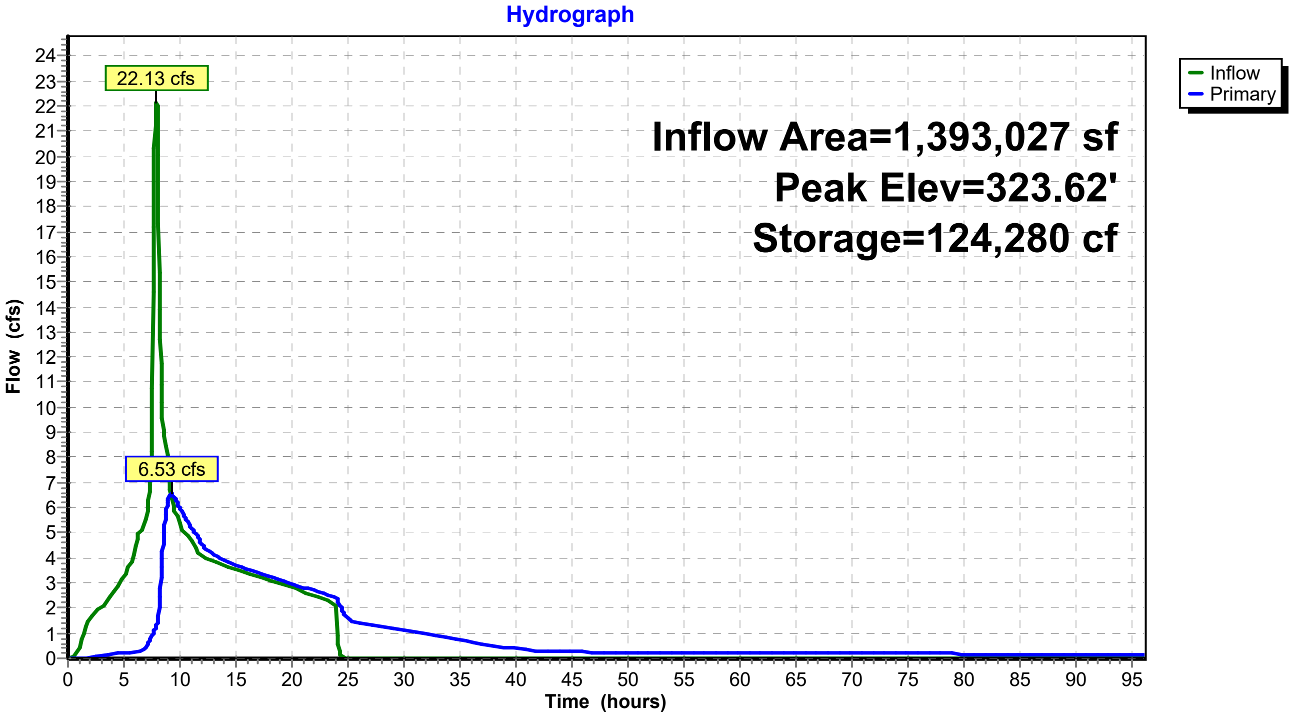
Volume	Invert	Avail.Storage	Storage Description
#1	319.00'	180,848 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
319.00	15,445	584.0	0	0	15,445
320.00	17,226	603.0	16,327	16,327	17,335
321.00	19,064	622.0	18,137	34,465	19,286
321.50	33,433	871.0	12,957	47,422	48,872
322.00	34,748	881.0	17,044	64,466	50,333
323.00	37,419	900.0	36,075	100,541	53,170
324.00	40,147	918.0	38,775	139,316	55,928
325.00	42,932	938.0	41,532	180,848	59,024

Device	Routing	Invert	Outlet Devices
#1	Primary	318.00'	**24.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 318.00' / 317.00' S= 0.1000 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 4	319.00'	**2.2' long Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 1.97 2.46 2.95 Coef. (English) 2.84 3.13 3.26 3.30 3.31 3.31
#3	Device 1	319.00'	**2.4" Vert. WQ Orifice** C= 0.620
#4	Device 1	321.50'	**6.0" Vert. Detention Orifice** C= 0.620
#5	Device 1	323.00'	**Grated Manhole, Cv= 3.19 (C= 3.99)** Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00 2.10 2.20 2.30 2.40 2.50 2.60 2.70 2.80 2.89 Width (feet) 0.00 1.83 2.54 3.05 3.45 3.79 4.06 4.29 4.48 4.63 4.76 4.86 4.93 4.98 5.00 5.00 4.97 4.92 4.84 4.74 4.61 4.45 4.26 4.02 3.74 3.40 2.98 2.45 1.69 0.00

Primary OutFlow Max=6.53 cfs @ 9.22 hrs HW=323.62' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 6.53 cfs of 32.52 cfs potential flow)
  ├─**3=WQ Orifice** (Orifice Controls 0.33 cfs @ 10.58 fps)
  ├─**4=Detention Orifice** (Orifice Controls 1.34 cfs @ 6.80 fps)
  │ └─**2=Broad-Crested Rectangular Weir** (Passes 1.34 cfs of 59.49 cfs potential flow)
  └─**5=Grated Manhole** (Weir Controls 4.86 cfs @ 2.78 fps)

Pond 1P: East Facility



Summary for Pond 2P: West Facility

Inflow Area = 1,304,867 sf, 69.30% Impervious, Inflow Depth = 3.01" for 25-YEAR event
Inflow = 21.83 cfs @ 7.92 hrs, Volume= 327,069 cf
Outflow = 12.32 cfs @ 8.25 hrs, Volume= 321,718 cf, Atten= 44%, Lag= 20.1 min
Primary = 12.32 cfs @ 8.25 hrs, Volume= 321,718 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 319.55' @ 8.25 hrs Surf.Area= 24,329 sf Storage= 91,804 cf
Flood Elev= 320.00' Surf.Area= 25,193 sf Storage= 102,900 cf

Plug-Flow detention time= 470.3 min calculated for 321,551 cf (98% of inflow)
Center-of-Mass det. time= 460.0 min (1,148.9 - 688.9)

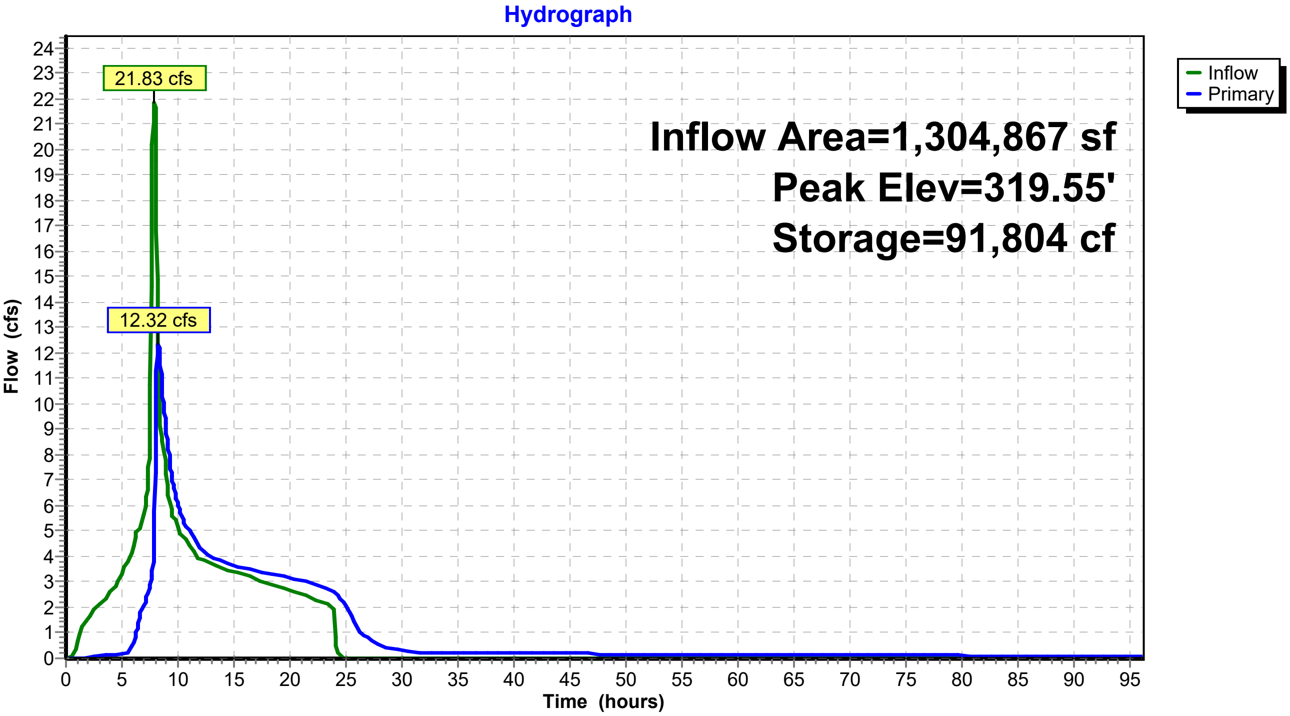
Volume	Invert	Avail.Storage	Storage Description
#1	315.00'	129,027 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
315.00	16,224	546.0	0	0	16,224
316.00	17,891	565.0	17,051	17,051	17,993
317.00	19,614	584.0	18,746	35,797	19,823
318.00	21,434	607.0	20,517	56,314	22,083
319.00	23,285	626.0	22,353	78,667	24,046
320.00	25,193	645.0	24,233	102,900	26,070
321.00	27,072	659.0	26,127	129,027	27,663

Device	Routing	Invert	Outlet Devices
#1	Primary	314.50'	**24.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 314.50' / 314.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 4	315.00'	**2.2' long Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 1.97 2.46 2.95 Coef. (English) 2.84 3.13 3.26 3.30 3.31 3.31
#3	Device 1	315.00'	**2.3" Vert. WQ Orifice** C= 0.620
#4	Device 1	317.00'	**10.0" Vert. Detention Orifice** C= 0.620
#5	Device 1	318.75'	**Grated Manhole, Cv= 3.19 (C= 3.99)** Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00 2.10 2.20 2.30 2.40 2.50 2.60 2.70 2.80 2.89 Width (feet) 0.00 1.83 2.54 3.05 3.45 3.79 4.06 4.29 4.48 4.63 4.76 4.86 4.93 4.98 5.00 5.00 4.97 4.92 4.84 4.74 4.61 4.45 4.26 4.02 3.74 3.40 2.98 2.45 1.69 0.00

Primary OutFlow Max=12.32 cfs @ 8.25 hrs HW=319.55' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Passes 12.32 cfs of 30.45 cfs potential flow)
  - **3=WQ Orifice** (Orifice Controls 0.30 cfs @ 10.50 fps)
  - **4=Detention Orifice** (Orifice Controls 3.97 cfs @ 7.27 fps)
    - **2=Broad-Crested Rectangular Weir** (Passes 3.97 cfs of 61.94 cfs potential flow)
  - **5=Grated Manhole** (Weir Controls 8.05 cfs @ 3.18 fps)

Pond 2P: West Facility

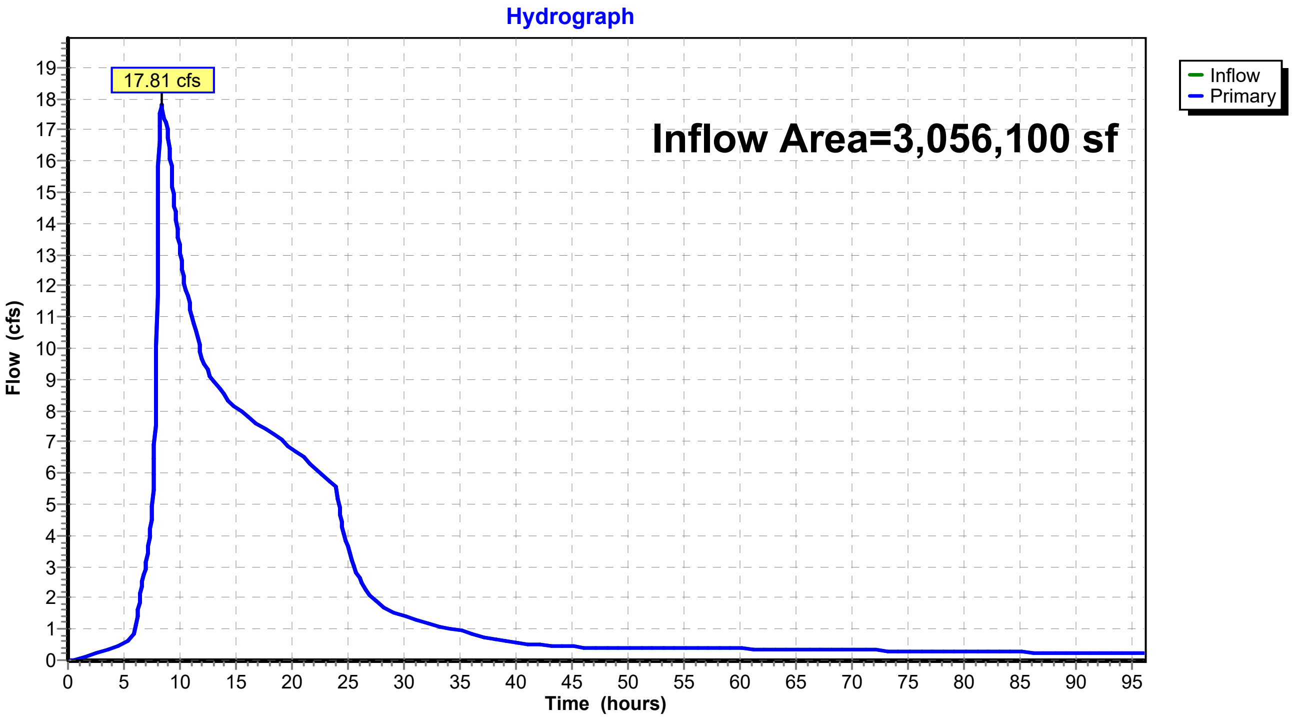


Summary for Link 1T: POST TOTAL

Inflow Area = 3,056,100 sf, 59.30% Impervious, Inflow Depth > 2.75" for 25-YEAR event
Inflow = 17.81 cfs @ 8.36 hrs, Volume= 701,408 cf
Primary = 17.81 cfs @ 8.36 hrs, Volume= 701,408 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link 1T: POST TOTAL

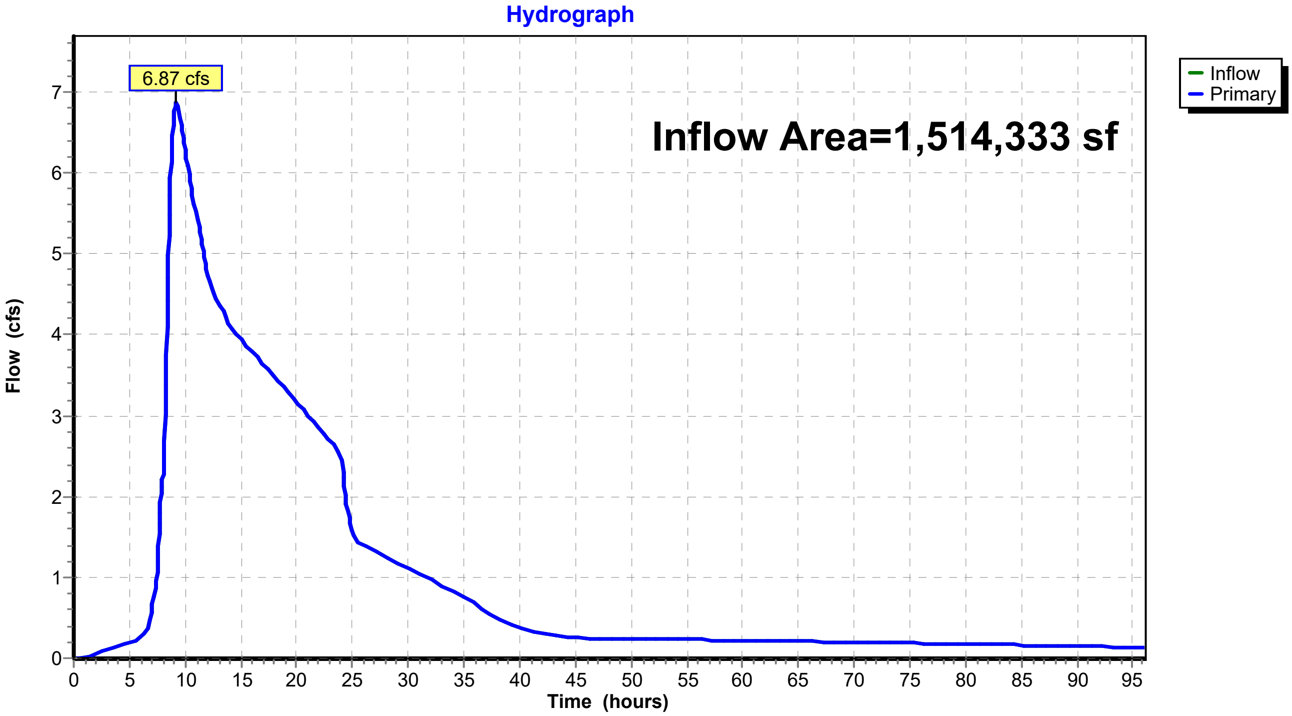


Summary for Link 2T: POST DEV EAST

Inflow Area = 1,514,333 sf, 57.88% Impervious, Inflow Depth > 2.68" for 25-YEAR event
Inflow = 6.87 cfs @ 9.19 hrs, Volume= 338,187 cf
Primary = 6.87 cfs @ 9.19 hrs, Volume= 338,187 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link 2T: POST DEV EAST

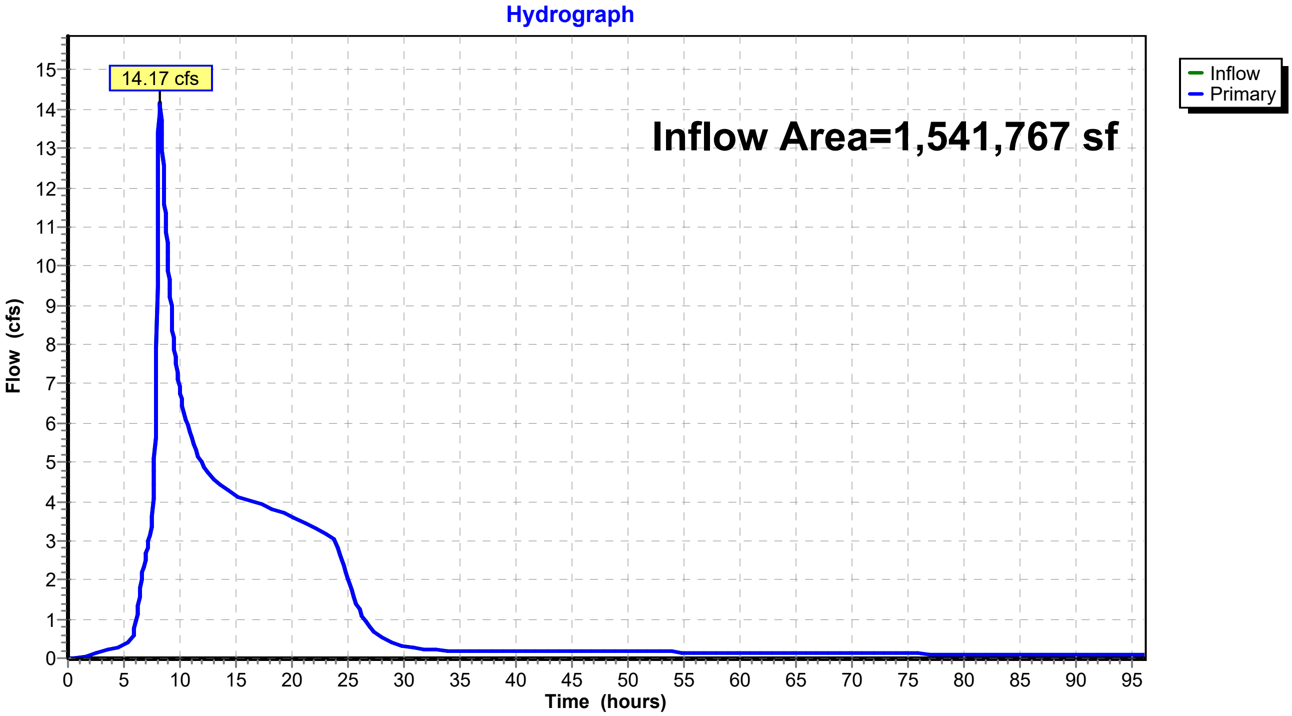


Summary for Link 3T: POST DEV WEST

Inflow Area = 1,541,767 sf, 60.70% Impervious, Inflow Depth > 2.83" for 25-YEAR event
Inflow = 14.17 cfs @ 8.22 hrs, Volume= 363,221 cf
Primary = 14.17 cfs @ 8.22 hrs, Volume= 363,221 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link 3T: POST DEV WEST



Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Future Commercial Runoff Area=26,911 sf 85.00% Impervious Runoff Depth=3.82"
Tc=5.0 min CN=74/98 Runoff=0.58 cfs 8,575 cf

Subcatchment2S: Future Commercial Runoff Area=61,043 sf 85.00% Impervious Runoff Depth=3.82"
Tc=5.0 min CN=74/98 Runoff=1.32 cfs 19,452 cf

Subcatchment3S: Runoff Area=68,508 sf 7.88% Impervious Runoff Depth=2.07"
Tc=5.0 min CN=74/98 Runoff=0.73 cfs 11,844 cf

Subcatchment4S: Runoff Area=9,392 sf 28.66% Impervious Runoff Depth=2.55"
Tc=5.0 min CN=74/98 Runoff=0.13 cfs 1,993 cf

Subcatchment5S: Runoff Area=1,198,943 sf 68.42% Impervious Runoff Depth=3.45"
Tc=5.0 min CN=74/98 Runoff=23.03 cfs 344,475 cf

Subcatchment6S: Runoff Area=121,306 sf 0.00% Impervious Runoff Depth=1.90"
Tc=5.0 min CN=74/0 Runoff=1.17 cfs 19,164 cf

Subcatchment7S: Runoff Area=1,295,050 sf 66.58% Impervious Runoff Depth=3.41"
Tc=5.0 min CN=74/98 Runoff=24.53 cfs 367,594 cf

Subcatchment120S: Onsite Undisturbed Runoff Area=31,991 sf 0.00% Impervious Runoff Depth=1.60"
Flow Length=100' Slope=0.0440 '/' Tc=22.7 min CN=70/0 Runoff=0.17 cfs 4,274 cf

Subcatchment130S: Onsite Undisturbed Runoff Area=4,856 sf 0.00% Impervious Runoff Depth=1.60"
Flow Length=50' Slope=0.0440 '/' Tc=15.2 min CN=70/0 Runoff=0.03 cfs 649 cf

Subcatchment140X: City Reservoir Runoff Area=61,130 sf 23.26% Impervious Runoff Depth=3.20"
Flow Length=50' Slope=0.0100 '/' Tc=13.4 min CN=86/98 Runoff=1.02 cfs 16,315 cf

Subcatchment150X: Upstream Boones Runoff Area=17,970 sf 51.67% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=74/98 Runoff=0.30 cfs 4,594 cf

Subcatchment160X: Upstream Properties Runoff Area=159,000 sf 14.70% Impervious Runoff Depth=2.71"
Flow Length=300' Slope=0.0400 '/' Tc=20.2 min CN=81/98 Runoff=1.94 cfs 35,935 cf

Pond 1P: East Facility Peak Elev=323.80' Storage=131,153 cf Inflow=25.69 cfs 388,832 cf
Outflow=9.66 cfs 375,399 cf

Pond 2P: West Facility Peak Elev=319.77' Storage=97,234 cf Inflow=25.23 cfs 377,097 cf
Outflow=17.37 cfs 371,623 cf

Link 1T: POST TOTAL Inflow=27.53 cfs 815,957 cf
Primary=27.53 cfs 815,957 cf

Link 2T: POST DEV EAST Inflow=10.18 cfs 394,563 cf
Primary=10.18 cfs 394,563 cf

Link 3T: POST DEV WEST

Inflow=19.84 cfs 421,394 cf
Primary=19.84 cfs 421,394 cf

Total Runoff Area = 3,056,100 sf Runoff Volume = 834,863 cf Average Runoff Depth = 3.28"
40.70% Pervious = 1,243,829 sf 59.30% Impervious = 1,812,271 sf

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Future Commercial Runoff Area=26,911 sf 85.00% Impervious Runoff Depth=2.91"
Tc=5.0 min CN=74/98 Runoff=0.44 cfs 6,537 cf

Subcatchment2S: Future Commercial Runoff Area=61,043 sf 85.00% Impervious Runoff Depth=2.91"
Tc=5.0 min CN=74/98 Runoff=1.01 cfs 14,828 cf

Subcatchment3S: Runoff Area=68,508 sf 7.88% Impervious Runoff Depth=1.36"
Tc=5.0 min CN=74/98 Runoff=0.44 cfs 7,787 cf

Subcatchment4S: Runoff Area=9,392 sf 28.66% Impervious Runoff Depth=1.78"
Tc=5.0 min CN=74/98 Runoff=0.09 cfs 1,395 cf

Subcatchment5S: Runoff Area=1,198,943 sf 68.42% Impervious Runoff Depth=2.58"
Tc=5.0 min CN=74/98 Runoff=17.15 cfs 257,920 cf

Subcatchment6S: Runoff Area=121,306 sf 0.00% Impervious Runoff Depth=1.21"
Tc=5.0 min CN=74/0 Runoff=0.66 cfs 12,187 cf

Subcatchment7S: Runoff Area=1,295,050 sf 66.58% Impervious Runoff Depth=2.54"
Tc=5.0 min CN=74/98 Runoff=18.21 cfs 274,610 cf

Subcatchment120S: Onsite Undisturbed Runoff Area=31,991 sf 0.00% Impervious Runoff Depth=0.98"
Flow Length=100' Slope=0.0440 '/' Tc=22.7 min CN=70/0 Runoff=0.08 cfs 2,606 cf

Subcatchment130S: Onsite Undisturbed Runoff Area=4,856 sf 0.00% Impervious Runoff Depth=0.98"
Flow Length=50' Slope=0.0440 '/' Tc=15.2 min CN=70/0 Runoff=0.01 cfs 396 cf

Subcatchment140X: City Reservoir Runoff Area=61,130 sf 23.26% Impervious Runoff Depth=2.32"
Flow Length=50' Slope=0.0100 '/' Tc=13.4 min CN=86/98 Runoff=0.73 cfs 11,841 cf

Subcatchment150X: Upstream Boones Runoff Area=17,970 sf 51.67% Impervious Runoff Depth=2.24"
Tc=5.0 min CN=74/98 Runoff=0.22 cfs 3,361 cf

Subcatchment160X: Upstream Properties Runoff Area=159,000 sf 14.70% Impervious Runoff Depth=1.90"
Flow Length=300' Slope=0.0400 '/' Tc=20.2 min CN=81/98 Runoff=1.30 cfs 25,119 cf

Pond 1P: East Facility Peak Elev=323.47' Storage=118,344 cf Inflow=18.99 cfs 289,453 cf
Outflow=4.37 cfs 276,200 cf

Pond 2P: West Facility Peak Elev=319.32' Storage=86,218 cf Inflow=18.82 cfs 282,646 cf
Outflow=8.15 cfs 277,421 cf

Link 1T: POST TOTAL Inflow=11.41 cfs 600,109 cf
Primary=11.41 cfs 600,109 cf

Link 2T: POST DEV EAST Inflow=4.59 cfs 288,387 cf
Primary=4.59 cfs 288,387 cf

Link 3T: POST DEV WEST

Inflow=9.42 cfs 311,722 cf
Primary=9.42 cfs 311,722 cf

Total Runoff Area = 3,056,100 sf Runoff Volume = 618,586 cf Average Runoff Depth = 2.43"
40.70% Pervious = 1,243,829 sf 59.30% Impervious = 1,812,271 sf

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Future Commercial Runoff Area=26,911 sf 85.00% Impervious Runoff Depth=2.58"
Tc=5.0 min CN=74/98 Runoff=0.39 cfs 5,794 cf

Subcatchment2S: Future Commercial Runoff Area=61,043 sf 85.00% Impervious Runoff Depth=2.58"
Tc=5.0 min CN=74/98 Runoff=0.89 cfs 13,142 cf

Subcatchment3S: Runoff Area=68,508 sf 7.88% Impervious Runoff Depth=1.12"
Tc=5.0 min CN=74/98 Runoff=0.35 cfs 6,404 cf

Subcatchment4S: Runoff Area=9,392 sf 28.66% Impervious Runoff Depth=1.52"
Tc=5.0 min CN=74/98 Runoff=0.07 cfs 1,186 cf

Subcatchment5S: Runoff Area=1,198,943 sf 68.42% Impervious Runoff Depth=2.27"
Tc=5.0 min CN=74/98 Runoff=15.04 cfs 226,719 cf

Subcatchment6S: Runoff Area=121,306 sf 0.00% Impervious Runoff Depth=0.97"
Tc=5.0 min CN=74/0 Runoff=0.50 cfs 9,829 cf

Subcatchment7S: Runoff Area=1,295,050 sf 66.58% Impervious Runoff Depth=2.23"
Tc=5.0 min CN=74/98 Runoff=15.94 cfs 241,138 cf

Subcatchment120S: Onsite Undisturbed Runoff Area=31,991 sf 0.00% Impervious Runoff Depth=0.77"
Flow Length=100' Slope=0.0440 '/' Tc=22.7 min CN=70/0 Runoff=0.06 cfs 2,054 cf

Subcatchment130S: Onsite Undisturbed Runoff Area=4,856 sf 0.00% Impervious Runoff Depth=0.77"
Flow Length=50' Slope=0.0440 '/' Tc=15.2 min CN=70/0 Runoff=0.01 cfs 312 cf

Subcatchment140X: City Reservoir Runoff Area=61,130 sf 23.26% Impervious Runoff Depth=2.01"
Flow Length=50' Slope=0.0100 '/' Tc=13.4 min CN=86/98 Runoff=0.62 cfs 10,233 cf

Subcatchment150X: Upstream Boones Runoff Area=17,970 sf 51.67% Impervious Runoff Depth=1.95"
Tc=5.0 min CN=74/98 Runoff=0.19 cfs 2,923 cf

Subcatchment160X: Upstream Properties Runoff Area=159,000 sf 14.70% Impervious Runoff Depth=1.61"
Flow Length=300' Slope=0.0400 '/' Tc=20.2 min CN=81/98 Runoff=1.07 cfs 21,305 cf

Pond 1P: East Facility Peak Elev=323.36' Storage=114,301 cf Inflow=16.59 cfs 253,737 cf
Outflow=3.21 cfs 240,582 cf

Pond 2P: West Facility Peak Elev=319.14' Storage=81,884 cf Inflow=16.52 cfs 248,578 cf
Outflow=5.73 cfs 243,454 cf

Link 1T: POST TOTAL Inflow=8.15 cfs 522,760 cf
Primary=8.15 cfs 522,760 cf

Link 2T: POST DEV EAST Inflow=3.37 cfs 250,411 cf
Primary=3.37 cfs 250,411 cf

Link 3T: POST DEV WEST

Inflow=6.54 cfs 272,349 cf
Primary=6.54 cfs 272,349 cf

Total Runoff Area = 3,056,100 sf Runoff Volume = 541,038 cf Average Runoff Depth = 2.12"
40.70% Pervious = 1,243,829 sf 59.30% Impervious = 1,812,271 sf

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Future Commercial Runoff Area=26,911 sf 85.00% Impervious Runoff Depth=2.02"
Tc=5.0 min CN=74/98 Runoff=0.31 cfs 4,533 cf

Subcatchment2S: Future Commercial Runoff Area=61,043 sf 85.00% Impervious Runoff Depth=2.02"
Tc=5.0 min CN=74/98 Runoff=0.70 cfs 10,283 cf

Subcatchment3S: Runoff Area=68,508 sf 7.88% Impervious Runoff Depth=0.74"
Tc=5.0 min CN=74/98 Runoff=0.20 cfs 4,220 cf

Subcatchment4S: Runoff Area=9,392 sf 28.66% Impervious Runoff Depth=1.08"
Tc=5.0 min CN=74/98 Runoff=0.05 cfs 849 cf

Subcatchment5S: Runoff Area=1,198,943 sf 68.42% Impervious Runoff Depth=1.75"
Tc=5.0 min CN=74/98 Runoff=11.51 cfs 174,414 cf

Subcatchment6S: Runoff Area=121,306 sf 0.00% Impervious Runoff Depth=0.61"
Tc=5.0 min CN=74/0 Runoff=0.24 cfs 6,149 cf

Subcatchment7S: Runoff Area=1,295,050 sf 66.58% Impervious Runoff Depth=1.72"
Tc=5.0 min CN=74/98 Runoff=12.16 cfs 185,101 cf

Subcatchment120S: Onsite Undisturbed Runoff Area=31,991 sf 0.00% Impervious Runoff Depth=0.46"
Flow Length=100' Slope=0.0440 '/' Tc=22.7 min CN=70/0 Runoff=0.02 cfs 1,214 cf

Subcatchment130S: Onsite Undisturbed Runoff Area=4,856 sf 0.00% Impervious Runoff Depth=0.46"
Flow Length=50' Slope=0.0440 '/' Tc=15.2 min CN=70/0 Runoff=0.00 cfs 184 cf

Subcatchment140X: City Reservoir Runoff Area=61,130 sf 23.26% Impervious Runoff Depth=1.48"
Flow Length=50' Slope=0.0100 '/' Tc=13.4 min CN=86/98 Runoff=0.45 cfs 7,551 cf

Subcatchment150X: Upstream Boones Runoff Area=17,970 sf 51.67% Impervious Runoff Depth=1.47"
Tc=5.0 min CN=74/98 Runoff=0.14 cfs 2,197 cf

Subcatchment160X: Upstream Properties Runoff Area=159,000 sf 14.70% Impervious Runoff Depth=1.14"
Flow Length=300' Slope=0.0400 '/' Tc=20.2 min CN=81/98 Runoff=0.71 cfs 15,074 cf

Pond 1P: East Facility Peak Elev=323.17' Storage=106,985 cf Inflow=12.60 cfs 194,051 cf
Outflow=1.81 cfs 181,162 cf

Pond 2P: West Facility Peak Elev=318.58' Storage=68,967 cf Inflow=12.66 cfs 191,427 cf
Outflow=3.19 cfs 186,468 cf

Link 1T: POST TOTAL Inflow=4.86 cfs 393,923 cf
Primary=4.86 cfs 393,923 cf

Link 2T: POST DEV EAST Inflow=1.91 cfs 187,311 cf
Primary=1.91 cfs 187,311 cf

Link 3T: POST DEV WEST

Inflow=3.65 cfs 206,612 cf
Primary=3.65 cfs 206,612 cf

Total Runoff Area = 3,056,100 sf Runoff Volume = 411,770 cf Average Runoff Depth = 1.62"
40.70% Pervious = 1,243,829 sf 59.30% Impervious = 1,812,271 sf

Appendix C:
Stormwater Quality Calculations

AKS
ENGINEERING & FORESTRY

STORMWATER QUALITY CALCULATIONS

Client: Lennar Northwest, INC
Project: Autumn Sunrise - East Facility
AKS Job No.: 7454
Date: 6/29/2021
Done By: DS
Checked By: PAS

IMPERVIOUS AREA

Total Site Area:	61.71	acres
Total Site Area:	2,688,206	square feet (sf)
Number of Lots:	196	
Impervious Area Per Lot:	2,640	sf
Total Impervious Lot Area:	517,440	sf
Road & Sidewalk Impervious Area:	359,040	sf
Total Impervious Area:	876,480	sf

WATER DESIGN QUALITY VOLUME (WQV)

(Per CWS 4.08.5a2 - R&O 19-05)

$$\text{WQV} = \frac{0.36\text{" X Area (ft)}}{12\text{" per ft}} = \mathbf{26294\ \ cubic\ feet}$$

WATER QUALITY FLOW (WQF)

(Per CWS 4.08.5a3 - R&O 19-05)

$$\text{WQF} = \frac{\text{WQV (sf)}}{4*60*60} = \mathbf{1.83\ \ cfs}$$

EXTENDED DRY BASIN DESIGN & CALCULATIONS

Hydraulic Design Criteria (Per CWS 4.09.5a/b/c - R&O 19-05)

Permanent Pool Depth: 0.2 ft
Permanent Pool covers bottom of basin
Design Detention Volume: 1.0 x Water Quality Volume (WQV)
Water Quality Drawdown Time: 48 hours
Maximum Depth of WQ Pool: 5 ft
Avoid direct flow across WQ pond to avoid short circuiting

Extended Dry Basin Sizing Design:

Bottom Slope (ft/ft)	**Minimum Bottom Width** (ft)	**Side Slopes** H:V	**Top of Pond Elev.** (ft)	**Perm. Pool Depth** (ft)	**Pool Bottom Area** (sf)	**Bottom of Pool Elev.** (ft)
0.0	15445	3.0	325.00	0.2	27073	319.0

Water Quality Flow Hydraulic Calculations:

Q (cfs)	**Pool Elev. at WQV** (ft)	**Orifice CL Height** (ft)	**Calculated Orifice Diameter** (in)	**Max. Pool Elev., 25-yr Event** (ft)	**Calculated Pond WQV** (cubic feet)	**Calculated WQV Pool Depth** (ft)
0.15	320.6	319.10	2.41	323.56	26989	1.6

Check Against Design Criteria:

	Calculated		Meet CWS Criteria?			
Minimum Freeboard:	1.4	feet	**Yes**	more than	1	foot
Minimum Bottom Width:	15445	feet	**Yes**	greater than	4	feet
Maximum Pool Depth at WQV:	1.6	feet	**Yes**	less than	5	feet
Detained Water Quality Volume:	26989	cubic feet	**Yes**	greater than	26294	cf

ENGINEERING & FORESTRY

STORMWATER QUALITY CALCULATIONS

Client: Lennar Northwest, INC
Project: Autumn Sunrise - West Facility
AKS Job No.: 7454
Date: 6/29/2021
Done By: DS
Checked By: PAS

IMPERVIOUS AREA

Total Site Area:	61.71	acres
Total Site Area:	2,688,206	square feet (sf)
Number of Lots:	204	
Impervious Area Per Lot:	2,640	sf
Total Impervious Lot Area:	538,560	sf
Future Commercial Impervious Area:	74,761	sf
Road & Sidewalk Impervious Area:	299,099	sf
Total Impervious Area:	912,420	sf

WATER DESIGN QUALITY VOLUME (WQV)

(Per CWS 4.08.5a2 - R&O 19-05)

$$\text{WQV} = \frac{0.36\text{" X Area (ft)}}{12\text{" per ft}} = \textbf{27373 cubic feet}$$

WATER QUALITY FLOW (WQF)

(Per CWS 4.08.5a3 - R&O 19-05)

$$\text{WQF} = \frac{\text{WQV (sf)}}{4*60*60} = \textbf{1.90 cfs}$$

EXTENDED DRY BASIN DESIGN & CALCULATIONS

Hydraulic Design Criteria (Per CWS 4.09.5a/b/c - R&O 19-05)

Permanent Pool Depth: 0.2 ft
Permanent Pool covers bottom of basin
Design Detention Volume: 1.0 x Water Quality Volume (WQV)
Water Quality Drawdown Time: 48 hours
Maximum Depth of WQ Pool: 5 ft
Avoid direct flow across WQ pond to avoid short circuiting

Extended Dry Basin Sizing Design:

Bottom Slope (ft/ft)	**Minimum Bottom Width** (ft)	**Side Slopes** H:V	**Top of Pond Elev.** (ft)	**Perm. Pool Depth** (ft)	**Pool Bottom Area** (sf)	**Bottom of Pool Elev.** (ft)
0.0	16224	3.0	321.00	0.2	12316	315.0

Water Quality Flow Hydraulic Calculations:

Q (cfs)	**Pool Elev. at WQV** (ft)	**Orifice CL Height** (ft)	**Calculated Orifice Diameter** (in)	**Max. Pool Elev., 25-yr Event** (ft)	**Calculated Pond WQV** (cubic feet)	**Calculated WQV Pool Depth** (ft)
0.16	317.0	315.10	2.32	319.82	27408	2.0

Check Against Design Criteria:

	Calculated		Meet CWS Criteria?			
Minimum Freeboard:	1.2	feet	**Yes**	more than	1	foot
Minimum Bottom Width:	16224	feet	**Yes**	greater than	4	feet
Maximum Pool Depth at WQV:	2.0	feet	**Yes**	less than	5	feet
Detained Water Quality Volume:	27408	cubic feet	**Yes**	greater than	27373	cf

Appendix D:
Site Geotechnical Report

Real-World Geotechnical Solutions
Investigation • Design • Construction Support

Preliminary Geotechnical Engineering Report

Autumn Sunrise Subdivision
SW Norwood Road & SW Boones Ferry Road
Tualatin, Oregon

GeoPacific Engineering, Inc. Project No. 20-5436
Updated May 18, 2021

14835 SW 72nd Avenue
Portland, Oregon 97224

Tel (503) 598-8445
Fax (503) 941-9281

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Updated May 18, 2021
Project No. 20-5436

Ms. Terry New
Lennar Northwest
11807 NE 99th Street, Suite 1170
Vancouver, Washington 98682
Phone: (360) 258-7871
Email: terry.new@lennar.com

SUBJECT: PRELIMINARY GEOTECHNICAL ENGINEERING REPORT
AUTUMN SUNRISE SUBDIVISION
SW NORWOOD ROAD & SW BOONES FERRY ROAD
TUALATIN, OREGON

Reference: *Geotechnical Report, Norwood Property, SW Norwood Road – T2S R1W Section 35 Tax Lot 100, Tualatin, Oregon,* GeoPacific Engineering, Inc. report updated August 18, 2021.

1.0 PROJECT INFORMATION

This report presents the results of a geotechnical engineering study conducted by GeoPacific Engineering, Inc. (GeoPacific) for the above-referenced project. The purpose of our investigation was to evaluate subsurface conditions at the site, and to provide geotechnical recommendations for site development. This geotechnical study was performed in accordance with GeoPacific Proposal No. P-7209, dated January 22, 2020, and your subsequent authorization of our proposal and *General Conditions for Geotechnical Services*. GeoPacific had previously issued a report for the Norwood Property to the north (referenced above), which is being incorporated into the Autumn Sunrise Subdivision.

Site Location:	Northeast of SW Boones Ferry Rd & SW Greenhill Lane, South of SW Norwood Road Washington County Property No. R560164, R560253, R560262, R560271, R560280, R560299, R560306, & R560315 Tualatin, Oregon (see Figures 1 and 2)

Developer:	**Lennar Northwest** 11807 NE 99th Street, Suite 1170 Vancouver, Washington 98682 Phone: (360) 258-7871
Jurisdictional Agency:	City of Tualatin, Oregon
Civil Engineer:	Darko Simic AKS Engineering & Forestry, LLC. 12965 SW Herman Road, Unit 100 Tualatin, Oregon 97062 Tel (503) 563-6151

2.0 SITE AND PROJECT DESCRIPTION

The subject site is located northeast of the intersection of SW Boones Ferry Road and SW Greenhill Lane extending north to SW Norwood Road in the City of Tualatin, Washington County, Oregon (Figure 1). The site consists of Washington County Properties R560164, R560253, R560262, R560271, R560280, R560299, R560306, and R560315, totaling approximately 60.5 acres in size. The site latitude and longitude are 45.3496, -122.7694, and the legal description is the SE ¼ of Section 35, T2S, R1W, Willamette Meridian. The regulatory jurisdictional agency is the City of Tualatin, Oregon. The site is bordered by SW Greenhill Lane to the south, by SW Boones Ferry Road to the west, by Interstate 5 to the east, and by residential homes, Horizon Christian High School, and SW Norwood Road to the north. The site contains three existing residential homes in the southern portion of the site with street addresses of 9185 SW Greenhill Lane, 9335 SW Greenhill Lane, and 9415 SW Greenhill Lane. Each residential property contains various barns and outbuildings. Two of the homes have swimming pools. The majority of the property has been historically used for agricultural purposes and appears to have been regularly plowed and farmed with several individual plots. Two homes were historically present in the north western portion of the site on Property No. R560262, which had a street address of 23620 SW Boones Ferry Road; and Property No. R56253, which had a street address of 23740 SW Boones Ferry Road.

Based on our review of available historical aerial photography the southern portion of the site has been altered over the years by agricultural and residential activity. Prior to the year 2000 the eastern portion of the site was heavily wooded with coniferous trees. During the 2000's residential development of properties to the north and construction of the high school was conducted, and the northern portion of this site was used as a stockpile and fill location. The northeastern corner of the property was used to stockpile soil and a bike track was present for many years. It appears that several periods of farming, grading, and various land use was conducted during this time period which likely resulted in placement of undocumented fill soils particularly in the northern portions. At this time vegetation at the site consists of open grass areas in the central portion, heavily wooded areas adjacent Interstate 5 and SW Norwood Road, blackberries and brush in the northeastern portion, and minor trees and landscaping around the existing homes in the southern portion. Topography at the site is level to gently sloping with site elevations range from approximately 310 to 360 feet above mean sea level (amsl).

Based upon review of preliminary site plans, GeoPacific understands that the proposed development at the site will consist of a residential development supporting construction of ± 400 attached and detached homes, new streets, stormwater facilities, parks and open space, and associated new underground utilities. We anticipate that the homes will be constructed with typical spread foundations and wood framing, with maximum structural loading on column footings and continuous strip footings on the order of 10 to 35 kips, and 2 to 4 kips respectively. At this time grading plans have not been created, however based on the current site elevations and topography we estimate that cuts and fills may be on the order of 10 feet or less. We expect final grades to be relatively level.

3.0 REGIONAL AND LOCAL GEOLOGIC SETTING

The subject site lies within the Willamette Valley/Puget Sound lowland, a broad structural depression situated between the Coast Range on the west and the Cascade Range on the east. A series of discontinuous faults subdivide the Willamette Valley into a mosaic of fault-bounded, structural blocks (Yeats et al., 1996). Uplifted structural blocks form bedrock highlands, while down-warped structural blocks form sedimentary basins.

The subject site is underlain by the Miocene aged (about 14.5 to 16.5 million years ago) Columbia River Basalt Formation, which are a thick sequence of lava flows which form the crystalline basement of the Tualatin Valley (Beeson et al., 1989; Gannett and Caldwell, 1998). The basalts are composed of dense, finely crystalline rock that is commonly fractured along blocky and columnar vertical joints. Individual basalt flow units typically range from 25 to 125 feet thick and interflow zones are typically vesicular, scoriaceous, brecciated, and sometimes include sedimentary rocks.

4.0 REGIONAL SEISMIC SETTING

At least four major fault zones capable of generating damaging earthquakes are thought to exist in the vicinity of the subject site. These include the Portland Hills Fault Zone, the Gales Creek-Newberg-Mt. Angel Structural Zone, and the Cascadia Subduction Zone.

4.1 Portland Hills Fault Zone

The Portland Hills Fault Zone is a series of NW-trending faults that include the central Portland Hills Fault, the western Oatfield Fault, and the eastern East Bank Fault. These faults occur in a northwest-trending zone that varies in width between 3.5 and 5.0 miles. The combined three faults vertically displace the Columbia River Basalt by 1,130 feet and appear to control thickness changes in late Pleistocene (approx. 780,000 years) sediment (Madin, 1990). The Portland Hills Fault occurs along the Willamette River at the base of the Portland Hills and is approximately 9.4 miles northeast of the site. The East Bank Fault is oriented roughly parallel to the Portland Hills Fault, on the east bank of the Willamette River, and is located approximately 13.2 miles northeast of the site. The Oatfield Fault occurs along the western side of the Portland Hills and is approximately 7.7 miles northeast of the site. The Oatfield Fault is considered to be potentially seismogenic (Wong, et al., 2000). Madin and Mabey (1996) indicate the Portland Hills Fault Zone has experienced Late Quaternary (last 780,000 years) fault movement; however, movement has not been detected in the last 20,000 years. The accuracy of the fault mapping is stated to be within 500 meters (Wong, et al., 2000). No historical seismicity is correlated with the mapped portion of the Portland Hills Fault Zone, but in 1991 a M3.5 earthquake occurred on a NW-trending shear plane located 1.3 miles east of the fault (Yelin, 1992). Although there is no definitive evidence of recent activity, the Portland Hills Fault Zone is assumed to be potentially active (Geomatrix Consultants, 1995).

According to the USGS Earthquake Hazards Program, the fault was originally mapped as a down-to-the-northeast normal fault but has also been mapped as part of a regional-scale zone of right-lateral, oblique slip faults, and as a steep escarpment caused by asymmetrical folding above a south-west dipping, blind thrust fault. The Portland Hills fault offsets Miocene Columbia River Basalts, and Miocene to Pliocene sedimentary rocks of the Troutdale Formation. No fault scarps on surficial Quaternary deposits have been described along the fault trace, and the fault is mapped as buried by the Pleistocene aged Missoula flood deposits. No historical seismicity is correlated with the mapped portion of the Portland Hills Fault Zone, but in 1991 a M3.5 earthquake occurred on a NW-trending shear plane located 1.3 miles east of the fault (Yelin, 1992). Although there is no definitive evidence of recent activity, the Portland Hills Fault Zone is assumed to be potentially active (Geomatrix Consultants, 1995).

4.2 Gales Creek-Newberg-Mt. Angel Structural Zone

The Gales Creek-Newberg-Mt. Angel Structural Zone is a 50-mile-long zone of discontinuous, NW-trending faults that lies approximately 10.1 miles southwest of the subject site. These faults are recognized in the subsurface by vertical separation of the Columbia River Basalt and offset seismic reflectors in the overlying basin sediment (Yeats et al., 1996; Werner et al., 1992). A geologic reconnaissance and photogeologic analysis study conducted for the Scoggins Dam site in the Tualatin Basin revealed no evidence of deformed geomorphic surfaces along the structural zone (Unruh et al., 1994). No seismicity has been recorded on the Gales Creek Fault or Newberg Fault (the fault closest to the subject site); however, these faults are considered to be potentially active because they may connect with the seismically active Mount Angel Fault and the rupture plane of the 1993 M5.6 Scotts Mills earthquake (Werner et al. 1992; Geomatrix Consultants, 1995).

4.3 Cascadia Subduction Zone

The Cascadia Subduction Zone is a 680-mile-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continent at a rate of 4 cm per year (Goldfinger et al., 1996). A growing body of geologic evidence suggests that prehistoric subduction zone earthquakes have occurred (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). This evidence includes: (1) buried tidal marshes recording episodic, sudden subsidence along the coast of northern California, Oregon, and Washington, (2) burial of subsided tidal marshes by tsunami wave deposits, (3) paleoliquefaction features, and (4) geodetic uplift patterns on the Oregon coast. Radiocarbon dates on buried tidal marshes indicate a recurrence interval for major subduction zone earthquakes of 250 to 650 years with the last event occurring 300 years ago (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). The inferred seismogenic portion of the plate interface lies approximately along the Oregon Coast at depths of between 20 and 40 kilometers below the surface.

5.0 FIELD EXPLORATION AND SUBSURFACE CONDITIONS

Our site-specific exploration for this report was conducted on March 11 & 12, April 13, and July 28, 2020. Six exploratory borings were drilled to depths of 5.5 to 25.5 feet and thirty seven exploratory test pits were excavated with a medium sized backhoe and a large excavator to depths ranging between 6.5 and 17 feet at the approximate locations presented on Figure 2. The explorations conducted on the northern property (Norwood) have been renumbered and consecutively added to the Autumn Sunrise explorations. It should be noted that exploration locations were located in the field by pacing or taping distances from apparent property corners and other site features shown on the plans provided. As such, the locations of the explorations should be considered approximate.

The boreholes were drilled using a trailer-mounted drill rig and solid stem auger methods. At each boring location, SPT (Standard Penetration Test) sampling was performed in general accordance with ASTM D1586 using a 2-inch outside diameter split-spoon sampler and a 140-pound hammer equipped with a rope and cathead mechanism. During the test, a sample is obtained by driving the sampler 18 inches into the soil with the hammer free-falling 30 inches. The number of blows for each 6 inches of penetration is recorded. The Standard Penetration Resistance ("N-value") of the soil is calculated as the number of blows required for the final 12 inches of penetration. If 50 or more blows are recorded within a single 6-inch interval, the test is terminated, and the blow count is recorded as 50 blows for the number of inches driven. This resistance, or N-value, provides a measure of the relative density of granular soils and the relative consistency of cohesive soils. At the completion of the borings, the holes were backfilled with bentonite.

A GeoPacific geologist continuously monitored the field exploration program and logged the explorations. Soils observed in the explorations were classified in general accordance with the Unified Soil Classification System (USCS). Rock hardness was classified in accordance with Table 1, modified from the ODOT Rock Hardness Classification Chart. During exploration, our geologist also noted geotechnical conditions such as soil consistency, moisture and groundwater conditions. Logs of the explorations are attached to this report. The following report sections are based on the exploration program and summarize subsurface conditions encountered at the site.

Table 1. Rock Hardness Classification Chart

ODOT Rock Hardness Rating	Field Criteria	Unconfined Compressive Strength	Typical Equipment Needed For Excavation
Extremely Soft (R0)	Indented by thumbnail	<100 psi	Small excavator
Very Soft (R1)	Scratched by thumbnail, crumbled by rock hammer	100-1,000 psi	Small excavator
Soft (R2)	Not scratched by thumbnail, indented by rock hammer	1,000-4,000 psi	Medium excavator (slow digging with small excavator)
Medium Hard (R3)	Scratched or fractured by rock hammer	4,000-8,000 psi	Medium to large excavator (slow to very slow digging), typically requires chipping with hydraulic hammer or mass excavation)
Hard (R4)	Scratched or fractured w/ difficulty	8,000-16,000 psi	Slow chipping with hydraulic hammer and/or blasting
Very Hard (R5)	Not scratched or fractured after many blows, hammer rebounds	>16,000 psi	Blasting

5.1 Soil Characteristics

Undocumented Fill: Undocumented fill soils were encountered in some portions of the site. As presented on Figure 3, GeoPacific encountered undocumented fill soils where a home had previously been present (test pit TP-1), and in the eastern portion of the property where soil stockpiles were created by the high school project (test pits TP-8, TP-9, TP-12, TP-18, and TP-19). Fill depths encountered ranged from approximately 3 to 14 feet bgs.

Fill materials around the demolished home at the location of test pit TP-1 were observed to consist of dark brown, soft, very moist, moderately organic Lean CLAY, containing fine roots extending to a depth of approximately 3 feet bgs. This material is likely unsuitable for re-use as engineered fill. Fill materials in the eastern portion of the property were observed to consist primarily of brown, very moist, moderately plastic, Gravel CLAY, and brown, moderately plastic Lean CLAY, extending to depths ranging from approximately 3 to 14 feet bgs. Layers of buried topsoil and buried organic soils were encountered within some of the explorations. In general, the fill material appeared to contain soils considered suitable for re-use as engineered fill, provided that the layers of buried organic soil and inorganic debris are separated during excavation.

Topsoil Horizon: The site is primarily vegetated with grasses and dense trees, however some areas contain brush, trees, blackberries, etc. The topsoil horizon in the grassy and open portions of the site was observed to consist of brown, organic Lean CLAY (OL-CL), containing fine roots extending to depths ranging from approximately 8 to 12 inches bgs, however some areas were observed to have roots extending to 18 inches, likely due to old farming till zones. In the highly treed northern portion of the site, the topsoil horizon consisted of moderately to highly organic silt (OL-ML), was generally loose, contained many fine roots, and extended to a depth of 8 to 12 inches. Root zones may be as deep as 18 inches in areas where extensive blackberries are present.

GeoPacific collect four samples of the topsoil from test pit explorations and submitted the samples to our soils laboratory for organic content and pH testing. The locations of the collected samples, and results of the laboratory testing are presented below in Table 2.

Table 2. Topsoil Organic Content and Soil pH

Test Pit	Depth of Sample (inches)	Soil Type	Organic Content by Weight % ASTM D2974	pH	Soil Moisture %
TP-2	0-12	OL-CL	11.9	6.4	49.7
TP-5	0-12	OL-CL	9.5	5.7	31.0
TP-6	0-12	OL-CL	7.3	5.9	35.1
TP-13	0-12	OL-CL	12.8	6.1	41.9

Lean CLAY/Gravelly CLAY (Residual Soil): Underlying the topsoil horizon and undocumented fill soils were residual soil resulting from in-place weathering of the underlying Columbia River Basalt Formation. The soils were observed to consist of brown, medium stiff to very stiff, moist to very moist, clayey SILT (ML), lean CLAY, and gravelly CLAY, containing varying degrees of subangular gravel to cobble-sized basalt fragments. Pocket penetrometer measurements conducted in the upper four feet of the ground surface indicated unconfined compressive strengths ranging from 1.5 to 4.5 tons/ft^2 (tsf). SPT N-Values ranged from 14 to 27 in the soil layer. Soils laboratory testing conducted on representative samples collected from test pit TP-1 indicated that the soil type classified as A-4(2), A-7-5(7), and A-7-5(28) according to AASHTO standards. Sieve analysis indicated 53 to 88 percent by weight passing the U.S. No. 200 sieve, and moisture content of 23 to 41 percent. Atterberg Limit testing indicated a liquid limit of 27 to 58, and a plasticity index of 2 to 31.

Columbia River Basalt Formation: Weathered basalt belonging to the Columbia River Basalt Formation was encountered underlying the residual soil. The weathered bedrock was encountered within soil borings B-1 through B-6 at depths ranging from approximately 2 to 20 feet. Drilling refusal with the solid-stem auger was encountered at depths ranging from 5.5 to 25.5 feet bgs. The bedrock was also encountered within test pits TP-11, TP-13, TP-17, and TP-21 through TP-37 at depths ranging from 0.5 to 10 feet bgs. Excavation refusal was achieved with a medium to large sized trackhoe equipped with rock teeth in test pits TP-6, TP-23, TP-25, and TP-28 at depths of 6.5 to 16 feet bgs. The basalt was weathered to Extremely Soft (R0) to Medium Hard (R3) consistency in accordance with the ODOT Rock Hardness Classification System (Table 1). A summary of the total depths of which basaltic bedrock was first encountered and the depth at which practical refusal was achieved is presented in Table 3. Please refer to the excavation logs for additional detail.

Table 3. Weathered Bedrock Excavation Depth Results

Exploration	Depth to Weathered Bedrock (Feet bgs)	Depth of Refusal (Feet bgs)	Excavator/ Drill Rig	ODOT Rock Hardness
B-1	15	17	Solid Stem Auger Drill	R1-R3
B-2	20	24	Solid Stem Auger Drill	R2-R3
B-3	10	11	Solid Stem Auger Drill	R1-R3
B-4	15	25.5	Solid Stem Auger Drill	R1-R3
B-5	2	5.5	Solid Stem Auger Drill	R1-R3
B-6	15	21	Solid Stem Auger Drill	R1-R3
TP-11	0.5	6	16,000 lbs Case Backhoe-Rock Teeth	R1-R3
TP-13	9	n/a-Stopped at 15 feet	16,000 lbs Case Backhoe-Rock Teeth	R1-R2
TP-17	7	n/a-Stopped at 10 feet	16,000 lbs Case Backhoe-Rock Teeth	R1-R2
TP-23	9	15	30,900 lbs Kobelco SK140 Trackhoe-Rock Teeth	R3
TP-25	13	16	30,900 lbs Kobelco SK140 Trackhoe-Rock Teeth	R3
TP-28	14	15.5	30,900 lbs Kobelco SK140 Trackhoe-Rock Teeth	R3

5.1 Shrink-Swell Potential

Lean CLAY soils present in the upper 10 feet of the ground surface display low to moderate plasticity characteristics. Atterberg Limit testing indicated a plasticity index ranging from 1 to 31 for the soil type. Based on our review of soil conditions, and experience on other local nearby projects, the shrink-swell potential of near surface soils are not anticipated to require special design measures where structures are proposed. However, the soil types are moisture sensitive, and will be difficult to work with during periods of wet weather.

5.2 Groundwater and Soil Moisture

On March 11 and 12, April 13, and July 28, 2020, observed soil moisture conditions were generally moist to very moist. Groundwater seepage was observed within some of our explorations which extended to a maximum depth of 25.5 feet bgs. Perched groundwater was encountered within soil boring B-4 at an approximate depth of 20 feet bgs and within test pit TP-12 at an approximate depth of 5.5 feet bgs. Light perched groundwater seepage was observed within test pits TP-1, TP-2, TP-11, and TP-22 at varying depths. Regional groundwater mapping indicates that static groundwater is present at a depth of approximately 120 feet below the ground surface (Snyder, 2008). Based on our review of available well logs from the State of Oregon, we understand that static groundwater is commonly encountered at depths ranging from 140 to 190 feet bgs in the vicinity of the subject site (Oregon Water Resources Department, 2021). During periods of wet weather, perched groundwater seepage may be encountered in localized areas. Seeps and springs may exist in areas not explored and may become evident during site grading. Shallow perched groundwater seepage may be encountered in utility trenches and deep excavations.

5.3 Infiltration Testing

Soil infiltration testing was performed using the open pit infiltration method in test pits TP-36 at a depth of 11 feet and test pit TP-37 at a depth of 5 feet. The soil was pre-saturated for a period of over 3 hours. The water level was measured to the nearest tenth of an inch every fifteen minutes to half hour with reference to the ground surface. Table 4 presents the results of our falling head infiltration testing and do not incorporate a factor of safety.

Table 4. Summary of Infiltration Test Results

Test Pit	Test Depth (feet)	Test Elevation (feet amsl)	Soil Type	Infiltration Rate (in/hr)	Hydraulic Head Range (inches)
TP-36	11	315	Weathered BASALT	***5.25***	5-27
TP-37	5	314	Weathered BASALT	0.75	5-12

Note: Storage capacity of fractured rock is extremely limited and the rate is unsustainable and not considered adequate for infiltration systems.

5.4 Hydrologic Soil Group Classification

Based on our soil infiltration testing, on site soils exhibit low permeability. The soils underlying the site contain consist of silty clay residual soils with abundant rock fragments underlain by weathered basalt bedrock. Although much of the site is mapped as having soils within Hydrologic Soil Group B by the Natural Resources Conservation Service Web Soil Survey (2021), the results of our test pit explorations indicate that the soils underlying the site classify as Hydrologic Soil Group C since they contain greater than 35 percent rock fragments (Natural Resources Conservation Service, 2009).

6.0 CONCLUSIONS AND RECOMMENDATIONS

Our investigation indicates that the proposed development is geotechnically feasible, provided that the recommendations of this report are incorporated into the design and sufficient geotechnical monitoring is incorporated into the construction phases of the project. In our opinion, the greatest geotechnical constraints for project completion include:

1. Undocumented fill soils. Undocumented fill was encountered in test pits TP-1, TP-8, TP-9, TP-18, and TP-19. Removal depths ranged from 3 to 14 feet, which include removal of the underlying buried topsoil.

2. The presence of shallow bedrock beneath the site. Weathered basalt bedrock was encountered throughout the site and basalt was first encountered at depths of 0.5 to 10 feet. Practical refusal was encountered on medium hard (R3) basalt at depths of 6.5 to 16 feet in test pits TP-11, TP-23, TP-25, and TP-28 and in borings B-1 through B-6 at depths of 5.5 to 25.5 feet. A larger excavator may be able to achieve greater depths; however, difficult excavating conditions should be expected.

3. Low permeability soils.

4. Native soils are considered moisture-sensitive and will be difficult to handle in wet weather.

6.1 Stormwater Disposal

The results of our infiltration testing indicate that soils have a limited infiltration capacity at depths of 5 and 11 feet below the ground surface (elevations of 314-315 feet above mean sea level) in weathered basalt, as presented in Table 4. Testing conducted in test pit TP-36 yielded a higher infiltration rate than testing conducted nearby in test pit TP-37 under similar geologic conditions. These higher rates may be due to fractures in the weathered basalt or rooted zones that would likely silt up over time or become saturated quickly in a storm event. Storage capacity of fractured rock is extremely limited and the rate is unsustainable and not considered adequate for infiltration systems.

Infiltration test methods and procedures attempt to simulate the as-built conditions of the planned subsurface disposal system. However, due to natural variations in soil properties, actual infiltration rates may vary from the measured and/or recommended design rates. All systems should be constructed such that potential overflow is discharged in a controlled manner away from structures, and all systems should include an adequate factor of safety. Infiltration rates presented in this report should not be applied to inappropriate or complex hydrological models such as a closed basin without extensive further studies. This report presents infiltration test results only, and should not be construed as an approval of a system design.

6.2 Site Preparation Recommendations

Areas of proposed construction and areas to receive fill should be cleared of any organic and inorganic debris, undocumented fill soils, and/or loose stockpiled soils. Inorganic debris and organic materials from clearing should be removed from the site. Organic-rich soils and root zones should then be stripped from construction areas of the site or where engineered fill is to be placed. Depth of stripping of existing topsoil is estimated to average approximately 6 to 9 inches in cut areas, between 9 to 12 inches in fill areas, and between 12 to 36 inches in areas where large trees are present.

As mentioned above and as shown on Figure 3, undocumented fill soils were encountered at the site. Fill was encountered where a house was demolished in the western portion of the site and where stockpiles had been previously created in the eastern portion of the site. In addition, the existing homes in the southern portion of the site contain swimming pools, and apparent landscaping fill areas which were not explored. We anticipate that much of the fill material may be suitable for re-use as engineered fill provided it is free of highly organic soils and debris. Some layers of highly organic soils were encountered within the large fill area in the northeastern portion of the site and should be separated from the clean fill material during grading. The area in the eastern portion of the site contains as much as 14 feet of undocumented fill.

The final depth of soil removal will be determined during site inspection after the stripping/excavation has been performed. Stripped topsoil should be removed from areas proposed for placement of engineered fill. Any remaining topsoil should be stockpiled only in designated areas and stripping operations should be observed and documented by the geotechnical engineer or his representative.

Where encountered, undocumented fills and any subsurface structures (dry wells, basements, swimming pools, driveway and landscaping fill, old utility lines, septic leach fields, etc.) should be completely removed and the excavations backfilled with engineered fill.

We recommend that areas proposed for placement of engineered fill are scarified and recompacted prior to placement of structural fill. The areas should be prepared by removing highly organic soil layers which contain abundant root concentration, or organic content in excess of approximately 4 to 5 percent by weight. Prior to placement of engineered fill, the underlying soils be over-excavated, ripped, aerated to optimum moisture content, and recompacted to project specifications for engineered fill as determined by the Standard Proctor (ASTM D698).

Areas proposed to be left at grade may require additional over-excavation of foundation areas in order to reach soils which will provide adequate bearing support for the proposed foundations. It is unlikely that site earthwork will be impacted by shallow groundwater, however native soils are moisture sensitive and will be difficult to handle during periods of wet weather. Stabilization of subgrade soils will require aeration and recompaction. If subgrade soils are found to be difficult to stabilize, over-excavation, placement of granular soils, or cement treatment of subgrade soils may be feasible options. GeoPacific should be onsite to observe preparation of subgrade soil conditions prior to placement of engineered fill.

6.3 Engineered Fill

All grading for the proposed development should be performed as engineered grading in accordance with the applicable building code at time of construction with the exceptions and additions noted herein. Proper test frequency and earthwork documentation usually requires daily observation and testing during stripping, rough grading, and placement of engineered fill. Imported fill material must be approved by the geotechnical engineer prior to being imported to the site. Oversize material greater than 6 inches in size should not be used within 3 feet of foundation footings, and material greater than 12 inches in diameter should not be used in engineered fill.

Engineered fill should be compacted in horizontal lifts not exceeding 8 inches using standard compaction equipment. We recommend that engineered fill be compacted to at least 95% of the maximum dry density determined by ASTM D698 (Standard Proctor) or equivalent. Field density testing should conform to ASTM D2922 and D3017, or D1556. All engineered fill should be observed and tested by the project geotechnical engineer or his representative. Typically, one density test is performed for at least every 2 vertical feet of fill placed or every 500 yd^3, whichever requires more testing. Because testing is performed on an on-call basis, we recommend that the earthwork contractor be held contractually responsible for test scheduling and frequency.

Site earthwork will be impacted by soil moisture and shallow groundwater conditions. Earthwork in wet weather would likely require extensive use of cement or lime treatment, or other special measures, at a considerable additional cost compared to earthwork performed under dry-weather conditions.

6.4 Excavating Conditions and Utility Trench Backfill

We anticipate that on-site soils can be excavated using conventional heavy equipment such as scrapers and trackhoes. Highly weathered basalt bedrock was encountered in test pits throughout the site at depths of 0.5 to 10 feet and practical refusal was encountered on medium hard (R3) basalt at depths of 6.5 to 16 feet in test pits TP-11, TP-23, TP-25, and TP-28 and in borings B-1 through B-6 at depths of 5.5 to 25.5 feet. A larger excavator may be able to achieve greater depths; however, difficult excavating conditions should be expected.

All temporary cuts in excess of 4 feet in height should be sloped in accordance with U.S. Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1926), or be shored. The existing upper native soils are classified as Type B Soil and temporary excavation side slope inclinations as steep as 1H:1V may be assumed for planning purposes. This cut slope inclination is applicable to excavations above groundwater seepage zones only. Maintenance of safe working conditions, including temporary excavation stability, is the responsibility of the contractor. Actual slope inclinations at the time of construction should be determined based on safety requirements and actual soil and groundwater conditions.

Saturated soils and groundwater may be encountered in utility trenches, particularly during the wet season. We anticipate that dewatering systems consisting of ditches, sumps and pumps would be adequate for control of perched groundwater. Regardless of the dewatering system used, it should be installed and operated such that in-place soils are prevented from being removed along with the groundwater.

Vibrations created by traffic and construction equipment may cause some caving and raveling of excavation walls. In such an event, lateral support for the excavation walls should be provided by the contractor to prevent loss of ground support and possible distress to existing or previously constructed structural improvements.

PVC pipe should be installed in accordance with the procedures specified in ASTM D2321. We recommend that trench backfill be compacted to at least 95% of the maximum dry density obtained by Modified Proctor ASTM D1557 or equivalent. Initial backfill lift thickness for a ¾”-0 crushed aggregate base may need to be as great as 4 feet to reduce the risk of flattening underlying flexible pipe. Subsequent lift thickness should not exceed 1 foot. If imported granular fill material is used, then the lifts for large vibrating plate-compaction equipment (e.g. hoe compactor attachments) may be up to 2 feet, provided that proper compaction is being achieved and each lift is tested. Use of large vibrating compaction equipment should be carefully monitored near existing structures and improvements due to the potential for vibration-induced damage.

Adequate density testing should be performed during construction to verify that the recommended relative compaction is achieved. Typically, one density test is taken for every 4 vertical feet of backfill on each 200-lineal-foot section of trench.

6.5 Erosion Control Considerations

During our field exploration program, we did not observe soil types that would be considered highly susceptible to erosion except in areas of moderately sloping topography. In our opinion, the primary concern regarding erosion potential will occur during construction, in areas that have been stripped of vegetation. Erosion at the site during construction can be minimized by implementing the project erosion control plan, which should include judicious use of straw wattles and silt fences. If used, these erosion control devices should be in place and remain in place throughout site preparation and construction.

Erosion and sedimentation of exposed soils can also be minimized by quickly re-vegetating exposed areas of soil, and by staging construction such that large areas of the project site are not denuded and exposed at the same time. Areas of exposed soil requiring immediate and/or temporary protection against exposure should be covered with either mulch or erosion control netting/blankets. Areas of exposed soil requiring permanent stabilization should be seeded with an approved grass seed mixture, or hydroseeded with an approved seed-mulch-fertilizer mixture.

6.6 Wet Weather Earthwork

Soils underlying the site are likely to be moisture sensitive and may be difficult to handle or traverse with construction equipment during periods of wet weather. Earthwork is typically most economical when performed under dry weather conditions. Earthwork performed during the wet-weather season will probably require expensive measures such as cement treatment or imported granular material to compact fill to the recommended engineering specifications. If earthwork is to be performed or fill is to be placed in wet weather or under wet conditions when soil moisture content is difficult to control, the following recommendations should be incorporated into the contract specifications:

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation or the removal of unsuitable soils should be followed promptly by the placement and compaction of clean engineered fill. The size and type of construction equipment used may have to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance caused by equipment traffic;
- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water;
- Material used as engineered fill should consist of clean, granular soil containing less than 5 percent fines. The fines should be non-plastic. Alternatively, cement treatment of on-site soils may be performed to facilitate wet weather placement;
- The ground surface within the construction area should be sealed by a smooth drum vibratory roller, or equivalent, and under no circumstances should be left uncompacted and exposed to moisture. Soils which become too wet for compaction should be removed and replaced with clean granular materials;
- Excavation and placement of fill should be observed by the geotechnical engineer to verify that all unsuitable materials are removed and suitable compaction and site drainage is achieved; and
- Geotextile silt fences, straw wattles, and fiber rolls should be strategically located to control erosion.

If cement or lime treatment is used to facilitate wet weather construction, GeoPacific should be contacted to provide additional recommendations and field monitoring.

6.7 Spread Foundations

Based upon review of preliminary site plans, GeoPacific understands that the proposed development at the site will consist of a residential and commercial development supporting construction of 248 homes. We anticipate that the homes will be constructed with typical spread foundations and wood framing, with maximum structural loading on column footings and continuous strip footings on the order of 10 to 35 kips, and 2 to 4 kips respectively. Information regarding commercial development is preliminary at this time but we understand that 2.89-acres will be dedicated in the southwestern portion of the site. At this time grading plans have not been created, however based on the current site elevations and topography we estimate that cuts and fills may be on the order of 10 feet or less. We expect final grades to be relatively level.

The proposed structures may be supported on shallow foundations bearing on stiff, native soils and/or engineered fill, appropriately designed and constructed as recommended in this report. Foundation design, construction, and setback requirements should conform to the applicable building code at the time of construction. For maximization of bearing strength and protection against frost heave, spread footings should be embedded at a minimum depth of 12 inches below exterior grade. If soft soil conditions are encountered at footing subgrade elevation, they should be removed and replaced with compacted crushed aggregate.

The anticipated allowable soil bearing pressure is 1,500 lbs/ft^2 for footings bearing on competent, native soil and/or engineered fill. The recommended maximum allowable bearing pressure may be increased by 1/3 for short-term transient conditions such as wind and seismic loading. For loads heavier than 35 kips, the geotechnical engineer should be consulted. If heavier loads than described above are proposed, it may be necessary to over-excavate point load areas and replace with additional compacted crushed aggregate. The coefficient of friction between on-site soil and poured-in-place concrete may be taken as 0.42, which includes no factor of safety. The maximum anticipated total and differential footing movements (generally from soil expansion and/or settlement) are 1 inch and ¾ inch over a span of 20 feet, respectively. We anticipate that the majority of the estimated settlement will occur during construction, as loads are applied. Excavations near structural footings should not extend within a 1H:1V plane projected downward from the bottom edge of footings.

Footing excavations should penetrate through topsoil and any disturbed soil to competent subgrade that is suitable for bearing support. All footing excavations should be trimmed neat, and all loose or softened soil should be removed from the excavation bottom prior to placing reinforcing steel bars. Due to the moisture sensitivity of on-site native soils, foundations constructed during the wet weather season may require over-excavation of footings and backfill with compacted, crushed aggregate.

Our recommendations are for residential construction incorporating raised wood floors and conventional spread footing foundations. After site development, a Final Soil Engineer’s Report should either confirm or modify the above recommendations.

6.8 Permanent Below-Grade Walls

Lateral earth pressures against below-grade retaining walls will depend upon the inclination of any adjacent slopes, type of backfill, degree of wall restraint, method of backfill placement, degree of backfill compaction, drainage provisions, and magnitude and location of any adjacent surcharge loads. At-rest soil pressure is exerted on a retaining wall when it is restrained against rotation. In contrast, active soil pressure will be exerted on a wall if its top is allowed to rotate or yield a distance of roughly 0.001 times its height or greater.

If the subject retaining walls will be free to rotate at the top, they should be designed for an active earth pressure equivalent to that generated by a fluid weighing 35 pcf for level backfill against the wall. For restrained wall, an at-rest equivalent fluid pressure of 55 pcf should be used in design, again assuming level backfill against the wall. These values assume that the recommended drainage provisions are incorporated, and hydrostatic pressures are not allowed to develop against the wall.

During a seismic event, lateral earth pressures acting on below-grade structural walls will increase by an incremental amount that corresponds to the earthquake loading. Based on the Mononobe-Okabe equation and peak horizontal accelerations appropriate for the site location, seismic loading should be modeled using the active or at-rest earth pressures recommended above, plus an incremental rectangular-shaped seismic load of magnitude 6.5H, where H is the total height of the wall.

We assume relatively level ground surface below the base of the walls. As such, we recommend passive earth pressure of 300 pcf for use in design, assuming wall footings are cast against competent native soils or engineered fill. If the ground surface slopes down and away from the base of any of the walls, a lower passive earth pressure should be used and GeoPacific should be contacted for additional recommendations.

A coefficient of friction of 0.42 may be assumed along the interface between the base of the wall footing and subgrade soils. The recommended coefficient of friction and passive earth pressure values do not include a safety factor, and an appropriate safety factor should be included in design. The upper 12 inches of soil should be neglected in passive pressure computations unless it is protected by pavement or slabs on grade.

The above recommendations for lateral earth pressures assume that the backfill behind the subsurface walls will consist of properly compacted structural fill, and no adjacent surcharge loading. If the walls will be subjected to the influence of surcharge loading within a horizontal distance equal to or less than the height of the wall, the walls should be designed for the additional horizontal pressure. For uniform surcharge pressures, a uniformly distributed lateral pressure of 0.3 times the surcharge pressure should be added. Traffic surcharges may be estimated using an additional vertical load of 250 psf (2 feet of additional fill), in accordance with local practice.

The recommended equivalent fluid densities assume a free-draining condition behind the walls so that hydrostatic pressures do not build-up. This can be accomplished by placing a 12 to 18-inch wide zone of sand and gravel containing less than 5 percent passing the No. 200 sieve against the walls. A 3-inch minimum diameter perforated, plastic drain pipe should be installed at the base of the walls and connected to a suitable discharge point to remove water in this zone of sand and gravel. The drain pipe should be wrapped in filter fabric (Mirafi 140N or other as approved by the geotechnical engineer) to minimize clogging.

Wall drains are recommended to prevent detrimental effects of surface water runoff on foundations – not to dewater groundwater. Drains should not be expected to eliminate all potential sources of water entering a basement or beneath a slab-on-grade. An adequate grade to a low point outlet drain in the crawlspace is required by code. Underslab drains are sometimes added beneath the slab when placed over soils of low permeability and shallow, perched groundwater.

Water collected from the wall drains should be directed into the local storm drain system or other suitable outlet. A minimum 0.5 percent fall should be maintained throughout the drain and non-perforated pipe outlet. Down spouts and roof drains should not be connected to the wall drains in order to reduce the potential for clogging. The drains should include clean-outs to allow periodic maintenance and inspection. Grades around the proposed structure should be sloped such that surface water drains away from the building.

GeoPacific should be contacted during construction to verify subgrade strength in wall keyway excavations, to verify that backslope soils are in accordance with our assumptions, and to take density tests on the wall backfill materials.

Structures should be located a horizontal distance of at least 1.5H away from the back of the retaining wall, where H is the total height of the wall. GeoPacific should be contacted for additional foundation recommendations where structures are located closer than 1.5H to the top of any wall.

6.9 Concrete Slabs-on-Grade

Preparation of areas beneath concrete slab-on-grade floors should be performed as recommended in the *Site Preparation Recommendations* section. Care should be taken during excavation for foundations and floor slabs, to avoid disturbing subgrade soils. If subgrade soils have been adversely impacted by wet weather or otherwise disturbed, the surficial soils should be scarified to a minimum depth of 8 inches, moisture conditioned to within about 3 percent of optimum moisture content, and compacted to engineered fill specifications. Alternatively, disturbed soils may be removed and the removal zone backfilled with additional crushed rock.

For evaluation of the concrete slab-on-grade floors using the beam on elastic foundation method, a modulus of subgrade reaction of 150 kcf (87 pci) should be assumed for the medium stiff, fine-grained soils anticipated to be present at foundation subgrade elevation following adequate site preparation as described above. This value assumes the concrete slab system is designed and constructed as recommended herein, with a minimum thickness of 8 inches of 1½”-0 crushed aggregate beneath the slab. The total thickness of crushed aggregate will be dependent on the subgrade conditions at the time of construction, and should be verified visually by proof-rolling. Under-slab aggregate should be compacted to at least 95 percent of its maximum dry density as determined by ASTM D1557 (Modified Proctor) or equivalent.

In areas where moisture will be detrimental to floor coverings or equipment inside the proposed structure, appropriate vapor barrier and damp-proofing measures should be implemented. A commonly applied vapor barrier system consists of a 10-mil polyethylene vapor barrier placed directly over the capillary break material. Other damp/vapor barrier systems may also be feasible. Appropriate design professionals should be consulted regarding vapor barrier and damp proofing systems, ventilation, building material selection and mold prevention issues, which are outside GeoPacific’s area of expertise.

6.10 Footing and Roof Drains

Construction should include typical measures for controlling subsurface water beneath the structure, including positive crawlspace drainage to an adequate low-point drain exiting the foundation, visqueen covering the expose ground in the crawlspace, and crawlspace ventilation (foundation vents). The client should be informed and educated that some slow flowing water in the crawlspaces is considered normal and not necessarily detrimental to the home given these other design elements incorporated into its construction. Appropriate design professionals should be consulting regarding crawlspace ventilation, building material selection and mold prevention issues, which are outside GeoPacific's area of expertise.

Down spouts and roof drains should collect roof water in a system separate from the footing drains to reduce the potential for clogging. Roof drain water should be directed to an appropriate discharge point and storm system well away from structural foundations. Grades should be sloped downward and away from buildings to reduce the potential for ponded water near structures.

If the proposed structure will have a raised floor, and no concrete slab-on-grade floors are used, perimeter footing drains may be eliminated at the discretion of the geotechnical engineer based on soil conditions encountered at the site and experience with standard local construction practices. Where it is desired to reduce the potential for moist crawl spaces, footing drains may be installed. If concrete slab-on-grade floors are used, perimeter footing drains should be installed as recommended below.

Where necessary, perimeter footing drains should consist of 3 or 4-inch diameter, perforated plastic pipe embedded in a minimum of 1 ft^3 per lineal foot of clean, free-draining drain rock. The drain pipe and surrounding drain rock should be wrapped in non-woven geotextile (Mirafi 140N, or approved equivalent) to minimize the potential for clogging and/or ground loss due to piping. A minimum 0.5 percent fall should be maintained throughout the drain and non-perforated pipe outlet. Figure 4 presents a typical perimeter footing drain detail. In our opinion, footing drains may outlet at the curb, or on the back sides of lots where sufficient fall is not available to allow drainage to meet the street.

6.11 Public Streets

GeoPacific conducted design calculations for the proposed new public streets in the project interior. Based upon our understanding of the anticipated traffic which includes light-duty passenger vehicles, weekly trash pickups, and occasional fire trucks weighing up to 75,000 lbs, we calculated an anticipated 18-kip ESAL count of approximately 143,620 over 20 years. Table 5 presents our flexible pavement design input parameters. Table 6 presents our recommended minimum dry-weather pavement section supporting 20 years of vehicle traffic per Washington County standards.

Table 5: Flexible Pavement Section Design Input Parameters for Interior Public Streets

Input Parameter	**Design Value**
18-kip ESAL Initial Performance Period (20 Years)	143,620
Initial Serviceability	4.2
Terminal Serviceability	2.5
Reliability Level	85 Percent
Overall Standard Deviation	0.5
Roadbed Soil Resilient Modulus (PSI)	7,500
Structural Number	**2.46**

Table 6: Recommended Minimum Dry-Weather Pavement Section: Interior Public Streets

Material Layer	Section Thickness (in.)	Structural Coefficient	Compaction Standard
Asphaltic Concrete (AC)	3.5 in.	.42	91%/ 92% of Rice Density AASHTO T-209
Crushed Aggregate Base ¾"-0 (leveling course)	2 in.	.10	95% of Modified Proctor AASHTO T-180
Crushed Aggregate Base 1½"-0	8 in.	.10	95% of Modified Proctor AASHTO T-180
Subgrade	12 in.	7,500 PSI	95% of Standard Proctor AASHTO T-99 or equivalent
Total Calculated Structural Number		**2.47**	

6.12 Subgrade Preparation

Roadway subgrade soils should be compacted and inspected by GeoPacific prior to the placement of crushed aggregate base for pavement. Typically, a proofroll with a fully loaded water or haul truck is conducted by travelling slowly across the grade and observing the subgrade for rutting, deflection, or movement. Any pockets of organic debris or loose fill encountered during ripping or tilling should be removed and replaced with engineered fill (see Section 6.1, *Site Preparation Recommendations*). In order to verify subgrade strength, we recommend proof-rolling directly on subgrade with a loaded dump truck during dry weather and on top of base course in wet weather. Soft areas that pump, rut, or weave should be stabilized prior to paving.

If pavement areas are to be constructed during wet weather, the subgrade and construction plan should be reviewed by the project geotechnical engineer at the time of construction so that condition specific recommendations can be provided. The moisture sensitive subgrade soils make the site a difficult wet weather construction project. General recommendations for wet weather pavement sections are provided below.

During placement of pavement section materials, density testing should be performed to verify compliance with project specifications. Generally, one subgrade, one base course, and one asphalt compaction test is performed for every 100 to 200 linear feet of paving.

6.13 Wet Weather Construction Pavement Section

This section presents our recommendations for wet weather pavement sections and construction for new pavement sections at the project. These wet weather pavement section recommendations are intended for use in situations where it is not feasible to compact the subgrade soils to project requirements, due to wet subgrade soil conditions, and/or construction during wet weather. Based on our site review, we recommend a wet weather section with a minimum subgrade deepening of 6 to 12 inches to accommodate a working subbase of additional 1½"-0 crushed rock. Geotextile fabric, Mirafi 500X or equivalent, should be placed on subgrade soils prior to placement of base rock.

In some instances, it may be preferable to use a subbase material in combination with over-excavation and increasing the thickness of the rock section. GeoPacific should be consulted for additional recommendations regarding use of additional subbase in wet weather pavement sections if it is desired to pursue this alternative. Cement treatment of the subgrade may also be considered instead of over-excavation. For planning purposes, we anticipate that treatment of the onsite soils would involve mixing cement powder to approximately 6 percent cement content and a mixing depth on the order of 12 to 18 inches.

With implementation of the above recommendations, it is our opinion that the resulting pavement section will provide equivalent or greater structural strength than the dry weather pavement section currently planned. However, it should be noted that construction in wet weather is risky and the performance of pavement subgrades depend on a number of factors including the weather conditions, the contractor's methods, and the amount of traffic the road is subjected to. There is a potential that soft spots may develop even with implementation of the wet weather provisions recommended in this letter. If soft spots in the subgrade are identified during roadway excavation, or develop prior to paving, the soft spots should be over-excavated and backfilled with additional crushed rock.

During subgrade excavation, care should be taken to avoid disturbing the subgrade soils. Removals should be performed using an excavator with a smooth-bladed bucket. Truck traffic should be limited until an adequate working surface has been established. We suggest that the crushed rock be spread using bulldozer equipment rather than dump trucks, to reduce the amount of traffic and potential disturbance of subgrade soils. Care should be taken to avoid over-compaction of the base course materials, which could create pumping, unstable subgrade soil conditions. Heavy and/or vibratory compaction efforts should be applied with caution. Following placement and compaction of the crushed rock to project specifications (95 percent of Modified Proctor), a finish proof-roll should be performed before paving.

The above recommendations are subject to field verification. GeoPacific should be on-site during construction to verify subgrade strength and to take density tests on the engineered fill, base rock and asphaltic pavement materials.

7.0 SEISMIC DESIGN

The Oregon Department of Geology and Mineral Industries (DOGAMI), Oregon HazVu: 2021 Statewide GeoHazards Viewer indicates that the site is in an area where *very strong* to *severe* ground shaking is anticipated during an earthquake. Structures should be designed to resist earthquake loading in accordance with the methodology described in the 2018 International Building Code (IBC) with applicable Oregon Structural Specialty Code (OSSC) revisions (current 2019). We recommend Site Class C be used for design as defined in ASCE 7-16, Chapter 20, and Table 20.3-1. Design values determined for the site using the Applied Technology Council (ATC) 2020 Hazards By Location Online Tool are summarized in Table 7.

Table 7. Recommended Earthquake Ground Motion Parameters (ASCE 7-16)

Parameter	Value
Location (Lat, Long), degrees	45.350, -122.769
Probabilistic Ground Motion Values, 2% Probability of Exceedance in 50 yrs	
Peak Ground Acceleration PGA_M	0.454 g
Short Period, S_s	0.83 g
1.0 Sec Period, S_1	0.385 g
Soil Factors for Site Class C:	
F_a	1.2
F_v	1.5
$SD_s = 2/3 \times F_a \times S_s$	0.664 g
$SD_1 = 2/3 \times F_v \times S_1$	0.385 g
Residential Seismic Design Category	D

7.1 Soil Liquefaction

The Oregon Department of Geology and Mineral Industries (DOGAMI), Oregon HazVu: 2021Statewide GeoHazards Viewer indicates that the site is in an area considered to be at *low* risk for soil liquefaction during an earthquake. Soil liquefaction is a phenomenon wherein saturated soil deposits temporarily lose strength and behave as a liquid in response to ground shaking caused by strong earthquakes. Soil liquefaction is generally limited to loose, sands and granular soils located below the water table, and fine-grained soils with a plasticity index less than 15. The upper 12 feet of the site was observed to be underlain by very stiff, fine-grained soils with moderate plasticity. Groundwater was not encountered within our subsurface explorations. Regional geologic mapping indicates static groundwater is present at a depth of 120 feet below the ground surface (Snyder, 2008). Based upon the results of our study, it is our opinion that the soils underlying the site are not prone to liquefaction.

If deemed necessary, quantitative liquefaction assessment, beyond the scope of this study, may be conducted at the subject site to determine whether or not liquefiable soil layers are present underneath the subject site beyond the depths explored. Cone penetrometer testing (CPT) would be conducted at a selected location within the site boundaries to explore deeper subsurface soil layers, and the data would be used to estimate anticipated dynamic settlement at the subject site during a seismic ground shaking event.

8.0 UNCERTAINTIES AND LIMITATIONS

We have prepared this report for the owner and their consultants for use in design of this project only. This report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, GeoPacific should be notified for review of the recommendations of this report, and revision of such if necessary.

Sufficient geotechnical monitoring, testing and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by explorations. The checklist attached to this report outlines recommended geotechnical observations and testing for the project. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipated, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications.

Within the limitations of scope, schedule and budget, GeoPacific attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

We appreciate this opportunity to be of service.

Sincerely,

GEOPACIFIC ENGINEERING, INC.

ELIZABETH K. RAPP
No. E2190
exp 2/1/22

14743PE
JAN. 23, 1990
JAMES D. IMBRIE
EXPIRES: 06/30/2023

Beth K. Rapp, C.E.G.
Senior Engineering Geologist

Reviewed by: James D. Imbrie, G.E., C.E.G.
Principal Geotechnical Engineer

Appendix E:
TR55 Runoff Curve Numbers

TR55 RUNOFF CURVE NUMBERS

Table 2-2a Runoff curve numbers for urban areas [1]

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area [2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

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[1] Average runoff condition, and $I_a = 0.2S$.

[2] The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

[3] CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

[4] Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

[5] Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b Runoff curve numbers for cultivated agricultural lands [1]

Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment [2]	Hydrologic condition [3]	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T+ CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T+ CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

---

[1] Average runoff condition, and I_a=0.2S

[2] Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.

[3] Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Table 2-2c Runoff curve numbers for other agricultural lands [1]

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing [2]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. [3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 [4]	48	65	73
Woods—grass combination (orchard or tree farm). [5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods. [6]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 [4]	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

[1] Average runoff condition, and $I_a = 0.2S$.

[2] *Poor:* <50%) ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: > 75% ground cover and lightly or only occasionally grazed.

[3] *Poor:* <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >75% ground cover.

[4] Actual curve number is less than 30; use CN = 30 for runoff computations.

[5] CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

[6] *Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

Table 2-2d Runoff curve numbers for arid and semiarid rangelands [1]

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition [2]	A [3]	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

[1] Average runoff condition, and $I_a = 0.2S$. For range in humid regions, use table 2-2c.
[2] Poor: <30% ground cover (litter, grass, and brush overstory).
Fair: 30 to 70% ground cover.
Good: > 70% ground cover.
[3] Curve numbers for group A have been developed only for desert shrub.

AFFIDAVIT OF MAILING

STATE OF OREGON)
) ss
COUNTY OF WASHINGTON)

I, being first duly sworn, depose and say:

That on the 5th day of November, I served upon the persons shown on Exhibit A, attached hereto and by this reference incorporated herein, a copy of a Notice of Hearing/Application/Decision marked Exhibit B, attached hereto and by this reference incorporated herein, by mailing to them a true and correct copy of the original hereof. I further certify that the addresses reflect information received from the relevant party or agency, and that said envelopes were placed in the United States Mail at Tualatin, Oregon, prepared to receive postage administered by city staff.

Dated this 5th of October, 2021

Lindsey Hagermann
Signature

SUBSCRIBED AND SWORN to before me this 5th day of November, 2021.

OFFICIAL STAMP
ROCIO D. VARGAS ALBA
NOTARY PUBLIC - OREGON
COMMISSION NO. 991242
MY COMMISSION EXPIRES SEPTEMBER 15, 2023

Rocio Vargas
Notary Public for Oregon

My commission expires: Sept. 15, 2023

RE: CUP21-0001 and SB21-0001 Autumnsunrise project

NOTICE OF APPLICATION SUBMITTAL AND OPPORTUNITY TO COMMENT

CASE FILES: CUP21-0001 and SB21-0001 — AUTUMN SUNRISE CONDITIONAL USE PERMIT AND SUBDIVISION

NOTICE IS HEREBY GIVEN that the public is invited to attend a public hearing before the Planning Commission on:

Thursday, December 2, 2021 at 6:30 pm

By Zoom Teleconference: https://tinyurl.com/t5whe2p8
Meeting ID: 832 2544 4836 Passcode: 935933
By phone: 1-669-900-9128

CUP21-0001 and SB21-0001

Autumn Sunrise: Conditional Use Permit (CUP) and Subdivision (SB)

Lennar Northwest, Inc. is requesting approval of a Small Lot Subdivision (CUP) and tentative plat approval (SB) of a 400-lot development for future construction of single family homes and townhomes on a 61.17 acre site.

To view the application materials, visit:
www.tualatinoregon.gov/projects
Comments and questions may be submitted to:
planning@tualatin.gov

The subject property is located at: 23620 & 23740 SW Boones Ferry Road; 9185, 9335, & 9415 SW Greenhill Lane, Tax Lots: 2S135D: 400, 401, 500, 501, 600, 800, and 900; and Tax Lot 1S35D 100

CITY OF
TUALATIN
Planning Division

- **CUP21-0001 Criteria**: Comprehensive Plan Chapters 3 and 10; Tualatin Development Code Chapters (TDC): 32, 33, 41
- **SB21-0001 Criteria**: TDC 32, 33, 36, 41, 51, 73A, 73B, 73C, 73G, 74, 75
- **The Staff report** will be available at **https://www.tualatinoregon.gov/tpc/planning-commission-meeting-7** at least seven days before the hearing. You may call 503-691-3028 to schedule a time to inspect the staff report and application at no cost, and print copies can be provided at a reasonable cost.
- **To comment in writing on the application:** email to **planning@tualatin.gov,** by mail: Attn: Planning Division 10699 SW Herman Road, Tualatin, OR 97062
- **All are invited to attend the hearing and provide verbal testimony.** Failure of an issue to be raised or failure to provide sufficient specificity to afford the decision maker an opportunity to respond to the issue precludes appeal to the State Land Use Board of Appeals (LUBA) based on that issue. The failure of the applicant to raise constitutional or other issues relating to the proposed conditions of approval with sufficient specificity to the decision maker to respond to the issue precludes an action for damages in circuit court.
- **Notice of the Decision** will only be provided to those who submit written comments regarding that application or testify at the hearing.

You received this mailing because you own property within 1,000 feet (ft) of the site or within a residential subdivision which is partly within 1,000 ft.

WIRKKALA JEFFREY G & WIRKKALA
JAYNIE A
30905 NE MICHAEL RD
NEWBERG, OR
97132

NOTICE OF APPLICATION SUBMITTAL AND OPPORTUNITY TO COMMENT
CASE FILES: CUP21-0001 and SB21-0001 — AUTUMN SUNRISE CONDITIONAL USE PERMIT AND SUBDIVISION

NOTICE IS HEREBY GIVEN that the public is invited to attend a public hearing before the Planning Commission on:

Thursday, December 2, 2021 at 6:30 pm

By Zoom Teleconference: https://tinyurl.com/t5whe2p8
Meeting ID: 832 2544 4836 Passcode: 935933
By phone: 1-669-900-9128

CUP21-0001 and SB21-0001
Autumn Sunrise: Conditional Use Permit (CUP) and Subdivision (SB)

Lennar Northwest, Inc. is requesting approval of a Small Lot Subdivision (CUP) and tentative plat approval (SB) of a 400-lot development for future construction of single family homes and townhomes on a 61.17 acre site.

To view the application materials, visit:
www.tualatinoregon.gov/projects
Comments and questions may be submitted to:
planning@tualatin.gov

The subject property is located at: 23620 & 23740 SW Boones Ferry Road; 9185, 9335, & 9415 SW Greenhill Lane, Tax Lots: 2S135D: 400, 401, 500, 501, 600, 800, and 900; and Tax Lot 1S35D 100

CITY OF
TUALATIN
Planning Division

- **CUP21-0001 Criteria**: Comprehensive Plan Chapters 3 and 10; Tualatin Development Code Chapters (TDC): 32, 33, 41
- **SB21-0001 Criteria**: TDC 32, 33, 36, 41, 51, 73A, 73B, 73C, 73G, 74, 75
- **The Staff report** will be available at **https://www.tualatinoregon.gov/tpc/planning-commission-meeting-7** at least seven days before the hearing. You may call 503-691-3028 to schedule a time to inspect the staff report and application at no cost, and print copies can be provided at a reasonable cost.
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- **Notice of the Decision** will only be provided to those who submit written comments regarding that application or testify at the hearing.

You received this mailing because you own property within 1,000 feet (ft) of the site or within a residential subdivision which is partly within 1,000 ft.

WILSHIRE SHERWOOD OWNER LLC
100 WILSHIRE BLVD STE 940
SANTA MONICA, CA
90401

TLID
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2S135AD06800
2S135AD10300
2S135AC12800
2S135AC13800
2S135AC09100

OWNER1
ZIMMERMAN STEPHEN A & MATHYS JACKIE L
ZACHER BRIAN M & ZACHER MICHAELA F
YOUNG DOUGLAS A & YOUNG TERESA S
YEE DONALD M & YEE PAMELA E
YARNELL REV LIV TRUST
YACKLEY DIANE M & GANNETT TOD C
WYBENGA DOUGLAS
WORKMAN STEPHEN G & WORKMAN MARY B
WOOLSEY RANDY M & WOOLSEY DONNA J
WOODRUFF VIRGINIA C
WONG JONATHAN D & WONG BETH J
WISER BRIAN R & LIRA MARIA ALEJANDRA
WILSON DAVID L & WILSON KAREN A
WILLIAMS MEGANN E & WILLIAMS AUSTIN J
WILLIAMS TOM K
WHEELER TERRANCE J & WHEELER LINDA K
WESSON MICHAEL SANDER
WELCH RAYMOND P & WELCH PAMELA K
WELBORN RANDALL J & JULIE ANN WELBORN LIV TRUST
WEBB BRIAN & ROBERTS KIRA
WASHINGTON COUNTY FACILITIES MGMT
WADSWORTH ERIC & WADSWORTH WENDY
VETETO MARK E & VETETO NANCY
VELAZQUEZ BRIAN A & VELAZQUEZ CHRISTINA RALSTON
VANDERBURG SUSAN B & VANDERBURG JOHN TIMOTHY REV TRUST & VANDERBURG JACQUELIN
TYGART DONALD G & MERCADO LORELEI
TURNER BENJAMIN & PERKINS EMILY A
TURNBULL BRENT D
TUALATIN CITY OF
TUALATIN CITY OF
TUALATIN CITY OF
TUALATIN CITY OF
TUALATIN CITY OF
TUALATIN CITY OF
TUALATIN CITY OF
TRIKUR MARTA LUIZA & TRIKUR SERGEY F
TRICKETT AARON & TRICKETT HEATHER
TRAN NICHOLAS
TOMPKINS TIMOTHY L & TOMPKINS RACHEL N
TOLER E TRENT & TOLER ROSEANN T
TIGARD-TUALATIN SCHOOL DISTRICT #23J
THURLEY CHRISTOPHER
THOMPSON WAYNE & THOMPSON JOYCE A
TENLY PROPERTIES CORP
TENLY PROPERTIES CORP
TAYLOR BRENDA & TAYLOR JOE N
TAYLOR ARTHUR R & MANANDIL MYLYN
TAPASA HEIDI L & TAPASA TUUMAMAO
TAM AARON L M & TAM AMY
SYVERSON FAMILY LIV TRUST
SWANK ERICA & SWANK TRAVIS
SUTHERLAND STUART P & SUTHERLAND LEEANN N FAM TRUST
STUART JAMES W & STUART HOLLY V
STRATTON GILLIAN M
STONE LEAH & STONE SHERRY
STIMSON TOM P & GUTIERREZ-STIMSON ERINN M
STILLS DANNY T & STILLS DEBRA J
ST CLAIR DEBORAH J
SPECHT-SMITH DANA LYNN & SPECHT DAVID LEE
SOMERTON RITA G & SOMERTON MARVIN

OWNERADDR	OWNERCITY	OWNERSTATE	OWNERZIP
24305 SW BOONES FERRY RD	TUALATIN	OR	97062
9325 SW QUINAULT LN	TUALATIN	OR	97062
987 SOLANA CT	MOUNTAIN VIEW	CA	94040
9105 SW STONO DR	TUALATIN	OR	97062
2260 SW 87TH PL	TUALATIN	OR	97062
23240 SW BOONES FERRY RD	TUALATIN	OR	97062
1510 WOODLAND DR	CORVALLIS	OR	97330
8810 SW STONO DR	TUALATIN	OR	97062
8775 SW STONO DR	TUALATIN	OR	97062
22740 SW 93RD TER	TUALATIN	OR	97062
9345 SW STONO DR	TUALATIN	OR	97062
22845 SW 89TH PL	TUALATIN	OR	97062
22750 SW 92ND PL	TUALATIN	OR	97062
8830 SW STONO DR	TUALATIN	OR	97062
9300 SW NORWOOD RD	TUALATIN	OR	97062
8745 SW STONO DR	TUALATIN	OR	97062
9385 SW IOWA DR	TUALATIN	OR	97062
8575 SW MARICOPA DR	TUALATIN	OR	97062
22885 SW VERMILLION DR	TUALATIN	OR	97062
22850 SW MANDAN DR	TUALATIN	OR	97062
169 N 1ST AVE #42	HILLSBORO	OR	97124
9265 SW STONO DR	TUALATIN	OR	97062
9220 SW STONO DR	TUALATIN	OR	97062
9325 SW PALOUSE LN	TUALATIN	OR	97062
21715 SW HEDGES DR	TUALATIN	OR	97062
22920 SW MANDAN DR	TUALATIN	OR	97062
22745 SW VERMILLION DR	TUALATIN	OR	97062
9340 SW IOWA DR	TUALATIN	OR	97062
18880 SW MARTINAZZI AVE	TUALATIN	OR	97062
18880 SW MARTINAZZI AVE	TUALATIN	OR	97062
18880 SW MARTINAZZI AVE	TUALATIN	OR	97062
18880 SW MARTINAZZI AVE	TUALATIN	OR	97062
18880 SW MARTINAZZI AVE	TUALATIN	OR	97062
18880 SW MARTINAZZI AVE	TUALATIN	OR	97062
18880 SW MARTINAZZI AVE	TUALATIN	OR	97062
22775 SW 90TH PL	TUALATIN	OR	97062
22580 SW VERMILLION DR	TUALATIN	OR	97062
8983 SW STONO DR	TUALATIN	OR	97062
22570 SW VERMILLION DR	TUALATIN	OR	97062
22595 SW 87TH PL	TUALATIN	OR	97062
6960 SW SANDBURG ST	TIGARD	OR	97223
9135 SW STONO DR	TUALATIN	OR	97062
9120 SW STONO DR	TUALATIN	OR	97062
PO BOX 6839	BEND	OR	97708
PO BOX 6839	BEND	OR	97708
22885 SW 94TH TER	TUALATIN	OR	97062
22675 SW VERMILLION DR	TUALATIN	OR	97062
22605 SW 94TH TER	TUALATIN	OR	97062
9250 SW IOWA DR	TUALATIN	OR	97062
8895 SW IOWA DR	TUALATIN	OR	97062
22715 SW MANDAN DR	TUALATIN	OR	97062
22805 SW 92ND PL	TUALATIN	OR	97062
9235 SW IOWA DR	TUALATIN	OR	97062
9195 SW IOWA DR	TUALATIN	OR	97062
8755 SW STONO DR	TUALATIN	OR	97062
8894 SW STONO DR	TUALATIN	OR	97062
3498 CHAPARREL LOOP	WEST LINN	OR	97068
9375 SW QUINAULT LN	TUALATIN	OR	97062
9380 SW QUINAULT LN	TUALATIN	OR	97062
9375 SW IOWA DR	TUALATIN	OR	97062

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2S136BC01400
2S136BC01500
2S135D000100
2S135AC14400

SNODDY ROBERT B
SMITH SCOTT M & SMITH ALLYN B
SMITH WILLIAM R & SMITH BARBARA J
SMITH ROBERT D & SMITH JANIS K
SLAWIK JON V & SLAWIK VAN MY
SIROIS TYSON & JARRARD LINDSEY
SINGLETERRY ELNORA & SEITLINGER LEO FRANCIS JR & SEITLINGER LAURA RENE
SHOBAKEN THOMAS R
SHMULEVSKY MICHAEL & BALANETSKAYA NATALIA
SHIPLEY HEATHER
SHIMADA HIROSHI & SHIMADA ANGELIQUE
SHEETZ DONALD K & MARY M SHEETZ REV LIV TRUST
SHAMBURG SCOTT A & SHAMBURG LISA G
SEPP JULIE & SEPP ROBERT
SELIVONCHICK GREGORY A & SELIVONCHICK GEORGANNE
SEKI KATSUMICHI & SEKI MIYUKI
SCOTT JERRY MICHAEL & STAMBAUGH DEBRA R
SCOTT JOAN D
SCHWEITZ ERIC J & SCHWEITZ KAREN M
SCHULTZ LARRY & JOANN REV LIV TRUST
SCHOTT DAVID M & SCHOTT COURTNEY A
SCHAFROTH J F & SCHAFROTH KATE R
SAYLOR ERIC M & SAYLOR BRITTA M
SAWAI STUART T & SAWAI MARY JANE
SANDSTROM GLENN M
SANCHEZ SALVADOR & VARGAS YOANA A
SALISBURY VERONICA PIPER & PAROSA JOSHUA DAVID
SALDIVAR CASIMIRO & SALDIVAR MARIA CONCEPCION
SACKETT ANTHONY
RUDISEL A TRUST
RONALD TY & RONALD JENNIFER
ROMINE CLAUDIA
ROMEIKE ROGER W & ROMEIKE SHERREL K
ROLISON MIKEL J
ROGERS JOHN & AGUILAR-NELSON LIZI
ROBLES MARCELINO
ROBERTS LISA A
RILEY SHAWN O
RHONDES ERIK & RHODES MEGAN
REYNHOLDS GLENN A & REYNHOLDS NANCY J
REPCAK ROMAN & PARK-REPCAK ROBIN
RAZ DOUGLAS JOHN
RAY CYNTHIA P
RAMKU FAMILY TRUST
RAMIREZ JOSE ANTONIO
RAMIREZ DANIEL LOPEZ & TOVAR LAURA BRAMBILLA
QIAN LIDONG & YANG YUYUAN
POTTER DYLAN D & POTTER MICHELLE P
PORTIS DAVID B & PORTIS PHYLLIS A
PITT CHARLES R
PIRTLE JAMES L JR & PIRTLE LINDA L
PIERCE KELLY JOANNE & PIERCE BRIAN LAWRENCE
PFEIFER STEPHANIE B
PETTY NEIL & HIBBITTS JOANN
PERRY JANETTE & PERRY KENNETH
PEEBLES CRAIG M & PEEBLES TANYA A
PATTON ANDREW M & PATTON LINDSEY M
PANOCH RICHARD S & CHAVEZ CARISA L
PADE VIRGIL DEAN & PADE DEBORAH LYNN
P3 PROPERTIES LLC
OSTROWSKI MICHAEL J & OSTROWSKI SHERIE M

9430 SW IOWA DR	TUALATIN	OR	97062
22750 SW VERMILLION DR	TUALATIN	OR	97062
22865 SW 89TH PL	TUALATIN	OR	97062
13547 SW HILLSHIRE DR	TIGARD	OR	97223
23445 SW 82ND AVE	TUALATIN	OR	97062
22500 SW PINTO DR	TUALATIN	OR	97062
23535 SW 82ND AVE	TUALATIN	OR	97062
8795 SW STONO CT	TUALATIN	OR	97062
25935 NE NORTH VALLEY RD	NEWBERG	OR	97132
9355 SW IOWA DR	TUALATIN	OR	97062
22645 SW 94TH TER	TUALATIN	OR	97062
9155 SW IOWA DR	TUALATIN	OR	97062
PO BOX 829	TUALATIN	OR	97062
9150 SW STONO DR	TUALATIN	OR	97062
8945 SW IOWA DR	TUALATIN	OR	97062
22625 SW 87TH PL	TUALATIN	OR	97062
9080 SW IOWA DR	TUALATIN	OR	97062
PO BOX 2594	TUALATIN	OR	97062
9390 SW SKOKOMISH LN	TUALATIN	OR	97062
8890 SW IOWA DR	TUALATIN	OR	97062
22690 SW VERMILLION DR	TUALATIN	OR	97062
8838 SW STONO DR	TUALATIN	OR	97062
22835 SW 90TH PL	TUALATIN	OR	97062
8891 SW IOWA DR	TUALATIN	OR	97062
9405 SW PALOUSE LN	TUALATIN	OR	97062
22570 SW MANDAN DR	TUALATIN	OR	97062
9360 SW IOWA DR	TUALATIN	OR	97062
22755 SW MANDAN DR	TUALATIN	OR	97062
22635 SW MANDAN DR	TUALATIN	OR	97062
PO BOX 1667	LAKE OSWEGO	OR	97035
8870 SW STONO DR	TUALATIN	OR	97062
22980 SW VERMILLION	TUALATIN	OR	97062
22665 SW MANDAN DR	TUALATIN	OR	97062
23685 SW 82ND AVE	TUALATIN	OR	97062
15309 NW DECATUR WAY	PORTLAND	OR	97229
22880 SW MANDAN DR	TUALATIN	OR	97062
22535 SW 94TH TER	TUALATIN	OR	97062
23365 SW BOONES FERRY RD	TUALATIN	OR	97062
9360 SW SKOKOMISH LN	TUALATIN	OR	97062
22795 SW 92ND PL	TUALATIN	OR	97062
22810 SW 93RD TER	TUALATIN	OR	97062
22685 SW 94TH TER	TUALATIN	OR	97062
8878 SW STONO DR	TUALATIN	OR	97062
14193 NW MEADOWRIDGE DR	PORTLAND	OR	97229
22560 SW 94TH TER	TUALATIN	OR	97062
23100 SW 82ND AVE	TUALATIN	OR	97062
8815 SW STONO DR	TUALATIN	OR	97062
23405 SW BOONES FERRY RD	TUALATIN	OR	97062
24195 SW 82ND	TUALATIN	OR	97062
8883 SW IOWA DR	TUALATIN	OR	97062
22780 SW 93RD TER	TUALATIN	OR	97062
8675 SW STONO DR	TUALATIN	OR	97062
22530 SW 93RD TER	TUALATIN	OR	97062
22985 SW 82ND	TUALATIN	OR	97062
8885 SW STONO DR	TUALATIN	OR	97062
22840 SW 90TH PL	TUALATIN	OR	97062
9270 SW STONO DR	TUALATIN	OR	97062
22530 SW MANDAN DR	TUALATIN	OR	97062
PO BOX 1310	SHERWOOD	OR	97140
PO BOX 691	WHITE SALMON	WA	98672
9370 SW STONO DR	TUALATIN	OR	97062

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ORLANDINI ANTHONY J & ORLANDINI JUDY R
O'NEAL DANNY F & O'NEAL JONI L
OLIVERA APOLINAR & OLIVERA DEBBIE & WHITWORTH DAVID ET AL
ODOMS LIVING TRUST
NOYES PATRICK A & THOMPSON CAMILLIA M
NORWOOD HEIGHTS OWNERS OF LOTS 11 13-24
NORWOOD HEIGHTS OWNERS OF LOTS 30 32-42
NORTH DAVID P & NORTH BARBARA
NGUYEN KHANH T & FONG TODD P
NEWTON KYLE C & NEWTON HAILEY R
NEWBERRY GARY B & THOMPSON DONNA L
NEULEIB TAMI R
NELSON MICHAEL D & NELSON ASHLEY K
NELSON KIRIN H
NELL ZACHARY D & NELL KENDRA
NEILL RACHEL & HUSUM BRENT
NEARY TIMOTHY & NEARY LUCY
MUSIAL LUKE & MUNSEY VICTORIA
MURPHY MICHAEL F & OLSON-MURPHY ANTONETTE K
MUELLER RICHARD II & MUELLER MICHELLE
MUD ROOM LLC
MOYES DUSTIN R & MOYES CAROL L
MOTT LINDA L LIV TRUST
MOSHOFSKY JOHN & MOSHOFSKY GINGER
MORELAND BEVERLY H & MORELAND BEVERLY H LIV TRUST
MOORE DAVID C & MOORE TAMMY
MOLLER THERESA
MILLER BARBRA C
MILLER CAROLE D LIV TRUST
MIKULA KATERINA
MICHELS ELIZABETH A
MICHAEL SCOTT CURTIS & MICHAEL TINA FRANCINE
MENES MARK A
MENESES VIRGINIA & VALENCIA DIEGO
MCREYNOLDS CHRIS & MCREYNOLDS AUDREY
MCNUTT SCOTT M JR & MCNUTT KATRIN M
MCMANUS HEIDI
MCLEOD TRUST
MCLAUGHLIN NATHANIEL ANDREW & MCLAUGHLIN AREENA DEVI
MCKEAN AMY & MCKEAN RAYMOND
MCKEAN JOHN R & MCKEAN LINDA L
MCGRADY ANDREA M
MCGILCHRIST STEPHEN R & NYSTROM-GERDES ELIZABETH R
MCDONOUGH JOHN MICHAEL & MCDONOUGH MAUREEN CLARE
MCCORMIC KIMBERLEY A
MCCALEB KEVIN L
MCALLISTER DENNIS C & MCALLISTER RAGNHILD
MATHERS LES D & MATHERS CHRIS A
MAST MARVIN R & JELI CARLENE M
MARTIN FAMILY TRUST
MARTIN GARY D & LUMLEY-MARTIN MEGAN B
MARLEAU ALLISON P
MARK HENRY & MARK CHRISTINE
MARBLE AMANDA L
MALONEY CHERYL L
MALONSON GARY D & MALONSON MARSHA L
MAIER DARLA & MAIER THOMAS
MADONDO JEFFRET & JOHNSON MORGAN IRENE
MACCLANATHAN MELANIE & MACCLANATHAN MICHAEL
LYNCH LARRY L & LYNCH SUZANNE M
LUSCOMBE BRUCE C TRUST

8555 SW MARICOPA DR	TUALATIN	OR	97062
22625 SW 94TH TER	TUALATIN	OR	97062
22640 SW VERMILLION DR	TUALATIN	OR	97062
PO BOX 2446	TUALATIN	OR	97062
22810 SW 92ND PL	TUALATIN	OR	97062
		OR	00000
		OR	00000
8818 SW STONO DR	TUALATIN	OR	97062
23605 SW 82ND AVE	TUALATIN	OR	97062
8814 SW STONO DR	TUALATIN	OR	97062
9295 SW IOWA DR	TUALATIN	OR	97062
9395 SW SKOKOMISH LN	TUALATIN	OR	97062
22590 SW VERMILLION DR	TUALATIN	OR	97062
8826 SW STONO DR	TUALATIN	OR	97062
8842 SW STONO DR	TUALATIN	OR	97062
9350 SW STONO DR	TUALATIN	OR	97062
22780 SW 92ND PL	TUALATIN	OR	97062
22825 SW 94TH TER	TUALATIN	OR	97062
8870 SW IOWA DR	TUALATIN	OR	97062
22660 SW 93RD TER	TUALATIN	OR	97062
1320 SW TURNER RD	WEST LINN	OR	97068
8765 SW STONO DR	TUALATIN	OR	97062
22525 SW MANDAN DR	TUALATIN	OR	97062
9310 SW SKOKOMISH LN	TUALATIN	OR	97062
753 KOTZY AVE S	SALEM	OR	97302
8990 SW STONO DR	TUALATIN	OR	97062
22825 SW 93RD TER	TUALATIN	OR	97062
9315 SW IOWA DR	TUALATIN	OR	97062
8834 SW STONO DR	TUALATIN	OR	97062
9330 SW PALOUSE LN	TUALATIN	OR	97062
22590 SW 93RD TER	TUALATIN	OR	97062
8580 SW MARICOPA DR	TUALATIN	OR	97062
9280 SW STONO DR	TUALATIN	OR	97062
22915 SW MANDAN DR	TUALATIN	OR	97062
22720 SW 87TH PL	TUALATIN	OR	97062
22565 SW MANDAN DR	TUALATIN	OR	97062
22820 SW 90TH PL	TUALATIN	OR	97062
23465 SW BOONES FERRY RD	TUALATIN	OR	97062
8960 SW IOWA DR	TUALATIN	OR	97062
22685 SW VERMILLION DR	TUALATIN	OR	97062
21370 MAKAH CT	TUALATIN	OR	97062
9260 SW SKOKOMISH LN	TUALATIN	OR	97062
22720 SW 93RD TER	TUALATIN	OR	97062
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8882 SW STONO DR	TUALATIN	OR	97062
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23050 SW 82ND AVE	TUALATIN	OR	97062
23845 SW BOONES FERRY RD	TUALATIN	OR	97062
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8989 SW STONO DR	TUALATIN	OR	97062
22820 SW VERMILLION DR	TUALATIN	OR	97062
22955 SW VERMILLION DR	TUALATIN	OR	97062
9340 SW PALOUSE LN	TUALATIN	OR	97062
22795 SW 94TH TER	TUALATIN	OR	97062
22575 SW 94TH TER	TUALATIN	OR	97062
23185 SW 82ND AVE	TUALATIN	OR	97062
22605 SW 87TH PL	TUALATIN	OR	97062

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LUEDERS TANNER P & LUEDERS TONJA A
LUCINI JOHN W & GRACE N FAM TRUST
LIMING JEANNE E
LILLEY KRISTEN M & LILLEY NICHOLAS L
LEMON CHASE ANTHONY & LEMON HEIDI
LEE WILLIAM B REV LIV TRUST
LEE FLORENCE & YAM WAI LUN
LEE DAVID O & RAPISARDA DEIDRE
LATHROP JEFFREY A & LATHROP MARIA M
LARSON ANDREW & WISEMAN LEAH DANIELLE
LARA SALVADOR
LANDCASTER DEVELOPMENT CORPORATION
LANDCASTER DEVELOPMENT CORPORATION
LAM DAVID & NGUYEN BETH NGOC BICH
LACEY LONNIE D & LACEY LORI A
KNUDSON THOMAS & KNUDSON LINDA SALYERS
KLOSSNER ANDREW J
KLEPICH DAVID & KLEPICH BRITTANI
KLAUSS CYDNI M
KIS JUAN ANTONIO & KIS CLAUDIA
KINNAMAN JEFFREY B & KINNAMAN JENNIFER D
KIMMEL RONALD A & KIMMEL REBECCA A
KERNER ROBERT
KERN KEVIN
KENNEDY MICHAEL C & KENNEDY LINDA M
KARIS ALEXANDER DONALD
KALATEH EBRAHIM SHIRDOOST & DOOST NOOSHIN NEZAM
JORGENSEN HEATHER & JORGENSEN COLBIE
JOHNSON FLETCHER & JOHNSON CHRISTINA
JENKINS PHILIP D & JENKINS KRISTEN K
JASTRAM WILLIAM E & JASTRAM CHRISTINE A
JACOBS JEFFREY W
INGRAM CLIFFORD KEITH & INGRAM ELISABETH JOY
HYRE TIMOTHY R & HYRE ANNILEE D
HUMPHREY MARGIE LIV TRUST
HUMPHREY SUSAN E
HUALA ROBIN PATRICK
HORIZON COMMUNITY CHURCH
HOOVER DAN M
HOLDBROOK-DADSON DENISE
HODGE KENNETH M
HILDRETH TYRONE MACGREGOR & HILDRETH SHANA LYNNE
HIGASHI DUSTIN L & SANTORO ANGELA C
HICKOK TODD J & HICKOK MOLLY J
HEYER TRUST
HERTZ PAULA D
HERRERA FERNANDO & HERRERA MARIA D
HERNANDEZ KIMBERLY A
HEIRONIMUS JULIE A & VALLECK GEORGE D
HEINZE JOINT TRUST
HAUDBINE PATRICK E & HAUDBINE DELEE H
HATCHER THOMAS W & HATCHER ELIZABETH A
HARRISON LIV TRUST
HANAWA IWAO & HANAWA LAURIE
HAMM STEVEN & HAMM SANDRA
HAMILTON JAMES & HAMILTON KRISTIN
HAMILTON GEORGE & ALICE TRUST
HALL SCOTT & HALL BETH
GUERRA FILEMON M JR & QUIRANTE MALINDA
GRIFFITH DWIGHT A & GRIFFITH H KAY
GREEN JUSTIN J

22650 SW MANDA DR	TUALATIN	OR	97062
23677 SW BOONES FERRY RD	TUALATIN	OR	97062
9380 SW SKOKOMISH LN	TUALATIN	OR	97062
22800 SW 89TH PL	TUALATIN	OR	97062
8940 SW IOWA DR	TUALATIN	OR	97062
37301 28TH AVE S UNIT 65	FEDERAL WAY	WA	98003
8822 SW STONO DR	TUALATIN	OR	97062
24245 SW BOONES FERRY RD	TUALATIN	OR	97062
9265 SW IOWA DR	TUALATIN	OR	97062
22845 SW 94TH TER	TUALATIN	OR	97062
22845 SW 93RD TER	TUALATIN	OR	97062
6770 SW CANYON DR	PORTLAND	OR	97225
6770 SW CANYON DR	PORTLAND	OR	97225
8700 SW STONO DR	TUALATIN	OR	97062
22665 SW 94TH TER	TUALATIN	OR	97062
8725 SW STONO DR	TUALATIN	OR	97062
8854 SW STONO DR	TUALATIN	OR	97062
22545 SW MANDAN DR	TUALATIN	OR	97062
22635 SW 87TH PL	TUALATIN	OR	97062
22615 SW 93RD TER	TUALATIN	OR	97062
8780 SW STONO DR	TUALATIN	OR	97062
23605 SW BOONES FERRY RD	TUALATIN	OR	97062
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22735 SW 87TH PL	TUALATIN	OR	97062
22930 SW MANDAN DR	TUALATIN	OR	97062
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9375 SW STONO DR	TUALATIN	OR	97062
9365 SW STONO DR	TUALATIN	OR	97062
9240 SW STONO DR	TUALATIN	OR	97062
9015 SW IOWA DR	TUALATIN	OR	97062
9360 SW PALOUSE LN	TUALATIN	OR	97062
22785 SW 87TH PL	TUALATIN	OR	97062
22840 SW VERMILLION DR	TUALATIN	OR	97062
22820 SW 92ND PL	TUALATIN	OR	97062
8801 SW STONO DR	TUALATIN	OR	97062
14607 NE 57TH ST	BELLEVUE	WA	98007
PO BOX 2690	TUALATIN	OR	97062
8993 SW STONO DR	TUALATIN	OR	97062
9330 SW SKOKOMISH LN	TUALATIN	OR	97062
9235 SW STONO DR	TUALATIN	OR	97062
9355 SW QUINAULT LN	TUALATIN	OR	97062
22895 SW MANDAN DR	TUALATIN	OR	97062
23855 SW BOONES FERRY RD	TUALATIN	OR	97062
22775 SW VERMILLION DR	TUALATIN	OR	97062
22900 SW MANDAN DR	TUALATIN	OR	97062
9360 SW STONO DR	TUALATIN	OR	97062
22500 SW MANDAN DR	TUALATIN	OR	97062
22710 SW 90TH PL	TUALATIN	OR	97062
8070 SW LAUREL ST	PORTLAND	OR	97225
9215 SW STONO DR	TUALATIN	OR	97062
22645 SW VERMILLION DR	TUALATIN	OR	97062
8976 SW STONO DR	TUALATIN	OR	97062
3528 CHEROKEE CT	WEST LINN	OR	97068
22725 SW VERMILLION DR	TUALATIN	OR	97062
9400 IOWA DR	TUALATIN	OR	97062
22740 SW 87TH PL	TUALATIN	OR	97062
9065 SW STONO DR	TUALATIN	OR	97062
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22905 SW VERMILLION DR	TUALATIN	OR	97062
8560 SW MARICOPA DR	TUALATIN	OR	97062

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GORGER MOLLY J TRUST
GOFORTH NATHAN L & TAAFFE JULIA C
GLASS BRIAN D & GLASS LEAH M
GLAESER CHARLES W & GLAESER CHRISTA M
GILCHRIST BEVERLY & GILCHRIST ROLAND T
GILBERT CHRISTOPHER S & GILBERT TAYLOR A
GIACCHI ROBYN M
GHODS SHAWN M & GHODS JENNA N
GEORGE TIMOTHY P & GEORGE BETHANY
GENSLER KRISTOPHER & GENSLER MARIAH
GARIBAY JAIME
GAMACHE ROBERT R & GAMACHE CHERI M
GALVER ROBERTO & GALVER PATRICIA BYRNE
FULLER ERIC M & FULLER XIAOYAN
FRY ALBERTA A TRUST
FRONIUS JOHN A & FRONIUS SUSAN A
FRIBLEY SARAH E & FRIBLEY CHAD C
FRENCH RODERICK LEE & FRENCH THERESE LYNN
FRAZIER FAMILY LLC
FRAZIER JOHN D IV & FRAZIER WANDA R
FRAVEL LINDA S
FRANKS TERRENCE D
FRANCIS FRANK J & FRANCIS HELEN MARIE
FRANCIS KATHLEEN & FRANCIS DAN
FOSSE PATRICIA J & FOSSE RANDY C
FORCE ROBERT B & FORCE JEANETTE M
FINDERS DEBRA P
FEUCHT DANIEL & BEVERLY LIV TRUST
FAST JEFFREY & FAST TIFFANY
FADLING JULIE H
ESZLINGER ERIC & ESZLINGER NATASHA
ERWERT EMILY
ERDMAN PAUL & ERDMAN PAMALA B
ENNIS MARK & ENNIS BARBARA
EDWARDS DANIELLE
EDELINE JENNIFER A & EDELINE SEAN M
EAKINS EILEEN G
DUNN PATRICK P & DUNN CLARA I RUSINQUE
DUFFIELD RICHARD & HELFER SUZANNE
DOW PETER J REV TRUST & SHERFY JENNIFER L REV TRUST
DOSS ANDREA & DOSS BRANDON
DITTMAN ADAM H & DITTMAN ELIZABETH A C
DERIENZO NICHOLAS C & DERIENZO COURTNEY LEIGH
DEMPSTER MICHAEL M
DEARDORFF CRAIG S & DEARDORFF ALBERTA
DAVIS JASON WAYNE
DAVIS JAMES HAYES & BRANSON-DAVIS NESHIA
DARLING LANCE F
CURTHOYS CAROL ANN REV LIV TRUST
CRUZ ALEJANDRO FRANCISCO
CRONKRITE ERIK
CRISP TONI K
CRANSTON MICHAEL S
COOPER JULIE ANN LIV TRUST
CONFER ANDREW B
COMMUNITY PARTNERS FOR AFFORDABLE HOUSING
COBB DANIEL Z & COBB ROSA
CLARK ROY H
CHRISTENSEN STANFORD DEE & CAROL MAE REV INTERVIVOS TRUST
CHRISTENSEN MICHAEL A & CHRISTENSEN JAMIE L
CHILDS ROBERT M & CHILDS MARY J

PO BOX 230725	TIGARD	OR	97281
22755 SW 90TH PL	TUALATIN	OR	97062
8900 SW SWEEK DR #537	TUALATIN	OR	97062
8955 SW IOWA DR	TUALATIN	OR	97062
9310 SW IOWA ST	TUALATIN	OR	97062
22680 SW 87TH PL	TUALATIN	OR	97062
8900 SW IOWA DR	TUALATIN	OR	97062
22815 SW 89TH PL	TUALATIN	OR	97062
9335 SW IOWA DR	TUALATIN	OR	97062
8540 SW MARICOPA DR	TUALATIN	OR	97062
22555 SW 94TH TER	TUALATIN	OR	97062
22770 SW VERMILLION DR	TUALATIN	OR	97062
22995 SW VERMILLION DR	TUALATIN	OR	97062
9365 SW QUINAULT LN	TUALATIN	OR	97062
9175 SW STONO DR	TUALATIN	OR	97062
22650 SW 87TH PL	TUALATIN	OR	97062
9005 SW STONO DR	TUALATIN	OR	97062
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22830 SW 89TH PL	TUALATIN	OR	97062
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9365 SW SKOKOMISH	TUALATIN	OR	97062
22730 SW 90TH PL	TUALATIN	OR	97062
9130 SW IOWA DR	TUALATIN	OR	97062
9345 SW SKOKOMISH LN	TUALATIN	OR	97062
22925 SW MANDAN DR	TUALATIN	OR	97062
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22760 SW 93RD TERR	TUALATIN	OR	97062
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22755 SW 87TH PL	TUALATIN	OR	97062
22830 SW MANDAN DR	TUALATIN	OR	97062
22595 SW 93RD TER	TUALATIN	OR	97062
9180 SW STONO DR	TUALATIN	OR	97062
23395 SW 82ND AVE	TUALATIN	OR	97062
22865 SW 94TH TER	TUALATIN	OR	97062
8879 SW IOWA DR	TUALATIN	OR	97062
9270 SW SKOKOMISH LN	TUALATIN	OR	97062
9315 SW PALOUSE LN	TUALATIN	OR	97062
9380 SW IOWA DR	TUALATIN	OR	97062
8845 SW STONO DR	TUALATIN	OR	97062
9390 SW IOWA DR	TUALATIN	OR	97062
22575 SW 87TH PL	TUALATIN	OR	97062
PO BOX 23206	TIGARD	OR	97281
22770 SW 89TH PL	TUALATIN	OR	97062
9295 SW PALOUSE LN	TUALATIN	OR	97062
8980 SW STONO DR	TUALATIN	OR	97062
23725 SW 82ND AVE	TUALATIN	OR	97062
22705 SW VERMILLION DR	TUALATIN	OR	97062

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CHEN RICHARD & CHEN LENA
CHEN RICHARD & CHEN LENA
CHAUSSE PETER L & CHAUSSE PAULINA
CHASE HARRY M & CHASE CATHY LEE
CHAND PARBIN
CHAN JOSEPH L
CHAN CHEUK YEE CHAN REVOC LIV TRUST
CHAMPAGNE PATRICK & ROY CELINE
CHAMBERLAND MATHEW & CHAMBERLAND JAMES W
CHAMBERLAIN JOHN & CHAMBERLAIN DEBRA
CHAMBERLAIN JOHN & CHAMBERLAIN DEBRA
CHAMBERLAIN JOHN & CHAMBERLAIN DEBRA
CHAMBERLAIN JOHN & CHAMBERLAIN DEBRA
CHAMBERLAIN JOHN & CHAMBERLAIN DEBRA
CHAMBERLAIN JOHN & CHAMBERLAIN DEBRA
CHAMBERLAIN JOHN & CHAMBERLAIN DEBRA
CHAMBERLAIN JOHN & CHAMBERLAIN DEBRA
CHAMBERLAIN PARTNERS LLC
CARNS STEVEN C
CARLSON RICHARD
CARDENAS FERNANDO
CARBAJAL PEDRO & CARBAJAL REGINA
CAMPBELL ANGELA R & CAMPBELL CHRISTOPHER A
CALVANO FAMILY TRUST
CALKINS MICHAEL & CALKINS DIANE
CALDERON CAMIE M
CAIS CARLY J
BURNS DANIEL D & KRILL DEANN R
BURCHFIEL LARRY & BURCHFIEL DEBORAH
BUNCE MICHAEL R REVOC LIV TRUST & BUNCE DEBORAH J REVOC LIV TRUST
BUHAY JASON & BUHAY MICHELLE
BRECK KOLTE TRISTON & BEATTIE DANIELLE NICOLE
BRASHEAR GREGORY A
BRACKNEY CHRIS
BOX MICHAEL L & BOX KATIE M
BOSKET JOHN A & BOSKET JULIE L
BOELL DONALD B & BOELL PATRICIA J
BOCCI JAMES A & BOCCI JULIA A
BLACK JENNIFER O & BLACK DAVID O JR
BIEBERDORF JENNIFER E & BIEBERDORF JEREMY
BENNETT JASON M & MCALEER MARGUERITE T
BEMROSE HEATHER LYNN
BELL JAMES M & BELL EVA J
BELL REV TRUST
BEIKMAN STEPHEN & BEIKMAN MONIQUE
BEEBE BRENT E & BEEBE SANDRA L
BEDIENT SONYA & GOUY PHIL
BECKSTEAD BRIAN A & BECKSTEAD ZERELDA G
BECKER SUSAN
BEAR ALISA ANN TRUST
BAZANT CHRISTINE LEE & BAZANT JOHN JOSEPH
BAVARO EMILY EVELYN & BAVARO JOSHUA
BANKS LANDON & BANKS MIRANDA
BADARACCO ERIN
BACA GREGORY R & BACA ELIZABETH R
BABCOCK GAYLON
AUTUMN SUNRISE LLC
AUTUMN SUNRISE LLC
AUTUMN SUNRISE LLC
AUTUMN SUNRISE LLC
AUTUMN SUNRISE LLC

PO BOX 1551	LAKE OSWEGO	OR	97035
PO BOX 1551	LAKE OSWEGO	OR	97035
22920 SW 82ND AVE	TUALATIN	OR	97062
8799 SW STONO DR	TUALATIN	OR	97062
22600 SW MANDAN DR	TUALATIN	OR	97062
23156 BLAND CIR	WEST LINN	OR	97068
11531 SE FLAVEL ST	PORTLAND	OR	97266
8880 SW IOWA DR	TUALATIN	OR	97062
8975 SW IOWA DR	TUALATIN	OR	97062
9000 SW GREENHILL LN	TUALATIN	OR	97062
9000 SW GREENHILL LN	TUALATIN	OR	97062
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10340 SW TUALATIN RD	TUALATIN	OR	97062
9335 SW QUINAULT LN	TUALATIN	OR	97062
11105 BERRY RD	VALLEY CENTER	CA	92082
9340 SW QUINAULT LN	TUALATIN	OR	97062
8925 SW IOWA DR	TUALATIN	OR	97062
22910 SW MANDAN DR	TUALATIN	OR	97062
22760 SW 90TH PL	TUALATIN	OR	97062
8890 SW STONO DR	TUALATIN	OR	97062
22735 SW 92ND PL	TUALATIN	OR	97062
9340 SW STONO DR	TUALATIN	OR	97062
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8995 SW IOWA DR	TUALATIN	OR	97062
8886 SW STONO DR	TUALATIN	OR	97062
9405 SW QUINAULT LN	TUALATIN	OR	97062
8525 SW MARICOPA DR	TUALATIN	OR	97062
36449 HWY 34	LEBANON	OR	97355
22940 SW VERMILLION DR	TUALATIN	OR	97062
22850 SW 93RD TER	TUALATIN	OR	97062
8456 SW MOHAWK ST	TUALATIN	OR	97062
16869 SW 65TH AVE #387	LAKE OSWEGO	OR	97035
8680 SW STONO DR	TUALATIN	OR	97062
8840 SW HOLLY LN	WILSONVILLE	OR	97070
8840 SW HOLLY LN	WILSONVILLE	OR	97070
8840 SW HOLLY LN	WILSONVILLE	OR	97070
8840 SW HOLLY LN	WILSONVILLE	OR	97070
8840 SW HOLLY LN	WILSONVILLE	OR	97070

2S135D000800
2S135D000900
2S135AC09400
2S135AD08000
2S135AD11000
2S135AC07800
2S136BC02000
2S135AC07700
2S135AC10900
2S135AD09300
3S102B000106
2S135AC03200
2S135AC08100
2S135CD00100
2S135AC01600
2S135AD10600
2S135AD03900
2S135CD00300

AUTUMN SUNRISE LLC
AUTUMN SUNRISE LLC
AUSTIN MICHAEL P & AUSTIN ALLISON M
AUST JOSEPHINE A
AUGEE JOEL L & AUGEE HEIDI M S
ATKINS DANIEL J & ATKINS DAWNITA G
AROZA EMMANUEL E
ARCIGA MARCO A & ARCIGA VIRGINIA L
ARCHULETA JOHN L & ARCHULETA ELISHA J
ANTHIMIADES GEORGE T & ANTHIMIADES STEPHANIE J
ANGIN JONATHAN & BRIDGET TRUST
ANDERSON SCOTT A & ANDERSON ANDREA N
ANDERSON RICHARD J JR
ALVSTAD RANDALL & ALVSTAD KAREN
ALLISON VICKI R
ALLARD JOHN A & ALLARD KELCIE L
AGORIO DIANA
AGHAZADEH-SANAEI MEHDI & ASIAEE NAHID

8840 SW HOLLY LN	WILSONVILLE	OR	97070
8840 SW HOLLY LN	WILSONVILLE	OR	97070
9325 SW IOWA DR	TUALATIN	OR	97062
8846 SW STONO DR	TUALATIN	OR	97062
8905 SW IOWA DR	TUALATIN	OR	97062
22570 SW 93RD TER	TUALATIN	OR	97062
17084 SW LYNNLY WAY	SHERWOOD	OR	97140
22550 SW 93RD TER	TUALATIN	OR	97062
9385 SW SKOKOMISH LN	TUALATIN	OR	97062
8735 SW STONO DR	TUALATIN	OR	97062
PO BOX 2413	TUALATIN	OR	97062
22825 SW 92ND PL	TUALATIN	OR	97062
22630 SW 93RD TER	TUALATIN	OR	97062
23515 SW BOONES FERRY RD	TUALATIN	OR	97062
8994 SW STONO DR	TUALATIN	OR	97062
8885 SW IOWA DR	TUALATIN	OR	97062
22790 SW 87TH PL	TUALATIN	OR	97062
23745 SW BOONES FERRY RD	TUALATIN	OR	97062

Exhibit F: CWS Service Provider Letter

Clean Water Services
Our commitment is clear.

CWS File Number
21-001425

Service Provider Letter

This form and the attached conditions will serve as your Service Provider Letter in accordance with Clean Water Services Design and Construction Standards (R&O 19-5, as amended by R&O 19-22).

Jurisdiction:	City of Tualatin	**Review Type:**	Tier 2 Analysis
Site Address / Location:	SW Boones Ferry/SW Norwood Rd Tualatin, OR 97062	**SPL Issue Date:**	June 23, 2021
		SPL Expiration Date:	June 23, 2023

Applicant Information:		**Owner Information:**	
Name	SONYA TEMPLETON	Name	DAVID FORCE
Company	AKS ENGINEERING & FORESTRY LLC	Company	LENNAR NORTHWEST INC
Address	12965 SW HERMAN RD SUITE 100 TUALATIN OR 97062	Address	11807 NE 99TH STREET, SUITE 1170 VANCOUVER WA 98682
Phone/Fax	(503) 867-2613	Phone/Fax	(360) 258-7879
E-mail:	templetons@aks-eng.com	E-mail:	David.force@lennar.com

Tax lot ID		**Development Activity**
2S135D000100, 400, 401, 500, 501, 600, 800, 900		Autumn Sunrise Residential Subdivision

Pre-Development Site Conditions:

Sensitive Area Present: ☒ On-Site ☒ Off-Site
Vegetated Corridor Width: 50
Vegetated Corridor Condition: Degraded

Post Development Site Conditions:

Sensitive Area Present: ☐ On-Site ☒ Off-Site
Vegetated Corridor Width:

Enhancement of Remaining Vegetated Corridor Required: ☐

Square Footage to be enhanced:

Encroachments into Pre-Development Vegetated Corridor:

Type and location of Encroachment:	Square Footage:
Stormwater Facility (Permanent Encroachment; Mitigation Required)	11,011

Mitigation Requirements:

Type/Location	Sq. Ft./Ratio/Cost
Per R&O 13-12 VC Encroachment Mitigation Requirement Met Through Wetland Mitigation Bank Credit Purchase	

☒ Conditions Attached ☒ Development Figures Attached (2) ☐ Planting Plan Attached ☐ Geotech Report Required

This Service Provider Letter does NOT eliminate the need to evaluate and protect water quality sensitive areas if they are subsequently discovered on your property.

In order to comply with Clean Water Services water quality protection requirements the project must comply with the following conditions:

1. No structures, development, construction activities, gardens, lawns, application of chemicals, uncontained areas of hazardous materials as defined by Oregon Department of Environmental Quality, pet wastes, dumping of materials of any kind, or other activities shall be permitted within the sensitive area or Vegetated Corridor which may negatively impact water quality, except those allowed in R&O 19-5, Chapter 3, as amended by R&O 19-22.
2. Prior to any site clearing, grading or construction the Vegetated Corridor and water quality sensitive areas shall be surveyed, staked, and temporarily fenced per approved plan. During construction the Vegetated Corridor shall remain fenced and undisturbed except as allowed by R&O 19-5, Section 3.06.1, as amended by R&O 19-22 and per approved plans.
3. **Prior to any activity within the sensitive area, the applicant shall gain authorization for the project from the Oregon Department of State Lands (DSL) and US Army Corps of Engineers (USACE). The applicant shall provide Clean Water Services or its designee (appropriate city) with copies of all DSL and USACE project authorization permits.**
4. An approved Oregon Department of Forestry Notification is required for one or more trees harvested for sale, trade, or barter, on any non-federal lands within the State of Oregon.
5. Prior to any ground disturbing activities, an erosion control permit is required. Appropriate Best Management Practices (BMP's) for Erosion Control, in accordance with Clean Water Services' Erosion Prevention and Sediment Control Planning and Design Manual, shall be used prior to, during, and following earth disturbing activities.
6. Prior to construction, a Stormwater Connection Permit from Clean Water Services or its designee is required pursuant to Ordinance 27, Section 4.B.
7. The water quality swale and detention pond shall be planted with Clean Water Services approved native species, and designed to blend into the natural surroundings.
8. **Should final development plans differ significantly from those submitted for review by Clean Water Services, the applicant shall provide updated drawings, and if necessary, obtain a revised Service Provider Letter.**

<u>This Service Provider Letter is not valid unless CWS-approved site plan is attached.</u>

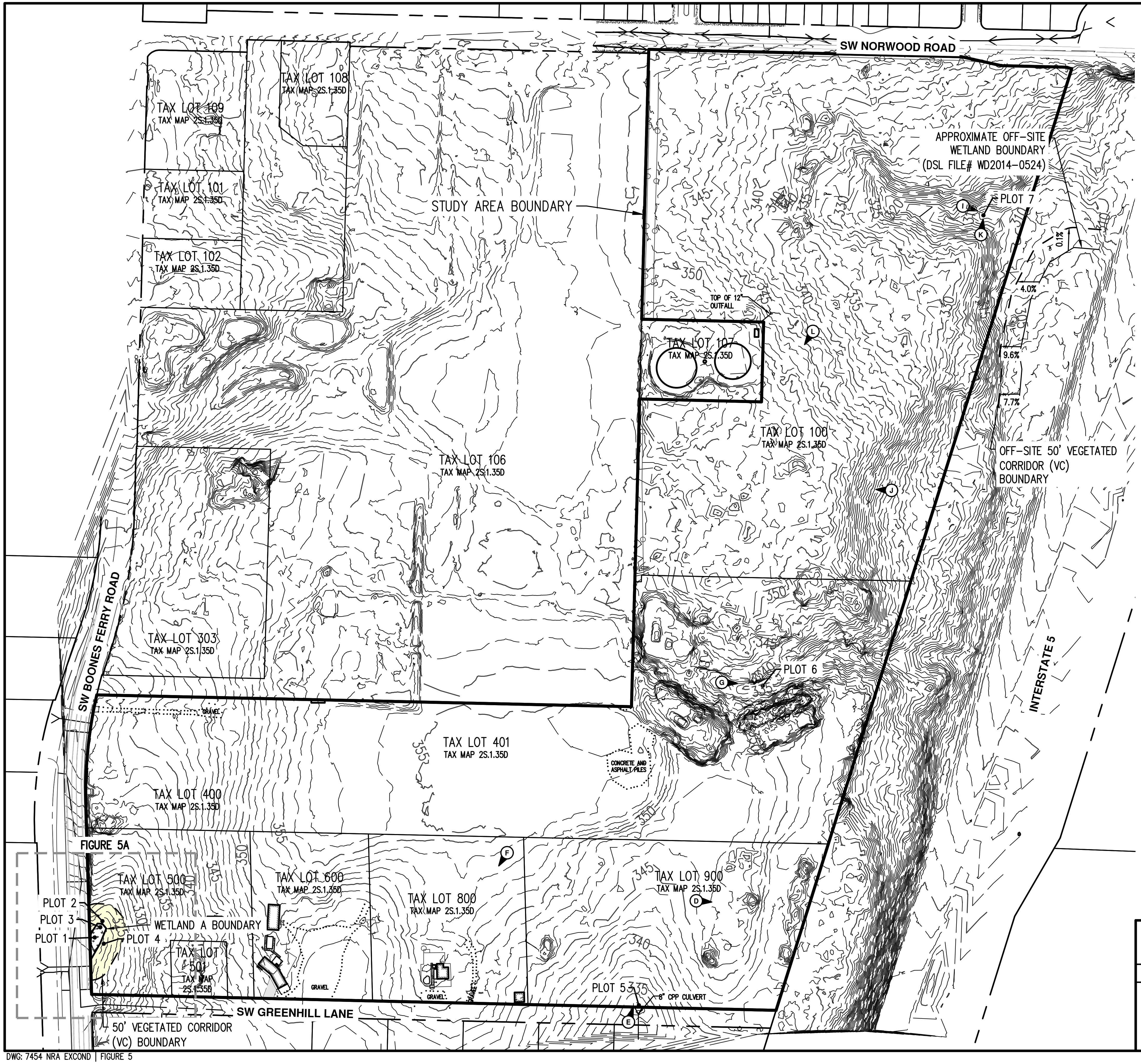
Please call (503) 681-3667 with any questions.

Stacy Benjamin

Stacy Benjamin
Environmental Plan Review

Attachments (2)

CWS FILE NO. 21-001425
Approved
Clean Water Services
FOR ENVIRONMENTAL REVIEW
By SNB Date 6/23/2021
SPL ATTACHMENT 1 OF 2



LEGEND (COLOR COPY):

⌄ ⌄ ⌄	ON-SITE PEM/SLOPE WETLAND A: 1,930 SF± (0.04 ACRES±)
▭	ON-SITE DEGRADED CONDITION VEGETATED CORRIDOR: 11,011 SF± (0.25 ACRES±)
Ⓐ▶	PHOTO LOCATION & ORIENTATION

WETLAND BOUNDARY SHOWN WAS DELINEATED BY AKS ENGINEERING & FORESTRY, LLC ON 02/24/2020 AND WAS LOCATED USING A TRIMBLE GEO 7X HANDHELD GPS RECEIVER WITH SUB-METER ACCURACY.

1-FOOT INTERVAL CONTOURS DERIVED FROM NOAA LIDAR EXISTING CONDITIONS, AND STUDY AREA ARE DERIVED FROM AKS LAND SURVEY WITH SUB-METER ACCURACY.

N

SCALE: 1"=250 FEET

250 0 50 125 250

ORIGINAL PAGE SIZE: 11" x 17"

DATE: 05/24/2021

NATURAL RESOURCES EXISTING CONDITIONS OVERVIEW

AUTUMN SUNRISE NATURAL RESOURCE ASSESSMENT

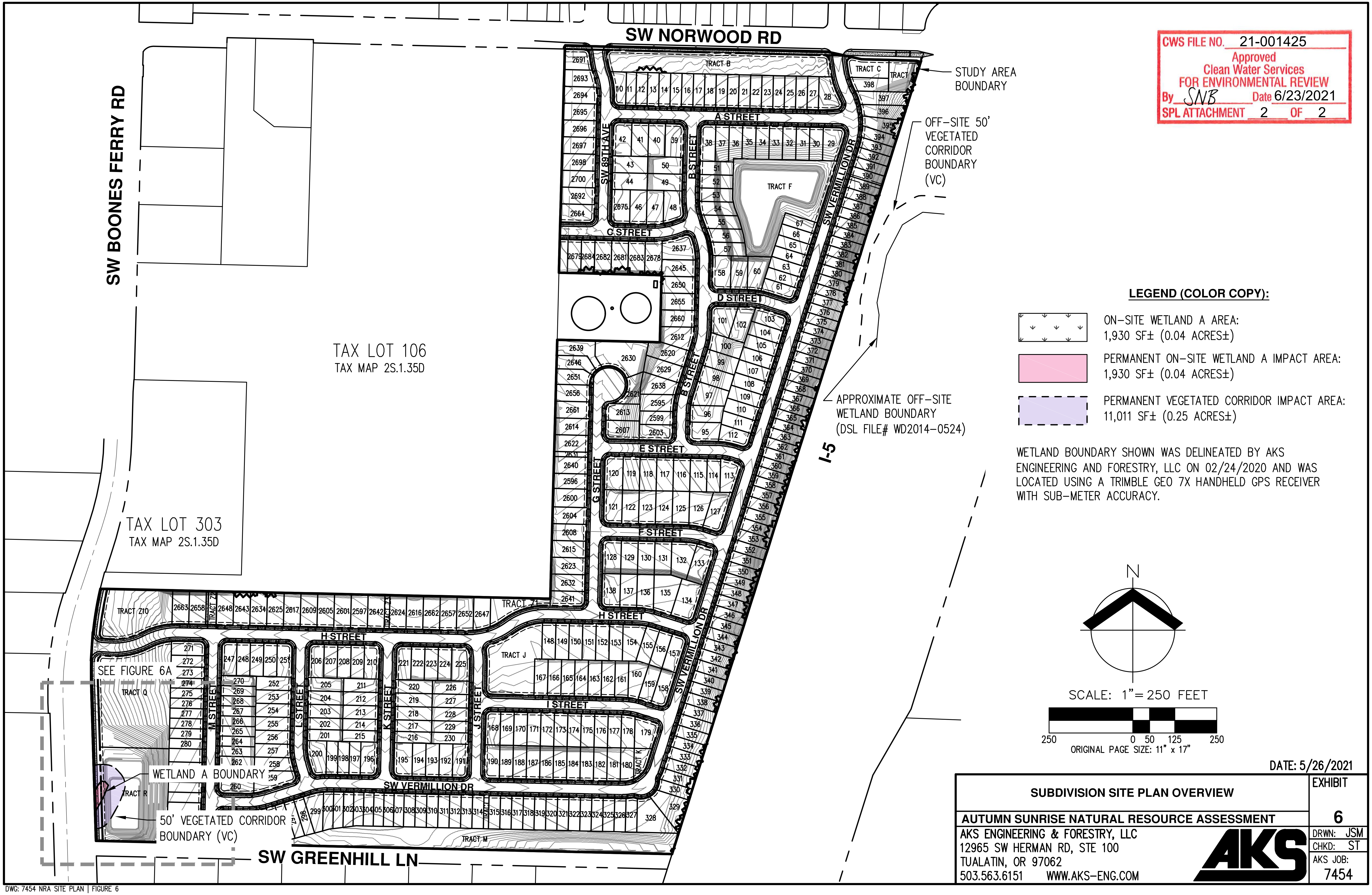
AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
503.563.6151 WWW.AKS-ENG.COM

AKS

FIGURE 5

DRWN: SKT
CHKD: SAR
AKS JOB: 7454

DWG: 7454 NRA EXCOND | FIGURE 5



CWS FILE NO. 21-001425
Approved
Clean Water Services
FOR ENVIRONMENTAL REVIEW
By SNB Date 6/23/2021
SPL ATTACHMENT 2 OF 2

LEGEND (COLOR COPY):

▨	ON-SITE WETLAND A AREA: 1,930 SF± (0.04 ACRES±)
🟪	PERMANENT ON-SITE WETLAND A IMPACT AREA: 1,930 SF± (0.04 ACRES±)
▨	PERMANENT VEGETATED CORRIDOR IMPACT AREA: 11,011 SF± (0.25 ACRES±)

WETLAND BOUNDARY SHOWN WAS DELINEATED BY AKS ENGINEERING AND FORESTRY, LLC ON 02/24/2020 AND WAS LOCATED USING A TRIMBLE GEO 7X HANDHELD GPS RECEIVER WITH SUB-METER ACCURACY.

DATE: 5/26/2021

SUBDIVISION SITE PLAN OVERVIEW

AUTUMN SUNRISE NATURAL RESOURCE ASSESSMENT

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
503.563.6151 WWW.AKS-ENG.COM

EXHIBIT
6

DRWN: JSM
CHKD: ST
AKS JOB:
7454

DWG: 7454 NRA SITE PLAN | FIGURE 6

Exhibit H – Public Comments

Steve Koper

From: Steve Koper
Sent: Wednesday, October 20, 2021 9:50 AM
To: Kim McMillan; Tony Doran
Subject: FW: City of Tualatin File Nos. SB-21-0001 and CUP-21-0001, Autumn Sunrise(the "Application"); Applicant's Extension of 120-Day Period

Tony,

Can you please save a copy of the email in the file?

Thanks,

-Steve

Steve Koper, AICP

Assistant Community Development Director
City of Tualatin | Planning Division
503.691.3028 | www.tualatinoregon.gov

From: Robinson, Michael C. <MRobinson@SCHWABE.com>
Sent: Friday, October 15, 2021 6:22 AM
To: Steve Koper <skoper@tualatin.gov>
Cc: Michael Anders <Mike.Anders@lennar.com>; Alexander Hurley P.E., P.L.S. <alex@aks-eng.com>; Mimi Doukas <MimiD@aks-eng.com>; Melissa Slotemaker <slotemakerm@aks-eng.com>; Darko Simic <darkos@aks-eng.com>; Justin McArthur <mcarthurj@aks-eng.com>
Subject: City of Tualatin File Nos. SB-21-0001 and CUP-21-0001, Autumn Sunrise(the "Application"); Applicant's Extension of 120-Day Period

Dear Mr. Koper,

This office represents the Applicant. The Applicant has authorized me to extend the 120-day period in ORS 227.178(1) for a final decision on the Application by the City. ORS 227.178(5) allows the Applicant to extend the 120-day period.

The 120-day period currently ends on November 27, 2021. The Applicant grants a thirteen day extension of the 120-day period through December 10, 2021. The extension is sufficient to allow the Tualatin Planning Commission to hold its public hearing on November 18, for the City to issue the notice of the Planning Commission decision and for the fourteen day appeal period to elapse.

In the event that the Planning Commission hearing is continued or an appeal of the decision is filed, the Applicant will consider granting additional reasonable extensions of the 120-day period so that the City has sufficient time in which to issue the final decision.

Sent from my iPhone

Oregon
Kate Brown, Governor

Department of Transportation
Region 1 Headquarters
123 NW Flanders Street
Portland, Oregon 97209
(503) 731.8200
FAX (503) 731.8259

October 28, 2021 ODOT #11988

ODOT Response

Project Name: Autumn Sunrise Subdivision	**Applicant:** AKS Engineering & Forestry LLC
Jurisdiction: City of Tualatin	**Jurisdiction Case #:** SB21-0001
Site Address: SW Norwood Rd & I-5 Tualatin, OR	**Legal Description:** 02S 01W 35D **Tax Lot(s):** 00100
State Highway: I 5	**Mileposts:** 287.3

The site of this proposed land use action is in the vicinity of Interstate 5. ODOT has permitting authority for this facility and an interest in ensuring that this proposed land use is compatible with its safe and efficient operation.

Please direct the applicant to the District Contact indicated below to determine permit requirements and obtain application information.

COMMENTS/FINDINGS

ODOT has reviewed the submitted application materials for the proposed Autumn Sunrise residential subdivision. The proposal includes a Conditional Use Permit to allow detached single-family homes in the Medium-Low Density Residential (RML) zone and a Subdivision review for 500 residential lots and two commercial lots.

The submitted application includes a revised Transportation Impact Analysis (TIA) completed by Lancaster Mobley and dated September 20, 2021.According to the updated TIA, the intersection of the I-5 southbound off-ramp and SW Elligsen Road is expected to operate with a volume to capacity (v/c) ratio that exceeds the Oregon Highway Plan (OHP) mobility target of 0.85 for off-ramps during the morning peak hour and during all subsequent scenarios. Furthermore, the TIA refers to the 2018 RTP project (11489) which proposes to construct a second right-turn lane on the southbound off-ramp. Although the project is listed on the RTP financially constrained list, funding for the project has not been committed to date. The RTP project acknowledges that "conditions are currently congested" and suggests that the time period for the improvement is 2028-2040.

Given that the proposed new development contributes traffic volumes to the I-5 southbound off-ramp, ODOT recommends that the proposed development be conditioned to contribute a proportional share to the RTP project. Current and future congestion relief are listed as the primary purpose and objective for the RTP project, which is estimated to cost $1,063,000 (in 2016 dollars). The proposed development's anticipated contribution for the southbound off-ramp movement is estimated at approximately 4.1 % for the 2026 year, the anticipated completion date for phase 4 of the development. Therefore, ODOT recommends that the development be conditioned to contribute the same percentage (4.1%) toward the RTP project.

ODOT has also reviewed the Preliminary Stormwater Report prepared by AKS Engineering & Forestry and dated July 2021. ODOT is satisfied with the findings in the report. Please note that an ODOT Miscellaneous Permit will be required for connection to state drainage facilities.

ODOT RECOMMENDED LOCAL CONDITIONS OF APPROVAL

Permits and Agreements to Work in State Right of Way

☒ An ODOT Miscellaneous Permit is required for connection to state highway drainage facilities. Connection will only be considered if the site's drainage naturally enters ODOT right of way. The applicant must provide ODOT District with a preliminary drainage plan showing impacts to the highway right of way.

A drainage study prepared by an Oregon Registered Professional Engineer is usually required by ODOT if:

1. Total peak runoff entering the highway right of way is greater than 1.77 cubic feet per second; or
2. The improvements create an increase of the impervious surface area greater than 10,758 square feet.

Please send a copy of the Staff Report and/or Notice of Decision including conditions of approval to:

ODOT Region 1 Planning
Development Review
123 NW Flanders St
Portland, OR 97209

ODOT_R1_DevRev@odot.state.or.us

Development Review Planner: Kate Hawkins	503.731.3049 kate.w.hawkins@odot.state.or.us
Traffic Contact: Avi Tayar	503.731.822121 abraham.tayar@odot.state.or.us
District Contact: District 2B	d2bup@odot.state.or.us

Memorandum

VIA E-MAIL

To:	Mr. Mike Anders, Lennar Northwest, Inc.
From:	Michael C. Robinson
Date:	November 15, 2021
Subject:	Autumn Sunrise; Analysis of Legal Basis for Oregon Department of Transportation ("ODOT") Requested Condition of Approval Requiring Proportional Payment for I-5 and SW Elligsen Road Interchange Improvements.

---

1. **Question**.

Can the City of Tualatin (the "City") impose ODOT's requested condition of approval on the subdivision application (the "Application") decision (the "Decision") requiring the Applicant to contribute 4.1% of the estimated construction cost of the future improvements to the I-5 and SW Elligsen Road interchange (the "Interchange") based on the Subdivision's vehicle trips through the Interchange?

2. **Short Answer**.

No, because the impact on the Interchange by the Subdivision's vehicle trips is not relevant to any applicable approval standard or guideline, there is no causal connection between the small number of the Application's vehicle trips through the Interchange, the failure of the Interchange's mobility standard of 0.85 and the failing Interchange is a pre-existing deficiency not caused by the Application.

3. **Relevant Facts**.

The Application will add additional vehicle trips to the Interchange. The ODOT Comment states that the Application's Traffic Impact Analysis (the "TIA") shows that the Interchange will exceed the 1999 Oregon Highway Plan's (the "OHP") mobility standard of 0.85 volume to capacity ("v/c") for the southbound off-ramp (the northwest corner of the interchange) during morning peak hours and "all subsequent scenarios" (it is unclear what ODOT means by the comment in quotation). The Interchange is an unfunded 2018 Regional Transportation project (the "RTP Project"). The Comment notes that the RTP Project states that the Interchange is already congested (a pre-existing deficiency) and that the RTP Project is likely to be constructed between 2026 and 2040, well after the Subdivision's completion. The Comment also states that the Application's vehicle trips will be about 4.1% of the southbound off-ramp vehicle trips and, on this basis, requests that the City impose a condition of approval requiring the Applicant to contribute its proportional share of 4.1% of the RTP Project's estimated cost of $1.063 million. The Comment does not attribute the Interchange's failure to the additional trips from the Subdivision.

The Application is a request for a tentative residential subdivision within the City. The Interchange is located outside of the City and the City's Transportation System Plan (the "TSP") Planning Area (the "Area") boundary because the Interchange is south of the Area's south boundary. TSP Page 2; *See also* TSP Figure 1, Page 13 not showing the Interchange in the TSP's Functional Classification Plan not a Regional Roadway project, TSP Table 9, Page 36 not listed as a Major Arterial, TSP Page 18; and not shown in the Regional Street Urban Upgrades, TSP Table 5, Pages 26 and 29. The Interchange is not part of the City's transportation infrastructure. The Application site is not adjacent to the Interchange and does not require an ODOT approach permit nor any Miscellaneous Permit concerning ODOT right-of-way other than a Miscellaneous Permit for a connection to ODOT's drainage facilities unrelated to the Interchange's capacity.

The Application is a *Limited Land Use decision* because it is a tentative subdivision within the Portland Metropolitan Urban Growth Boundary (the "UGB"). ORS 197.015(12). The Application is not an amendment to the City's land use regulations, the Tualatin Development Code (the "TDC"), or to the Tualatin Comprehensive Plan (the "TCP"). A Limited Land Use decision is subject to ORS 197.195(1) requiring comprehensive plan policies, including the TSP, to be properly incorporated into the TDC before the TCP or the TSP can be applied to the Application. *Oster v. City of Silverton, 79 Or LUBA 447 (2019).* The Application is also a *Needed Housing* application as defined in ORS 197.303(1)(a) and is subject to the clear and objective standards, procedures and conditions requirements in ORS 197.307(4) and (6) and 227.173(2).

The City's notice of public hearing lists the relevant City approval standards and guidelines found in TDC Chapters 32, 33, 36, 41, 51, 73B, 74 and 75 and TCP Chapter 3. The Notice does not list TCP Chapters 8 ("Transportation") or 9 ("Public Facilities and Services," which does not include transportation facilities). The Oregon Transportation Planning Rule (the "TPR"), OAR 660-012-0060, is not applicable to the Application because the Application is not an amendment to the TDC or the TCP.

The OHP is also not an applicable approval standard because OHP Policy 1.F, "Highway Mobility," applies only to post-acknowledgment plan amendments (OHP Page 28) and OHP Policy 1.B, "Land Use and Transportation," only requires coordination between the City and ODOT but coordination is a process whereby the City must allow ODOT to comment on the Application and must consider but is not required to adopt ODOT's recommended condition of approval. ORS 197.015(5), definition of "coordinated" requiring accommodation of the Comment as much as possible but not requiring the City to agree with ODOT.

4. **Analysis of Legal Basis for Condition of Approval.**

The condition can be required based only on either a relevant approval standard or guideline, or a causal connection between the Application and the failure of the mobility standard, neither of which is present in this Application.

A. **TPR and OHP.**

Neither the TPR nor the OHP contain standards that the City may apply to impose the condition of approval. OHP Policy 1.B requires that the City coordinate with ODOT on the Application but does not require a substantive result nor that the City agree with ODOT.

B. **TDC.**

TDC 36.120(4)(a)-(i) contain the approval standards for a tentative subdivision application.

TDC 36.120(4)(a)(ii) applies only to City infrastructure standards. TDC 31.050 defines "City" as the City of Tualatin and thus excludes ODOT facilities from any standard applying to City infrastructure. The City's transportation infrastructure requirements are found in the TSP but the TSP does not include the Interchange because it is not listed in any of the TSP elements and is outside of the TSP Planning Area boundary.

TDC 36.120(4)(c) applies only to City infrastructure and the Interchange is not City infrastructure.

TDC 36.120(4)(d) requires that the street system in and adjacent to the Subdivision conform to the TSP. The Interchange is not adjacent to the Subdivision nor is the term "conforms" clear and objective. No applicable TSP element requires that the Application to demonstrate compliance with the OHP mobility standards.

TDC 36.120(4)(c) applies to the street system adjacent to the Subdivision. The Interchange is not adjacent to the Subdivision.

TDC 36.120(4)(g) requires the Application to mitigate the transportation system consistent with the approved TIA. The transportation system, based on the TSP, does not include the Interchange but even if it does, the TIA does not show that the Subdivision causes the southbound off-ramps to fail since the RTP Project acknowledges that the Interchange is already congested nor does the Comment identify a causal connection between mobility standard failure and the additional vehicle trips from the Subdivision.

C. **TCP.**

TCP Chapter 8 contains no standards that require the Application to mitigate pre-existing conditions at the Interchange.

D. **Summary**.

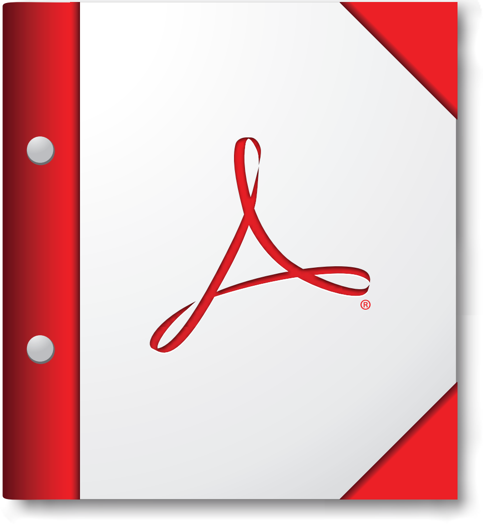
No applicable approval standard or guideline requires that the Application mitigate pre-existing deficiencies at the Interchange which is not a City transportation facility and is not adjacent to the Subdivision and where no relevant ODOT permit is required.

5. **Conclusion**.

The City is not required to include the condition as a condition of approval because ODOT has not identified a relevant legal standard nor a causal connection between the impact of the Application's vehicle trips and the need for the condition of approval.

MCR:jmhi

PDX\136188\267185\MCR\32216731.1



lancaster
mobley

321 SW 4th Ave., Suite 400
Portland, OR 97204
503.248.0313
lancastermobley.com

Memorandum

To: **Kim McMillan, Community Development Director, City of Tualatin**

Copy: **David Force, Lennar**
Mimi Doukas, AKS Engineering & Forestry, LLC

From: **Jennifer Danziger, PE**

Date: **November 19, 2021**

Subject: **Autumn Sunrise – Response to Neary Email Comments Received November 11, 2021**

The attached email was submitted the City of Tualatin listing some concerns about the proposed Autumn Sunrise subdivision. This memorandum addresses some of the concerns raised by Mr. Neary.

Increasing congestion in the area is a concern that many raise when new developments are proposed. The agencies in the Portland metropolitan area work together to develop long-range plans for the transportation facilities to address anticipated growth. These plans specific the classification and size of the major roadway network.

SW Boones Ferry Road is under City of Tualatin jurisdiction north of SW Norwood Road, Washington County jurisdiction from SW Norwood Road to SW Day Road, and ODOT[1] jurisdiction south of SW Day Road. Together, these jurisdictions have planned for the road to be 2 or 3 (with a center refuge) lanes north of the Basalt Creek Parkway Extension and 4 or 5 (with a center refuge) lanes from the extension to the freeway. Most of SW Boones Ferry Road is already at its full width and only the segment between the Basalt Creek Parkway Extension and SW Day Road is planned to have added through lanes in the future but there are no near-term plans to widen this section of the road. Turning lanes may be added at some intersections as the area develops but the through lanes will remain the same.

SW Norwood Road, SW 65th Avenue, SW 82nd Avenue, and SW Frobase Road are all under Washington County jurisdiction. SW Norwood Road is a collector street and is planned to remain as a 2-lane roadway. SW 65th Avenue is designated as an arterial and is planned as a 2- or 3-lane roadway. All portions of these roadways east of I-5 and south of I-205 are outside of the urban growth boundary and will remain rural roads until the boundary changes.

The one significant change in the network will be the construction of the Basalt Creek Parkway Extension[2] from SW Grahams Ferry Road to a connection with SW Boones Ferry Road just south of SW Greenhill Lane. This connection is designed to have a 4- to 5-lane cross section. Washington County expects to begin construction of this project in the summer of 2023 and be completed in the fall of 2024. This improvement will provide the

---

[1] Oregon Department of Transportation

[2] https://www.co.washington.or.us/LUT/TransportationProjects/basalt-creek-parkway-extension.cfm

residents of the Autumn Sunrise subdivision with a route to employment areas in Tualatin and Sherwood and other areas to the northwest that will be faster than traveling along SW Boones Ferry Road.

In addition to planning the long-term transportation network needs, the agencies also establish performance standards for the operation of the system. Within the Portland metropolitan area, these standards allow for significant congestion on the transportation system for a variety of reasons. These include the cost of construction and impacts to existing businesses and residences of continually widening roadways to accommodate new demand as well as a goal to shift more people to other travel modes that don't involve individuals driving a car for every trip made.

The transportation impact analysis (TIA) and supplemental analysis memoranda for Autumn Sunrise were prepared within this framework of planned improvements and agency performance standards. The TIA demonstrates that project can comply with the agency performance standards with some improvements.

The project is required to provide frontage improvements along SW Boones Ferry Road and SW Norwood Road that will add complete the streets to the standards established by the City of Tualatin and Washington County. These improvements will widen travel lanes, add curb and gutter where it's missing, add needed bicycle and pedestrian facilities.

The project will also be required to add a traffic signal at the new access on SW Boones Ferry Road. This signal will allow most of the traffic from the development to access SW Boones Ferry Road without having to use SW Norwood Road. This signal may provide some gaps in the traffic flow that could make turning from SW Norwood Road onto SW Boones Ferry Road easier.

The project cannot address system deficiencies that are beyond its control such as freeway congestion, neighborhood connectivity, or unimproved roadways in other areas of the community. However, all development is required to contribute to the long-term planned improvements to the transportation system through the Transportation Development Tax (TDT). This fee is collected at the time of construction to help pay for capital costs of roads and transit needed to serve new development.

From: Tim N. <imneary@gmail.com>
Sent: Thursday, November 11, 2021 9:40 AM
To: Ext - Planning <Planning@tualatin.gov>
Subject: CUP21-0001 & SB21-0001 Comments

Hello,
ello,

I am unable to attend the planned meeting, but I wanted to submit my comments.

I am concerned about the traffic impact of the proposed subdivision. If the subdivision proceeds, additional traffic solutions will need to be implemented on SW Boones Ferry Rd, as well as SW Norwood Rd, SW 82nd Rd, SW Frobase Rd, and SW 65th.

SW Boones Ferry Rd from SW Iowa South to I5 is already a traffic bottleneck during rush hour times. Traffic on this stretch of Boones Ferry is already high due to the two high schools in close proximity. There are additional times of peak traffic on this road from Amazon delivery vehicles. Industrial traffic impacts the final stretch of Boones Ferry to I5, coming from SW Day Rd. Traffic on SW Boones Ferry between SW Iowa and I5 will significantly worsen with the addition of these homesites, which primarily feed to SW Boones Ferry Rd, if no significant action is taken. In order to better accommodate current traffic needs as well as the traffic needs of the proposed subdivision, I strongly suggest SW Boones Ferry be widened to accommodate 4 lanes of traffic from SW Iowa to Day Rd, and adding a 5th southbound lane from Day Rd to I5. I also believe it will be necessary for a traffic light to be installed at SW Boones Ferry and Norwood Rd.

SW Norwood Rd East to SW 65th will also likely be heavily utilized as an additional route to I5. This will likely significantly increase traffic on SW 82nd and SW Frobase roads, and these roads in particular are unlined and residential, they do not seem prepared to handle an increase in volume.

It may also be necessary to increase traffic lanes on SW 65th from SW Norwood Rd to SW Elligsen Rd to accommodate the increased traffic.

Please share my comments to help develop an effective traffic solution. Thank you.

Tim Neary
Resident of Norwood Heights in Tualatin

M E M O R A N D U M

Date: October 29, 2021

To: Tony Doran, Engineering Associate, City of Tualatin

From: Jackie Sue Humphreys, Clean Water Services (CWS)

Subject: Autumn Sunrise Subdivision, CUP21-0011 and SB21-001

Please include the following comments when writing your conditions of approval:

PRIOR TO ANY WORK ON THE SITE AND PLAT RECORDING

A Clean Water Services (CWS) Storm Water Connection Permit Authorization must be obtained prior to plat approval and recordation. Application for CWS Permit Authorization must be in accordance with the requirements of the Design and Construction Standards, Resolution and Order No. 19-5 as amended by R&O 19-22, or prior standards as meeting the implementation policy of R&O 18-28, and is to include:

a. Detailed plans prepared in accordance with Chapter 2, Section 2.04.

b. Detailed grading and erosion control plan. An Erosion Control Permit will be required. Area of Disturbance must be clearly identified on submitted construction plans. If site area and any offsite improvements required for this development exceed one-acre of disturbance, project will require a 1200-CN Erosion Control Permit. If site area and any offsite improvements required for this development exceed five-acres of disturbance, project will require a 1200-C Erosion Control Permit.

c. Detailed plans showing each lot within the development having direct access by gravity to public storm and sanitary sewer. Construction of the proposed Norwood Pump Station will be required.

d. Provisions for water quality in accordance with the requirements of the above named design standards. Water Quality is required for all new development and redevelopment areas per R&O 19-5, Section 4.04. Access shall be provided for maintenance of facility per R&O 19-5, Section 4.07.6.

e. If use of an existing offsite or regional Water Quality Facility is proposed, it must be clearly identified on plans, showing its location, condition, capacity to treat this site and, any additional improvements and/or upgrades that may be needed to utilize that facility.

f. If private lot LIDA systems proposed, must comply with the current CWS Design and Construction Standards. A private maintenance agreement, for the proposed private lot LIDA systems, needs to be provided to the City for review and acceptance.

g. Show all existing and proposed easements on plans. Any required storm sewer, sanitary sewer, and water quality related easements must be granted to the City.

h. Applicant shall comply with the conditions as set forth in the Service Provider Letter No. 21-001425, dated June 23, 2021.

i. If there is any activity within the sensitive area, the applicant shall gain authorization for the project from the Oregon Department of State Lands (DSL) and US Army Corps of Engineers (USACE). The applicant shall provide Clean Water Services or its designee (appropriate city) with copies of all DSL and USACE project authorization permits.

j. Any proposed offsite construction activities will require an update or amendment to the current Service Provider Letter for this project.

CONCLUSION

This Land Use Review does not constitute CWS approval of storm or sanitary sewer compliance to the NPDES permit held by CWS. CWS, prior to issuance of any connection permits, must approve final construction plans and drainage calculations.

WASHINGTON COUNTY
OREGON

November 19, 2021

To: **Tony Doran - Engineering Associate**

From: **Naomi Vogel - Associate Planner**

RE: Autumn Sunrise Subdivision
City File Number: CUP21-0001 / SB21-0001
County File Number: CP21-919
Tax Map and Lot Number: 2S135D000100/400/401/500/501/600/800/900 & 1S35D000100
Location: SW Boones Ferry Road/SW Norwood Road/SW Greenhill Lane

Washington County Department of Land Use and Transportation has reviewed the above noted development application to subdivide eight (8) existing lots into 400 residential lots for single family homes and townhomes, two commercial lots, and eleven (11) tracts on a 61.17 acre site. Access to the future development will be via three (3) new public streets, two on SW Norwood Road (Collector) and one on SW Boones Ferry Road (Arterial). SW Boones Ferry Road and SW Norwood Road are county-maintained roads.

The applicant submitted a Traffic Impact Analysis dated September 20, 2021 (Lancaster/Mobley) and a supplemental Memorandum dated November 12, 2021 for the proposed development. County Traffic Engineering has reviewed the TIA for compliance with County R&O 86-95 “Determining Safety Improvements for Traffic” and concurs with the findings and recommendations of the TIA and Memo. The traffic mitigation measures have been included in the conditions of approval noted below.

CONDITIONS OF APPROVAL

I. PRIOR TO ISSUANCE OF A PUBLIC IMPROVEMENT PERMIT FOR PHASE I/II BY THE CITY OF TUALATIN:

A. Obtain a Washington County Facility Permit for all public improvements on SW Norwood and SW Boones Ferry Road as noted below.

   1. Submit to Washington County Public Assurance Staff: A completed "Design Option"

form (original copy), City's Notice of Decision (NOD) and County's Letter dated November 19, 2021.

2. **$35,000.00** Administration Deposit

NOTE: The Administration Deposit is a cost-recovery account used to pay for County services provided to the developer, including plan review and approval, field inspections, as-built approval, and permit processing. The Administration Deposit amount noted above is an estimate of what it will cost to provide these services. If, during the project, the Administration Deposit account is running low, additional funds will be requested to cover the estimated time left on the project (at then-current rates per the adopted Washington County Fee Schedule). If there are any unspent funds at project close out, they will be refunded to the applicant. Any point of contact with County staff can be a chargeable cost. If project plans are not complete or do not comply with County standards and codes, costs will be higher. There is a charge to cover the cost of every field inspection. Costs for enforcement actions will also be charged to the applicant.

3. Electronic submittal of engineering plans, geotech/pavement report, engineer's estimate, preliminary sight distance certification and the "Engineer's Checklist" (Appendix 'E' of County Road Standards) for construction of the following public improvements:

Note: Improvements within the ROW may be required to be relocated or modified to permit the construction of public improvements. All public improvements and modifications shall meet current County and ADA standards. Public improvements that do not meet County standards shall submit a design exception to the County Engineer for approval.

SW Norwood Road:

a. Construction of a half-street improvement to a County C-1 standard along the site's frontage of SW Norwood Road. The half-street shall include C-1 pavement width, 6-foot bike lane, gutter/curb and a 12 foot wide multi-use path.

b. Installation of continuous street lighting and conduit along the site's frontage of SW Norwood Road to County standards.

c. Closure of all existing access on SW Norwood Road not approved with this development.

d. Public street access to SW Norwood Road (Vermillion Street/89th Street). Public streets shall align with the public streets located on the north side of SW Norwood Road.

e. Construction access and traffic circulation/control plan.

f. Preliminary Sight Distance Certification and mitigation for access to SW Norwood Road.

II. PRIOR TO ISSUANCE OF A PUBLIC IMPROVEMENT PERMIT FOR PHASE III BY THE CITY OF TUALATIN:

A. Obtain a Washington County Facility Permit for public improvements on SW Boones Ferry Road.

1. Submit to Washington County Public Assurance Staff: A completed "Design Option" form (original copy), City's Notice of Decision (NOD) and County's Letter dated November 19, 2021.

2. **$35,000.00** Administration Deposit / **$25,000.00** Administration Deposit (traffic signal)

NOTE: The Administration Deposit is a cost-recovery account used to pay for County services provided to the developer, including plan review and approval, field inspections, as-built approval, and permit processing. The Administration Deposit amount noted above is an estimate of what it will cost to provide these services. If, during the project, the Administration Deposit account is running low, additional funds will be requested to cover the estimated time left on the project (at then-current rates per the adopted Washington County Fee Schedule). If there are any unspent funds at project close out, they will be refunded to the applicant. Any point of contact with County staff can be a chargeable cost. If project plans are not complete or do not comply with County standards and codes, costs will be higher. There is a charge to cover the cost of every field inspection. Costs for enforcement actions will also be charged to the applicant.

3. Electronic submittal of engineering plans, geotech/pavement report, engineer's estimate and the "Engineer's Checklist" (Appendix 'E' of County Road Standards) for construction of the following public improvements:

Note: Improvements within the ROW may be required to be relocated or modified to permit the construction of public improvements. All public improvements and modifications shall meet current County and ADA standards. Public improvements that do not meet County standards shall submit a design exception to the County Engineer for approval.

SW Boones Ferry Road

a. Construction of a 12 foot wide multi-use path and 6 foot planter strip (includes curb) with street trees. Street trees shall be to City standards. County root barrier detail is required.

b. Installation of continuous street lighting and conduit along the site's frontage of SW Boones Ferry Road to County standards.

c. Closure of all existing access on SW Boones Ferry Road and SW Greenhill Lane not approved with this development.

d. Public street access, H Street, to SW Boones Ferry Road. Lane configuration shall be 2 outbound lanes and 1 inbound lane. Location of street shall be coordinated with Washington County Capital Services. Include truck turning templates per County Engineer.

e. Construction access and traffic circulation/control plan.

f. Traffic signal, associated equipment, and signal conduit at the intersection of SW Boones Ferry Road and H Street. The signal poles and equipment shall be located at the ultimate location. Note: signal conduit shall be installed along the site's frontage of SW Boones Ferry Road.

g. Preliminary Sight Distance Certification and mitigation for access to SW Boones Ferry Road.

h. Construction of a transit stop pull-out along SW Boones Ferry Road adjacent to the project site. Note: Subject to the addition of a project consisting of a transit stop pull-out along SW Boones Ferry Road to the City's Transportation Development Tax (TDT) approved project list, TriMet approval, and Washington County approval.

III. PRIOR TO APPROVAL OF THE SUBDIVISION PLAT BY THE CITY OF TUALATIN AND WASHINGTON COUNTY:

A. The following shall be noted on the plat and recorded with Washington County Survey Division (Survey Division 503.846.8723):

1. Provision of a non-access restriction along the site's frontage of SW Norwood Road and SW Boones Ferry Road.

2. Dedication of right-of-way required to permit the construction of the public improvements on SW Boones Ferry Road.

3. Dedication of right-of-way required to permit the construction of the public improvements on SW Norwood Road, including adequate corner radius at the intersection with the new public streets.

4. Dedication of an 8-foot PUE along the site's frontage of SW Norwood Road and SW Boones Ferry Road.

5. Dedication of right-of-way for the traffic signal and associated equipment at the intersection of SW Boones Ferry Road/H Street, including adequate corner radius to allow truck turning movements (per County Engineer).

6. Dedication of right-of-way for the future Basalt Creek Parkway Extension along the site's frontage of SW Greenhill Lane, including an 8 foot PUE and slope easement (if required).

IV. PRIOR TO OCCUPANCY BY THE CITY OF TUALATIN FOR PHASE I/II:

A. The road improvements required in condition **I.A.3.** above shall be completed and accepted by Washington County, including final sight distance certification for both accesses to SW Norwood Road.

V. PRIOR TO OCCUPANCY BY THE CITY OF TUALATIN FOR PHASE III:

A. The road improvements required in condition **II.A.3** above shall be completed and accepted by Washington County, including final sight distance certification for the intersection of SW Boones Ferry Road/H Street.

VI. PRIOR TO OCCUPANCY BY THE CITY OF TUALATIN FOR THE 298TH DWELLING:

A. The traffic signal shall be installed and accepted by Washington County, including final sight distance certification for the intersection of SW Boones Ferry Road/H Street. Signal cannot be operational until the signal warrants are met (subject to County Engineer approval).

If you have any questions, please contact me at 503-846-7639.

Cc: Road Engineering Services
Traffic Engineering Services
Assurances Section
Transportation File

DRAFT

murraysmith

CITY OF TUALATIN

Water System Master Plan

July 2021

Water Master Plan

City of Tualatin

July 2021

Murraysmith

888 SW 5th Avenue
Suite 1170
Portland, OR 97204

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murraysmith

Executive Summary

Executive Summary

Introduction

The purpose of this Water System Master Plan (WSMP) is to provide the City of Tualatin (City) with the information needed to inform long-term water infrastructure decisions. The objectives of the WSMP include:

- Document water system upgrades completed since the 2013 *Water Master Plan.*
- Estimate future water requirements including potential water system expansion areas.
- Identify deficiencies and recommend water facility improvements that correct deficiencies and provide for growth, including a preliminary evaluation of the water system's seismic resilience.
- Provide suggestions for updates to the City's capital improvement project list.
- Evaluate existing system development charges (SDCs) and water rates based on the proposed project list, as a follow-on analysis to this WSMP.
- Comply with water system master planning requirements for Public Water Systems established under Oregon Administrative Rules (OAR).

Water System Overview

Service Area

The City provides potable water to approximately 27,200 people through over 7,050 residential, commercial, industrial, and municipal service connections. The existing service area includes all areas within the current city limits and additional areas within the Metro Urban Growth Boundary (UGB). The study area of this planning effort includes the existing service area and expanded areas within the UGB, including the Basalt Creek area.

Supply

The City purchases treated water from the Portland Water Bureau (PWB) as its sole source of water. In summer months, the City also has limited supplementary supply from its Aquifer Storage and Recovery (ASR) well. As the name implies, ASR programs work by storing treated water in an aquifer during the wet, low demand (winter and spring) season and recovering some of this stored volume in the dry, high demand (summer) season. In an emergency, the City can also supply or receive water via several emergency interties with neighboring cities.

Distribution System

The City's existing distribution system is divided into four pressure zones labelled A, B, C, and Bridgeport Village (BV). Pressure zones are usually defined by ground topography and designed to provide acceptable pressures to all customers in the zone. Zones are designated by hydraulic grade lines (HGLs) which are set by overflow elevations of water storage facilities or outlet settings of pressure reducing facilities serving the zone. An HGL approximately 100 feet above the elevation of a service connection, results in a pressure of approximately 43 pounds per square inch (psi). Pressure zone boundaries are further refined by street layout and specific development projects.

Within each pressure zone, storage reservoirs provide gravity supply to looped distribution piping serving customers throughout the service area. The water system has 12.8 million gallons (MG) of available storage, used for water system equalizing (fluctuations in demand throughout the day), fire suppression, and emergency conditions.

Water Demand

Water demand refers to all water required by the system including residential, commercial, industrial, and irrigation uses. Demands are described using water metrics including average day demand (ADD) and maximum day demand (MDD).

Future expansion of the City's water service area will include continued development in the Basalt Creek and Southwest Industrial areas, as well as infill development within the existing City limits. The forecasted future water demands are calculated based on the 2020 estimate of system demand and a 0.4 percent growth rate, resulting in a build-out of the City's water service area in approximately 30 years.

Population growth within the water service area was projected based on population forecasts from the Population Research Center (PRC, Portland State University, 2019). Historical demand data was used to forecast water use per residential customer as well as water use for other customer categories including commercial, industrial, and irrigation accounts. MDD was projected based on the historic ratio of MDD to ADD, also called a peaking factor. Both ADD and MDD were forecasted through 2040, shown for the planning years of 2025, 2030, 2040, and build-out in **Table ES-1**. The forecasted time steps support identification of existing and future system deficiencies, prioritization of Capital Improvement Program (CIP) projects to support development and growth, and sizing of future infrastructure to serve the long-term needs of the City.

Table ES-1 | Projected Water Demand

Year	ADD (mgd)	MDD (mgd)
2025	4.69	9.00
2030	5.06	9.72
2040	5.28	10.14
Build-out	5.65	10.83

Analysis Criteria

Performance guidelines and system criteria are used with water demands presented in **Table ES-1** to assess the water distribution system's ability to provide adequate water service under existing conditions and to guide improvements needed to provide for future water needs. Criteria are established through a review of City design standards, state requirements, American Water Works Association (AWWA) acceptable practice guidelines, Ten States Standards, the Washington Water System Design Manual, and practices of other water providers in the region.

Water Supply

Supply capacity must be sufficient to provide MDD from all sources operating together, including ASR wells, during the peak summer season. During the off-peak season, the PWB supply system must be capable of providing, off-peak season demand plus water for ASR injection.

Service Pressure

The acceptable service pressure range under ADD conditions is 50 to 80 psi. Per the *Oregon Plumbing Specialty Code*, maximum service pressures must not exceed 80 psi. During a fire flow event or emergency, the minimum service pressure is 25 psi, which is 5 psi higher than required by Oregon Health Authority (OHA) Drinking Water Services (DWS) regulations.

Storage Capacity

Adequate storage capacity must be provided for each pressure zone. Recommended storage volume is the sum of four components.

- Operational Storage: the volume of water between operational setpoints of pumps (or wholesale supply connections) filling the reservoir
- Equalization Storage: the volume of water dedicated to supplying demand fluctuations throughout the day, estimated as the difference between the peak hour demand and the available supply to the pressure zone, for a duration of 150 minutes
- Fire Storage: the volume of water needed in each zone to meet the largest required fire flow for the duration specified in the Oregon Fire Code

- Emergency Storage: the volume of water needed to supply customers in each zone in the event of an emergency that makes supply to the zone temporarily unavailable, estimated as twice the ADD

Pump Stations

Pump stations should have adequate firm capacity to meet MDD in the pressure zones they serve. Firm capacity is defined as the station's pumping capacity with the largest pump out of service. In the case that a pump station serves a closed zone, or a zone with no storage or additional sources, the pumps station must provide peak hour demand plus fire flow.

Fire Flow

The distribution system should be capable of supplying recommended fire flows while supplying MDD and maintaining minimum residual pressures of 25 psi everywhere in the system.

Distribution System Analysis

A hydraulic network computer model was used to analyze the distribution system, which was evaluated based on the performance criteria described above and projected demands summarized in **Table ES-1**. Recommended CIP projects and pressure zone configuration or operational changes were developed based on the deficiencies identified through this analysis.

Fire Flow Analysis

Fire flow scenarios test the distribution system's ability to provide required fire flows at a given location while simultaneously supplying MDD and maintaining a minimum residual service pressure at all services. There were two general results from the fire flow analysis:

- **Known Industrial deficiencies in the A and B Levels** – The City is aware of fire flow deficiencies in the A and B Levels. Some of this deficiency is due to undersized and non-looped mains. To mitigate these risks, the City currently requires new customers who require large fire flows to install fire flow pumps. Increased looping in this area and upsizing of keys mains will also improve available flows.

- **C Level Deficiencies –** Most development in the C Level is residential homes less than 3,600 square feet, requiring 1,000 gallons per minute (gpm) fire flow. Larger homes or fire flows may require sprinkler use to reduce demand. As the system currently operates, a 1,000 gpm fire flow is generally available during MDD to the C Level. However, if larger homes are constructed and sprinklers are not required, the system cannot meet these upsized demands without pumping during a fire flow or increased transmission.

B and C Level Transmission Capacity

The Basalt Creek Planning Area located at the south end of the C Level is beginning to develop with two developments currently moving into land use approval. Existing transmission limitations through the B Level and fire flow requirements that exceed existing maximum available supply in the C Level require transmission improvements in both the B and C Levels prior to development. Findings are summarized below, and projects are incorporated into the CIP under "Transmission Improvements."

- C Level transmission capacity between the Norwood Pump Station and C Level Reservoirs is inadequate to serve continued development in the C Level and specifically for the development of the Basalt Creek area. This deficiency results in inadequate fire flow capacity to serve proposed developments with fire flows greater than 1,000 gpm in 2020, and all fire flows by 2040.
- B Level transmission between the Boones Ferry Pressure Reducing/Flow Control Valve (PRV/FCV) and B Level Reservoirs is inadequate to supply B Level and C Level peak demands while refilling the B Level reservoirs.

Based on the summary of findings above, the City should consider the following phased improvements, which are included in the CIP.

C Level

- *Prior to Basalt Creek Development:* Development in the Basalt Creek area should not be allowed without the completion of the following improvements.
    - C Level Pump Station operational changes and permanent standby power installation to address current fire flow deficiencies to support CPAH development
    - 344 feet of 18-inch diameter main from SW Vermillion Drive to I-5 Crossing
    - Oversize Autumn Sunrise subdivision piping parallel to Norwood Road to 18-inch diameter when constructed
    - Upsizing from east of I-5 Crossing towards SW Frobase Road, approximately 2,500 linear feet (lf) of 18-inch diameter main
    - Upsize transmission from C Pump Station to Norwood Road to 18-inch diameter when moved by developers
- *Long-term Recommendations:* Full development of the Basalt Creek area will require the build-out of a transmission main loop, as identified in the WSMP, and the following improvements to address the transmission deficiency between the Norwood Pump Station and C Level Reservoirs.

  - Construct the remaining 18-inch diameter main from Frobase Road to the C Level Reservoirs.

B Level

- *Prior to Basalt Creek Development:* Further development of the B Level and C Level should be limited until the following improvement is completed.
  - Upsize existing transmission to 18-inch diameter main from Norwood Reservoirs to SW Ibach Street.
- *Long-term Recommendations:* With full development of the B and C Levels, further transmission improvements are recommended in the B Level.
  - Upsize existing transmission to 18-inch diameter main in SW Boones Ferry Road from SW Ibach Street to SW Sagert Street.

Storage Capacity

Storage in the A Level is currently deficient, while storage in the B and C Levels is projected to be deficient within 20 years. The City should consider constructing a 2.5 MG reservoir at the Norwood site, similar to the existing B Reservoirs, within the next 10 years to address deficits in all levels. By buildout and as development requires, the City should consider a second reservoir, potentially at the ASR site, to address any remaining storage deficit.

It is recommended that all new storage is combined in the B Level because reservoir site alternatives are limited in the City area, the system is relatively well connected, and A and C Level existing storage can meet most of the future storage requirements in those zones.

- Sites with sufficient elevation for ground level tanks, without dead storage, are limited within Tualatin City boundaries. New sites to serve the A Level would likely include long transmission lines, or significant dead storage if collocated at existing A Level Reservoir sites. New sites to serve the C Level would face similar issues with long transmission. Additionally, C Level deficits are minimal by buildout and could be mostly addressed by either relying on C Level pumping for fire supply or, if the City decides to accept this risk, nesting fire flow storage within emergency storage.
- Storage at the B Level may also be allowed because the system is well connected. The A Level can be served by the B Level by gravity via five PRPS valves along the A/B Level boundary. These would automatically supply the A Level in the event of a failure of the A Level PWB supplies. The C Level can be served by the B Level by the C Level pump station, located adjacent to the proposed 2.5 MG reservoir. As discussed earlier in this report, this station can meet C Level needs through buildout, with a single pump active. Increased transmission in the B and C Levels will also improve distribution.

- Existing storage in the A and C Levels can meet all buildout storage requirements except for 33 percent of A Level emergency storage and 20 percent of C Level emergency storage. If emergency deficits were significantly greater, or either zone did not have sufficient storage to meet daily operational requirements, combined storage in the B Level would not be recommended.

A 2.5 MG reservoir is included in the CIP within 10 years, and a 1.0 MG reservoir is included in the CIP in 20+ years. However, future development timing may require adjustment of these timelines.

Pump Stations

Pumping capacity will be discussed by zone supply, from A to B Level and from B to C Level, and evaluated based on the MDD of the zones being pumped to. Pumping to the B Level must meet the needs of both the B and C Levels because all C Level supply is pumped from B Level. While there are two existing A to B Level pump stations (Martinazzi and Boones Ferry), they are not reliably operable, have insufficient capacity, and have reached the end of their usable lives and are not included in existing supply. B to C Level pumping is required for normal operation and so the station should be able to meet MDD under firm capacity (largest pump out of service). Pumping from A to B is only required under emergency or maintenance operations and therefore the entire station capacity can be used to meet MDD.

B-Level Pumping

The Boones Ferry PRV/FCV is the only supply to the B and C Levels. A pump station from A to B Level is recommended for redundancy and reliability. Three pumping alternatives were developed to address deficiencies in the event of a supply failure and provide a reliable supplement to the primary B Level supply from the Tualatin Supply Main (TSM) (Boones Ferry supply): 1) upgrade or replace the existing Martinazzi Pump Station, 2) build a new pump station near the A-2 reservoir, or 3) acquire and build a portable pumping system. Based on this analysis, the City should either replace the Martinazzi Pump Station or acquire a portable pump station. The CIP presented in this WSMP assumes the more expensive option of upgrading Martinazzi Pump Station.

C-Level Pumping

The C Level Pump Station at Norwood operates daily and is the only supply to the C Level. The station's existing firm capacity (one pump out of service) of 2.02 MGD (1,400 gpm) is adequate to supply the needs of the C Level through build-out.

Additional improvements should be considered for risk mitigation:

- The City should add permanent standby power with automatic switching in the event of a power failure to the station.

- The station is not operationally redundant. This means there is no secondary supply to the C Level, whether from a pump station or PRVs from higher levels. A failure of the C Level

Pump Station or supply mains would mean total reliance on the stored water in the C Level Reservoirs, or possible emergency supply from Wilsonville via the Wilsonville Intertie. It is recommended that the City purchases a portable pump station for this application. Costs of this equipment would include annual maintenance, storage, and additional training for use. It is possible this pump station would also be adequate for A to B pumping, as described above.

Water Supply Analysis

The City conducted a separate overall water supply strategy in parallel with this WSMP.

The Water Supply Strategy focused on ensuring the continued reliability of the City's water supply and documents community values, expected current system performance during emergencies, and opportunities for improved emergency performance. The project resulted in a recommended three-prong strategy.

- **Strategy 1 - Invest in a New Backup Supply** to address the City's vulnerability to an outage of the TSM. The preferred option is to work with the City of Sherwood and the Willamette Water Supply System (WWSS) to interconnect the WWSS Water Treatment Plant and the Sherwood Emergency Supply Main. Improvements to the Sherwood Emergency Supply Main is a viable alternative if the Sherwood/WWSS combination is determined to be not feasible or desirable.

- **Strategy 2 – Continue to Support Reliability of the PWB System** working with the PWB. Considerations include ensuring the City's demands are included in future analyses of backup supply options, resolving future maintenance of the Washington County Supply Line (WCSL), and reaching agreement on a new wholesale agreement.

- **Strategy 3 – Increase Reliability of Local Interties** working with neighboring agencies to make sure agreements are in place and test interties on a regular basis. The City should also continue to take advantage of future intertie opportunities, such as within the Basalt Creek area.

As part of this study, neighboring water agencies were also asked about their capacity to potentially provide long-term supply in the future. The intent was not to initiate a change in the City's water supply, but instead to understand water supply availability in the region if PWB's water were to become unavailable or unaffordable. Though short-term supplies could likely be provided by two of the neighboring water agencies, there is no agency with excess supply sufficient to meet the long-term needs of the City. *PWB remains the most reliable source of long-term supply for the City*.

Water Quality and Conservation

Water Quality Regulations

The City of, along with all public drinking water systems, must follow both state and federal regulations. At the federal level, the Environmental Protection Agency (EPA) establishes water quality standards, monitoring requirements, and enforcement procedures. At the state level, either the EPA or a state agency will implement the EPA rules. As a primacy state, Oregon administers most of the EPA's drinking water rules through the OHA DWS. The DWS rules for water quality standards and monitoring are adopted directly from the EPA. The DWS is required to adopt rules at least as stringent as federal rules. To date, the DWS has elected not to implement more stringent water quality or monitoring requirements.

At the Federal level, the Safe Drinking Water Act (SDWA) is the primary drinking water regulation. It was originally enacted in 1974 by Congress to ensure the quality of America's drinking water with a focus on water treatment. The act was reauthorized and updated in 1986 and 1996 to expand protections to source water and improve operator training, system improvement funding, and public education. The SDWA contains the following assignment and programs for the EPA and the states to administer including:

- State revolving loan fund for water system construction
- Public notification reports
- Source water assessment and protection
- Monitoring reductions based on source water protection
- Mandatory certification of operators

These assignments have been implemented by the EPA and/or individual states and are regularly updated. Under the authority of the SDWA, the EPA sets various rules and regulations to maintain safe drinking water.

The City currently meets all existing and proposed water quality regulations that govern the operation and performance of the water system.

Water Conservation

The City is not required by the state to develop a formal Water Management and Conservation Plan as it does not have any active municipal water rights. However, PWB requires the City to establish a joint conservation program and create a water conservation plan under the wholesale water supply agreement and the City is committed to reducing water usage.

The City implements various aspects of water conservation including:

- Public education and outreach as part of the Regional Water Providers Consortium (RWPC)
- Leak Prevention and Detection

Seismic Resilience Evaluation

System Backbone

Consistent with the Oregon Resilience Plan (ORP) guidelines, the City identified critical facilities and customers that will need uninterrupted or quickly restored water service following the anticipated magnitude 9.0 (M9) Cascadia Subduction Zone (CSZ) earthquake. Critical customer locations along with critical water supply and distribution facility locations were used to develop a water system “backbone” connecting key facilities and water mains.

Seismic Hazards Assessment

Seismic hazards all have the potential to damage buried water mains and other water facilities. Within the Tigard water service area, these hazards were evaluated based on existing M9 CSZ earthquake hazard maps published for the Portland Metro region by the Oregon Department of Geology and Mineral Industries (DOGAMI). These maps were refined using geotechnical exploration data and subsurface boring logs from reservoirs, pump station sites, and various projects constructed near critical water facilities in the City’s water service area.

Summary of Recommendations

The seismic resilience recommendations are summarized below.

- Facility Seismic Improvements:
    - Upgrade the Boones Ferry PRV/FCV – Upgrades to this facility should include rehabilitation or replacement of the buried utility vault and piping transitions. This is a critical water supply facility for transmitting PWB supply to the B level and C level service zones.
    - A-1 Reservoir Structural Analysis – A structural analysis should be performed for this reservoir to better quantify seismic risk and determine if cost-effective mitigation strategies are available.
    - Reservoir Connections: Flexibility and Isolation – Install new flexible connections (where current flexible connections are not provided or are inadequate) and seismic isolation valves at all six of the City’s existing reservoirs. New reservoirs should be designed and constructed with these features.
    - Install a permanent standby generator at the Norwood Pump Station with adequate fuel storage for a minimum of 24-hours of operation.
- Backbone Piping:
    - Implement the Seismic Design Standards presented in this section.

  - TSM Study – Conduct a study to assess the condition and performance of the TSM, especially in the context of seismic resilience. The study should present mitigation strategies and costs for City consideration in the broader context of water supply reliability.

- Emergency Preparedness:
  - Implement the strategies, recommendations and improvements presented in the Emergency Water Plan, documented in this WSMP.

Recommended Capital Improvement Program (CIP)

A summary of all recommended improvement projects and estimated project costs is presented in **Table ES-2**. This CIP table provides for project sequencing by showing prioritized projects for the 5-year, 6 to 10-year, 11 to 20-year, and beyond 20-year timeframes defined as follows.

- 5-year timeframe - recommended completion through 2025
- 6 to 10-year timeframe - recommended completion between 2026 and 2030
- 11 to 20-year timeframe - recommended completion between 2031 and 2040
- 20+ year timeframe – recommended completion beyond 2041

Estimated project costs presented in the CIP are intended to provide guidance in system master planning and long-range project scheduling and implementation. Final project costs will vary depending on actual labor and material costs, market conditions for construction, regulatory factors, final project scope, project schedule, and other factors.

Table ES-2 summarizes these projects by type and investment timeframe. The City's proposed CIP includes significant investment, particularly in transmission and storage improvements. This new capacity will serve growth while also providing more resilient water facilities that benefit all customers. An evaluation of water rates and SDCs in support of the water system CIP will be completed as follow-on work to this WSMP.

Table ES-2 | CIP Cost Summary

Project Type	0-5 Years	6-10 Years	11-20 Years	20+ Years	Total
Residential Fire Flow		$318,000	$660,000		$978,000
Non-Residential Fire Flow	$-	$1,334,000	$3,538,000	$3,538,000	$8,410,000
System Looping	$-	$3,475,000	$-	$-	$3,475,000
Transmission	$7,066,000	$1,360,000	$5,011,000	$-	$13,437,000
Facilities	$10,650,000	$-	$-	$2,000,000	$12,650,000
Pipe Replacement	$-	$-	$10,000,000	$1,000,000/yr[1]	$10,000,000
Total	**$17,716,000**	**$6,487,000**	**$19,209,000**	**$5,538,000**	**$48,950,000**

Note:

1. 20+ year pipe replacement not included in total as it masks other CIP costs. Pipe replacement is a perpetual ongoing cost and should be planned for. An assumed $1,000,000/year was assumed to allow for systematic replacement of aging mains.

Section **1**

Section 1

Introduction

1.1 Purpose

The purpose of this Water System Master Plan (WSMP) is to perform an analysis of the City of Tualatin's (City's) water system and:

- Document water system upgrades completed since the 2013 *Water Master Plan.*
- Estimate future water requirements including potential water system expansion areas.
- Identify deficiencies and recommend water facility improvements that correct deficiencies and provide for growth including a preliminary evaluation of the water system's seismic resilience.
- Provide suggestions for updates to the City's capital improvement project list.
- Evaluate existing system development charges (SDCs) and water rates based on the proposed project list, as a follow-on analysis to this WSMP.

This report is divided into nine sections to address the goals described above. The first four sections summarize the existing system and water demands, estimate future water demands, and list the performance criteria used to analyze the system. Sections 5, 6, and 7 utilize the prior sections to identify system deficiencies, analyze current water quality and conservation goals, and provide a more detailed seismic resiliency analysis. Section 8 summarizes improvement projects to mitigate existing and projected system deficiencies and vulnerabilities while Section 9 presents a financial analysis to support those projects. Section 9 presents the Emergency Water Plan intended to address water system recovery after a catastrophic event such as a Cascadia Subduction Zone seismic event. The planning and analysis efforts presented in this WSMP are intended to provide the City with the information needed to inform long-term water supply and distribution infrastructure decisions.

1.2 Compliance

This plan complies with water system master planning requirements established under Oregon Administrative Rules (OAR) for Public Water Systems, Chapter 333, Division 61.

1.3 Acronyms

Acronym	Definition
A	
AACE	Association for the Advancement of Cost Engineering International
ADD	average daily demand
ALA	American Lifelines Alliance
ASCE	American Society of Civil Engineers
ASR	Aquifer Storage and Recovery
AWWA	American Water Works Association
BV	Bridgeport Village (pressure zone)
C	
CERT	Community Emergency Response Team
CIP	capital improvement program
City	City of Tualatin
CP	cathodic protection
CRBG	Columbia River Basalt Group
CSZ	Cascadia Subduction Zone
D	
D/DBP	Disinfectants/Disinfection Byproducts
DEQ	Oregon Department of Environmental Quality
DOGAMI	Department of Geology and Mineral Industries
DWPLF	Drinking Water Protection Loan Fund
DWS	Drinking Water Services
E	
EPA	Environmental Protection Agency
ERU	Equivalent Residential Unit
F	
FCV	Flow Control Valve
FEMA	Federal Emergency Management Agency
fps	feet per second
fy	fiscal year
G	
GIS	geographic information system
gpad	gallons per acre per day
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
H	
HAA5s	Haloacetic Acids
HAZUS	

Acronym	Definition
HGL	hydraulic grade line
hp	horsepower
I	
I-5	Interstate 5
IFA	Infrastructure Finance Authority
in/s	inches per second
J	
JMP	Joint Monitoring Program
JWC	Joint Water Commission
L	
LCR	Lead and Copper Rule
lf	linear feet
LT1ESWTR	Long-Term 1 Enhanced Surface Water Treatment Rule
LT2ESWTR	Long-Term 2 Enhanced Surface Water Treatment Rule
M	
M9	Magnitude 9.0
MCL	maximum contaminant level
MDD	maximum day demand
mgd	million gallons per day
MG	million gallons
mg/L	milligrams per liter
MOU	Memorandum of Understanding
MTSM	Metzger-Tualatin Supply Main
N	
NEPA	National Environmental Policy Act
NRCS	National Resource Conservation Service
O	
OAR	Oregon Administrative Rule
OFC	Oregon Fire Code
OHA	Oregon Health Authority
ORP	Oregon Resilience Plan
OWRD	Oregon Water Resources Department
P	
P3DD	Peak Three Day Demand
PHD	peak hour demand
PGD	permanent ground deformation
PGV	peak ground velocity
ppm	parts per million
PRPS	Pressure Reducing/Pressure Sustaining (Valves)
PRV	pressure reducing valve
PRV/FCV	Pressure Reducing/Flow Control Valve
PSD	Peak Season Demand

Acronym	Definition
PSU PRC	Portland State University Population Research Center
PSE	Peterson Structural Engineers
Psi	pounds per square inch
PWB	Portland Water Bureau
R	
RLIS	Metro's Regional Land Information System
RR	rates of repair
RWD	Raleigh Water District
RWPC	Regional Water Providers Consortium
S	
SCADA	supervisory control and data acquisition
SDCs	system development charges
SDWA	Safe Drinking Water Act
SDWRLF	Safe Drinking Water Revolving Loan Fund
SOCs	synthetic organic contaminants
SOPs	Standard Operating Procedures
T	
TSM	Tualatin Supply Main
TTHMs	Total Trihalomethanes
TVFR	Tualatin Valley Fire & Rescue
TVWD	Tualatin Valley Water District
U	
UCMR 4	Unregulated Contaminant Monitoring Rule 4
UGB	urban growth boundary
V	
VFDs	variable frequency drives
VOCs	volatile organic contaminants
W	
WCSL	Washington County Supply Line
WIFIA	Water Infrastructure Finance and Innovation Act
WRWTP	Wilamette River Water Treatment Plant
WSMP	Water System Master Plan
WWSS	Willamette Water Supply System

Section 2

Section 2

Existing Water System

2.1 Background and Study Area

The City provides potable water to approximately 27,200 people through over 7,050 residential, commercial, industrial, and municipal service connections. The existing service area includes all areas within the current city limits and additional areas within the Metro Urban Growth Boundary (UGB). The study area of this planning effort includes the existing service area and expanded areas within the UGB, including the Basalt Creek area.

The City purchases wholesale water from the Portland Water Bureau (PWB) as it sole supply through a single 36-inch diameter supply line extending south from the Washington County Supply Line (WCSL), a major regional transmission main supplying wholesale water supply from PWB to water providers in Washington County. The City's water distribution system currently consists of four pressure zones supplied by six steel storage facilities, three pump stations (two of which are for emergency operations only), and an Aquifer Storage and Recovery (ASR) facility.

A system map and hydraulic schematic are included in **Figure 2-1** and **Figure 2-2**.

2.2 Supply

The City purchases treated water from PWB as its sole source of water. In summer months, the City also has limited supplementary supply from its ASR well. As the name implies, ASR programs work by storing treated water in an aquifer during the wet, low demand (winter and spring) season and recovering some of this stored volume in the dry, high demand (summer) season. In an emergency, the City can also supply or receive water via several emergency interties with neighboring cities.

2.2.1 Portland Water Bureau Wholesale Purchase

2.2.1.1 Wholesale Supply Contract

The City purchases finished water from PWB through a wholesale water supply contract signed in 2006. The current contract extends through 2026. Under the terms of the agreement, the City is obligated to purchase a minimum annual volume of water equal to 4.4 million gallons per day (mgd). Under the current wholesale contract terms, this volume can be increased but not decreased.

The wholesale water rate paid by the City is based on three factors: 1) the guaranteed minimum purchase (4.4 MGD), 2) the City's peak seasonal factor (1.32 for fiscal year (FY) 2021-22) , and 3) the City's peak 3-day factor (1.62 for FY 2021-22). Items 2 and 3 are the ratio of the average daily water volume purchase from July 1 to September 30 and the average daily water use over the three consecutive highest days, respectively, to the guaranteed minimum purchase. These peaking factors are calculated specifically for the PWB contract and are different from maximum day and peak hour peaking factors discussed later in **Section 3.**

In April of 2016, the City and PWB signed an amendment to the original wholesale agreement. This amendment updates the calculations used for determining peaking factors and summer interruptible (water provided over the minimum agreed upon volume) water purchase.

In February 2021, PWB issued a Memorandum of Understanding (MOU) Regarding the Regional Water Sales Agreement to all wholesale water providers, informing the wholesalers of PWB's intent to provide notice that PWB will not renew the current agreement. A copy of the MOU is included in this WSMP as **Appendix A**. The MOU states that it is PWB's desire to continue to supply the wholesale customers and that this notice is consistent with negotiations that have been occurring between the wholesalers and PWB regarding the framework of a new agreement. The City continues to be an active participant in the process of developing a new agreement that is in the common interest of PWB and the wholesale customers.

2.2.1.2 Wholesale Source

The PWB primarily sources its water from the Bull Run watershed, a protected watershed located near Mt. Hood. Two surface water impoundments, Bull Run Reservoir No. 1 and No. 2 store up to approximately 9.9 billion gallons in the watershed. The Bull Run Watershed averages 130 inches of precipitation per year, with the heaviest rains occuring from late fall through spring, filling the two reservoirs for storage. Because rain is scarce during the summer season, the water stored in the reservoirs is essential for meeting summer water demand. Drawdown is when PWB begins to take more water out of the reservoirs than streamflow brings in during the summer and into the fall. Streamflow provides about half of the dry season supply and gradually decreases over the summer. Fall rains typically replenish the supply in late September, but in dry years this can happen as late as November or December.

The PWB also operates a secondary groundwater supply, the Columbia South Shore Wellfield. This wellfield pulls from three regional aquifers to supplement the Bull Run surface water storage in the summer and to provide a level of source redundancy. The wellfield has a total capacity of approximately 100 mgd.

Currently, the Bull Run water is unfiltered and disinfected with chlorine at the Bull Run Reservoir No. 2 Headworks. Further treatment occurs at the Lusted Hill facility where ammonia is added to the water to form a more robust residual disinfectant, chloramines. Additionally, at Lusted Hill, the water pH is adjusted with sodium hydroxide to decrease the water's corrosive qualities. Temporary corrosion control improvements at Lusted Hill are currently underway, converting from liquid sodium hydroxide to a combination of soda ash and carbon dioxide for pH adjustment.

Figure 2-1

TUALATIN WATER MASTER PLAN

EXISTING CITY OF TUALATIN WATER SYSTEM

May 2021

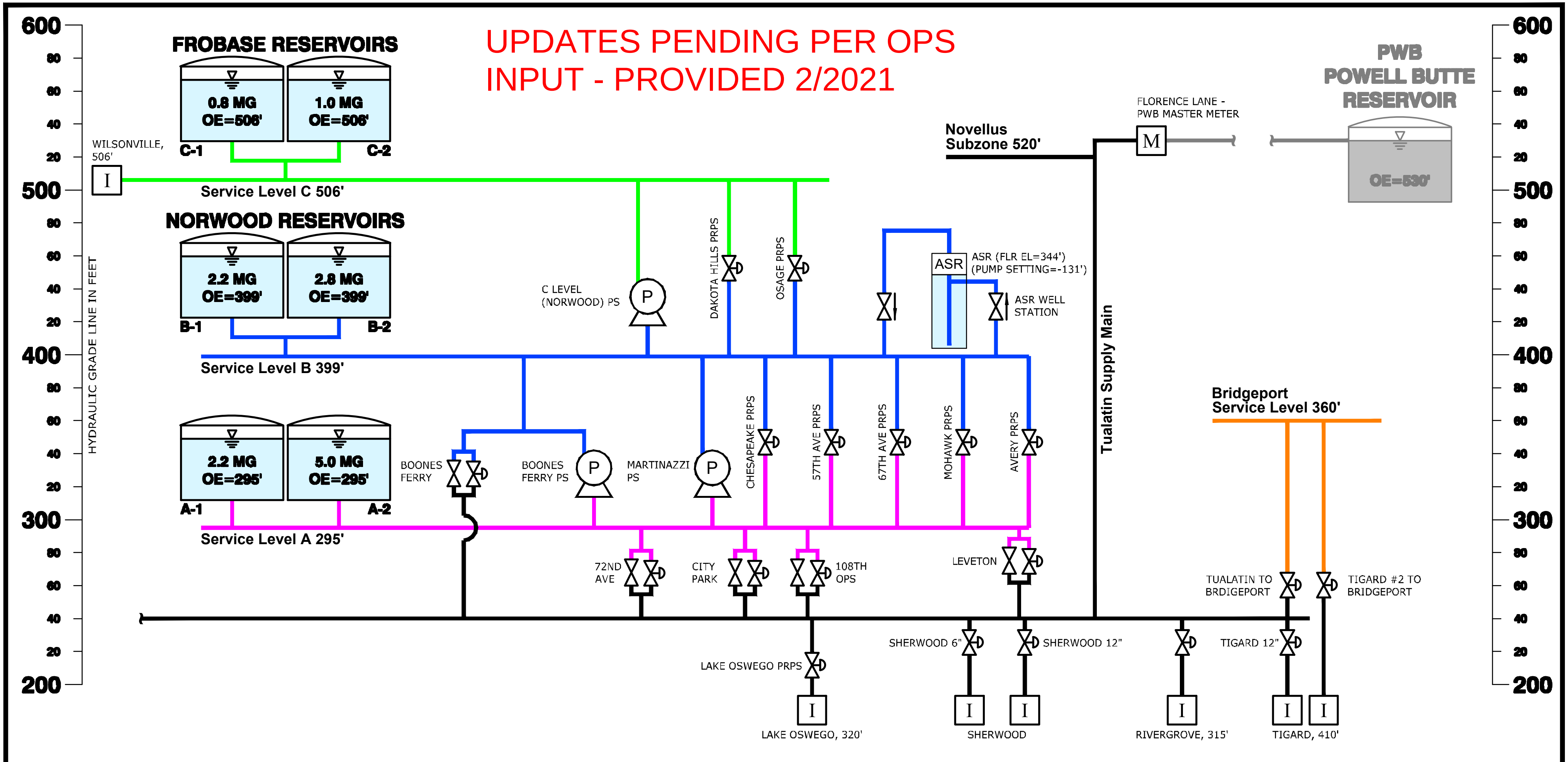
murraysmith

17-2000.402

SOURCE:
Water System - City of Tualatin (2016).
Base Mapping - Metro RLIS (May 2017).

G:\PDX_Projects\17\2000 - Tualatin WMP Update\GIS\17-2000-402-OR-FIGURE 2-1.mxd 11/17/2017 9:59:29 AM Claire.DeVoe

G:\PDX_Projects\17\2000 - Tualatin WMP Update\CAD\Figures\17-2000-402-OR-FIGURE 2-2 UPDATE APRIL 2020.dwg Figure 2-2 4/16/2020 9:33 AM KENT.HARJALA 23.0s (LMS Tech)



LEGEND

SERVICE LEVEL A - 295'

SERVICE LEVEL B - 399'

SERVICE LEVEL C - 506'

BRIDGEPORT SERVICE LEVEL - 360'

⋈ FLOW CONTROL VALVE (FCV)

PRESSURE REDUCING VALVE (PRV) OR PRESSURE RELIEF/PRESSURE SUSTAINING VALVE (PRPS)

ASR AQUIFER STORAGE & RECOVERY (ASR) WELL

I EMERGENCY INTERTIE

M METER STATION

P PUMP STATION (PS)

STORAGE TANK

1.0 MG OE=399'

CAPACITY

OVERFLOW ELEVATION

Figure 2-2

TUALATIN WATER MASTER PLAN

EXISTING CITY OF TUALATIN WATER SYSTEM HYDRAULIC SCHEMATIC

April 2020

murraysmith

17-2000.402

These improvements will be completed as early as 2022. The PWB is proceeding with designs for a water treatment plant which will include filtration, disinfection, and permanent corrosion control facilities. These updates are directed to comply with the Environmental Protection Agency (EPA) requirement to address the potential for cryptosporidium contamination under the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and are projected to be fully in place by 2027.

The construction of new infrastructure will be funded in-part through wholesale rates which will affect the City's existing rates.

2.2.1.3 Wholesale Transmission

The WCSL conveys water by gravity from PWB's Powell Butte Reservoirs in southeast Portland to Washington County wholesale customers including the City, Tualatin Valley Water District (TVWD), and Raleigh Water District (RWD). **Figure 2-3** presents an overview of the WCSL and the PWB wholesale customers supplied by this transmission main.

The WCSL begins as a 66-inch diameter transmission line at the PWB's two 50 million gallon (MG) Powell Butte Reservoirs and ending as a 36-inch diameter main, referred to as the Tualatin Supply Main (TSM) in this report, approximately 22 miles southwest of Powell Butte in Tualatin. Details regarding the distance and diameter of the WCSL system are identified below.

WCSL Segment - From	WCSL Segment - To	Distance (miles)	Diameter (inches)
Powell Butte	SE 136 & Holgate	1.1	66
SE 136th & Holgate	SE 67th & Holgate	3.4	66
SE 67th & Holgate	Hannah Mason PS	5.3	60
Hannah Mason PS	SW B-H Hwy @ Oleson Rd	4.2	60
SW B-H Hwy @ Oleson Rd	SW 80th and Florence Ln	2.5	48
SW 90th and Florence Ln	Tualatin Community Park	5.9	36

The 36-inch diameter TSM supplies the Tualatin distribution system at five metered control valves, the southernmost connection being the Boones Ferry Road Pressure Reducing/Flow Control Valve (PRV/FCV). These supply connections reduce pressure from the Powell Butte level to Tualatin service pressures in the A and B levels, approximately the City area north of Ibach Road. Areas south of Ibach Road (the C level) are supplied via distribution pumping from the B level to the C level.

Within the City of Tualatin, a 24-inch diameter ductile iron main, City of Sherwood-owned main branches off the TSM near Upper Boones Ferry Road. Historically, this was used to supply the City of Sherwood from the City of Tualatin's PWB supply connection at City Park, just south of the Tualatin River. In 2011, the City of Sherwood transitioned supply to the Willamette River Water Treatment Plant (WRWTP) near the City of Wilsonville, and so the 24-inch diameter main currently exists as an emergency intertie only.

2.2.1.4 Wholesale Transmission Capacity

Currently, the City of Tualatin is the furthest WCSL user to receive water from Portland. This means intermediate demands of the other customers affect the flow rate of water available, although the City has not had supply issues related to this. The City owns 18 percent of the WCSL pipe nominal capacity and approximately 58 percent of the Metzger-Tualatin Supply Main (MTSM) 48-inch diameter pipe nominal capacity. The City owns the 36-inch diameter pipe that conveys water from the Florence Lane Master Meter to the City of Tualatin (the TSM, referenced in **Section 2.2.1.3**).

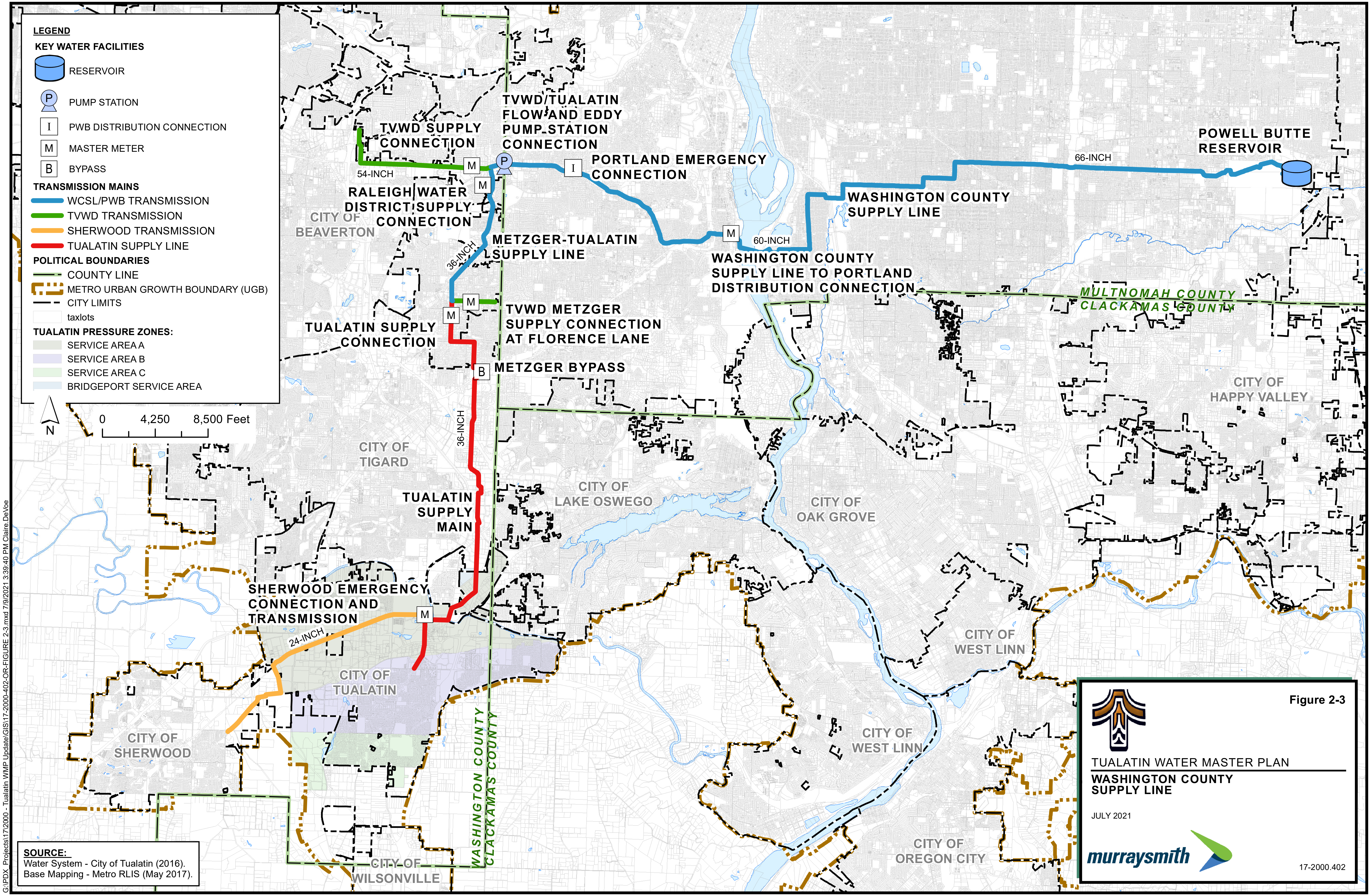
2.2.2 City of Tualatin Aquifer Storage and Recovery

The City has operated one ASR facility since 2011. ASR operations allow the City to store surplus drinking water in a groundwater aquifer during low demand periods (fall through spring) and recover the water from a groundwater well during high demand periods (summer). Under The State of Oregon Water Resources Department authorizing limited license (ASR Limited License #010) the City can recover up to 95 percent of the water injected over the current water year (October 1 through September 30 of the next year). The volume of water available for recovery drops by five percent each year the injected water remains in the ground.

The ASR facility is located on SW 108th Avenue near SW Dogwood Street receiving recharge water from, and recovering to, the B Level to aid in meeting B-level and C-level demands during the summer. The recharge water is injected from Tualatin's distribution system into the well by gravity flow. A 150 horsepower (hp) vertical turbine well pump recovers water in the summer.

Onsite treatment was recently converted to a liquid feed system. During injection, water is hypochlorinated at just under 4 parts per million (ppm) to minimize the risk of biofouling in the well. During recovery, hypochlorite is added to the water to achieve a chlorine residual of 1.5 ppm and ammonia is also added to form chloramines to match the disinfectant used in the PWB supply. Both chemicals are stored on-site within the ASR well house.

The City has been operating the ASR well as a pilot project since 2011 and more regularly in the past few years. In 2019 and 2020, recovery rates between 300 and 400 gallons per minute (gpm) were seen, depending on aquifer level and hydraulic conditions. In the 2019 water year, the City water year, the City injected 77 MG and recovered 30 MG. In recent years, there have been significant breaks during the injection and recovery pumping due to maintenance and upgrades, including installation of a new Automatic Transfer Switch, upgrade of water quality analyzers, and replacement of chemical feed systems.



SOURCE:
Water System - City of Tualatin (2016).
Base Mapping - Metro RLIS (May 2017).

Figure 2-3

TUALATIN WATER MASTER PLAN

WASHINGTON COUNTY SUPPLY LINE

JULY 2021

murraysmith

17-2000.402

G:\PDX_Projects\17\2000 - Tualatin WMP Update\GIS\17-2000-402-OR-FIGURE 2-3.mxd 7/9/2021 3:39:40 PM Claire DeVoe

2.2.3 Emergency Supply

2.2.3.1 Emergency Interties

Several emergency interties with neighboring water providers potentially allow for alternate supply during emergencies. However, these interties are rarely, if ever, used or maintained and supply capacity is often severely limited and dependent on operational conditions of the supplying system. Additionally, the City is not legally allowed to use certain interties due to the 2002 City Charter amendment prohibiting drinking water sourced from the Willamette River without a citizen vote (Chapter 10, Section 46 of the City Charter), with the exception of an emergency declaration by the State of Oregon (such as would likely occur following a large seismic event).

Existing interties include connections with the Cities of Tigard, Sherwood, Wilsonville, and Lake Oswego, and the Rivergrove Water District. Except for the Tigard intertie at 72nd and Boones Ferry which provides additional fire flow to the Bridgeport Village, all emergency interties exist as normally closed valves that can be manually operated. **Figure 2-1** shows the location of these emergency interties and **Table 2-1** summarizes important details.

Table 2-1 | Emergency Intertie Summary

Intertie	Water Source	Type	Hydraulic Grade (Tualatin)	Hydraulic Grade (Other)	Diameter[1] (in)
Willamette Water Supply System (124th and Tualatin-Sherwood Road)	Willamette River	Emergency[2]	295 (A)	~450	12
Lake Oswego (65th & McEwan)	Clackamas River (Tigard-LO Partnership)	Emergency	295 (A)	320	12
Tigard (Boones Ferry & Lower Boones Ferry)	Clackamas River (Tigard-LO Partnership)	Emergency	295 (A)	410	10
Tigard (72nd & Boones Ferry)[3]	Clackamas River (Tigard-LO Partnership)	Fire flow (Bridgeport Village)	295 (A)	410	10
Rivergrove (65th & Childs)	Rivergrove Wellfield	Emergency	295 (A)	315	8
Sherwood - Supply Main (City Park)	Willamette River WTP	Emergency	295 (A)	380	24
Sherwood (Cipole and Galbreath)	Willamette River WTP	Emergency	295 (A)	380	12
Wilsonville (Frobase Site)	Willamette River WTP	Emergency	507 (C)	506	8

Notes:

1. Intertie capacity is unknown. Pipe diameters can be used to approximate capacity, however available supply is dependent on boundary conditions of both supplying and receiving systems.
2. Connection with the Willamette Water Supply System. Currently, use of this intertie is limited to water supply following an emergency declaration by the State of Oregon.
3. Bridgeport Intertie. Located at 72nd & Boones Ferry, there is both a fire flow connection (10-inch to 10-inch) and a separate intertie (10-inch to 10-inch) near this location. The intertie is just around the corner and can connect into the distribution system in Zone A, with an HGL of ~410 ft on the Tigard side and ~295 ft on the Tualatin side. This intertie an also connect to the Tualatin Supply Main. As its pressure is lower than the normal pressure in the Tualatin Supply Main, Portland's supply would need to be valved off (which would likely be the case if the Tualatin Supply Main were out of service). Because of the reversed hydraulics, this intertie is not usually listed in Tualatin's emergency connections.

2.2.3.2 Tualatin Valley Water District Portable Pump Stations

In 2014, the City and TVWD recognized their vulnerability to Portland supply failures. In response, the construction and purchase of two portable pumps was finalized (named “Flow” and “Eddy”) for emergency use in a PWB supply disruption. The piping near the TVWD meter at the intersection of Beaverton Hillsdale Highway and Oleson Road was reconfigured to allow for emergency connection of the pumps between TVWD’s transmission main and the WCSL. Each pump has a capacity of 5MGD and is designed to supply water from the Joint Water Commission (JWC) or other TVWD-Wolf Creek water supplies along Oleson Road towards TVWD-Metzger and Tualatin customers through the WCSL and the TSM.

2.2.3.3 Inter-Pressure Zone Pumping Connections

Three six-inch diameter flange stubs are located at grade to allow for external temporary pumping from the A to B and B to C Levels. These stubs are located at the B-1 and B-2 Reservoirs (Norwood) site, the Martinazzi Pump Station, and at 10900 SW Avery Street where the B and C levels meet.

These sites are for emergency use only and will require the use of a portable pump station to provide minimal supply to localized areas near the connection point. Presently, the City does not own a portable pump station, but is acquiring appurtenances (flange connections and hoses) to support emergency pumping. Further discussion is included later in this document.

2.2.3.4 Intertie Expansion

The City explored permanent alternatives to supply redundancy, including diversifying its water supply through the expansion of an emergency intertie into a routinely used supply to meet normal system demands. As documented in the *City of Tualatin – Water Supply Strategy* (The Formation Lab, 2021), includes as **Appendix B** of this report, the City met with nearby water purveyors to determine if alternate long-term water supplies exist. Based on that study, the City confirmed that the most reliable long-term supply available to the City is wholesale supply from PWB.

2.3 Water Rights

While the City does not hold any municipal drinking water rights, it does hold a limited license for ASR operations, summarized in **Table 2-2**.

The City’s single ASR facility operates under Oregon Water Resources Department (OWRD) ASR Limited License No. 010, which was most recently renewed for an additional 5 years on May 12, 2019. This Limited License authorizes the City to operate an ASR system of up to five wells storing 475 MG of water for a combined recovery of up to 3,500 gpm during the summer season. Presently, the City does not use the full limited license.

Table 2-2 | Water Rights

Permit No.	Certificate No.	Authorized Use	Priority Date	Authorized Rate	Description
ASR LL #010	N/A	ASR	2004	2,750/3,500gpm injection/recovery	ASR injection and recovery

2.4 Pressure Zones

The City's existing distribution system is divided into four pressure zones labelled A, B, C, and Bridgeport Village (BV). Pressure zones are usually defined by ground topography and designed to provide acceptable pressures to all customers in the zone. Zones are designated by hydraulic grade lines (HGL) which are set by overflow elevations of water storage facilities or outlet settings of pressure reducing facilities serving the zone. An HGL approximately 100 feet above the elevation of a service connection, results in a pressure of approximately 43 pounds per square inch (psi). Pressure zone boundaries are further refined by street layout and specific development projects.

Each of the four Tualatin pressure zones is summarized in **Table 2-3** and illustrated on **Figure 2-1.** This information is presented in more detail in the following sections including descriptions of the service area, supply mechanism, storage facilities, and pumping facilities serving each zone.

Table 2-3 | Pressure Zones

Zone Name	HGL (ft)	Primary Customer Type	Current ADD (mgd)	Current MDD (mgd)	Usable Storage (MG) [1]	Max Fireflow Required (gpm)
A	295	Commercial, industrial, residential	2.24	4.28	6.0	3,000
B	399	Residential, commercial and industrial	1.46	2.79	5.0	3,000
C	506	Residential, institutional	0.34	0.65	1.8	2,000
BV	446	Commercial	0.03	0.06	0	3,000

Note:

1. Usable storage calculated as the potential volume of water stored above the tank height that can provide 20 psi to all zone customers.

2.4.1 A Level

The A Level covers Tualatin north of SW Tualatin-Sherwood Road and includes a broad array of customer types including commercial, industrial, and residential (see **Figure 2-1**).

2.4.1.1 Supply

The A Level is supplied by four PRV/FCVs off the TSM. These valves drop the hydraulic grade from approximately 530 feet, as set by the PWB Powell Butte Reservoir, to 295 feet, as set by the A-Level Reservoirs. The four valves are located at 72nd Avenue, City Park (located in Tualatin

Community Park at SW Tualatin Road), 108th Avenue/Operations, and Leveton, with 72nd, Leveton and 108th/Operations supplying most of the flow. The valves are primarily operated in flow control mode, meaning that the valve modulates to maintain a constant flow rate that is set by City staff. These control valves also have an overriding pressure setting to maintain pressures within an acceptable service range on either side of the valve. The Leveton PRV/FCV supplies an area of higher pressure within the A level to meet the water supply needs of industrial customers.

In an emergency, five Pressure Reducing/Pressure Sustaining Valves (PRPS) can provide limited supply from the B Level. These valves are located along the interface between the A and B Levels. The PRPS valve will open when the A Level pressure drops below a set point and shut either when the A Level pressure rises above that set point or the B Level pressure drops below a second set point that prevents the pressure in B level from dropping below minimum acceptable levels. These valves are intended only for emergency supply. The flow rate available through the PRPS valves can range from less than 100 gpm up to 1,000 gpm, or more, depending on reservoir levels and water demands.

2.4.1.2 Storage

Storage in the A Level is provided by two welded steel tanks with a combined total volume of 7.2 MG. The A-1 tank, formerly known as the Avery tank, was built in 1971. It is located in the residential area south of Avery Road. The A-2 tank was built in 2006 and is located West of the City, just south of Tualatin-Sherwood Road. When A Level tanks drop below 8 feet in depth, static pressures in the A Level are less than 25 psi. Therefore, the A Level reservoirs have approximately 1.2 MG of dead storage (bottom 8 feet of both tanks) and a combined accessible storage of 6 MG.

2.4.1.3 Distribution

The A Level distribution piping is looped with 12-inch diameter mains primarily along Herman, Tualatin-Sherwood, and Nyberg Roads. A 16-inch transmission line beneath the Tualatin River connects the portions of the A Level north and south of the Tualatin River. Additional 16-inch and 18-inch diameter mains extend along Tualatin-Sherwood Road from Avery Street west, and a 16-inch diameter main extends north-south between Tualatin-Sherwood Road and Herman Road.

2.4.2 B Level

The B Level primarily serves customers south of SW Tualatin-Sherwood Road and north of Ibach Street (see **Figure 2-1**).

2.4.2.1 Supply

During normal operations, the B Level is supplied by a single PRV/FCV off the TSM at Boones Ferry Road. This valve drops the hydraulic grade from approximately 530 feet, as set by the PWB Powell Butte Reservoir, to 399 feet, as set by the B-Level Reservoirs. This valve is set by flow control and operates in two conditions: reservoir filling and reservoir supply. During reservoir filling, the valve supplies approximately 3,100 gpm to the B Level customers with excess supply filling the B

Reservoirs, with the limitation on available capacity being over pressurization of low elevation customers in the B level. The C-Level pump station subsequently pumps out of the B Reservoirs to supply the C Level. During low demand periods, to facilitate turnover of water in the B level reservoirs, the Boones Ferry valve operates at approximately 400 gpm (during periods when the ASR well is not being recharged).

There are times at which a combination of factors including high system demands, simultaneous low tank levels in the B and C Levels, and supply limitations that result in unsatisfactory supply to the B and C Levels. This deficiency is addressed in further detail in **Section 5**.

Additional supply comes from the City's ASR facility, which is connected to the B Level distribution system. In the winter, water is injected into the aquifer from the B level at a rate of approximately 350 to 400 gpm. In the summer, water is recovered from the aquifer and supplied to the B level at a rate of 350 gpm. Additional explanation of ASR operations is included earlier in **Section 2.2.2**.

In an emergency, two PRPS valves exist at Osage Street and Dakota Avenue can provide limited supply from the C Level to the B level. These valves operate in the same way as the PRPS valves from the B to A Levels.

2.4.2.1.1 Pump Stations

Historically, the Martinazzi Pump Station and the Boones Ferry Pump Station supplied water to the B Level, pumping water from A-level distribution. However, these pump stations have not been operated as part of normal system operation for at least 20 years. As such, the ability to reliably operate these stations in the event of a supply failure of either the Boones Ferry PRV/FCV or PWB supply through the PSM is uncertain at this time. Further analysis of the functionality and value of the pump stations is presented in **Section 5.**

The Boones Ferry Pump Station is located near the intersection of SW Boones Ferry Road and SW Mohawk Street in a buried, pre-fabricated vault. The pump station is adjacent to the Boones Ferry PRV/FCV and has been used to pump water from the A to B Levels. The pump station houses two 25-hp, 500 gpm centrifugal pumps.

The Boones Ferry Pump Station has not been upgraded or exercised in at least a decade. Extensive studies and upgrades would likely be required to operate the station at a reliable level of service.

The Martinazzi Pump Station is located near the northeast corner of the intersection of SW Martinazzi Avenue and SW Warm Springs Street in a below grade, cast-in-place, concrete vault. The pump station is sued to pump water from the A to B levels. The pump station currently houses two centrifugal 50-hp pumps, each with a nominal capacity of approximately 1,000 gpm. The pump performance curves for the Martinazzi Pump Station pumps are included as **Appendix C**.

The Martinazzi Pump Station is maintained and tested annually.

2.4.2.2 Storage

Storage in the B Level is consolidated at the Norwood site, south of the City near the Horizon Christian School. Two welded steel tanks provide a total of 5.0 MG of storage at an overflow elevation of 399 feet. The 2.2 MG B-1 Reservoir was built in 1971 and the 2.8 MG B-2 Reservoir was built in 1989. Both were seismically upgraded to 2006 standards. The B-1 Reservoir received a new concrete ringwall, manway, anchor bolts, and new welded steel anchor chairs. The B-2 Reservoir received similar upgrades and additional pipe modifications. The B-1 Reservoir was repainted and sandblasted in 2015 and similar rehab to the B-2 Reservoir is planned.

2.4.2.3 Distribution

The B Level distribution system is looped with 12-inch diameter lines along Sagert Street, Avery Street, Borland Road and Boones Ferry Road, and along Ibach Street to the ASR facility. The B Reservoirs are connected to the rest of the B Level distribution system by approximately 4,800 linear feet (lf) of 12-inch diameter cast iron main.

2.4.3 C Level

The C Level primarily serves residential customers south of Ibach Street (see **Figure 2-1**).

2.4.3.1 Supply

The C Level is supplied only by the C Level Pump Station at the Norwood site. The pump station was upgraded in 2009 and houses twin 75 hp, 1400 gpm pumps with variable frequency drives (VFDs). The pump performance curves for the Martinazzi Pump Station are included as **Appendix C**. In the event of a power outage, the station is equipped with automatic switching for continued operation with a mobile standby generator.

2.4.3.2 Storage

The C Level Pump Station pumps from the B Level to the C Level Reservoirs located at the Frobase site, south of the City. The 0.8 MG C-1 tank was built in 1981 and underwent seismic improvements including construction of a new concrete ringwall and concrete collar around the base of the tank in 2006. Further seismic improvements completed in 2017, included installation of a new roof and center column to raise the available freeboard for sloshing during a seismic event. The C-2 tank was built in 2016 and provides an additional 1.0 MG of storage.

2.4.3.3 Distribution

Distribution mains in the C-Level are primarily looped, 8 and 10-inch diameter residential distribution mains, a 10-inch diameter main from Iowa Street to Grahams Ferry Road, and 12-inch diameter mains in Grahams Ferry Road and Boones Ferry Road. From immediately west of Interstate 5 (I-5), extending east on Norwood Road across I-5 and south, the piping between the Norwood Pump Station and the C-level storage tanks is a single dead end 12-inch diameter main.

2.4.4 Bridgeport Village

The BV zone is an isolated zone supplying commercial customers within Bridgeport Village, north of the City (see **Figure 2-1**).

Bridgeport Village does not contain gravity storage. Instead, the BV Level is constantly supplied directly from the TSM through the SW 82nd Avenue PRV which drops the hydraulic grade from approximately 530 feet to an HGL of approximately 360 feet (or approximately 80 psi) in the BV Pressure Zone. A second PRV from the City of Tigard is available for additional fire suppression flow capacity, or in the event the pressure downstream of this valve drops below 65 psi (15 psi lower than normal).

2.4.5 Corrosion Control System

Corrosion of metal (such as a pipeline or reservoir) is a natural process by which the refined metal returns to its original native mineral state as an ore (the familiar red rust). The process is an electrochemical reaction between the metal and its environment that results in a loss of material at the anode (the pipe or reservoir wall). Stray current from rail, high voltage power lines, and other utilities can accelerate this process if infrastructure is not protected.

Soil corrosivity also affects corrosion. The City has not conducted a corrosion study to determine local soil corrosivity. Anecdotally, the City does not experience significant corrosion, so it is likely the soil is not very corrosive.

There are several methods of protecting infrastructure from corrosion including passive cathodic protection (CP), active CP, and other physical methods.

- In a passive CP system, a sacrificial material is added to the circuit, often in the form of zinc and/or magnesium plates buried in the soil and connected to the pipeline with a wire. Zinc and magnesium oxidize more readily than steel or cast iron and therefore corrosion occurs at the anode rather than the pipe.
- An active CP system or Impressed Current system includes the addition of an electrical current to the pipeline to further force the reaction away from using the pipe as the anode.
- Physical barriers can also limit corrosion. These include methods such as poly-wrap or coatings.

The City has installed a passive CP system on the TSM within the system, an active CP system on large diameter piping north of 72nd Avenue to Florence Lane. Four of the reservoirs (A-1, B-1, B-2, and C-1) all have functioning active CP systems. The active CP system at the C-2 Reservoir, built in 2016, has not yet been connected. This is common practice to provide sufficient time for possible manufacturing errors in the coating to be fixed within the warranty period by the contractor. The A-2 Reservoir, built in 2006, does not have a CP system.

2.4.6 System Summary

The following tables summarize the components of the City's Water System.

Table 2-4 | Flow Control Supply Valves

Valve ID	Upper Zone	Lower Zone	Valve Diameter (in)	October - May		June - September	
				Low Setting (gpm)	High Setting (gpm)	Low Setting (gpm)	High Setting (gpm)
72nd Ave	TSM	A	6/12	200	700	500	1,000
City Park	TSM	A	3/12	50	100	50	100
108th/Operations	TSM	A	8/12	200	800	400	1,200
Leveton	TSM	A	4/12	50	400	100	600
Boones Ferry	TSM	B	10/-	400	2,200	1,000	3,100

Table 2-5 | Pressure Reducing Supply Valves

Valve ID	Type	Upper Zone	Lower Zone	Ground Elev. (ft)	Valve 1 Diameter (in)	Valve 2 Diameter (in)	Valve 1 Setting (psi)	Valve 2 Setting (psi)
Bridgeport (Portland)	PRV	TSM	BV	175	3	8	360	348
Bridgeport (Tigard)	PRV	Tigard	BV	175	3	8	325	318

Table 2-6 | Pressure Reducing/Pressure Sustaining Valves

Valve ID	Upper Zone	Lower Zone	Pressure Reducing Setting		Pressure Sustaining Setting	
			(psi)	(HGL)	(psi)	(HGL)
Avery Street	B	A	35	251	84	364
65th Avenue	B	A	50	246	99	359
Chesapeake Drive	B	A	28	265	78	380
Mohawk Street	B	A	41	255	91	370
57th Avenue	B	A	34	242	84	357
Dakota Drive	C	B	33	358	84	476
Osage Street	C	B	33	356	84	474

Note:

2. These valves typically remain closed. Pressure reducing function activates to supply lower zones in the event of an emergency, or high flow event as all zones are primarily served by other means.

Table 2-7 | Storage Reservoirs

Reservoir Name	Max Volume (mg)	Available Capacity (mg)	Floor Elevation (ft)	Overflow Elevation/ Height (ft)	Shell Height (ft)	Year built	Type	Dia (ft)
A-1 (Avery)	2.2	1.8	248	295/ 47	50	1971	Steel	90
A-2	5.0	4.2	248	295/ 47	52	2006	Steel	135
B-1 (Norwood)	2.2	2.2	352	399/ 47	50	1971	Steel	90

B-2 (Norwood)	2.8	2.8	352	399/ 47	50	1989	Steel	100
C-1 (Frobase)	0.8	0.8	458.5	507.5/ 49	53	1981	Steel	54
C-2 (Frobase)	1.0	1.0	458.5	507.5/ 49	53	2016	Steel	59

Note:

1. As noted earlier in this section, maximum capacity reflects the maximum volume of water stored in the reservoir. Where storage is below an elevation required to provide 25 psi to customers, it is considered dead storage and not included as available capacity.

Table 2-8 | Pump Stations

Pump Station	Facility Type [1]	Supplying Zone	Receiving Zone	No. of Pumps	Individual Pump Capacity (gpm)	Firm Capacity (gpm) [2]	Pump Type
Martinazzi[3]	Emergency	A	B	2	1,000	1,000	End-Suction Centrifugal
Boones Ferry	*As discussed early in this section, the Boones Ferry PS is no longer considered operational, and is not part of the active water system analyzed in this WSMP.*						
Norwood[3]	Distribution System	B	C	2	1,400	1,400	End-suction centrifugal

Notes:

1. Facility type indicates how the station functions in the system. Tualatin has one distribution system pump station (C Level) that is required for normal service and is operated daily. Tualatin has one permanent emergency stations that may be available for emergency use to pump water from the A to B levels, if the Boones Ferry PRV is out for an extended period. Recent operation of this pump station has been limited so they are not guaranteed supply.
2. Firm Capacity: Operating capacity with largest pump out of service.
3. Pump performance curves are included in **Appendix C** of this WSMP

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Section 3

Section 3

Water Requirements

3.1 Introduction

This section presents the development of water demand forecasts for the City's water service area. Population and water demand forecasts are developed from regional and City planning data, current land use designations, historical water demand records, and previous City water supply planning efforts. A description of the water service area limits is also included in this section.

The City conducts an annual demand estimate as part of their contract with the PWB. The annual demand estimates are used to determine peak three-day demand, peak season demand, annual demand, and interruptible water demand. These values may be different from the ones calculated in this section and should not be interchanged.

3.2 Planning and Service Areas

The current water service area includes the area within the existing city limits plus two small areas outside the city limits that are served by the City. The entire Bridgeport Village commercial area in the northeast is served by the City including the movie theater that is in the City of Tigard. East of the freeway, the residential lots between the Tualatin River and SW Childs Road in the City of Rivergrove, as well as the commercial/industrial area between SW 63rd Avenue and I-5, are also served by the City. These areas are illustrated in **Figure 3-1**.

3.2.1 Development Areas

Two large development areas are currently under consideration for City service: the Basalt Creek Concept Area and the Southwest Industrial Area. Both areas are expected to begin development within the 20-year planning period of this WSMP. In addition, this WSMP provides a cursory look at impacts of potential service to the Stafford Urban Reserve area that could be brought into the UGB in the future and incorporated into the City.

3.2.1.1 Basalt Creek Concept Area

The Basalt Creek Concept Area is located south of the city limits, within the UGB, and just north of the City of Wilsonville. The area is anticipated to be served by both cities, divided into north and south sections approximately along Greenhill Road. The area highlighted in **Figure 3-1** is the area will be served by Tualatin.

As of the writing of this plan, the overall character of development has been accepted as part of the concept plan. Annexation to the City of Tualatin in the Basalt Creek area, including specific local roadways and development configurations will be determined with the review and approval of land use applications. A combination of single family residential, multifamily residential, and commercial development is expected in currently vacant land within the City's service area.

3.2.1.2 Southwest Industrial Area

The Southwest Industrial Area was studied in the prior WSMP, although development in the area has still not occurred. The area is located southwest of the City and within the UGB.

The updated development plan includes a mix of industrial and commercial zoning. However, the Tigard Sand and Gravel Quarry is currently operating in the area and is expected to continue operations through this planning period. Therefore, for the purpose of this plan, development will be assumed to be restricted to select taxlots north and south of the quarry. There is no expected increase in population from this area, although some water intensive industries could drastically increase the water demand, if allowed by the City.

3.3 Historical and Future Population Estimates

In 2020, Tualatin supplied water to approximately 27,195 residents. Current and historical population estimates for the City were taken from the 2020 Portland State University Population Research Center (PSU PRC) population estimates and are presented in **Figure 3-2**. Over the past five years, the average annual growth rate in the City has been approximately 0.4 percent with a maximum annual rate of 1.6 percent in 2013.

Based on known population drivers, the City is expected to continue experiencing growth at a similar rate. Using the past five-year, 0.4 percent average growth rate, the 5, 10, 20, and 40-year projection population forecasts were calculated and are presented in **Table 3-1** and **Figure 3-2**. These projections will be used to determine the timing of water supply and infrastructure upgrades and are addressed later in this section.

CURRENT SERVICE AREA INCLUDES THE CITY LIMITS PLUS THE TWO SMALL AREAS OUTSIDE THE CITY LIMITS.

Figure 3-1

TUALATIN WATER MASTER PLAN

PLANNING AREA AND SERVICE AREA

May 2021

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17-2000.402

SOURCE:
Planning Areas - City of Tualatin (2016).
Base Mapping - Metro RLIS (May 2017).

G:\PDX_Projects\17\2000 - Tualatin WMP Update\GIS\17-2000-402-OR-FIGURE 3-1.mxd 6/19/2017 4:30:45 PM Claire.DeVoe

Figure 3-2 | Historical and Projected Population

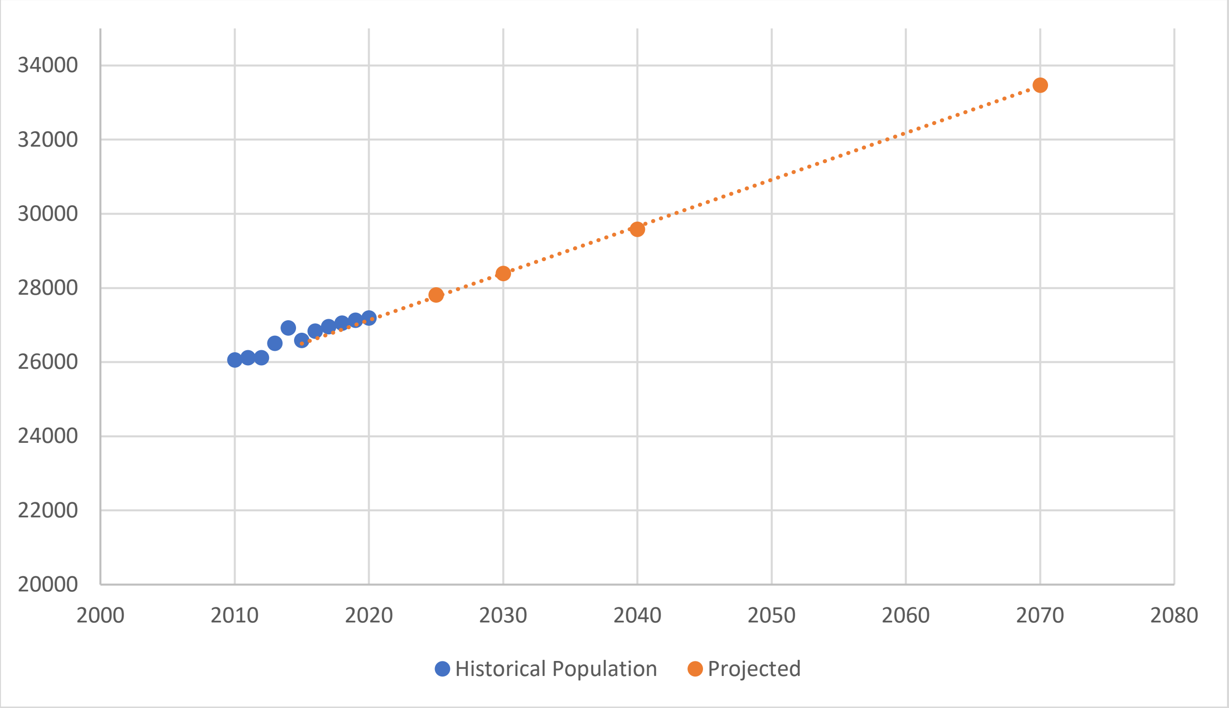


Table 3-1 | Historical and Projected Population

Year	Population	Average Annual Growth Rate (AAGR)
2012	26,120	1.49%
2013	26,510	1.57%
2014	26,925	-1.24%
2015	26,590	0.94%
2016	26,840	0.45%
2017	26,960	0.35%
2018	27,055	0.30%
2019	27,135	0.30%
2020	27,195	
2025	27,813	
2030	28,391	
2040	29,583	
2070	33,469	

Note:

1. The negative growth rate for 2014 to 2015 population estimates are assumed to be an anomaly and reflect the level of accuracy available from annual population estimates.

3.4 Historical Water Usage

Terminology used in this section to describe uses of drinking water supplied by the municipal water system is defined below.

A Water balance accounts for all water supplies and demands in the system.

Water consumption is the amount of metered water usage billed to customers by the City. Water consumption is also commonly referred to as customer usage.

Water demand refers to all water requirements in the system including water consumption, ASR recharge and unaccounted-for water.

Water production is the amount of water produced and delivered to the distribution system. The City of Tualatin purchases wholesale water from PWB. The City also recovers water from an ASR well it recharges annually. For the purposes of this study, water production is purchased plus recovered water.

Unaccounted-for water includes system leakage, or water loss, and unmetered uses. Unaccounted-for water is the unmeasured portion of the water balance and can be calculated as the difference between water production and water demand.

Peaking factor is the ratio of high to low water demand and is useful for characterizing the total water system demands. Peaking factors can be developed for any number of demand conditions such as maximum day demand (MDD) or peak hour demand (PHD) to average day demand (ADD).

Water usage is discussed in terms of volume per unit of time such as gpm, gallons per day (gpd), or mgd. Demands are also related to per capita use such as gallons per capita per day (gpcd) or per acre use such as gallons per acre per day (gpad).

3.4.1 Historical Water Production and Demand

The City's water balance has changed significantly since the last plan. In 2011, the City of Sherwood began transitioning supply to water from the WRWTP in Wilsonville and discontinued purchasing PWB water wheeled through the Tualatin system. The 24-inch Sherwood supply main remains connected as an emergency supply to the City of Sherwood but has not been utilized in several years and would require inspection, disinfection, and flushing prior to resuming use. Also in 2011, the City began piloting the ASR program. The City began injecting water in 2011 and began recovering water to meet peak season demands in 2014.

3.4.1.1 Unaccounted for Water

Unaccounted for or non-revenue water in the Tualatin system is approximately six percent, which is fairly typical for a system of this size. Unaccounted for use reflects unmetered authorized use such as system flushing, unmetered unauthorized use, and minor leaks. Unaccounted-for water volumes that are less than 10 percent of total water production are within an acceptable operating range consistent with OWRD municipal water conservation guidelines (OAR 690-086-0150(4)).

Table 3-2 provides a summary of the historical water production, water demand, and unaccounted-for water.

Table 3-2 | Historical Water Production and Demand

Year	Purchase/Production (mg)			Demand (mg)				Unaccounted for Water	
	PWB Supply[1]	ASR Recovery[2]	Total	City of Tualatin	City of Sherwood	ASR Recharge[2]	Total	Volume (mg)	Percent
2012	1610	62	1672	1336	133	110	1579	93	5.5%
2013	1523	55	1579	1365	66	83	1514	65	4.1%
2014	1648	53	1701	1456	85	108	1649	53	3.1%
2015	1650	50	1700	1522	28	95	1645	56	3.3%
2016[3]	1547	43	1590	1486	0	24	1511	80	5.0%
2017	1593	44	1638	1465	1	73	1539	99	6.0%
2018	1666	37	1703	1546	0	37	1584	119	7.0%
2019	1624	30	1654	1499	0	67	1566	88	5.4%
2020	1624	22	1655	1485	0	61	1546	100	6.1%

Notes:

1. PWB Supply provided by the City from Metzger Meter Readings.
2. ASR supply assumed recovery between July 1 and September 30, and recharge between October 1 and June 30.
3. ASR recovery and recharge in 2016 were interrupted due to mechanical issues.
4. ASR volumes documented here are per calendar year. Other documents present ASR volumes in terms of water year.

3.4.2 Historical Water Demand Characterization

3.4.2.1 Demand Peaking Factors

Water demands fluctuate greatly over the course of a day, month, or year. These variations reflect changes in water use based on daily water use patterns, specific industry use, or irrigation seasons.

The industry standard to characterize system-wide water use is ADD. However, ADD does not capture these daily or seasonal variations. Therefore, peaking factors based on the ratio of ADD to demand in a specific period of time are used to understand these variations and predict future maximums.

For this plan, two different sets of peaking factors will be used, the PWB wholesale contract peaking factors and City water use peaking factors. The PWB peaking factors are used to calculate wholesale water rates and include Peak Season Demand (PSD) and Peak Three Day Demand (P3DD). They are based on a ratio of the City's Guaranteed Minimum Purchase to the water purchased during the 90 days from July 1 to September 30 and the peak three consecutive days of water purchase during that season, respectively.

For planning purposes, peaking factors based on water demand are used for infrastructure sizing and include MDD and PHD, calculated as the ratio of these demand periods to ADD.

Table 3-3 presents a summary of recent system demands and maximum peaking factors.

Table 3-3 | System Demands

Year	Demand Condition (mgd)				
	Average Day	Peak Season	Peak 3-Day	Maximum Day	Peak Hour
2014	4.36	6.78	7.71	7.83	n/a
2015	4.40	6.56	8.30	8.45	n/a
2016	4.28	6.19	7.68	8.37	n/a
2017	4.29	6.69	8.46	9.54	n/a
2018	4.56	6.61	8.14	8.41	n/a
2019	4.33	5.92	7.53	7.64	n/a
Maximum Peaking Factors:		**1.47**	**1.82**	**1.90**	**2.0**[1]

Notes:

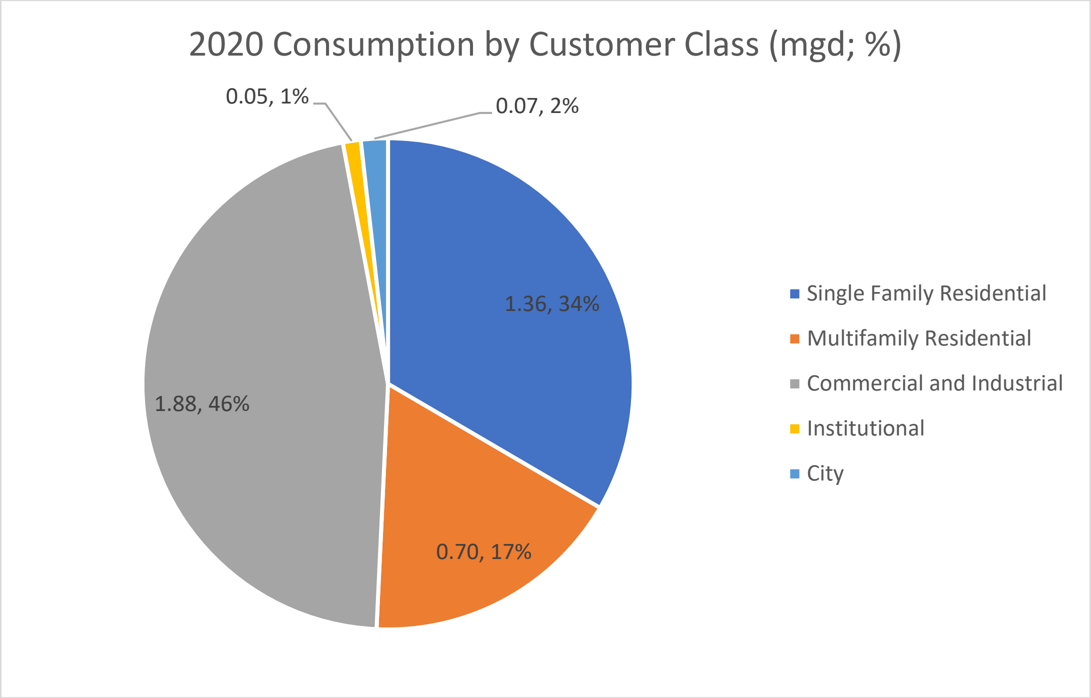
1. PHD is not available based on data provided by the City and instead the 2.0 peaking factor shown above is typical of similar water systems in Oregon (data review for the cities of Tigard, Newberg and Beaverton – PHD peaking factor ranged from 1.7 to 2.0).
2. System demands include unaccounted for water at a rate of roughly 6%.

3.4.2.2 Consumption by Customer Class

In the Tualatin water system, customers are assigned to one of five general customer classes based on the type of water use or facility being served. Customer classes include Residential, Multifamily, Commercial or Industrial, Institutional, or City.

Consumption is split primarily between residential use and commercial or industrial use. Residential water use is generally consistent on a per capita or per household basis. Commercial and industrial use, however, varies depending on the type of industry. Distribution warehouses have relatively low water consumption while fruit and vegetable processing facilities are extremely water intensive. Therefore, it is useful to classify consumption by customer class and also to consider the type of industry when considering future loading. **Figure 3-3** illustrates consumption by customer class for 2020.

Figure 3-3 | Consumption by Customer Class



3.5 Water Demand Projections

3.5.1 Approach

In order to reasonably estimate future water demands, water use characteristics under existing conditions must be related to some measure of future growth within the water service area. Historical population growth often provides a reasonable approximation of system-wide water demand growth. However, this approach is less reliable in systems with high percentages of non-residential water demand and large areas of planned non-residential development, as there is in Tualatin. Additionally, a population growth based approach generally requires Capital Improvement Program (CIP) projects to be tied to a population threshold or a fixed timeline, as opposed to growth metrics that correlate to actual demand growth. Therefore, a more detailed projection based on customer type and estimated development timing will be used to predict future demands.

For this analysis, demands are standardized based on the annual average consumption of a single-family residential unit, defined as an Equivalent Residential Unit (ERU) and used with tax lot information on customer class, developable acreage, and development timing to calculate system demands from existing through buildout conditions. The following sections describe this process including.

- Development of an ERU demand
- Conversion of customer class demands to number of ERUs
- Calculation of ERUs/acre for each customer class

- Application of ERUs/acre factors and calculation of forecasted system demand through buildout condition

3.5.2 Existing Equivalent Residential Units

For this planning effort, the water needs of non-residential and multi-family residential customers are represented in terms of single-family residential units. The number of average single-family residential units that could be served by the water demand of these other types of customers is referred to as a number of ERUs.

Different from actual metered service connections, ERUs relate all water services to an equivalent number of representative single-family residential services. For example, a commercial customer could on average use half the amount of water an average single family residential customer uses (one ERU). Therefore, that commercial customer could be represented as half of an ERU.

3.5.2.1 Average Consumption per ERU

The average consumption per ERU is calculated as the total annual consumption by single-family residential customers divided by the total number of single-family residential service connections. Both total consumption and total number of service connections are tracked by the City. For the years 2012 through 2016, the average daily consumption per ERU for Tualatin was approximately 231 gpd and based on a review of more recent data, this still represents an accurate estimate of usage per ERU for forecasting.

3.5.2.2 Existing ERUs by Customer Class

For this WSMP, customers within each customer class are assumed to share similar water use characteristics. Therefore, the total number of existing ERUs per customer class is calculated by dividing the aggregate annual consumption of each customer class by the average consumption per ERU. This total number of ERUs is then distributed across developed tax lots to calculate existing ERUs per acre for each customer class. **Table 3-4** presents the results of these calculations.

Table 3-4 | Existing ERUs and Developed Area Summary by Customer Class

Customer Class	2016 Water Consumption (mgd)	2016 ERUs[2]	Developed Area (acres)	ERUs per Acre
Single Family	1.32	5,701	1,318	4.3
Multifamily	0.70	3,014	325	9.3
Commercial and Industrial	1.90	8,218	1,807	4.5
Institutional	0.05	219	190	1.2
Public	0.11	465	141	3.3
System Wide Total	**4.07**	**17,617**	**3,781**	

Notes:

1. 2016 Water Consumption is based on consumption data and does not include the approximately 5% of unaccounted for demands.
2. ERU differences between Table 3-4 and 3-5 due to rounding.

3.5.2.2.1 Determining Existing Developed Acreage and Customer Class

Determining existing developed acreage and customer class required understanding demands on a per tax lot basis. Geolocated water billing records and data available through Metro's Regional Land Information System (RLIS) were used to classify tax lots. In an ideal system, each address of a water billing record would match an address of a developed tax lot. However, differences in address syntax between RLIS tax lot information and City water billing records, as well as multiple tax lot records that exist for a single water service prevent this one-to-one match. To account for these deficiencies, determining the customer class and development potential of tax lots is a multistep process.

First, tax lot addresses that matched geolocated billing data or were easily spatially linked to billing data were considered developed and assigned a customer class from the billing data. Approximately 80 percent of tax lots were classified through this method.

The remaining tax lots were classified based on Metro data and aerial photography review. Customer class was assigned based on LANDUSE categories available from Metro. Development was primarily based on BLDGVAL greater than 0 and spot checked with aerial photography for accuracy.

3.5.2.3 Existing ERUs by Service Level

The existing number of ERUs in each service level were estimated using the ERUs per acre calculated in **Table 3-4** and the tax lot data developed in the prior section. Existing 2016 demand and ERUs for each service level are summarized in **Table 3-5**. The 2016 data represents the current distribution of demand and customers by zone. A review of 2017 through 2020 data confirmed that customer water use distribution and characteristics have remained consistent.

Table 3-5 | Estimated Existing Water Consumption and ERUs by Service Level

Service Level	2016 ERUs	2016 Water Consumption (mgd)	Existing Consumption %
A	9,680	2.24	55%
B	6,336	1.46	36%
C	1,456	0.34	8%
BV	134	0.03	1%
Total	**17,606**	**4.07**	

Notes:

1. Existing consumption calculated without the 5% unaccounted for water.

3.5.3 Future ERUs and Water Demands

As described earlier in this section, future ERUs and associated water demands are assigned to each service level based on the land use type and the total developable land available in each service level. Development is expected both as new development within and outside of the existing service area, and redevelopment of large parcels within the existing service area.

Projected timing of development and redevelopment was developed with input from the City's planning department. A summarized report of expected ERUs and demands by pressure zone is included in **Table 3-6** at the end of this section.

3.5.3.1 Development and Redevelopment Areas

All areas located within the 100-year floodplain based on Federal Emergency Management Agency (FEMA) flood mapping, and with a slope greater than 25 percent based on RLIS hazard mapping, are considered undevelopable. Existing developed tax lots within these zones are considered developed but no new development or redevelopment will occur in the future. This is consistent with similar planning efforts in the region.

3.5.3.1.1 SW Industrial Area

The SW Industrial Area is expected to eventually develop as entirely commercial or industrial businesses at existing "Commercial and Industrial" densities. However, the existing Tigard Sand and Gravel quarry in the middle of the planning area will likely continue to operate and not develop for the planning period of this WSMP. For the purposes of this WSMP, it is anticipated than no additional development will occur in the 20-year planning horizon. Most of the SW Industrial Area will be served by the B Level, although portions of the quarry will require C Level pressures.

3.5.3.1.2 Basalt Creek Planning Area

The Tualatin portion of the Basalt Creek Planning Area is expected to develop as a mixture of residential and commercial or manufacturing purposes. Customer class is assigned based on City planning documents. Residential development is expected to occur at a density of 8 ERUs/ net acre, to account for both single family and multifamily residential development. Residential areas will likely develop within the next five years while non-residential will likely begin development five years after residential development and will not reach saturation development within this planning period. For the purposes of this WSMP, at build-out, the Basalt Creek area is forecasted to have approximately 1,600 ERUs.

3.5.3.1.3 Development within Existing Service Area

There are limited undeveloped areas within the existing service area. Residential areas will likely develop within the next five years at densities closer to 6 ERUs/acre. Employment and industrial areas will continue developing at existing densities within the next 10-20 years.

3.5.3.1.4 Redevelopment within Existing Service Area

Redevelopment of single-family residential tax lots greater than 0.5 acres is expected to occur where environmental hazards do not exist. Development is expected at densities of 6 ERUs/acre after development occurs elsewhere in the system.

3.5.3.2 Future Demands

Future demands are calculated for the whole system and by pressure zone at 5, 10, and 20- years, and for buildout conditions. The forecasted time steps support identification of existing and future system deficiencies, prioritization of CIP projects to support development and growth, and sizing of future infrastructure to serve the long-term needs of the City.

The forecasted number of ERUs and future water demands are calculated based on the 2020 estimate of system demand and a 0.4 percent growth rate, resulting in a build-out of the City's water service area in approximately 30 years. The distribution of future demands by pressure zone was developed using the assumptions for development timing and future ERU densities as described in **Section 3.5.3.1**.

Table 3-6 | Future ERUs and Water Demand Summary by Service Level

Pressure Zone	2016	2020	2025	2030	2040	Buildout
ERUs						
A	9,680	9,841	10,541	10,991	11,491	11,591
B	6,336	6,441	6,741	7,241	7,341	8,491
C	1,456	1,480	1,930	2,530	2,830	3,080
BV	134	136	136	136	136	136
Total	**17,606**	**17,898**	**19,348**	**20,898**	**21,798**	**23,298**
Average Day Demand						
A	2.35	2.39	2.55	2.66	2.78	2.81
B	1.54	1.56	1.63	1.75	1.78	2.06
C	0.35	0.36	0.47	0.61	0.69	0.75
BV	0.03	0.03	0.03	0.03	0.03	0.03
Total	**4.27**	**4.34**	**4.69**	**5.06**	**5.28**	**5.65**
Maximum Day Demand[1]						
A	4.50	4.58	4.90	5.11	5.34	5.39
B	2.95	2.99	3.13	3.37	3.41	3.95
C	0.68	0.69	0.90	1.18	1.32	1.43
BV	0.06	0.06	0.06	0.06	0.06	0.06
Total	**8.19**	**8.32**	**9.00**	**9.72**	**10.14**	**10.83**

Notes:

1. MDD:ADD peaking factor = 1.92
2. Demands include a 5% markup for unaccounted for water.

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Section 4

Section 4

Planning and Analysis Criteria

4.1 Introduction

This section documents the performance criteria used for water system analysis presented in **Section 5** of this WSMP. Criteria are established for evaluating water supply, distribution system piping, service pressures, storage and pumping capacity, and fire flow availability. These criteria are used in conjunction with the water demand forecasts presented in **Section 3** to complete the water system analysis.

4.2 Performance Criteria

The water distribution system should be capable of operating within certain performance limits under varying customer demand and operational conditions. The recommendations of this plan are based on the performance criteria summarized in **Table 4-3** at the end of this section. These criteria have been developed through a review of City design standards, State requirements, American Water Works Association (AWWA) acceptable practice guidelines, *Ten States Standards*, the *Washington Water System Design Manual,* the *Oregon Resilience Plan,* and practices of other water providers in the region.

4.2.1 Water Supply

As described in **Section 2**, the City's sole supply is wholesale water purchased from PWB and delivered through the 66-inch diameter WCSL, the 48-inch diameter MTSM to the PWB master meter at Florence Lane, and Tualatin's 36-inch diameter TSM. The primary water supply for PWB is the Bull Run Watershed and secondary supply is the Columbia South Shore Wellfield.

4.2.1.1 Supply Capacity

During peak summer water demand, the City withdraws water at a limited rate from the Columbia River Basalt Group (CRBG) aquifer with an ASR well. Total volume of available water in the aquifer is limited to 95 percent of water injected that year and an annually decreasing volume of water not recovered in previous years. Emergency interties with the Cities of Tigard, Sherwood, Lake Oswego, and Wilsonville, the Willamette Water Supply System, and the Rivergrove Water District can also likely provide minimal additional supply although these interties have rarely been utilized and the actual capacity is available is undocumented.

Due to seasonal changes in the City's supply sources, such as ASR supply availability during the summer months and the need to inject water for ASR in the winter, it is important to look at the impact of both the peak and off-peak season water demands on the City's supply capacity.

Based on current water system operations, the City should plan for adequate peak season (summer) supply capacity to provide MDD from PWB. The supply system must also be capable of providing ADD plus water for ASR injection during the off-peak season. For the purposes of this WSMP, the off-peak season is defined as the period when the City is injecting supply to the ASR wells, from approximately November to mid-May each year.

4.2.1.2 Supply Transmission

For the City's system, transmission piping is piping that falls into one of two categories.

- Mains that operate a hydraulic grade independent of the surrounding pressure zone. These mains, include the TSM, the 24-inch diameter main in Boones Ferry Road between the TSM and the Boones Ferry PRV/FCV, and the main extending from the TSM to the 10th/Operations and Levelton PRV/FCV. The key feature of these transmission mains is that they: do not have service connections and are not directly connected to the surrounding distribution mains.
- Distribution mains larger than 12-inch diameter which operate at the same hydraulic grade as the adjacent distribution mains, are directly connected to those same distribution mains, and may have direct service connections.

Transmission mains will be evaluated based on: 1) the required carrying capacity to serve their purpose (i.e., for the TSM, the capacity to supply MDD from PWB wholesale supply) and 2) maintaining a maximum velocity of 8 feet per second (fps) under peak flow conditions. While this velocity criteria will typically not be sued as a sole basis for recommending improvements, it provides a basis for identifying potential capacity deficiencies and for sizing future mains.

4.2.2 Distribution System

The distribution system will be evaluated under two demand scenarios: 1) MDD + fire flow and 2) PHD. These two scenarios typically account for the largest instantaneous demands on the system. Evaluating the system under these conditions helps identify deficiencies in the distribution network and suggest improvements to be included in the Capital Improvements Projects list.

4.2.2.1 Main Size

Typically, new water distribution mains should be at least 8 inches in diameter to supply minimum fire flows. Potential water quality issues will be considered on a case by case basis when sizing pipes for any proposed water main improvements identified during distribution system analysis.

4.2.3 Service Pressure

Water distribution systems are separated by ground elevation into pressure zones to provide service pressures within an acceptable range to all customers. Typically, water from a reservoir will serve customers by gravity within a specified range of ground elevations so as to maintain acceptable minimum and maximum water pressures at each individual service connection. When it is not feasible or practical to have a separate reservoir for each pressure zone, pump stations or PRVs are used to serve customers in different pressure zones from a single reservoir.

The three primary Tualatin pressure zones are served by reservoirs in each zone while the Bridgeport service area is only supplied by PRV connection to the TSM. PRVs also exist between service areas within the system for emergency supply.

The acceptable service pressure range under normal (ADD) operating conditions is 50 to 80 psi. Where mainline pressures exceed 80 psi, services must be equipped with individual PRVs to maintain their static pressures at no more than 80 psi in compliance with the *Oregon Plumbing Specialty Code.* A maximum mainline pressure of 110 psi is recommended, except in special circumstances (such as a high pressure transmission main without services or looping connections to distribution).

The minimum residual service pressure at any meter under fire flow conditions during MDD is 20 psi as required by Oregon Health Authority (OHA) regulations and OAR 333-061. As an added factor of safety, the City has a goal of reaching 25 psi under these same conditions. This condition should be met even under the most extreme storage conditions where all operational, equalization, and fire suppression storage is depleted. Recommended service pressure criteria are summarized in **Table 4-1**.

Table 4-1 | Recommended Service Pressure Criteria

Service Pressure Criterion	Pressure (psi)
Minimum, during emergency or fire flow *(5 psi higher than regulatory minimum of 20 psi)*	25
Normal minimum, during ADD *(used to establish pressure zone boundaries)*	50
Normal Maximum (to guide pressure zone boundaries for customer compliance with the Oregon Plumbing Sepcialty Code)	80
1. Maximum Mainline Pressure	110

4.2.4 Storage Capacity

Tualatin water storage reservoirs should provide capacity for four purposes: operational storage, fire storage, equalization storage, and standby or emergency storage. Additionally, dead storage and headroom for seismic sloshing should also be included in storage volume calculations, where tanks have not been constructed to include seismic slosh height. While storage is typically discussed as a volume, limiting factors may actually be based on vertical space in a tank, flow rates, or actual volume of water. Adequate storage capacity for each purpose must be provided for each pressure zone, although the volume may be divided among multiple tanks. **Figure 4-1** provides a visual of the six storage volume components and is followed by a brief discussion of each storage element below, based on the *Washington State Water System Design Manual* guidelines.

4.2.4.1 Operational Storage

Operational storage is the volume of water stored between the nominal on/off reservoir level set points for the supplying pump stations or supply valves. This volume is dedicated to supplying demand fluctuations throughout the day and minimizing constant pump cycling. Operational storage can be varied throughout the year to provide reservoir turnover. For example, winter tank levels are normally set lower than summer levels to allow for continued turnover with lower winter demands.

4.2.4.2 Fire Storage

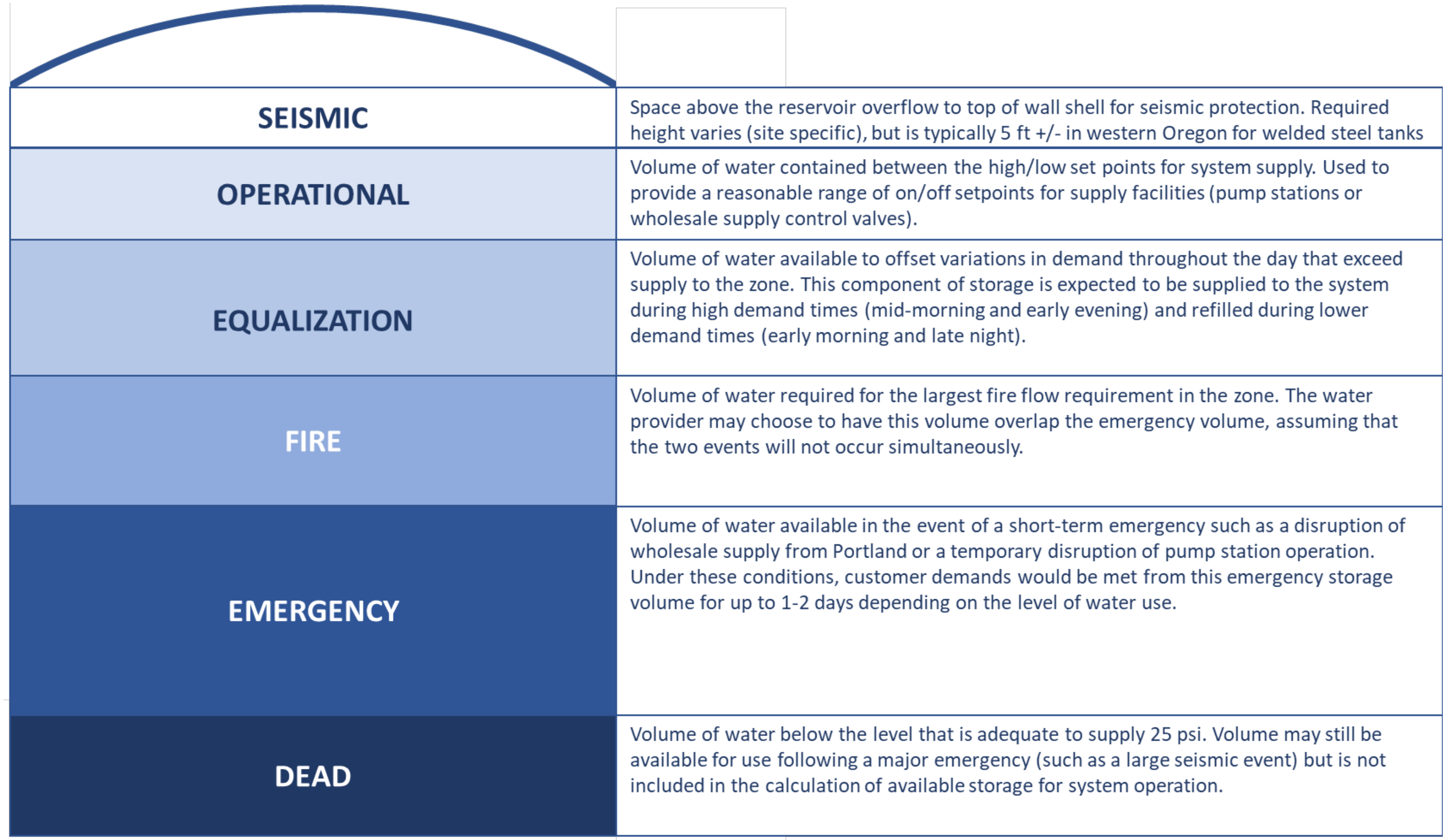
Water stored for fire suppression is typically provided to meet the single most severe fire flow demand within each pressure zone. Fire services in the Tualatin water service area are provided by Tualatin Valley Fire & Rescue (TVFR). Although the final fire flow requirement for any one property is determined by the Fire Marshal, TVFR provides the *Fire Code Applications Guide* which addresses general requirements by building construction and development type.

The maximum required fire flow for any future development in the TVFR service area is 3,000 gpm for a recommended duration of three hours. The recommended fire storage volume is determined by multiplying the fire flow rate by the duration of that flow. Fire flow requirements by land use type and zoning are discussed later in this section and summarized in **Table 4-2**.

4.2.4.3 Equalization Storage

Equalization storage is required to meet water system demands when zone demands exceed supply delivery capacity. The Washington Standards calculate equalization storage as (Peak Hour Demand-Qs)x150 minutes, where Qs is the total supply available to the zone excluding emergency supply.

Figure 4-1| Storage Volumes



SEISMIC	Space above the reservoir overflow to top of wall shell for seismic protection. Required height varies (site specific), but is typically 5 ft +/- in western Oregon for welded steel tanks
OPERATIONAL	Volume of water contained between the high/low set points for system supply. Used to provide a reasonable range of on/off setpoints for supply facilities (pump stations or wholesale supply control valves).
EQUALIZATION	Volume of water available to offset variations in demand throughout the day that exceed supply to the zone. This component of storage is expected to be supplied to the system during high demand times (mid-morning and early evening) and refilled during lower demand times (early morning and late night).
FIRE	Volume of water required for the largest fire flow requirement in the zone. The water provider may choose to have this volume overlap the emergency volume, assuming that the two events will not occur simultaneously.
EMERGENCY	Volume of water available in the event of a short-term emergency such as a disruption of wholesale supply from Portland or a temporary disruption of pump station operation. Under these conditions, customer demands would be met from this emergency storage volume for up to 1-2 days depending on the level of water use.
DEAD	Volume of water below the level that is adequate to supply 25 psi. Volume may still be available for use following a major emergency (such as a large seismic event) but is not included in the calculation of available storage for system operation.

4.2.4.4 Emergency Storage

Emergency storage is provided to supply water from storage during emergencies such as supply pipeline failures, equipment failures, power outages, or natural disasters. The amount of emergency storage provided can be highly variable depending upon an assessment of risk and the desired degree of system reliability. For the Tualatin system, an emergency storage volume of 2x ADD is recommended, consistent with recommendations in the Washington Water System Design Manual.

4.2.4.5 Dead Storge and Seismic Volume

Some reservoirs may include two additional, non-usable volumes of air or water. Dead storage is the volume of water at the base of the reservoir that does not provide a minimum 25 psi or exists below the outlet. Seismic volume is only required in older reservoirs that do not meet current seismic standards. It includes the volume of space between the maximum water surface allowed and the base of the tank roof. This space is maintained as a buffer in the event of a seismic event to minimize forces on the tank caused by uplift and the resultant sloshing. For older reservoirs with inadequate freeboard, this volume of space may require the reservoir to be operated such that the maximum operational level is below the set overflow elevation of the tank.

4.2.5 Pump Stations

4.2.5.1 Station Capacity

Pumping capacity requirements vary depending on the water demand, volume of available storage, and the number of pumping facilities serving a particular pressure zone. When pumping to storage reservoirs, a firm pumping capacity equal to the pressure zone’s MDD is recommended. Firm pumping capacity is defined as a station’s pumping capacity with the largest pump out of service.

4.2.5.2 Backup Power

It is recommended that pump stations supplying gravity storage reservoirs include, at a minimum, manual transfer switches and connections for a portable back-up generator. Automatic transfer switches, however, are preferable and are the updated recommended standard. The emergency storage volume in each reservoir will provide short term water service reliability in case of a power outage at the pump station. Permanently installed on-site back-up generators should be in place for pump stations critical to the City’s operations (i.e., Norwood Pump Station).

4.2.6 Required Fire Flow

The water distribution system nominally provides water for domestic uses and is also expected to provide water for fire suppression. The amount of water required for fire suppression purposes is associated with the local building size and type or land use of a specific location within the distribution system. Fire flow requirements are typically much greater in magnitude than the MDD in any local area. Adequate hydraulic capacity must be provided for these potentially large fire flow demands. Emergency response in the City of Tualatin is provided by TVFR. TVFR establishes fire flow requirements for each building within the City. General TVFR fire flow guidelines are described in the *Fire Code Applications Guide* consistent with the 2019 *Oregon Fire Code* (OFC). Fire flow requirements by land use type based on these guidelines are summarized in **Table 4-2** and reflect a balance between providing fire suppression flows from the water system and requiring on-site fire suppression (per the OFC) to reduce the demand on the water system.

4.2.6.1 Single-Family Residential

The OFC and TVFR guidelines specify a minimum fire flow of 1,000 gpm for single-family and two-family dwellings with a square footage less than 3,600 square feet. For residential structures larger than 3,600 square feet, the minimum fire flow requirement is 1,750 gpm.

For the purposes of this WSMP, distribution piping fire flow capacity will be tested in the water system hydraulic model with a requirement of 1,000 gpm. For structures requiring a larger fire flow rate, the City has determined that the developer/owner may require sprinklers to reduce fire flow requirements to 1,000 gpm.

4.2.6.2 Multi-Family Residential

A required fire flow of 2,000 gpm is recommended for medium density residential properties. Properties zoned for neighborhood services and community services commercial are anticipated to require similar flows for fire suppression. While on-site fire sprinkler use can reduce the fire flow requirement for specific structures, it is recommended that the City plan for system storage, pumping and distribution capacity to meet a 2,000 gpm fire flow in all pressure zones with potential multi-family development.

4.2.6.3 Commercial, Industrial, and Institutional

A 3,000 gpm fire flow is recommended for commercial, industrial, and institutional development consistent with TVFR maximum fire flow guidelines. This maximum fire flow requirement is also appropriate for institutional and public facilities, such as, schools or community centers. As with other development types, the actual required fire flow for a given structure will vary depending on construction type, occupancy, and the presence of on-site fire sprinklers. It is recommended that the City plan for system storage, pumping and distribution capacity to meet a 3,000 gpm fire flow in all pressure zones with potential large commercial or industrial development.

Recommended fire flow requirements by land use type are summarized in **Table 4-2**.

Table 4-2 | Required Fire Flow Summary

Land Use Type	Applicable Zoning	Required Fire Flow (gpm)	Required Duration (hours)
Single-Family Residential	RL, RML	1,000	1
Multi-Family Residential	RMH, RH, RH-HR	2,000	2
Commercial, Industrial, and Institutional		3,000	3

4.3 Seismic Resilience

Recently, regional emergency preparedness programs have focused on the eminent threat and extreme risk of a Cascadia Subduction Zone (CSZ) earthquake. Following this research, the State of Oregon has developed the Oregon Resilience Plan (ORP) to establish target timelines for utilities to provide service following a seismic event.

As part of this WSMP, the City has completed a seismic risk assessment of their existing water system. Seismic criteria and analysis are presented in **Section 7**.

4.4 Summary

The criteria presented in this section and summarized in **Table 4-3** were developed from various regional planning and design documents, as well as criteria used in similar regional systems. The criteria will be used to evaluate the existing system in **Section 5** and additional criteria related to seismic resilience will be developed and presented in **Section 7.**

Table 4-3 | Water System Performance Criteria

Water System Facility	Evaluation Criterion	Value	Design Standard/Guideline
Water Supply	Transmission Capacity	MDD	Ten State Standards, Washington Water System Design Manual
	Supply Capacity	Summer: MDD Winter: ADD + ASR Recharge	
Service Pressure	Normal Range (ADD[1] Conditions)	50-80 psi	Ten State Standard
	Maximum	110 psi system pressure and 80 psi at service with individual PRVs	Oregon Plumbing Specialty Code, Section 608.2
	Minimum, during MDD[2] with Fire Flow	25 psi	2019 Oregon Fire Code, OAR 333-061, City recommendation
Distribution Piping	Velocity during PHD[3]	Not to exceed 8 fps	AWWA M32, Washington Water System Design Manual
	Minimum Pipe Diameter	8-inch diameter Ductile Iron, 4- or 6-inch acceptable for short mains without fire service	Tualatin Public Works Construction Code
Storage	Total Available Storage Capacity	Sum of operational, equalization, fire suppression, and emergency storage volumes (does not include Seismic or Dead storage volumes)	Washington Water System Design Manual
	Operational	Tank level set points	
	Equalization	(PHD-Qs)*(150 minutes)	
	Fire	Required fireflow x flow duration	
	Emergency (Standby)	2 x ADD	
Pump Stations	Minimum no. of Pumps	2	Ten State Standards
	Open Zone Capacity[3]	MDD[2]	Washington Water System Design Manual
	Backup Power	At least two independent sources	Ten State Standards
Required Fire Flow and Duration	Single Family Residential	1,000 gpm for 1 hour	2019 Oregon Fire Code, Tualatin Valley Fire & Rescue Fire Code Applications Guide
	Multifamily Residential	2,000 gpm for 2 hours	
	Commercial, Industrial, and Institutional	3,000 gpm for 3 hours	

Notes:

1. ADD: Average daily demand, defined as the average volume of water delivered to the system during a 24-hour period = total annual demand/365 days per year. MDD: Maximum day demand, defined as the maximum volume of water delivered to the system during any single day. PHD: Peak hour demand, generally the peak hour of MDD. Estimated as 2xMDD.
2. Open zone is defined as a pressure zone supplied by gravity from a storage reservoir.

Section **5**

Section 5

Water System Analysis

5.1 Distribution System Analysis

5.1.1 Hydraulic Model

A steady-state hydraulic network analysis model (a model that represents the system as a series of lines and junctions, and calculates system flows and pressures at a specific point in time) was used to evaluate the performance of the City's existing distribution system and identify proposed piping improvements based on hydraulic performance criteria described in Section 4. The purpose of the model is to determine pressure and flow relationships throughout the distribution system for average and peak water demands under existing and projected future conditions, which ultimately inform the need for future improvement projects. Modeled pipes are shown as "links" between "nodes" which represent pipeline junctions or pipe size changes. Diameter, length, and head loss coefficients are specified for each pipe and an approximate ground elevation is specified for each node.

The current hydraulic model was updated during the 2013 WSMP using the Innovyze InfoWater modeling software platform and the City's geographic information system (GIS) base mapping. The model was updated again in late 2016 to reflect new development and infrastructure renewal. Building on the facilities identified in the prior model and updated facility and operations data provided by the City, the model was then calibrated using fire hydrant flow test data and analysis scenarios were created to evaluate existing and projected 20-year demands. The existing water demands in the model have been updated from year 2016 to 2020 demand conditions for this analysis.

5.1.2 Modeled Water Demands

Existing and projected future demands are summarized in Section 3. Within the existing water service area, demands are assigned to the model based on current customer billing address and billed water consumption. Future demands in water service expansion areas are assigned uniformly over each proposed pressure zone area.

5.1.3 Model Calibration

Model calibration typically involves adjusting the model parameters such that pressure and flow results from the model more closely reflect those measured at the City's fire hydrants. This calibration process tests the accuracy of model pipeline friction factors, demand distribution, valve status, network configuration, and facility parameters such as tank elevations, PRV settings, and pump controls and curves. The required level of model accuracy can vary according to the intended use of the model, the type and size of water system, the available data, and the way the system is controlled and operated. Pressure and flow measurements are recorded for the City's fire hydrants through a process called fire flow testing. This data is used to calibrate the model for future analysis.

The complete 2016 model calibration memo can be found in **Appendix D.**

5.1.3.1 Calibration Hydrant Flow Testing

Hydrant flow testing consists of recording static pressure at a fire hydrant and then "stressing" the system by flowing an adjacent hydrant. While the adjacent hydrant is flowing, residual pressure is measured at the first hydrant to determine the pressure drop that occurs when the system is "stressed". Boundary condition data such as reservoir levels and pump on/off status must also be known to accurately model the system conditions during the time of the flow test. For this plan, 30 hydrant flow tests were conducted in September 2016 distributed across the A, B, and C Levels. The recorded time of each fire hydrant flow test was used to collect boundary condition information from the City's supervisory control and data acquisition (SCADA) system.

No hydrant flow tests were completed in Bridgeport Village. This is a closed zone normally served from the Tualatin Supply Main via a PRV. Emergency or fire flow supply is available via an intertie and PRV with the City of Tigard. No additional development in the area has occurred since the model was last calibrated, and the zone has minimal connections with the rest of the City's system. Therefore, Bridgeport Village was not calibrated in this model and assumed to be accurate for planning purposes.

5.1.3.2 Pressure Reducing Valve/Flow Control Valve Settings

Supply to the Tualatin distribution system from Portland is dependent on dual-purpose PRV/FCVs. A pressure reducing valve sets the downstream pressure by throttling flow through the valve. A flow control valve sets the flow through the valve by varying pressure drop across the valve. A dual-purpose valve can have minimum or maximum settings for both flow and pressure, with either flow or pressure setting being the primary setting.

The PRV/FCVs have summer and winter operating modes, with low and high flow settings for each season. For the model calibration, the valves in the model were set at the maximum flow seen from SCADA and PRV settings were used to limit flow. In both the A and B Levels, flow through the FCV is overestimated for lower demand periods but aligns well during higher demand periods.

For system evaluation, calibration settings are used as "typical operation". For analysis of system performance under fire flow conditions and under peak hour conditions, the PRV/FCV stations are assumed to be closed or operating at a low flow setting.

5.1.3.3 Steady-State Calibration Results

Overall, the City's water system model calibrated well with moderate to high calibration confidence. Each existing pressure zone's overall confidence level was determined by the number of low, medium and high-confidence results for percentage difference in static pressure, and pressure change difference during a fire flow. Results are summarized in **Table 5-1**.

Table 5-1 | Calibration Confidence Results

Pressure Zone	Static Pressure Average % Difference/Confidence		Residual Fire Flow Pressure Average Pressure Difference/Confidence	
A	<1%	Moderate-High	2.5 PSI	High
B	4.5%	Moderate-High	4.7 PSI	High
C	2%	Moderate-High	2.3 PSI	High

Note:

1. Complete results listed in Tualatin Calibration Memo in Appendix D.

For most water systems, a portion of the data needed to fully characterize the distribution system (boundary conditions, customer demands, pressure and flow at specific locations, etc.) will be missing or inaccurate and assumptions will be required. This does not necessarily mean the use of the hydraulic model will be compromised. Depending on the accuracy and completeness of the available information, some pressure zones may achieve a higher degree of calibration than others. Models that do not meet the highest degree of calibration can still be useful for planning purposes.

5.1.4 Fire Flow Analysis

Fire flow scenarios test the distribution system's ability to provide required fire flows at a given location while simultaneously supplying MDD and maintaining a minimum residual service pressure at all services. As discussed in **Section 4**, a minimum pressure of 25 PSI, rather than the typical 20 PSI, was selected by the City. Required fire flows are assigned based on the zoning surrounding each node as summarized in **Table 4-2**.

The following boundary conditions were used for fire flow analysis in the model.

- Tanks set with fire flow storage depleted (only emergency + dead storage included) or minimum historical operating level, whichever is less. This translates to a depth of 30 feet in the A Level, 24 feet in the B Level, and 20 feet in the C Level.

- System demands were set at either 2020 or 2040 demands.

- All residential fire flow demands were calculated at 1,000 gpm. It is assumed that single family residential structures over 3,600 square feet would be sprinklered to reduce the fire flow requirement to this level.

- Available fire flow in the Tualatin System is highly dependent on the available supply to each zone (Portland supply valves in A and B Levels, C Level Pump Station in C Level). For fire flow analysis, Portland supply valves were set to high winter flows. For peak hour analysis, Portland supply valves were set to low summer flows. See **Table 2-4** for winter/summer low/high supply rates from Portland valves.

5.1.4.1 Fire Flow Results

Fire flow deficits were calculated for each scenario. **Figure 5-1** and **Figure 5-2** show the resulting deficits under 2020 and 2040 high flow conditions. There were two general results from the fire flow analysis:

- **Known Industrial deficiencies in the A and B Levels** – The City is aware of fire flow deficiencies in the A and B Levels. Some of this deficiency is due to undersized and non-looped mains. To mitigate these risks, the City currently requires new customers who require large fire flows to install fire flow pumps. Increased looping in this area and upsizing of keys mains will also improve available flows.

- **C Level Deficiencies –** Most development in the C Level is residential homes less than 3,600 square feet, requiring 1,000 gpm fire flow. Larger homes or fire flows may require sprinkler use to reduce demand. As the system currently operates, a 1,000 gpm fire flow is generally available during MDD to the C Level. However, if larger homes are constructed and sprinklers are not required, the system cannot meet these upsized demands without pumping during a fire flow or increased transmission. C Level Transmission is discussed further in **Section 5.1.6**.

Projects to address fire flow deficiencies are included in the CIP under Residential Fire Flow and Nonresidential Fire Flow.

5.1.5 Peak Hour Demand Analysis

For distribution system modeling, the Portland supply valves are assumed to operate in the summer low setting with reservoirs providing most of the supply to each zone. Storage reservoirs are modeled at 75 percent full, slightly less than typical summertime lows for a more conservative estimate. These two assumptions present a worst-case scenario for testing the system under stressed conditions.

Distribution system pressures were evaluated under peak hour demand conditions to confirm identified piping improvements. Peak hour demands were estimated as two times the MDD. No additional pressure deficiencies were identified under these conditions, as the fire flow condition creates a greater stress on the system. No additional CIP projects were identified for Peak Hour supply.

5.1.6 B and C Level Transmission Capacity

The Basalt Creek Planning Area located at the south end of the C Level is beginning to develop with two developments currently moving into land use approval. Existing transmission limitations through the B Level and fire flow requirements that exceed existing maximum available supply in the C Level require transmission improvements in both the B and C Levels prior to development. The analysis and complete findings from this study can be found in the *Water System Capacity Analysis – Basalt Creek Service Technical Memorandum* (Murraysmith, 2021) which is included as **Appendix E.** Findings from this report are summarized below, and projects are incorporated into the CIP under "Transmission Improvements."

- C Level transmission capacity between the Norwood Pump Station and C Level Reservoirs is inadequate to serve continued development in the C Level and specifically for the development of the Basalt Creek area. This deficiency results in inadequate fire flow capacity to serve proposed developments with fire flows greater than 1,000 gpm in 2020, and all fire flows by 2040.
- B Level transmission between the Boones Ferry PRV/FCV and B Level Reservoirs is inadequate to supply B Level and C Level peak demands while refilling the B Level reservoirs.

Based on the summary of findings above, the City should consider the following phased improvements, which are included in the CIP.

C Level

- *Prior to Basalt Creek Development:* Development in the Basalt Creek area should not be allowed without the completion of the following improvements.
    - C Level Pump Station operational changes and permanent standby power installation to address current fire flow deficiencies to support CPAH development
    - 344 feet of 18-inch diameter main from SW Vermillion Drive to I-5 Crossing
    - Oversize Autumn Sunrise subdivision piping parallel to Norwood Road to 18-inch diameter when constructed
    - Upsizing from east of I-5 Crossing towards SW Frobase Road, approximately 2,500 lf of 18-inch diameter main
    - Upsize transmission from C Pump Station to Norwood Road to 18-inch diameter when moved by developers

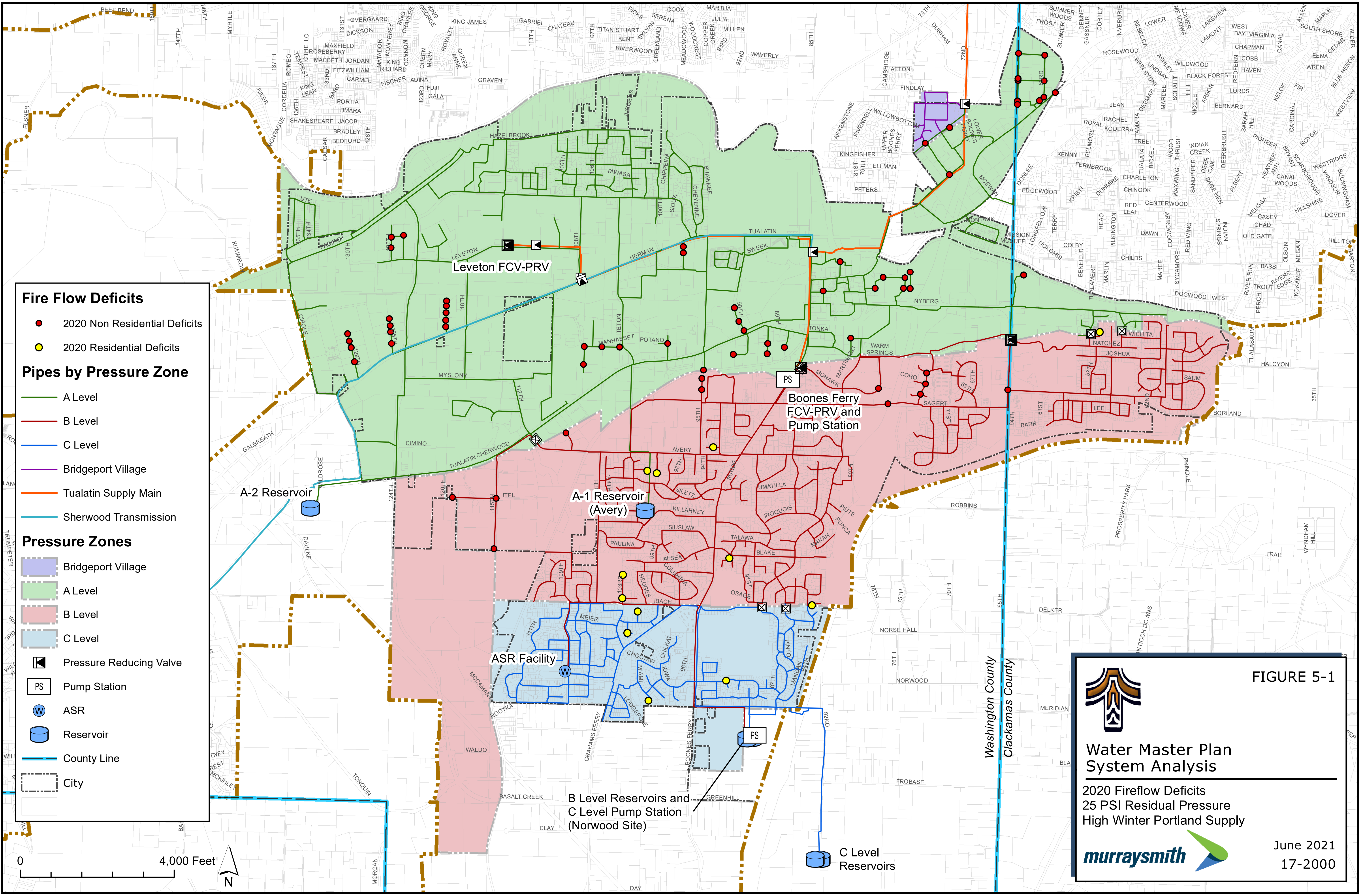


FIGURE 5-1

Water Master Plan
System Analysis

2020 Fireflow Deficits
25 PSI Residual Pressure
High Winter Portland Supply

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June 2021
17-2000

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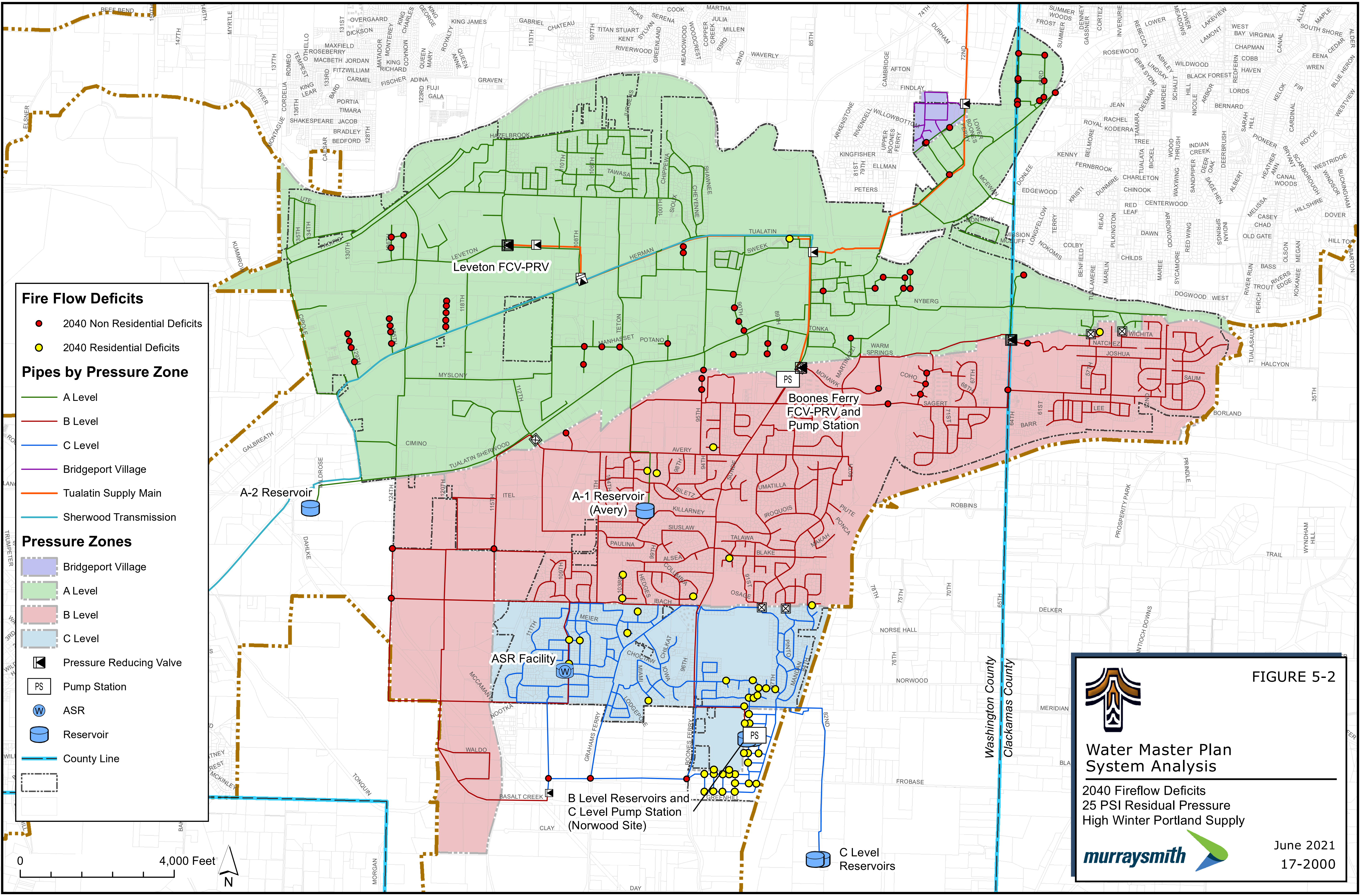

FIGURE 5-2

Water Master Plan System Analysis

2040 Fireflow Deficits
25 PSI Residual Pressure
High Winter Portland Supply

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- *Long-term Recommendations:* Full development of the Basalt Creek area will require the build-out of a transmission main loop, as identified in the WSMP, and the following improvements to address the transmission deficiency between the Norwood Pump Station and C Level Reservoirs.
    - Construct the remaining 18-inch diameter main from Frobase Road to the C Level Reservoirs.

B Level

- *Prior to Basalt Creek Development:* Further development of the B Level and C Level should be limited until the following improvement is completed.
    - Upsize existing transmission to 18-inch diameter main from Norwood Reservoirs to SW Ibach Street.
- *Long-term Recommendations:* With full development of the B and C Levels, further transmission improvements are recommended in the B Level.
    - Upsize existing transmission to 18-inch diameter main in SW Boones Ferry Road from SW Ibach Street to SW Sagert Street.

5.2 Pump Station Analysis

The City relies on pumping under two situations: 1) normal operation and 2) PWB supply disruption.

1. Under normal operation, the only system pumping required is from the B to C Level. This is via the C Level Pump Station located at the Norwood Reservoir (B Level) site. The A and B Levels are supplied by gravity directly by PRV/FCV connections off the Tualatin Supply Main and do not require pumping.
2. If supply from Portland through the Tualatin Supply Main is disrupted, or the Boones Ferry PRV/FCV is offline, pumping would be required from the A to B Level. This is in addition to the regular C Level pumping.

Station reliability, pumping redundancy, and zone supply capacity will be addressed below based on these two supply modes.

5.2.1 Capacity Analysis

Pumping capacity will be discussed by zone supply, from A to B Level and from B to C Level, and evaluated based on the MDD of the zones being pumped to. Pumping to the B Level must meet the needs of both the B and C Levels because all C Level supply is pumped from B Level. While there are two existing A to B Level pump stations (Martinazzi and Boones Ferry), they are not reliably operable, have insufficient capacity, and have reached the end of their usable lives and are not included in existing supply. B to C Level pumping is required for normal operation and so the station should be able to meet MDD under firm capacity (largest pump out of service). Pumping from A to B is only required under emergency or maintenance operations and therefore the entire station capacity can be used to meet MDD.

Table 5-2 summarizes the recommended pumping capacity through build-out.

Table 5-2 | Pumping Capacity Needs

	Supply Failure Pumping, A to B Level:	Normal Pumping, B to C Level:
Operation Type and Pump Conditions	Emergency – Total Capacity	Normal - Firm Capacity
Existing Pump Station	None4	C Level (Norwood)
Number of Existing Pumps	0	2
Existing Station Firm Capacity2 (MGD)	0	2.02
Service Area(s) Supplied	B+C5	C
Max Day Demands (MGD)		
Existing	3.69	0.69
2040	4.73	1.32
Buildout	5.38	1.43
Pumping Deficit3 (MGD)		
Existing	-3.69	1.33
2040	-4.73	0.70
Buildout	-5.38	0.58

Notes:
1. MGD – Million Gallons per Day.
2. Firm capacity is the station capacity with the largest pump out of service. The C Level pump station has two equal pumps and so firm capacity is a single pump active.
3. A negative value under pumping deficit indicates additional pumping required to meet system demands.
4. The existing Boones Ferry and Martinazzi pump stations are in poor condition, have reached the end of their usable lives, and are not exercised sufficiently for reliable operation. Therefore, neither is shown as existing.
5. The C Level is supplied from B Level, therefore pumping capacity to the B Level must be adequate to meet MDD of both B and C Levels.

5.2.2 C-Level Pumping

The C Level Pump Station at Norwood operates daily and is the only supply to the C Level. Based on the capacity needs analysis presented in **Table 5-2**, the station's existing firm capacity (one pump out of service) of 2.02 MGD (1,400 gpm) is adequate to supply the needs of the C Level through build-out. However, additional improvements should be considered for risk mitigation.

The City considers the station reliable based on historical operations. In addition, two pumps of equal size that are each individually capable of providing flow allows for pump maintenance without service disruption. With consistent maintenance, the City does not foresee a need to change operations to improve reliability. The City should add permanent standby power with automatic switching in the event of a power failure to the station.

The station is not operationally redundant. This means there is no secondary supply to the C Level, whether from a pump station or PRVs from higher levels. A failure of the C Level Pump Station or supply mains would mean total reliance on the stored water in the C Level Reservoirs, or possible emergency supply from Wilsonville via the Wilsonville Intertie. If the C Level Reservoirs are completely full, this translates to about 64 hours of supply under present MDD, or 33 hours of supply under 2040 MDD. If the tanks are lowered to emergency levels (20 feet of storage), supply time is reduced by approximately 3/5 to 27 hours under existing MDD or 13 hours under 2040 MDD.

The City may consider a second supply route to the C Level. This could be a second C Level Pump Station, potentially located at the ASR site, which may be available sooner after a seismic event than the Portland supply. It is the City's preference to not construct a pump station that's only purpose is for emergency supply. Alternatively, the City should consider purchasing portable pumping equipment for use at the existing 6-inch stub-outs located at the Norwood site. Portable pumping has not been used here in recent memory and the portable pumps the City jointly owns with TVWD (Flow and Eddy) would not work at this location due to pump curve requirements. The City currently would rely on leased equipment (commercial rental businesses) or borrowed equipment (neighboring water systems) for service through the 6-inch stub-outs, although neither of these approaches have been investigated seriously. It is recommended that the City purchases a portable pump station for this application. Costs of this equipment would include annual maintenance, storage, and additional training for use. It is possible this pump station would also be adequate for A to B pumping, as discussed in **Section 5.2.3.1.**

5.2.2.1 C Level Fire Flow Pumping

Prior to construction of C Level transmission upsizing (discussed in **Section 5.1.6**), the City should consider adding pressure controls to the C Level Pump Station for improved fire flow availability in the C Level. The current pump station is operated by reservoir level. Fire flow availability is improved when this pump station is active. Currently, there is no guarantee the pump station is active during the fire until the reservoir level drops to their low settings and until then, system pressures may be low if flows above 1,000 gpm are required. A second trigger based on system pressures should be added to the existing C Level Pump Station to activate the station when pressures in the C Level drop below approximately 35 psi downstream of the C Pump Station.

5.2.2.2 C Level Operational Adjustment

Both pumps at the C Level Pump Station are equipped with VFDs, allowing them to modulate supply between on and off. However, they are not currently used. The City should consider modifying the operations to make use of the VFDs to pace flow to maintain constant reservoir levels with longer duration, lower rate pump run cycles, particularly in the summer. In coordination with this operational change, increasing the C Level Pump Station on setpoint (effectively reducing the required operational storage volume and increasing the volume available for equalizing, fire suppression, and emergency). With active mixing of reservoir contents, deep cycling of the reservoirs is less important for maintaining water quality, especially during the peak summer season.

5.2.3 Supply Failure Pumping

The Boones Ferry PRV/FCV is the only supply to the B and C Levels. A pump station from A to B Level is recommended for redundancy and reliability. Three alternatives for this pump station are outlined in the next section.

A pump station from A to B Level could potentially address two supply failure conditions. First, the pump station could supply the B and C Levels when the Boones Ferry supply is offline for either maintenance or failure. Second, if all supply from PWB is disrupted and the City has a connection to the Willamette Water Supply System (WWSS) as recommended in the *Supply Alternatives Technical Memorandum* (2021, The Formation Lab) and summarized in Section 5.4, then the City could take WWSS water through the TSM connection to the Sherwood Emergency Supply Main. As it is unclear whether there will be sufficient hydraulic grade to directly serve the B Level, WWSS water could be pumped from the A Level connections up to the B and C Levels. This would require an amendment to the City Charter which currently prohibits the City from using Willamette River water for municipal use unless the Governor declares an emergency. It is not clear if a disruption in the PWB supply would constitute such an emergency that would allow the City to override the charter and use Willamette River water.

5.2.3.1 A to B Level Pumping Alternatives

Three pumping alternatives were developed to address deficiencies in the event of a supply failure and provide a reliable supplement to the primary B Level supply from the TSM (Boones Ferry supply): 1) upgrade or replace the existing Martinazzi Pump Station, 2) build a new pump station near the A-2 reservoir, or 3) acquire and build a portable pumping system. Based on this analysis, the City should either replace the Martinazzi Pump Station or acquire a portable pump station.

5.2.3.1.1 Alternative 1: Upgrade Martinazzi Pump Station

The City could upgrade the existing Martinazzi Pump Station. This will likely require a complete replacement as the existing underground station is past its usable lifespan, not seismically up to code, and extensive structural upgrades would be required in addition to pump upsizing. A new pump station would ideally include a modern pump station structure with adequate access, operations and maintenance, and safety features, likely necessitating land acquisition for this alternative.

The Martinazzi Pump Station is located adjacent to 12-inch diameter A and B Level piping and is in close proximity to the major transmission piping from the Boones Ferry PRV/FCV to the Norwood Reservoir, which means this site will likely not require upsizing of nearby piping to adequately transmit A to B Level flows. However, transmission from the proposed emergency connection at the WWSS would be through existing piping in the A Level and may be limited due to the size of transmission piping across the A Level and the distance between the proposed connection point and the Martinazzi Pump Station.

In addition, the existing Martinazzi Pump Station site may be inadequate to support a modern pump station structure with the required access, operations and maintenance, and safety features required, likely necessitating land acquisition for this alternative.

As a permanent pump station, the new Martinazzi Pump Station could be set up to run for a few hours once a week, or as is necessary, to ensure the station is available for emergency conditions. Continued operation of this station would not need to be significant but could address some of the failures of the existing two stations.

5.2.3.1.2 Alternative 2: Build a New Pump Station at the A-2 Reservoir Site

A new pump station could be built adjacent to the existing A-2 Reservoir on the west side of the system. There are two primary advantages to this solution: improving existing water quality issues and location. Significantly, however, this alternative is highly contingent on development of the Southwest Industrial Area for transmission piping that may not occur in this planning period.

While the primary purpose of this station would be for supply disruption, the pump station could be operated regularly to boost B Level supply and water quality. This alternative would improve the turnover in the A-2 Reservoir during normal operation by pulling more water through the tank, although existing water quality issues have been largely mitigated by chlorine boosting and tank mixing. This alternative would also provide supplemental pumping capacity to the B Level during peak demands, particularly on the west side of the system to help supply new development and large fire flows.

The site is located in close proximity to the proposed emergency supply connection to the WWSS which would result in the ability to effectively supply the B Level without the construction of additional transmission piping. The advantage of this alternative is increased if the City considers the use of the City of Sherwood’s 24-inch diameter PWB supply main to transmit water to the east side of the A Level, as well.

However, a pump station at the A-2 site has several negatives. This alternative is contingent on the development of B Level piping south from the A-2 Reservoir through the existing Tigard Sand and Gravel properties. Either significant pipe installation will be required prior to development, or the City will continue to be without emergency supply until development reaches this area, which could be beyond the planning period of this master plan. A pump station at the A-2 site also needs to contend with significant road and infrastructure crossings. 124th Street is a significant thoroughfare and construction in this right of way may include additional constraints. Crossing the WWSP transmission line is also constrained by the WWSP. Significant coordination with the WWSP and major site limitations may limit feasibility of this location.

5.2.3.1.3 Alternative 3: Portable Pump Stations

Portable pumping would expand the existing portable pumping infrastructure. The City currently has three sites where a Portable Pump Station can be installed to provide supplemental pumping. Two of these sites (along SW Avery Street and the Boones Ferry PRV site) provide pumping from the A to B Levels. Additional stub out locations could be built at several sites along the A/B Level interface. Several portable pumps would need to be purchased and could be installed at any combination of these sites to provide sufficient supply to match the failure.

Portable pumps allow for locational flexibility and could be used for failures in the C Level pumping and/or be available as a regional resource to aid in a regional emergency.

There are several drawbacks to portable pumping. The stations requires storage, annual maintenance, and training that would place an increased load on City staff. Additionally, the stations require initial deployment and set up, and cannot be automatically turned on in an emergency. This is especially significant in the not unlikely event that a winter storm and power outage occur during (or directly cause) a supply failure. Moving the stations to deployment locations, and even getting employees on location to operate the stations will be a significant challenge.

5.2.3.1.4 A to B Level Pumping Summary

The three alternatives were evaluated based and summarized below in **Table 5-3.**

Table 5-3 | Additional B Level Pumping Alternative Factors

Pumping Alternative:	Upgrade Martinazzi	New Pump Station near A-2 Reservoir	Portable Pumping System
Long Term Capacity Needs	+	+	-/0
Capital Cost	0	0	+
Ease of Operation	+	+	-
Proximity to Emergency Supply	0	+	0
Fatal Flaw	Land acquisition	Land acquisition, WWSP coordination, development timing	Not instantaneous or permanent

Based on the analysis in **Table 5-3**, a new A to B pump station located near A-2 Reservoir would be recommended, if not for the fatal flaw of unknown development timing. Instead, the City should investigate both options of upgrading Martinazzi or portable pumping. The CIP presented in **Section 9** assumes the more expensive option of upgrading Martinazzi Pump Station.

5.3 Storage Analysis

5.3.1 Storage Capacity Analysis

The City should consider additional storage to meet the needs of the A, B, and C Levels. Construction of two reservoirs at the B Level, one within the next 10 years and one by buildout, would provide flexibility with system growth, adequate site selection, and operations.

The storage volume criteria developed in **Section 4** are summarized below.

- Operational: Volume in between reservoir low/high set points, assumed a low level of 40 feet (summer) in all tanks and high of tank overflow. Volume calculated in existing reservoirs and maintained through buildout.

- Equalization Storage: The amount of storage required to offset peak hour demand from nominal supply capacity calculated as (PHD-Qs)*(150 minutes) where

  - PHD = Peak Hour Demand
  - Qs = Sum of all permanent and seasonal sources. Assumed as summer high supply valve flows in A and B Levels, and one pump active in C Level.

- Fire Flow Storage: 2019 OFC

- Emergency Storage: 2x ADD

Table 5-4 summarizes the individual storage components and combined storage needs recommended for operational, equalization, fire, and emergency purposes for each service area under 2020, 2040, and build-out conditions.

Table 5-4 | Storage Volume Recommendation Summary (MG)

Service Area	Operational	Fire Flow	Equalization[1]	Emergency[2]	Total Required Storage	Existing Available Storage[3]	Storage Deficit[4]
2020							
A	1.07	0.54	0.52	4.77	6.90	6.01	-0.89
B	0.74	0.54	0.40	3.12	4.81	5.00	0.19
C	0.33	0.24	0.00	0.72	1.29	1.80	0.51
2040							
A	1.07	0.54	0.68	5.57	7.86	6.01	-1.85
B	0.74	0.54	0.49	3.56	5.33	5.00	-0.33
C	0.33	0.24	0.03	1.37	1.98	1.80	-0.18
Buildout							
A	1.07	0.54	0.69	5.62	7.92	6.01	-1.91
B	0.74	0.54	0.60	4.12	6.00	5.00	-1.00
C	0.33	0.24	0.06	1.49	2.12	1.80	-0.32

Notes:

1. Equalization Storage includes credits for continuously available pumping. ASR is not considered in these calculations. PHD estimated as 2xMDD. As the C Pump Station pulls from the B Level, the reduced Qs storage in the C Level must be included in the B Level equalization storage. This is not required for A and B Levels as it is assumed PWB supply volumes are sufficient to meet the system's needs.
2. Emergency Storage presented in this column is 2xADD. Nesting fire storage within emergency storage was discussed with the City. However, this is not recommended given the City's limited supply alternatives, and the lack of extreme emergency that would require the City to rely on emergency storage (PWB supply outage).
3. Available storage accounts for approximately 1.2 MG of dead storage in the A Level.
4. Additional storage in excess of the existing storage required to meet the calculated needs of the zone. Positive numbers indicate available excess capacity in the existing storage.

5.3.1.1 Future Storage Alternatives

Storage in the A Level is currently deficient, while storage in the B and C Levels is projected to be deficient within 20 years. The City should consider constructing a 2.5 MG reservoir at the Norwood site, similar to the existing B Reservoirs, within the next 10 years to address deficits in all levels. By buildout and as development requires, the City should consider a second reservoir, potentially at the ASR site, to address any remaining storage deficit.

It is recommended that all new storage is combined in the B Level because reservoir site alternatives are limited in the City area, the system is relatively well connected, and A and C Level existing storage can meet most of the future storage requirements in those zones.

- Sites with sufficient elevation for ground level tanks, without dead storage, are limited within Tualatin City boundaries. New sites to serve the A Level would likely include long transmission lines, or significant dead storage if collocated at existing A Level Reservoir sites. New sites to serve the C Level would face similar issues with long transmission. Additionally, C Level deficits are minimal by buildout and could be mostly addressed by either relying on C Level pumping for fire supply or, if the City decides to accept this risk, nesting fire flow storage within emergency storage.

- Storage at the B Level may also be allowed because the system is well connected. The A Level can be served by the B Level by gravity via five PRPS valves along the A/B Level boundary. These would automatically supply the A Level in the event of a failure of the A Level PWB supplies. The C Level can be served by the B Level by the C Level pump station, located adjacent to the proposed 2.5 MG reservoir. As discussed earlier in this report, this station can meet C Level needs through buildout, with a single pump active. Increased transmission in the B and C Levels will also improve distribution.
- Existing storage in the A and C Levels can meet all buildout storage requirements except for 33 percent of A Level emergency storage and 20 percent of C Level emergency storage. If emergency deficits were significantly greater, or either zone did not have sufficient storage to meet daily operational requirements, combined storage in the B Level would not be recommended.

A 2.5 MG reservoir is included in the CIP within 10 years, and a 1.0 MG reservoir is included in the CIP in 20+ years. However, future development timing may require adjustment of these timelines.

5.3.2 Current Storage Operational Considerations

Historically, the City has had trouble maintaining reservoir levels in the B and C Levels during peak hour demand when both the B and C Level Reservoirs are filling. The Boones Ferry supply cannot keep up with this high demand and so the B Reservoirs drain to unacceptably low levels. The City has mitigated this issue by increasing summertime low levels of the B and C Reservoirs to 40 feet. The City can further mitigate supply issues by improving transmission in the B and C Levels, as discussed in **Section 5.1.6**.

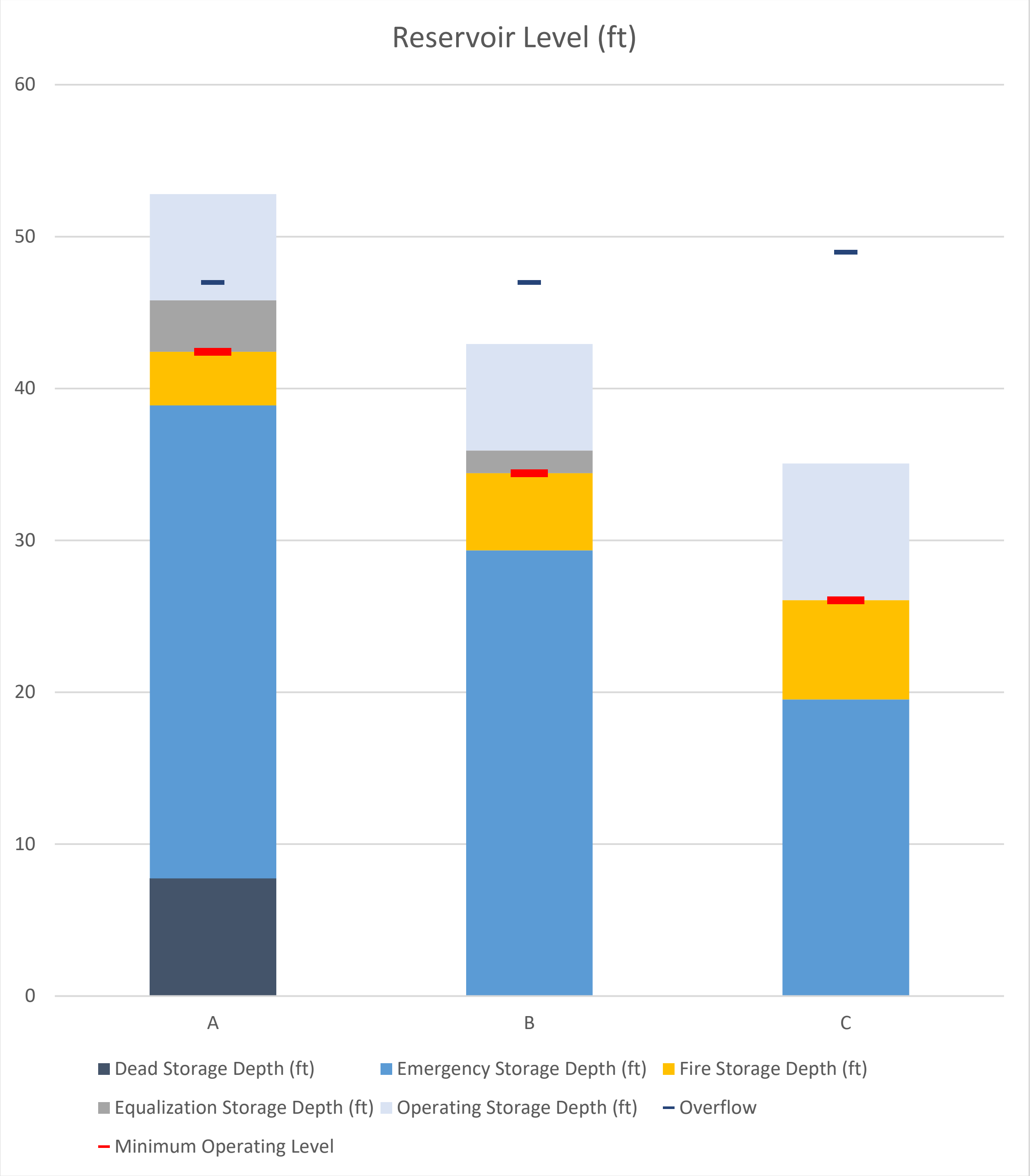
Increasing the low-level set point during the winter will exacerbate water turnover issues and may trigger low chlorine residual concerns. However, lower winter levels are typically acceptable, because winter demand is typically much lower than summer demands. Therefore, the City may be able to continue winter operations as is, but should be aware how operational changes affect emergency and fire storage.

Current storage allocations were calculated from existing storage reservoir and pressure zone characteristics to help the City make operational decisions, particularly during high demand conditions. The Calculated Storage Volume Levels are calculated from the floor up and are shown at the bottom of **Table 5-5** and illustrated in **Figure 5-3**. The Base of Equalization Storage is the calculated low point the reservoir levels should not dip below during normal operations, to maintain adequate fire and emergency storage.

Table 5-5 | Minimum Reservoir Storage Levels

Tank Characteristics	Pressure Zone A	B	C
Tank Floor Elevation (ft)	248	352	458.5
Tank Height (ft)	47	47	49
Existing Summer Low Level (ft)	40	40	40
Existing Storage (MG)	7.2	5	1.8
Volume/Depth (MG/ft)	0.153	0.106	0.037
Zone Characteristics	A	B	C
Maximum Zone Ground Elevation (ft)	198	286	359
Minimum HGL to serve maximum ground elevation at 25 psi (ft)	255.75	343.75	416.75
Minimum Tank Depth to serve maximum ground elevation at 25 psi (ft)	7.75	0	0
Dead Storage (MG)	1.2	0	0
Usable Storage (MG)	6	5	1.8
Zone Demand, Fire Flow, and Supply	A	B	C
2020 Average Day Demand (MGD)	2.39	1.56	0.36
2020 Max Day Demand (MGD)	4.58	3	0.69
PHD: Max Day Demand PF	2	2	2
Fire Flow Rate (gpm)	3000	3000	2000
Fire Flow Duration (hrs)	3	3	2
Qs (regularly available supply to zone) (gpm)	2900	3100	1600
Calculated Storage Volumes	A	B	C
Emergency Storage (MG)	4.77	3.12	0.72
Fire Storage (MG)	0.54	0.54	0.24
Equalization Storage (MG)	0.52	0.16	0
Operating Storage (MG)	1.07	0.74	0.33
Calculated Storage Volume to Depth Conversion	A	B	C
Operating Storage Depth (ft)	7	7	9
Equalization Storage Depth (ft)	3	1	0
Fire Storage Depth (ft)	4	5	7
Emergency Storage Depth (ft)	31	29	20
Dead Storage Depth (ft)	8	0	0
Calculated Storage Volume Levels (Shown in Figure 1)	A	B	C
Tank Overflow (ft)	47	47	49
Base of Operating Storage (ft)	46	36	26
Base of Equalization Storage (ft)	42	34	26
Base of Fire Storage (ft)	39	29	20
Base of Emergency Storage (ft)	8	0	0
Floor (ft)	0	0	0

Figure 5-3 | Calculated Storage Volume Levels



5.4 Water Supply Analysis

The City conducted a separate overall water supply strategy in parallel with this Water Master Plan. The *City of Tualatin – Water Supply Strategy* (The Formation Lab, 2021) documents the City's overall water supply strategy and is included in **Appendix B**.

The Water Supply Strategy focused on ensuring the continued reliability of Tualatin's water supply and documents community values, expected current system performance during emergencies, and opportunities for improved emergency performance. The project resulted in a recommended three-prong strategy:

- **Strategy 1 - Invest in a New Backup Supply** to address the City's vulnerability to an outage of the TSM. The preferred option is to work with the City of Sherwood and the WWSS to interconnect the WWSS Water Treatment Plant and the Sherwood Emergency Supply Main. Improvements to the Sherwood Emergency Supply Main is a viable alternative if the Sherwood/WWSS combination is determined to be not feasible or desirable.

- **Strategy 2 – Continue to Support Reliability of the PWB System** working with the PWB. Considerations include ensuring the City's demands are included in future analyses of backup supply options, resolving future maintenance of the WCSL, and reaching agreement on a new wholesale agreement.

- **Strategy 3 – Increase Reliability of Local Interties** working with neighboring agencies to make sure agreements are in place and test interties on a regular basis. The City should also continue to take advantage of future intertie opportunities, such as within the Basalt Creek area.

As part of this study, neighboring water agencies were also asked about their capacity to potentially provide long-term supply in the future. The intent was not to initiate a change in the City's water supply, but instead to understand water supply availability in the region if PWB's water were to become unavailable or unaffordable. Though short-term supplies could likely be provided by two of the neighboring water agencies, there is no agency with excess supply sufficient to meet the long-term needs of the City. *PWB remains the most reliable source of long-term supply for the City*.

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Section 6

Section 6

Water Quality & Water Conservation

6.1 Water Quality Regulations

The City of Tualatin, along with all public drinking water systems, must follow both state and federal regulations. At the federal level, the EPA establishes water quality standards, monitoring requirements, and enforcement procedures. At the state level, either the EPA or a state agency will implement the EPA rules. If a state meets certain requirements, it can be given primacy, meaning it is the primary authority for implementing the EPA's rules within the state.

As a primacy state, Oregon administers most of the EPA's drinking water rules through the OHA Drinking Water Services (DWS). The DWS rules for water quality standards and monitoring are adopted directly from the EPA. The DWS is required to adopt rules at least as stringent as federal rules. To date, the DWS has elected not to implement more stringent water quality or monitoring requirements.

In some areas not directly related to water quality, DWS rules cover a broader scope than EPA rules. These areas include general construction standards, cross connection control, backflow installation standards, and other water system operation and maintenance standards. The City's activities are also governed by the Oregon Department of Environmental Quality (DEQ). The complete rules governing the DWP in the State of Oregon are contained in OAR Chapter 333, Division 61, Public Water Systems.

6.1.1 Status of Drinking Water Regulations

At the Federal level, the Safe Drinking Water Act (SDWA) is the primary drinking water regulation. It was originally enacted in 1974 by Congress to ensure the quality of America's drinking water with a focus on water treatment. The act was reauthorized and updated in 1986 and 1996 to expand protections to source water and improve operator training, system improvement funding, and public education. The SDWA contains the following assignment and programs for the EPA and the states to administer including:

- State revolving loan fund for water system construction
- Public notification reports
- Source water assessment and protection
- Monitoring reductions based on source water protection
- Mandatory certification of operators

These assignments have been implemented by the EPA and/or individual states and are regularly updated. Under the authority of the SDWA, the EPA sets various rules and regulations to maintain safe drinking water. The following sections identify relevant rules and the City's existing compliance status.

6.1.2 Disinfectants/Disinfection Byproducts Rule

The City is required to monitor for Disinfectants/Disinfection Byproducts (D/DBP) under stage 1 and 2 of the D/DBP Rule. This rule regulates exposure to disinfectants, disinfection byproducts, and precursors that may react with disinfectants to produce harmful chemicals. Disinfectants are added to drinking water to kill harmful pathogens. At low levels, these disinfectants keep our water safe and do not affect human health. At higher concentrations (such as typical concentrations in pool water), exposure could lead to nausea, vomiting, and diarrhea. Disinfection byproducts occur when disinfectants react with usually non-harmful nutrients in the water to produce contaminants. When these precursors are not present, there is nothing for the disinfectants to react with and so disinfection byproducts are not formed. Therefore, it is important to monitor for both the precursors and resultant contaminants.

Specifically, the D/DBP Rule regulates the following contaminants.

Disinfectants

- Chlorine
- Chloramine
- Chlorine Dioxide

Disinfection Byproducts

- Total Trihalomethanes (TTHMs)
    - Trichloromethane (chloroform)
    - Tribromomethane (bromoform)
    - Bromodichloromethane
    - Dibromochloromethane
- Haloacetic Acids (HAA5s)
    - Monochloroacetic acid
    - Dichloroacetic acid
    - Trichloroacetic acid
    - Monobromoacetic acid
    - Dibromoacetic acid
- Chlorite
- Bromate

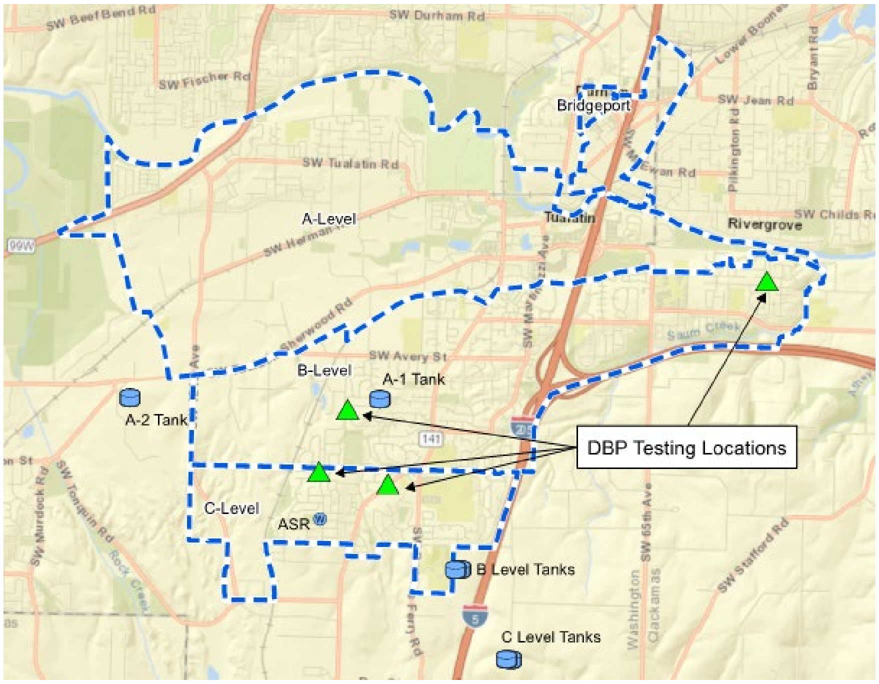
The City of Portland currently uses a chloramine treatment process. Therefore, the relevant contaminants in the City of Tualatin are chloramine, TTHMs, and HAA5s.

Stage 2 of the D/DBPs Rule requires that maximum contaminant level (MCL) of the listed contaminants be calculated on the locational running annual average of samples taken quarterly. Compliance sites consist both of locations where high concentrations of disinfection byproducts are found (typically sites with long detention times), and sites with average detention times within the distribution system. The number of sites is based on the type of source water and population served. The rule also provides for reduced monitoring for systems with very low disinfection by-products based on two years of existing data.

6.1.2.1 City Compliance

The City is currently monitoring for and maintaining a steady level of chloramine in the system, is also monitoring for D/DBPs and is meeting all D/DBP Rule requirements. Monitoring locations for D/DBPs were identified in a 2006 study, and the City has continued to sample at these same locations at quarterly intervals (see **Figure 6-1**).

Figure 6-1 | Sampling Sites for Disinfection Byproducts



Statistics for the TTHM and HAA5 sampling results from 2017 through 2019 for the Stage 1 and 2 D/DBP Rules are shown in **Table 6-1**. No values exceed regulations. Chlorine monitoring results are discussed in the next section as chlorine levels directly affect total coliforms.

Table 6-1 | Quarterly Disinfection Byproduct Monitoring Results

	Trihalomethanes (TTHM) (mg/l)	Haloacetic Acids (HAA5) (mg/l)
Maximum Contaminant Level (Regulation)	0.080	0.060
Quarterly DBP Monitoring Results, 2017 – 2019		
Average Measurement	0.027	0.026
Maximum Measurement	0.046	0.041

6.1.3 Total Coliform Rule

The City is required to monitor for coliform bacteria under the Total Coliform Rule, which applies to all surface water and groundwater systems. Most coliforms are not disease causing. Rather, their presence indicates the sanitary conditions of the water and are one of the easiest indicator species to monitor.

Total coliforms include both environmental and fecal coliforms. Both types are important to measure as both can indicate the presence of pathogens, although fecal coliforms are generally more concerning. E. coli bacteria is used to indicate fecal coliforms, as it is one of the major species of fecal coliforms that does not reproduce in the absence of fecal matter.

Sampling requirements vary according to population served and history of positive samples. Tualatin is required to take 30 samples from across the system per month and test for total coliforms. If total coliforms are found to be present at any site, additional testing for E. coli is required to determine compliance.

6.1.3.1 City Compliance

The City is currently meeting all applicable requirements for the Total Coliform Rule.

To ensure continued compliance and minimize bacterial growth, it is important to retain a minimum chlorine residual and limit the accumulation of sediments. Additionally, it is important to maintain active circulation of water throughout the distribution system, in both pipes and reservoirs.

EPA standards for the residual disinfectant concentration in the water entering the distribution system cannot be less than 0.2 milligrams per liter (mg/L) for more than four hours (40 CFR 141.72(a)(3) and (b)(2)). The residual disinfectant concentration in the distribution system cannot be undetectable in more than five percent of the samples each month for any two consecutive months that the system serves water to the public (40 CFR 141.72(a)(4) and (b)(3)). The City samples monthly for chlorine residual at 30 points in the distribution system. In 2019, the average residual of monthly samples ranged from 0.67 to 1.92 mg/L, well above the minimum of 0.2 mg/L and below the maximum recommended level of 4 mg/L (per the D/DBP Rule).

6.1.3.2 Potential City Action

While currently meeting standards, the City should continue to proactively maintain chlorine residuals. Three best practices to maintain chlorine residuals include:

- Distribution system circulation and strategic flushing
- Reservoir turnover and mixing
- Secondary chlorination, as needed

6.1.3.2.1 Distribution System Circulation and Flushing

Stagnant water is problematic for a water distribution system for two primary reasons. Chlorine breaks down over time and so if water is not mixed within the distribution system, pockets of low chlorine residual can form which can lead to organic growth. Additionally, stagnant water lets non harmful particles such as calcium deposits settle out of the stream, creating a physical buildup in the pipes blocking flow, and a habitat for organic growth.

Active circulation and sediment accumulation should be considered as new pipelines and reservoirs are added to the system. Large dead-end pipes like those in the industrial area of the A Level should be avoided because the lack of circulation results in a loss of chlorine residual. Where they are installed, it is important for the City to continue the existing program of regular flushing of these lines. Flushing programs must be regular and not just in response to loss of chlorine residuals, because by that time, coliforms may already be growing in the system and in the water delivered to customers. The locations of these large, dead-end pipes should be identified and tracked in the City's asset management program.

6.1.3.2.2 Reservoir Turnover and Mixing

Reservoirs should be designed and operated to ensure adequate mixing and reservoir turnover to promote good water quality. The City's reservoirs include inlet mixing systems on most reservoirs, and reservoirs are operated at reduced capacity to ensure adequate turnover during periods of low water use. In order to improve reservoir mixing, if future conditions warrant (low disinfectant residuals in the distribution system), an active mixing system could be considered. These systems include solar- or utility-powered internal mixers or external circulation pumps.

6.1.3.2.3 Secondary Chlorination

Secondary chlorination is another option to boost chlorine levels in the distribution system. This action must be properly calibrated based on the specific chemistry of the system to prevent harmful levels of DBPs. Free chlorine will react with organic materials in the water and result in high levels of DBPs. For the City, booster chlorination would serve the purpose of forming chloramines by adding chlorine to bind up free ammonia that is present as a result of decay of the source water disinfectant. Because of the risk of DBP formation and the challenges of obtaining the proper ration of chlorine to ammonia, secondary chlorination should only be considered if other measures are not adequate.

The City has identified chlorine residual issues in the vicinity of the A-2 Reservoir and has a booster trailer set to maintain a chlorine residual of 1.00 mg/L. Future system improvements, specifically expansion of the B-level and development of a new A-level to B-level pump station near to the A-2 Reservoir will help reduce water age in the reservoir and reduce the need for booster chlorination.

6.1.4 Lead and Copper Rule

The Lead and Copper Rule (LCR) was first established in 1991 to limit lead and copper exposure. The LCR was updated with revisions in 2000, 2007, and 2016 and full text can be found on the EPA website (https://www.epa.gov/dwreginfo/lead-and-copper-rule). The most common sources of lead in the water system are pipes, faucets, and plumbing fixtures. Therefore, testing within the distribution system, rather than just at the water source, is important.

Historically, the City was sampled as part of the PWB Bull Run system for LCR monitoring, also known as the Joint Monitoring Program (JMP). Four samples were collected yearly in the City since 1999. In the fall of 2016, Tigard left the JMP and the City increased sampling to 9 homes. In spring 2017, TVWD left the JMP and the City increased sampling to 15 homes. Due to continued operation of the City's ASR program, the City left the JMP in the fall of 2017 and began its own Lead and Copper Monitoring Program. In 2019 after three rounds of lead and copper results below EPA Action Levels, the City reduced monitoring to annually from June 1 – September 30 at 63 customer taps across the City. If there is an exceedance, sampling requirements may increase and additional reduction actions will apply.

Water samples at the customer's tap are required to be taken at high-risk locations, which are defined as homes with the following conditions.

- Lead solder installed after 1982
- Lead service lines
- Lead interior piping

For a water system to comply with the LCR, the samples at the customer's tap must not exceed the following action levels.

- Lead - 0.015 mg/L detected in the 90th percentile of all samples
- Copper -1.3 mg/L detected in the 90th percentile of all samples

If action levels are exceeded for either lead or copper, there are additional requirements including source monitoring, public education, and corrosion control studies.

The EPA is currently in the process of finalizing additional revisions to the LCR that are schedule to take effect on December 16, 2021. While the specific requirements of the final rule revisions are unknow at this time, it is anticipated that new requirements will include:

- Updated sampling procedures to improve identification of elevated levels of lead at customer taps
- Revised action levels and corrosion control treatment implementation timelines
- More aggressive lead service line replacement requirements
- Water utility inventory of lead service lines
- Sampling at schools and child-care facilities

A summary of the lead and copper monitoring for the City and PWB for reference is presented in **Table 6-2.**

Table 6-2 | Lead and Copper Rule Monitoring Results, 90th Percentile

	Tualatin				Portland Water Bureau[2]			
	Lead		Copper		Lead		Copper	
Action Level, 90th Percentile (mg/l)	0.015		1.30		0.015		1.30	
Result (mg/l) / Exceedance (Y/N)								
2020 - Fall	0.0121	N	0.2253	N	0.0138	N	0.2620	N
2019 - Spring	0.0120	N	0.154	N	0.0131	N	0.2690	N
2018 - Fall	0.0120	N	0.167	N	0.0119	N	0.2163	N
2018 - Spring	0.0170	Y	0.159	N	0.0126	N	0.2212	N
2017 - Fall	0.0160	Y	0.159	N	0.0170	Y	0.2520	N
2017 - Spring	0.0145	N	0.190	N	0.0145	N	0.1948	N

Notes:

1. Lead and Copper results from yourwater.oregon.gov
2. PWB results shown for reference.

The proposed LCR revisions should not have a significant impact on the City's compliance. It is anticipated that the most significant action required will be the completion of the lead service line inventory, which is anticipated to be required by September 16, 2024. The City should revie the requirements of the revisions when they are promulgated in late 2021 to confirm if there are revisions that may impact the City's compliance.

6.1.5 Unregulated Contaminant Monitoring Rule

The EPA uses the Unregulated Contaminant Monitoring program to collect data for contaminants suspected to be present in drinking water, but that do not heave health-based standards set under the SDWA. The program began in 1996 with Rule 1. The Unregulated Contaminant Monitoring Rule 4 (UCMR 4) was enacted by the EPA in December 2016, requiring monitoring for 30 contaminants between 2018 and 2020.

6.1.5.1 City Compliance

The City is currently monitoring annually for lead and copper at high risk customer taps. In Spring of 2019, five of the 63 samples exceeded EPA action limits. No additional actions are currently required for the City. However, the goal for detectable lead is 0 mg/L, as any lead can be potentially harmful. Therefore, PWB is actively working to increase corrosion control to limit dissolving lead from pipes and fixtures into water. Currently, PWB adds sodium hydroxide to during water treatment to increase pH, and is building improved corrosion control treatment that will be online by 2022.

UCMR 4 List 1 Contaminants

- Cyanotoxins
  - Total microcystin
  - Microcystin-LA
  - Microcystin-LF
  - Microcystin-LR
  - Microcystin-LY
  - Microcystin-RR
  - Microcystin-YR
  - Nodularin
  - Anatoxin-a
  - Cylindrospermopsin

- Metals
  - Germanium
  - Manganese*

- Pesticides and Pesticide Manufacturing Byproduct
  - Alpha-hexachlorocylohexane
  - Chlorpyrifos
  - Dimethipin
  - Ethoprop
  - Oxyfluorfen
  - Profenofos
  - Tebuconazole
  - Total permethrin (cis & trans)
  - Tribufos

- Brominated Halocaetic Acid Groups
  - HAA5*
  - HAA6Br*
  - HAA9*

- Alcohols
  - 1-butanol
  - 2-methoxyethanol
  - 2-propen-1-ol

- Semivolatile Chemicals
  - Butylated hydroxyanisole
  - O-toluidine
  - Quinoline

Note: An asterisk (*) indicates the contaminant was detected in the City's water. At the levels detected, negative health effects are unlikely. More detailed results are available on the City's website at tualatinoregon.gov/publicworks/water-quality.

6.1.6 Aquifer Storage and Recovery Sampling

The City operates an ASR facility under Limited License #010. Licensing requirements include additional water quality sampling and reporting to the OHA DWS. Pilot testing began at the facility in 2009.

Current sampling and reporting is set by the *Monitoring Plan for Cycle Year 11-15 (GSI, 2019)*. The monitoring schedule laid out in the plan was created to ensure water quality standards are met throughout the year in the source water, stored groundwater, and recovered water. The City is required monitor for various water quality parameters including field parameters, geochemicals, metals, DBPs, microbial growth, radionuclides, Synthetic Organic Compounds (SOCs), and Volatile Organic Compounds (VOCs). The complete list and frequency of monitoring is documented in the 2019 Monitoring Plan.

6.1.6.1 City Compliance

Based on test results from required monitoring, water injected into and recovered from the ASR currently meets or exceeds state and federal drinking water standards. The most recent ASR monitoring results are summarized in the ASR Cycle 11 Test Results report by GSI (February 2020).

6.1.7 Additional Wholesale Provider Regulatory Issues

As the source water provider, PWB is responsible for sampling, monitoring and compliance with numerous water quality regulations that do not need to be addressed directly by the City. These include:

- Synthetic Organic Chemicals and Inorganic Chemicals
- Volatile Organic Compounds
- Arsenic
- Sulfate
- Fluoride
- Radon/Radionuclides
- Groundwater Rule
- Surface Water Treatment Rule and Supplementary Rules:
    - Interim Enhanced Surface Water Treatment Rule
    - Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR)
    - LT2ESWTR

6.1.7.1 City Compliance

As the wholesale water provider to the City, PWB is responsible for meeting these regulatory requirements. The cost to meet these requirements is passed on to the City and other wholesale customers through wholesale water rates. The primary water supply for PWB is the Bull Run

Watershed, a protected watershed near Mount Hood. All human access to the watershed is highly controlled and it is geographically isolated from upstream impacts by a ridge.

The PWB is proceeding with designs for a water treatment facility to comply with the EPA requirement to reduce potential for cryptosporidium contamination under the LT2ESWTR. Currently PWBis planning on completing design and construction of a new water filtration facility by 2027.

6.2 Water Conservation

The City is not required by the state to develop a formal Water Management and Conservation Plan as it does not have any active municipal water rights. However, PWB requires the City to establish a joint conservation program and create a water conservation plan under the wholesale water supply agreement and the City is committed to reducing water usage.

The City implements various aspects of water conservation including:

- Public education and outreach as part of the Regional Water Providers Consortium (RWPC)
- Leak Prevention and Detection

6.2.1 Public Education and Outreach

As a member of the RWPC, the City actively participates in regional water conservation program development and implementation. Comprised of 23 water providers and the Metro Regional Government, the RWPC provides a forum for collaboration on water supply, resource management, emergency preparedness, and conservation issues affecting the region. The 2016 Regional Water Supply Plan Update is the region's water supply strategy and recognizes that water conservation plays a key role in meeting future water needs. The updated plan evaluated regional source options while reflecting the actions and plans of the individual members. The plan also updated water demand forecasts and continued to emphasize opportunities for regional conservation programs where economies of scale and regionally consistent conservation messages and benefits can be achieved. The RWPC's conservation objectives are to:

- Plan and implement regional programs and events focused on reducing peak summer water use.

- Effectively encourage customers to visit and utilize the web site at www.regionalh2o.org

- Integrate consistent conservation messages into the daily lives of customers.

- Develop and implement effective monitoring and reporting techniques to verify program effectiveness.

- Invite stakeholder participation in conservation program development.

- Seek economies of scale by working together.

- Foster public awareness of the RWPC's collaborative efforts.

The RWPC's conservation plan contains a variety of programs and outreach opportunities which include:

- Summer marketing campaign
- Education programs
- Regional events
- Landscape industry partnerships
- A web site (www.regionalh20.org)
- Informational materials (brochures, kits, and water-saving devices)

Given the City's participation in RWPC, further City-specific public education and outreach programs are not likely to offer cost-effective water conservation results.

6.2.2 Leak Prevention and Detection

Water loss prevention and leak detection programs are typically economical when annual water losses regularly exceed 10 percent. Given that the estimated percentage of unaccounted-for water is below this level, the City does not currently have and is not planning for implementation of a comprehensive on-going leak detection program within the distribution system. However, the City regularly replaces leaking water meters, provides guidance and troubleshooting for customers on the customer side of the meter, and encourages residents to take advantage of the leak detection program through the RWPC.

Additionally, the City has actively replaced aging water mains systematically with a focus on existing asbestos cement pipe and associated service lines to reduce water loss and excessive main breaks. The continuation of this program as a key element of the City's water system capital budget is recommended to maintain current low levels of water loss.

6.2.3 Water Conservation Recommendations

As a member of the RWPC, the City contributes funds to the promotion of water conservation throughout the Portland Metropolitan area and realizes significant benefit from the conservation program of this organization. It is recommended that the City continue to invest its water conservation funds in the larger RWPC conservation program. Generally, further investment in City-specific water conservation measures is not recommended at this time; however, as the City continues to grow and develop, future efforts to encourage and support water conservation efforts may help to delay the need to make substantial capital improvements to meet increased water demands. It is recommended that the City develop tools to monitor, track and document infrastructure failures to better inform the need for age or condition-related replacements. This should include annual water loss auditing, development of an asset management database, and potential use of targeted non-destructive pipeline condition assessment techniques to evaluate critical pipeline assets. The City should also continue to evaluate potential conservation-encouraging programs with future WSMP updates.

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Section **7**

Section 7

Seismic Resilience Evaluation

7.1 Introduction

Cities throughout the region are increasingly aware of the risk to their infrastructure from potential seismic activity. Following recent seismic research, which presented persuasive evidence on the eminent threat and extreme risk of a CSZ earthquake, the State of Oregon developed the ORP in 2013. The ORP established target timelines for water utilities to provide service following a seismic event. The ORP also recognized that currently water providers and existing water infrastructure are unable to meet these recovery goals. To improve existing water systems' seismic resilience, one of the ORPs key recommendations was for water utilities to complete a seismic risk assessment and mitigation plan as part of their periodic WSMP update. The State of Oregon formalized this recommendation under 333-061-0060(5)(J) and now cities located in seismic hazard areas are required to include a seismic risk assessment and mitigation plan in their WSMPs.

As part of this WSMP, the City has chosen to complete a seismic risk assessment of their existing water system. The scope of this evaluation includes risk findings and general recommendations regarding seismic design standards for future water infrastructure. Recommended improvements to mitigate specific facility risks will be included in this WSMP's capital improvement list or will be assessed by the City as follow-on work to this WSMP.

The overall objective of this evaluation is to identify and document risks and establish a framework for mitigating these risks over a 50-year or longer period so the City's water system achieves a higher level of resilience to seismic events.

A companion section of this WMSP, **Section 9** Emergency Water Plan, was prepared in coordination with The Formation Lab and documents short-term strategies to provide emergency water supply within the City following a seismic event (or other water system disruption). The recommendations presented in that report are intended to provide mitigation for a seismic event, if it occurs before the City can implement the resilience recommendations presented herein.

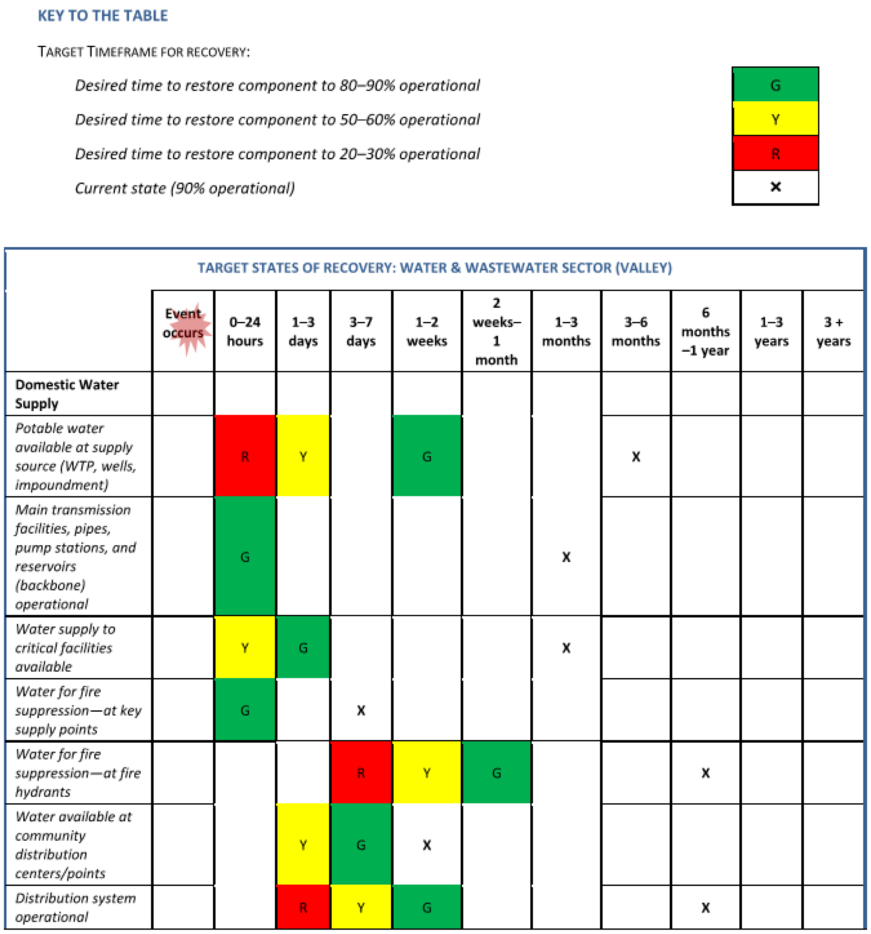
7.2 Key Water System Facilities

Through a workshop process involving City staff and local/regional emergency responders, the project team identified the transmission backbone and key facilities that should have water service uninterrupted or quickly restored post seismic event, consistent with ORP guidelines. Critical customers or potential emergency water distribution sites were also identified, primarily along these transmission routes.

After a seismic event, it will be important to return service to critical customers and key locations as quickly as possible. The ORP has developed targets for getting various portions of the distribution system operational (see **Figure 7-1**). These time frames range from 0 to 24 hours for key facilities and some fire suppression to 6 months to 1 year for 90 percent distribution system operational.

The purpose of these goals is to establish a target for water providers to strive towards over a 50-year period of system improvement and mitigation. *For the City of, the capital investment required to meet these goals, especially related to the full distribution system operation, is far greater than the financial resources of the City and will only be achievable if outside sources of State and/or Federal funding become available.* In recognition of this, this section of the WSMP also presents a strategy for post-seismic event response and recovery that reflects the reality that the system may not be significantly more resilient when a major earthquake occurs and prioritizes planning and low-cost investment in the means to provide basic drinking water requirements for the community in coordination with first responders, emergency management agencies, and community groups.

Figure 7-1 | Target States of Recovery for Willamette Valley Water Utilities



KEY TO THE TABLE

TARGET TIMEFRAME FOR RECOVERY:

Desired time to restore component to 80–90% operational	G
Desired time to restore component to 50–60% operational	Y
Desired time to restore component to 20–30% operational	R
Current state (90% operational)	X

TARGET STATES OF RECOVERY: WATER & WASTEWATER SECTOR (VALLEY)

	Event occurs	0–24 hours	1–3 days	3–7 days	1–2 weeks	2 weeks–1 month	1–3 months	3–6 months	6 months –1 year	1–3 years	3 + years
Domestic Water Supply											
Potable water available at supply source (WTP, wells, impoundment)		R	Y		G			X			
Main transmission facilities, pipes, pump stations, and reservoirs (backbone) operational		G					X				
Water supply to critical facilities available		Y	G				X				
Water for fire suppression—at key supply points		G		X							
Water for fire suppression—at fire hydrants				R	Y	G			X		
Water available at community distribution centers/points			Y	G	X						
Distribution system operational			R	Y	G				X		

7.2.1 Critical Customers

During the workshop with City staff and first responders, a list of potential sites available for water distribution were identified. If the distribution system is unusable, these sites should be available for customers to get water. The locations are primarily located along the backbone transmission lines. Service to the selected water distribution sites should be restored within three to seven days.

One of the most critical customers is the Meridian Park Hospital. It is located in the B level at SW 65th and Borland Road, just north of I-205. Given the distance from the backbone of the City's system, increasing the resilience of the distribution piping serving these customers will be an expensive, long-term objective. It is understood that the hospital has a well for emergency water supply. The City should coordinate with the hospital to understand their emergency water supply plans and the condition/capacity of this well to supply the hospital's water needs during an emergency that disrupts supply from the water distribution system.

7.2.2 Water System Backbone

The primary objective of establishing this backbone and identifying critical facilities is to focus the City's investment in mitigating seismic risk on these facilities that will be essential to supplying drinking water to the community at discreet locations (and in limited volumes) immediately following a seismic event.

The City identified critical transmission piping and categorized it into two tiers. Tier 1 transmission connects key A and B Level facilities, and Tier 2 transmission includes supply from the PWB and additional transmission mains to the C Level Reservoirs, and the A-2 Reservoir.

The City then used this backbone transmission, critical customers noted in the prior section, and typical system operations to identify key water system facilities. Key City water facilities and their critical supply and distribution functions are summarized in **Table 7-1** and illustrated on **Figure 7-2**. Facilities were assigned a tier corresponding to the connecting transmission piping tiers.

Table 7-1 | Key Water System Facilities

Tier	Facility Name	Critical Functions
1	ASR Facility	▪ Only current supply if PWB supply is disrupted[1]
1	B Level Reservoirs	▪ B Level storage
1	A-1 Reservoir	▪ Primary A Level storage
1	Boones Ferry PRV	▪ Primary supply to the B Level from PWB
2	C-Level Reservoirs	▪ C Level storage
2	A-2 Reservoir	▪ Secondary A Level storage
2	C Level Pump Station	▪ City supply (ASR or PWB) to C Level
2	Leveton FCV-PRV	▪ PWB supply to A Level
2	65th Ave PRPS	▪ City distribution from B to A Level

Note:

1. The ability to utilize supply from ASR may be disrupted in a major seismic event where main breaks disrupt the connection between the ASR facility and the B-level reservoirs.

7.3 Seismic Hazards Evaluation

The seismic hazards evaluation for the City's water service area was conducted by geotechnical engineers McMillen Jacobs and Associates, as summarized in the following paragraphs. More detailed information is available in their technical memorandum included as **Appendix F**.

7.3.1 Seismicity and Assessment Earthquake

There are two main sources of seismicity in the Tualatin area: the CSZ at the boundary between the oceanic Juan de Fuca Plate and the North American Plate, and crustal faults within the North American Plate. The CSZ is located off the Pacific Coast and stretches from Vancouver Island, British Columbia south to northern California. Subduction zone earthquakes are much larger and longer in duration than crustal earthquakes, but also occur much further away. For the purposes of this evaluation, seismic hazards to the water system are assessed under a CSZ magnitude 9.0 (M9) earthquake as this is regarded as the greatest threat to the region.

Paleoseismic evidence and historic tsunami studies indicate that the most recent CSZ event occurred in the year 1700, probably ruptured the full length of the CSZ, and may have reached a magnitude of 9.0. Recent seismological and geological research (Goldfinger et al., 2012) provides the best understanding of the CSZ mega-thrust earthquake hazard for Oregon and Washington. The magnitude of a CSZ earthquake depends on the rupture length along the subduction zone, full rupture will likely generate mega-M9 and above earthquake events, and partial rupture will likely cause large-magnitude 8.0 to 8.5 earthquakes.

These earthquake events are estimated to recur approximately every 500 years for the mega-magnitude full rupture events and 200 to 300 years for the large-magnitude partial rupture events. Thus, the probability of a future occurrence is high because we are “past due” based on historic earthquakes documented in ocean sediments. The CSZ earthquake with a magnitude greater than 8.5 — similar to recent events in Japan, Chile, and Indonesia — has an estimated 16 to 22 percent probability of occurring off the Oregon Coast in the next 50 years (Goldfinger and others, 2016).

7.3.2 Subsurface Condition Assessment

Seismic hazards were evaluated based on existing M9 CSZ earthquake hazard maps published for the Portland Metro region by the Oregon Department of Geology and Mineral Industries (DOGAMI) (Madin and Burns, 2012). For this assessment, these maps were refined for the City’s water service area (including the Tualatin Supply Main) using geotechnical exploration data and subsurface boring logs from reservoirs, transmission main extensions, and various projects constructed between 1990 and 2017 near critical water facilities.

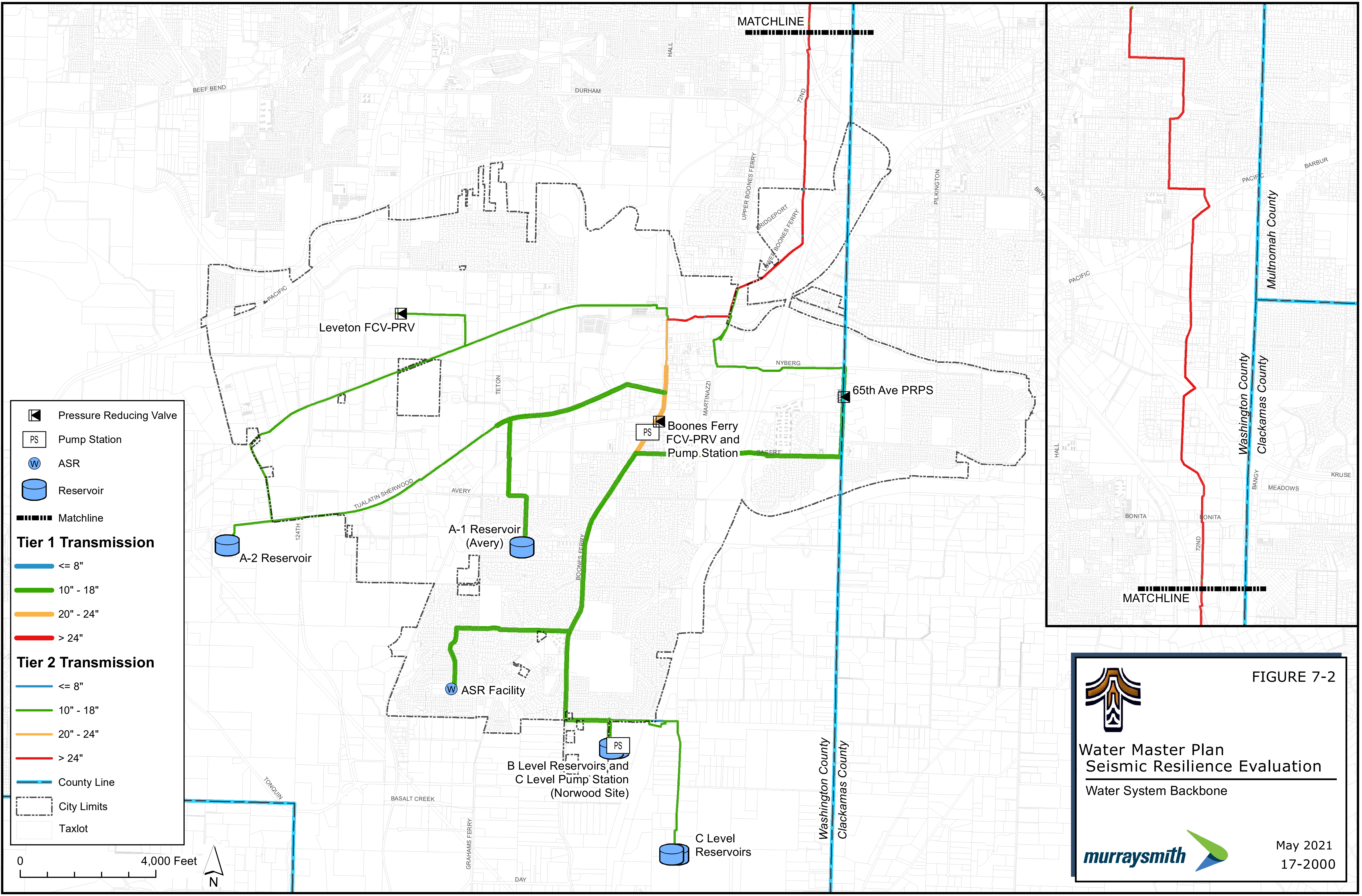


FIGURE 7-2

Water Master Plan
Seismic Resilience Evaluation

Water System Backbone

murraysmith

May 2021
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7.3.3 Seismic Hazard Findings

The likelihood and magnitude of four sources of seismic hazard were analyzed including the following.

- liquefaction settlement
- lateral spreading displacement
- landslides
- strong ground shaking

These hazards all have the potential to damage buried water mains and other water facilities.

Seismic hazards are present for the City's water system.

- In the A and B levels, a large percentage of the City and its backbone transmission system are located in high to medium liquefaction hazard zones.

- Within the liquefaction hazard zone, lateral spreading is also a hazard along creek banks and other sloped areas steeper than four degrees.

As further discussed in **Section 7.5**, these seismic hazards result in a higher risk of pipeline failure during a seismic event. New piping in areas with higher levels of seismic hazards should be designed to withstand these seismic hazards, and the City should prioritize backbone hardening in these areas where there is the highest likelihood of main breaks and leaks following a seismic event.

7.3.3.1 Liquefaction

The liquefaction hazard varies significantly across the service area. Liquefaction potential in the south is low due to the shallow basalt bedrock layer. Liquefiable soils are present in the rest of the project area and there is the potential for over 9 inches of liquefaction induced settlement, predominantly in the northern portion of the service area near the Tualatin River, and along other creeks. Liquefaction hazards for the City's water service area are illustrated on **Figure 7-3**.

Liquefaction occurs when saturated soil experiences enough shaking that it loses its shear strength and transforms from a solid into a nearly liquid state. The results of soil liquefaction include loss of bearing capacity, loss of soil materials through sand boils or flow, flotation of buried chambers and pipes, and post-liquefaction reconsolidation (ground settlement). The assessed liquefaction hazard for the City's water service area is quantified as a magnitude of post-liquefaction settlement.

7.3.3.2 Lateral Spreading

In general, the lateral spreading hazard is minimal over most the water service area due to its relative flatness. Lateral spreading is primarily localized to creeks and rivers, areas with a liquefaction hazard where the ground is sloped steeper than 4 degrees. The highest lateral spreading hazard exists in the sloped ground around the Tualatin River, Nyberg Creek, and Saum Creek. The permanent ground deformation (PGD) in the high hazard lateral spread areas is estimated to be over 6 feet Lateral spreading hazards for the City's water service area are illustrated on **Figure 7-4**.

Associated with soil liquefaction settlement, the liquefied soil and non-liquefied soil crust can generate horizontal movement known as lateral spreading. Lateral spreading generally occurs near and along riverbanks, as well as other sloped ground. The potential for lateral spreading depends on the liquefaction potential of the soil, the seismic horizontal loading, the residual shear strength of the soil, and the area’s topography.

7.3.3.3 Landslide

Due to the relative flatness of the water service area most of the water system is not subject to a landslide hazard. However, steeper slopes along rivers and creeks provide a potential for landslides to occur. Estimated landslide displacement in localized areas of the City is primarily between 1 and 4 feet, as illustrated in **Figure 7-5**.

Earthquake induced landslides can occur due to the inertial force from an earthquake adding load to a slope. The ground movement due to landslides can be extremely large and damaging to pipelines.

7.3.3.4 Ground Shaking

The estimated ground shaking intensity, Peak Ground Velocity (PGV), depends on the subsurface materials. The ground shaking near the surface will be amplified by thick soil units overlying deep bedrock. In areas with shallow bedrock, such as the south, average PGV is estimated to be less than 10 inches per second (in/s). In the A and B Levels, average PGV is expected to be over 15 in/s due to amplification. **Figure 7-6** shows estimated PGV for the water service area.

The rapid and extreme shaking during an earthquake can cause transient stress and strain in pipelines that can be damaging if the pipe material and joints are not strong enough to withstand the shaking. Damage from ground shaking occurs even when there is no permanent ground deformation. The intensity of ground shaking can be quantified with the PGV at a site due to an earthquake.

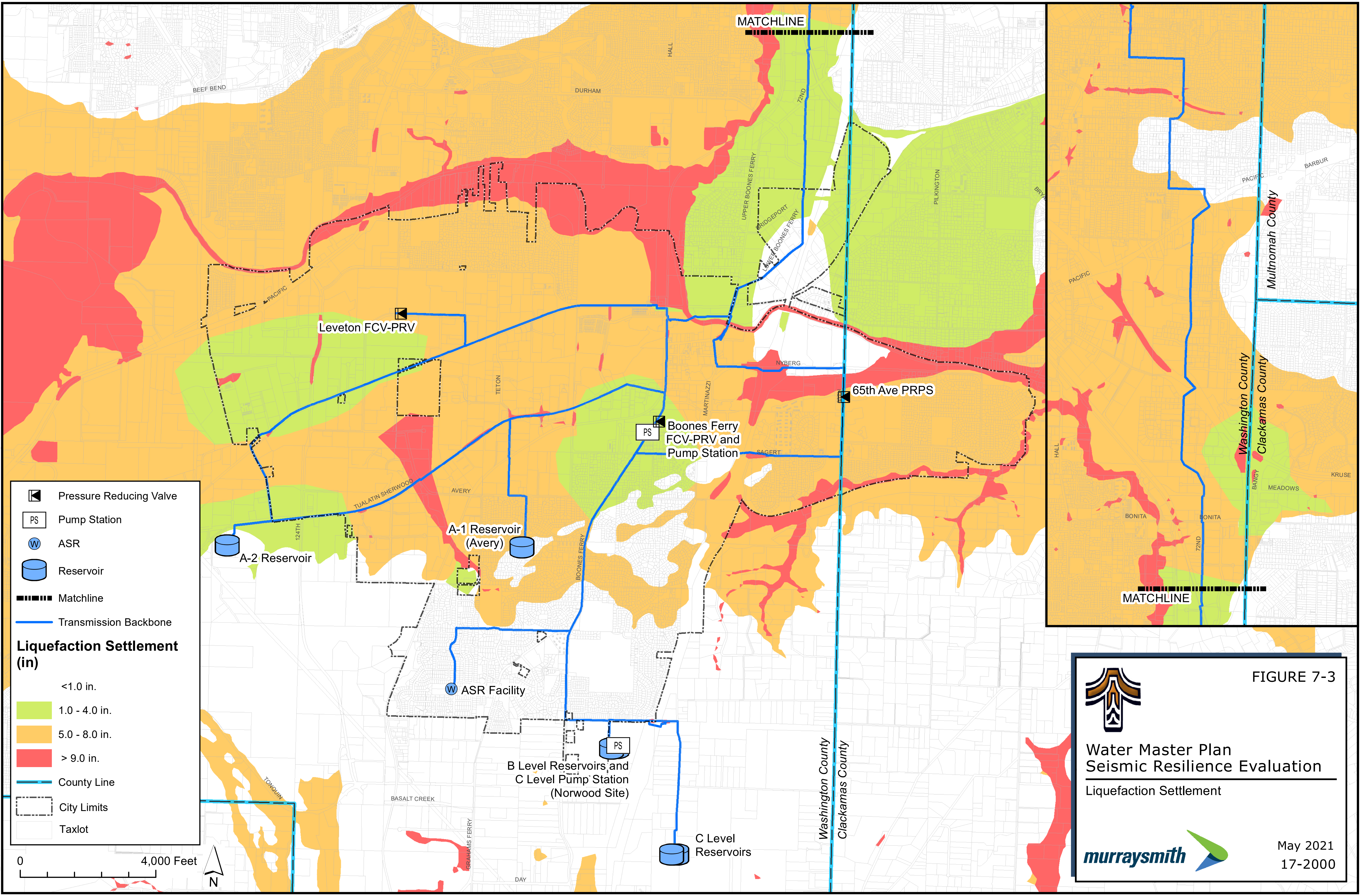

FIGURE 7-3

Water Master Plan
Seismic Resilience Evaluation

Liquefaction Settlement

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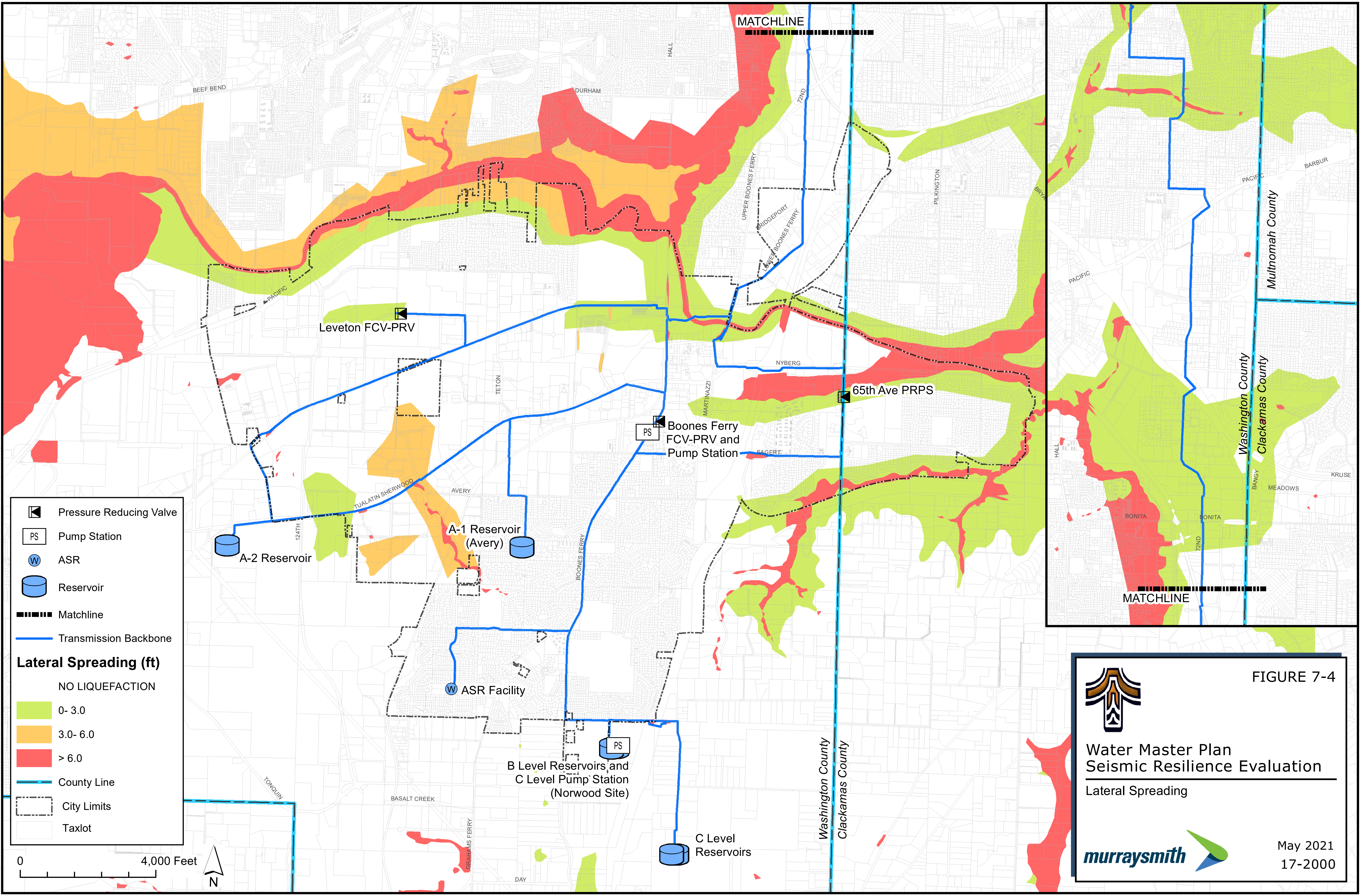

FIGURE 7-4

Water Master Plan
Seismic Resilience Evaluation

Lateral Spreading

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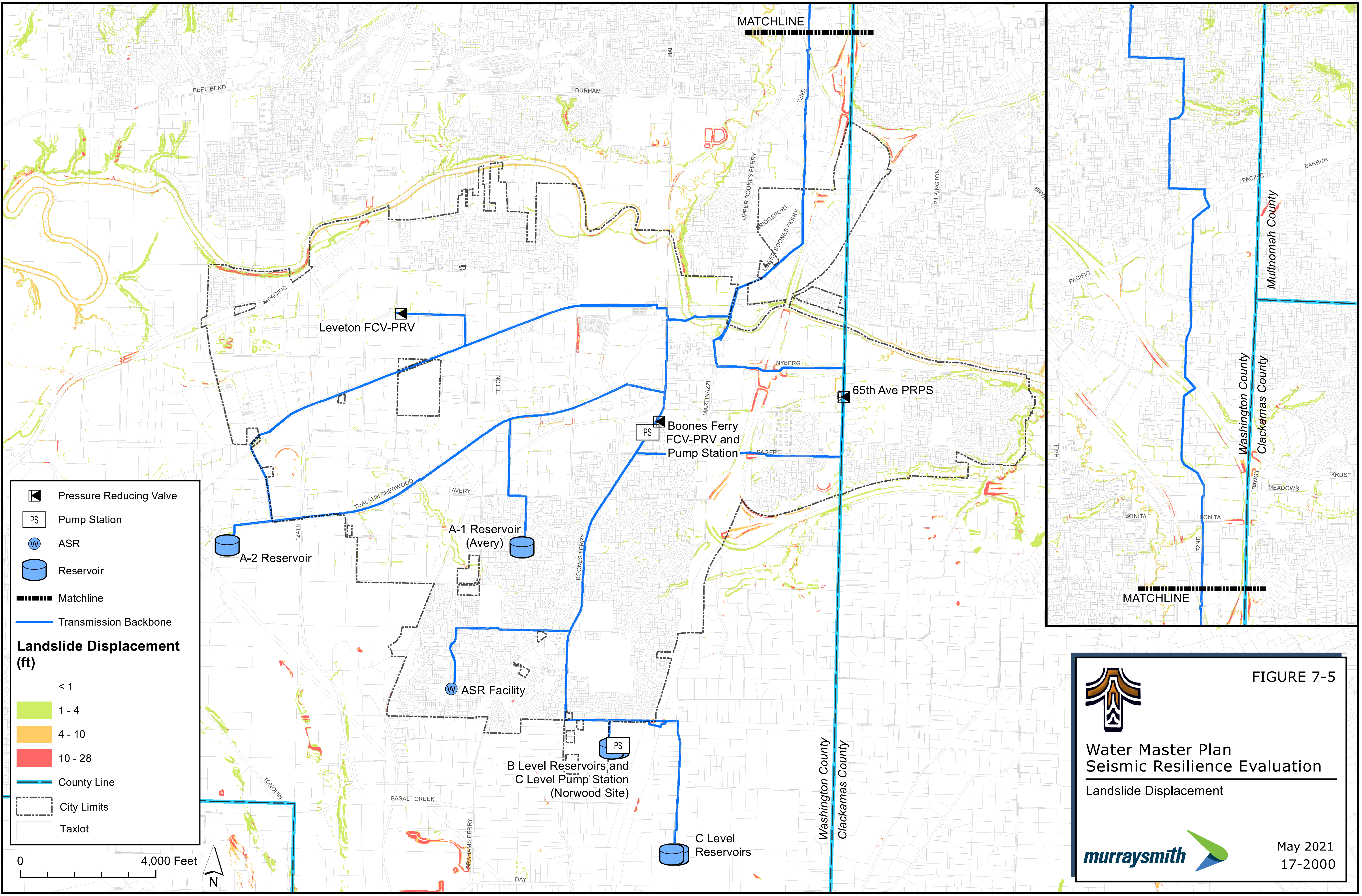

◧	Pressure Reducing Valve
PS	Pump Station
W	ASR
⛁	Reservoir
▬ ▪ ▪ ▬	Matchline
▬	Transmission Backbone

Landslide Displacement (ft)

	< 1
🟩	1 - 4
🟧	4 - 10
🟥	10 - 28
▬	County Line
⬚	City Limits
☐	Taxlot

FIGURE 7-5

Water Master Plan
Seismic Resilience Evaluation

Landslide Displacement

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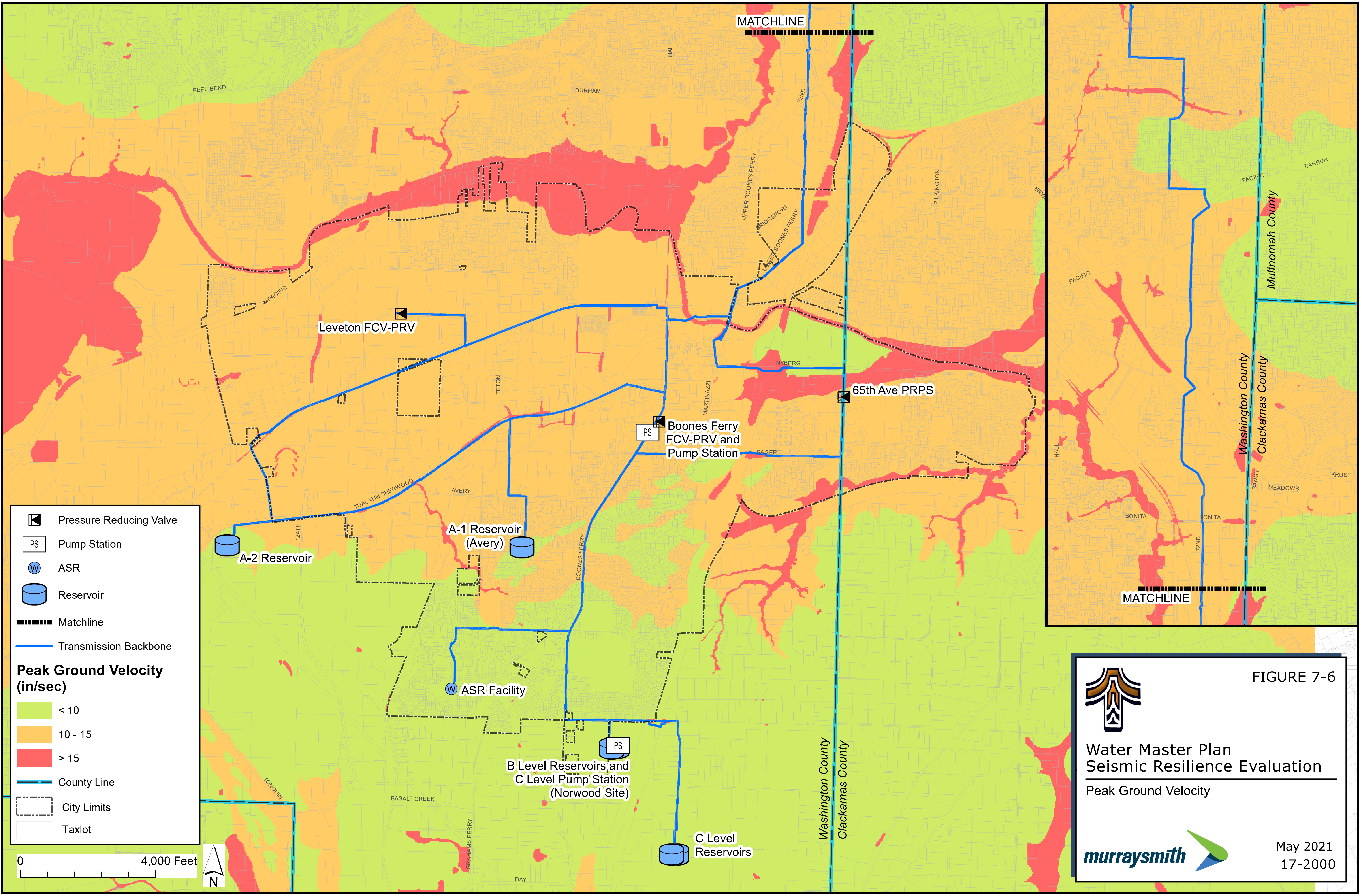

FIGURE 7-6

Water Master Plan
Seismic Resilience Evaluation

Peak Ground Velocity

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7.4 Water Facility Seismic Vulnerability

7.4.1 Impact of Site Conditions

In addition to the seismic hazard study for the overall service area, reservoir, pump station, and valve site visits were also conducted to assess potential impacts from subsurface conditions and facility orientation at each site. Assessed facilities include the A-1, A-2, and B Level Reservoirs, the C Level and Boones Ferry Pump Stations, and the Boones Ferry, City Park, and 108th Operations Supply Control Valves. These facilities correspond approximately to the Tier 1 facilities described in **Table 7-1**.

7.4.1.1 Site Condition Findings Summary

- There is a general lack of geotechnical data and subsurface information at all of the visited sites, except for the C-level Reservoir site and the A-2 Reservoir.
- Liquefaction settlement and lateral spreading at the A-2 Reservoir is anticipated to be negligible. However, a thorough review of the existing data is recommended to confirm the mapped subsurface conditions.
- Liquefaction settlement and lateral spreading at the A-1 Reservoir and the Norwood site (B Level Reservoirs and C Level Pump Station) is anticipated to be low. Due to the anticipated low level of liquefaction hazard, site-specific studies do not need to be prioritized.

7.4.2 Impact of Structure Design, Age, and Condition

As part of this seismic risk assessment, a high-level building evaluation was conducted by Petersen Structural Engineers (PSE) at 10 of the City's water facilities, as summarized in the following paragraphs. More detailed information is available in their visual observations report included as **Appendix G** to the WSMP.

Observations of facility construction, age and condition were made based on as-built drawings provided by the City and site visits conducted April 25, 2018. Opinions of seismic performance are based solely on building age, condition, and type. No load-based analysis was conducted for this evaluation. The observed water facilities include:

- ASR Pump Station
- Boones Ferry Control Station
- Martinazzi Pump Station
- C Level (Norwood) Pump Station
- 2.2 MG A-1 Reservoir – Welded Steel
- 5.0 MG A-2 Reservoir – Welded Steel
- 2.2 MG B-1 Reservoir – Welded Steel
- 2.8 MG B-2 Reservoir – Welded Steel

- 0.8 MG C-1 Reservoir – Welded Steel
- 1.0 MG C-2 Reservoir – Welded Steel

7.4.2.1 Structure Condition Rating

Each facility was given a condition rating which is indicative of the overall structural condition with some adjustment for age. This rating is not a descriptor of design quality. Specific deficiencies or areas of concern are noted for each facility. Water facility structure condition ratings are defined in **Table 7-2**.

Table 7-2 | Structure Condition Rating Definitions

Rating	Description
9-10	Very good
7-8	Good, shows slight signs of wear
6-6	Shows expected level of aging
3-4	Shows wear and will need rehabilitation or replacement
1-2	Should be replaced or rehabilitated as soon as possible

7.4.2.2 Structure Seismic Performance Expectation

Each facility was assigned a seismic performance expectation based on a visual inspection of the structure and review of the original construction drawings. Construction drawing review referenced "benchmark buildings" from the American Society of Civil Engineers (ASCE) 41 Seismic Evaluation of Existing Buildings. The benchmark building gives a baseline code edition for many types of buildings. If the building is designed to the benchmark code (or a later iteration of that code) the building is likely to have been detailed sufficiently to prevent a catastrophic failure or life-safety risk in a seismic event. Water facility seismic performance expectation ratings are defined in **Table 7-3**.

Table 7-3 | Structure Seismic Performance Expectation Rating Definitions

Rating	General Performance/Damage	Re-Occupancy	Maintained Serviceability	Repairs or Replacement
Good	Structure likely to perform well with minor damage	Likely	Likely	Some repairs
Moderate	Structure likely to retain primary shape without collapse, moderate to heavy damage	Possible	Possible	Extensive repairs or replacement expected
Poor	Partial or comprehensive structure collapse likely with extensive damage	Unlikely	Unlikely	Extensive repairs or replacement probable

7.4.2.3 Structure Condition Findings Summary

Most facilities identified are in generally good condition. However, significant updates to code provisions for seismic design and detailing criteria have occurred (the Oregon Structural Specialty Code is revised and updated every 3 years in coordination with the International Building Code) since most structures were designed, which may lead to additional upgrades depending on the level of risk the City is willing to accept.

Storage racks, piping, HVAC, tanks, pumps and control panels in all pump stations and ASR well buildings generally have inadequate bracing for seismic resistance. It is recommended that these be evaluated and upgraded with code compliant seismic bracing. Much of this bracing can be upgraded by City staff, as procurement and installation are not complex and generally inexpensive. Specific ratings and notes for each water facility structure are summarized in **Table 7-4**.

Table 7-4 | Structure Seismic Performance Investigation

Water Facility	Condition Rating	Seismic Performance Expectation	Notes
ASR Pump Station	9	Good	▪ Recent 2010 construction with seismic considerations. ▪ Seismic bracing upgrades have been completed.
Boones Ferry PRV/FCV Station	3	Poor	▪ Poor overall condition, no seismic upgrades. ▪ Unlikely to be operational post seismic event due to failure of rigid pipe to vault connections and potential structural vault failure.
Martinazzi Pump Station	4	Poor	▪ Poor overall condition, no seismic upgrades. ▪ Unlikely to be operational post seismic event.
C Level Pump Station	8	Good	▪ Recent 2010 construction with seismic considerations. ▪ Seismic bracing upgrades recommended.
2.2 MG A-1 Reservoir	6	Moderate	▪ 2006 seismic retrofit, buckled plates, areas of questionable welds, structural analysis recommended. ▪ Damage expected in seismic event. ▪ Existing overflow discharge could cause foundation damage.
5.0 MG A-2 Reservoir	8	Good	▪ Recent 2006 construction, well anchored, 5’ freeboard.
2.2 MG B-1 Reservoir	5	Poor	▪ 2006 seismic retrofit, buckled plates, areas of questionable welds, structural analysis recommended. ▪ Damage expected in seismic event. ▪ Existing overflow discharge could cause foundation damage.
2.8 MG B-2 Reservoir	7	Moderate	▪ 2006 seismic retrofit. ▪ Limited freeboard (2’), recommend increasing to reduce potential for roof damage.
0.8 MG C-1 Reservoir	4	Moderate - Good	▪ 2006 seismic retrofit included roof replacement. ▪ Limited freeboard (12”), recommend increasing to reduce potential for roof damage. Addressed by setpoints that maintain 4-feet of freeboard.
1.0 MG C-2 Reservoir	10	Good	▪ Recent 2016 construction with seismic considerations, 4’ freeboard.

7.4.3 ASR Facilities

The City's existing ASR well system has the potential to be a significant asset after a seismic event if the facilities remain operational and other water sources are compromised. According to a study of well survivability in previous seismic events (Ballantyne, AWWA 2010), water wells have historically insignificant vulnerability to seismic impacts. The greatest risks to wells from a seismic event are large earth deformations and liquefaction of soil surrounding the well casing and screen.

7.5 Pipe Fragility Analysis

Pipeline fragility describes the likelihood of pipeline damage by estimating the necessary rate of repair (RR) per 1,000 feet of main following an earthquake. The estimated RR is based on the pipe material, installation, and surrounding ground conditions. While the actual location of pipeline damage cannot be predicted, pipeline fragility analysis provides a measure of the expected severity of damage to the water system backbone overall and may identify areas of higher relative risk where mitigation efforts should be focused first.

7.5.1 Analysis Method

This analysis focused on estimating RR for the water system backbone mains illustrated on **Figure 7-2** which were identified for this analysis with City water utility and emergency management staff input. Backbone mains are divided into higher-priority Tier 1 mains and lower-priority Tier 2 mains.

Backbone pipeline fragility was evaluated using data provided by the City, seismic geohazards described earlier in this section, and the Seismic Fragility Formulations for Water Systems guideline developed by the American Lifelines Alliance (ALA). The ALA is a partnership between FEMA and ASCE.

The ALA guideline damage algorithms used to calculate RR per 1,000 lf of pipe are based on empirical evidence catalogued after major earthquakes such as the 1989 Loma Prieta Earthquake in the San Francisco bay area and the 1995 Great Hanshin earthquake in Hyogoken-Nanbu (Kobe), Japan. The guideline recommends using two pipe vulnerability functions, each of which address a different seismic hazard:

1. $RR = K1 * 0.00187 * PGV$

This function estimates a RR per 1,000 LF of pipe due to seismic wave propagation or ground shaking. The magnitude of ground shaking is represented by PGV, described earlier in this section.

2. $RR = K2 * 1.06 * PDG^{0.391}$

This function estimates a RR per 1,000 LF of pipe due to PGD, which can be the result of landslide or lateral spreading due to soil liquefaction, described earlier in this section.

In the pipe vulnerability equations above, K1 and K2 are empirical fragility constants which are used to scale the repair rates for different pipe diameters, pipe materials, and joint types. K1 generally represents the strength and flexibility of the pipe material to withstand ground shaking. K2 generally represents the strength and flexibility of the pipe joint to resist separation during ground deformation. A larger K value correlates with higher material or joint vulnerability.

7.5.2 Pipe Installation and Materials (K Value Selection)

The ALA seismic fragility guideline provides a range of K values which scale estimated RR for different pipe materials and joint types. K values are estimated based on empirical damage evidence from previous earthquakes. Thus, the influence of some variables, such as pipe diameter, are inconclusive based on the currently available historical water main damage data. Selected K values for the City's water system backbone are summarized in **Table 7-5** based on the ALA guideline and the City's current water system asset management data and mapping.

K1 generally represents the pipe material. RR for some material types are also influenced by pipe diameter and soil corrosivity. Large diameter, defined as 16-inch diameter and greater, welded steel or concrete cylinder mains show lower damage rates in previous seismic events than smaller diameter mains of the same material. This may be attributed to higher quality control during construction, fewer bends and lateral connections than smaller mains or lower soil loads as a function of pipe strength for the same depth of cover. The City's water system mapping data includes water main diameter for all pipes and pipe material for most pipes.

Soil corrosivity also influences K1 values for cast iron and steel pipes. If these pipes are installed in corrosive soils, anticipated damage rates would be higher. Based on soil survey data from the National Resource Conservation Service (NRCS), soil corrosivity is believed to be high throughout Tualatin's water service area. City staff informed the project team that this is not consistent with observations of soil conditions and pipe performance in the field. The K1 value was adjusted to reflect a moderate level of soil corrosivity, in alignment with the City's observations.

K2 generally represents the pipe joint and is selected based on joint type and pipe material. Joint type information was not available for City water system mains. Joint type is assumed based on pipe material and common construction methods at the time of pipe installation. The City's water system mapping data includes installation date for most pipes.

Table 7-5 | Pipe Fragility K Values[1]

Pipe Material	Installation Date	Assumed Joint Type	Diameter	K1	K2
Cast Iron	<1970	Cement	All	1.4	1.0
Cast Iron	>=1970	Rubber Gasket	All	0.8	0.8
Ductile Iron	All	Rubber Gasket	Small [2]	0.5	0.5
Ductile Iron	All	Rubber Gasket	12-24”	0.8	0.7
Ductile Iron	All	Rubber Gasket	>24”	1.0	1.0
Concrete w/Steel Cylinder	CCP >=1970; Ameron All	Rubber Gasket or Carnegie-style push-on	Large [3]	0.8	0.7
Polyvinyl Chloride	All	Rubber Gasket	Small	0.5	0.8
High Density Polyethylene	All	Welded or fused	Large	0.15	0.15
Asbestos Cement	All	Cement	All	1.0	1.0
Unknown	All	Unknown	All	1.0	1.0

Notes:

1. Higher K values reflect pipe that has a greater risk of breaks and/or joint failure during a seismic event
2. Small = 4- to 12-inch diameter
3. Large = 16-inch diameter and greater

7.5.3 Pipe Fragility Seismic Hazard Values

Pipe fragility RR per 1,000 lf of pipe are calculated for the following seismic hazards.

- strong ground shaking, expressed as PGV
- settlement due to liquefaction, expressed as PGD_{LIQ}
- liquefaction induced lateral spreading, expressed as PGD_{LAT}

Relative potential hazard levels for each of these three hazards are shown as negligible, low, medium, and high in **Figure 7-3**, **Figure 7-4**, and **Figure 7-6**. As illustrated on **Figure 7-5**, ground movement due to landslide is unlikely throughout the water service area except for very localized areas. Thus, pipe fragility due to landslide is not calculated for the City's water system backbone overall. Specific values for PGV and PGD used in the pipe fragility RR calculations are summarized in **Table 7-6**.

Table 7-6 | Pipe Fragility Seismic Hazard Values

Seismic Hazard	**Variable (units)**	**Negligible**		**Low**		**Medium**		**High**	
		Range	Pipe Fragility Value	Range	Pipe Fragility Value	Range	Pipe Fragility Value	Range	Pipe Fragility Value
Ground Shaking[1]	PGV (inches/second)	0		< 10		10 to 15		> 15	
Liquefaction Settlement	PGD_{LIQ} (inches)	< 1	1	1 to 4	2.5	5 to 8	6.5	> 9	9
Lateral Spreading	PGD_{LAT} (inches)	0	0	0 to 3	1.5	3 to 6	4.5	> 6	6

Note:

1. Ground shaking provided as integer values rather than ranges. Pipe fragility values for ground shaking used in calculations are those integer values.

7.5.4 Pipe Fragility Findings

Buried pipeline damage caused by ground failure (liquefaction and lateral spreading) will be significantly more severe than damage caused by ground shaking. Empirical data used to develop the ALA's pipe fragility analysis method reveals repair rates two orders of magnitude higher for damage caused by ground failure. FEMA's Hazus methodology, a nationally recognized risk model used to assess potential earthquake damage to buried pipelines, also supports this conclusion. For pipeline repairs caused by ground failure, HAZUS assigns 80 percent of the repairs as "breaks" and 20 percent as "leaks". For ground shaking, 20 percent are considered breaks and 80 percent leaks.

In the City's water service area, liquefaction and lateral spreading during a seismic event present the largest risk to transmission and distribution mains. **Table 7-7** summarizes the total estimated water system backbone repairs by pressure zone due to both ground shaking and ground failure. Total repairs are split into potential breaks and leaks based on the 80 percent to 20 percent ratios described in the previous paragraph. **Figure 7-7** illsutrates estimated RR for ground failure, **Figure 7-8** illustrates estimated RR for lateral spreading and **Figure 7-9** illustrates the estimated RR for liquefaction settlement.

Tier 1 backbone mains are the most critical for restoring water service and connecting pressure zones. It is recommended that damage mitigation planning focus on these mains first. There is predicted to be limited damage south of Ibach Street, primarily due to the relatively shallow bedrock which results in low rates of expected lateral spreading and settlement. Tier 1 mains along Boones Ferry Road, Tualatin Sherwood Highway, and Sagert Street are expected to experience medium RR due to settlement. Tier 2 mains along Herman Road to the Leveton PRV are also expected to experience medium rates of repair due to settlement. Lateral spreading is expected to affect the City pipe less than settlement but could result in medium RR near the Park PRV, in the vicinity of the I-5 crossing to the C Level Reservoirs, and along the Tualatin River.

Pipe material plays a key role in predicting failures. Most of the City's distribution piping is small diameter ductile iron. Generally, this material is expected to withstand better in an earthquake than some other materials. One area of concern for the City is the Tier 1 transmission along Tualatin-Sherwood Road between Boones Ferry and Teton. This line connects the A-1 Reservoir to the distribution system. The line was built in 1969 and is 12-inch diameter cast iron, which is generally expected to perform relatively poorly in a seismic event. Additionally, distribution system looping is more limited in this industrial area of the City, which means the City is more reliant on this pipeline.

Table 7-7 | Estimated Backbone Pipe Repairs by Pressure Zone

Pressure Zone	Length (mi)		Ground Shaking		Ground Failure		TOTAL
	Tier 1	Tier 2	Tier 1	Tier 2	Tier 1	Tier 2	
A Level	2.0	5.4	< 1	< 1	19	42	61
B Level	4.6		< 1	< 1	24	< 1	24
C Level		1.4	< 1	< 1	< 1	4	4
Tualatin Transmission[1]	0.4	7.7	< 1	< 1	2	81	84
Total Estimated Backbone Repairs	**7.0**	**14.5**	**< 1**	**1**	**45**	**127**	**173**
Estimated Leaks			**< 1**	**< 1**	**36**	**102**	**139**
Estimated Breaks			**< 1**	**< 1**	**9**	**25**	**34**

Note:

1. Transmission includes piping from the Florence Lane Master Meter to the Boones Ferry PRV, or A or Bridgeport Level PRVs.

For context, this analysis indicates that approximately two percent of the backbone piping in the system (not including the TSM, which extends north outside of the City's water service area) is likely to require repair of breaks or leaks following a seismic event. If the same RR is applied to the remaining distribution system, over 100 miles of pipe, the City should expect that there may be in excess of 600 required repairs following a seismic event.

While there is a need to focus on increasing the resilience of the City's piping network, beginning with the backbone and eventually extending to the entire distribution system, the City lacks the financial resources to achieve a more resilient water distribution system in the near-term and it will be a challenge to achieve this goal even over a long period of time (50 years). As such, the next part of this section presents short-term investments and strategies to ensure that emergency water supply is available to the community following a seismic event.

7.6 Emergency Plan - Valve Isolation Study

In planning for recovery after a major earthquake, the City needs specific policies and Standard Operating Procedures (SOPs) in place to efficiently and safely bring facilities back online. This study specifically looked at bringing the transmission line between the Boones Ferry PRV and the Norwood Site (B Level Reservoirs) back online. However, the pressure testing procedures described herein are applicable to bringing any pipe infrastructure back online after an earthquake. This strategy is integrated into the *Emergency Water Plan* presented in **Section 9**.

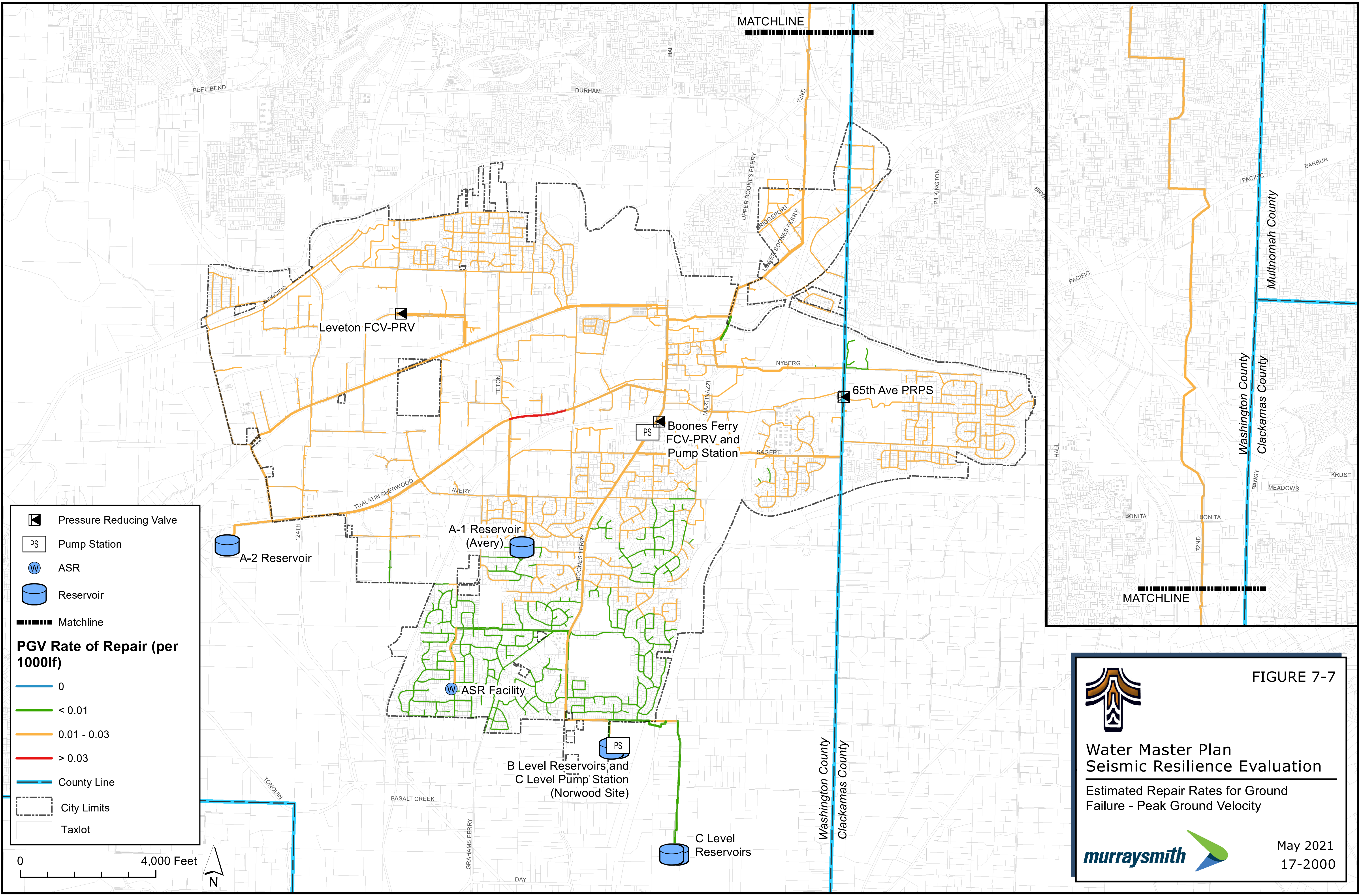

FIGURE 7-7

Water Master Plan
Seismic Resilience Evaluation

Estimated Repair Rates for Ground Failure - Peak Ground Velocity

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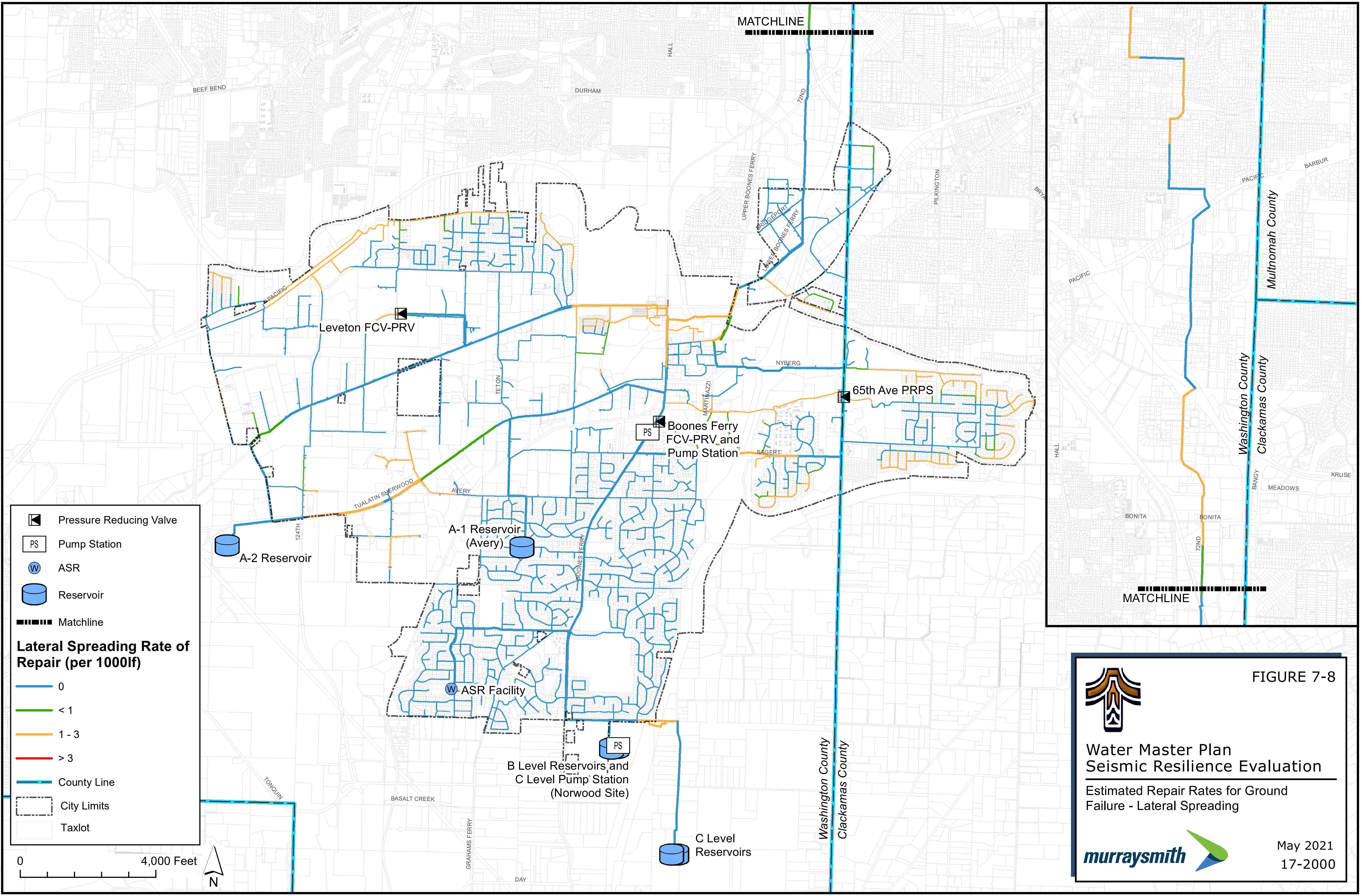

FIGURE 7-8

Water Master Plan
Seismic Resilience Evaluation

Estimated Repair Rates for Ground Failure - Lateral Spreading

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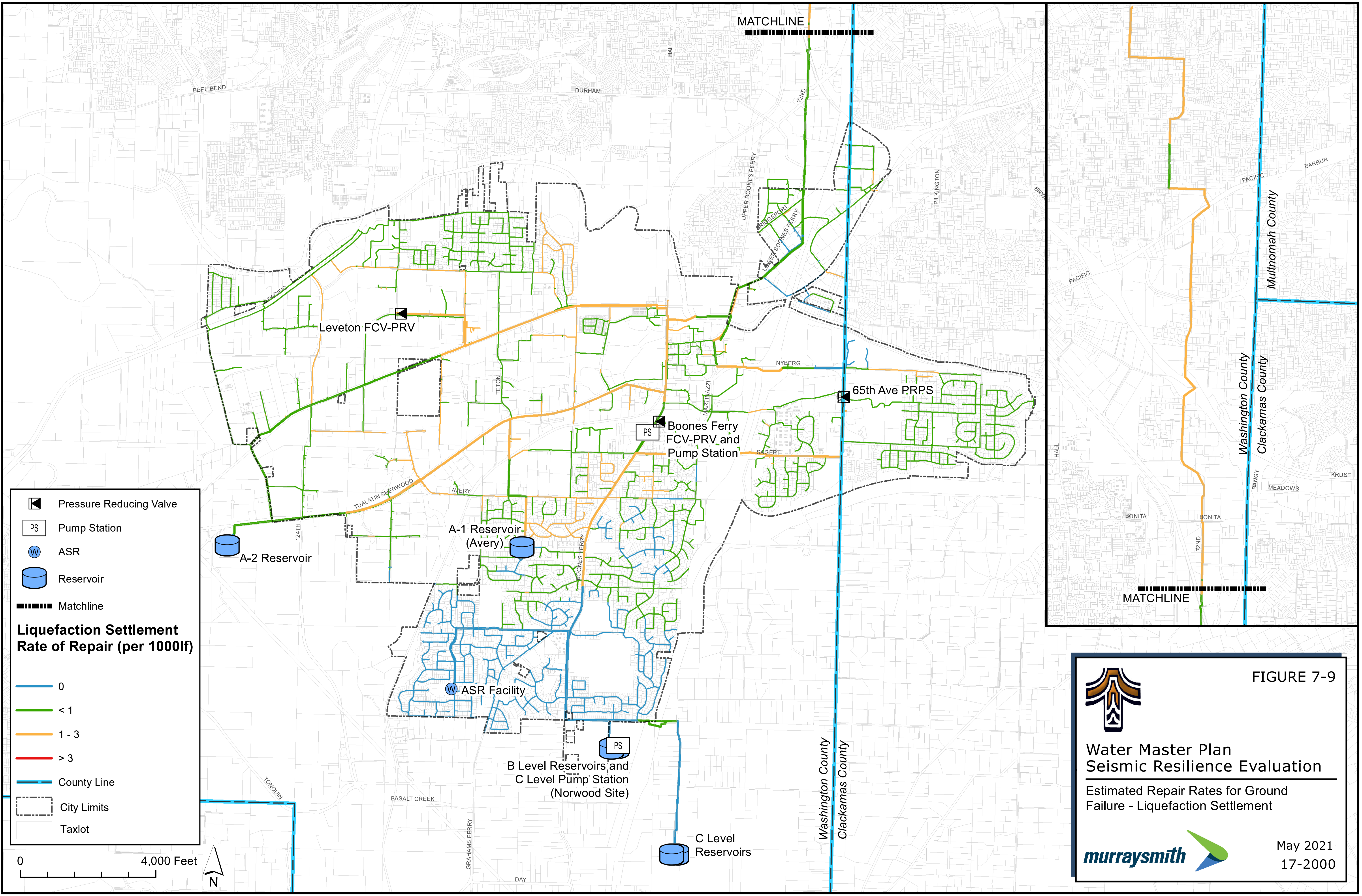

FIGURE 7-9

Water Master Plan
Seismic Resilience Evaluation

Estimated Repair Rates for Ground
Failure - Liquefaction Settlement

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7.6.1 System Operations – During the Seismic Event

In the event of a significant earthquake, proposed seismically actuated valves at the reservoirs (see **Section 7.9**) will activate, isolating the tanks from the system. Distribution and transmission pipes will likely rupture in several locations throughout the system. Water in the distribution system will be lost through the leaks but, if the reservoirs are intact and the seismic valves operate properly, water will remain in the reservoirs. Services and hydrants will no longer receive water.

It is recommended that the City plan for the installation of seismically actuated valves at reservoirs in each pressure zone in order to preserve stored water following a seismic event. Specific recommendations are discussed later in this section and included in the CIP presented in ***Section 8****.*

7.6.2 System Operations – Post Seismic Event, Backbone Reinstatement

After a seismic event, the highest priority will be reinstating the Tier 1 and 2 Backbone mains, in addition to the key facilities listed in **Table 7-4**. After obvious failures have been fixed, the remaining pipe will need to be incrementally pressure tested, and the identified leaks repaired.

A map was developed to identify the pressure test sequencing for the transmission main between the Norwood Site and the Boones Ferry PRV (see **Figure 7-10**). Starting at the B Level Reservoirs and drawing water from them, valves can be closed to isolate pipe segments that are progressively further from the Reservoir. Adjacent hydrants can be used for pressure measurements.

The segments south of Ibach Street do not have hydrants off the transmission main, as the pressure in that segment does not adequately serve the surrounding area. This limits the necessity of valve closures for branching distribution piping, but also limits the hydrant availability for pressure measurements. As this transmission line is upgraded, blowoff valves or sample connection ports should be added every 1,000 feet along the transmission line for this purpose, as discussed further in **Section 7.7.1.1**.

In order to facilitate pressure testing, the City should acquire a small pump and associated appurtenances for performing the pressure testing. It may be difficult to rent or acquire this equipment following a seismic event and purchasing it now allows the City to configure the apparatus and connection points for efficient setup.

7.6.3 System Operations – Post Seismic Event, Distribution Reinstatement

Reinstating distribution lines after a seismic event will likely be a similar process to reinstatement of transmission lines. However, as there are service laterals off distribution lines, leaks may be more prevalent, or more difficult to test. Pressure testing working incrementally from water supply out to distribution can help identify major system leaks. Additional leak detection measures such as acoustic devices will also likely be used. The ORP guidelines suggest full operation within one month but depending on the severity of the earthquake and the resiliency of the distribution system, reinstatement may take longer.

7.6.4 Next Steps

As the City replaces system pipes, additional consideration should be given for seismic resiliency. In the next section, possible design standards are listed.

7.7 Design Standards for Seismic Resilience

Oregon Structural Specialty and Mechanical Specialty Codes will dictate that all new water facility construction meet current earthquake standards which are based on an M9 event. Suggestions for City design and construction standards include recommendations for the following types of facilities.

- Pipelines
- Reservoirs
- Pump Stations
- ASR

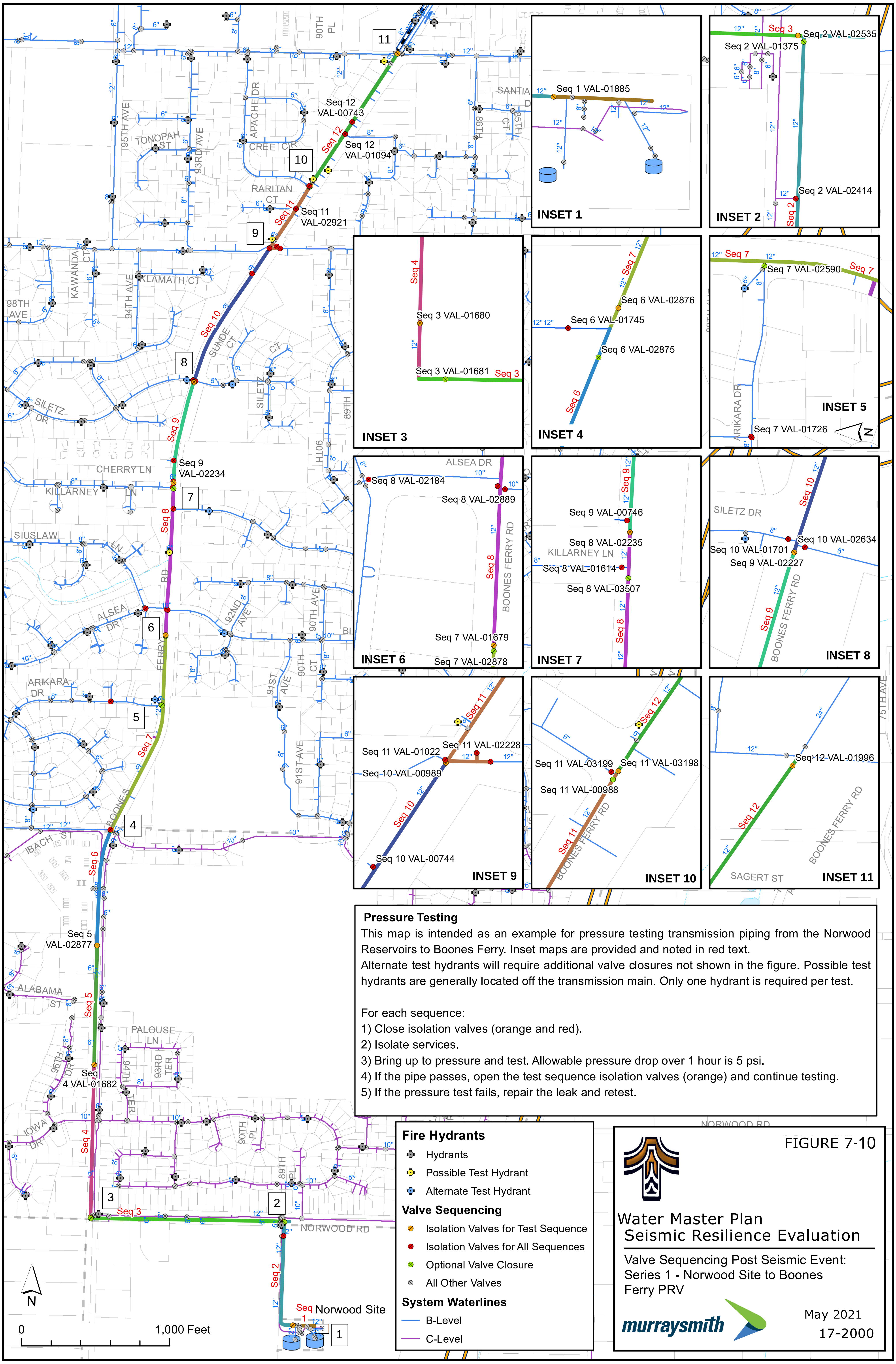
7.7.1 Pipelines

Based on the seismic vulnerability of the City's water system, restrained joint ductile iron pipe provides the best balance of cost, performance, and life cycle. Fully restrained ductile iron pipe reduces the risk of separation at standard push-on joints and allows limited deflection as a result of ground shaking and ground deformation. Furthermore, ductile iron is a piping material that City crews are familiar with and stock adequate supplies to respond to leaks and main breaks.

For pipes larger than 24-inch diameter, the City should consider the most appropriate pipe material for the specific conditions. The selection of piping material, lining, and coating system, and other design parameters should be made on a case-by-case basis with adequate consideration of specific alignment seismic hazards, hydraulics, performance and life-cycle expectations, soil considerations, etc.

7.7.1.1 Pipeline Pressure Testing

To allow for pressure testing of pipes after a seismic event, blow off valves, or other locations that will allow the City to isolate and pressure test key pipe segments should be installed, as replacement allows. This is especially key in areas without fire hydrants on the transmission main, such as the B Level transmission south of Ibach Street, through the C Level, to the B Level Reservoirs. Pressure test sites for new, or upgraded, backbone piping should be located every 1,000 feet, with the proper valving to allow for pipe isolation.



Pressure Testing

This map is intended as an example for pressure testing transmission piping from the Norwood Reservoirs to Boones Ferry. Inset maps are provided and noted in red text.

Alternate test hydrants will require additional valve closures not shown in the figure. Possible test hydrants are generally located off the transmission main. Only one hydrant is required per test.

For each sequence:

1) Close isolation valves (orange and red).
2) Isolate services.
3) Bring up to pressure and test. Allowable pressure drop over 1 hour is 5 psi.
4) If the pipe passes, open the test sequence isolation valves (orange) and continue testing.
5) If the pressure test fails, repair the leak and retest.

Fire Hydrants
- Hydrants
- Possible Test Hydrant
- Alternate Test Hydrant

Valve Sequencing
- Isolation Valves for Test Sequence
- Isolation Valves for All Sequences
- Optional Valve Closure
- All Other Valves

System Waterlines
- B-Level
- C-Level

FIGURE 7-10

Water Master Plan
Seismic Resilience Evaluation

Valve Sequencing Post Seismic Event:
Series 1 - Norwood Site to Boones Ferry PRV

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7.7.2 Reservoirs

It is assumed that future reservoir structures will be designed to meet earthquake standards consistent with current Structural and Mechanical Specialty codes, and these codes should be considered when the City is evaluating the condition, performance and rehabilitation needs of existing reservoirs. There are two key design considerations associated with reservoir configuration and connections to the distribution system.

- Pipe to reservoir connections
- Automated isolation valves at reservoir inlet and outlet piping connections

7.7.2.1 Pipe to Reservoir Connections

At each distribution or transmission piping connection to the reservoir, significant stress can be placed on the pipe as a result of the difference in response to ground motion and deformation by the pipe and reservoir foundation. To minimize the risk of pipe breakage at this location, it is recommended that a flexible expansion joint be installed at this interface. Flexible expansion joints must be capable of allowing axial expansion/contraction and differential movement that results in a vertical or horizontal offset. It is recommended that the City review as-built drawings to determine if adequate flexible connection exist currently, and if not, the City should plan to add flexible expansion joints at each reservoir in coordination with seismic actuated valves described below.

7.7.2.2 Automated Isolation Valves

Automated isolation valving with seismic valve actuators should be considered at all reservoir piping connections. There are several considerations to be weighed in determining whether to use an automatic shut-off valve at each reservoir as summarized in **Table 7-8**.

Table 7-8 | Automatic Shut-off Valve Considerations at Reservoirs

If a seismic valve actuator is used for automatic shut-off at reservoirs:	YES	NO
Water Available for Fire Suppression Immediately After Event?		✓
Reservoir Water Volume Preserved for Use During Recovery?	✓	
Requires Maintenance of Batteries for Valve Actuation?	✓	
Vulnerable to Accidental Closure due to False Alarm?	✓	

The City should consider the specific performance objectives of each reservoir associated with a seismic event and the anticipated response and recovery period to determine whether the installation of seismically actuated valves is warranted. For example, if two reservoirs serve a pressure zone, one may be equipped with seismic valves to preserve the water volume for future use during recovery while the other will remain connected to the system to provide adequate pressure if limited, or no damage occurs in the system, with the risk that this volume may be lost through main breaks.

In order to maximize the volume of water retained in storage following a seismic event, it is recommended that the City install seismic isolation valves on all reservoirs. Recent advances in the technology makes these valves far less prone to false alarms and maintenance issues, and there is the potential to operate these valves with a signal from seismic warning systems that are in ongoing development and expansion across the Northwest.

During preliminary design, the City should confirm the configuration of seismic isolation valves, including:

- Single or dual valves for isolation of sites with multiple reservoirs
- Source of standby power for valve operation (standby generator versus batter backup)

7.7.3 Pump Stations

Similar to reservoir structures, pipe connections at the pump station building present specific vulnerability as a result of differential movement and settlement. To minimize the risk of pipe breakage at this location, it is recommended that a flexible expansion joint be installed at this interface. Flexible expansion joints must be capable of allowing axial expansion/contraction and differential movement that results in a vertical or horizontal offset.

Standby power should also be provided, in the form of a standby generator, at all critical pump station facilities. The standby generator should be equipped with on-site fuel storage for at least 24 hours of operation. While a significantly greater volume of fuel will likely be required to sustain operation of the generator through the recovery period following a seismic event, storage of greater volumes of fuel present complications and are likely not economically feasible. The City's public works facility includes on-site fuel storage that will extend the City's ability to operate without sourcing additional fuel following an emergency.

7.7.4 ASR

Future upgrades and design considerations can further enhance seismic resiliency of the City's ASR well. These include:

- flexible couplings at the wellhead to withstand ground motion

- quick-connect couplers to deliver water to a truck or skid-mounted tank if the water distribution system has failed

- easy access over the wellhead to clean and repair the well after a major seismic event

As described in **Section 5**, the most significant improvement to increase the City's ability to beneficially use water from the ASR well following a seismic event is the construction of a new B-level reservoir at the site to provide on-site storage for distribution of water.

7.8 Next Steps

This initial seismic evaluation demonstrates that there are significant risks to the City's water system during a seismic event. The City has made significant steps towards identifying and planning for these risks through the Emergency Water Supply Study. As discussed in the study, it is recommended that the City:

- Continue coordination with emergency managers to refine understanding of post-disaster water needs which will inform water facility performance goals and design choices.
- Pursue a more detailed analysis of vulnerable facilities to develop a 50-year seismic CIP consistent with the ORP.
- Consider seismic implications when replacing transmission or distribution piping.
- Include blow-off valves and other appurtenances to allow for systematic pressure testing of mains after a seismic event.

7.9 Summary of Recommendations

The recommendations presented in this section are summarized below. For those recommendations that include capital investment, see **Section 8** for the proposed capital improvement cost and timing relative to the conditional and capacity related improvements described elsewhere in this WSMP.

- Facility Seismic Improvements:
  - Upgrade the Boones Ferry PRV/FCV – Upgrades to this facility should include rehabilitation or replacement of the buried utility vault and piping transitions. This is a critical water supply facility for transmitting PWB supply to the B-level and C-level service zones.
  - A-1 Reservoir Structural Analysis – A structural analysis should be performed for this reservoir to better quantify seismic risk and determine if cost-effective mitigation strategies are available.
  - Reservoir Connections: Flexibility and Isolation – Install new flexible connections (where current flexible connections are not provided or are inadequate) and seismic isolation valves at all six of the City's existing reservoirs. New reservoirs should be designed and constructed with these features.

  - Install a permanent standby generator at the Norwood Pump Station with adequate fuel storage for a minimum of 24-hours of operation.

- Backbone Piping:

  - Implement the Seismic Design Standards presented in this section.

  - TSM Study – Conduct a study to assess the condition and performance of the TSM, especially in the context of seismic resilience. The study should present mitigation strategies and costs for City consideration in the broader context of water supply reliability.

- Emergency Preparedness:

  - Implement the strategies, recommendations and improvements presented in **Section 9**, Emergency Water Plan.

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Section **8**

Section 8

Capital Improvement Program (CIP)

This section presents recommended improvements for the City's water system based on the analysis and findings presented earlier in this WSMP and projects identified in the 2013 WSMP. These improvements include supply, storage reservoir, pump station, and water main projects. The CIP presented in **Table 8-2** later in this section summarizes recommended improvements and provides an approximate timeframe for each project. Proposed improvements are illustrated in **Figure 8-1**.

8.1 Project Cost Estimates

An estimated project cost has been developed for each recommended improvement consistent with previously identified projects from the City's 2013 plan and current preliminary design work, as applicable. Cost estimates represent opinions of cost only, acknowledging that final costs of individual projects will vary depending on actual labor and material costs, market conditions for construction, regulatory factors, final project scope, project schedule and other factors. The Association for the Advancement of Cost Engineering International (AACE) classifies cost estimates depending on project definition, end usage and other factors. The cost estimates presented here are considered Class 5 with an end use being a study or feasibility evaluation and an expected accuracy range of -50 percent to +100 percent. As the project is better defined, the accuracy level of the estimates can be narrowed.

8.2 Timeframes

A summary of all improvement projects and estimated project costs is presented in **Table 8-1**. This CIP table provides for project sequencing by showing projects prioritized by timeframes defined as follows.

- 0 to 5-year timeframe - recommended completion through 2025
- 6 to 10-year timeframe - recommended completion between 2026 and 2030
- 11 to 20-year timeframe - recommended completion between 2031 and 2040
- 20+ year timeframe – recommended completion beyond 2041

A note on timeframes – these recommendations are based on an understanding as of early 2021. If development occurs at a faster or slower rate, some projects, such as a second B-Level tank at the ASR site, may be required earlier than written. Additional studies may be required for certain projects, as well.

8.3 Supply

8.3.1 Portland Supply

The WCSL will need investment in the form of rehabilitation and eventual replacement. The City should plan for continued investment in the WCSL and an additional study when replacement is deemed necessary. As partners of the WCSL change their use of the supply main, this investment may change as well. A recent investigation by PWB evaluated potential changes in water quality as a result of increased water age as the WCSL's largest user, TVWD, discontinues use of the transmission main for wholesale supply in 2026. While the study indicated that increased water age should be offset by water quality improvements associated with the implementation of filtration of the Bull Run supply, the City should prepare for potential increases in disinfection by-product formation and lower disinfectant residuals when these changes occur in 2026.

8.3.2 Emergency Supply Development

As discussed in the *City of Tualatin - Water Supply Strategy* (The Formation Lab, 2021), PWB remains the most reliable source of long-term supply for the City and a three prong strategy is recommended to ensure the continued reliability of Tualatin's water supply including:

- Invest in a New Backup Supply
- Continue to Support Reliability of the PWB System
- Increase Reliability of Local Interties

Tasks under these strategies are included in the CIP as project 604, Emergency Supply Improvements, with an assumed bulk cost to apply towards the various projects.

8.4 Storage Reservoirs

As presented in **Section 5**, the City will need additional storage at all supply levels. Due to site and transmission limitations, it may make the most sense to build all additional storage at the B Level, and pump or valve to appropriate pressures for the A and C Levels.

It is recommended that the City implement the following strategy for development of additional storage:

- Construct an additional 2.5-MG Reservoir adjacent to the existing B Level (Norwood) Reservoirs in the next 5 years (2021-2025). This improvement will address short-term storage deficits. The City should pursue securing property for a third reservoir at this site with adjacent property owners.

- The remaining system-wide deficit at build-out should be addressed by constructing a 1.0 MG reservoir at the City's ASR site, but only as required by development.

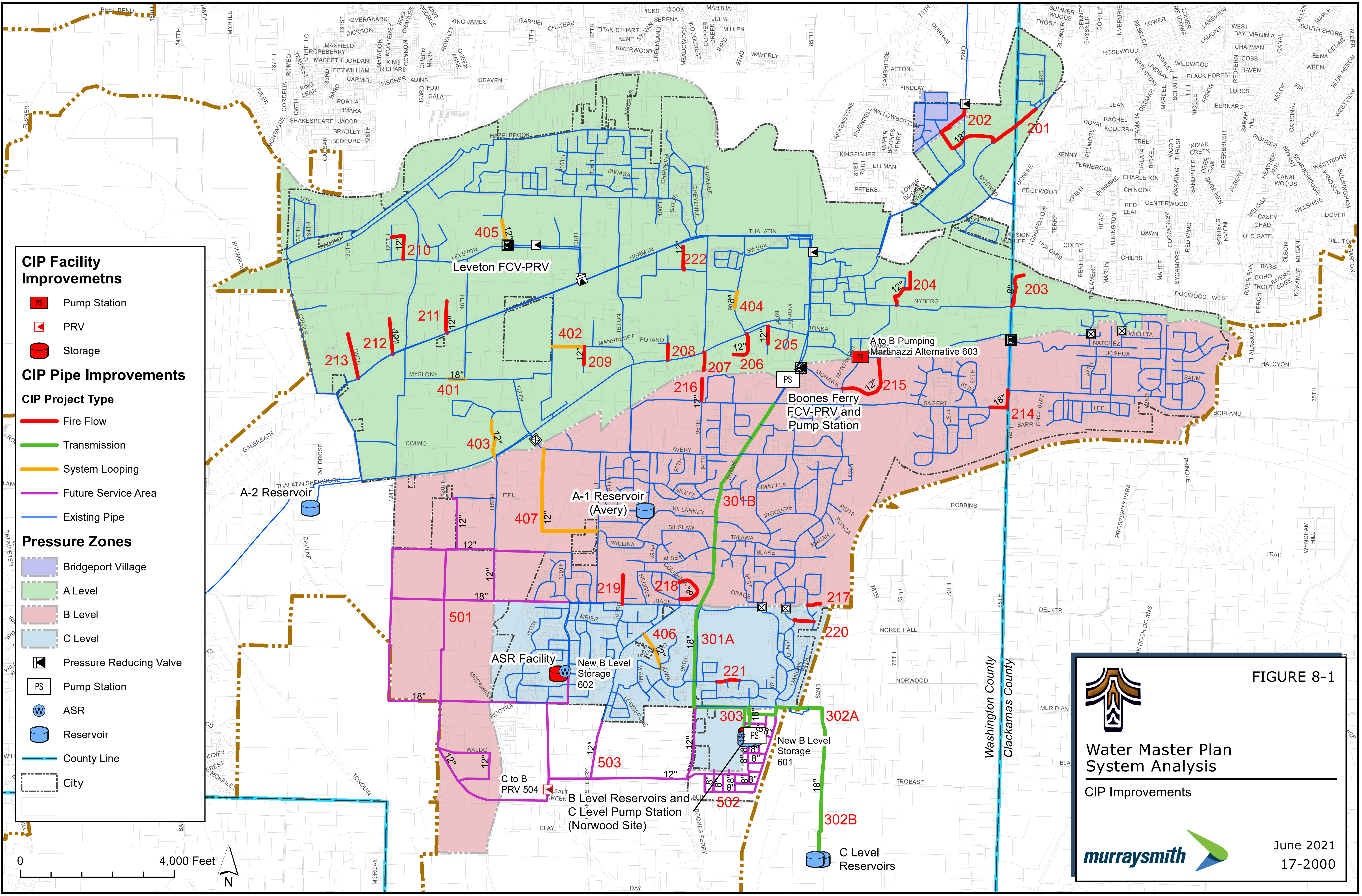

FIGURE 8-1

Water Master Plan System Analysis

CIP Improvements

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8.4.1 Existing Reservoir Improvements

City staff previously identified projects at the existing storage reservoirs to continue to improve service, and through the seismic analysis in this WSMP, additional improvements to increase the resilience of the City's water storage facilities were identified. These projects include seismic upgrades at reservoirs as discussed in Section 7.

8.5 Pump Stations

8.5.1 A to B Pumping

It is recommended the City invest in a facility to provide pumping from the A to B Levels in the event of a Boones Ferry Supply outage. This could either be through portable pump stations or upgrading the Martinazzi Pump Station with an up-to-date facility. This pump station upgrade should occur in the next 5 years and is included as one of the projects in the Water Supply Strategy. Funding for this project is included in the CIP table under project 604, Emergency Supply Improvements.

8.5.2 Portable Pump Station

As discussed in Section 5.2.2,, it is recommended the City purchase a portable pump station to use at the various stub outs accessible throughout the system, for both A to B and B to C Level pumping. The timing of this project is recommended in the next 6-10 years and additional study should be completed prior to purchase. The portable pump should be designed for an approximate flow rate of 2 MGD at 150 feet of total dynamic head (approximately 100 horsepower pump and motor), allowing for throttled operation to pump between service levels.

8.6 Distribution Mains

Replacement costs for distribution mains were estimated on a base assumption of $36/inch-diameter per linear foot (a 12-inch diameter pipe costs $300/lf to replace). These costs are calculated as project costs based on RSMeans pipe costs and recent bid tabulations in the region, and include general markups for earthwork and construction, erosion, and traffic control (five percent), meters (10 percent), fittings and valves (30 percent), mobilization (10 percent), contingencies (30 percent), contractor overhead (15 percent), engineering design (20 percent), and legal/admin coordination (10 percent). Actual costs will vary based on roadway improvements and other conditions.

8.6.1 Fire Flow Improvements

As presented in Section 5, the City's distribution system is generally well looped. Adequate fire flow is available throughout most of the existing distribution system. Localized water main upgrades are recommended to address fire flow deficiencies. However, it understood that some industrial sites have onsite pumping that is not included in this analysis and may mitigate some of the deficiencies. Improvements to address sites that may have pumping are included in the plan.

Current deficiencies and should be addressed when possible. High priority improvements (those that address multiple fire flow deficiencies) are suggested within 6-10 years. All remaining improvements listed under 11-20 years. However, due to the uncertainty of onsite pumping, non-residential improvements were split evenly in the summary table between 11-20 years and 20+ years.

8.6.2 B-Level Transmission Main

Proposed improvements between the Boones Ferry PRV and the B-Level reservoirs are recommended to improve supply to the B and C Levels during maximum day demands. A replacement 18-inch diameter main is recommended. The completion of this major capital improvement projects is split into 2 segments.

A. Norwood Reservoir Site to Ibach Street (Norwood Road and Boones Ferry Road) within the immediate timeframe (0-5 yrs, 2021-2025)

B. Ibach Street to Sagert Street (11-20 yrs, 2031-2040)

8.6.3 C Level Transmission Main

Upsized transmission is recommended between the C Level Pump Station at the Norwood site and the C Level Reservoirs at the Frobase site. It is understood that this project may face significant construction challenges in part because of the difficulties of an additional crossing of I-5. As described in **Section 5** and the *Water System Capacity Analysis – Basalt Creek Service Technical Memorandum* (see **Appendix E**) this improvement is divided into multiple segments.

- 0-5 Years, 2021-2025 C Level Transmission Improvements:
    - 344 feet of 18-inch diameter main from SW Vermillion Drive to I-5 Crossing
    - Oversize Autumn Sunrise subdivision piping parallel to Norwood Road to 18-inch diameter when constructed (project 303)
    - Upsizing from east of I-5 Crossing towards SW Frobase Road, approximately 2,500 lf of 18-inch diameter main
- 6-10 Years, 2026-2030 C Level Transmission Improvements:
    - Construct the remaining 18-inch diameter transmission between the Norwood site (Norwood Pump Station) and I-5.
    - Construct the remaining 18-inch diameter main from Frobase Road to the C-level Reservoirs

8.6.4 Replacements, Opportunity Projects, and Maintenance

The City has established on-going capital expenditures to maintain the existing distribution system level of service including.

- Water main replacements: Pipes were assumed to need replacement after 75 years. Total costs for the full time period were uniformly divided into annual costs for the respective timeframes. These costs represent a significant investment in the water system, and substantially more than the City's current annual water main replacement budget, however, continue investment in renewal and replacement of the water system is essential to ensuring reliable system operation and minimizing expensive emergency repairs associated with failing pipeline infrastructure.
- Opportunity projects: Upsizing or extension of water mains in concert with other utility or road work in the same area. Costs for these projects are not known but may be allocated in other capital projects slated for the future, or in pipe replacement.
- Annual maintenance: Annual maintenance for pipes, tanks, pump stations, valves, and other facilities is not considered in the CIP list. It is assumed these maintenance items are addressed in the operations budget.

8.7 Planning Studies

8.7.1 System-wide Planning

It is recommended that the City continue to update the WSMP every 10 years. An updated Plan is required by the State of Oregon for a 20-year planning period. However, with the rapid pace of growth in Tualatin and the broader metro area, it is prudent for the City to continue to regularly evaluate capital investment and prioritize needs for the water system in the WSMP.

8.8 Capital Improvement Program

Individual projects are listed and costed in Table 8-2. Table 8-1 summarizes these projects by type and investment year. The City's proposed CIP includes significant investment, particularly in supply and storage improvements. This new capacity will serve growth while also providing more resilient water facilities that benefit all customers. An evaluation of water rates and SDCs in support of the water system CIP will be completed as follow-on work to this WSMP.

Table 8-1 | CIP Cost Summary

Project Type	0-5 Years	6-10 Years	11-20 Years	20+ Years	Total
Residential Fire Flow		$318,000	$660,000		$978,000
Non-Residential Fire Flow	$-	$1,334,000	$3,538,000[1]	$3,538,000[1]	$8,410,000
System Looping	$-	$3,475,000	$-	$-	$3,475,000
Transmission	$7,066,000	$1,360,000	$5,011,000	$-	$13,437,000
Facilities	$10,650,000	$-	$-	$2,000,000	$12,650,000
Pipe Replacement	$-	$-	$10,000,000	$1,000,000/yr[2]	$10,000,000
Total	**$17,716,000**	**$6,487,000**	**$19,209,000**	**$5,538,000**	**$48,950,000**

Notes:

1. Non-residential fire flows listed in **Table 8-2** as 11-20 year split evenly between 11-20 and 20+ years in this table for cost distribution. Not all of these improvements may be required with onsite pumping.
2. 20+ year pipe replacement not included in total as it masks other CIP costs. Pipe replacement is a perpetual ongoing cost and should be planned for. An assumed $1,000,000/year was assumed to allow for systematic replacement of aging mains.

Table 8-2 | CIP Projects

CIP #	Project Type	Description	Diameter (in)	Length (lf)	Cost Estimate	Timing
303	Transmission	Upsize proposed residential near I5 for C Pump Station	18	600	$349,000	0-5
605	Facilities	Seismic Upgrades (Tanks)			$900,000	0-5
603	Facilities	Portable Pump Station	4,000 gpm		$1,750,000	0-5
302A	Transmission	C Level Transmission upsizing - C Pump Station to Frobase Rd	18	3,700	$2,397,000	0-5
604	Facilities	Emergency Supply Improvements			$3,000,000	0-5
301A	Transmission	B Level Transmission upsizing - Ibach to B Level Reservoirs	18	5,000	$4,320,000	0-5
601	Facilities	B Level Reservoir at Norwood Site	2.5 MG		$5,000,000	0-5
404	System Looping	90th Ave (A Level)	8	500	$126,000	6-10
220	Fire Flow	Residential - SW Dakota Dr	8	600	$148,000	6-10
221	Fire Flow	Residential - SW Iowa Dr	8	600	$170,000	6-10
401	System Looping	Myslony Rd (A Level)	18	500	$272,000	6-10
405	System Looping	Leveton (A Level)	12	800	$303,000	6-10
402	System Looping	Manhasset Dr (A Level)	12	900	$363,000	6-10
403	System Looping	Amu St Extension (A Level)	12	1,000	$417,000	6-10
406	System Looping	Iowa St (C Level)	12	1,100	$444,000	6-10
214	Fire Flow	Non-residential - SW Sagert St and 65th Ave	18	1,000	$586,000	6-10
202	Fire Flow	Non-residential - SW Bridgeport Rd	12, 18	1,300	$748,000	6-10
302B	Transmission	C Level Transmission upsizing - Frobase Rd to C Reservoirs, I-5 Crossing	18	2,100	$1,360,000	6-10
407	System Looping	Avery to 105th via Industrial Way (B Level)	12	3,600	$1,550,000	6-10
217	Fire Flow	Residential - SW Lummi St	8	400	$99,000	11-20
208	Fire Flow	Non-residential - SW 97th Ave	12	500	$187,000	11-20
205	Fire Flow	Non-residential - SW 89th Ave	12	500	$195,000	11-20
209	Fire Flow	Non-residential - SW Manhasset Dr	12	500	$204,000	11-20
207	Fire Flow	Non-residential - SW 95th Ave	12	500	$208,000	11-20
219	Fire Flow	Residential - SW 103rd Ct	8	800	$217,000	11-20
216	Fire Flow	Non-residential - SW 95th Ave	12	600	$244,000	11-20
222	Fire Flow	Non-residential - SW Herman Rd	12	700	$268,000	11-20
203	Fire Flow	Non-residential - Stonesthrow Apartments	8	1,100	$288,000	11-20
218	Fire Flow	Residential - SW Columbia Cir	8	1,200	$344,000	11-20
211	Fire Flow	Non-residential - SW 119th Ave	12	900	$362,000	11-20
206	Fire Flow	Non-residential -SW 90th Ct	12	900	$376,000	11-20
212	Fire Flow	Non-residential - SW 125th Ct	12	1,000	$396,000	11-20
210	Fire Flow	Non-residential - SW 124th Ave	12	1,000	$406,000	11-20
213	Fire Flow	Non-residential - SW 129th Ave	12	1,200	$514,000	11-20
204	Fire Flow	Non-residential - Nyberg Rivers Looping	12	1,200	$516,000	11-20
215	Fire Flow	Non-residential - SW Mohawk St	12	1,900	$802,000	11-20
201	Fire Flow	Non-residential - SW Hazel Fern Rd, McEwan Rd, and I-5 Crossing	18	3,300	$2,110,000	11-20
301B	Transmission	B Level Transmission upsizing - Ibach to Sagert	18	5,800	$5,011,000	11-20
602	Facilities	B Level Reservoir at ASR Site	1 MG		$2,000,000	20+
501	Future Service Area	Western B Level Extension	12, 18	32,800	Developer Driven and Funded	
502	Future Service Area	Planned Residential near I5	8, 12	11,600		
503	Future Service Area	C Level Extension	12	9,600		
504	Future Service Area	C to B Level PRV in Basalt Creek	Fire Flow			

Notes:
1. Assumed City to pay only oversizing costs. Total cost shown consistent with other pipe improvements.
2. Low priority fire flow improvements shown in 11-20 year time frame. Some of these improvements may be for locations with onsite pumping.

8.9 Funding Sources

A variety of sources may contribute to the funding of the City's CIP. In general, these sources can be summarized as: 1) governmental grant and loan programs; 2) publicly issued debt; and 3) cash resources and revenues. These sources are described below.

8.9.1 Government Loan and Grant Programs

8.9.1.1 Oregon State Safe Drinking Water Financing Program

Annual grants from the EPA and matching state resources support the Safe Drinking Water Fund. The program is managed jointly by the OHA DWS and Business Oregon's Infrastructure Finance Authority (IFA). The Safe Drinking Water Fund program provides low-cost financing for construction and/or improvements of public and private water systems. This is accomplished through two independent programs: the Safe Drinking Water Revolving Loan Fund (SDWRLF) for collection, treatment, distribution and related infrastructure, and the Drinking Water Protection Loan Fund (DWPLF) for sources of drinking water improvements prior to the water system intake.

The SDWRLF lends up to $6 million per project, with a possibility of subsidized interest rate and principal forgiveness for a Disadvantaged Community. The standard loan term is 20 years or the useful life of project assets, whichever is less, with interest rates at 80 percent of the current state/local bond rate. The maximum award for the DWPLF is $100,000 per project.

8.9.1.2 Special Public Works Fund

The Special Public Works Fund program provides funding for the infrastructure that supports job creation in Oregon. Loans and grants are made to eligible public entities for the purpose of studying, designing, and building public infrastructure that leads to job creation or retention.

Water systems are listed among the eligible infrastructure projects to receive funding. The Special Public Works Fund is comprehensive in terms of the types of project costs that can be financed. As well as actual construction, eligible project costs can include costs incurred in conducting feasibility and other preliminary studies and for the design and construction engineering.

The Fund is primarily a loan program. Grants can be awarded, up to the program limits, based on job creation or on a financial analysis of the applicant's capacity for carrying debt financing. The total loan amount per project cannot exceed $10 million. The IFA is able to offer discounted interest rates that typically reflect low market rates for very good quality creditors. In addition, the IFA absorbs the associated costs of debt issuance thereby saving applicants even more on the overall cost of borrowing. Loans are generally made for 20-year terms but can be stretched to 25 years under special circumstances.

8.9.1.3 Water/Wastewater Fund

The Water/Wastewater Fund was created by the Oregon State Legislature in 1993. It was initially capitalized with lottery funds appropriated each biennium and with the sale of state revenue bonds since 1999. The purpose of the program is to provide financing for the design and construction of public infrastructure needed to ensure compliance with the SDWA or the Clean Water Act.

Eligible activities include costs for constructing improvements for expansion of drinking water, wastewater, or stormwater systems. To be eligible a system must have received, or be likely to soon receive, a Notice of Non-Compliance by the appropriate regulatory agency, associated with the SDWA or the Clean Water Act. Projects also must meet other state or federal water quality statutes and standards. Funding criteria include projects that are necessary to ensure that municipal water and wastewater systems comply with the SDWA or the Clean Water Act.

In addition, other limitations apply, including:

- The project must be consistent with the acknowledged local comprehensive plan.
- The municipality will require the installation of meters on all new service connections to any distribution lines that may be included in the project.
- The funding recipient shall certify that a registered professional engineer will be responsible for the design and construction of the project.

The Water/Wastewater Fund provides both loans and grants, but it is primarily a loan program. The loan/grant amounts are determined by a financial analysis of the applicant's ability to afford a loan including the following criteria: debt capacity, repayment sources, and other factors.

The Water/Wastewater Fund financing program's guidelines, project administration, loan terms, and interest rates are similar to the Special Public Works Fund program. The maximum loan term is 25 years or the useful life of the infrastructure financed, whichever is less. The maximum loan amount is $10 million per project through a combination of direct and/or bond funded loans. Loans are generally repaid with utility revenues or voter-approved bond issuance. A limited tax general obligation pledge may also be required. Certain entities may seek project funding within this program through the sale of state revenue bonds, although this can be a significant undertaking.

8.9.1.4 Water Infrastructure Finance and Innovation Act

The Water Infrastructure Finance and Innovation Act of 2014 (WIFIA) established the WIFIA program, a federal credit program administered by EPA. The program can provide financing for a broad range of eligible water and wastewater projects or combinations of projects. Up to 49 percent of eligible project costs can be financed through WIFIA, which can be combined with other local funding sources such as revenue bonds.

The WIFIA program offers the potential for substantial savings to municipalities on borrowing costs through a combination of lower interest rates, deferred payments, flexible payment structuring, and longer loan term. Lower borrowing costs can reduce the level of rate increases needed to fund capital improvements.

The savings on borrowing costs begin with lower interest rates. The interest rate on WIFIA loans is fixed and is tied by statute to the 30-year Treasury rate as of closing, which is typically well below the market rate on revenue bond financing. Unlike with revenue bonds, funds from WIFIA loans are disbursed over time on a reimbursement basis as expenses are incurred. Interest accrues on WIFIA loan funds only as they are disbursed.

WIFIA loans are set up for 30-year repayment periods, with the loan term beginning after substantial completion of construction. Payments can be deferred throughout the construction period and for up to 5 years after substantial completion. The result is a potential loan term of up to 35 years after substantial completion. The WIFIA program also allows for flexible payment structuring throughout the loan term to help the borrower manage the impact of loan payments on rate increase requirements.

Projects are selected to apply for WIFIA financing through a competitive annual process administered by the EPA. Appropriate related federal provisions apply under the loans, such as National Environmental Policy Act (NEPA), Davis-Bacon, and American Iron and Steel.

8.9.2 Public Debt

8.9.2.1 General Obligation Bonds

General obligation bonds are backed by the City’s full faith and credit, as the City must pledge to assess property taxes sufficient to pay the annual debt service. This tax is beyond the State’s constitutional limit of \$10 per \$1,000 of assessed value. A “double-barrel” bond uses a mix of property taxes and user fees and is a mix of the general obligation bond and a revenue bond.

Oregon Revised Statutes limit the maximum bond term to 40 years. The realistic term for which general obligation bonds should be issued is 15 to 20 years, or more. Under the present economic climate, lower interest rates will be associated with the shorter terms.

Financing of water system improvements by general obligation bonds is usually accomplished by the following procedure.

1. Determination of the capital costs required for the improvement.
2. An election by the voters to authorize the sale of bonds.
3. The bonds are offered for sale.
4. The proceeds from the bond sale are used to pay the capital costs associated with the project(s).

General obligation bonds are similar to revenue bonds in matters of simplicity and cost of issuance. Since the bonds are secured by the power to tax, these bonds usually command a lower interest rate than other types of bonds. General obligation bonds lend themselves readily to public sale at a reasonable interest rate because of their high degree of security, tax-exempt status, and public acceptance.

General obligation bonds, which impact the community's tax burden through the full faith and credit pledge, are normally associated with the financing of facilities that benefit a large portion of the community and must be approved by a majority vote.

8.9.2.2 Revenue Bonds

For revenue bonds, the City pledges the net operating revenue of the utility to repay the bonds. The primary source of the net revenue is user fees, and the primary security is the City's pledge to charge sufficient user fees to pay all operating costs and debt service.

The general shift away from ad valorem property taxes and toward a greater reliance on user fees makes revenue bonds a frequently used option for payment of long-term debt. Many communities prefer revenue bonding because it ensures that no tax will be levied. In addition, debt obligation will be limited to system users since repayment is derived from user fees. An advantage with revenue bonds is that they reserve the tax-based revenues for other services and are not typically restricted by debt limitation statues. Furthermore, the issuing authority can set user rates to fund the debt repayment without needing a public vote.

Municipalities may elect to issue revenue bonds for revenue producing facilities without a vote of the electorate (ORS 288.805-288.945). Certain notice and posting requirements must be met and a 60-day waiting period is mandatory. A petition signed by five percent of the municipality's registered voters may cause the issue to be referred to an election.

8.9.2.3 Improvement Bonds

Improvement (Bancroft) bonds can be issued under an Oregon law called the Bancroft Act. These bonds are an intermediate form of financing that is less than full-fledged general obligation or revenue bonds, but is quite useful, especially for smaller issues or for limited purposes.

An improvement bond is payable only from the receipts of special benefit assessments, not from general tax revenues. Such bonds are issued only where certain properties are recipients of special benefits not occurring to other properties. For a specific improvement, all property within the improvement area is assessed on an equal basis, regardless of whether it is developed or undeveloped. The assessment is designed to apportion the cost of improvements among the benefited property owners approximately in proportion to the afforded direct or indirect benefits. This assessment becomes a direct lien against the property, and owners have the option of either paying the assessment in cash or applying for improvement bonds. If the improvement bond option is taken, the municipality sells Bancroft improvement bonds to finance the construction, and the assessment is paid over 20 years in 40 semi-annual installments with interest. Cities and special districts are limited to improvement bonds not exceeding three percent of true cash value.

8.9.3 Water Fund Cash Resources and Revenues

The City financial resources available for capital funding include rates, cash reserves, and SDCs. Rates are the backbone of a municipal water system's revenue and are typically established to provide funds to capitalize improvement projects or to repay debt-financed improvement projects.

An SDC is a fee collected on new development. The SDC is used to finance the necessary capital improvements required by the development. The charge is intended to recover an equitable share of the costs of existing and planned facilities that provide capacity to serve new growth.

Oregon Revised Statutes 223.297 – 223.314 establish guidelines on the establishment of the SDC methodology and administration. By statute, an SDC amount can be structured to include one or both of the following two components.

- *Reimbursement Fee* – Intended to recover an equitable share of the cost of facilities already constructed or under construction.
- *Improvement Fee* – Intended to recover a fair share of future planned capital improvements needed to increase the capacity of the system.

The reimbursement fee methodology must consider the cost of existing facilities and the value of unused capacity in those facilities. The calculation must also ensure that future system users contribute no more than an equitable share of existing facilities costs. Reimbursement fee proceeds may be spent on any capital improvements or debt service repayment related to the system for which the SDC is applied. For example, water reimbursement SDCs must be spent on water improvements or water debt service.

The improvement fee methodology must include only the cost of projected capital improvements needed to increase system capacity. In other words, the cost of planned projects that correct existing deficiencies or do not otherwise increase capacity may not be included in the improvement fee calculation. Improvement fee proceeds may be spent only on capital improvements (or related debt service), or portions thereof, that increase the capacity of the system for which they were applied.

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Section 9

Section 9

Emergency Water Plan

9.1 Introduction

This section documents development and results of the Emergency Water Plan. The Emergency Water Plan is intended to address water system recovery after a catastrophic event such as a CSZ seismic event. In this scenario, it is assumed there is significant damage to water system infrastructure and the distribution system is not functioning. Water will initially be distributed at emergency water sites located throughout the community, with community members traveling to and those sites on foot. After a catastrophic event, City staff will be focused on recovering function of the water system, with emergency distribution activities largely being accomplished by emergency response agencies and the Community Emergency Response Team (CERT) and local volunteers. The Emergency Water Plan was developed with significant input from those agencies and groups.

The Emergency Water Plan has two components: 1) a Water System Recovery Plan describing the approach to incrementally recovering water system function following a catastrophic event and 2) Improvements and Materials needed to implement the plan.

9.2 Planning Process

The Emergency Water Plan was developed based on input from Emergency Responders and CERT. Prior to starting the project, the plan was envisioned as identifying specific sites through the City where emergency water would be distributed after a catastrophic event, with City staff delivering water to those sites in tanks or trucks and CERT and other volunteers directly distributing water from those sites to members of the community. Through the planning process and input from the emergency responders and CERT, it emerged that the plan should be more flexible and focus on working with existing infrastructure and supplies.

The plan was developed as follows.

- Emergency Responders Workshop. This workshop engaged local agencies involved in emergency response, educating them about the local water system and receiving input on water distribution sites characteristics and locations.
- Draft Emergency Water Plan. Based on the outcome of the workshop, the project team developed a draft plant to incrementally recover water system function.
- CERT Workshop. The project team shared the water system recovery plan with CERT, both to share information on the planned approach and to receive feedback.

- Revised Emergency Water Plan. A revised version of the Emergency Water Plan was presented to City Council.

Additional information on the two workshops is provided herein.

9.2.1 Emergency Responders Workshop

Goals of the Emergency Responders Workshop were as follows.

- Introduce attendees to Tualatin's need for an Emergency Water Plan.
- Solicit feedback on ideal characteristics of an emergency water distribution site.
- Identify potential emergency water distribution sites for further consideration.

Attendees included representatives from: City of Tualatin Public Works and Police Departments, American Red Cross, Tualatin Valley Fire & Rescue, Washington County Emergency Management, Legacy Meridian Park Medical Center, Clackamas County Disaster Management, CERT, and the consultant team.

The workshop included initial live polling of attendees, a brainstorming exercise to identify ideal water distribution site characteristics, and an interactive exercise to identify potential water distribution site locations.

9.2.1.1 Level of Emergency Water Service

Attendees were polled during the meeting on their role in emergency response and expected level of emergency water service that can be provided to the community after a catastrophic event. Results of the polling included:

- 70 percent of attendees reported having a role in providing drinking water after an emergency.
- Attendees expressed a desire to move to a high level of preparedness (6 on a scale of 7) from the current low level of preparedness (3 on a scale of 7).
- All attendees have emergency water stored at home, with half meeting the recommended 14 gallons per person.
- Attendees estimated the maximum distance residents can be expected to walk to emergency water distribution sites as between a quarter and half-mile.
- Attendees on average thought that six to ten emergency water sites could be managed, though many thought fewer sites are more realistic.

Attendees recognize the number of sites that can be managed will drive the distance community members need to walk to get water, with the required distance likely exceeding the quarter to half-mile identified as preferable.

9.2.1.2 Ideal Characteristics of a Water Distribution Site

Attendees went through a brainstorming exercise to identify characteristics of an ideal emergency water distribution site. The group developed the following list.

- Accessible/traffic flow
- On a major street
- Appropriate distribution
- Co-located with other community points of distribution:
    - Near shelters
    - Near demand – SW99
    - Legal (get agreements in place)
- Securable – parking lots are hard
    - Familiar
- Open space for helicopter access
- Away from hazard exposure - flood earthquake, landslides, hazardous materials (check DOGAMI map), no overhead things (power)
- Schools, parks, churches, some reservoirs, big box stores
- Geographic equity:
    - Residential/across the city
    - Economically disadvantaged
    - Elderly

Attendees acknowledged that when National Guard or other emergency responders come in from outside the region, they will select their own sites for distribution of supplies that won't be affected by local plans or points of distribution. So, any designated emergency sites may be temporary. Those external emergency response agencies typically bring in bottled water that is distributed along with food and other supplies.

Attendees also noted the need for flexibility – selecting high priority or preferred sites is helpful, but don't convey to the public that all of those specific sites will be active or exactly as assumed.

9.2.1.3 Water Distribution Sites Opportunities

The group was divided into three subgroups to identify sets of emergency sites. A summary of the individual sites and notes provided by attendees on their rationale is provided in **Table 9-1**. Sites are organized by area. The sites selected by the groups were very similar – most of the most beneficial sites were identified by all three groups.

Table 9-1 | Emergency Water Dsitribution Sites Identified by Emergency Responders

Site Description		Rationale
Northeast	Angel Haven & Riverpark	▪ Site could accommodate large group of people
	Lam Research – Parking Lot	▪ Large parking area where many employees in commercial area may congregate
	Hazelbrook MS	▪ Close to residential population. Good staging area.
	Jurgens Park	▪ Large open area for staging and close to residential area
	Parking Lot – Former Haggen Grocery	▪ Centrally located
North east	Providence Bridgeport Immediate Care	▪ Location north of Tualatin River
	Parking Lot – 24 Hour Fitness	▪ Location north of Tualatin River
Southeast	Bridgeport Elementary	▪ Site could accommodate large group of people
	Alfalati Park	▪ Lots of available space. Close to denser, low-income housing
	Parking Lot – Legacy Meridian Hospital	▪ Likely site for general emergency response coordination
Southwest	Living Savior Lutheran Church	▪ Good access. Parking lot. Close to residential populations.
	Tualatin HS or Edward Byrom Elementary	▪ Proximity to residential population. May be able to use existing irrigation well.
	ASR Well Site	▪ Proximity to residential population. ASR well may be a source of water.
	A1 Reservoir	▪ Likely stored water available.
	Ibach Park	▪ Close to large population center
	Tualatin Elementary	▪ Central location to large population center

9.2.1.4 Outcomes

A key outcome from the workshop is that the City of Tualatin Public Works Department cannot select and drive specific water distribution sites in isolation of other emergency response efforts. The Emergency Water Plan, with its information on where emergency water can most easily be delivered within the City, should instead feed into ongoing efforts in Washington County to identify community points of distribution.

Another second key outcome of the Emergency Responders Workshop was the recognition that the majority of the emergency distribution sites selected by the group lay along a major backbone pipe through the City's water system. The focus then shifted from identifying specific water distribution system sites to developing a plan to recover water system function along that backbone, with the goal of restoring supply of continuously flowing, piped water to multiple sites along that backbone.

CERT Workshop

The project team presented the proposed Emergency Water Plan to CERT, including the core of the water system recovery plan described in **Section 9.3**. In the presentation, the team shared information on how Tualatin's water system works and what can be expected from the water system after a catastrophic event.

Goals of the meeting were for CERT to:

- Gain a better understanding of the water system
- Know what to expect from the water system after a catastrophic emergency
- Understand CERT roles in distributing water during an emergency

The City's goal for the meeting was to receive feedback from CERT members on its plan to recover water system function, including the water distribution site characteristics and support needed by CERT to fill its role. In addition to providing feedback during the meeting, CERT members provided written feedback on forms distributed at the event.

Overall, CERT members appreciated the planning effort and general approach, in the words of one CERT member "It is flexible and seems to focus on what is doable as the main goal." Other CERT feedback included:

- Emergency water should be available at locations familiar to City residents (e.g., schools)
- Distribution locations should be provided throughout the City (including east of the I-5 freeway)
- Any portable tanks should be designed to work with pick-up trucks, allowing community members to transport water using their own vehicles
- CERT members would like training and clear written instructions on emergency water procedures (how to operate equipment and disinfect water, how much water to give per person)

CERT feedback was incorporated into the water system recovery plan described in **Section 9.3**.

9.3 Water System Recovery Plan

This section summarizes the first two phases of a Water System Recovery Plan, identifying the general approach, assumptions, and required improvements and supplies. The Water System Recovery Plan includes the four phases shown in **Table 9-2**. This plan focuses on the first two stages – additional detail for those two phases is provided in this chapter.

Table 9-2 | Water System Recovery Plan Phases

Stage/Duration	Goals
Stage 1 First few weeks	▪ Hold on to water stored in reservoirs ▪ Allow volunteers to access the stored water and move it around the City
Stage 2 First couple month	▪ Create a sustained, emergency level, water distribution system ▪ Get running water to a series of emergency water distribution sites along the City's pipe backbone ▪ Connect the City's well to that backbone system
Stage 3 One to four months	▪ Connect our emergency backbone to the Portland supply or other available working supply
Stage 4 Several months to years	▪ Recover full normal function of the water distribution system ▪ Restore water service to individual homes and businesses throughout the City

9.3.1 Stage 1

Stage 1 captures the first few days and weeks after a catastrophic event. It is assumed that the water distribution system is non-operational, with multiple pipe breakages throughout the distribution system. The general approach to this stage is:

- Seismic valves on the reservoirs capture the stored water and prevent it from leaking from the distribution system.
- Water system operators initially focus on repairing any damage to the tanks to prevent losses of stored water. If some tanks are badly damaged, operators will need to assess whether all reservoirs can be maintained.
- Emergency water is provided to the community via trucked water. Based on CERT feedback, water will be transported using portable tanks designed to fit the beds of standard-sized pick-up trucks. It is assumed water will be transported by CERT or other community members in their own vehicles, using tanks provided by the City.
- CERT and other community members will distribute water to community members from the portable tanks. It is assumed a portion of immediate water needs will be filled through community members using their own stored water.

9.3.1.1 Reservoir Storage Capacity

The City has six water storage reservoirs with a total water storage volume of 14.0 MG. Though under normal conditions this storage would meet demands for only a couple days, they can provide water at a subsistence level (two gallons per person per day). Calculations are shown in **Table 9-3** and show subsistence-level water needs can be met for the City's population for approximately 120 days, assuming reservoirs retain half their volume.

Table 9-3 | Ability of Stored Water to Meet Subsistence-Level Water Needs

Item/Description	Value
Total Stored Water Volume Based on 50% of reservoir total volume	7.0 MG
Daily Subsistence Water Need Based on two gallons per person and City population of 28,000	56,000 GAL
Days of Stored Water Stored water volume divided by daily subsistence water need	120 days

9.3.1.2 Required Improvements and Supplies

Improvements and supplies for this stage are listed in **Section 9.4** and include:

- Improvement: Seismic valves on all tanks, prioritizing Reservoirs B-1 and B-2. Facilities to allow easy filling of portable tanks at each reservoir.
- Supplies: four portable water tanks designed to be transported by standard size pick-up trucks.
- Supplies: Bottled water at the Operations Center to sustain City staff and community members supporting emergency water distribution.

Community members will also require individual containers to transport water home from the emergency distribution sites. It is assumed sufficient containers will be available through individual preparedness – the City does not plan to purchase or provide individual containers.

9.3.2 Stage 2

Stage 2 includes the first couple of months after the event. The focus during this stage is on recovering function of a backbone pipeline that can be used to provide a continuous supply to emergency water distribution sites.

The general approach to this stage is:

- Function of the backbone pipeline is recovered incrementally, working from valve to valve, starting from Reservoirs B-1 and B-2.
- At each step, the set of valves immediately downstream will first be closed. The upstream valve will then be partially opened to allow water to flow into the segment of pipe to identify leaks. The upstream valve will then be reclosed while major leaks are repaired or bypassed. Once the segment is recovered, the upstream valve will be opened and work will move to the next segment.
- Hydrants along recovered portion of the backbone pipe will be available for emergency water distribution. Distribution will occur via manifolds designed to connect to fire

hydrants. Public Works staff will connect the manifolds, with community volunteers responsible for monitoring and distributing water from the manifolds to community members.

- The backbone will be recovered working north from Reservoir B-1 and B-2 along SW Norwood Road and SW Boones Ferry Road to SW Avery Street, then working west to connect the A-1 Reservoir and east towards Legacy Meridian Park Medical Center. Finally, the backbone will be extended to connect to the City's ASR well.

9.3.2.1 ASR Capacity

The City has a single ASR well with a conservative sustainable flow rate of approximately 300 gpm. Though the ASR well can itself serve as a source of emergency water, it cannot be used to directly feed a manifold as the flow rate is too for the system to operate efficiently. The Water System Recovery Plan instead assumes the backbone pipe will connect to the ASR well, with Reservoirs B-1 and B-2 providing storage and allowing the well to be operated at full capacity.

Though under normal conditions the ASR would meet only a small portion of average demands, it can provide water at a subsistence level (two gallons per person per day) to the City. Calculations are shown in **Table 9-4** and show subsistence-level water needs can be met for 100 percent of the City's population.

Table 9-4 | Ability of ASR Well to Meet Subsistence-Level Water Needs

Item/Description	Value
ASR Daily Flow Rate Based on capacity of 300 gpm and 10-hour per day operation	252,000 gallons per day
Portion of City Population Based on total population of ****	100 %

9.3.2.2 Required Improvements and Supplies

Supplies needed for this stage consist of materials for pipeline repair and bypass. Specific supplies are identified in **Section 9.4**. One goal of the Emergency Water Plan was to minimize the need for supplies that will not be used and maintained as part of normal water system operation. The supplies shown in **Section 9.4** focus on increasing inventory of currently used supplies, rather than focusing on specialized materials and approaches.

9.4 Improvements and Supplies

Improvements and supplies required to implement the Water System Recovery Plan are summarized in **Table 9-5**. Improvements were incorporated as individual items within the capital improvement budget in **Section 8**. Required supplies are beyond what can be accommodated within the operations and maintenance budget and are included as a single line item within the Capital Improvements Plan.

Table 9-5 | Water System Recovery Plan Improvements and Supplies

Item	Estimated Cost
Emergency Water Supplies	
Portable Tank Fill Station at Reservoirs (A-1, A-2, B-1/B-2)	$30,000
Portable water tanks (4)	$10,000
Bottled water supply for operations center	$2,000
Water distribution manifolds (10)	$25,000
Temporary Pipe and Fittings	$50,000
Miscellaneous Items	$8,000
Total Investment	**$125,000**

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Appendix

APPENDIX A
PORTLAND WATER BUREAU WHOLESALE CONTRACT MEMORANDUM OF UNDERSTANDING

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MEMORANDUM OF UNDERSTANDING
REGARDING THE REGIONAL WATER SALES AGREEMENT

This Memorandum of Understanding ("MOU") is between the City of Portland ("Portland") and its nineteen current wholesale customers ("Wholesale Customers") who purchase water at a wholesale water rate from Portland to sell to their own retail water customers through the 2006 Wholesale Water Purchase Agreement ("current agreement") set to sunset for most Wholesale Customers in 2026. The Wholesale Customers and the expiration dates of their individual current agreements are listed in Exhibit A to this MOU.

This MOU is intended to memorialize the working relationship that exists between Portland and the Wholesale Customers (collectively, "Parties") and to outline steps the Parties propose to develop and ultimately agree to a new Regional Water Sales Agreement ("New Agreement") to be effective on or before July 1, 2026. The relationship between the Parties is built on mutual trust and open, honest, and transparent communication. This affiliation is critical to ensure that the New Agreement can be created that mutually works well for the Parties.

The Parties recognize the importance of developing and strengthening a regional water system that provides water to approximately one million people. This robust system can move water between basins through a planned regional transmission network to address seismic resiliency, wildfire suppression incidents, and other events. The Parties recognize that a reliable water supply system is critical to protect the health and safety of all customers and maintain the economic stability and growth of the greater metropolitan area.

The Parties agree on the importance of creating a fair and equitable New Agreement that shares the reasonable costs associated with building, operating, and maintaining a regional water supply system.

The Parties agree that following items are in their common interest:

1. The current agreement no longer meets many of the needs of the Parties. The current agreement was created to address a set of conditions, many of which do not exist today. Since 2006, Portland and the Wholesale Customers have worked hard to develop regional collaboration based on mutual trust and an understanding of shared goals.

2. With a few exceptions, the current agreement renews (or expires) in 2026 (see Exhibit A). On or before June 30, 2021, most of the Wholesale Customers are required to notify Portland, or vice versa, if they intend to exit the current agreement in 2026.

3. For the past year, the Parties have been developing a framework for a new wholesale water sales agreement that will replace the current agreement and provide terms that are mutually acceptable and agreed upon by the Parties.

4. To that end, the Wholesale Customers hired FCS Group ("FCS"), a financial consulting firm, to work with the Parties to identify elements that they would like to include in the New Agreement. The FCS report (attached as Exhibit B) identified common goals and principles the Parties want to include in the New Agreement.

5. To assure that New Agreement will be in place on or before July 1, 2026, Portland will provide notice to Wholesale Customers on or before June 30, 2021, that Portland will not renew the current agreement.

6. The Parties intend to work together collaboratively to develop the New Agreement with a final draft completed by June 30, 2022.

7. With this MOU, Portland is stating its desire to continue selling water to all current Wholesale Customers who intend to purchase water from Portland. The Parties intend to jointly develop the New Agreement that will govern the terms of sale of that water to the Wholesale Customers beyond the 2026 expiration date of the current agreement.

8. The New Agreement will be based on the principles and goals jointly developed by the Parties and documented in the FCS report.

9. Nothing in this MOU modifies the current agreement between Portland and the Wholesale Customers, which for most Wholesale Customers remains in full force and effect until July 1, 2026.

IN WITNESS WHEREOF, the Parties have executed this MOU to be effective as of the date last executed. The parties attest that the signatories to this MOU have the authority to enter into this agreement on behalf of their respective agencies.

City of Portland

Signature: Gabriel Solmer

Print Name: Gabriel Solmer

Title: Administrator, Portland Water Bureau

Date: 2/10/2021

Agency: ______________________

Signature: ______________________

Print Name: ______________________

Title: ______________________

Date: ______________________

APPENDIX B
CITY OF TUALATIN WATER SUPPLY STRATEGY, THE FORMATION LAB, 2021

THE FORMATION LAB
new thinking · real change

City of Tualatin

City of Tualatin Water Supply Strategy

Water Supply Strategy

(Rev. 7/9/21)

Introduction

The City of Tualatin (Tualatin) is developing a Water Supply Strategy to ensure a safe and reliable supply of drinking water for their community. The City currently purchases wholesale water from the City of Portland and plans to continue use of the Portland supply into the future. Portland's water source is the Bull Run watershed, supplemented with groundwater from the Columbia South Shore Wellfield. To reach Tualatin, Portland water travels over 50 miles through three large diameter pipes between the watershed and Powell Butte in SE Portland, and then through the Washington County Supply Line. After 2026, Tualatin Valley Water District (TVWD)—a major user of the Washington County Supply Line—will no longer use Portland as its main supply. This may leave the City of Tualatin with a greater share of the pipeline's maintenance and repair costs. The final 6 miles of Tualatin's supply system, the Tualatin Supply Main, is owned solely by Tualatin. It is over 40 years old and is Tualatin's sole supply connection. If the Tualatin Supply Main pipeline were to break, Tualatin would have very limited supply available through a combination of the City's single Aquifer Storage and Recovery (ASR) well and a number of small connections with neighboring water systems. Many of those neighboring systems use water sourced from the Willamette River—use of Willamette River water is prohibited under a City of Tualatin charter amendment unless allowed under a governor-declared state of emergency.

In response to these vulnerabilities, Tualatin committed to developing a water supply strategy. The water supply strategy focuses on understanding the system's current performance during different types of emergencies then identifying opportunities to increase Tualatin's water supply reliability under emergency conditions. The intent of the strategy is not to initiate a change in Tualatin's supply but to understand current and future opportunities to maintain Tualatin's supply if the current system is interrupted.

As part of this study, neighboring water agencies were also asked about their capacity to potentially provide long-term supply in the future. The intent was not to initiate a change in Tualatin's water supply, but instead to understand water supply availability in the region if Portland's water were to become unavailable or unaffordable. Though short-term supplies could be provided by several of the water agencies listed above, there is no agency with excess supply sufficient to meet the long-term needs of Tualatin. ***Portland remains the most reliable source of long-term supply for the City of Tualatin***.

The document is organized into the following sections:

- Community Conversation and Values
- Existing Water System and Supply
- Existing Backup Supplies and Interties
- Long-term Supply Availability
- Current System Performance in an Emergency

- Opportunities to Increase Reliability
- Water Supply Strategy

Community Conversation and Values

A significant part of the Water Supply Strategy is to engage in a community conversation about water—educating the public on vulnerabilities of Tualatin's existing water supply and receiving feedback on community values. The City reached out the community in two ways.

First, stakeholder interviews were conducted with City Council and community leaders. The input from stakeholders was used to develop an initial set of community values relevant to the water system. That process identified seven community values.

Next, community members were asked to rank community values to identify the most important values to consider in developing a reliable supply. Efforts to gain input on values included tabling at community events, including events focused on Tualatin's Latino/ Hispanic community; results from the online survey; and presentations to community and City advisory groups. Community input was gathered from a total of 267 community members through these efforts. In addition to providing input on values, community members were asked about emergency preparedness and awareness.

Key learnings from community engagement are summarized here. More information on the outreach efforts and results are provided in *Attachment A – Community Conversation Summary*.

Water quality and reliable delivery—now and into the future—are most important to Tualatin customers. Ordered from most to least important, the community values are:

- Provides safe, high-quality water
- Provides enough water for future needs
- Prepares the community for an earthquake or natural disaster
- Continues conservation as an important strategy
- Allows our community to be a good steward of our natural and water resources
- Deliver the best value to customers
- Prepares the community for global climate change

All the identified community values resonated with the community and were seen as important. Cost is important, but not as important as having high-quality reliable water—'best value' ranked sixth out of the seven values. The top values are consistent with stakeholder input and are reasonably consistent among the different groups polled. Overall, these community values show a willingness to invest in safe, reliable water.

Customers take the reliability of their water for granted—when they learn about vulnerabilities, they support City action. Customers are generally aware of and have positive response to Portland's Bull Run as Tualatin's primary supply. But almost across the board, water is taken for granted and there is little to no awareness of the vulnerabilities of Tualatin's supply. Stakeholders note it is important to educate the public about the existing system and its limitations. Explaining the issue—the 'why'—to the general public is important to gain the public's attention. Once they become aware, they are concerned and motivated to increase the reliability of the system. They want solutions to focus on long-term needs, not short-term fixes.

The Willamette River carries a negative perception with some, but the landscape shifts when considering emergency use. Highly knowledgeable stakeholders consider the Willamette a good source of supply and see use by others in the region as evidence of its quality. Others in the community have a sense of the Willamette as dirty or contaminated—not as good as the Portland Bull Run supply or other regional options. The number of people with negative perceptions of the Willamette is relatively small—fewer than 10% of survey respondents noted a negative perception of the Willamette when prompted for input on water sources. However, those who have negative perceptions of the Willamette River often feel strongly. Participants acknowledge the Willamette River is more acceptable as an emergency option, as opposed to replacing Portland as the main supply.

Existing Water Supply and System

Tualatin's existing water supply and distribution system and current and projected demands are detailed in the 2021 Water Master Plan. The summary below captures information critical to understanding and evaluating backup supply options.

Water Supply System

Tualatin's sole source of supply is wholesale water purchased from Portland Water Bureau. That water is delivered by gravity from Portland's Powell Butte Reservoir on the east side of Portland via the Washington County Supply Line—a large diameter pipeline with a length of 22.2 miles and diameter ranging from 36 to 66 inches. Closer to Tualatin, the Metzger-Tualatin Supply Line is co-owned with TVWD and extends 2.5 miles from SW Beaverton Hillsdale Highway at Oleson Road, to SW 80th Avenue and Florence Lane. The final section of pipeline is the Tualatin Supply Main. It is owned solely by Tualatin and includes 5.9 miles of 36-inch diameter pipe. A schematic of this system is shown in Figure 1.

Tualatin has a single Aquifer Storage and Recovery (ASR) well used to supplement supply during peak demands. During the winter when demands are low, Portland water is injected into the well and stored underground. That water is then pumped out during the hottest parts of the summer to offset Tualatin's peak demands. The pumping capacity of the well is around 0.5 million gallon per day (MGD)— less than 10% of Tualatin's peak summer demand.

Water Distribution System

A map of Tualatin's water system is presented in Figure 2. Tualatin's water system has three major water pressure zones—in order from lowest to highest elevation, Zone A (295 feet), Zone B (399 feet), and Zone C (506 feet). There is an additional, very small pressure zone that serves commercial customers within Bridgeport Village (BV, 360 feet). This zone is isolated from the rest of the system and has its own backup supply connection from the City of Tigard—it is not discussed further within the Water Supply Strategy.

Each zone is described by its water pressure, measured as a hydraulic grade line (HGL) or equivalent water elevation. Zones with higher HGLs are required in higher elevation areas (such as in the southern area of Tualatin), and zones with lower HGLs are needed in lower elevation areas (in the northern area of Tualatin). If the HGL were the same everywhere in a system, pressures in low lying areas would be too high and do damage to the water system and household plumbing. Conversely,

Figure 1. Tualatin's Water Supply System

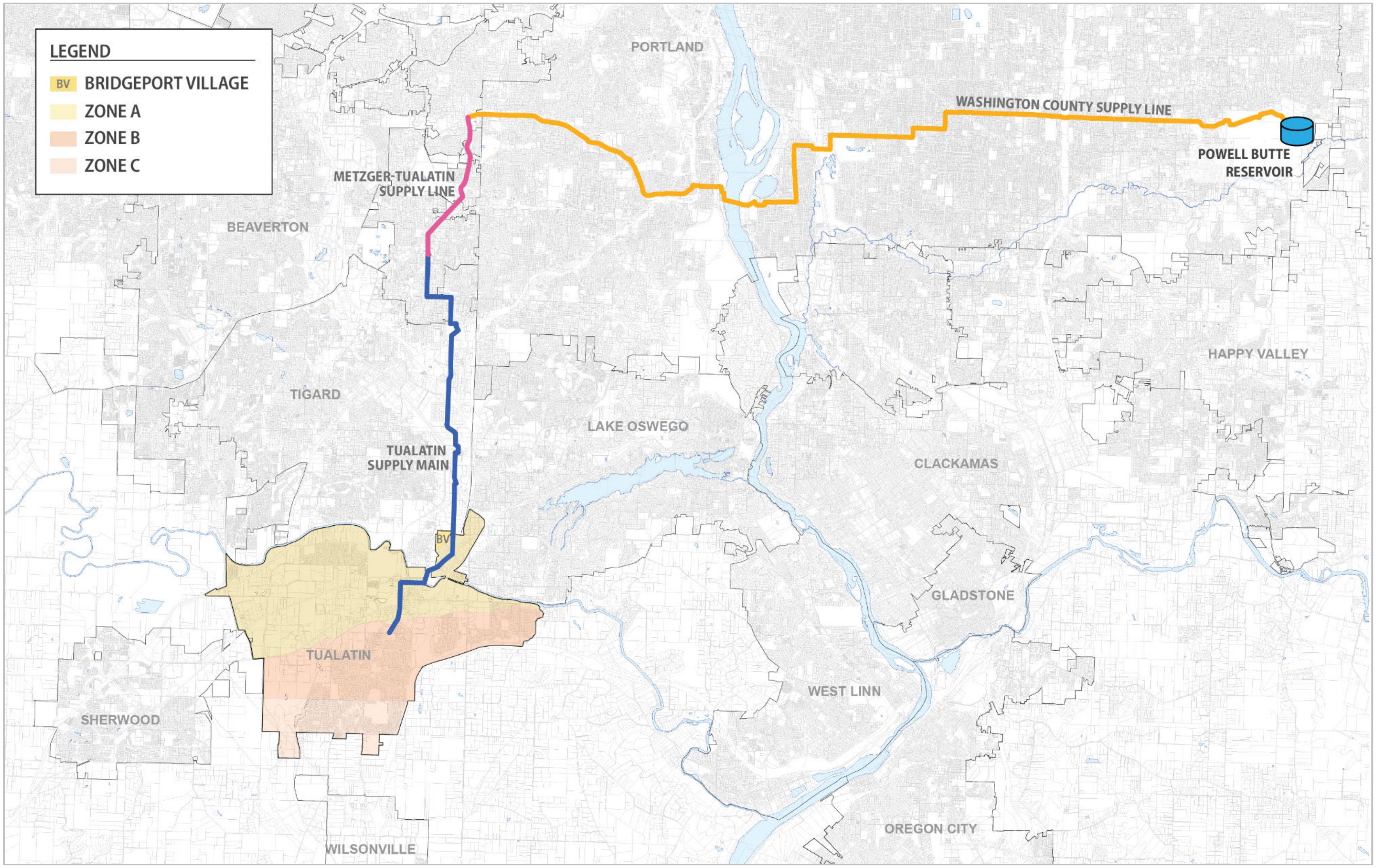
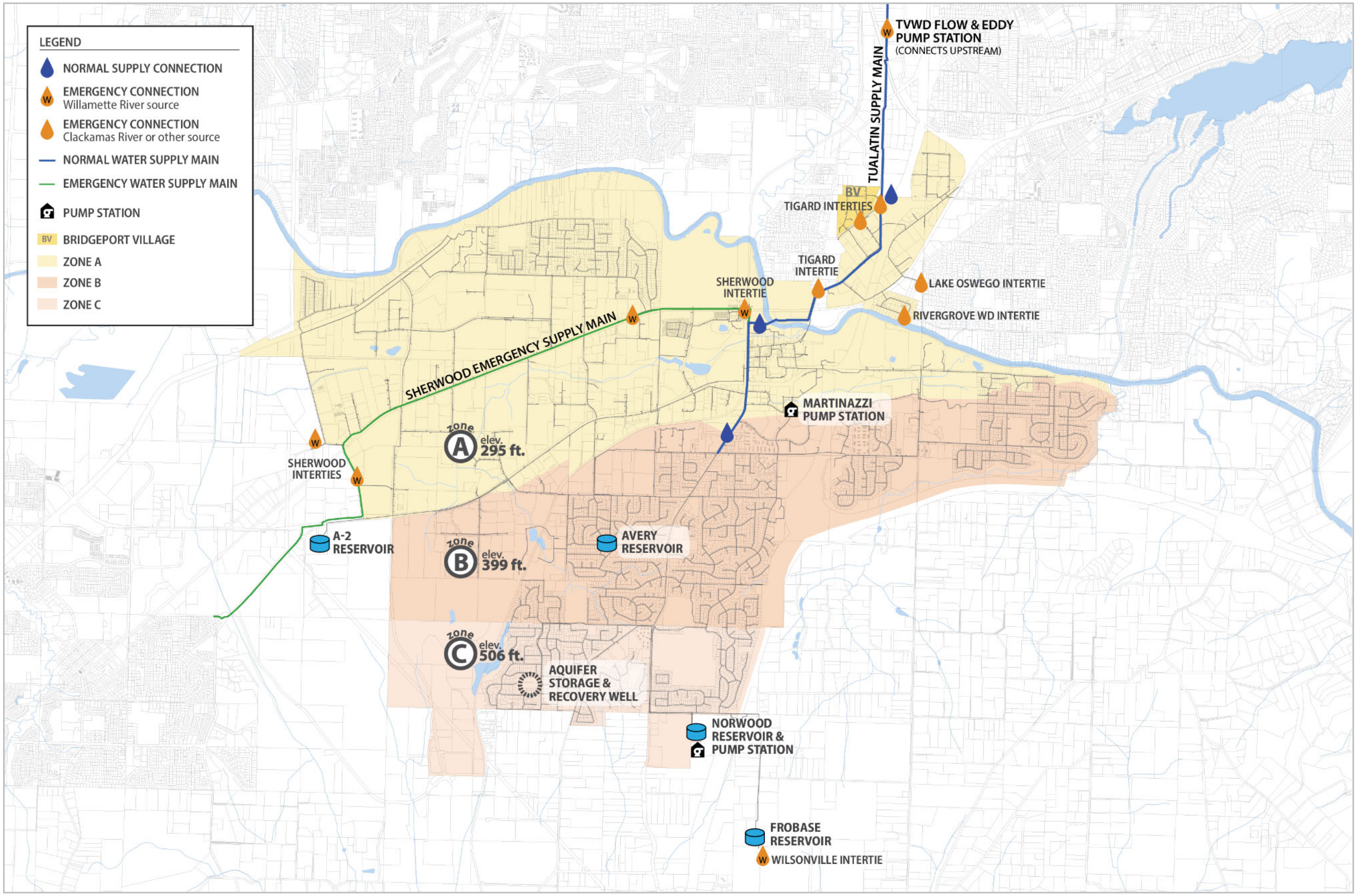


Figure 2. Tualatin's Water System



up on a hill, the pressure would be too low and the City wouldn't be able to fight fires or deliver reasonable water pressure to people's homes and businesses.

In general, water can be moved from areas with a higher HGL to areas with a lower HGL, in the same way that a ball would roll down a hill from a higher elevation point to a lower one. When water is moved to a lower pressure zone, pressure reducing valves are used to reduce the water pressure down to that of the receiving service level. Pumping is required to move water up to a higher service level.

Tualatin's two main water service zones—Zones A and B—are served directly by the Tualatin Supply Main, which extends into Tualatin's system. Water can reach all areas of the system from Zone B; water flows to Zone A via pressure reducing stations and is pumped to Zone C by the C-Level Pump Station. Within the existing system, there is very limited ability to pump water from Zone A to Zone B. The Martinazzi Pump Station pumps from Zone A to Zone B, but has not been in normal operation for over 20 years. Annual tests have verified the pump station is still operating, but it has limited reliability.

Water systems are designed with larger water transmission pipelines (in this case, the Tualatin Supply Main) that connect to increasingly smaller distribution pipes as the water moves through the distribution system to its outer reaches. To provide reliable supply-level water service, a backup supply needs to be able to connect to transmission pipelines, as the distribution pipes are too small to convey a significant amount of water.

Water Demands

Tualatin's water demands are summarized in Table 1. Tualatin has enough water supply capacity to meet current and estimated future demands. On a peak day, Tualatin's demands are around 8.1 MGD, expected to increase to around 10.6 MGD when Tualatin is built out. On an average day, demands are around half of peak demands. In the winter, when water is not being used for outdoor watering, the City uses around 3.2 MGD. That includes indoor uses like drinking, bathing, and flushing the toilet, as well as industrial and commercial uses. A backup supply should, at a minimum, be able to meet winter demands but would preferably be able to maintain normal water service at an average day or greater level of service.

Table 1. Current and Project Demands

Type of Demand	Actual Demand in 2017	Estimated Demand at Buildout
Winter Demand Winter demands are used to estimate indoor water use—the water used for drinking, showering, washing, cooking, and flushing toilets.	3.2 MGD	4.1 MGD
Average Day Demand (ADD) The average amount of water the community uses in a day, averaged over an entire year. It includes indoor use and a limited amount of outdoor, irrigation use.	4.2 MGD	5.5 MGD

Type of Demand	Actual Demand in 2017	Estimated Demand at Buildout
Maximum Day Demand (MDD) The maximum amount of water the community uses in a single day over the year, typically after a string of very hot summer days when there is very high water use for irrigation.	8.1 MGD	10.6 MGD

[*] Based on 2017 and buildout demands from the Water System Master Plan, winter demands are around 75% of average day demands.

Existing Backup Supplies and Interties

Tualatin's existing connections to neighboring utilities can be classified as either backup supplies or local interties. To be considered a backup supply, a connection must have the following characteristics:

- Connection between Tualatin and the neighboring system must have a large diameter (at least 24 inches).
- Direct connection to a reservoir or major transmission pipeline (24 inches or larger) within the neighboring distribution or supply system.
- Connection to a major transmission pipeline—the Tualatin Supply Main—within the City's system so that the backup supply can be distributed to all areas of the City's system.
- Ideally, reliance on a different water supply source so that it will still be available if Portland's supply is temporarily unavailable.

A backup supply differs from a local intertie, which is a connection at the edge of the distribution system that connects two adjacent water systems. These interties generally have low (and unreliable) capacity, due to the small diameter of the connection (less than 12 inches), limited pipeline capacity to deliver water to and away from the intertie, and often limited (and variable) pressure available to deliver water. Local interties are useful to address localized distribution system outages but are not considered sufficiently reliable to address a system-wide supply interruption.

It is not possible to accurately determine the capacities of individual local interties. Assumptions based on pipeline diameter tend to overestimate available flow. There may be an insufficient difference in hydraulic grade line (HGL) (too flat) from the neighboring system to Tualatin's receiving zone, or pipelines around the local intertie may have limited hydraulic capacity.

Existing and potential connections between Tualatin and neighboring water systems are summarized in Table 2, with additional information provided in *Attachment B – Regional Water Opportunities*. The information was developed based on Tualatin's 2021 Water Master Plan and meetings with staff from Portland Water Bureau, Tualatin Valley Water District and the Cities of Tigard, Lake Oswego, Sherwood and Wilsonville.

Table 2. Existing Interties and Backup Supplies[1]

Intertie or Backup Supply	Water Source	Type	Pressure Zone Served (HGL)	HGL (other)	Dia. (in)	Relies on TSM
TVWD/Tualatin Flow and Eddy Pump Station From TVWD system into TSM	WWSP/Joint Water Commission	Supply-level	Zones A (295) and B (399)	450	36″	Yes, long section
Tigard Intertie Boones Ferry & Lower Boones Ferry	Clackamas River (LO-Tigard Partnership)	Local Intertie	Zone A (295)	410	10″	Yes, short section
Tigard – Bridgeport Intertie Fire connection and separate intertie at 72nd & Boones Ferry[2]	Clackamas River (LO-Tigard Partnership)	Local Intertie & Fire Conn.	Zone A (295)/ TSM	410	10″	No
Lake Oswego Intertie 65th & McEwan	Clackamas River (LO-Tigard Partnership)	Local Intertie	Zone A (295)	320	12″	No
Rivergrove Intertie 65th & Childs	Rivergrove wellfield	Local Intertie	Zone A (295)	315	8″	No
Sherwood Emergency Supply Main City Park	Willamette River WTP	Local Intertie	Zone A (295)	380	24″	No
Sherwood Intertie Cipole and Galbreath	Willamette River WTP	Local Intertie	Zone A (295)	380	8″	No
Wilsonville Intertie Frobase Reservoir Site	Willamette River WTP	Local Intertie	Zone C (507)	506	8″	No

[1] HGL – hydraulic grade line (water level), TSM – Tualatin Supply Main, LO – Lake Oswego. WTP – Water Treatment Plant

[2] Intertie not listed in Water Master Plan as intertie normally serves emergency water from the Tualatin Supply Main to Tigard. Pressure in Tigard system is lower than pressure in the Tualatin Supply Main. Operation would require the main be valved off from the Portland Supply.

Table 2 notes the regional supply accessed through each connection. Tualatin is fortunate to be located adjacent to utilities using a number of different regional supplies. The four supplies used by neighboring utilities are:

- **Joint Water Commission** sources water from the Tualatin and Trask watersheds, stored in Hagg Lake and Barney Reservoir. The water is filtered in Forest Grove and the system is co-owned by TVWD and the Cities of Hillsboro, Beaverton, and Forest Grove .
- **Lake Oswego-Tigard Water Partnership** sources water from the Clackamas River. The water is filtered in Lake Oswego and the system serves both Lake Oswego and Tigard.
- **Willamette Water Supply System (WWSS)** is currently under construction and will be in service in 2026. The new system will source water from the Willamette River which will be filtered at a new site in Sherwood. The system will be co-owned by TVWD and the Cities of Hillsboro and Beaverton.
- **Willamette River Water Treatment Plant** is located in the City of Wilsonville. It sources water from the Willamette River and is co-owned by the Cities of Wilsonville and Sherwood. This supply shares an existing river intake with the Willamette Water Supply System.

Only one of the existing connections—water pumped by the TVWD/Tualatin Flow and Eddy Pump Station—is considered a backup supply. The pump station is co-owned by Tualatin and TVWD and has two pumps that pump water from the TVWD system into the last sections of the Washington County Supply Line and then into the Tualatin Supply Main. With a combined capacity of 10 MGD, Flow and Eddy can provide sustained supply at average day demands, or at peak day demands if TVWD does not require emergency supply at the same time. If activated today, this pump station would provide water from the Joint Water Commission and Portland supplies. Starting in 2026, this connection would also provide water from the WWSS.

Other existing connections are classified as local interties because of their location at the periphery of the distribution system and the small diameter of their connections. The one exception is a 24-inch Sherwood Emergency Supply Main that was constructed to ‘wheel’ Portland water through Tualatin to Sherwood. It connects directly to the Tualatin Supply Main and has sufficient diameter to meet backup supply requirements. However, the pressure and pipe diameters on the Sherwood side mean it can only serve the lowest zone (Zone A) and flow would be limited. This connection sources water from the Willamette River Water Treatment Plant in Wilsonville.

Long-term Supply Availability

Neighboring water utilities were also asked about the availability of non-emergency, long-term wholesale supplies. The intent was not to initiate a change in supply, but to understand options Tualatin would have if Portland supply were to become unavailable or unaffordable.

Tualatin has been a long-term wholesale customer of Portland. As part of that relationship, Portland includes Tualatin’s needs within its water supply and infrastructure planning efforts. Though either party can terminate the agreement, long-term wholesale agreements are typically not terminated by the wholesale provider and provide a reliable long-term source of water. Tualatin would be seeking an equivalently stable wholesale relationship if need for an alternate long-term supply were to arise.

Overall, **none of the neighboring utilities are able to offer an equivalently secure wholesale relationship**. Utilities have only secured sufficient supplies to meet their own long-term needs. Two of the neighboring utilities (TVWD and the City of Sherwood) have wholesale water available for a limited period. Water could be available for 20 or 30 years, or even longer, but these agencies would not be able to make a long-term commitment equivalent to Tualatin's current relationship with Portland. Both utilities use water supplied from the Willamette River.

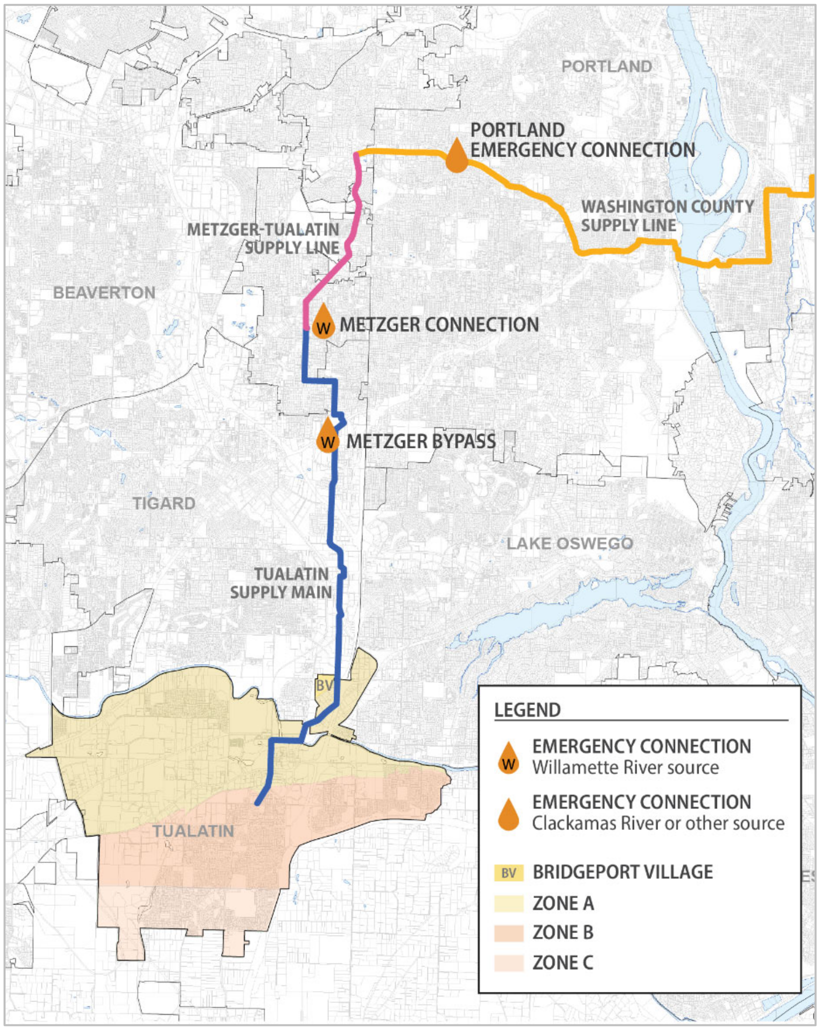
Performance of Existing System During an Emergency

This study focused on two different scenarios for interruption of Tualatin's supply—the first is interruption of supply upstream of the Tualatin Supply Main and the second is failure of the Tualatin Supply Main itself. Water systems can also experience localized outages due to distribution pipeline or pump station failures, system maintenance, or construction. These localized outages are best addressed through local interties and are not the focus of the water supply strategy. The expected system performance under each scenario is discussed below.

Scenario 1 - Loss of the supply system upstream of the Tualatin Supply Main

This scenario could include an outage or severe curtailments of Portland's Bull Run and groundwater supplies, contamination of the transmission system by algal toxins or a malevolent act, or maintenance activities on the transmission system that last longer than a few days. In this scenario, the Tualatin Supply Main is assumed to still be intact and available to convey water from neighboring water systems.

Figure 3. Connections Available During Supply System Failure Upstream of the Tualatin Supply Main



Overall, this scenario has low likelihood because of investments Portland Water Bureau has made in reliability of the supply system. Those investments include the availability of the groundwater system as a backup supply and the ability to bypass significant portions of the Washington County Supply Line through other existing infrastructure. Information on that bypassing approach is provided in *Attachment C – Portland Water Bureau's Planned Response to an Outage of the Washington County Supply Line*. The location where the bypassed supply would enter the Washington County Supply Line is shown in Figure 3, labelled Portland Emergency Connection.

Portland Water Bureau is also investing in a new water filtration facility that will further increase reliability of the supply, allowing continued operation after a fire in the watershed and protecting against algal toxins and any future contamination.

Current System Performance. If Portland's systems were to fail, Tualatin has made its own investment—the TVWD/Tualatin Flow and Eddy Pump Station—that would provide reliable water service in this scenario. The Emergency Pump Station can provide reliable supply to meet average day demands (including industrial and commercial needs) at a minimum, up to full peak day demands if TVWD does not also require emergency pumping. This emergency water could be supplemented with flows from both the City's ASR well and from local interties. Water stored in the City's reservoirs would help meet demands while the pump station and other emergency connections are deployed. If the emergency were to occur today, the Flow and Eddy Pump Station would deliver water from the Portland system. After 2026, this connection will provide water from the Willamette Water Supply System. Though not a formal intertie, TVWD is also able to bypass around the Metzger-Tualatin Supply Line and upper portions of the Tualatin Supply main using distribution piping in the Metzger area (labeled 'Metzger Bypass' in Figure 3). The bypass piping has the capacity to deliver flow at around half Tualatin's average day demand.

Conclusion. The combined existing Portland Water Bureau and Tualatin systems offer a high level of reliability and no further investments are needed to address this scenario.

Scenario 2 - Failure of the Tualatin Supply Main

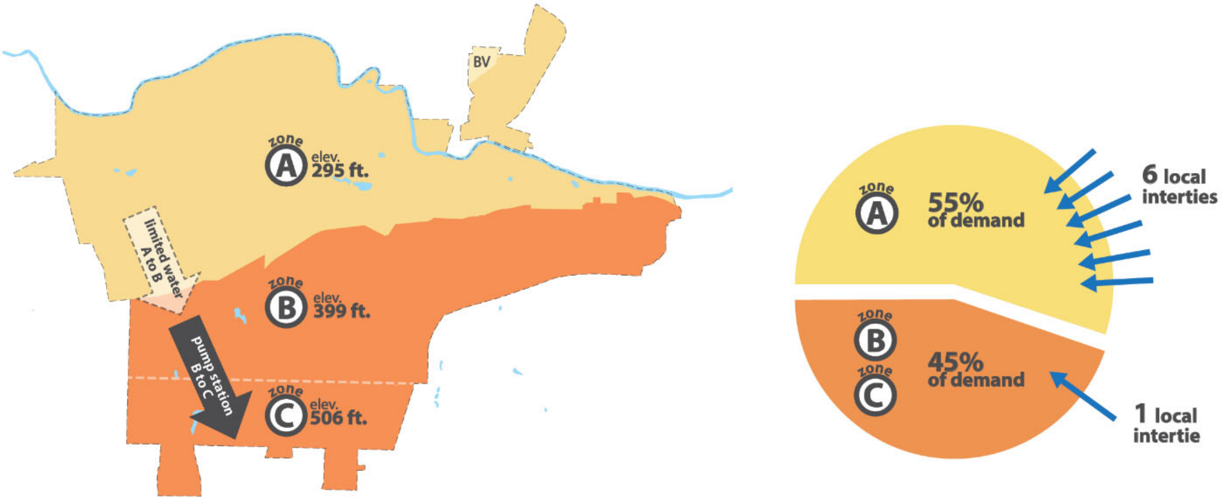
The second scenario is supply interruption due to pipe failure or maintenance of the Tualatin Supply Main, downstream of the TVWD intertie mentioned above. This pipeline is over 40 years old and is a concern because there is no infrastructure in place to bypass the pipeline. This is important because some existing and potential backup supply options use the Tualatin Supply Main and would be unavailable in this scenario.

Current System Performance. If interruption of the Tualatin Supply Main were sustained beyond a couple of days, it is likely the system would experience severe disruption of water service. The main reason for that disruption is that the main backup supply—the TVWD/Tualatin Flow and Eddy Pump Station—relies on the Tualatin Supply Main and could not be used. This would leave the City dependent on water stored in its reservoirs (which provide around two average days of water), the ASR well (that can meet around 7% of peak day demands), and local interties.

Local interties are limited in their capacity, their reliability, and their locations within the Tualatin system. Many of Tualatin's residential customers are located within the higher zones (Zones B and C) in the southern half of the City; these Zones encompass around 45% of total system demands. Unfortunately, most of the local interties (six of seven) connect to the lowest Zone (Zone A) and most are clustered in the northeast corner of the system. Zone C has a single local intertie and Zone B has none. In this scenario, Zones B and C would mostly be reliant on the Martinazzi Pump Station to provide service—this pump station has not been regularly used for over 20 years and is not considered reliable. The locations of demands and interties are shown in Figure 4.

Conclusion. If the Tualatin Supply Main fails, the City will be unable to reliably provide water service to significant portions of the City. ***Tualatin requires a backup supply that is independent of the Tualatin Supply Main and can reach all areas of the City's system***.

Figure 4. Geographic Location of Interties and Demands



Potential New Backup Supplies and Interties

Discussions with neighboring utilities and subsequent analyses identified five opportunities to increase system reliability. Those potential improvements are summarized in Table 3, with additional information provided in *Attachment B - Regional Water Opportunities*.

Identified Opportunities

Local interties may be useful to address localized distribution system outages but do not have the capacity to serve a system-wide supply interruption. The opportunities include two local interties:

- **WWSS Intertie** would increase the diameter of the existing connection between the City's distribution system and the WWSS. The intertie was established to provide construction water to the WWSS and serves Zone A.
- **Wilsonville Intertie at Basalt Creek** would connect new areas of the Wilsonville and Tualatin distribution systems within the Basalt Creek area, within Zone B.

The above local intertie opportunities are documented here, but not further discussed as they do not significantly affect overall vulnerability of Tualatin's system.

Backup supplies have sufficient capacity to provide a reliable supply during an emergency. The opportunities include three options for a new backup supply:

- **Lake Oswego/Tigard Supply Connection** would connect the Lake Oswego-Tigard supply pipeline directly to the Tualatin Supply Main where the two pipelines cross at SW 80th Avenue and Florence Lane.
- **Improved Sherwood Emergency Supply Main** would extend the existing Sherwood Emergency Supply Main within the Sherwood system to connect directly to Sherwood's supply from the Willamette River Water Treatment Plant.

Table 3. Potential New Interties and Backup Supplies[1]

Intertie	Water Source	Type	Pressure Zone Served (HGL)	HGL of Supply	Dia. (in)	Dependent on TSM
Lake Oswego/Tigard Supply Connection Connection between the Lake Oswego-Tigard supply line and the Tualatin Supply Main	Portland/WWSP	Supply-level	Zone B (399 ft)	410	24″	Yes
Improved Sherwood Emergency Supply Main Sherwood Supply Main with extension to increase capacity	Willamette River WTP	Supply-level	Zone B (399 ft)	470	24″	No
Sherwood Emergency Supply Main + WWSS Connection Delivery of WWSS supply via the Sherwood Emergency Supply Main	Willamette Water Supply System WTP	Supply-level	Zone B (399 ft)	520	24″	No
WWSS Intertie Connection to Tualatin's distribution system at 124th Avenue	Willamette Water Supply System WTP	Local Intertie	Zone A (295 ft)	520	12″	No
Wilsonville Intertie Intertie at Basalt Creek	Willamette River WTP	Local Intertie	Zone B (399 ft)	400	~10″	No

[1] HGL – hydraulic grade line (a measure of water pressure), Dia. – diameter of the supply pipeline, WWSS – Willamette Water Supply System.

[3] Uses a section of the Tualatin Supply Main located downstream of most of the supply connections between the supply main and Tualatin's system, so unlikely to be impacted by a Tualatin Supply Main outage affecting Portland supply.

- **Sherwood Emergency Supply Main + WWSS Connection** would connect the WWSS Water Treatment Plant to the Sherwood Emergency Supply Main, delivering WWSS water directly into Tualatin's transmission system.

The three backup supply opportunities were screened to identify improvements that would address existing deficiencies—providing a reliable backup supply throughout the City during a failure of the Tualatin Supply Main. The screening is shown in Table 4. Two of the opportunities, both utilizing the Sherwood Emergency Supply Main, meet the requirements.

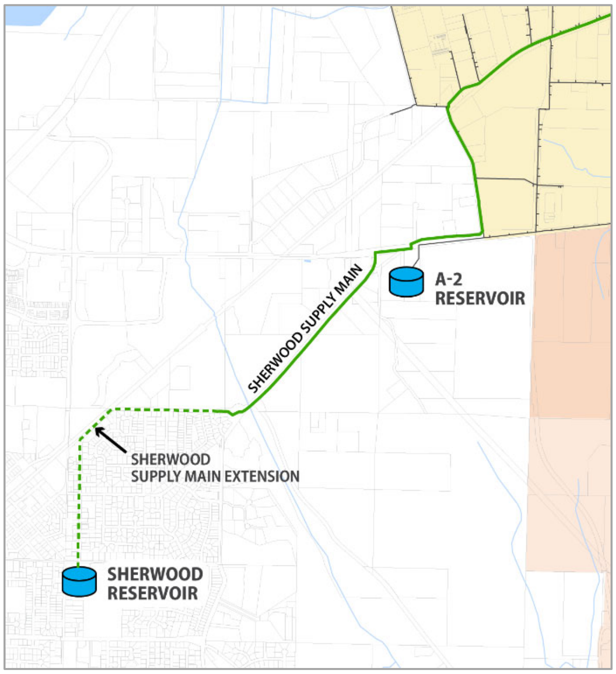
Table 4. Screening of Backup Supply Opportunities

Backup Supply	Provides Backup Supply to All Areas of the City?	Independent of Tualatin Supply Main?
Lake Oswego/Tigard Supply Connection	✓	X
Improved Sherwood Emergency Supply Main	✓	✓
Sherwood Emergency Supply Main + WWSS Connection	✓	✓

Summary of Feasible Options

There are two viable options to address Tualatin's emergency supply deficiency. A brief summary and an order of magnitude cost for each of the two options is below.

Figure 5. Option 1 – Improved Sherwood Emergency Supply Main

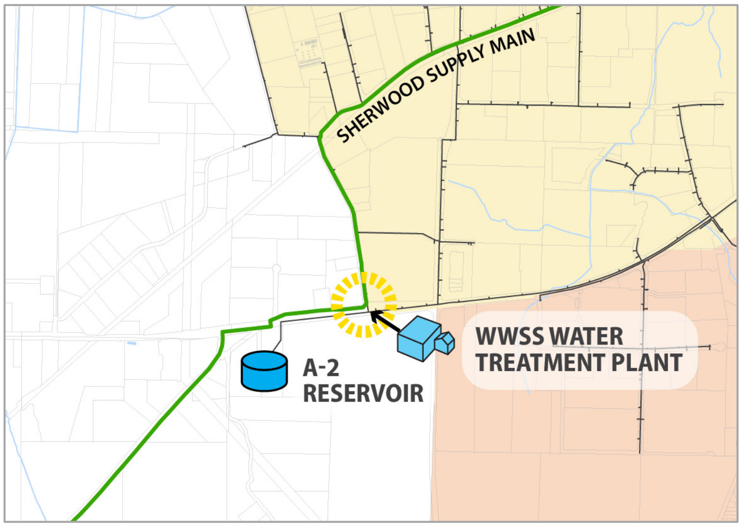


Option 1 – Improved Sherwood Emergency Supply Main. This option would make improvements within the Sherwood system to upgrade the existing Sherwood Supply Main into a supply-level connection. The Sherwood Supply Main was designed to transfer Portland water from TVWD through Tualatin to Sherwood. To serve Tualatin, the flow in the pipeline would be reversed, feeding Sherwood's Willamette supply into Tualatin's Zone A and the downstream end of the Tualatin Supply Main. Though the pipeline connects to the Tualatin's transmission system, under current conditions there is not enough water pressure to serve Tualatin's Zone B. To achieve the required water pressure, the Sherwood Supply Main would be extended within Sherwood to the reservoir where the Willamette Supply enters the system, as shown in Figure 5.

This connection would cost on the order of two million dollars, based on a required pipeline length of around three quarters of a mile. Actual cost would depend on the specific route and requirements.

Option 2 - Sherwood Emergency Supply Main + WWSS Connection. This option would connect the new WWSS Water Treatment Plant to the existing Sherwood Emergency Supply Main, as shown in Figure 6. The WWSS Water Treatment Plant has an existing 12-inch diameter connection with Tualatin's distribution system at 124th Avenue and Tualatin-Sherwood Road. Though this connection could be upsized, it is limited by its connection to the Tualatin distribution system within the lowest Zone (Zone A). It has both limited capacity and cannot reach portions of the system outside of Zone A. By connecting the WWSS Water Treatment Plant to the Sherwood Emergency Supply Main, the supply would feed directly into the Tualatin's transmission system, allowing the water to reach all areas of Tualatin's system. Because the water in the Sherwood Emergency Supply Main is stagnant, the line would need to be flushed with fresh water before it could be used, delaying use by around 48 hours. Tualatin's ASR well, storage reservoirs, and local interties would be used to meet demands during that period.

Figure 6. Option 2 - Sherwood Emergency Supply Main + WWSS Connection



The capital cost of this project would be on the order of $0.5 million, as the Sherwood Emergency Supply Main is located very close to the WWSS Water Treatment Plant. It is assumed there would also be 'wheeling' charges for use of the Sherwood Emergency Supply Main during an emergency, similar to the wheeling charges Sherwood paid in the past to use the Tualatin Supply Main. A wheeling charge is a cost per unit of water transferred through another agency's infrastructure and is usually documented in an interagency agreement.

Preferred Option

A comparison of the two viable options is presented in Table 5. Overall, the options provide very similar characteristics and benefits:

- Both options deliver water directly to the Tualatin transmission system via the Sherwood Emergency Supply Main, providing effective delivery of emergency water to all areas of Tualatin's system.
- Both options address vulnerability of the Tualatin Supply Main, providing reliable backup supply if the Tualatin Supply Main were out of service.
- Both options deliver water sourced from the Willamette River.

Table 5. Comparison of Backup Supply Opportunities

Backup Supply	Option 1 – Improved Sherwood Emergency Supply Main	Option 2 – Sherwood Emergency Supply Main + WWSS Connection
Provides backup supply to all areas of the system	✓	✓
Provides backup supply during failure of the Tualatin Supply Main	✓	✓
Can be designed to meet average day demands	✓	✓
Order of Magnitude Cost	~$2 Million	~$0.5M
Complexity of partnering relationships	Single Partner - Requires agreement with Sherwood on use of both the pipeline and use of supply	Multiple Partners Requires agreement with Sherwood on use of the Supply Main, and WWSS on use of supply.
Water Source	Willamette River water treated at the Willamette River Water Treatment Plant	Willamette River water treated at the WWSS Water Treatment Plant

The options differ in two main factors:

- Option 2 has a lower cost as the WWSS Water Treatment Plant is located very close to the Sherwood Emergency Supply Main, requiring minor improvements. Option 1 requires more extensive piping.
- Option 1 has more simple partnering requirements, as the City would be partnering with Sherwood for emergency access to both the pipeline and supply. Option 2 is more complex, requiring agreement with both Sherwood and the WWSS.

Overall, Option 2 – Sherwood Emergency Supply Main + WWSS Connection is the preferred option, based its lower cost and simpler infrastructure requirements.

Water Supply Strategy

A three-pronged strategy is recommended to continue reliable water service to the City's customers.

Strategy 1 - Invest in a New Backup Supply. The City's existing system is vulnerable to an outage of the Tualatin Supply Main. The preferred option to address this vulnerability is to work with the City of Sherwood and the WWSS to interconnect the WWSS Water Treatment Plant and the Sherwood Emergency Supply Main. The first step will be to approach both agencies to discuss the opportunity, identify benefits and concerns, and work towards a shared project. The Improved Sherwood

Emergency Supply Main is a viable alternative if the Sherwood/WWSS combination is determined to not be feasible or desirable.

Strategy 2 – Continue to Support Reliability of the Portland System. Portland Water Bureau will be conducting a distribution system master plan within the next 5 years. It is important that Tualatin stay engaged with those efforts to ensure the City's demands are included in analysis of backup supply options. The City should also continue ongoing engagement related to future maintenance of the Washington County Supply Line, with the goals of maintaining reliable and affordable supply.

Strategy 3 – Increase Reliability of Local Interties. The City should work with neighboring agencies to increase the reliability of their interties: making sure agreements are in place and working together to test interties on a regular basis. The City should also continue to take advantage of future intertie opportunities, such as within the Basalt Creek area.

Attachment A

Community Conversation Summary

City of Tualatin Water Supply Strategy Community Conversation Summary

(Rev. 4/6/20)

Introduction

The City of Tualatin is developing a Water Supply Strategy to ensure a safe and reliable supply of drinking water for the community. A significant part of the study is to engage in a community conversation about water—educating the public on vulnerabilities of Tualatin's existing water supply and receiving feedback on community values. The City reached out the community in two ways:

- **Stakeholder Interviews.** Stakeholder interviews were conducted with City Council and community leaders. The stakeholder interviews were used to develop an initial set of community values relevant to the water system.
- **Community Values Input.** Community members were asked to rank community values to identify the most important values to consider in developing reliable supply. Efforts to gain input on values included tabling at community events, including events focused on Tualatin's Latinx community, results from the online survey, and presentations to community and City advisory groups.

This memorandum summarizes learnings from the community conversation into four sections: stakeholder interview summary, community values, additional input collected through the online survey, and overall conclusions. Community input summarized in this memorandum will integrated into the City's overall water supply strategy.

Stakeholder Interview Summary

In Spring 2019, interviews were conducted with 17 stakeholders representing a cross-section of community representatives, elected officials, health and safety professionals, business owners, educators, and community leaders. A list of interviewed stakeholders is provided in Appendix A and stakeholder interview questions are provided in Appendix B. This summary reflects the advice, feelings, and attitudes of the individuals interviewed. It is not intended to provide a statistically valid profile of community opinion as a whole.

Participants were asked to share their perceptions of Tualatin's current and future water supply vulnerabilities and opportunities, along with their suggestions to improve reliability. Participants were also asked to provide insight on ways to engage the community in the planning process. The observations, insights, and suggestions provided by the interview participants were used to develop additional community outreach for the project and inform development of the strategy.

Overall Themes

Few people think about water or where it comes from. Almost across the board, stakeholders feel the public takes water for granted with limited knowledge of where their water comes from, current risks, or regional supply options. Explaining the issue—the 'why'—to the general public is important to gain the public's attention.

> "It's not real high on anybody's radar."
>
> "For most people, you turn on the tap and you get water."
>
> "Explain why we should consider a change of water source, the different options, and provide information on water quality and safety, then budget."

Understanding the risks of a single water source changes the stakes. Stakeholders are generally aware and have positive response to Bull Run as Tualatin's primary supply. However, there is concern that the system lacks redundancy of multiple sources. Stakeholders note it is important to educate the public about the existing system and its limitations.

> "Where we are today is not sustainable"
>
> "Consensus of shock that we have no redundancy."
>
> "The need for a secondary source is understood—especially with regional growth, climate change, and natural disaster."
>
> "As far as getting emergency interties to other water supplies, I don't understand why we haven't done that already."

Focus on long-term needs, not just short-term fixes or emergency conditions. Stakeholders advise the City to have a clear, long-term plan that that fits in with the City's other priorities.

> "We need to consider how the strategy fits with the future and look at the day to day impacts on the community, not just in an emergency."
>
> "The strategy needs to be tied into what the City envisions for itself moving forward."
>
> "Have a plan that is well thought out in regard to climate change and growth."
>
> "Make sure it's sustained. For me that means that 5 years or 10 years down the road the supply is still there, and we can continue providing our residents with the quality and abundance we need."

Top water supply values are supply reliability and water quality. Stakeholders worry about performance of the system in an emergency situation—whether an earthquake, or other impact such as a pipe breakage or the Salem toxic algae event. There is strong interest in water quality and knowing the water is safe.

> "Some Councilors are worried about the rising cost of water, I don't consider that important. I'm more concerned with redundancy."
>
> "Redundancy is number one. Having multiple suppliers contributes to system resilience as well as redundancy. Need to make sure the system is stronger and can take a hit."
>
> "I've just heard about the situation in Portland where the pipes are more than 100 years old."
>
> "Need to think about cleanliness of water and source."
>
> "Safety should be first and foremost. What good is getting water if it's not clean and safe."

Cost is a concern, but increased rates are acceptable if decisions are smart and well explained. Stakeholders agree that cost and rates could be an issue but frame the concern as making best value decisions and demonstrating the return on investment.

> "Incremental costs everyone understands. If Tualatin is taking a dramatic turn in water supply that would cause a significant investment, it'll drive interest."
>
> "Residents will care about rates. Businesses will just factor it in."
>
> "If the conversation is about cost, that's one thing. If it's about these are the things we need to do to get water for our city, probably less so."

The Willamette River still carries a negative perception with some. Highly knowledgeable stakeholders consider the Willamette a good source of supply and see use by others in the region as evidence of its quality. Others have a sense of the Willamette as dirty or contaminated—not as good as the Portland Bull Run supply or other regional options. Participants acknowledge the landscape shifts when a water source is being considered only as an emergency option. Changes to the charter amendment would require a heavy lift.

> "Everyone says Bull Run water is the best. Everyone is fearful of the Willamette."
>
> "I'd worry about the quality of the Willamette based on everything the river touches on its way to us. I think others would share this concern."
>
> "A repeal to the Willamette River ban would fail. If it was for emergency only, it might pass."
>
> "If there's an emergency, the humanitarian thing to do is to find water for citizens. No limitations in case of an emergency."
>
> "Nobody in Wilsonville is dying of dysentery or cholera, so I don't have any negative feelings about it."

Transparency and community involvement are valued. Stakeholders underscore the importance of sharing information and being transparent about current risks and vulnerabilities to help affect change. Be honest about the risks and why the study is needed.

> "Having the public engaged, not just feeling a part, but being a part of the process is important."
>
> "As a taxpayer, it's such a critical need, yes, we want to make it better, but we also want to see the decisions are prudent, smart, and cost effective."
>
> "Once the plan is pulled together, hold a large business/water user summit and clearly explain their place in the plan."
>
> "It'd be nice to get into the schools and talk about water."

Use multiple forms of communication to inform and engage. Stakeholders emphasize using a mix of communication methods – City newsletter, social media, utility inserts, media outlets, community events – to reach different groups. Stakeholders advise the City to connect with engaged citizens, business owners, and community organizations who will share information within their networks.

> "Go to the people and use a meeting space that's more managed by the community and offers opportunity for conversation rather than testimony."
>
> "Provide something 'splashy' to draw children so that you can draw in families."
>
> "Think of the audience first. Provide information in a format that meets audience and population, including translation and material for different education levels."

Community Values

Community members were engaged to identify community values that will guide the Water Supply Strategy. Outreach was conducted in both English and Spanish. Efforts to gain input on values included:

- **Online survey.** The online survey was developed in both English and Spanish and advertised in both languages on the City's website, through the Tualatin Today online newsletter, and on postcards distributed at community events and available to the public in City offices.
- **Tabling at community events.** The project team hosted tables at four community events: Concert on the Commons, Reading on the Commons, and two events focused on Tualatin's Latinx community—National Night Out and Viva Tualatin. The project team also hosted a table at the Juanita Pohl Center (Tualatin's Active Aging Center). Community members at these events were invited to complete the online survey, fill out a paper survey that was then entered into the online survey, or identify their top three values on English- or Spanish-language posters. Most responses were included in the online survey.
- **Presentation and live polling at community organization meetings.** The project team provided a presentation on Tualatin's current water supply and vulnerabilities at meetings of four community organizations: Chamber of Commerce, Community Emergency Response Team (CERT), Youth Advisory Committee, and Kiwanis.

All events included ranking of seven community values identified through the stakeholder interviews and previous public opinion research in the region. In the online survey and at the CERT meeting, respondents were asked to score each value on a scale from 1 (not at all important) to 5 (extremely important). At other events, attendees were asked to select the three values most important to them using live voting or by indicating selections on a poster.

Community input was gathered from a total of 267 community members through these efforts; values input is summarized in Table 1. The table identifies values input and number of participants from each outreach effort. Results from the online survey and posters at community events were combined as both measures include input from tabling at community events. To aid comparison of results, the top three values from each group are highlighted in green in Table 1. Learnings were as follows.

Top values are water quality and reliable delivery—now and in the future. All values resonate well with the community. Average scores for the seven values range from 3.7 to 4.9 on a scale from 1 (not important) to 5 (extremely important), with only climate change scoring below 4.0. Consistent with input from stakeholder interviews, the three most important community values are:

- Provides safe, high-quality water
- Provides enough water for future needs
- Prepares the community for an earthquake or natural disaster

These results are reasonably consistent among the different groups polled.

Cost matters—but water matters more. 'Delivers the best value for customers' ranked sixth out of the seven values. The highest this value ranked for any individual outreach effort was fourth—including for groups representing business interests. This doesn't mean cost isn't important. It just means that having high-quality, reliable water is more important.

Table 1. Prioritization of Community Values

Value	Overall	Online Survey & Event Posters		Youth Advisory Council	Kiwanis	CERT	Chamber of Commerce
		English	Spanish				
Provides safe, high-quality water	1	1	3	2	2	2	1
Provides enough water for future needs	2	2	5	5	1	3	3
Prepares the community for an earthquake or natural disaster	3	4	6	1	3	1	2
Continues conservation as an important strategy	4	3	4	2	6	4	5
Allows our community to be a good steward of our water and natural resources	5	5	1	5	4	5	7
Delivers the best value for customers	6	6	6	5	4	6	4
Prepares the community for global climate change	7	7	2	4	6	7	5
Total Responses	267	196	18	5	11	28	9

The more community members know, the greater their interest in being prepared for an emergency. As noted in stakeholder interviews, water is not 'top of mind.' However, when provided with information, community members are very interested in addressing water system vulnerabilities. Indeed, community members who received the most information (members of community organizations that hosted a PowerPoint presentation) ranked preparedness greater than other surveyed community members. This demonstrates the importance of educating customers on Tualatin's water challenges and the selected strategy.

Prioritization of values differed between those who responded in Spanish versus English. Among Spanish-language responses, the top values were environmental— 'allows our community to be a good steward of our water and natural resources' and 'prepares the community for global climate change.' Both values ranked much lower among English-language responses. This may indicate differences in values prioritization among Tualatin's Latinx community, However, there was an insufficient number of Spanish-language responses to make that determination with confidence.

Additional Community Input

In addition to requesting input on community values, the online survey included questions about existing supply, emergency preparedness and water supply options. Results for the English- and Spanish-language surveys are provided in Appendix C and D, respectively. Separate results for English- and Spanish-language responses are provided where they differed notably.

Results included:

- Most of the English-language respondents (75%) live in single-family homes. Most Spanish-language respondents (58%) live in apartments or multi-family homes.
- Just over half of all respondents are long-term residents of Tualatin, having resided in Tualatin for 10 years or longer.
- Respondents are very happy with the quality of drinking water they receive from the City of Tualatin. English-language respondents gave an average score of 4.3 on a scale from 1 (poor) to 5 (excellent), with 85% of respondents giving a score of 4 or 5. Spanish-language responses averaged 4.0.
- Respondents are even happier with the water service they receive from the City of Tualatin, with an average score of 4.4 on a scale from 1 (poor) to 5 (excellent) and 87% of respondents giving a score of 4 or 5. Spanish-language responses averaged 4.25.
- Many respondents know the source of their water, with 72% correctly selecting either Bull Run Watershed (City of Portland) or a combination of sources. This level of knowledge was lower but still strong among Spanish-language respondents, with 58% correctly identifying the source. Overall, the high percentage may in part reflect information respondents received at community events or meetings as part of the project prior to completing the survey.
- Respondents are more prepared with emergency water than the project team has observed in similar communities, with almost 20% meeting the recommended quantity (one gallon per person per day) and over 70% having at least some emergency water stored.
- Respondents want to learn more. When asked to select from specific topics, a majority of both English- and Spanish-language respondents indicated interest in learning about emergency preparedness (64%) and drinking water quality (54%). Fewer were interested in learning about conservation (38%) or billing (10%).

- When asked whether they have questions about potential supplies from the Willamette and Clackamas Rivers, 21% of respondents asked a question or provided comment. Top response topics were: 11% expressed specific concerns about one or both sources (more frequently but not always the Willamette), 5% asked general questions about water quality of available options, and 2% asked questions about cost. Spanish-language responses included a single question about water treatment.
- When asked whether they have general questions about Tualatin's Water Supply Strategy, 32% responded with a question or comment. The top topics were emergency water supply and preparedness (14% of respondents), project timeline (4%), and dislike of the Willamette River as a supply (3%). Two Spanish-language responses were received, on the topics of water quality and a desire to volunteer.

Conclusions

Overall conclusions of the community conversation are as follows:

- Tualatin's customers are happy with the water and service they receive. Water isn't top of mind because water is not perceived as a problem.
- The community has a high level of awareness and interest in being prepared for an earthquake or other emergency. With education on the vulnerability of the City's existing water supply, this interest can translate into support for needed water system improvements.
- Water quality is a top community value. Regardless of the approach recommended in the Water Supply Strategy, the community will want thorough and accurate information on water quality and treatment of backup supplies.
- Some Tualatin residents are adamantly against using treated water from the Willamette River. From online survey responses, the proportion appears small. However, this contingent feels very strongly and is likely to engage with elected officials and the broader community on the Water Supply Strategy.

Community values and other input summarized in this memorandum will guide development of Tualatin's Water Supply Strategy.

Appendix A
Interviewed Stakeholders

Listed individuals were interviewed as part of the stakeholder interview process for the Tualatin Water Supply Strategy.

Individual	*Organization*
Frank Bubenik	Tualatin Mayor
Bridget Brooks	Tualatin City Council
Maria Reyes	Tualatin City Council
Robert Kellogg	Tualatin City Council
Bob Ingber	Legacy Meridian Park Medical Center
Paul Morrison	Tualatin City Council
Jon Kawaguchi	Washington County Health Department
Candice Kelly	Tualatin Tomorrow
John Niggley	Lam Research
Linda Moholt	Tualatin Chamber of Commerce
Susan Noack	Tualatin Aging Task Force
Scott Porter	Washington County Emergency Management
Darin Barnard	Tualatin School District
Kate Stoller	Tualatin Valley Fire & Rescue
Charlie Benson	East Tualatin CIO
Cathy Holland	Commercial CIO
Angela DeMeo	Midwest CIO

Appendix B
Stakeholder Discussion Guide

The below discussion guide was used to guide stakeholder interviews for the Tualatin Water Supply Strategy. The discussion guide is organized with an introduction, which was read to the interviewees, followed by a series of questions divided into four sections.

Introduction

The City of Tualatin purchases wholesale water from Portland Water Bureau and also operates a well that stores that water and delivers it to the system when needed. These supplies meet the City's daily needs under normal operations but lack system redundancy – during a supply outage or natural disaster the City may be unable to provide water to customers.

There are multiple other supplies available in the region, but the City lacks the infrastructure and agreements to reliably meet emergency needs from those suppliers. Costs to purchase water from Portland are also increasing due to Portland's investment in a new filtration plant.

The goal of the Water Supply Strategy is to evaluate Tualatin's water needs under normal and emergency operations and identify the best approach to reliably meet those needs in the future. The City is seeking your advice on its decisions for the future.

Stakeholder Questions

Introductory Questions

1. Have you been involved with previous evaluations of City of Tualatin's water supply source? (How?)
2. What's your understanding of the water supply situation for Tualatin? (Currently, and for the future?)
3. What's the current level of public awareness of the City's long-term water supply needs and source options?

Issues

4. What values or principles should guide decisions about Tualatin's Water Supply Strategy? (What factors should be considered in evaluating / choosing supply options?)
5. What issues do you expect will arise as the City involves customers in decisions on future water supply sources?
6. What persons or groups do you anticipate will be most interested? What will be their interests?
7. Cost and impact on rates are issues often raised in public when water suppliers consider water supply options. Do you expect that issue could arise here? (Explain.)

8. Some years ago, the City Council adopted a charter amendment that prohibits use of the Willamette River as a water source, even during emergencies. What's your view now on that chart amendment?

Water Supply Sources

9. There are several regional water supply sources serving communities around Tualatin. Do you have any questions, suggestions or concerns on these possible sources?
    - Portland / Bull Run
    - Willamette River at Wilsonville
    - Joint Water Commission (Tualatin, Hagg Lake)
    - Clackamas River
    - Other sources

Communications

10. What is the best way to communicate with customers about the City's Water Supply Strategy? Which sources do customers rely on as the most credible places to get information? What events are coming up where we could share information about the project?
11. What information will be of greatest interest to customers? What questions would you anticipate?
12. What key messages should customers understand about the City's future water needs and supply options?

Wrap-Up

13. If you were asked to provide your single most important piece of advice for Tualatin's Water Supply Strategy, what would it be?
14. Any further comments or suggestions?

Appendix C.1
English-Language Survey Results

The online survey was conducted using SurveyMonkey in 2019. Survey responses to individual multiple choice and ranking questions are attached. The survey also included two open ended responses:

- Q7. Two of the backup sources that may be available to Tualatin are water from the Clackamas River treated at the Lake Oswego Tigard Water Treatment Plant and water from the Willamette River treated at filtration plants in Wilsonville and Sherwood. Do you have any questions about these sources?
- Q10. What questions do you have about our community's Water Supply Strategy?

Responses received for the two open-ended questions were coded by topic; those topics are summarized in Tables C.1 and C.2 respectively.

Table C.1. Open-Ended Responses on Willamette and Clackamas River Sources[1]

Topic	*Number Of Responses*	*Examples*
Specific concerns about the Willamette or Clackamas River sources	22	Is Willamette River water safe? In the past, there has been problems with upstream pollution and pesticide runoff into the river. Have these been properly taken care of? My family and I will not drink water from filtration plants. I will use bottled water!
Water quality	10	How does the quality of water from these sources compare to our current water source?
Cost	4	Will it change my water bill?
Fluoride	3	Is the water fluorinated? Would like to have fluorinated water if possible, even though we do not now. Can we get the fluoride out if our water supply? It's a neurotoxin and it's poison.
Desire for additional information	3	Please provide more information to the residents of Tualatin.
Being prepared for emergencies	2	If we get hit with the big earthquake, which would provide a more reliable water source?

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[1] Full text of Question 7 was: Two of the backup sources that may be available to Tualatin are water from the Clackamas River treated at the Lake Oswego Tigard Water Treatment Plant and water from the Willamette River treated at filtration plants in Wilsonville and Sherwood. Do you have any questions about these sources?

Table C.2. Open-Ended Responses on Questions about the Water Supply Strategy[1]

Topic	*Number Of Responses*	*Example*
Emergency Water Supply and Preparedness	26	Great to be looking for backup sources in case of natural disaster. Loss &/or lack of water in an emergency is real concern for our family.
Project Timeline and Results	7	What is the timeline for figuring out the solution to a backup water source?
Concerns about Willamette River water	6	What is the strategy for safe clean water other then Willamette River water?
Water quality, taste or lead	5	Testing for Lead and other contaminants?
Water conservation and reuse	4	What incentives at a residential level can be done to encourage greywater use or water-on-site reuse to reduce the impact of water needs and sewer flow?
Cost	4	How much will it cost customers long term?
Support for continued Portland supply	2	Bull Run Water is a big plus and Portland has groundwater to supplement.
Fluoride	2	Are we getting the fluoride out of our water?
Climate change	1	How to adapt to climate crisis and rapid changes.
Other	8	Where does the current water supply for the City of Tualatin come from?

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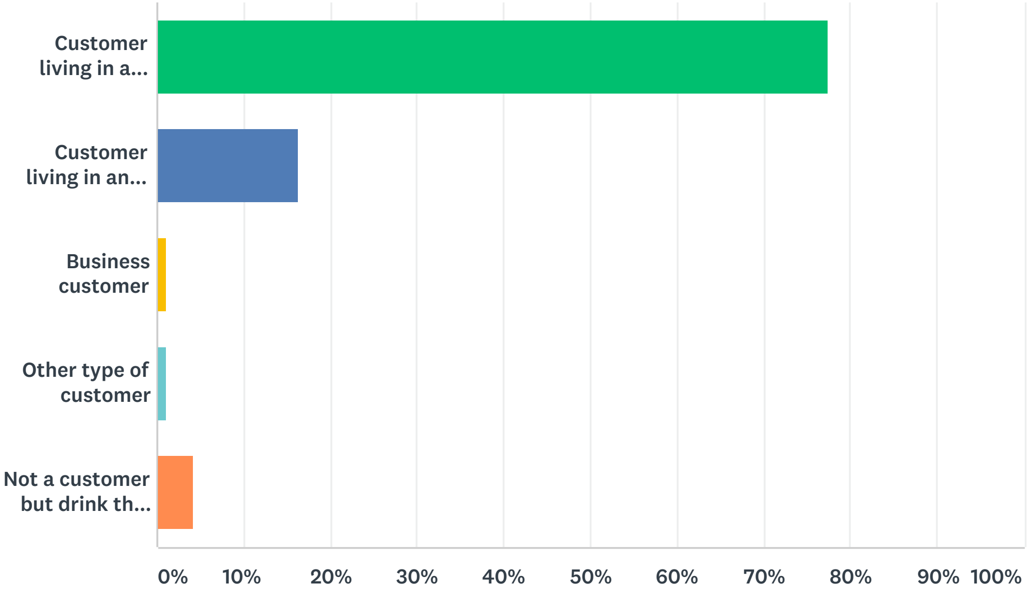
[1] Full text of Question 10 was: What questions do you have about our community's Water Supply Strategy?

Q1 Which best describes you?

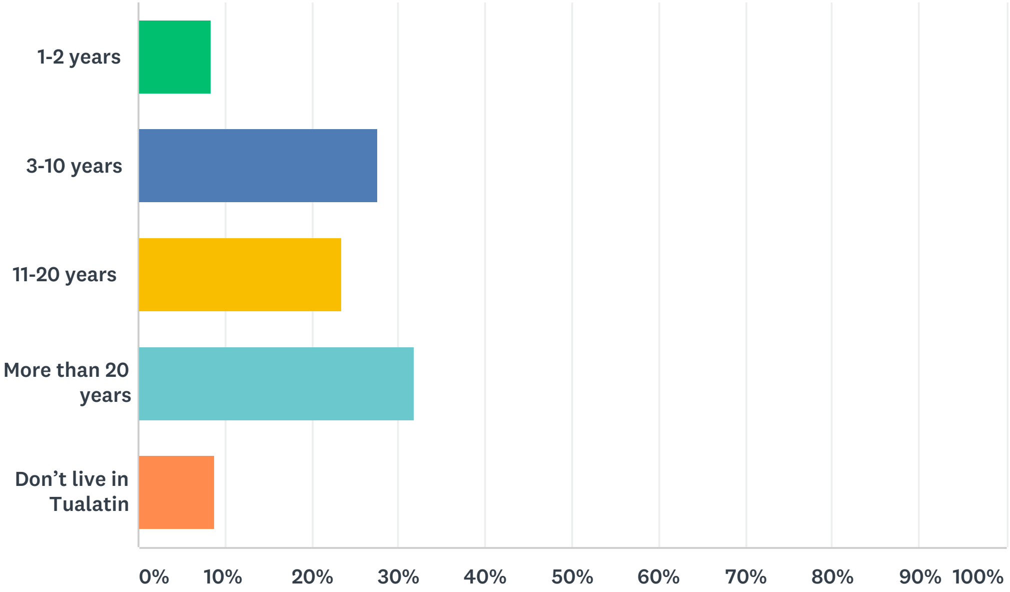
Answered: 191 Skipped: 1



ANSWER CHOICES	RESPONSES	
Customer living in a single-family home	77.49%	148
Customer living in an apartment or multi-family residence	16.23%	31
Business customer	1.05%	2
Other type of customer	1.05%	2
Not a customer but drink the water	4.19%	8
TOTAL		191

Q2 How long have you lived in Tualatin?

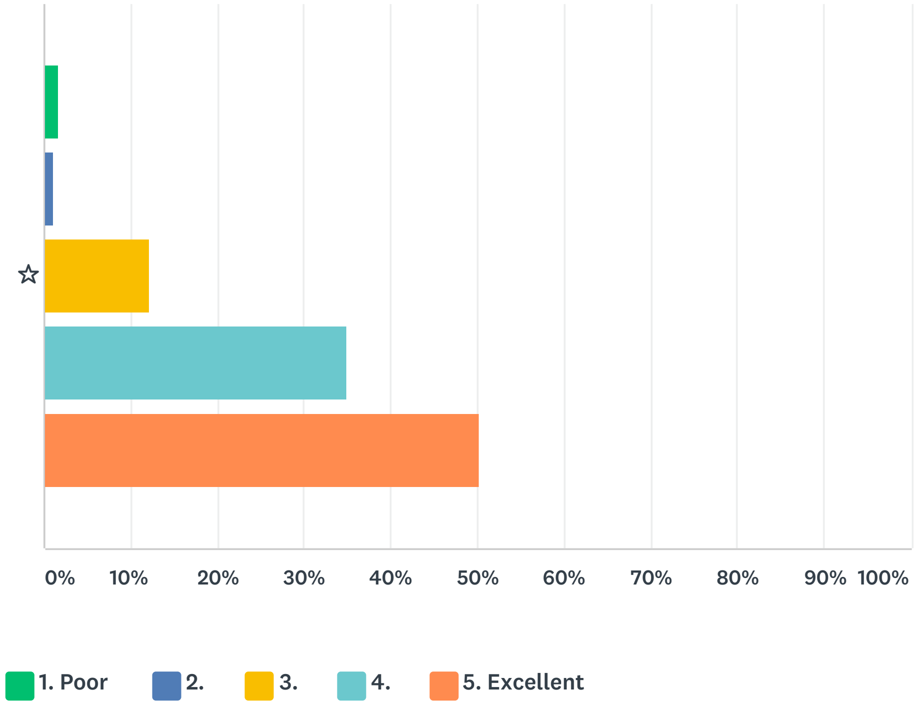
Answered: 192 Skipped: 0



ANSWER CHOICES	RESPONSES	
1-2 years	8.33%	16
3-10 years	27.60%	53
11-20 years	23.44%	45
More than 20 years	31.77%	61
Don’t live in Tualatin	8.85%	17
TOTAL		192

Q3 How would you rate the quality of the drinking water you receive from the City of Tualatin?

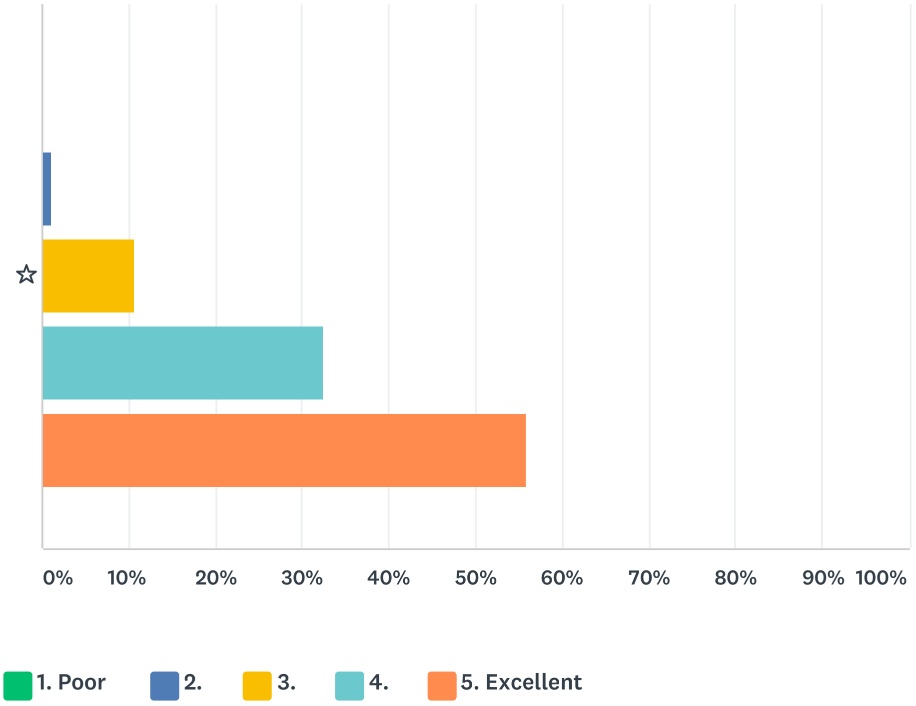
Answered: 189 Skipped: 3



	1. POOR	2.	3.	4.	5. EXCELLENT	TOTAL	WEIGHTED AVERAGE
☆	1.59% 3	1.06% 2	12.17% 23	34.92% 66	50.26% 95	189	4.31

Q4 How would you rate the water service you receive from the City of Tualatin?

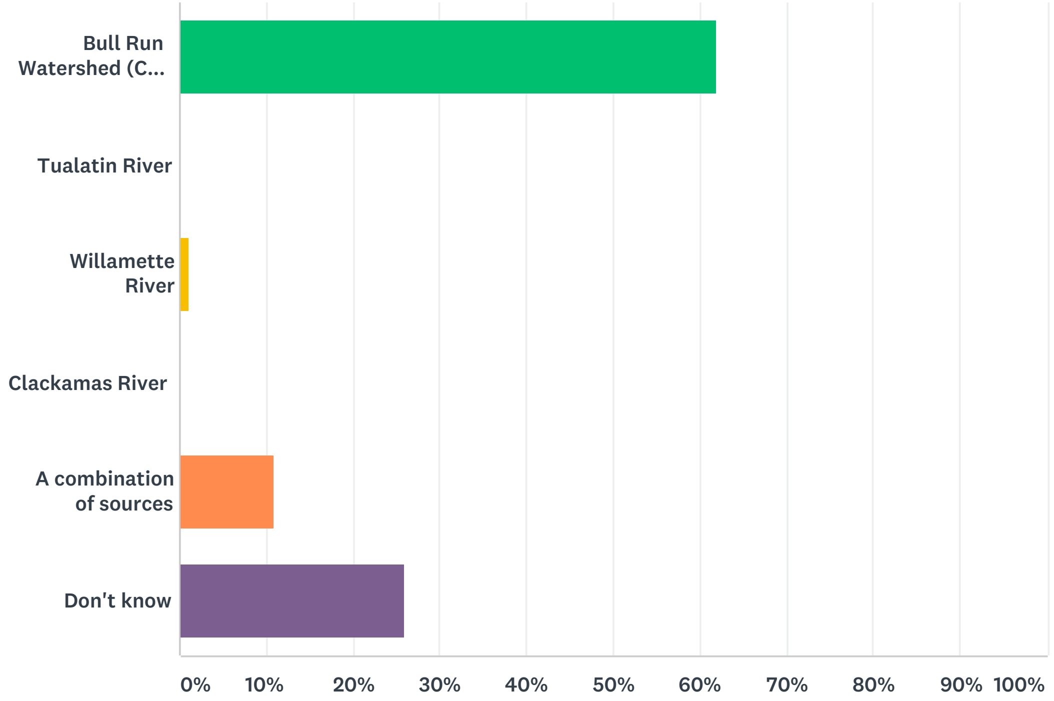
Answered: 188 Skipped: 4



	1. POOR	2.	3.	4.	5. EXCELLENT	TOTAL	WEIGHTED AVERAGE
☆	0.00% 0	1.06% 2	10.64% 20	32.45% 61	55.85% 105	188	4.43

Q5 Do you know the main source of Tualatin's drinking water?

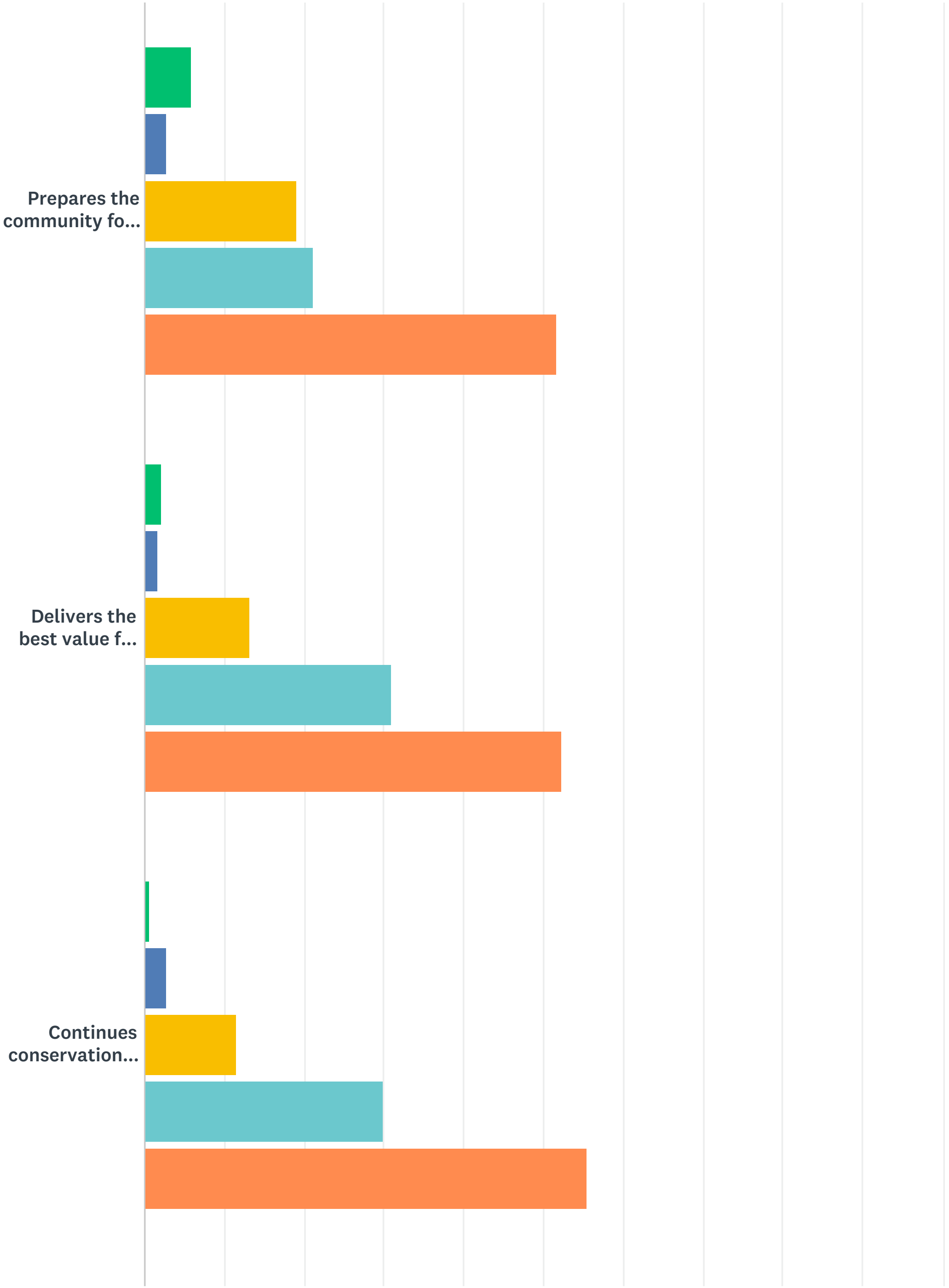
Answered: 192 Skipped: 0

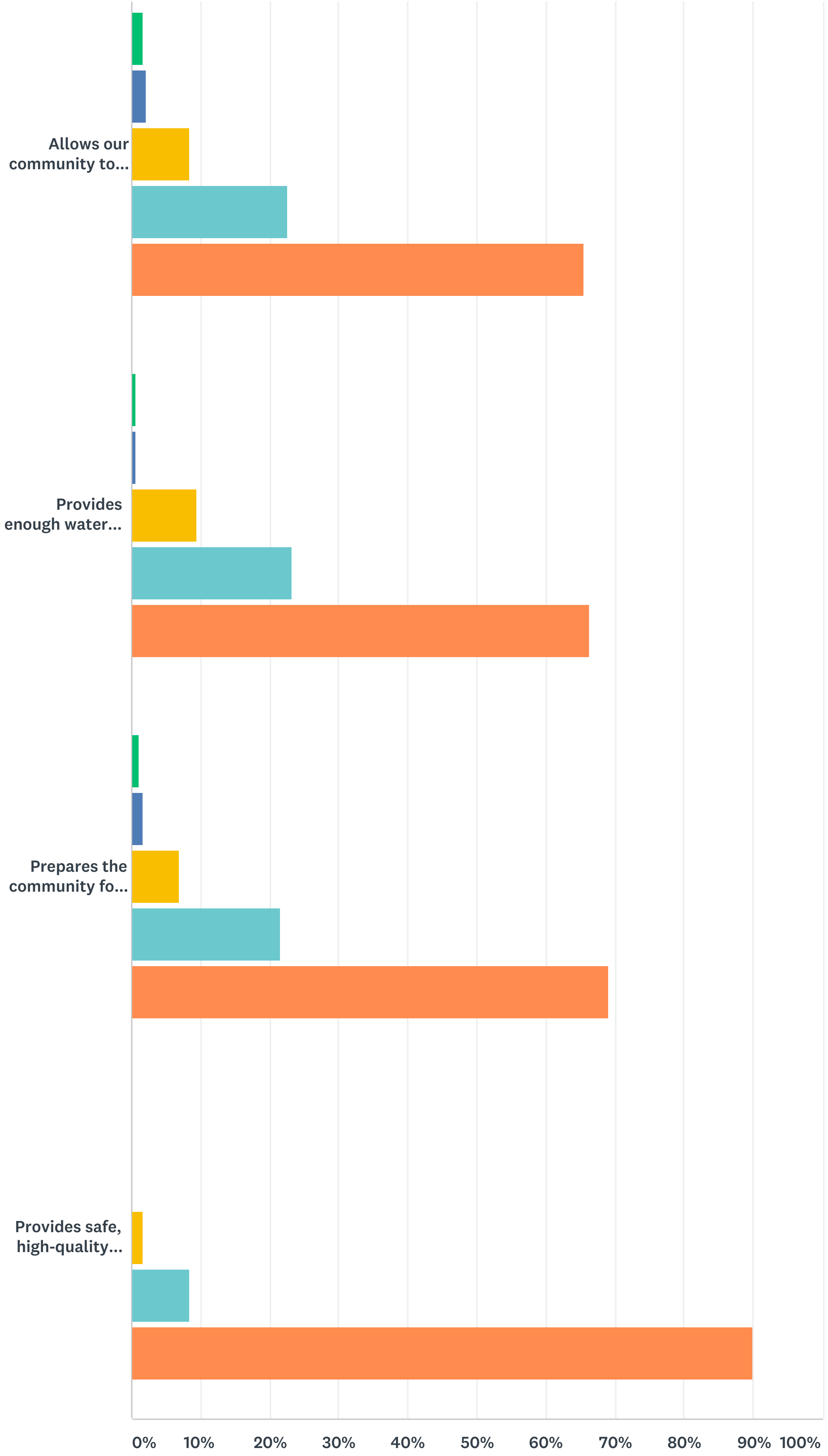


ANSWER CHOICES	RESPONSES	
Bull Run Watershed (City of Portland)	61.98%	119
Tualatin River	0.00%	0
Willamette River	1.04%	2
Clackamas River	0.00%	0
A combination of sources	10.94%	21
Don't know	26.04%	50
TOTAL		192

Q6 Tualatin is a City of Portland wholesale customer. We purchase all of our water from the City of Portland. Portland's primary source of water is the Bull Run Watershed. Tualatin currently does not have a backup source of drinking water which leaves us vulnerable if the supply from Portland is interrupted due to a pipeline break or a natural disaster. How important are the following values when considering possible backup sources?

Answered: 192 Skipped: 0




Allows our community to...
Provides enough water...
Prepares the community fo...
Provides safe, high-quality...
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

🟩 1. Not important 🟦 2. 🟨 3. 🟦 4. 🟧 5. Very important

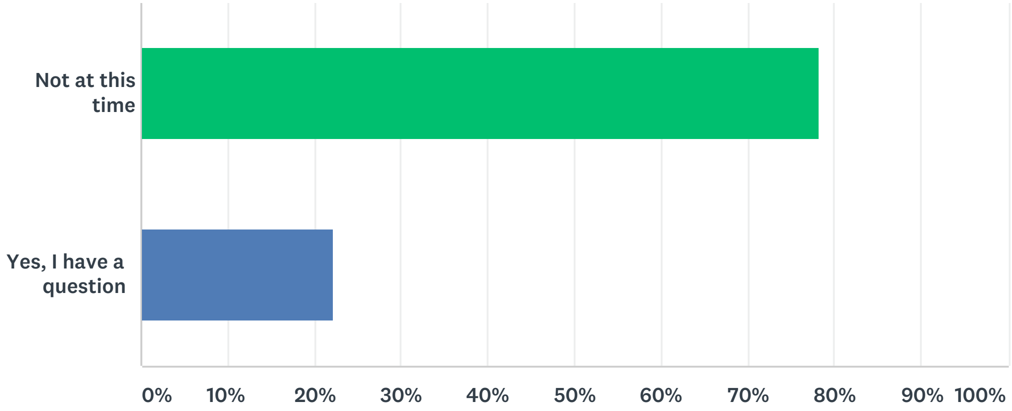
	1. NOT IMPORTANT (1)	2. (2)	3. (3)	4. (4)	5. VERY IMPORTANT (5)	TOTAL
Prepares the community for global climate change	5.79% 11	2.63% 5	18.95% 36	21.05% 40	51.58% 98	190
Delivers the best value for customers	2.09% 4	1.57% 3	13.09% 25	30.89% 59	52.36% 100	191
Continues conservation as an important water supply strategy	0.52% 1	2.62% 5	11.52% 22	29.84% 57	55.50% 106	191
Allows our community to be a good steward of our water and natural resources	1.57% 3	2.09% 4	8.38% 16	22.51% 43	65.45% 125	191
Provides enough water for future needs	0.53% 1	0.53% 1	9.47% 18	23.16% 44	66.32% 126	190
Prepares the community for an earthquake or other natural disasters	1.05% 2	1.58% 3	6.84% 13	21.58% 41	68.95% 131	190
Provides safe, high-quality water	0.00% 0	0.00% 0	1.57% 3	8.38% 16	90.05% 172	191

BASIC STATISTICS

	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Provides enough water for future needs	1.00	5.00	5.00	4.54	0.73
Continues conservation as an important water supply strategy	1.00	5.00	5.00	4.37	0.83
Prepares the community for global climate change	1.00	5.00	5.00	4.10	1.15
Prepares the community for an earthquake or other natural disasters	1.00	5.00	5.00	4.56	0.78
Provides safe, high-quality water	3.00	5.00	5.00	4.88	0.37
Delivers the best value for customers	1.00	5.00	5.00	4.30	0.90
Allows our community to be a good steward of our water and natural resources	1.00	5.00	5.00	4.48	0.86

Q7 Two of the backup sources that may be available to Tualatin are water from the Clackamas River treated at the Lake Oswego Tigard Water Treatment Plant and water from the Willamette River treated at filtration plants in Wilsonville and Sherwood. Do you have any questions about these sources?

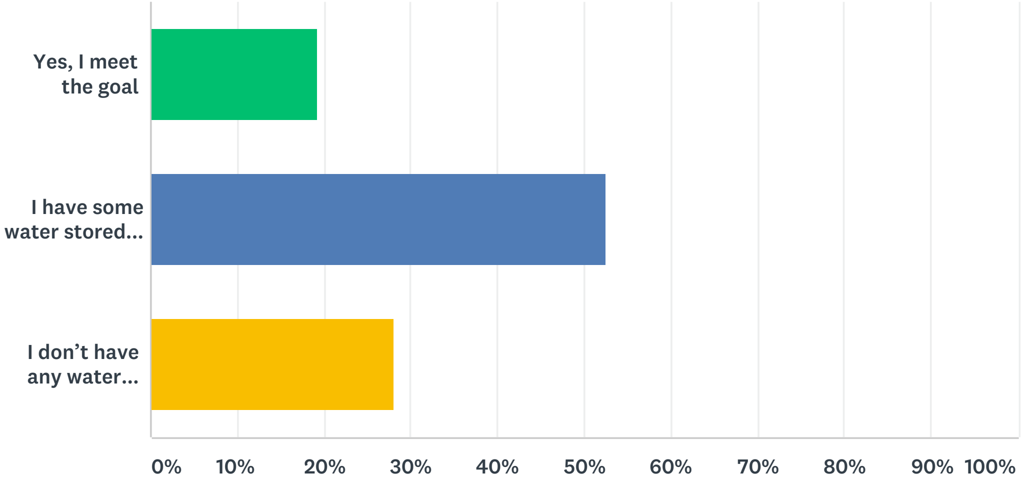
Answered: 189 Skipped: 3



ANSWER CHOICES	RESPONSES	
Not at this time	78.31%	148
Yes, I have a question	22.22%	42
Total Respondents: 189		

Q8 Do you have emergency water stored at home? You need at least one gallon per person or pet per day for 14 days. That amount assumes you will use about half a gallon for drinking and another half-gallon to meet sanitation and food preparation needs.

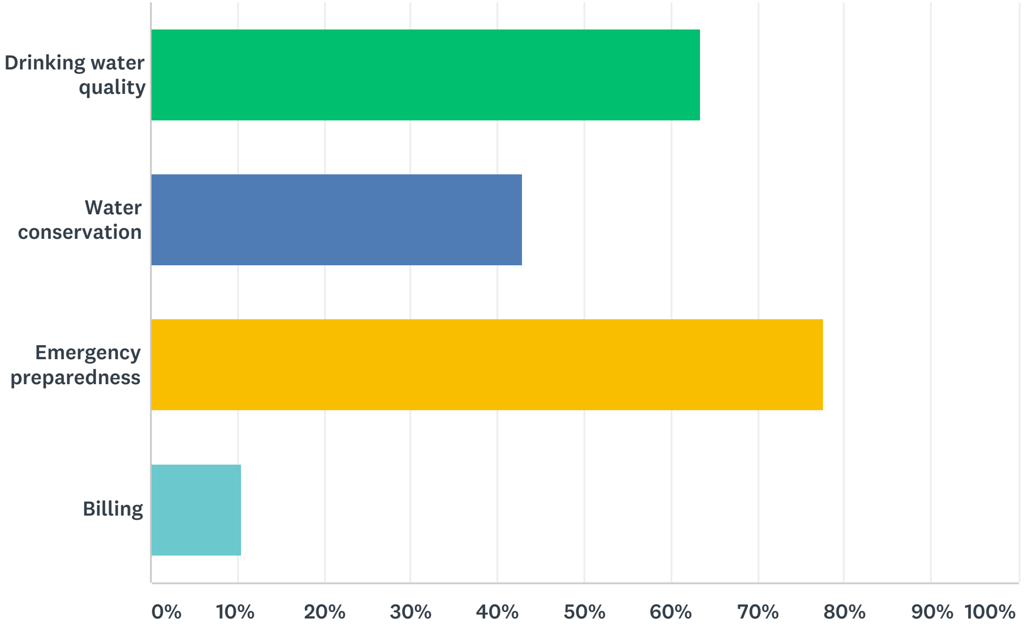
Answered: 192 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes, I meet the goal	19.27%	37
I have some water stored, but not enough	52.60%	101
I don’t have any water stored	28.13%	54
TOTAL		192

Q9 What topics would you like to learn more about? (Select all that apply)

Answered: 161   Skipped: 31



ANSWER CHOICES	RESPONSES	
Drinking water quality	63.35%	102
Water conservation	42.86%	69
Emergency preparedness	77.64%	125
Billing	10.56%	17
Total Respondents: 161		

Q10 What questions do you have about our community's Water Supply Strategy?

Answered: 91 Skipped: 101

Q11 Enter your name in the drawing for an emergency preparedness kit! We will not share your email with other organizations.

Answered: 155 Skipped: 37

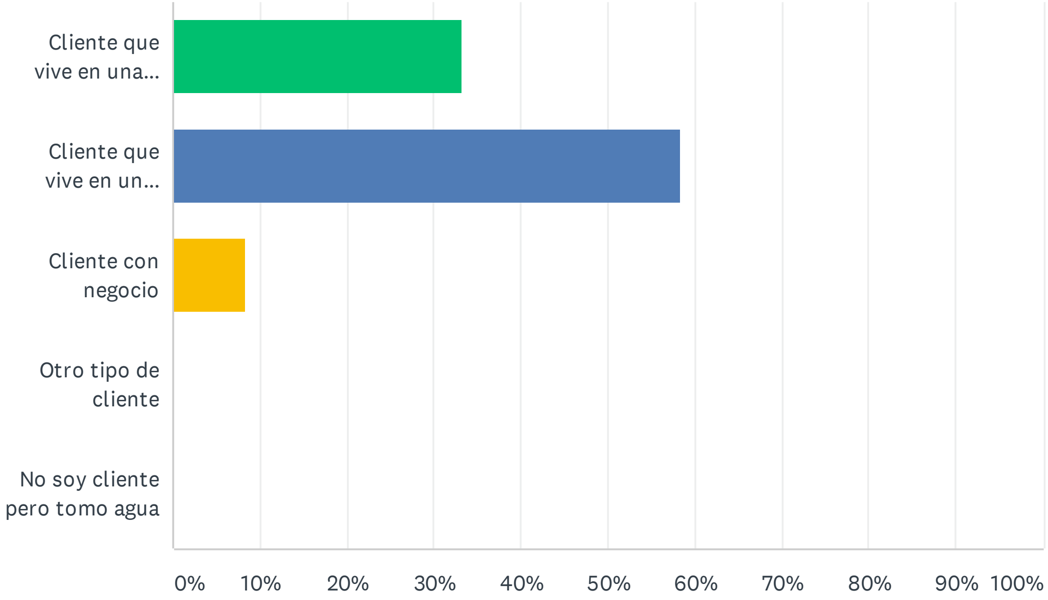
ANSWER CHOICES	RESPONSES	
Name	100.00%	155
Company	21.94%	34
Address	0.00%	0
Address 2	0.00%	0
City/Town	96.77%	150
State/Province	0.00%	0
ZIP/Postal Code	97.42%	151
Country	0.00%	0
Email Address	98.06%	152
Phone Number	0.00%	0

Appendix D
Spanish-Language Survey Results

The online survey was conducted using SurveyMonkey in 2019. Survey responses to all questions are attached.

Q1 ¿Cuál es la mejor descripción de usted?

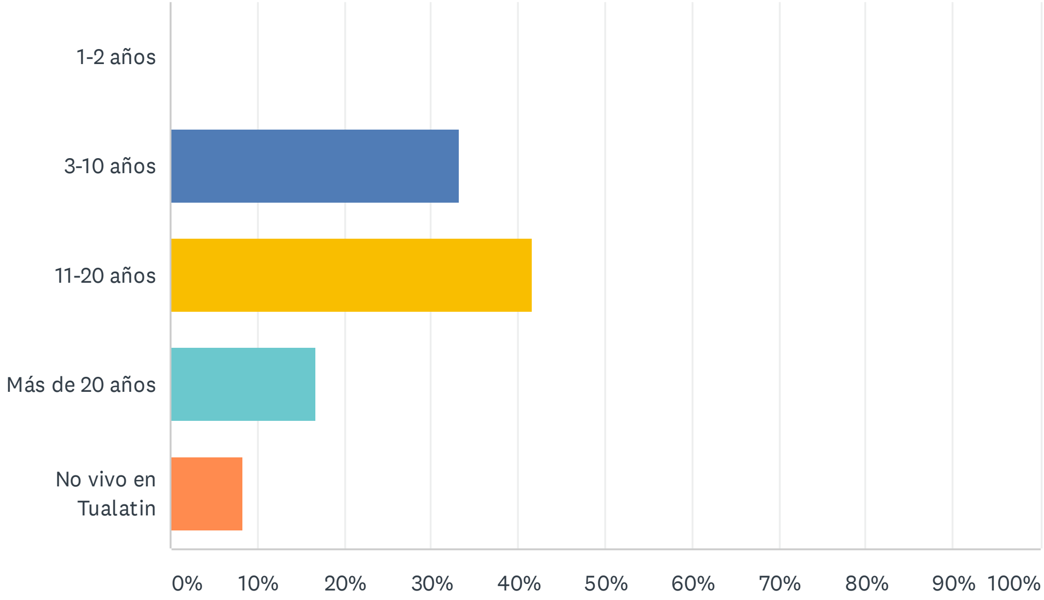
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
Cliente que vive en una casa unifamiliar	33.33%	4
Cliente que vive en un apartamento o residencia multifamiliar	58.33%	7
Cliente con negocio	8.33%	1
Otro tipo de cliente	0.00%	0
No soy cliente pero tomo agua	0.00%	0
TOTAL		12

Q2 ¿Cuánto tiempo lleva viviendo en Tualatin?

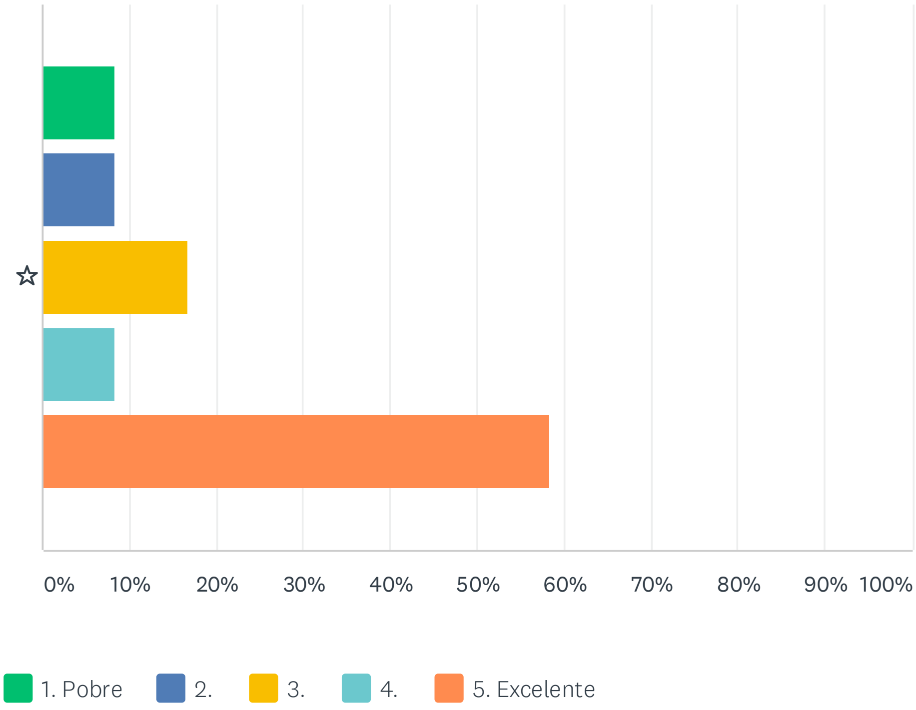
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
1-2 años	0.00%	0
3-10 años	33.33%	4
11-20 años	41.67%	5
Más de 20 años	16.67%	2
No vivo en Tualatin	8.33%	1
TOTAL		12

Q3 ¿Cómo calificaría usted la calidad del agua potable que recibe de la Ciudad de Tualatin?

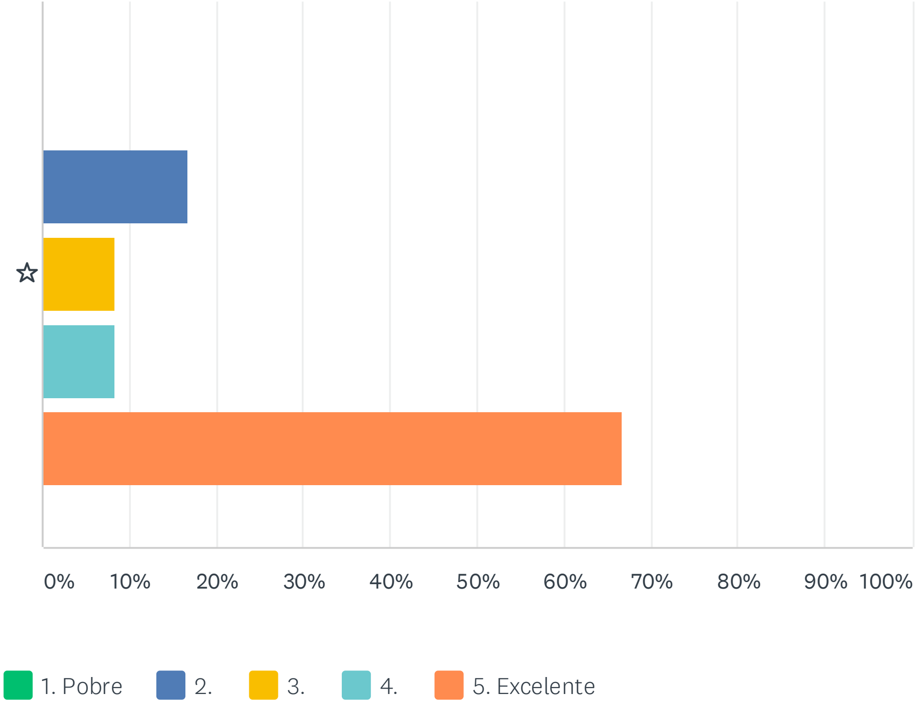
Answered: 12 Skipped: 0



	1. POBRE	2.	3.	4.	5. EXCELENTE	TOTAL	WEIGHTED AVERAGE
☆	8.33% 1	8.33% 1	16.67% 2	8.33% 1	58.33% 7	12	4.00

Q4 ¿Cómo calificaría usted el servicio de agua que recibe de la Ciudad de Tualatin?

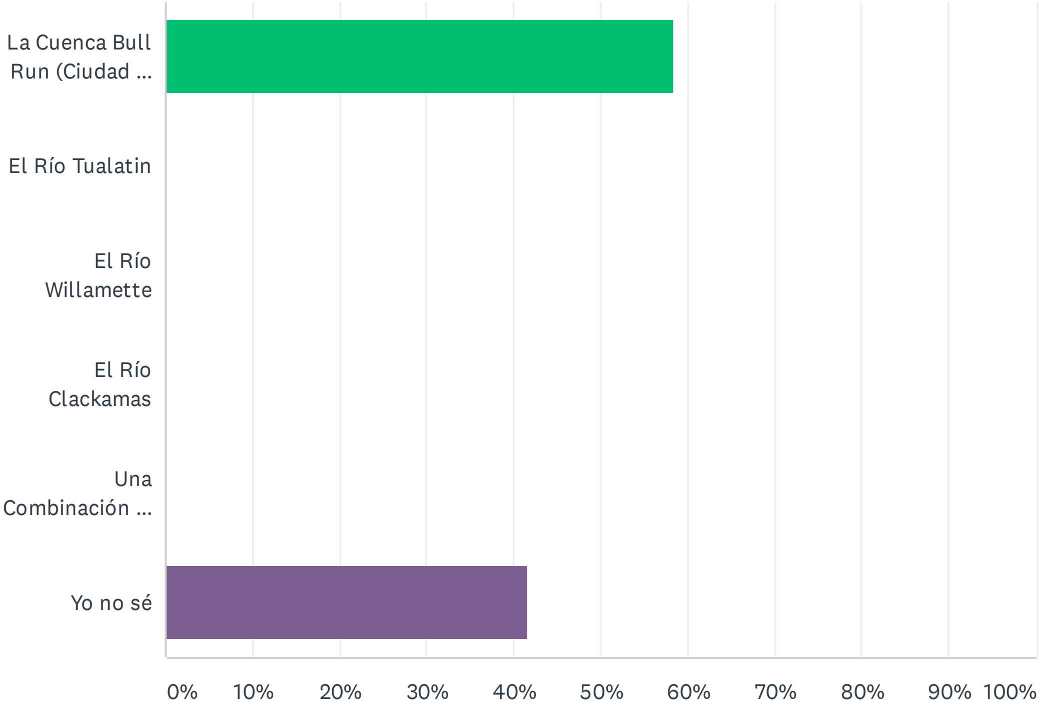
Answered: 12 Skipped: 0



	1. POBRE	2.	3.	4.	5. EXCELENTE	TOTAL	WEIGHTED AVERAGE
☆	0.00% 0	16.67% 2	8.33% 1	8.33% 1	66.67% 8	12	4.25

Q5 ¿Sabe usted cuál es la fuente principal de agua potable de Tualatin?

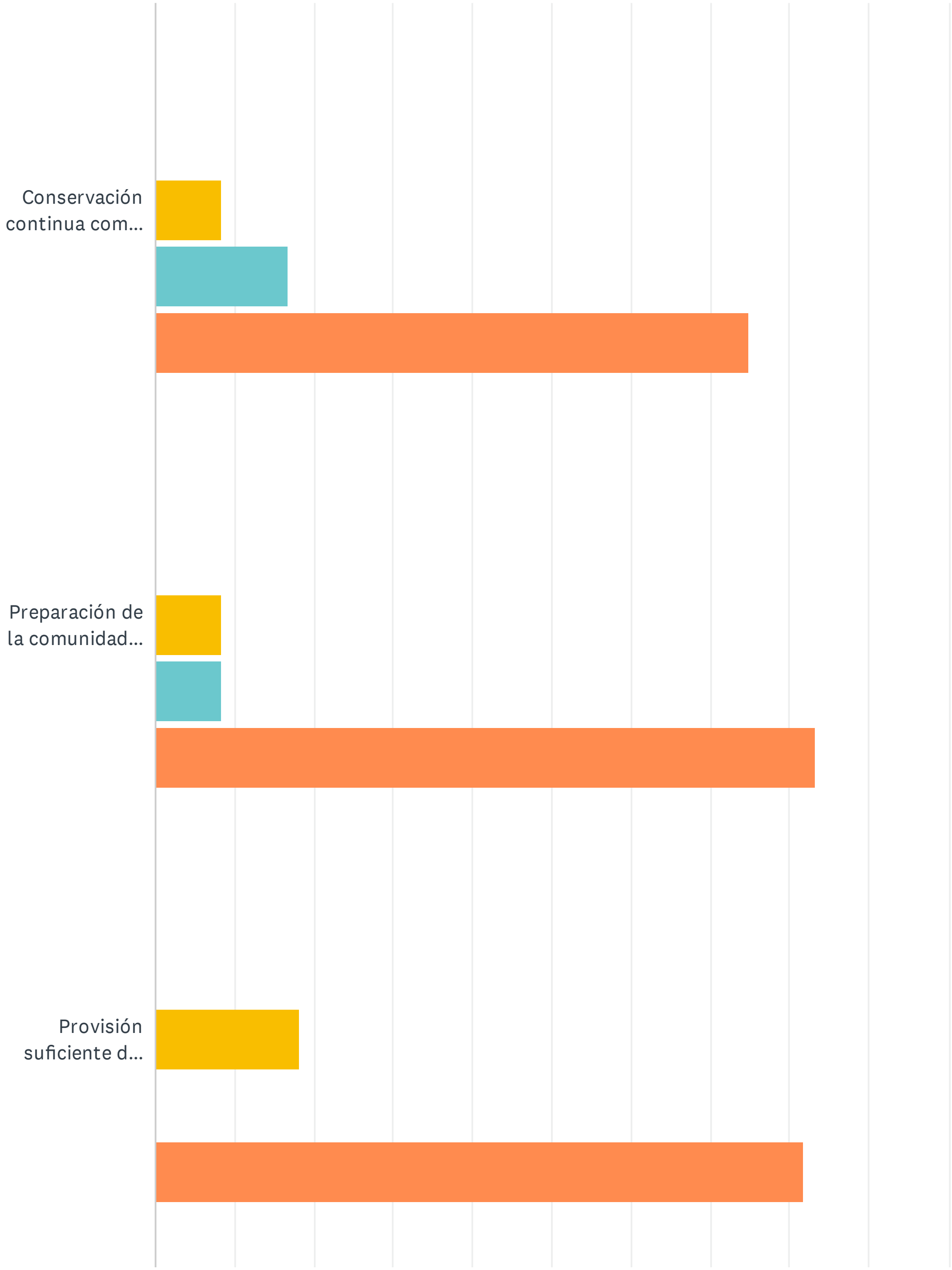
Answered: 12 Skipped: 0

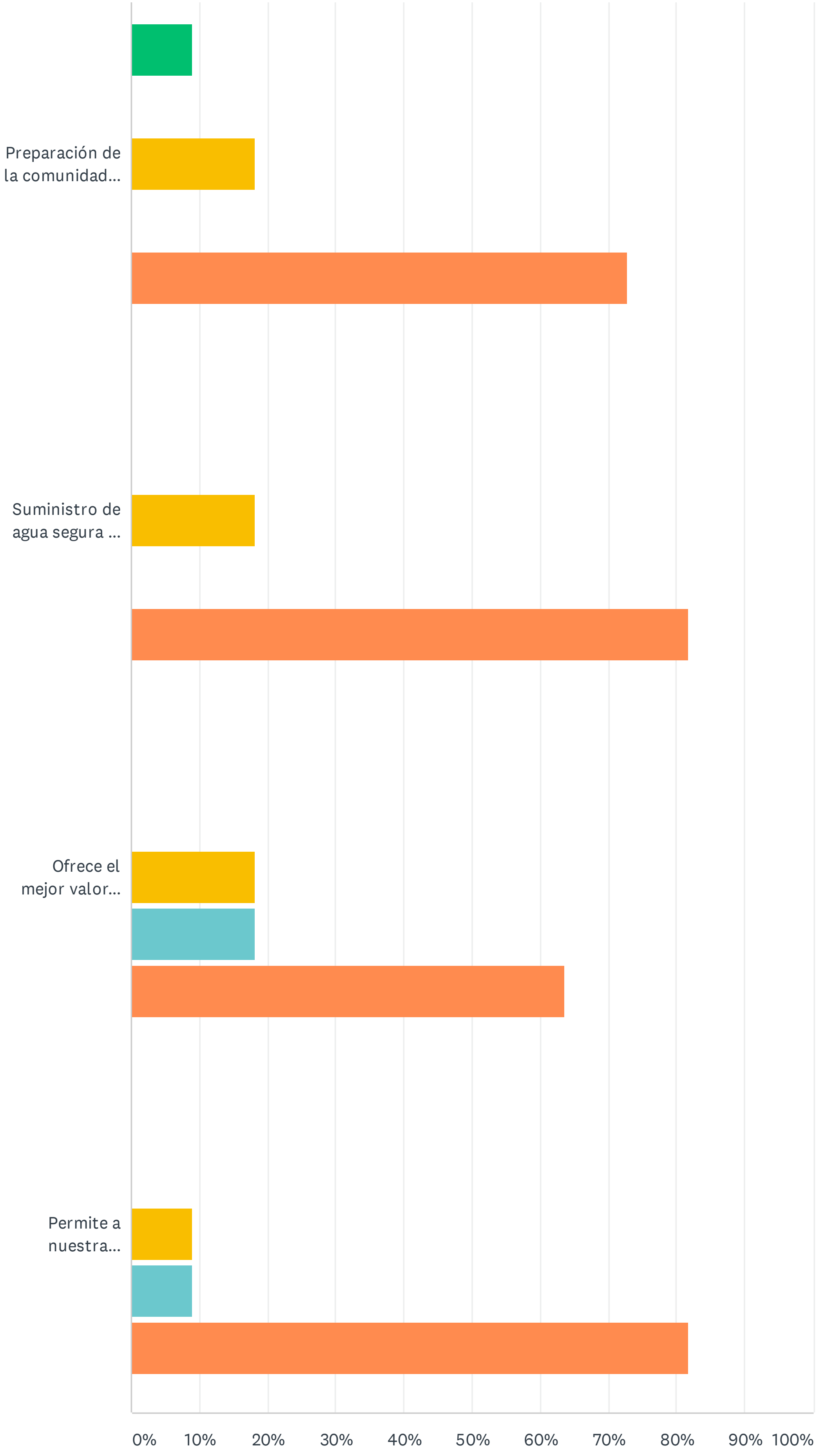


ANSWER CHOICES	RESPONSES	
La Cuenca Bull Run (Ciudad de Portland)	58.33%	7
El Río Tualatin	0.00%	0
El Río Willamette	0.00%	0
El Río Clackamas	0.00%	0
Una Combinación de Fuentes	0.00%	0
Yo no sé	41.67%	5
TOTAL		12

Q6 Tualatin es un cliente mayorista de la ciudad de Portland. Compramos toda nuestra agua de la ciudad de Portland. La principal fuente de agua de Portland es la Cuenca Bull Run. Tualatin actualmente no cuenta con una fuente alternativa de agua potable, lo que nos deja vulnerables si se interrumpe el suministro de Portland debido a una rotura de la tubería o a un desastre natural.¿Qué importancia tienen para usted los siguientes valores al considerar posibles fuentes alternativas?

Answered: 12   Skipped: 0




Preparación de la comunidad...
Suministro de agua segura ...
Ofrece el mejor valor...
Permite a nuestra...
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

🟩 1. No es importante 🟦 2. 🟨 3. 🟦 4. 🟧 5. Es muy importante

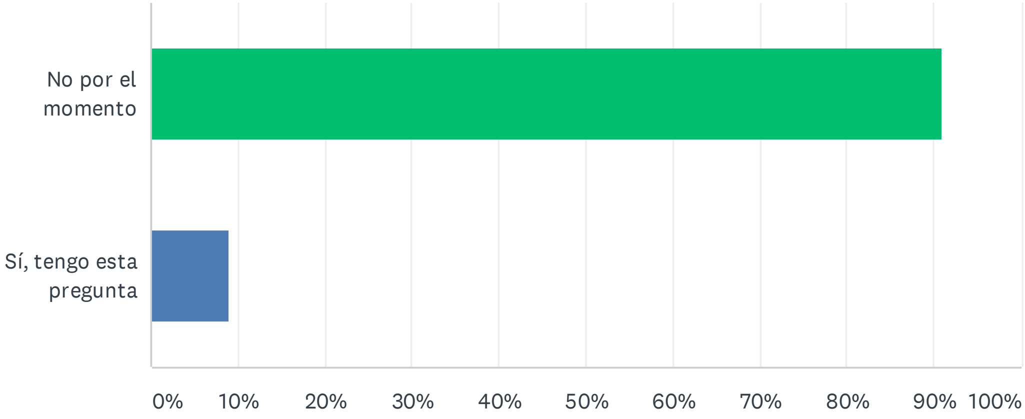
	1. NO ES IMPORTANTE (1)	2. (2)	3. (3)	4. (4)	5. ES MUY IMPORTANTE (5)	TOTAL
Conservación continua como una importante estrategia de la provisión del agua	0.00% 0	0.00% 0	8.33% 1	16.67% 2	75.00% 9	12
Preparación de la comunidad para el cambio climático global	0.00% 0	0.00% 0	8.33% 1	8.33% 1	83.33% 10	12
Provisión suficiente de agua para futuras necesidades	0.00% 0	0.00% 0	18.18% 2	0.00% 0	81.82% 9	11
Preparación de la comunidad para terremotos u otros desastres naturales	9.09% 1	0.00% 0	18.18% 2	0.00% 0	72.73% 8	11
Suministro de agua segura y de alta calidad	0.00% 0	0.00% 0	18.18% 2	0.00% 0	81.82% 9	11
Ofrece el mejor valor para los clientes	0.00% 0	0.00% 0	18.18% 2	18.18% 2	63.64% 7	11
Permite a nuestra comunidad ser buena administradora de nuestra agua y de nuestros recursos naturales	0.00% 0	0.00% 0	9.09% 1	9.09% 1	81.82% 9	11

BASIC STATISTICS

	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Preparación de la comunidad para terremotos u otros desastres naturales	1.00	5.00	5.00	4.27	1.29
Ofrece el mejor valor para los clientes	3.00	5.00	5.00	4.45	0.78
Provisión suficiente de agua para futuras necesidades	3.00	5.00	5.00	4.64	0.77
Suministro de agua segura y de alta calidad	3.00	5.00	5.00	4.64	0.77
Conservación continua como una importante estrategia de la provisión del agua	3.00	5.00	5.00	4.67	0.62
Permite a nuestra comunidad ser buena administradora de nuestra agua y de nuestros recursos naturales	3.00	5.00	5.00	4.73	0.62
Preparación de la comunidad para el cambio climático global	3.00	5.00	5.00	4.75	0.60

Q7 Dos de las fuentes alternativas que podrían estar disponibles para Tualatin son el agua del Río Clackamas tratada en la planta de tratamiento del agua de Lake Oswego en Tigard y el agua del Río Willamette tratada en las plantas de filtración en Wilsonville y Sherwood. ¿Tiene alguna pregunta sobre estas fuentes?

Answered: 11   Skipped: 1

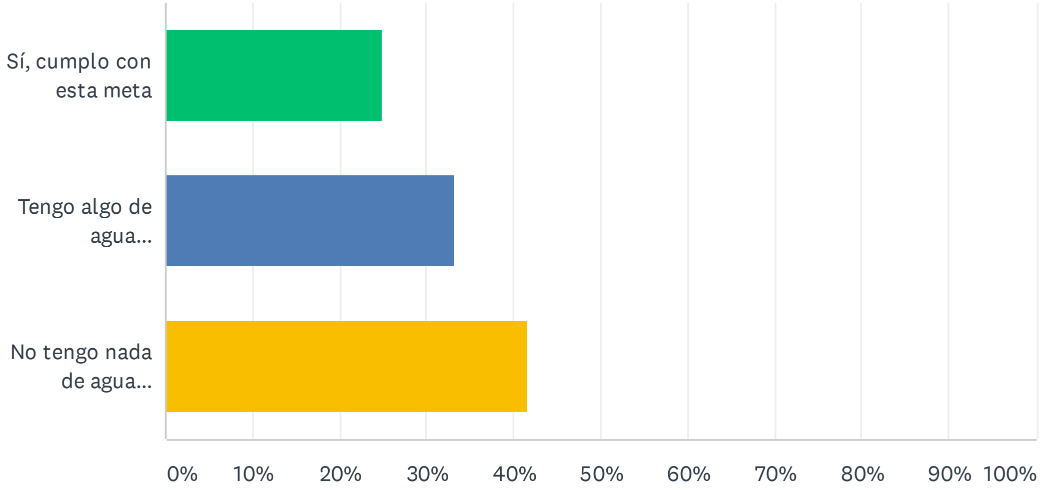


ANSWER CHOICES	RESPONSES	
No por el momento	90.91%	10
Sí, tengo esta pregunta	9.09%	1
Total Respondents: 11		

#	SÍ, TENGO ESTA PREGUNTA	DATE
1	Como tratanel agua.	9/14/2019 3:34 PM

Q8 ¿Tiene usted agua almacenada en su casa en caso de alguna emergencia?Necesita tener al menos un galón por persona o por mascota por día durante 14 días. Esa cantidad supone que usted utilizará aproximadamente medio galón para beber y otro medio galón para satisfacer las necesidades de higiene y preparación de los alimentos.

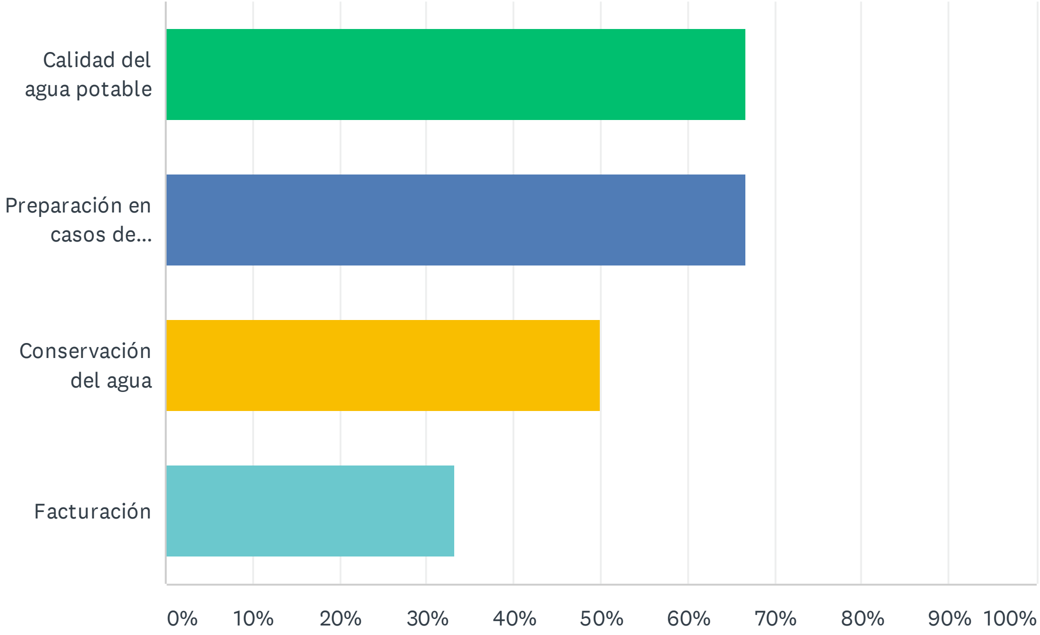
Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
Sí, cumplo con esta meta	25.00%	3
Tengo algo de agua almacenada, pero no la suficiente	33.33%	4
No tengo nada de agua almacenada	41.67%	5
TOTAL		12

Q9 ¿Sobre qué otros temas le gustaría a usted saber más? (Seleccione usted todos los que se le apliquen)

Answered: 12 Skipped: 0



ANSWER CHOICES	RESPONSES	
Calidad del agua potable	66.67%	8
Preparación en casos de emergencia	66.67%	8
Conservación del agua	50.00%	6
Facturación	33.33%	4
Total Respondents: 12		

Q10 ¿Qué otras preguntas tiene usted acerca de la estrategia del suministro de agua de nuestra comunidad?

Answered: 2 Skipped: 10

#	RESPONSES	DATE
1	Me gustaria saber si el agua potable es Buena para Tomar sin filtrar .¿	9/14/2019 4:47 PM
2	Me gustaria ser voluntario y ayudar con eventos y proyectos que van a hacer en el futuro.	8/6/2019 7:24 PM

Q11 ¡Participe escribiendo su nombre en el dibujo para un paquete de preparación en caso de alguna emergencia! No compartiremos su correo electrónico con otras organizaciones.

Answered: 12 Skipped: 0

ANSWER CHOICES	RESPONSES	
Nombre	100.00%	12
Compañía	33.33%	4
Address	0.00%	0
Address 2	0.00%	0
Ciudad/Pueblo	75.00%	9
State/Province	0.00%	0
Código Postal	58.33%	7
Country	0.00%	0
Correo Electrónico	50.00%	6
Phone Number	0.00%	0

#	NOMBRE	DATE
1	Edith Romero	9/14/2019 4:47 PM
2	Magdalena Torres	9/14/2019 3:34 PM
3	Lorenzo	9/14/2019 3:02 PM
4	Pedro Del Campo	9/14/2019 2:50 PM
5	Alva Rebolledo	9/14/2019 2:43 PM
6	Tavita rubio	9/14/2019 2:31 PM
7	Elizabeth	8/6/2019 7:35 PM
8	Omar lopez	8/6/2019 7:24 PM
9	Irania Roque	8/6/2019 7:09 PM
10	Jennypastrana	8/6/2019 7:02 PM
11	Armando Perez	8/6/2019 6:54 PM
12	Jesus vitela	8/6/2019 6:34 PM

#	COMPAÑÍA	DATE
1	971 732 09 13	9/14/2019 4:47 PM
2	5039987736	9/14/2019 3:02 PM
3	831-234-7247	9/14/2019 2:50 PM
4	AAA / Oregon	8/6/2019 6:34 PM

#	ADDRESS	DATE
	There are no responses.	

#	ADDRESS 2	DATE
	There are no responses.	

#	CIUDAD/PUEBLO	DATE
1	Tualatin	9/14/2019 4:47 PM
2	Tualatin	9/14/2019 3:34 PM
3	Tigard	9/14/2019 2:50 PM
4	Tualatin	9/14/2019 2:43 PM
5	Tualatin	9/14/2019 2:31 PM
6	Tualatin	8/6/2019 7:35 PM
7	Tualatin	8/6/2019 7:24 PM
8	Tualatin or	8/6/2019 6:54 PM
9	Tualatin	8/6/2019 6:34 PM

#	STATE/PROVINCE	DATE
	There are no responses.	

#	CÓDIGO POSTAL	DATE
1	97062	9/14/2019 4:47 PM
2	97062	9/14/2019 3:34 PM
3	97062	9/14/2019 2:43 PM
4	97062	9/14/2019 2:31 PM
5	97062	8/6/2019 7:35 PM
6	97062	8/6/2019 7:24 PM
7	97062	8/6/2019 6:54 PM

#	COUNTRY	DATE
	There are no responses.	

#	CORREO ELECTRÓNICO	DATE
1	torrez0403@comcast.net	9/14/2019 3:34 PM
2	uzimeldy@icloud.com	9/14/2019 2:43 PM
3	elizabethmoreno24@hotmail.com	8/6/2019 7:35 PM
4	503 9751588	8/6/2019 7:24 PM
5	willsonville97062@gmail.com	8/6/2019 6:54 PM
6	jesus1998us@yahoo.com	8/6/2019 6:34 PM

#	PHONE NUMBER	DATE
	There are no responses.	

Attachment B

Regional Water Opportunities

Regional Water Opportunities

Introduction

This attachment documents additional detail on current and potential supply connections that could be used in an emergency, in support of the Water Supply Strategy. Representatives from the City of Tualatin, The Formation Lab, and Murraysmith met with representatives from six local agencies: Portland Water Bureau, Tualatin Valley Water District (TVWD) and the Cities of Tigard, Lake Oswego, Sherwood and Wilsonville. A summary of existing and potential future water supply options based on the meetings with these providers is summarized in this memorandum.

Interviewed water agencies were also asked about their capacity to potentially provide long-term supply in the future. The intent was not to initiate a change in Tualatin's water supply, but instead to understand water supply availability in the region if Portland's water were to become unavailable or unaffordable. Though short-term supplies could be provided by several of the water agencies listed above, ***there is no water agency with excess supply available to meet the long-term needs of Tualatin***. Water utilities have designed their supplies to meet their own long-term needs and have not planned for excess capacity. Portland remains the most reliable source of long-term supply for the City of Tualatin.

This summary is provided only to understand potential opportunities and does not indicate an intent to provide emergency or non-emergency supply to or from any neighboring water provider.

Information in this attachment is organized by water agency, provided in alphabetical order: City of Lake Oswego, City of Sherwood, City of Tigard, Tualatin Valley Water District, and City of Wilsonville.

City of Lake Oswego

Existing Intertie:

- Existing intertie at 65th and McEwan. The intertie is on a 16-inch line, with a 12-inch connection through the vault.
  - The Hydraulic Grade Lines (HGL) at the intertie location are ~300 ft in the Tualatin system (connecting to Zone A) and ~320 ft in the Lake Oswego system.
  - In 2010, this connection was used to supplement Tualatin's supply for around a week.
  - Some documents have mentioned an additional 12-inch intertie along Macadam Avenue. Previous efforts have been unsuccessful in locating the intertie and it appears the previous mentions were in error.

Opportunities:

- Lake Oswego-Tigard Supply Connection. This opportunity is discussed below under City of Tigard.

Long-Term Supply:

- Lake Oswego and Tigard completed their supply expansion in 2007 (the Lake Oswego-Tigard Water Partnership) to meet their projected supply needs. Excess supply is not available.

City of Sherwood

Existing Interties:

- Existing 8-inch intertie is at Cipole Road and Galbreath Drive. The intertie is located at the extreme end of both systems and would have very limited capacity. In that area, the two systems also have hydrants next to each other that could be used for an above-ground connection between two 12-inch lines.
- Sherwood Emergency Supply Main. A 24-inch pipeline was constructed in the late 90s to wheel TVWD water from Portland through the Tualatin Supply Main to Sherwood, with a design capacity of 3 MGD.
    - It was designed to deliver water to Sherwood's distribution system (HGL 380 ft). Right now, the line is filled with three-year-old water because it is not being used.
    - On Tualatin's end, it passes through Zone A and connects directly to the Tualatin Supply Main, allowing this connection to serve Zone A or connect to the A2 Reservoir. It could serve Zone B by back-feeding the Tualatin Supply Main, if more pressure were available.
    - Under current conditions, capacity to Tualatin is limited by hydraulic restrictions and system pressures (380 HGL) in Sherwood.

Opportunities:

- Improved Sherwood Emergency Supply Main. There is an opportunity to make improvements on the Sherwood side of the Sherwood Emergency Supply Main.
    - The improvements would increase both the available flow and the pressure, allowing the pipeline to serve Zone B and from there reach all areas of the Tualatin system.
    - The pipeline would need to be extended within Sherwood around ¾ of a mile to where the Willamette Supply enters the system via a 48-inch diameter line (HGL around 470 ft).
    - Cost for this project would be on the order of $2M for ¾ mile of 24″ pipe but would depend on the specific route and requirements.
    - Capacity would be anticipated to be 3+ MGD.

Long-Term Supply:

- Sherwood does not have long-term supply available. Sherwood's owned capacity in the Willamette Intake Facility is limited to their projected long-term demands. This would not leave any supply available to wholesale to Tualatin or any other agency.
- Sherwood does have excess capacity available in the short term and available capacity in their supply pipeline. A short-term arrangement would not be beneficial to the City.

City of Tigard

Existing Interties:

- Boones Ferry & Lower Boones Ferry Intertie. This is a single 10-inch to 10-inch intertie.

- Bridgeport Intertie. Located at 72nd & Boones Ferry, there is both a fire flow connection (10-inch to 10-inch) and a separate intertie (10-inch to 10-inch) near this location. The intertie is just around the corner and can connect into the distribution system in Zone A, with an HGL of ~410 ft on the Tigard side and ~295 ft on the Tualatin side. This intertie an also connect to the Tualatin Supply Main. As its pressure is lower than the normal pressure in the Tualatin Supply Main, Portland's supply would need to be valved off (which would likely be the case if the Tualatin Supply Main were out of service). There is also very limited capacity available in the Tigard system at this location. Because of the reversed hydraulics and the limited capacity, the ability to serve Zone B through the Tualatin Supply Main via this connection is questionable and this intertie is listed as serving Zone A only.

Opportunities:

- Lake Oswego/Tigard Supply Connection. There is an opportunity for a supply line intertie at Florence Lane and SW 80th Avenue, where the Lake Oswego-Tigard supply pipeline (downstream of the Bonita Pump Station) crosses the Tualatin Supply Main.
  - For Tualatin, the benefit of this connection is redundant with the TVWD/Tualatin Flow and Eddy Pump Station. It would connect just south of TVWD's Metzger Connection and is reliant on the Tualatin Supply Main being intact.
  - This is sometimes confused with a proposed regional intertie at Bradley Corners. Further to the west, the Lake Oswego-Tigard pipeline crosses near an existing 24-inch Portland water supply pipeline (formerly used by Metzger and Tigard) at Bradley Corners. Other agencies are considering a major intertie connecting the Lake Oswego-Tigard, Portland and Willamette supplies at this location. The cost for this connection would be in the millions—the pipelines are relatively close together, but the connection is deep. The Bradley Corners intertie would not connect to the Tualatin Supply Main or Tualatin's distribution system.

Long-Term Supply:

- Lake Oswego and Tigard completed their supply expansion in 2007 (the Lake Oswego-Tigard Water Partnership) to meet their projected supply needs. Excess supply is not available.

Tualatin Valley Water District

Existing Interties:

- TVWD/Tualatin Flow and Eddy Pump Station
  - TVWD and Tualatin jointly invested in the Flow and Eddy Pump Station that can wheel water through TVWD into the Washington County Supply Line to reach Metzger and Tualatin.
  - Capacity is 10 MGD, with Tualatin owning 5 MGD of the capacity. The full 10 MGD of capacity would be available to Tualatin if TVWD did not need the water at the same time.
  - This pump station relies on the Metzger-Tualatin Supply Line and Tualatin Supply Main being in good condition and available to carry water.

  - The pump station is designed to be connected to the system at the existing flow meter where the Metzger-Tualatin Supply Line connects to the Washington County Supply Line.
- TVWD Metzger Bypass Opportunities
  - Though not formal interties, there are a number of ways to bypass portions of the southern main of the WCSL and the upper portion of the Tualatin Supply Main using distribution piping in Metzger (labelled in maps as the Metzger Bypass). However, the best of these will provide about half of Tualatin's average day demand.
  - This approach was recently used to enable air valve replacement on a portion of the Tualatin Supply Main. During that event, normal pressures were maintained, but flow into the system was significantly less than normal. Tualatin relied on existing storage and the reduced flow into the system for approximately 24 hours while the Metzger Tualatin Supply Line was depressurized.
- Willamette Water Supply System (WWSS) Intertie
  - The existing connection is a 12-inch tee off of the 72-inch transmission line. The connection was constructed to provide construction water to the WWSS transmission pipeline along 124th Avenue, connecting to Zone A.
  - Upsizing of the existing connection could increase flow but would still be limited in capacity by its connection to the distribution system (connecting to two pipes, 12- and 16-inches in diameter respectively). It has sufficient pressure (HGL ~530 ft) to serve Zone B, but only connects to Zone A.

Opportunities:

- Sherwood Emergency Supply Main + WWSS Water Treatment Plant Connection
  - The Sherwood Emergency Supply Main passes by the WWSS Water Treatment Plant property near the intersection of SW 124th Avenue and SW Tualatin-Sherwood Road.
  - A connection between the Sherwood Emergency Supply Main and the WWSS would allow WWSS water to be fed directly into the Tualatin Supply Main. This combined backup supply connection would likely be able to meet Tualatin's full demands and would use Tualatin's existing internal transmission pipelines and pump station to distribute water throughout the City.

Long-Term Supply:

- Similar to Sherwood, TVWD does not have long-term supply available. TVWD's capacity in the Willamette Water Supply System is designed to meet their full needs, but not to provide excess capacity for wholesale.
- Similar to Sherwood, TVWD does have excess capacity available in the short term. A short-term arrangement would not be beneficial to the City.

Wilsonville

Existing Intertie:

- C Level Intertie. Tualatin and Wilsonville prepared to use the existing 10-inch diameter intertie in 2019 because Wilsonville needed water.
  - Existing intertie does have an intertie agreement (Tualatin has a copy).

    - Existing intertie connects Wilsonville's Level C to Tualatin Zone C. The reservoirs are at the same level and hydraulics are very flat. However, in a supply interruption, reservoir level will likely drop in the receiving system.

Opportunities:

- Basalt Creek Intertie. A new intertie around the Basalt Creek area could be possible, connecting Wilsonville's Level B to Tualatin's Zone B.
    - Both agencies plan to eventually build reservoirs at this level.
    - Similar to the existing intertie, reservoirs in the adjacent zones would be at similar elevation creating flat hydraulics.

Long-Term Supply:

- No long-term supply is available. Capacity in the Willamette Intake Facility (WIF) and the Willamette River Water Treatment Plant are only sufficient to meet Wilsonville's needs.

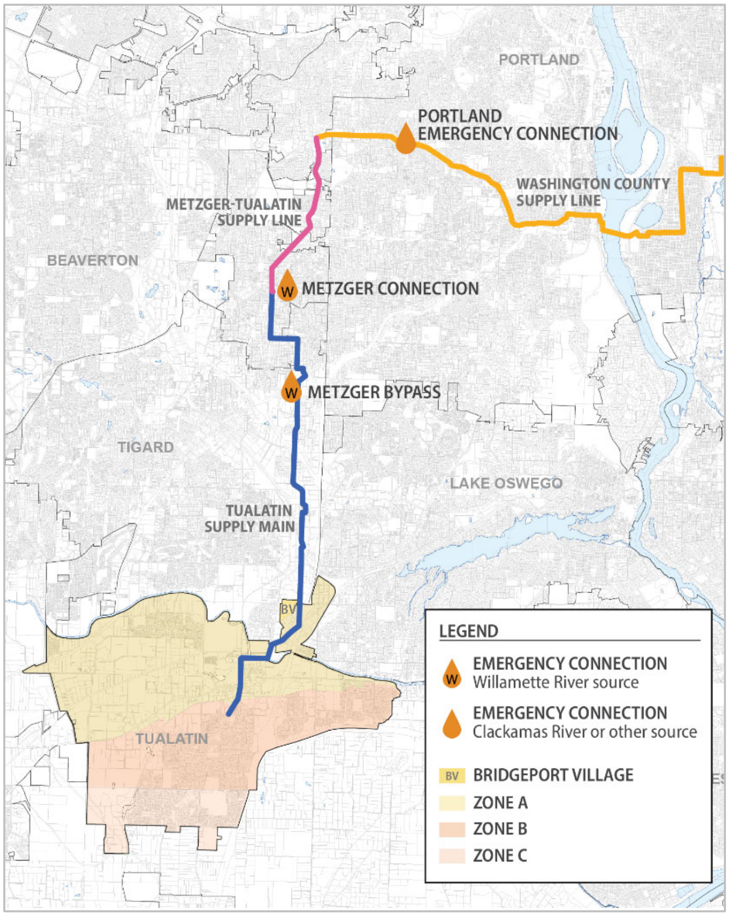
Attachment C

Portland Water Bureau’s Planned Response to an Outage of the Washington County Supply Line

Portland Water Bureau's Planned Response to an Outage of the Washington County Supply Line

The information provided here is based on discussions with Portland Water Bureau staff in April 2020. There are two main ways to serve water to the Washington County Supply Line (WCSL) in an emergency, depending on the section of pipeline that is out of service. The main backup supply connects with the Burlingame system and is not considered seismically resilient. The second option relies on the new, resilient, Willamette crossing.

Main Backup



If the WCSL is out of service from the river to the east, then there is another crossing at the Sellwood Bridge to the south. It goes to two pump stations: the Hannah Mason Pump Station (PS) in Willamette Park and the Carolina PS, located several blocks north. Both of those station pump water up the hill to the Burlingame Tanks and Westwood Tank, located a bit South of Wilson Highschool—this hydraulic area is referred to as the Burlingame System.

Downstream of those pump stations there is an intertie between the Burlingame System and the WCSL, located near the intersection of Bertha Boulevard and Beaverton Hillsdale Highway. This location is labelled "Portland Emergency Connection" in the adjacent figure. There is a large regulating station that regulates the pressure down to WCSL pressures at that location.

Secondary Backup

The WCSL can also be supplied from downtown Willamette River crossings, including the new seismically resilient crossing. There is a normally closed valve just north of the Carolina PS that connects water from the downtown crossings to the Burlingame System and then to the WCSL. This backup would connect to the WCSL at the same location as the Main Backup.

The crossing was designed to be large enough to supply the wholesale customers and the west side of the City of Portland. However, other improvements in the distribution system would need to be made to meet the full summer demands for wholesale and retail customers. Without those improvements, water would be available at an emergency level (likely somewhere between winter and average demands).

Studies

PWB is currently working on a Supply System Master Plan that applies to all pipelines upstream of terminal storage. This study did not include the WCSL because it is downstream of terminal storage. The WCSL will be included in the bureau's Distribution System Master Plan. That project has not yet been scoped and it is not known how much of the emergency capacity analysis will be included in the study.

murraysmith

APPENDIX C
PUMP STATION HYDRAULIC PERFORMANCE CURVES

TESTING

SECTION# 44 42 56.10

EQ TAG# PMP-0402A & PMP-0402B

CERTIFIED PERFORMANCE & HYDROSTATIC TESTING (NON-WITNESSED)

APPROVAL OF TEST RESULTS REQUIRED PRIOR TO RELEASE OF EQUIPMENT FOR SHIPMENT

NOTE:
CERTIFIED PERFORMANCE TESTS
TO BE INSERTED HERE IN THE
FINAL O & M MANUAL

TEST PAGE #'S WILL BE 1 THUR 6 AND INSERTED HERE IN FINAL O & M MANUAL

Type Test Report
Three-Phase Induction Motors

Serial Number
PT16525

WEG Indústrias S.A. - Motores
Departamento de Controle da Qualidade

08/10/2009

Customer:WEG ELECTRIC MOTORS CORP.
Order: -

IDENTIFICATION

Item: -
Model: 364/5T
Assembly: B3R
Approximate weight: - kg
Design: B
Ins. Class: F (80K)

Voltage: 208-230 / 460 / 380 V
Current: 189-171 / 85.3 / 102 A
Power: 75 HP
Frequency: 60 / 50 Hz
Full load Speed: 1780 / 1465 rpm
Time Rating: S1

Service Factor: 1.15
Enclosure: IP23
Power Factor: -
Eff. - 75%: -
Eff. - 100%: -
Il/In: -

TESTS - CSA C390 - Method 1

1. Resistance Measurement

Resistance: 0.1232 Ohms
Ambient Temp.: 21.70 °C
Connection: Delta

2. Locked Rotor Test

Voltage: 460 V
Frequency: 60 Hz
Current: 540.01 A
Power: 195.29 kW
Tl/Tn: 2.31

3. Temperature Rise Test

Voltage: 460 V
Frequency: 60 Hz
Service Factor: 100.00%
CoilTemperature Rise: 37.1 K
DE Bearing: 21.4 K

4. Load Test

Voltage: 460 V
Frequency: 60 Hz
Full load torque (Tn): 30.06 mkgf
(1 mkgf / mkp = 9.813 Nm)

% of Full Load	Current (A)	Speed (rpm)	Efficiency (%)	Cos Ø
50	49.43	1790	94.1	0.74
75	66.08	1785	94.2	0.83
100	84.71	1779	93.6	0.87

5. No Load Test

Voltage: 460 V
Frequency: 60 Hz
Current: 27.10 A
Losses: 1081.00 W

6. Break-down Torque Test

Voltage: 460 V
Frequency: 60 Hz
Tb/Tn: 2.73

7. High Voltage Test

Voltage: 1920 V
Time : 60 seconds

8. Insulation Resistance Test

Resistance: 5000 MOhms
Ambient Temp.: 20.6 °C

NOTES

The values included in this report refer to an unit electrically identical.

ACCEPT

Sonia Regina Diel
Laboratory WEG
Tested on 09/29/2007

Sonia

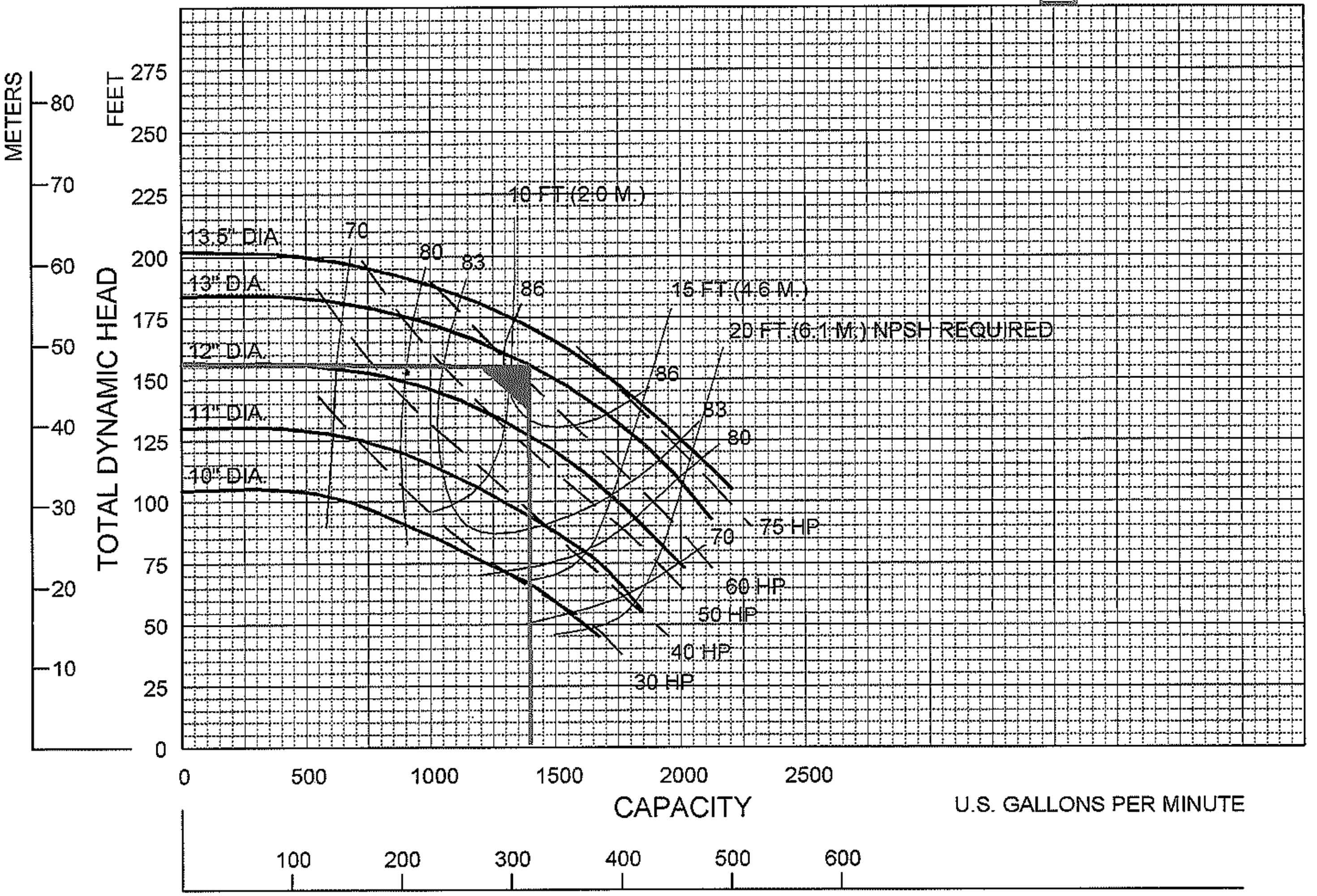
Witness:

Feet x .305 = Meters
Inches x 25.4 = Millimeters
GPM x .227 = Cubic Meters/Hour
GPM x 3.785 = Liters/Minute
HP x .746 = KW

Speed	Impeller Dia.	Style	Solids Dia.	N_S	Suction	Discharge	No. vanes
1780	VARIOUS	ENCLOSED	1.0"	1654	8"	5"	6

DOUBLE VOLUTE

MOUNTING CONFIG.: CC, VM, F, VF, EM, VC



Performances shown are for cool water, close-coupled electric configuration with packing. Other mounting styles or liquids may require horsepower and/or performance adjustments.

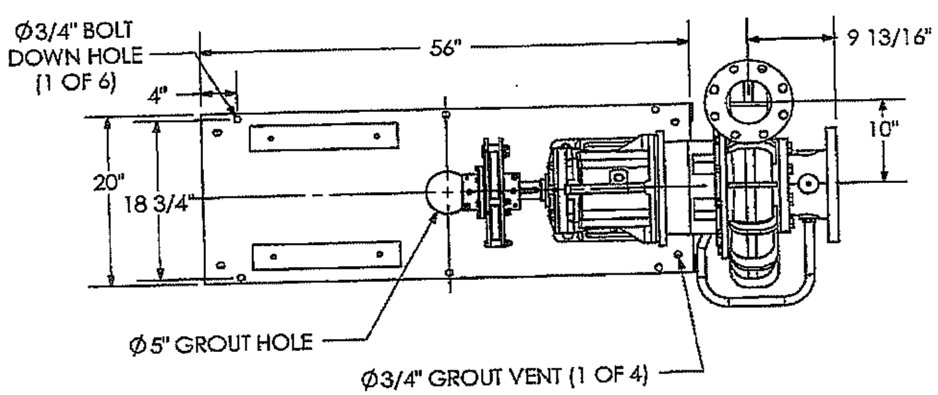
CONDITIONS: 1400 GPM @ 156' TDH

7/99

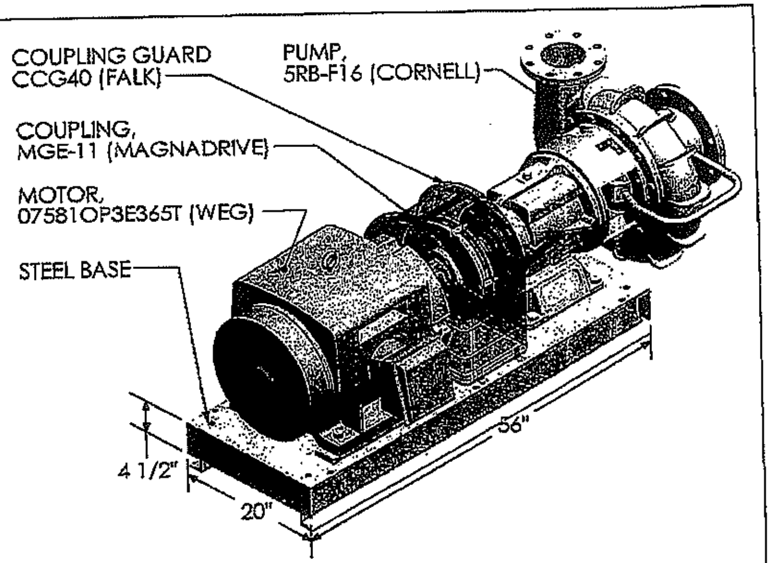
Cornell Pump Company • Portland, Oregon

5RB - 1800 RPM

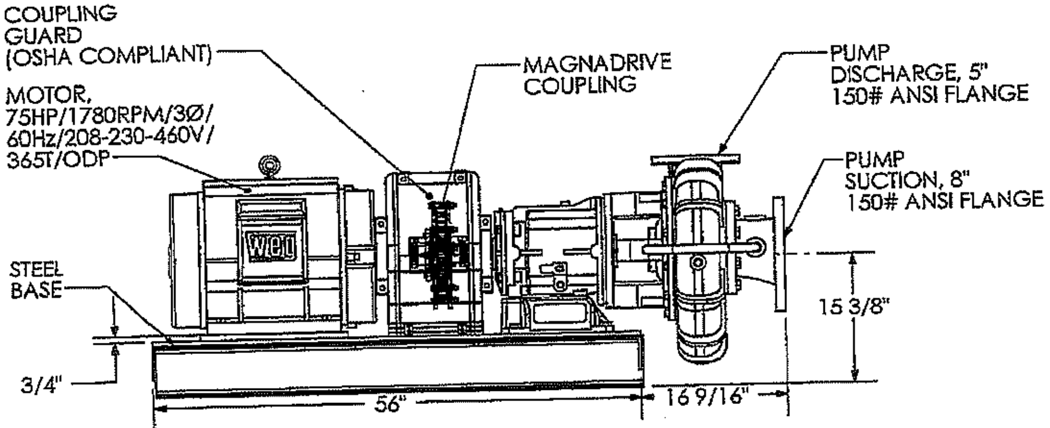
NOTE: OPERATING CONDITION ACHIEVED BY 13 1/2" IMPELLER DIAMETER @ 1725 RPM



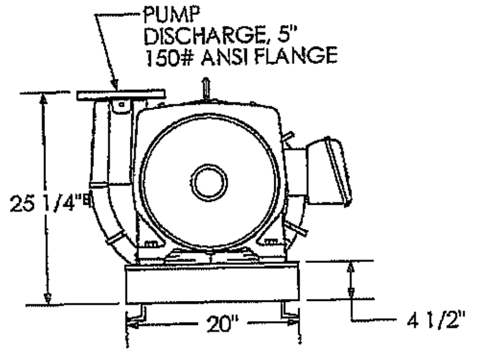
TOP VIEW - DETAIL



ISO VIEW



SIDE VIEW



FRONT VIEW

UNLESS OTHERWISE SPECIFIED:		NAME	INIT.	DATE
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: +/- 1/8 ANGULAR: 1DEG ONE PLACE DECIMAL +/-0.2 TWO PLACE DECIMAL +/-0.07	DRAWN	MAO		05-14-09
	CHECKED	A.B.		
	SALES APPR.	G.C.		
	PURCH.APPR.			
INTERPRET GEOMETRIC TOLERANCING PER:	MFG APPR.			
MATERIAL Steel				
FINISH				
DO NOT SCALE DRAWING				

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF PUMPTECH, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF PUMPTECH, INC. IS PROHIBITED.

PumpTech inc.

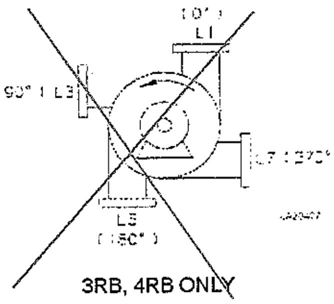
QUOTE# 79057

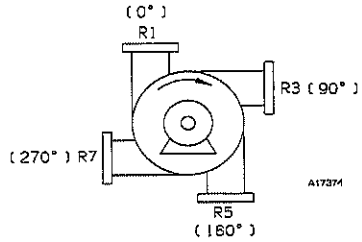
CITY OF TUALATIN

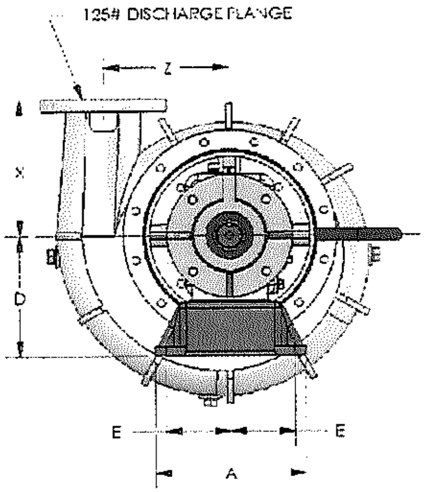
NORWOOD P.S.

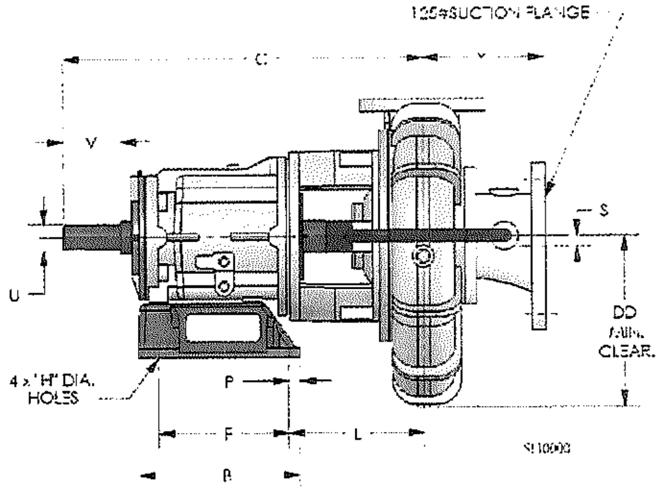
PUMP/MOTOR BASE

SIZE	DWG. NO.		REV
A	M01554		
SCALE: 1:20	WEIGHT: ~3,000	SHEET 1 OF 1	









NOTES:

a. Discharge positions viewed from the drive end.

b. Consult factory for other discharge positions.

NOTES:

1. "V" Dimension is maximum useable shaft.
2. Frame mounting foot thickness is .75".
3. Flange connection dimension can vary ± .12 inch.
4. Do not use for construction unless certified.

PUMP DIMENSIONS

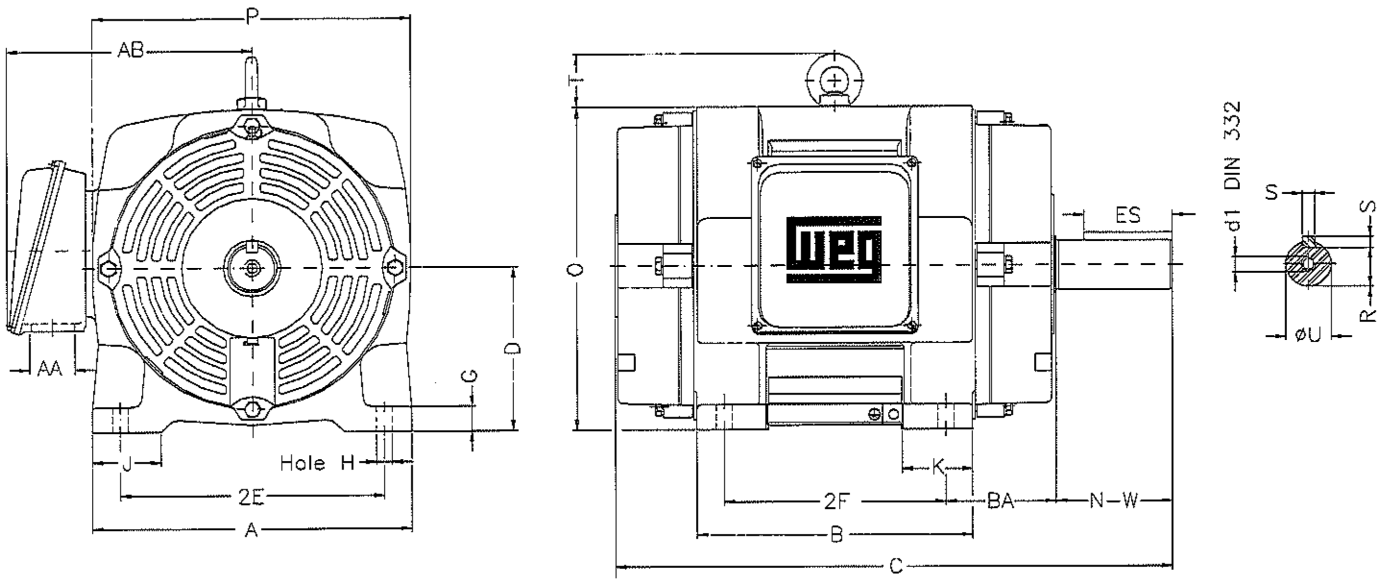
MODEL	FRAME	CONNECTION		A	B	C	D	DD	E	F	H	L	P	S	T	U	V	X	Y	Z	KEYWAY
		DISCH.	SUCT.																		
2.5RB	F16	2.5	4	12	12.88	25.5	9.75	9	5.12	10.38	0.81	7.65	0.88	-	2.87	2	4.5	9.75	6	6.75	.50X.25
3RB	F16	3	5	12	12.88	25.62	9.75	10	5.12	10.38	0.81	7.78	0.88	-	3	2	4.5	8.5	5.25	7.75	.50X.25
3RC	F16	3	5	12	12.88	25.62	9.75	10	5.12	10.38	0.81	7.78	0.88	-	3	2	4.5	8.5	5.25	7.75	.50X.25
4RB	F16	4	6	12	12.88	25.75	9.75	11	5.12	10.38	0.81	7.9	0.88	-	3.12	2	4.5	10	7.38	8	.50X.25
4RC	F16	4	6	12	12.88	25.75	9.75	11	5.12	10.38	0.81	7.9	0.88	-	3.12	2	4.5	10	7.38	8	.50X.25
5RB	F16	5	8	12	12.88	28.62	9.75	14.25	5.12	10.38	0.81	10.77	0.88	0.88	3.47	2	4.5	11	9.78	10	.50X.25
5RB-S	F16	5	8	12	12.88	25.38	9.75	14.25	5.12	10.38	0.81	7.53	0.88	0.88	3.47	2	4.5	11	9.78	10	.50X.25
5RC	F16	5	8	12	12.88	25.38	9.75	14.25	5.12	10.38	0.81	7.53	0.88	0.88	3.47	2	4.5	11	9.78	10	.50X.25
6RB	F16	6	10	12	12.88	29.06	9.75	15.38	5.12	10.38	0.81	11.21	0.88	1	3.91	2	4.5	11	9.91	9.5	.50X.25
6RB-S	F16	6	10	12	12.88	25.81	9.75	15.38	5.12	10.38	0.81	7.97	0.88	1	3.91	2	4.5	11	9.91	9.5	.50X.25
6RC	F16	6	10	12	12.88	25.81	9.75	15.38	5.12	10.38	0.81	7.97	0.88	1	3.91	2	4.5	11	9.91	9.5	.50X.25

12/15/2005

CORNELL **CORNELL PUMP COMPANY**

R-SERIES HORIZONTAL F16 FRAME MOUNTED PUMPS
WITH TANGENTIAL VOLUTE

DIM2066



Notes:

Performed by:

Checked:

Customer: City of Tualatin - Norwood PS

W21 Severe Duty and General Purpose - High Efficiency - Three-Phase : ODP (IP21/IP23)

Three-phase induction motor

5/11/2009

Frame 365T - IP23

Version

2E 14.000	2F 11.250/12.250	H 0.657	BA 5.875	A 17.170
B 15.400	C 29.764	D 9.000	G 1.480	J 3.150
K 4.140	O 18.425	P 17.874	T 2.795	ES 4.330
S 0.625	N-W 5.874	U 2.375	R 2.019	AB 16.378
AA NPT 3	d1 DUNC 3/4-10			

MARTINAZZI BOOSTER

11A. CENTRIFUGAL PUMP

A. SCOPE

This section covers the work necessary for furnishing and installing the centrifugal water booster pump including the pump assembly, electric motor and accessories. The pump will be used to pump potable water to the City of Tualatin's Level B reservoir.

MANUFACTURER'S REPRESENTATIVE. The manufacturer of the centrifugal pump shall furnish the services of a qualified representative to supervise the unpacking, installation, and field testing of pump equipment at no cost to the Contractor.

Upon completion of the pump installation, the manufacturer's representative shall issue certificates showing:

- Condition of pump upon unpacking at jobsite.
- That the handling of pump equipment was satisfactory to the manufacturer.
- The installation is as specified and is acceptable to the manufacturer.
- The warranty or guarantee is in full effect with no qualifications or reservations.

B. MATERIALS

OWNER FURNISHED MATERIAL. The owner shall furnish the required pumps in accordance with the conditions in Section 1A, GENERAL REQUIREMENTS. The pumps will be Cornell Pump Co. Model 4WB vertical mounted with a 50 H.P. motor.

The pumps shall have the following characteristics:

Speed	3600 RPM
Total Dynamic Head	80 Ft. @ 1200 GPM 196 Ft. @ 600 GPM
Impeller	7 1/16" Diameter Bronze
Volute	Cast Iron
Mechanical Seal	Single

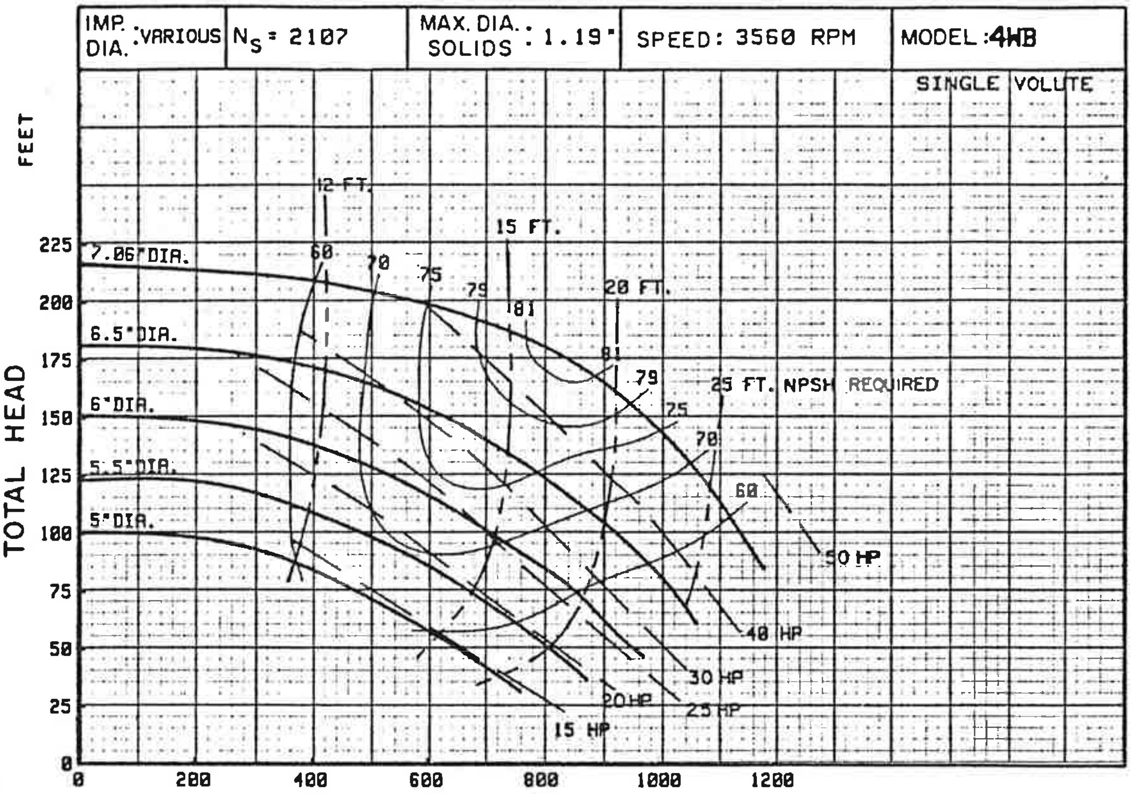
MODEL 4WB

SPEED 3600 & 1800 RPM

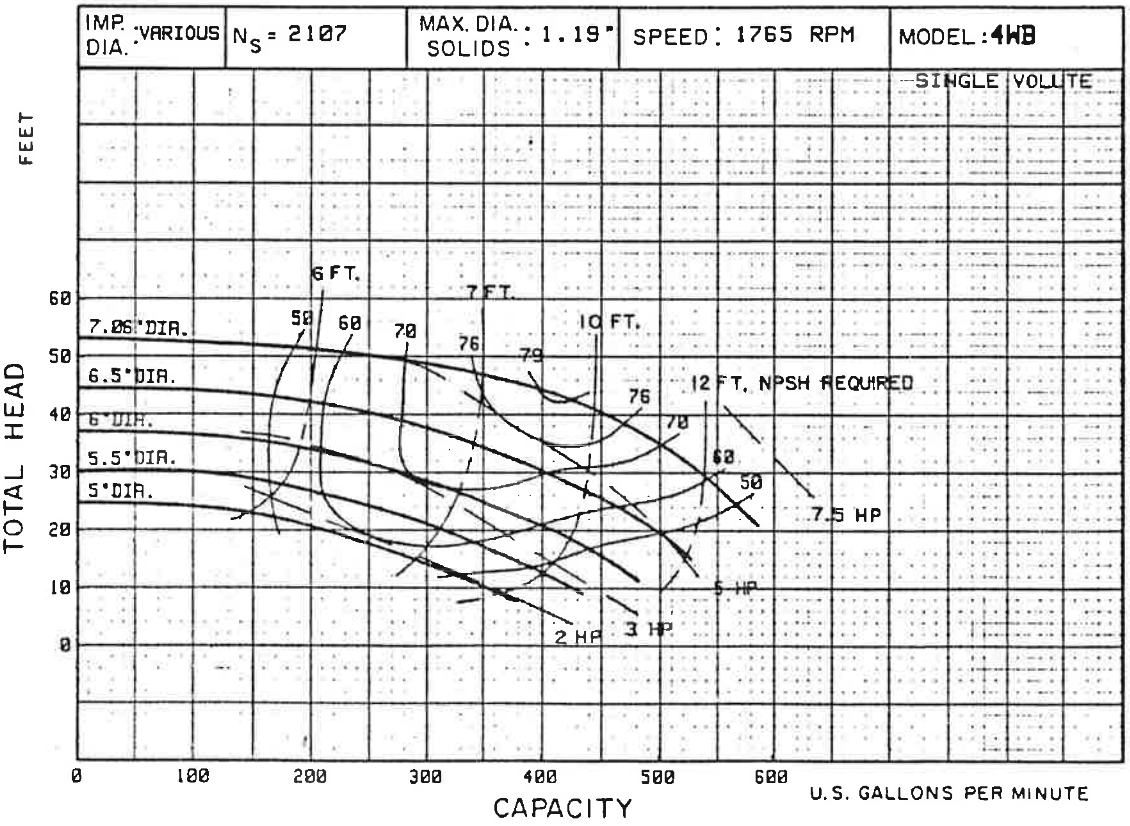
VARIOUS IMPELLER

60 HERTZ

Performances shown are for close coupled electric configuration with packing. Other styles may require horsepower and/or performance adjustments.



FT. x .305 = METERS
GPM x .227 = CUBIC METERS PER HOUR



APPENDIX D
CITY OF TUALATIN WATER SYSTEM HYDRAULIC CALIBRATION MEMO, MURRAY, SMITH & ASSOCIATES, INC., 2017

MSA
Murray, Smith & Associates, Inc.
Engineers/Planners
888 SW 5th Avenue, Suite 1170 ▪ Portland, OR 97204 ▪ PHONE 503.225.9010 ▪ FAX 503.225.9022

MEMORANDUM

DATE: June 6, 2017

PROJECT: 16-1826

TO: Jeff Fuchs, PE – City Engineer/Public Works Director
City of Tualatin

FROM: Brian M. Ginter, PE
Michael L. McKillip, PE
Murraysmith

RE: City of Tualatin Water System Hydraulic Model Calibration

Introduction

The City of Tualatin (City) requested Murraysmith perform a calibration update to the water system hydraulic model. The model was originally developed prior to the 2003 Water Master Plan (WMP) and more recently updated for use with the 2013 WMP. Due to budget constraints and limited calibration data, the calibration effort for the 2013 WMP was limited to spot checking of static pressure conditions. This memorandum summarizes the calibration update work.

Model Calibration Overview

Model calibration typically involves adjusting model parameters to match field data, such as pressure and flow measurements recorded at system fire hydrants. The required level of model accuracy can vary according to the intended use of the model, the type and size of water system, the available data, and how the system is controlled and operated.

Model accuracy depends on the quality of the data available for the distribution system. Accurate system modeling assumes correct pipe connectivity, diameter, internal roughness and length. Knowing the status of system facilities, including pumps and reservoirs, referred to as "boundary conditions" is also critical during calibration.

The first component of model calibration is to match field-measured static pressure with model simulated pressure. Ideally, model results would be identical to those measured in the field; however, for any system a portion of the data describing the distribution system will be inaccurate or unverified, and some assumptions will be required. During steady state calibration, demand distribution, system connectivity, service elevations, boundary conditions and any assumptions used to develop the model are verified.

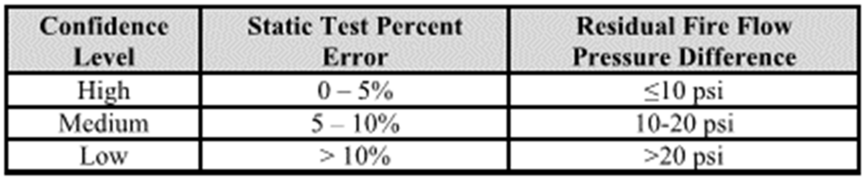
The second component of calibration utilizes fire flow tests to verify pipe diameters, connectivity and friction factors along with system boundary conditions such as pump operation and reservoir level. Fire flow testing consists of recording static pressure at a hydrant and then “stressing” the system by flowing an adjacent hydrant. While the adjacent hydrant is flowing, residual pressure is measured at the first hydrant to determine the pressure drop that occurs when the system is “stressed”. Boundary condition data, such as reservoir levels and pump on/off status, must also be known to accurately model the system conditions during the time of the flow test. The recorded time of each fire hydrant flow test is used to collect boundary condition information from the City’s system supervisory control and data acquisition (SCADA) system.

City of Tualatin Model Calibration

For the City’s water system distribution model, thirty hydrant flow test were performed between September 7, 2016, and September 21, 2016. Test were conducted in all service levels (12 each in level A and B, 6 in level C). Hydrant test locations and flow test instructions were provided in the “Fire Hydrant Flow Testing for Water System Hydraulic Model Update” memo (August 1, 2016). Fire flow test location are shown on Figure 1. Table 1 summarizes the field measured and model simulated static and residual pressure for each flow test.

Overall the calibration was good and model confidence can be considered Medium-High based on the calibration criteria outlined in Table 2 below. In general, pressure drops due to fire flow tests were underestimated in the model. The fact that this model is underestimating pressure drop does not mean that it should not be used or that model results are not valid; however, this should be kept in mind when using the model for system analysis.

Table 2
Model Calibration Criteria



Confidence Level	Static Test Percent Error	Residual Fire Flow Pressure Difference
High	0 – 5%	≤10 psi
Medium	5 – 10%	10-20 psi
Low	> 10%	>20 psi

Model results are sensitive to boundary conditions such as reservoir levels and valve settings (pressure reducing valves, PRVs, and flow control valves, FCVs). In this model, results are particularly sensitive to settings at the main PRV stations from the Portland Supply line into service levels A and B. Based on flow test data it appears that flow is being controlled primarily by FCV settings as opposed to PRV settings. Settings for these valves should be considered carefully when using this model to perform analysis as the results can vary significantly if FCV or PRV valves are changed.

MLM:sam

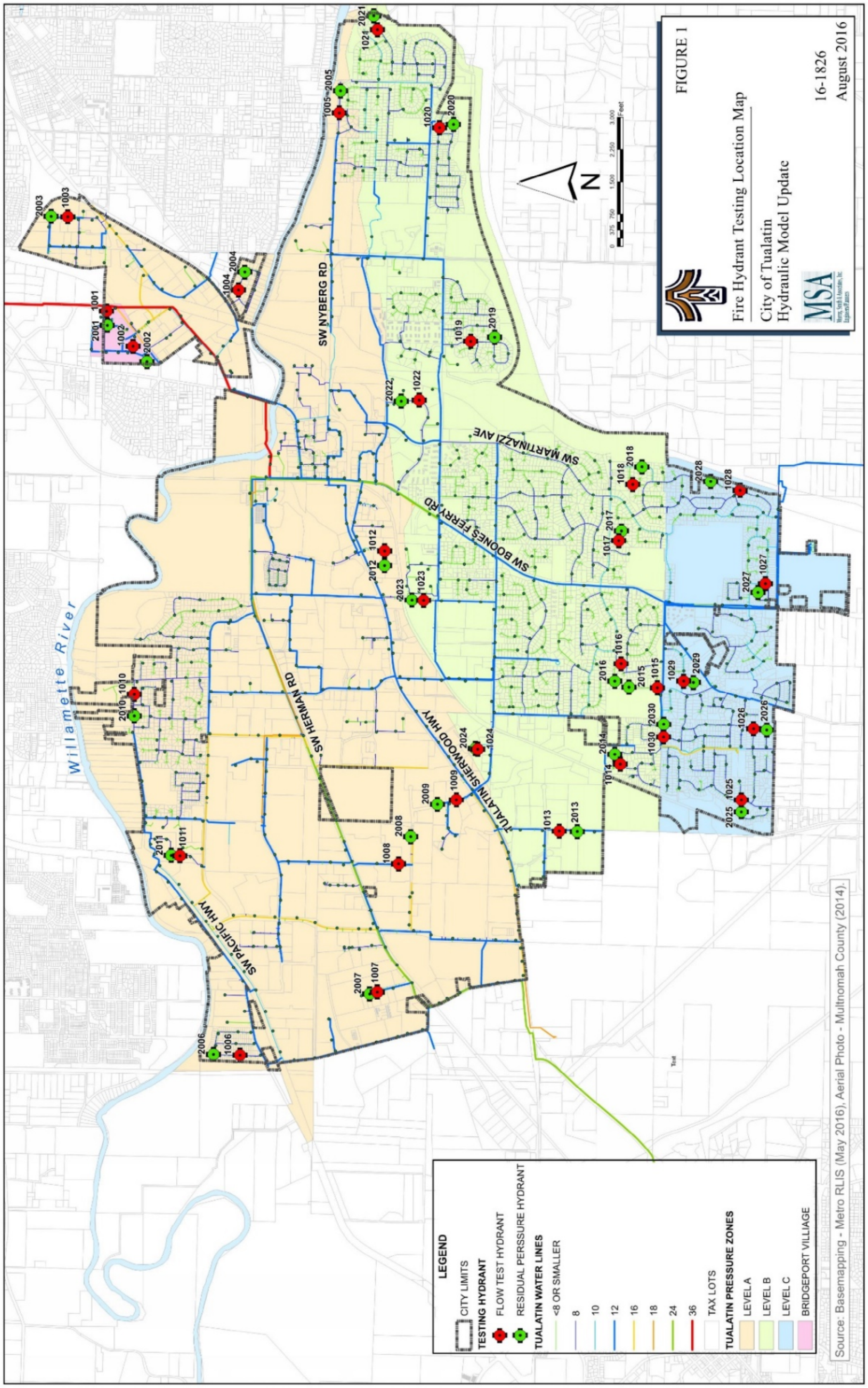


FIGURE 1

Fire Hydrant Testing Location Map

City of Tualatin
Hydraulic Model Update

16-1826
August 2016

Source: Basemapping - Metro RLIS (May 2016), Aerial Photo - Multnomah County (2014).

murraysmith

APPENDIX E
WATER SYSTEM CAPACITY ANALYSIS - BASALT CREEK, MURRAYSMITH 2021

Technical Memorandum

Date: June 29, 2021

Project: 20-2737.0407

To: Mr. Casey Fergeson, PE
Ms. Kim McMillan, PE
City of Tualatin

From: Brian Ginter, PE
Claire DeVoe, PE

Re: Water System Capacity Analysis – Basalt Creek Service

Introduction

The City of Tualatin's Basalt Creek Planning Area located at the south end of the C Level is beginning to develop with two developments currently moving into land use approval. Based on preliminary planning completed for the Water System Master Plan (WSMP, Murraysmith 2021), the system has adequate storage capacity to meet the developments' needs. However, existing transmission limitations through the B Level and fire flow requirements that exceed existing maximum available supply in the C Level require transmission improvements in both the B and C Levels prior to development. The complete findings from this report are summarized in the last section, *Summary and Recommendations.*

Basalt Creek Development

The two proposed developments are located in the Basalt Creek Planning Area of the C Level (see **Figure 1**). Community Partners for Affordable Housing (CPAH) is a proposed multifamily development with 116 planned units located off SW Boones Ferry Road. Autumn Sunrise includes approximately 400 planned single family residential homes located east of SW Boones Ferry Road and west of I-5. Together, these developments represent an increase of 486 Equivalent Residential Units (ERUs, 0.75 multifamily units/ERU). **Table 1** summarizes the two developments.

Table 1
Basalt Creek Developments

Development	CPAH	Autumn Sunrise
Type	Multifamily	Single Family
Units	116	400
ERUs[1]	86	400
Required Fire Flow (gpm)[2]	1,500	1,000

1. ERUs calculated as 1 ERU/single family unit and 0.75 ERUs/multifamily unit.
2. It is assumed that on-site fire suppression sprinklers will be installed to fire flow capacity requirements in excess of these values.

There is sufficient storage in the C Level to support the development of up to 900 ERUs (see WSMP, Section 5). However, the existing system has transmission limitations. During peak summer demands, the City has difficulties maintaining adequate water levels in both the B and C Reservoirs due to insufficient transmission capacity from the Portland Supply at Boones Ferry Road north of SW Sagert Street to the B Level Reservoir Site at SW Norwood Rd. Adding additional customers to either the B or C Levels will increase the risk associated with this deficiency, resulting in declining reservoir levels that could leave insufficient fire and emergency storage available during multiple days of high water use. Additionally, the anticipated CPAH fire flow requirement exceeds the existing gravity supplied, C Level maximum available fire flow of 1,000 gpm. The rest of this document identifies improvements required in B and C Level transmission to meet the needs of the Basalt Creek developments.

Model Scenarios for Transmission Analysis

The hydraulic model was updated to include the two planned developments in the Basalt Creek area. The following table documents boundary conditions and reasoning for both the B and C Level Transmission analyses.

Table 2
Hydraulic Model Boundary Conditions for Transmission Analysis

Facility/Setting	C Level Transmission Scenarios	B Level Transmission Scenarios
Analysis Type	Available Fire Flow	Reservoir Filling
Criteria	Meet C Level fire flow requirements during MDD.	System to provide MDD to the B and C Levels and fill the B Level at historical rates without excessive strain on B and C Level Reservoirs and over pressurizing the B Level.
System Demand	MDD plus Fire Flow. Maximum planning flow rate to evaluate system hydraulics (flow and pressure)	MDD – Reservoir filling limitations occur during peak usage. Existing demands used to understand additional capacity with improvements.
Reservoir Levels	Emergency Storage Only – Assumes all operational, equalizing and fire storage is depleted, C Reservoirs at 14' (472.5' HGL).	Reservoirs at 75% (36', 388' HGL)- Reservoirs would likely be operating within this range during the summer.
Boones Ferry FCV/PRV Setting	Not Relevant to C Level gravity supply.	Pressure Control at 112 PSI – maximum pressure allowed at Boones Ferry to limit B Level over pressurization, from historical records and prior analysis.
ASR	Off – Does not affect C Level.	On – ASR offsets Boones Ferry required supply by about 350 gpm and is assumed to be operating under peak summer conditions.
C Level Pumps	Off – Conservative assumption as there is currently no certainty the pump station is on during a fire.	Off – Co-located at the Norwood site with the B Reservoirs. Does not change how water moves through the system.

1. MDD – maximum day demand; HGL – hydraulic grade line; Boones Ferry FCV/PRV – Boones Ferry Flow Control Valve/Pressure Reducing Valve; PSI – pounds per square inch; ASR – aquifer storage and recovery; gpm – gallons per minute.

C Level Transmission

Required transmission main improvements in the C Level are governed by the need to address fire flow capacity deficiencies. When the C Level Pump Station is off, the C Level Reservoirs are the sole supply to the C Level via a single 5,000 linear foot (lf), 12-inch diameter transmission line (see **Figure 1**). Available fire flow in the C Level is currently limited to approximately 1,000 gpm.

A fire flow analysis was run under various scenarios using the City's water system hydraulic model, summarized in **Table 2**. Deficiencies were analyzed at the maximum fire flow requirement in the zone (CPAH, 1,500 gpm) and the maximum elevation in the zone (adjacent to the ASR site, 1,000 gpm). Excess capacity was calculated in terms of ERUs under MDD conditions at a rate of 443 gpd/ERU (WSMP Section 3).

C Level transmission is currently adequate to provide 1,000 gpm fire flow required at single-family homes. However, the existing transmission is at its limit and should be upsized to serve the proposed 1,500 gpm fire flow required at CPAH. It is recommended to install a parallel transmission line from SW Norwood Road to SW Frobase Road prior to development of the Basalt Creek area (see **Figure 1** for proposed improvements). *The City may consider delaying this transmission upsizing temporarily to allow CPAH and Autumn Sunrise to develop by implementing operational changes to the C Level Pump Station, until the transmission upsizing is completed.* Operational changes to the pump station include:

- ***Prior to any additional development:*** Update the C Level Pump Station pump on-off settings to include pressure controls that would trigger the pumps to start in the event of a drop in C Level pressure due to a fire flow event.
- ***Before Summer 2022:*** Modify C Level Pump Station operations to make use of the variable frequency drives (VFDs) to pace flow to maintain constant reservoir levels with longer duration, lower rate pump run cycles. In coordination with this operational change, increasing the C Level Pump Station on setpoint (effectively reducing the operational storage volume and increasing the volume available for equalizing, fire suppression, and emergency). With active mixing of reservoir contents, deep cycling of the reservoirs is less important for maintaining water quality, especially during the peak summer season.
- ***Within the next 2 years:*** Add permanent onsite standby power generation and automatic transfer switch (ATS) to ensure reliable operation of the C Level Pump Station in the event of a power outage.

Within the next 5 years, the existing system will no longer have the capacity to meet the minimum 1,000 gpm fire flow and the transmission main must be upsized from the C Level Pump Station at the Norwood site to Frobase Road.

Completing transmission improvements from Frobase Road to the C Level Reservoirs is recommended once an additional 600 ERUs are constructed in the C Level, including the approximately 486 ERUs at full build-out of CPAH and Autumn Sunrise.

It is assumed that once the existing 12-inch diameter transmission main reaches the end of its usable life, it will be abandoned. The parallel main has therefore been sized to operate long-term as the only supply line. Results shown in **Table 3** maintain this assumption.

Table 3
Available FF at in the C Level

Demands	Piping Improvements	Available FF (gpm)		Meets FF?	
		CPAH	Max Elev.	CPAH	Max Elev.
2020 MDD	Existing infrastructure	1,075	1,000	No	Yes
2020 MDD	18” from Norwood access to Frobase Rd	1,675	1,375	Yes	Yes
2020 MDD	18” from Norwood access to C Reservoirs	>2,000	1,975	Yes	Yes
2040 MDD	18” from Norwood access to Frobase Rd	800	725	No	No
2040 MDD	18” from Norwood access to C Reservoirs	>2,000	>2,000	Yes	Yes

1. All scenarios leave I-5 crossing as is: 8-inch diameter main suspended from the overpass and a 12-inch diameter below-grade crossing.
2. 1,500 gpm required fire flow at CPAH, 1,000 gpm required fire flow at maximum elevation in the C Level.
3. C Reservoirs set at 14’ (fire flow storage depleted).

B Level Transmission

Required transmission capacity in the B Level is primarily governed by reservoir filling under maximum ay demand conditions. The only B Level supply is the Boones Ferry FCV/PRV on the north side of the zone. This single supply facility must transmit the entire water supply needs of the B and C Levels into the B Level transmission/distribution system. The B Level Reservoirs and the C Level Pump Station at the Norwood Site are at the southern limits of the zone, with primarily 12-inch diameter piping connecting the single point of supply with the largest points of demand (reservoir filling and C Level Pumping).

With existing infrastructure, the Boones Ferry FCV/PRV has difficulties providing enough supply at acceptable pressures to fill the B Level Reservoirs, supply the C Level Pump Station, and meet B Level demands. This deficiency forces the City to either over pressurize the system near the Boones Ferry FCV/PRV to push enough water through the system up to the reservoirs or reduce supply and draw on storage while demand is greater than supply. The latter condition frequently occurs during peak demand in the summer, resulting in extended periods of time where both B and C Level Reservoirs experience unacceptably low water levels.

Without an accurately configured and calibrated Extended Period Simulation (EPS) model, reservoir turnover and reservoir upsizing scenarios are difficult to model. Adding more storage to the Norwood Site may help provide additional buffer to supply demands when the Boones Ferry Supply cannot keep up, but this volume still needs to be refilled and existing transmission is not sufficient to refill this volume between peak hours. This issue has lessened since the City increased the minimum B and C Reservoir levels to 40 ft from 36 ft, reducing the total volume of refill required. However, as demands grow, balancing flows will continue to limit distribution system operation.

The City needs to upsize transmission to reduce headloss between the Boones Ferry FCV/PRV and the B Reservoirs. This analysis focuses on upsizing transmission; developing additional reservoir storage capacity should be considered in the context of overall storage needs and not as a measure to mitigate transmission capacity limitations.

Pipe Upsizing

It is assumed that the existing B Level transmission would be upsized, rather than completed as a parallel main, recognizing that the existing main in Boones Ferry will eventually reach the end of its service life and will need to be taken out of service. Transmission upsizing was divided into the following sections. See **Table 4** and **Figure 2** for exact locations.

Table 4
Existing B Level Transmission

Section	Start Road	End Road	Existing Diameter (in)	Length (ft)
1	Norwood Site	SW Ibach St	12	4,750
2	SW Ibach St	SW Blake St	12	1,575
3	SW Blake St	SW Sagert St	12	4,200
4	SW Sagert St	Boones Ferry FCV/PRV	24	1,125

Boones Ferry Supply

The Boones Ferry FCV/PRV is currently set as flow control, with a maximum allowable pressure (pressure reducing setting). This analysis is concerned with the maximum flow available through the control valve station so the facility was modelled as a PRV set at the maximum allowed downstream pressure, set at 112 psi. This pressure setting is consistent with historical operation and limits potential over pressurization of B Level customers at the A/B Level boundary. Under this condition, static pressures for these customers are above maximum allowable pressures without individual service PRVs. It was assumed that existing locations with high static pressures already have individual PRVs, and thus this pressure is acceptable.

The total flow required from the Boones Ferry FCV/PRV should be sufficient to provide B and C Level MDD and fill the B Level Reservoirs. Based on historical operations and best practices for reservoir refilling, a refill rate of 6 feet of reservoir level in 8 hours was used for this analysis, resulting in a reservoir refill flow rate of 1,400 gpm. By 2040, it was assumed a third B Level reservoir will be constructed at the Norwood site, increasing fill rate requirements by 50% to 2,100 gpm. The C Level Reservoirs have sufficient equalizing storage to meet peak hour demand through at least 2040, therefore only C Level MDD is considered. **Table 5** summarizes the pressure and flow requirements from the Boones Ferry FCV/PRV.

Table 5
B Level Transmission Pressure and Flow Requirements

Condition	Requirement - 2020	Requirement - 2040
Maximum Allowable Pressure	112 psi/425’ HGL at Boones Ferry PRV	
B + C MDD	2,600 gpm	3,300 gpm
B Filling	1,400 gpm	2,100 gpm
Required Supply from Boones Ferry FCV/PRV	**4,000 gpm**	**5,400 gpm**

Results

The maximum flow through the system was modelled under various combinations of transmission upsizing. The available capacity in excess of required supply from Boones Ferry FCV/PRV (calculated in **Table 5**) was converted into ERUs, in the same manner as for the C Level Transmission Analysis. The results of this analysis are presented below in **Table 6**.

It is recommended that the City upsize transmission to 18-inch diameter from the B Level Reservoir site to SW Ibach Street as soon as possible to support further development, in order to minimize further impacting system performance during peak demands. Beyond this initial improvement, **Table 6** summarizes the approximate number of additional ERUs that can be supported in the B and C level before additional segments of the transmission piping require upsizing to 18-inch diameter.

Table 6
B Level Transmission Analysis Results

	Improvement (18-inch diameter main)	Boones Ferry Supply (gpm)	ASR Supply (gpm)	Excess Capacity (gpm)	Available Additional ERUs with Upsized Transmission
2020	Existing	3,125	350	-525	None
	Norwood to Ibach St	3,950	350	300	976
	Norwood to Blake St	4,425	350	775	2,521
	Norwood to Sagert St	5,425	350	1,775	5,774
2040	Existing	3,050	350	-2,000	None
	Norwood to Ibach St	4,175	350	-875	None
	Norwood to Blake St	4,475	350	-575	None
	Norwood to Sagert St	5,400	350	350	1,138

Summary and Recommendations

The purpose of this memorandum is to quantify the extent of improvements in the B and C Levels required to support near-term development of the Basalt Creek area, in the context of overall transmission system improvements recommended to serve build-out of the B and C Levels. The findings of the analysis are summarized below:

- C Level transmission capacity between the C Level (Norwood) Pump Station and C Level Reservoirs is inadequate to serve continued development in the C Level and specifically for the development of the Basalt Creek area. This deficiency results in inadequate fire flow capacity to serve proposed developments east of Boones Ferry Road and south of Norwood Road (Autumn Sunrise development and CPAH development). While operation of the C Level Pump Station in a pressure maintenance mode (rather than just reservoir filling) to boost pressure during peak demand and fire flow events alleviates this deficiency in the near-term, it should not be relied upon as long-term mitigation for this deficiency.
- B Level transmission between the Boones Ferry FCV/PRV and B Level Reservoirs is inadequate to supply B and C Level peak demands while refilling the B Level Reservoirs. The resulting condition, which has been observed over the last several summers, is the sustained decline of available storage volume in the B and C Level reservoirs during multiple days of high water use. The need to manage the pressure in the B Level distribution prevents increasing the hydraulic grade of the incoming PWB wholesale supply at Boones Ferry FCV/PRV to transmit additional flow into the B Level for reservoir filling.
- While additional storage in the B Level is ultimately required, construction of additional storage volume will provide limited mitigation for the transmission capacity deficiency.

Based on the summary of findings above, the City should consider the following recommendations which will be incorporated into the Water System Master Plan.

C Level

- *Prior to CPAH and Autumn Sunrise Development:* Before any C Level development occurs, the following improvements should be completed:
    - Change C Level Pump Station operation to include activation due to C Level pressure drops and use VFD abilities at the pumps to provide longer, more consistent pump station run times. Low pressure activation will mitigate current fire flow deficiencies to support CPAH development and VFD use should reduce the impact of C Level pumping on B Level reservoir levels.
    - Install permanent standby power at C Level Pump Station

- *Prior to Further Basalt Creek Development:* Continued development in the Basalt Creek area beyond CPAH and Autumn Sunrise should not be allowed without the completion of the following improvements:
    - Upsize from SW Vermillion Dr to I-5 Crossing, 344 lf, to 18-inch diameter main

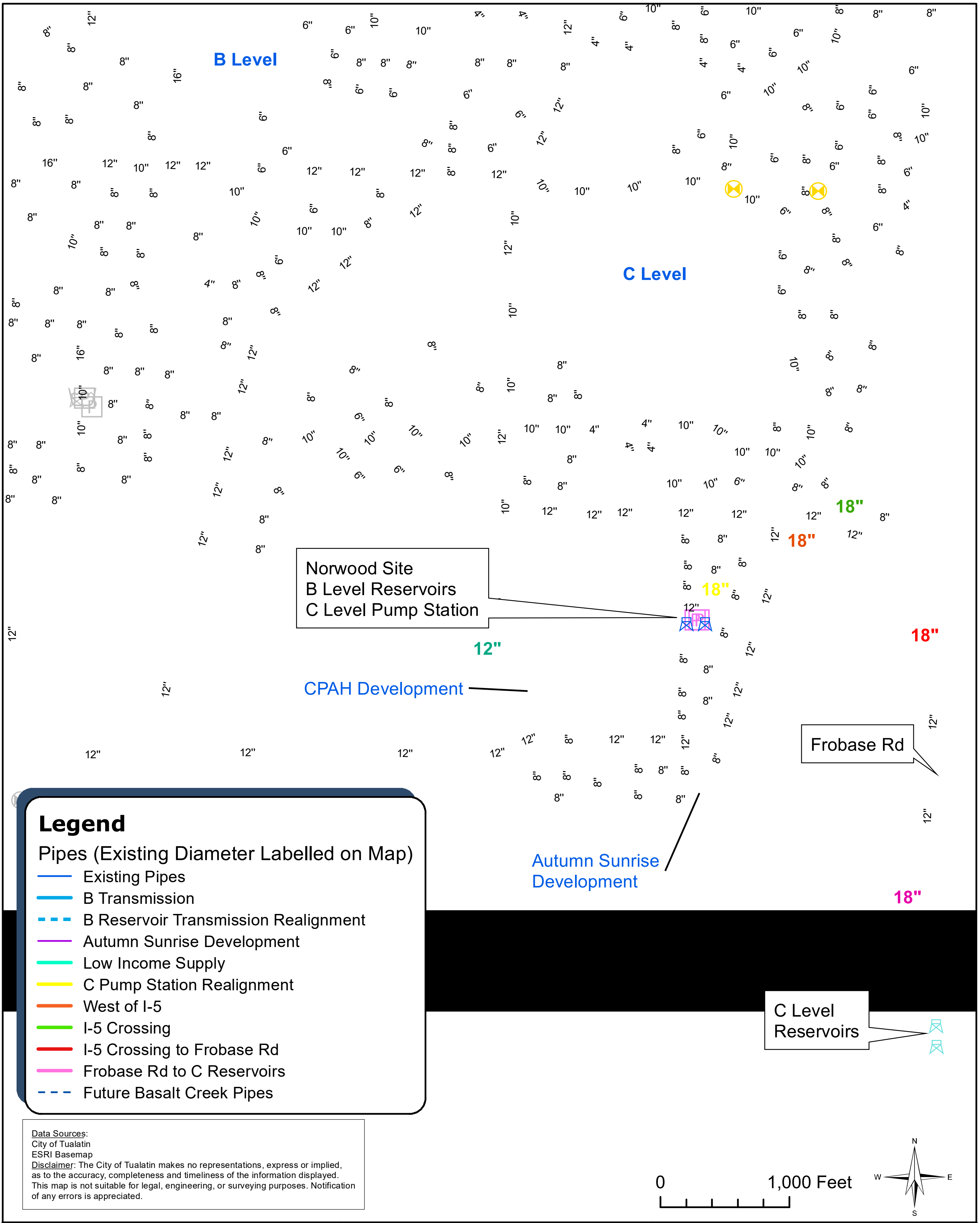
  - Oversize Autumn Sunrise subdivision piping parallel to Norwood Road to 18-inch diameter when constructed
  - Upsize from east of I-5 Crossing towards SW Frobase Road, approximately 2,500 lf, to 18-inch diameter main
  - Upsize from C Level Pump Station to Norwood Road to 18-inch diameter when moved by developers
- *Long-term Recommendations:* Full development of the Basalt Creek area will require the build-out of a transmission main loop, as identified in the Water System Master Plan, and the following improvements to address the transmission deficiency between the C Level Pump Station and C Level Reservoirs.
  - Upsize the remaining transmission from Frobase Road to the C Level Reservoirs, approximately 2,000 lf, to 18-inch diameter

B Level

- *Prior to Basalt Creek Development:* Development in the B and C Levels should be limited until the following improvement is completed:
  - Upsize existing transmission to 18-inch diameter main from Norwood Reservoirs to SW Ibach St. In the near-term, further development will increase the risk that B and C Level reservoirs will be drawn down to levels that deplete storage for fire suppression and emergencies during peak summer demand conditions. The City is aware of this risk for the CPAH and Autumn Sunrise developments.
  - In order to mitigate for the existing deficiency until the transmission improvements described above are completed, B Level Reservoir operating setpoints (high and low level settings) for Boones Ferry FCV/PRV should be adjusted to provide a narrower range of operating storage, effectively providing more available storage for equalizing, fire and emergency uses. With active mixing in the City's reservoirs, the need for cycling of the reservoirs for water quality is not critical, especially during the summer season when the maintaining full reservoirs reduces the risk to the system. A low level setting of 43 feet would help to maintain full storage volumes, but this may require upgrade in control settings to allow Boones Ferry FCV/PRV flows to modulate incrementally between the high and low setpoints rather than step between these two setpoints.
- *Long-term Recommendations:* With full development of the B and C Levels, further transmission improvements are recommended in the B Level:
  - Upsize existing transmission to 18-inch diameter main in SW Boones Ferry Road from SW Ibach St to SW Sagert St

Long-term storage deficiencies, associated with continued B and C Level development are addressed in the Water System Master Plan. For B Level storage, the City should reserve adequate space adjacent to the existing B Level Reservoirs to construct an additional reservoir at this site.

As noted throughout this memorandum, the proposed development in the Basalt Creek area can be expected to exacerbate existing deficiencies in both the B and C Levels, and approval of these developments should be conditioned for construction of near-term improvements to mitigate these deficiencies before development is completed and water service is required. All of the improvements recommended herein address a combination of existing deficiencies and long-term capacity needs and should be considered eligible for use of system development charge (SDC) funds, as they provide expanded capacity for future development and will be incorporated into the City's Water SDC calculation.



Legend

Pipes (Existing Diameter Labelled on Map)

- Existing Pipes
- B Transmission
- B Reservoir Transmission Realignment
- Autumn Sunrise Development
- Low Income Supply
- C Pump Station Realignment
- West of I-5
- I-5 Crossing
- I-5 Crossing to Frobase Rd
- Frobase Rd to C Reservoirs
- Future Basalt Creek Pipes

Data Sources:
City of Tualatin
ESRI Basemap
Disclaimer: The City of Tualatin makes no representations, express or implied, as to the accuracy, completeness and timeliness of the information displayed. This map is not suitable for legal, engineering, or surveying purposes. Notification of any errors is appreciated.

City of Tualatin
Basalt Creek Service

Figure 1
C Level Transmission Upsizing

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June 2021

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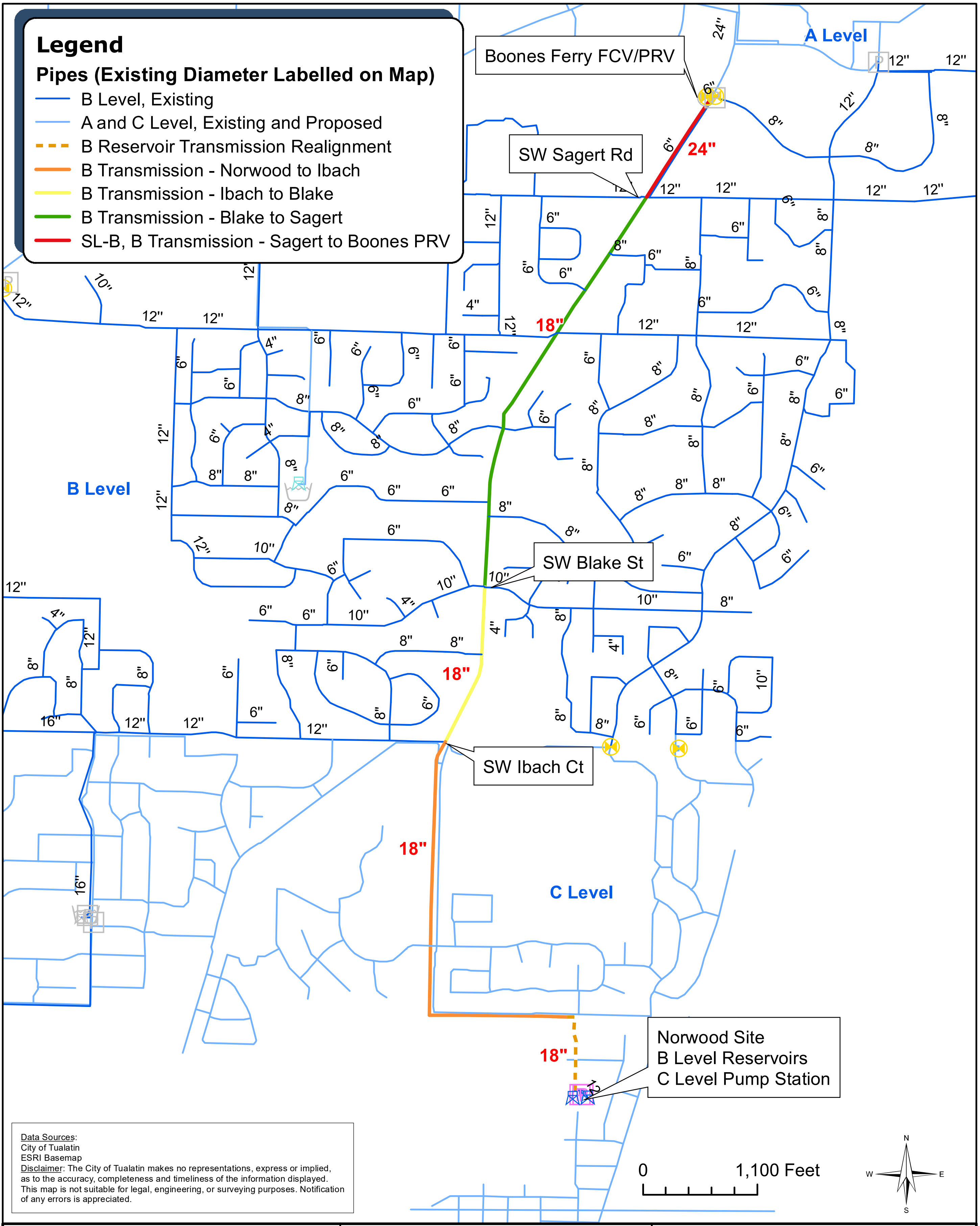

Data Sources:
City of Tualatin
ESRI Basemap
Disclaimer: The City of Tualatin makes no representations, express or implied, as to the accuracy, completeness and timeliness of the information displayed. This map is not suitable for legal, engineering, or surveying purposes. Notification of any errors is appreciated.

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City of Tualatin
Basalt Creek Service

Figure 2
B Level Transmission Upsizing

June 2021

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murraysmith

APPENDIX F
SEISMIC HAZARDS EVALUATION, MCMILLEN JACOBS ASSOCIATES, 2018

Technical Memorandum

To:	Brian Ginter, PE, Murraysmith, Inc.	Project:	City of Tualatin Water System Seismic Resiliency Study
From:	Wolfe Lang, PE, GE	cc:	
Prepared by:	Farid Sariosseiri, PE	Job No.:	5804
Date:	June 22, 2018		
Subject:	Seismic Hazards Evaluation		

1.0 Introduction

The City of Tualatin is conducting an update to its Water Master Plan and this seismic resiliency study is part of the update. The city has contracted Murraysmith, Inc. (Murraysmith) to provide professional engineering services for the Water Master Plan update. McMillen Jacobs Associates (McMillen Jacobs) has been retained by Murraysmith to provide a seismic hazards evaluation as part of the seismic resiliency study.

This memorandum presents the results of McMillen Jacobs' evaluation. The following tasks were completed in accordance with our scope of work:

1. Review of DOGAMI seismic hazard maps for a magnitude 9.0 CSZ event in the city's service area;
2. Review of available geological information;
3. Review of available geotechnical boring information provided by the city to verify DOGAMI seismic hazard maps;
4. Site reconnaissance to address key geological and geotechnical assumptions and to examine areas that are potentially prone to failures from lateral spreading and seismic landslide hazards;
5. Develop estimates of strong ground shaking, liquefaction-induced settlement, lateral spreading permanent ground displacement, and seismic landslide slope instability. Also develop maps illustrating these hazards in relation to the city's service area; and
6. Develop this memorandum summarizing the results of our evaluations, including updated hazard maps.

These tasks were completed at the identified city's facilities as shown on Figures 2 to 6. In the following sections, we present the results of the data review, seismic hazards evaluation, and a summary of geotechnical hazards along the backbone system.

2.0 Data Review

We reviewed previous geotechnical reports and subsurface data for various projects in the area, conducted between 1990 and 2017. A list of reviewed documents is provided below:

- Preliminary Geotechnical Engineering Report, Old Tualatin Elementary School, Tualatin, Oregon, August 22, 2008, GeoPacific Engineering, Inc.
- Report of Geotechnical Engineering Services, Myslony Site, SW Myslony Street and SW 112th Avenue, Tualatin, Oregon, March 28, 2007, GeoDesign, Inc.
- Geotechnical Engineering Report, Proposed U-Haul Expansion, 7100 SW McEwan Road, Tualatin, Oregon, August 9, 2016, PSI.
- Final Summary Report Field and Laboratory Testing, SW 65th/SW Nyberg Street Improvements, Tualatin, Oregon, April 23, 2004, Northwest Geotech, Inc.
- Geotechnical Investigation, Bluff-Cipole Sanitary Sewer Extension, Tualatin, Oregon, January 18, 1996, GRI.
- Report of Geotechnical Engineering Services, Kock Corporate Center: Earthwork and Surcharging, SW 115th Avenue and SW Tualatin Sherwood Road, Tualatin, Oregon, June 9, 2009, GeoDesign, Inc.
- Geotechnical Investigation, Hageman Way Street Project, Tualatin, Oregon, March 16, 1990, Northwest Geotech, Inc.
- Geotechnical Engineering Services, Sanderson Subdivision, Tualatin, Oregon, June 16, 2000, GeoDesign, Inc.
- Geotechnical Exploration for Proposed C-2 Reservoir, Tualatin, Oregon, July 7, 1994, CH2M HILL.
- Preliminary Assessment of Subsurface Conditions Bluff-Cipole Sanitary Sewer Extension, Tualatin, Oregon, April 30, 1998, Northwest Geotech Inc.
- Geotechnical Engineering Services Addendum No. 1, Tualatin Business Park - Building 1, SW Myslony Street and SW 112th Avenue, Tualatin, Oregon, May 13, 2016, GeoDesign, Inc.
- Public Roadway Improvements, Library Oaks Townhome Subdivision, Tualatin, Oregon, June 5, 2000, Northwest Geotech, Inc.
- Tualatin Water Master Plan, Existing Transmission Backbone, Figure 2-4, October 2017, Murraysmith, Inc.
- Geotechnical Investigation, PTI-OSB Water Treatment Tank, 9900 SW Herman Road, Tualatin, Oregon, November 24, 2014, Carlson Geotechnical.
- Hedges Construction Drawing Review, SW 112th Avenue and SW Tualatin-Sherwood Highway, Tualatin, September 10, 2014, Perlo Construction.
- Geotechnical Data Report, SW 124th Avenue Water Transmission Line Project, March 6, 2014, Jacobs Associates.
- Draft Geotechnical Data Report, Willamette Water Supply Program, Pipeline Main Stem Section 4.2 (PLM_4.2), Washington County, July 31, 2017, Shannon and Wilson, Inc.

3.0 Site Reconnaissance

On May 30, 2018, Farid Sariosseiri, PE, performed a geotechnical reconnaissance of the following sites within the city's service area:

- A-2 Reservoir
- A-1 Reservoir (Avery Reservoir)
- Norwood Reservoirs and Pump Station
- Boones Ferry Pump Station and Supply Control Valve
- City Park Supply Control Valve
- 108th Operations Supply Control Valve

We selected these facilities for site visit because they are within the mapped seismic hazard zones or considered critical facilities (Figures 3, 4 and 5). During the reconnaissance, we noted site conditions, surface or exposed soil conditions, site topography, proximity to bodies of water, and significant features (i.e. culverts). Selected photographs from the site visits are provided in Appendix A. Our assessment results from the site visits and review of available data are discussed in Section 7.

4.0 Geology and Seismic Setting

4.1 Geologic Setting

The Tualatin basin is a structural depression created by complex folding and faulting of the basement rocks, a sequence of middle Miocene age, about 17 to 6 Ma ("Mega annum" or million years ago), lava flows of the Columbia River Basalt Group (CRBG). An extensive sedimentary fill was then accumulated in the basin and overlies the CRBG basement (Trimble, 1963; Tolan and Beeson, 1984). The Tertiary sedimentary units include up to 1,300 feet of the Sandy River Mudstone, which directly overlies the CRBG, and 100 to 350 feet of sandstone and conglomerate of the Troutdale Formation, which overlies the Sandy River Mudstone (Pratt et al., 2001).

Unconsolidated sediments at the top of the basin fill sequence consist primarily of catastrophic flood sediments deposited near the end of the last ice age, between 15,300 and 12,800 radiocarbon years ago (Mullineaux et. al., 1978; Waitt, 1987; Allen et al., 2009). Forty or more catastrophic floods occurred at intervals over several decades on the Columbia River system. The flood waters swept across the Tualatin basin and deposited tremendous loads of sediment. Boulders, cobbles, and gravels were deposited near the mouth of the Columbia River Gorge and along the main channel of the Columbia River, while great cobble and gravel bars stretched westward across the Portland basin, grading to thick blankets of micaceous sand. Within the Tualatin basin, the flood deposits mantle the Troutdale Formation at elevations below about 350 feet above mean sea level. The flood deposits generally consist of unconsolidated gravel topped by fine sand and silt and range from a few feet in thickness to more than 200 feet thick.

During the late Pliocene epoch, fluvial conglomerate, volcaniclastic sandstone, siltstone, and debris flow deposits, originating in the Cascade Range, were deposited in a broad fan in the Boring Hills area at the southern margin of the Tualatin basin (Tolan and Beeson, 1984). These deposits, the Springwater Formation, interfingered with the late Troutdale Formation sediments. Deposition of the Springwater Formation continued into the Pleistocene (Madin, 1994).

During the middle to late Pleistocene (after about 2 Ma), Boring Lava erupted from several local vents in the basin and in the Boring Hills south of Gresham, intruding the Sandy River Mudstone, Troutdale

Formation, and Springwater Formation sediments (Trimble, 1963; Madin, 1994). The lava flows were relatively thin and apparently of small volume because they do not appear to have flowed far from their source. Both the Springwater Formation and the Boring Lavas are very deeply weathered and decomposed.

During the late Pleistocene, wind-blown silt, or “loess” funneled westward through the Columbia River Gorge and accumulated on hilltops around the Tualatin basin. The loess deposits were named “Portland Hills Silt” for the thick accumulation that mantled Portland’s West Hills, but the loess is also present over the Boring Hills in the southern part of the basin. Lentz (1977) observed Boring Lava interbedded in loess deposits near Elk Point in the West Hills, helping to bracket the age of the silt between 36,000 and 700,000 years before the present time.

During the Holocene epoch (the last 10,000 years), minor alluvial deposits have accumulated along the several creeks and streams that drain the area. These young alluvial sediments are largely reworked from older materials in the Boring Hills and from the catastrophic flood deposits on the basin floor. Other active geologic processes include soil creep and landslide.

4.2 Seismic Setting

The Pacific Northwest is located near an active tectonic plate boundary. Off the coast, the Juan de Fuca oceanic plate is subducting beneath the North American crustal plate. This tectonic regime has resulted in seismicity in the Pacific Northwest occurring from three primary sources:

- Shallow crustal faults within the North American plate;
- CSZ intraplate faults within the subducting Juan de Fuca plate; and
- CSZ megathrust events generated along the boundary between the subducting Juan de Fuca plate and the overriding North American plate.

Among these three sources, CSZ megathrust events are considered as having the most hazard potential due to the anticipated magnitude and duration of associated ground shaking. Recent studies indicate that the CSZ can potentially generate large earthquakes with magnitudes ranging from 8.0 to 9.2 depending on rupture length. The recurrence intervals for CSZ events are estimated at approximately 500 years for the mega-magnitude full rupture events (magnitude 9.0 to 9.2) and 200 to 300 years for the large-magnitude partial rupture events (magnitude 8.0 to 8.5). Additionally, current research indicates the probability of a future occurrence because the region is “past due” based on historic and prehistoric recurrence intervals documented in ocean sediments. For example, over the next 50 years, the CSZ earthquake has an estimated probability of occurrence off the Oregon Coast on the order of 16 to 22 percent (Goldfinger et. al., 2016).

In 2013, the State of Oregon developed the Oregon Resilience Plan (ORP, 2013) to prepare for the magnitude 9.0 CSZ event. We understand that this earthquake scenario is selected as the seismic source in the City of Tualatin’s seismic hazard study.

5.0 Subsurface Conditions

The subsurface within the project area is dominated by the following geologic units:

- Alluvial Deposits: Generally consist of soft fine grained material near existing surface water locations and low lying areas. This material is highly variable in its susceptibility to seismic liquefaction and lateral spreading hazards.
- Fine Grained Missoula Flood Deposits: Generally consist of very soft to stiff silt with varying concentrations of clay and sand. When saturated, this material is generally prone to seismic liquefaction and lateral spreading hazards.
- Coarse Grained Missoula Flood Deposits: Generally consist of medium dense to very dense sand and gravel with varying concentrations of silt. This material is generally seismically stable and not susceptible to liquefaction and lateral spreading permanent ground deformations.
- Troutdale Formation: Generally consists of very dense silty sand and gravel. This material is seismically stable and not susceptible to liquefaction and lateral spreading permanent ground deformations.
- Boring Lava: Generally consists of basalt in varying states of weathering. This material is seismically stable and not susceptible to liquefaction and lateral spreading permanent ground deformations.

A geologic map, provided in Figure 1, shows the overall distribution of these geologic units. In general, the subsurface conditions vary across the City of Tualatin’s service area.

6.0 Geotechnical Seismic Hazards

The effect of seismic hazards, including strong ground shaking, liquefaction settlement, lateral spreading, and seismic-induced landslides, was analyzed. These hazards have the potential to damage facilities (i.e., pipelines, reservoirs, and pump stations) through either permanent ground deformation (PGD) or intense shaking. Our analysis of these seismic hazards is based on information provided from existing geotechnical explorations, DOGAMI hazard maps, and our knowledge of the geotechnical conditions of the area. In our seismic analyses, we assumed a magnitude 9.0 earthquake and a peak ground acceleration (PGA) of 0.20g to represent the effects of a M9 CSZ seismic event in the project area. No significant geotechnical data was available for pump stations and reservoirs within the city’s service areas. Therefore, DOGAMI hazard maps and some exploration data along the I-5 were used for evaluation.

6.1 Ground Shaking

6.1.1 Seismic Ground Shaking Parameters for CSZ Earthquake

To assess the hazard potential of ground shaking in the project area, we reviewed the peak ground velocity (PGV) map published by DOGAMI for the Portland Metro Area in the event of a M9 CSZ earthquake (DOGAMI O-18-02, Bauer et. al., 2018).

The estimated ground shaking intensity (PGV) depends on the subsurface materials. The ground shaking near the surface will be amplified by thick soil units. Generally, the PGV values are estimated to range between 7 and 16 inches per second. The PGV map is shown in Figure 2.

6.2 Liquefaction

Liquefaction is a phenomenon affecting saturated, granular soils in which cyclic, rapid shearing from an earthquake results in a drastic loss of shear strength and a transformation from a granular solid mass to a viscous, heavy fluid mass. The results of soil liquefaction include loss of shear strength, loss of soil materials through sand boils, flotation of buried chambers/pipes, and post liquefaction settlement.

To evaluate the hazard potential of soil liquefaction in the project area, we reviewed liquefaction hazard maps published by DOGAMI for the Portland Metro Area in the event of a M9 CSZ earthquake (Bauer, et. al., 2018). Where geotechnical data was available, we conducted site specific analyses based on the subsurface conditions shown in previous geotechnical explorations listed in Section 2, using the latest SPT-based liquefaction susceptibility and settlement assessment procedures (Boulanger and Idriss, 2014; Idriss and Boulanger, 2008). Based on our calculated post-liquefaction settlement results, we revised DOGAMI's liquefaction probability map and developed a liquefaction induced settlement map (see Figures 3 and 4).

The liquefaction hazard varies significantly across the city. The potential for liquefaction is low in the south and northeast of the project area due to shallow bedrock (at the south) and Coarse-Grained Missoula Flood Deposits (in the northeast). Liquefiable soils are present in the rest of the city area where Fine-Grained Missoula Flood Deposits and Alluvial Deposits are located. Estimated settlement ranges from a few inches in the silty Flood Deposits to more than 10 inches in the silty and sandy Alluvial soils along Tualatin River.

6.3 Lateral Spreading

Liquefaction can result in progressive deformation of the ground known as lateral spreading. The lateral movement of liquefied soil breaks the non-liquefied soil crust into blocks that progressively move downslope or toward a free face in response to the earthquake generated ground accelerations. Seismic movement incrementally pushes these blocks downslope as seismic accelerations overcome the strength of the liquefied soil column. The potential for and magnitude of lateral spreading depends on the liquefaction potential of the soil, the magnitude and duration of earthquake ground accelerations, the site topography, and the post-liquefaction strength of the soil.

To assess the hazard potential of lateral spreading in the project area we reviewed a lateral spreading hazard map published by DOGAMI for the Portland Metro Area in the event of a M9 CSZ earthquake (Bauer et. al., 2018). To verify and refine the map, we used pseudo-static slope stability analyses for areas with gentle slope with no free face and used the lateral displacement index (LDI) method (Zhang et. al., 2004) for areas with free face (gentle slope and flat ground).

The pseudo-static slope stability analyses were completed using the computer software SLIDE to calculate the approximate slope at which lateral spreading may occur. In our analyses, we used an average residual shear strength of 250 psf for the liquified soil. The residual shear strength was estimated for Missoula Flood Deposits and Alluvial soils assuming soft consistency. A pseudo-static coefficient of 0.1g, approximately ½ of PGA was applied. The results of the analyses indicate that lateral spreading may occur for slopes steeper than 12 percent (7 degrees) located within liquefaction susceptible areas.

The LDI method involves integrating shear strains over the depth of potentially liquefiable soils. The LDI method was used for areas with free face. We modified the map within the areas with free face based on the distance from the free face and the height of the free face.

The estimated lateral displacements are shown in Figure 5. The majority of the lateral spreading exists within the northern part of the service area, along the Tualatin River, and near the Nyberg Creek areas.

6.4 Seismic Landslides

Earthquake induced landslides can occur on slopes due to the inertial force from an earthquake adding load to a slope. The ground movement due to landslides can be extremely large and damaging to pipelines and other structures.

To assess the hazard potential of seismic landslides in the project area we reviewed a landslide deformation map published by DOGAMI for the Portland Metro Area in the event of a M9 CSZ earthquake (Bauer et. al., 2018). We reviewed the topography of the project area in conjunction with visual assessment of slopes during our site visit. Except for the areas near the bank of creeks and the Tualatin River, the risk of seismic landslide in the city is considered low. Seismic landslide displacements are shown in Figure 6.

7.0 Seismic Hazard Assessment and Recommendations for Critical Facilities

In addition to the seismic hazard study for the overall service area, we conducted site visits to six sites, including reservoirs, pump stations, and supply control valves, which are located within or near the mapped liquefaction areas. These facilities are listed in Table 1 and shown in Figures 1 through 6 (along with other facilities). Table 1 presents the summaries of the results of the site visit, document review, as well as the geotechnical opinions regarding the seismic hazards and geotechnical concerns at these locations. Recommendations for future studies and mitigations are also provided in Table 1.

Seismic hazards for the rest of the sites are relatively low. We recommend further evaluation of these sites to be combined with future improvement projects for the sites.

MCMILLEN JACOBS ASSOCIATES

Farid Sariosseiri, P.E.
Senior Project Engineer

Wolfe Lang, P.E., G.E.
Senior Associate

Table 1. Preliminary Seismic Hazard Assessment Summary for Critical Facilities

Structure Name	Available or Nearby Geotechnical Information	Mapped Seismic Hazards and Levels	Anticipated Subsurface Conditions and Site Topography	Preliminary Geotechnical Seismic Concerns & Issues	Recommendations/Notes
A-2 Reservoir	Review of the available geotechnical information at the City of Tualatin Operation Office indicate bedrock within 2 feet of the ground surface.	Liquefaction settlement and lateral spreading is not anticipated at the site.	The site is located at the top a hill with a gentle slope toward north. The reservoir is located approximately 250 feet behind the top of the slope. Basalt outcrop was observed at south side of the reservoir. Geologic map indicates the site is underlain by Basalt, consistent with our observation.	Subsurface data was briefly reviewed in the City of Tualatin Operations office.	Liquefaction hazard is negligible. A thorough review of the existing data is recommended to confirm the mapped subsurface conditions.
A-1 Reservoir (Avery Reservoir)	No geotechnical data available.	Risk of liquefaction settlement and lateral spread is anticipated to be relatively low.	The site is located on a flat ground, but in general the area is gently sloped toward the north. The reservoir was built in the 1960's and was seismically upgraded in 2005. No creek or water body was identified near the site. The geologic map indicates the site is near the limit of Basalt and Fine-grained Missoula Flood Deposits. Rock outcrop was not observed at or near the site. We anticipate a relatively shallow bedrock underlain Fine-grained Missoula Flood Deposits across the site.	Lack of subsurface information.	Considering the subsurface conditions, liquefaction hazard is anticipated to be low. From a seismic hazard risk perspective, a site-specific study for this reservoir may not need to be prioritized and can be combined with future site improvement design.
Noorwood Reservoirs and Pump Station	No geotechnical data available.	Liquefaction settlement and lateral spreading is not anticipated at the site.	The site is located on a flat area. The reservoirs' foundation levels are approximately 3 feet lower than adjacent ground. The pump station was built in 2009. The reservoirs appear to predate the pump station. No creek or a body of water was identified near the site. The geologic map indicates the site is underlain by Basalt. Rock outcrop was not observed at or near the site.	Lack of subsurface information.	Liquefaction hazard is anticipated to be low. From a seismic hazard risk perspective, a site-specific study for this site may not need to be prioritized, and can be combined with future site improvement design.
Boones Ferry Pump Station and Supply Control Valve	No geotechnical data available.	Liquefaction settlement: 5 to 8 inches, Lateral spreading displacement: 0.5 to 3 feet.	The site is located on a gently northern slope. A body of water (a wetland) was identified approximately 2,000 feet northwest of the site using aerial image (Google Earth). The geologic map indicates the site is underlain by Fine-grained Missoula Flood Deposits.	Lack of subsurface information.	Perform subsurface investigation and site-specific hazard evaluation.
City Park Supply Control Valve	No geotechnical data available.	Liquefaction settlement: 5 to 8 inches, Lateral spreading displacement: 0.5 to 3 feet.	The site is located on a flat area, approximately 300 feet from the Tualatin River. Geologic map indicates the site is located near the limit of alluvium and Missoula Flood Deposits.	Lack of subsurface information.	Perform subsurface investigation and site-specific stability evaluation.
108th Operations Supply Control Valve	No geotechnical data available.	Liquefaction settlement: 5 to 8 inches, Lateral spreading displacement: 0.5 to 3 feet.	The site is located on a flat area. A body of water (a wetland) was identified approximately 1,000 feet south of the site using aerial image (Google Earth). The geologic map indicates the site is underlain by Fines-grained Missoula Flood Deposits.	Lack of subsurface information.	Perform subsurface investigation and site-specific stability evaluation.

8.0 References

Allen, J., Burns, M., and Burns, S., 2009, Cataclysms on the Columbia: The Great Missoula Floods, Portland, Oregon., Ooligan Press, 211 p.

Bauer, J.M., Burns, W.J., and Madin, I.P, 2018, Open File Report O-18-02, Earthquake Regional Impact Analysis for Clackamas, Multnomah, and Washington Counties, Oregon. Oregon Department of Geology and Mineral Industries (DOGAMI).

Boulanger, R.W. and Idriss, I.M., 2014. CPT and SPT Based Liquefaction Triggering Procedures, Report No. UCD/CGM 14-01, Center for Geotechnical Modeling, Department of Civil and Environmental Engineering, UC Davis, April 2014.

Goldfinger, C., Galer, S., Beeson, J., Hamilton, T., Black, B., Romsos, C., Patton, J., Hans Nelson, C., Hausmann, R., and Morey, A., 2016, The Importance of Site Selection, Sediment Supply, and Hydrodynamics: A Case Study of Submarine Paleoseismology on the Northern Cascadia Margin, Washington USA, Marine Geology.

Idriss, I. and Boulanger, R., 2008, Soil Liquefaction During Earthquakes. Monograph MNO-12, Earthquake Engineering Research Institute, Oakland, CA, 261 p.

Lentz, R., 1977, The Petrology and Stratigraphy of the Portland Hills Silt—A Pacific Northwest Loess: Oregon Geology, v. 43, n. 1, pp. 3-10.

Madin, I., 1994, Geologic Map of the Damascus Quadrangle, Clackamas and Multnomah Counties, Oregon: Oregon Department of Geology and Mineral Industries Geological Map Series GMS–60, scale 1:24,000.

Mullineaux, D., Wilcox, R., Ebaugh, W., Fryxell, R., and Rubin, M., 1978, Age of the Last Major Scabland Flood of the Columbia Plateau in Eastern Washington: Quaternary Research, v. 10, no. 2, p. 171-180.

Pratt, T., Odum, T., Stephenson, W., Williams, R., Dadisman, S., Holmes, M., and Haug, B., 2001, Late Pleistocene and Holocene Tectonics of the Portland basin, Oregon and Washington, from High-Resolution Seismic Profiling: Bulletin of the Seismological Society of America, v. 91, n. 4., pp. 637-650.

The Oregon Resilience Plan (ORP), 2013, Reducing Risk and Improving Recovery for the Next Cascadia Earthquake and Tsunami, Report to the 77th Legislative Assembly, Salem, Oregon.

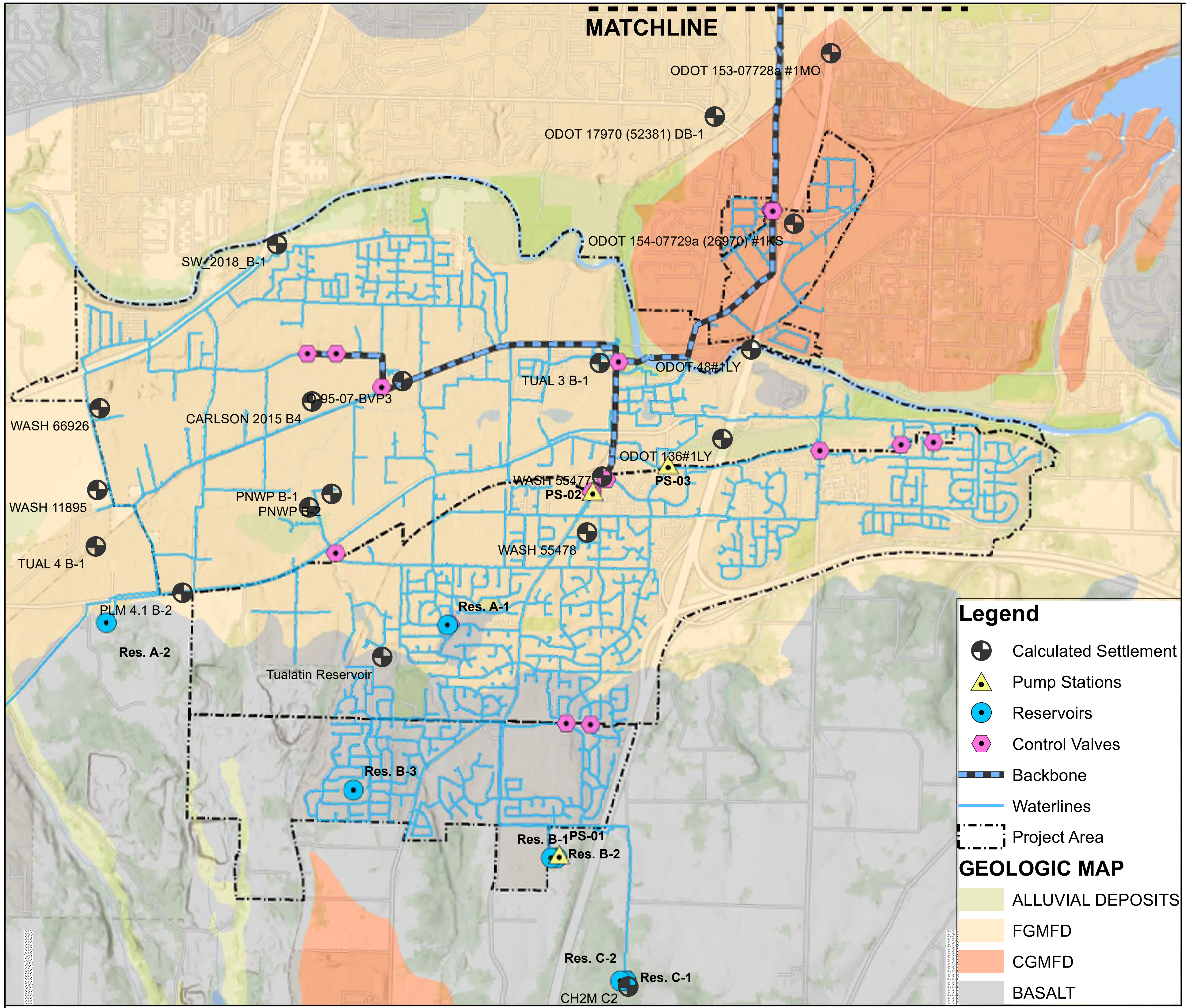
Tolan, T., and Beeson, M., 1984, Intracanyon Flows of the Columbia River Basalt Group and their Relationship to the Troutdale Formation: Geological Society of America Bulletin v. 95, no. 4, p. 463–477.

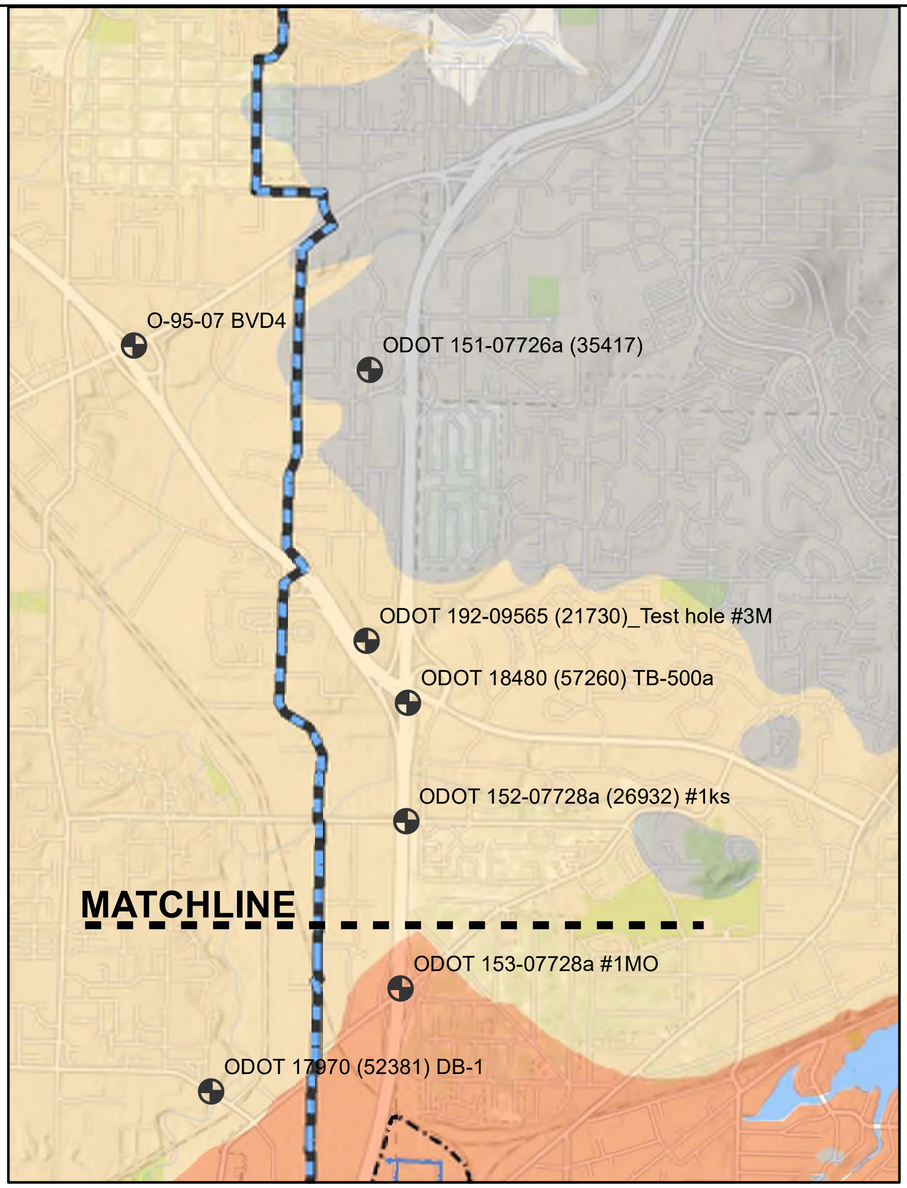
Trimble, 1963, Geology of Portland, Oregon and Adjacent Areas: A Study of Tertiary and Quaternary Deposits, Lateritic Weathering Profiles, and of Quaternary History of Part of the Pacific Northwest: U.S. Geological Survey Bulletin 1119, 119 p.

Waitt, R., 1987, Evidence for Dozens of Stupendous Floods from Glacial Lake Missoula in Eastern Washington, Idaho, and Montana, in Hill, M., ed., Cordilleran Section of the Geological Society of America: Boulder, Colo., Geological Society of America Centennial Field Guide, v. 1, p.345-350.

Zhang, G., Robertson, P.K., and Brachman, W.I., 2004, Estimating Liquefaction-induced Lateral Displacement Using the Standard Penetration Test or Cone Penetration Test, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 130, No. 8, p861-871.

Figures





NOTES:

1. FGMFD: FINE-GRAINED MISSOULA FLOOD DEPOSITS
2. CGMFD: COARSE-GRAINED MISSOULA FLOOD DEPOSITS
3. DATA SOURCE: DOGAMI OGDC-6
   Topographic Map 3D - Portland, OR USA: Esri, Esri Community Maps Contributors

GEOLOGIC MAP

1 " = 3,000 '

0 3,000 6,000 '

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McMILLEN JACOBS ASSOCIATES

TUALATIN WATER

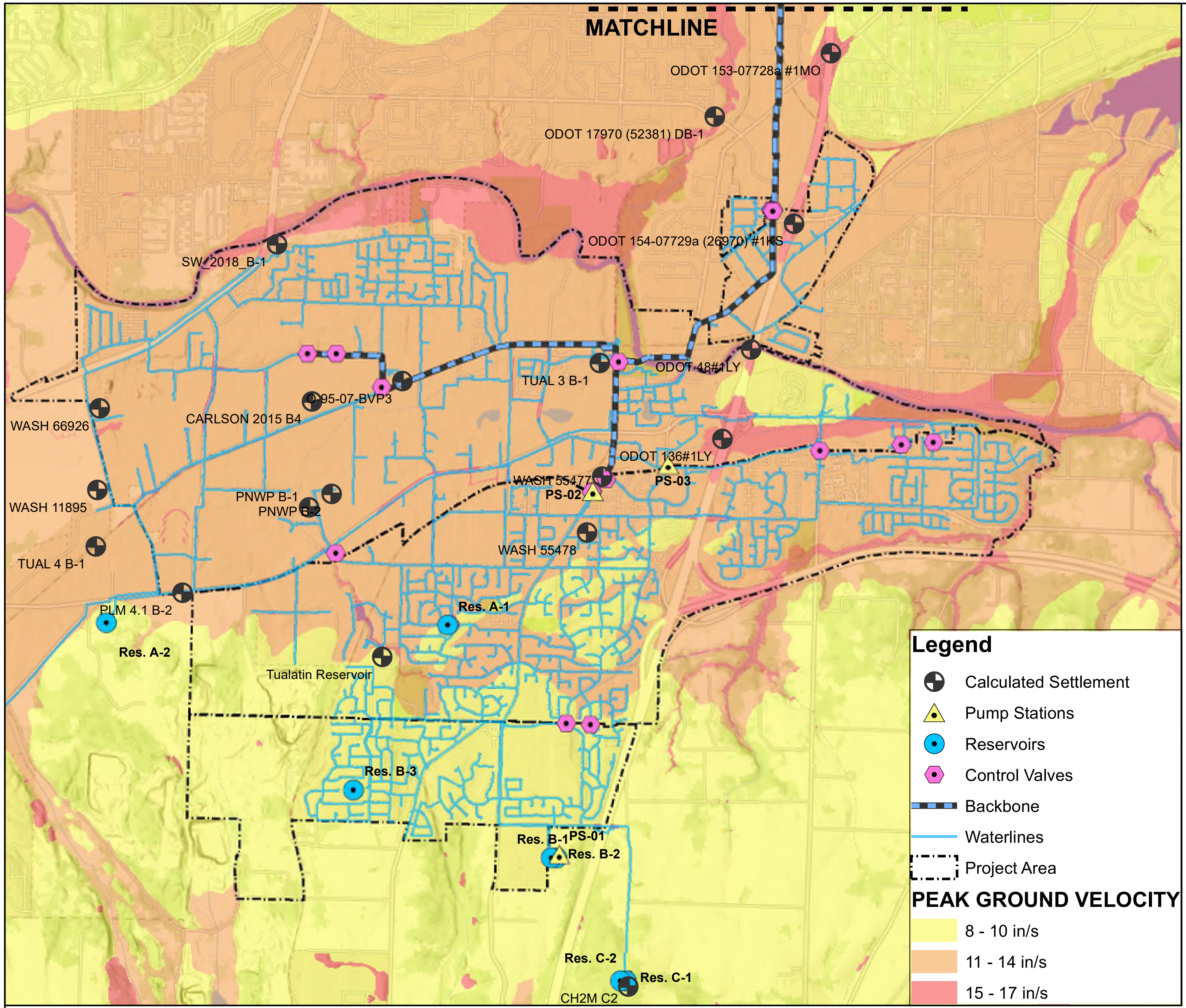
SEISMIC HAZARD EVALUATION

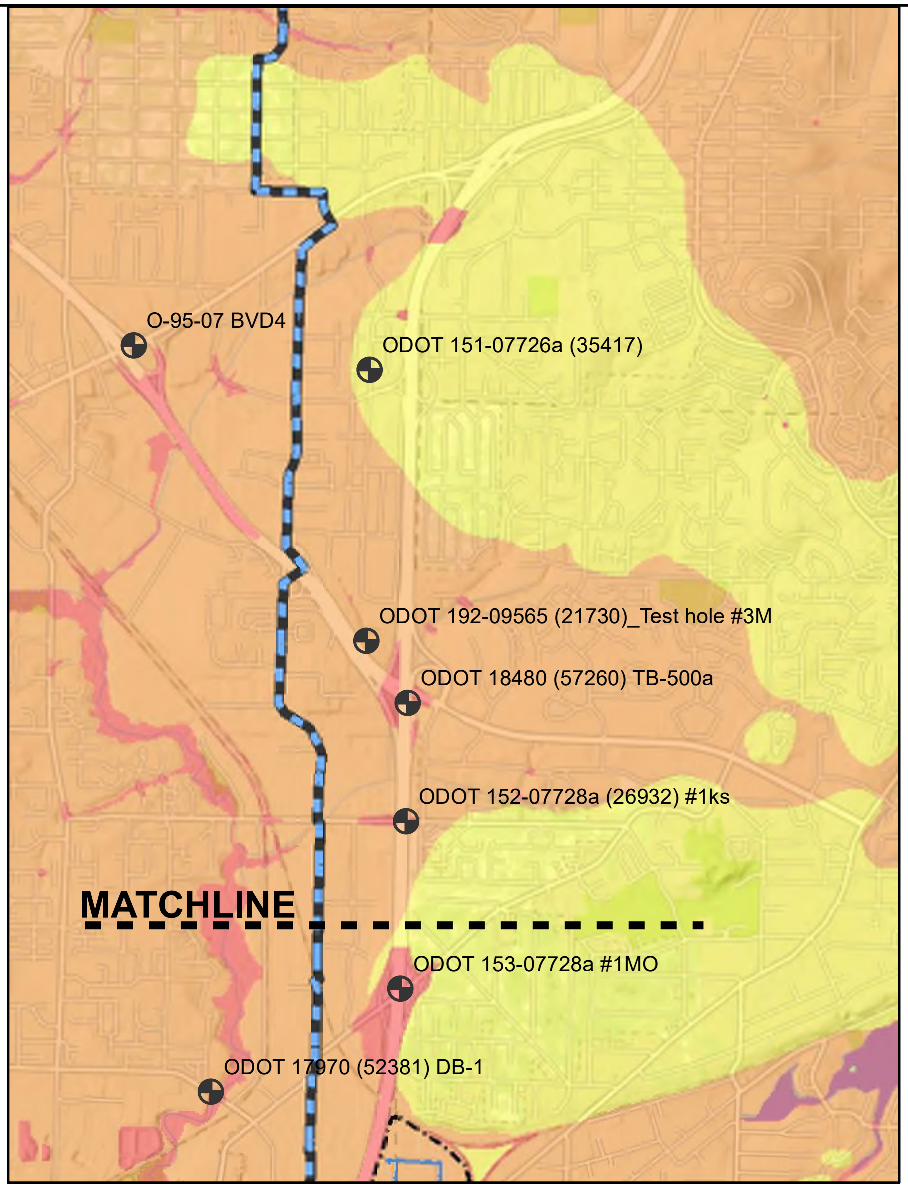
TECHNICAL MEMORANDUM
SEISMIC HAZARDS
GEOLOGIC MAP

FIG. 1

Jun 2018

Document Path: C:\Users\roth\Box\Jobs\5804.0 Tualatin Water Sys Seismic Resiliency Eval\Project Work\02 - GIS Files\TualatinWaterSeismicEval.mxd





NOTES:

1. ESTIMATES SHOWN ARE BASED ON HAZARD DATA FROM DOGAMI OPEN-FILE REPORT O-18-02 AND DATA FROM EXISTING BORINGS. AREAS OUTSIDE OF EXISTING BORING LOCATIONS HAVE NOT BEEN VERIFIED.
2. DATA SOURCE: DOGAMI O-18-02
Topographic Map 3D - Portland, OR USA: Esri, Esri Community Maps Contributors

PEAK GROUND VELOCITY

1 " = 3,000 '

0 3,000 6,000 '

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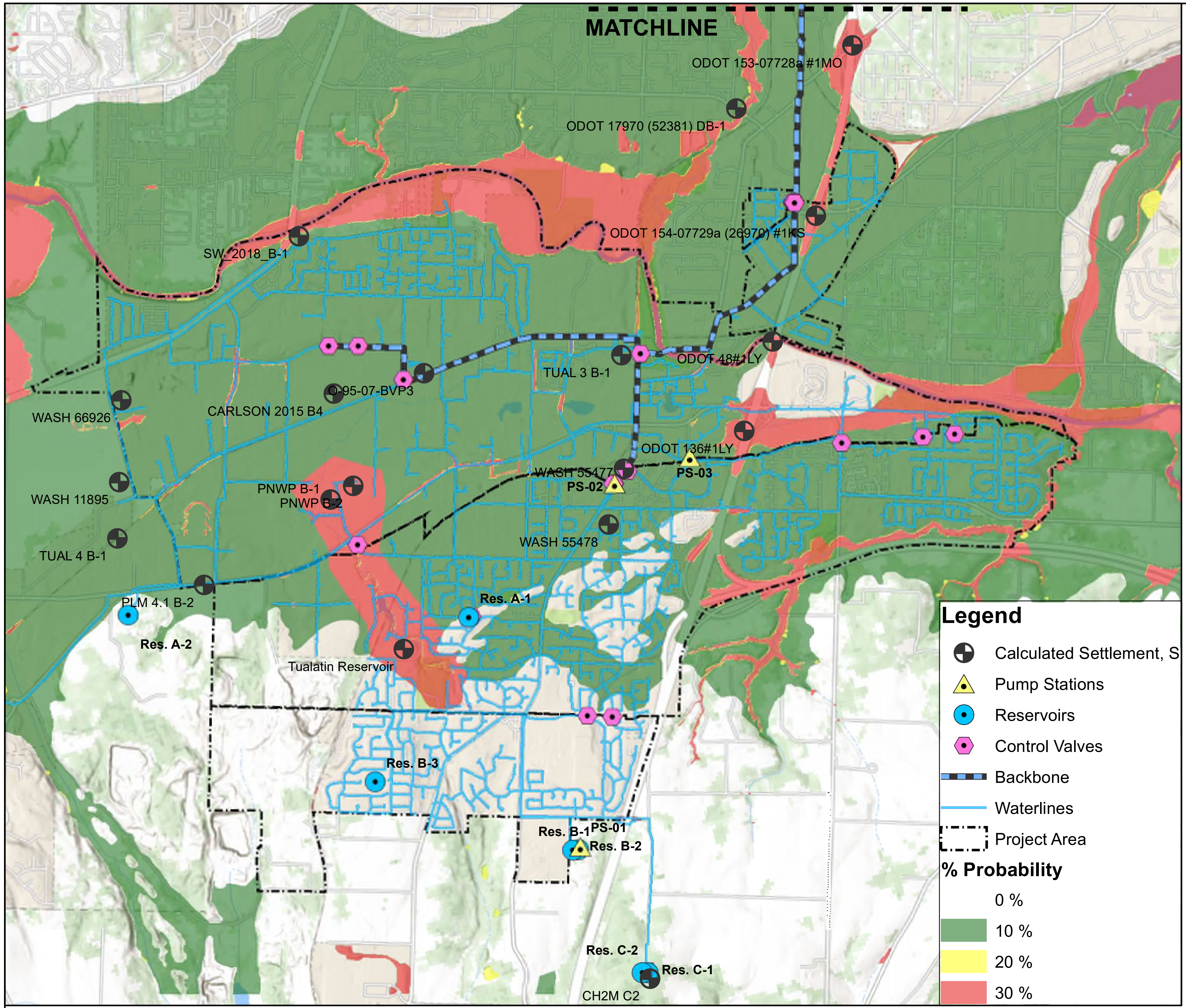
McMILLEN JACOBS ASSOCIATES

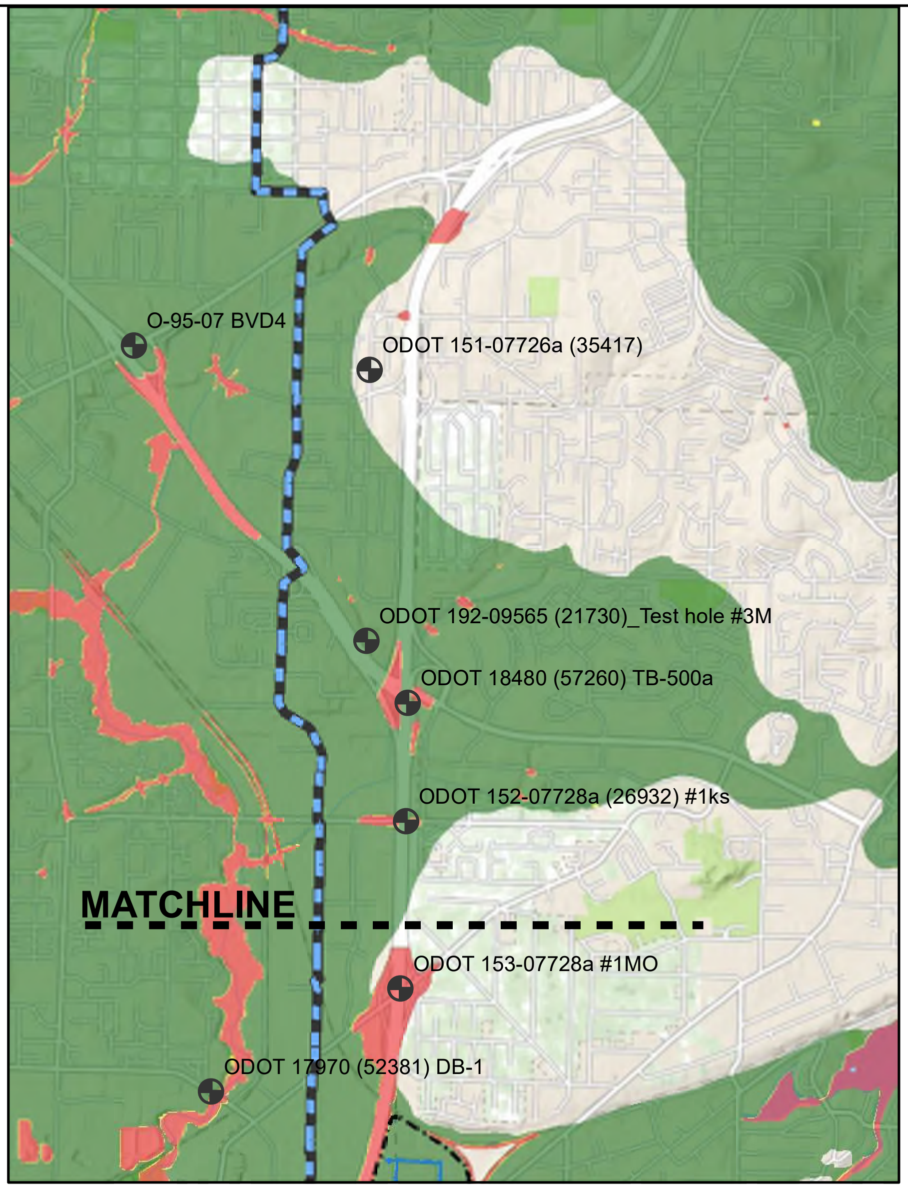
TUALATIN WATER
SEISMIC HAZARD EVALUATION
TECHNICAL MEMORANDUM
SEISMIC HAZARDS
PEAK GROUND VELOCITY

FIG. 2

Jun 2018

Document Path: C:\Users\roth\Box\Jobs\5804.0 Tualatin Water Sys Seismic Resiliency Eval\Project Work\02 - GIS Files\TualatinWaterSeismicEval.mxd





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2. DATA SOURCE: DOGAMI O-18-02
Topographic Map 3D - Portland, OR USA: Esri, Esri Community Maps Contributors

PROBABILITY OF LIQUEFACTION

1 " = 3,000 '

0 3,000 6,000 '

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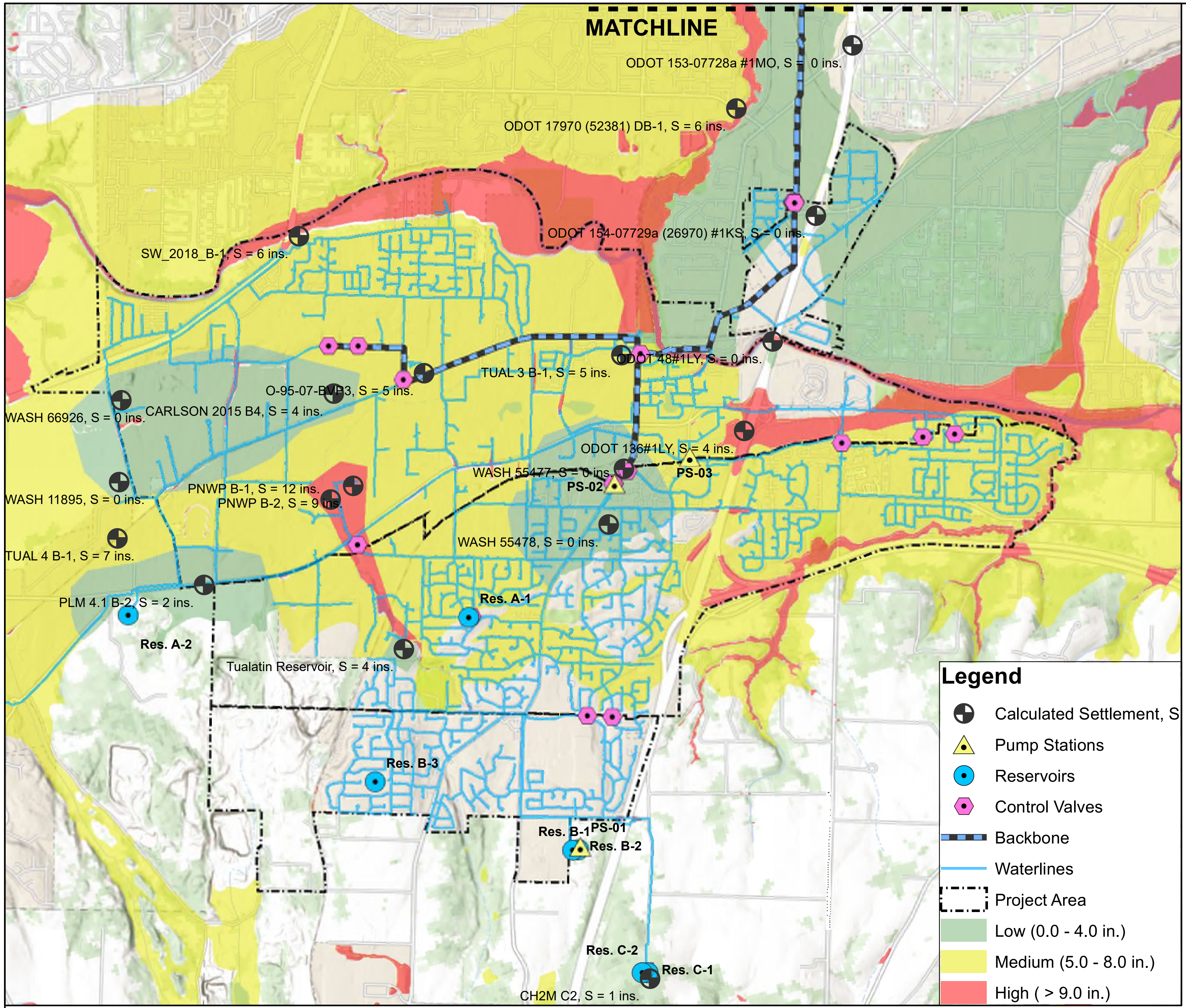
McMILLEN JACOBS ASSOCIATES

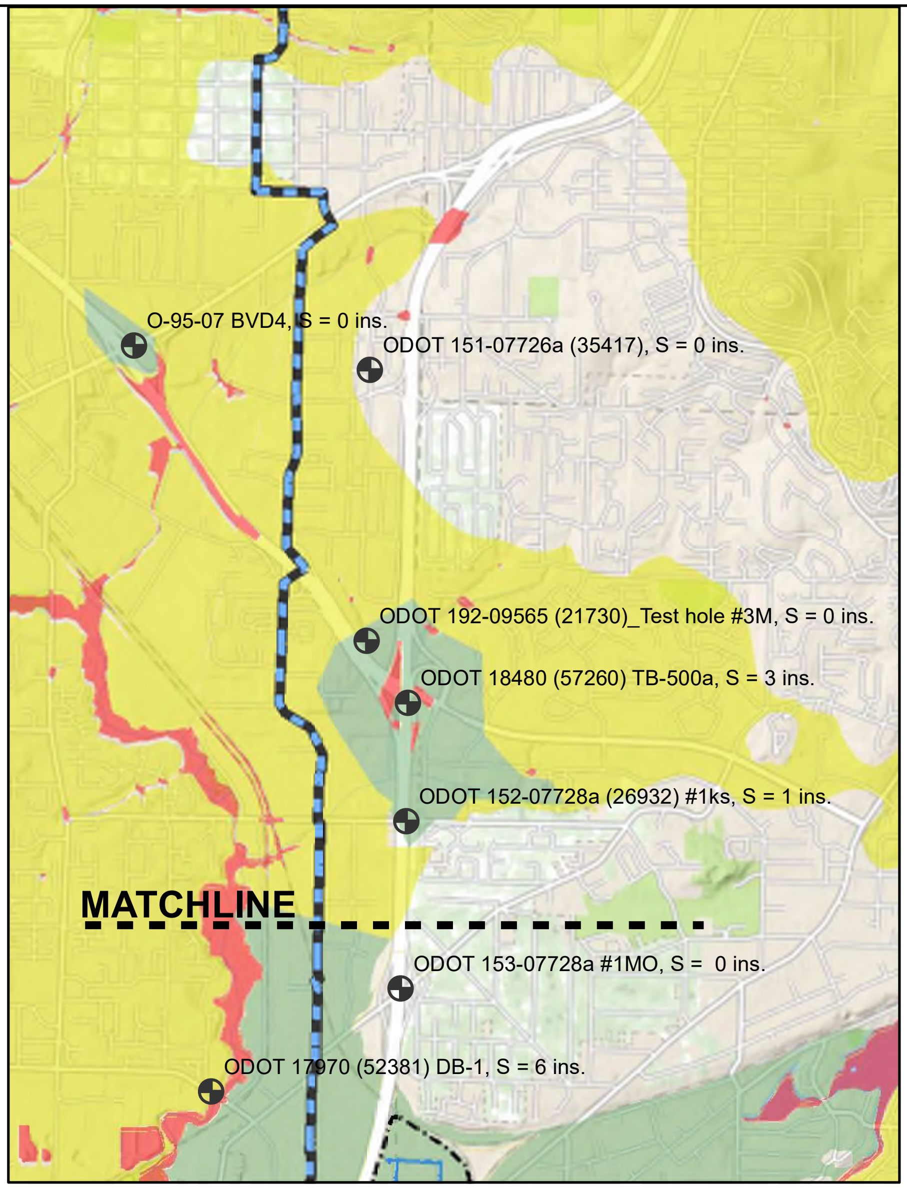
TUALATIN WATER
SEISMIC HAZARD EVALUATION
TECHNICAL MEMORANDUM
SEISMIC HAZARDS
PROBABILITY OF LIQUEFACTION

FIG. 3

Jun 2018

Document Path: C:\Users\roth\Box\Jobs\5804.0 Tualatin Water Sys Seismic Resiliency Eval\Project Work\02 - GIS Files\TualatinWaterSeismicEval.mxd





NOTES:

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2. DATA SOURCE: DOGAMI O-18-02
Topographic Map 3D - Portland, OR USA: Esri, Esri Community Maps Contributors

LIQUEFACTION-INDUCED SETTLEMENT

1 " = 3,000 '

0 3,000 6,000 '

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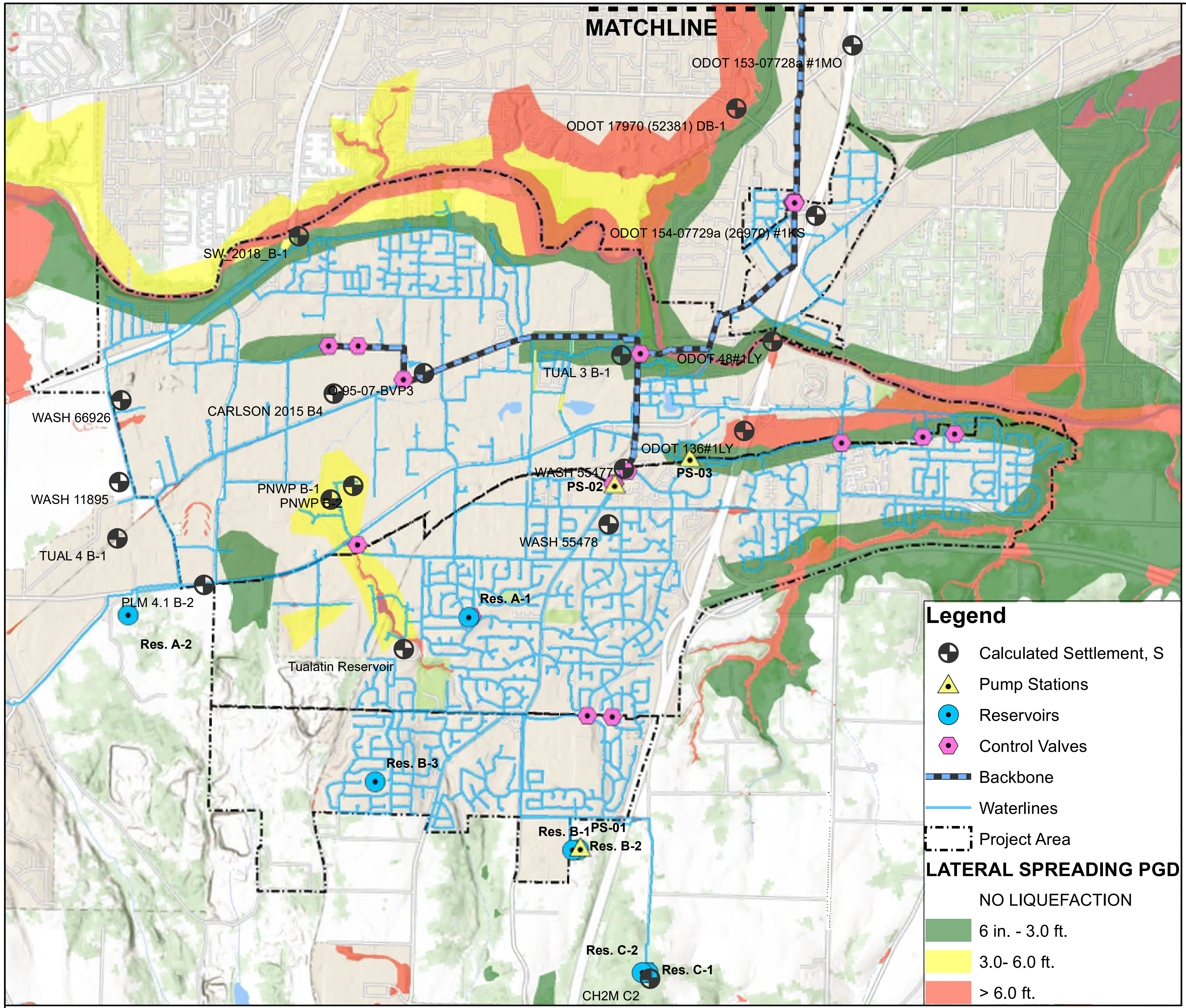
McMILLEN
JACOBS
ASSOCIATES

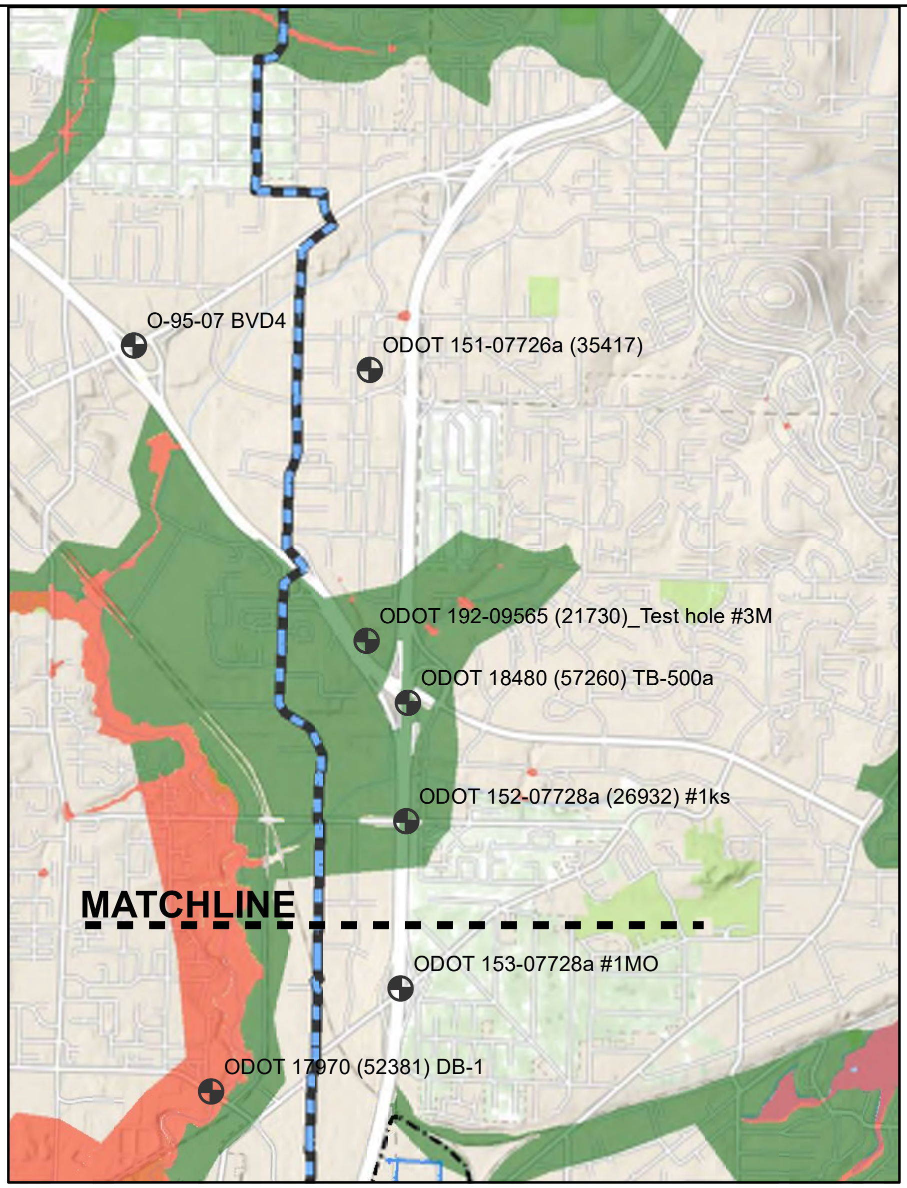
TUALATIN WATER
SEISMIC HAZARD EVALUATION
TECHNICAL MEMORANDUM
SEISMIC HAZARDS
LIQUEFACTION-INDUCED SETTLEMENT

FIG. 4

Jun 2018

Document Path: C:\Users\roth\Box\Jobs\5804.0 Tualatin Water Sys Seismic Resiliency Eval\Project Work\02 - GIS Files\TualatinWaterSeismicEval.mxd





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2. DATA SOURCE: DOGAMI O-18-02
Topographic Map 3D - Portland, OR USA: Esri, Esri Community Maps Contributors

LATERAL SPREADING DISPLACEMENT

1 " = 3,000 '

0 3,000 6,000 '

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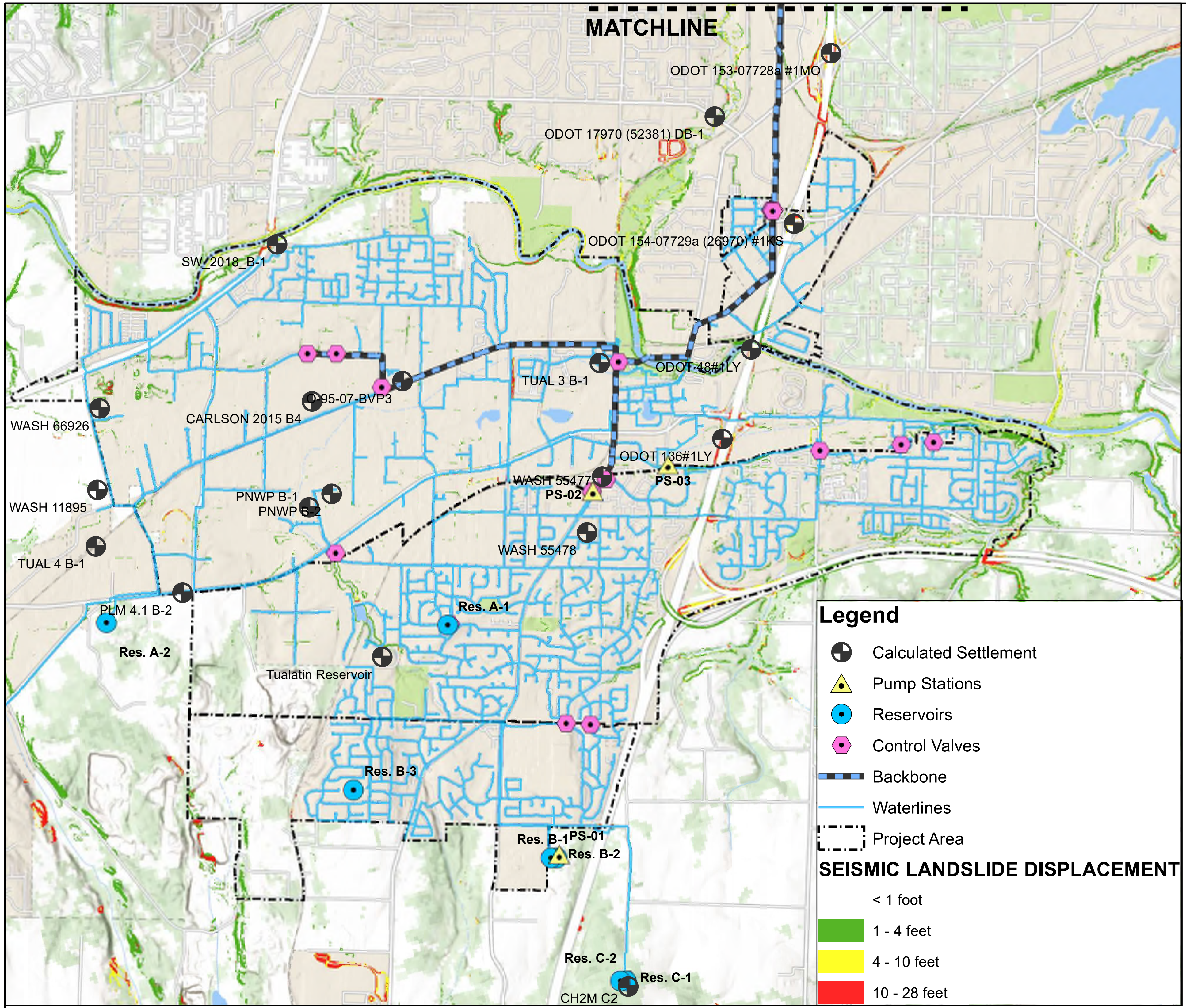
McMILLEN JACOBS ASSOCIATES

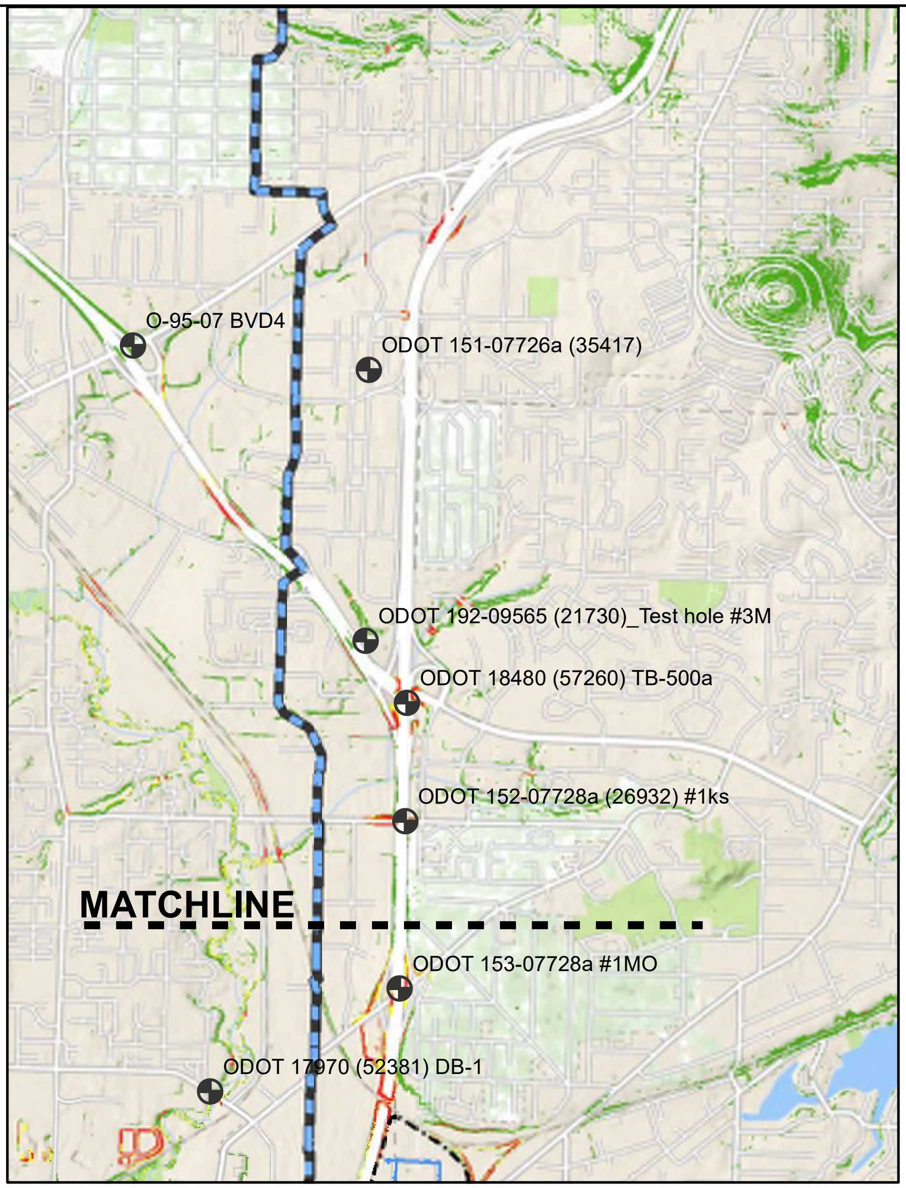
TUALATIN WATER
SEISMIC HAZARD EVALUATION
TECHNICAL MEMORANDUM
SEISMIC HAZARDS
LATERAL SPREADING DISPLACEMENT

FIG. 5

Jun 2018

Document Path: C:\Users\rroth\Box\Jobs\5804.0 Tualatin Water Sys Seismic Resiliency Eval\Project Work\02 - GIS Files\TualatinWaterSeismicEval.mxd





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2. DATA SOURCE: DOGAMI O-18-02
Topographic Map 3D - Portland, OR USA: Esri, Esri Community Maps Contributors

SEISMIC LANDSLIDE DISPLACEMENT

1 " = 3,000 '

0 3,000 6,000 '

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McMILLEN JACOBS ASSOCIATES

TUALATIN WATER
SEISMIC HAZARD EVALUATION
TECHNICAL MEMORANDUM
SEISMIC HAZARDS
SEISMIC LANDSLIDE DISPLACEMENT

FIG. 6

Jun 2018

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Appendix A Site Visit Photos

Photo 1: A-2 Reservoir, looking south (May 30, 2018).

Photo 2: A-2 Reservoir, rock outcrop south of the reservoir (May 30, 2018).

McMILLEN JACOBS ASSOCIATES	**CITY OF TUALATIN WATER SYSTEM SEISMIC RESILIENCY STUDY** **SEISMIC HAZARDS EVALUATION TECHNICAL MEMORANDUM** **SELECTED PHOTOGRAPHS** **May 2018 SITE VISIT**	**June 2018** **SHEET** **1**

Photo 3: A-2 Reservoir site, looking north (May 30, 2018).

Photo 4: A-1 Reservoir, foundation and structure elements (May 30, 2018).

McMILLEN JACOBS ASSOCIATES	**CITY OF TUALATIN WATER SYSTEM SEISMIC RESILIENCY STUDY** **SEISMIC HAZARDS EVALUATION TECHNICAL MEMORANDUM** **SELECTED PHOTOGRAPHS** **May 2018 SITE VISIT**	**June 2018** **SHEET** **2**

Photo 5: Norwood reservoirs and pump station, looking south (May 30, 2018).

Photo 6: Norwood reservoirs and pump station, looking west (May 30, 2018).

Photo 7: Boones Ferry Road Pump Station and Supply Control Valve (May 30, 2018).

APPENDIX G
RESILIENCY INVESTIGATION REPORT, PETERSTON STRUCTURAL ENGINEERS, 2018

PSE
PETERSON STRUCTURAL ENGINEERS

PORTLAND OFFICE
9400 SW Barnes Rd.
Suite 100
Portland, OR 97225
Phone: 503.292.1635

5/21/18

Brian Ginter
Murraysmith
888 SW 5th Ave., Suite 1170
Portland, OR 97204

File: PSE\17-128-12

Re: City of Tualatin Resiliency Investigation – Visual Observations Report

Dear Brian,

The following report serves to convey the results of our visual observation inspections of various water system structures for the City of Tualatin. Various facilities were selected by the City for high level inspection, review and preliminary recommendations by an engineer. The purpose of this report is to provide our visual observation comments on the general condition of each structure and to provide a condition rating and opine on the expected level of seismic performance. Please note that we have performed no load-based analysis of the subject structures and that seismic performance is based solely on building age, condition and type and the opinions of an Oregon licensed Professional Engineer.

Overview

On April 25th, 2018 members of our office joined members of the City of Tualatin staff to observe a total of 10 structures. The structures ranged from pump stations to various water storage reservoirs. Our observations were limited to the visible elements provided for inspection; the duration of each structure inspection averaged approximately 30 minutes of site time.

We've given each structure a "Condition Rating" which is indicative of the overall structural condition of the structure, with some adjustment for age. For example, a structure rated an "8" indicates that the structure is largely in good condition but shows some minor signs of wear. A structure rated a "4" indicates that the structure shows more extensive wear and will need to be repaired or replaced in the near term. The condition rating is not a descriptor of design quality and notable deficiencies are highlighted in the text.

We've also given a "Seismic Performance Expectation" for each structure. This is based on a visual inspection of the structure for obvious deficiencies and review of the original construction drawings, where available. In conjunction with our review of the construction drawings, we've also reviewed the "Benchmark Buildings" criteria from the ASCE 41 "Seismic Evaluation of Existing Buildings" to assist in our seismic performance expectation rating. The benchmark building gives a baseline code edition for many types of buildings; if the building is designed to the benchmark code (or a later iteration of that code) the building is likely to have been detailed sufficiently to prevent a catastrophic failure or life-safety risk in a seismic event.

The following is a list of structures captured in the current observations:

Pump Stations:

- ASR Pump Station
- Boones Ferry Control Station
- Martinazzi Pump Station
- C Level Norwood Pump Station

Water Storage Reservoirs:

- 2.2 MG A1 Reservoir – Welded Steel
- 5.0 MG A2 Reservoir – Welded Steel
- 2.2 MG B1 Reservoir – Welded Steel
- 2.8 MG B2 Reservoir – Welded Steel
- 0.8 MG C1 Reservoir – Welded Steel
- 1.0 MG C2 Reservoir – Welded Steel

Description of Ratings

The condition ratings show in this report are indicative of the overall structure condition, as observed and documented during our site visit. The supporting commentary for each structure was developed from further review of our photos and notes, and of the available as built drawings.

Condition Rating Scale:

Rating	Description
9-10	Very Good
7-8	Good, Shows Slight Signs of Wear
5-6	Shows Expected Level of Aging
3-4	Shows Wear and Will Need Rehabilitation or Replacement
1-2	Should be Replaced or Rehabilitated As Soon As Possible

Seismic Performance Expectation Scale:

Rating	Description
Good	Structure likely to perform well with minor damage, re-occupancy and maintained serviceability likely, some repairs necessary
Moderate	Structure likely to retain primary shape without collapse, expect moderate to heavy damage, re-occupancy and maintained serviceability possible, extensive repairs or replacement expected
Poor	Partial or comprehensive structure collapse likely with extensive damage, re-occupancy and maintained serviceability unlikely, extensive repairs or structure replacement probable

Pump Stations

ASR Pump Station

Condition Rating: 9
Seismic Performance Expectation: Good

Comments:

The ASR Pump Station is a concrete masonry unit building constructed in 2010. It has a nail plated wood truss roof and a concrete foundation. It is in good condition and with a recent design and construction date we expect it would meet the current requirements of an ASCE 41 seismic evaluation. While on site we noted a standby generator positioned near the building. The standby generator is considered temporary at this time and therefore does not require seismic anchorage, however if it becomes a permanent installation it should be anchored. Most of the piping and mechanical equipment inside the structure appeared to be adequately braced for seismic resistance. However, we noted a few elements that should be evaluated and upgraded with code compliant seismic bracing, including the electrical cabinets, vent fans, and the chemical barrels in the room at the North side of the building.

ASR Pump Station

ASR Pump Station – Temporary Generator

ASR Pump Station – Electrical Cabinets & Hanging HVAC Equipment

ASR Pump Station – Unbraced Chemical Barrels

Boones Ferry Control Station

Condition Rating: 3
Seismic Performance Expectation: Poor

Comments:

The Boones Ferry Control Station is a buried pre-cast concrete panel structure with an assumed construction date of mid to late 1980s according to city personnel. There does not appear to be a mechanical connection between the wall panels and the roof or floor panels. The structure appears to be in poor condition and shows more than the expected level of aging for assumed date of construction. It is expected during a code level seismic event that this structure will perform poorly. Because of the buried nature of the structure, performing upgrades to increase seismic performance is likely not an economically viable endeavor. Additionally, the piping is lacking modern bracing and flexible joints at wall penetrations. It is very likely that a full replacement of the structure would be a more viable approach.

Boones Ferry Control Station

Boones Ferry Control Station – Vertical Pipe Bracing Only, No Lateral Bracing

Boones Ferry Control Station – Rigid Pipe Penetration Through Vault Wall

Martinazzi Pump Station

Condition Rating: 4
Seismic Performance Expectation: Poor

Comments:

The Martinazzi Pump Station is a buried pre-cast concrete panel structure constructed around 1976. There does not appear to be a mechanical connection between the wall panels and the roof or floor panels. The structure appears in poor condition due to age and corrosion. It is expected during a code level seismic event that this structure will perform poorly. We feel it unlikely that this structure and the systems within will be functional post seismic event. Because of the buried nature of the structure, performing upgrades to increase seismic performance is likely not an economically viable endeavor. The piping is also lacking modern bracing and flexible joints at wall penetrations. It is very likely that a full replacement of the structure would be a more viable approach.

Martinazzi Pump Station

Martinazzi Pump Station – Rigid Pipe Penetrations Through Vault Wall

Martinazzi Pump Station – Bottom of Roof Panels Showing Pooor Concrete Condition

Martinazzi Pump Station – Outdated Pipe Bracing

C Level Norwood Pump Station

Condition Rating: 8
Seismic Performance Expectation: Good

Comments:

The C Level Norwood Pump Station is a concrete masonry unit building constructed in 2010. It has a wood framed roof system and a concrete foundation. It is in good condition and with a recent design and construction date we expect it would meet the current requirements of an ASCE 41 seismic evaluation. While most of the piping appears to be well braced, some of the electrical and mechanical equipment appears to be inadequately braced for seismic resistance. We recommend that plumbing, piping, HVAC, tanks, pumps and control panels all be evaluated and upgraded with code compliant seismic bracing.

C Level Norwood Pump Station

C Level Norwood Pump Station – Vertical Pipe Bracing, Limited Lateral Support

C Level Norwood Pump Station – HVAC Equipment with Limited Lateral Strength

C Level Norwood Pump Station – Electrical Cabinets, Verify/Add Lateral Bracing

Water Storage Reservoirs

2.2 MG A1 Reservoir

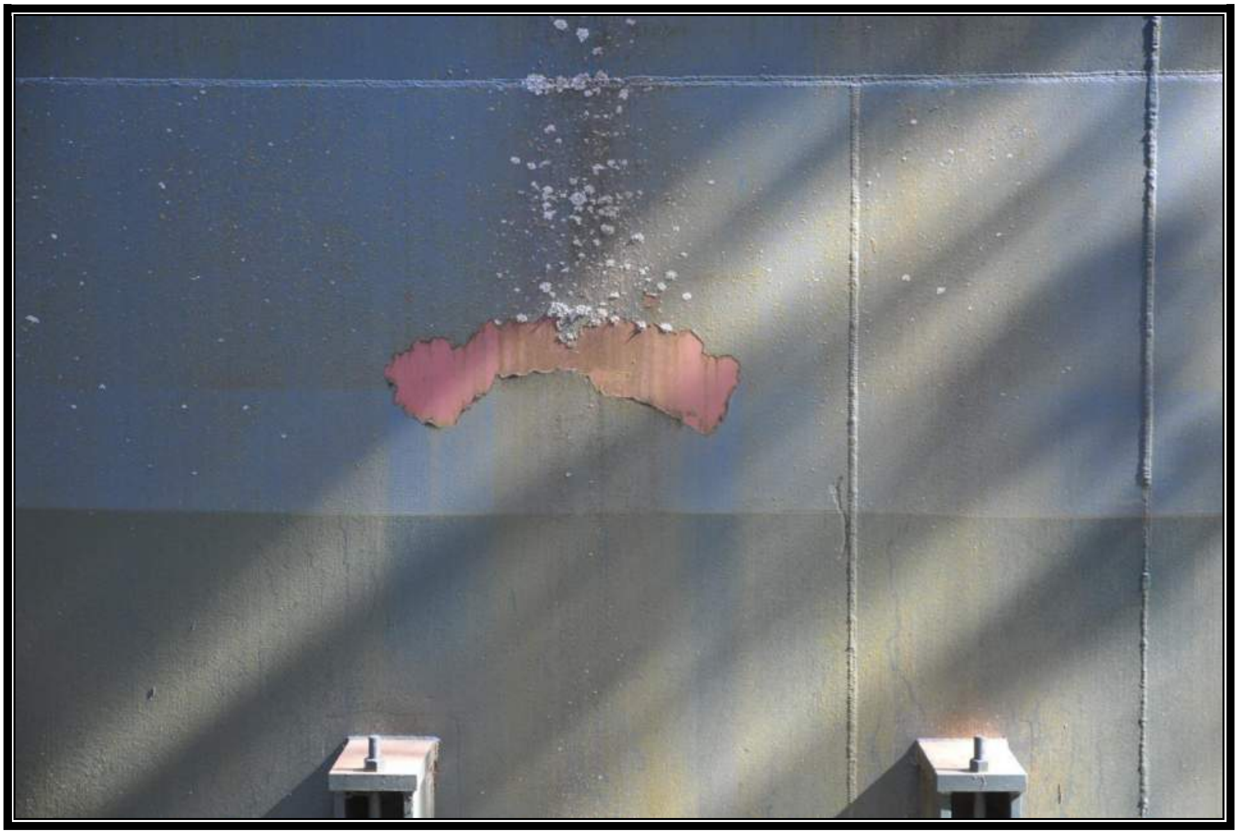
Condition Rating: 6
Seismic Performance Expectation: Moderate

Comments:

A1 is a 2.2 MG welded steel reservoir with a concrete foundation that was constructed in 1971. This reservoir was constructed using a previously existing Hanford tank that was cut into segments and then reassembled with additional plates to obtain the desired volume. The reservoir was retrofitted in 2006 with additional concrete added to the foundation and anchorage, both of which appear to be in good condition. The exterior coating appears as expected for the age of the structure, some spots of peeling have occurred. The welds appear questionable in some areas. Some areas around the top of the tank have buckled, which may be due in part to the additional plates appearing to be tangential rather than curved to the radius of the tank. The overflow was observed to discharge directly onto the ground outside the tank. We gave the condition and seismic performance ratings largely based on the observed condition of the welds and buckling near the roof. We recommend recoating the exterior and mitigating the discharge of the overflow to prevent the potential for excess water to compromise the foundation of the reservoir. We recommend that an updated structural analysis be performed on this reservoir to bring the expected performance related to seismic resiliency up to date with the codes currently in force.

2.2 MG A1 Reservoir

2.2 MG A1 Reservoir – Foundation and Anchorage Retrofit



2.2 MG A1 Reservoir – Exterior Coating Peeling

2.2 MG A1 Reservoir – Buckled Wall Shell Plates

2.2 MG A1 Reservoir – Overflow Discharge

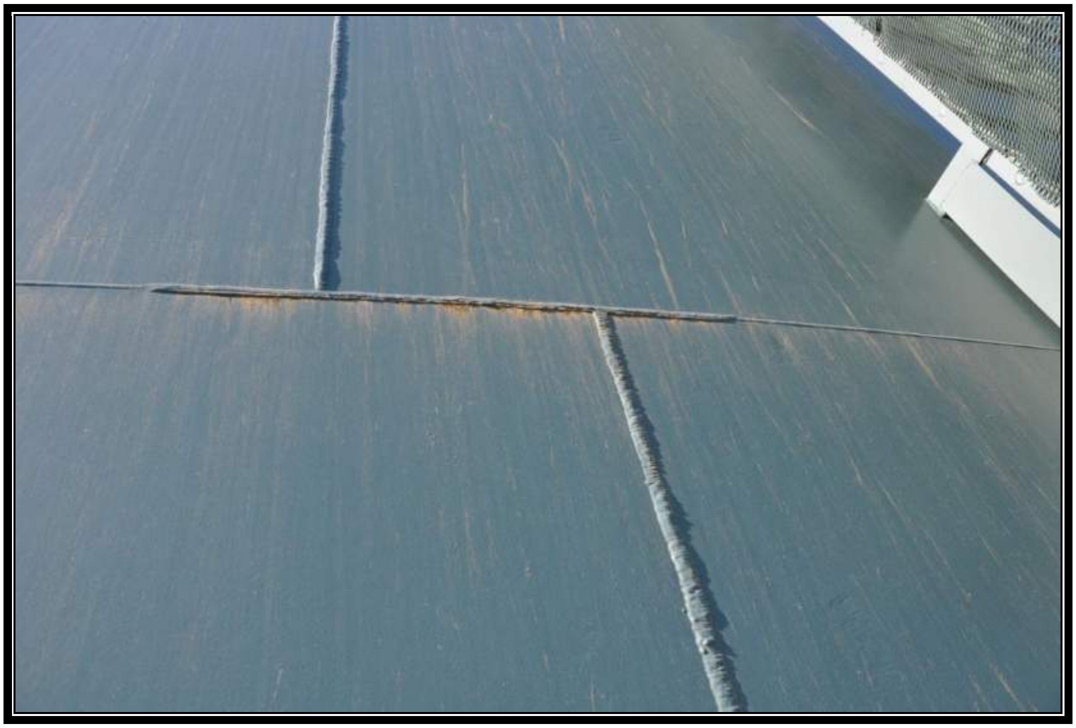
5.0 MG A2 Reservoir

Condition Rating: 8
Seismic Performance Expectation: Good

Comments:

A2 is a 5.0 MG welded steel reservoir with a concrete foundation that was constructed in 2006. With a recent construction date the reservoir is likely in conformance with most of the current seismic code requirements. The reservoir appears to have 5 feet of freeboard which is in the range of what we would expect for a reservoir designed to current seismic code requirements. The foundation concrete, anchorage, exterior coating, and welds all appear to be in good condition. There is also a small steel framed shelter for electrical equipment on site near the reservoir, the structure appears to be well anchored and in good condition. Overall the reservoir appears to be in good condition from our ground assessment.

5.0 MG A2 Reservoir



5.0 MG A2 Reservoir – Wall Shell Welds

5.0 MG A2 Reservoir - Shelter

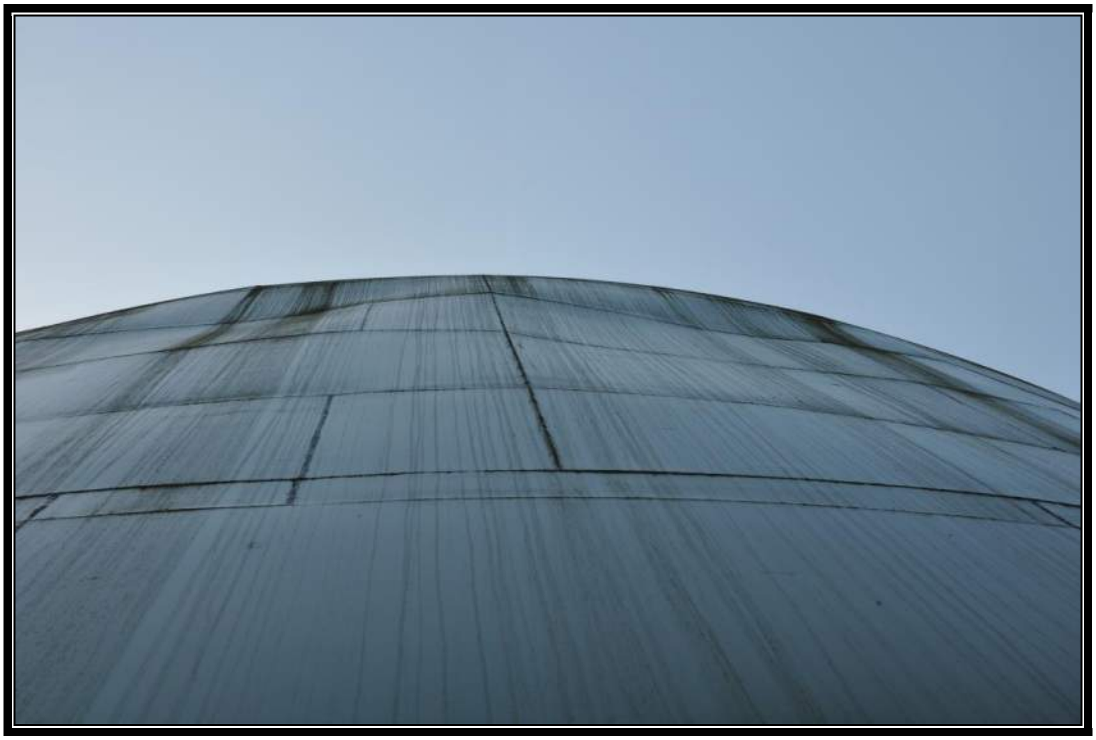
2.2 MG B1 Reservoir

Condition Rating: 5
Seismic Performance Expectation: Poor

Comments:

B1 is a 2.2 MG welded steel reservoir with a concrete foundation that was constructed in 1971. This reservoir was constructed using a previously existing Hanford tank that was cut into segments and then reassembled with additional plates to obtain the desired volume. The reservoir was retrofitted in 2006 with additional concrete added to the foundation and anchorage, both of which appear to be in good condition. The exterior coating appears to be in good condition, no notable signs of peeling. The welds appear questionable in some areas. The overflow was observed to discharge directly onto the ground outside the tank with a minimal concrete catch. We noted some buckling near the top of the tank, which may be due in part to the additional plates appearing to be tangential rather than curved to the radius of the tank. Given the amount of buckling and the eccentricity, we expect it would lead to damage in a seismic event. We recommend mitigating the discharge of the overflow to prevent the potential for excess water to compromise the foundation of the reservoir. We recommend that an updated structural analysis be performed on this reservoir to bring the expected performance related to seismic resiliency up to date with the codes currently in force.

2.2 MG B1 Reservoir



2.2 MG B1 Reservoir – Wall Shell Plate Buckling

2.2 MG B1 Reservoir – Overflow Discharge and Catch Basin

2.2 MG B2 Reservoir

Condition Rating: 7
Seismic Performance Expectation: Moderate

Comments:

B2 is a 2.2 MG welded steel reservoir with a concrete foundation that was constructed in 1989. The reservoir was retrofitted in 2006 with additional concrete added to the foundation and anchorage, which appears to be in good condition. The exterior coating appears as expected for the age of the structure. The welds appear to be in good condition. Based on our review of the provided as-built drawings there appears to be approximately 2 feet of freeboard beyond the elevation of the overflow. From an analytical standpoint, 2 feet of freeboard would not meet current code requirements, and if the reservoir is operating at overflow elevation during a seismic event there would likely be damage to the roof. We recommend recoating the exterior. Overall the reservoir appears to be in good condition from our ground assessment.

2.2 MG B2 Reservoir

2.2 MG B2 Reservoir – Anchorage Retrofit

2.2 MG B2 Reservoir – Wall Shell Plates

0.8 MG C1 Reservoir

Condition Rating: 4
Seismic Performance Expectation: Moderate

Comments:

C1 is a 0.8 MG welded steel reservoir with a concrete foundation constructed in 1972. The reservoir was retrofitted in 2006 with the addition of a concrete ballast ring around the base. The exterior coating was in moderate condition, with some peeling noted at the interface of the ballast ring and the reservoir wall. The welds appear to be in good condition for the age of the structure. Based on our review of the provided as-built drawings there appears to be approximately 12 inches of freeboard beyond the elevation of the overflow. From an analytical standpoint, 12 inches of freeboard would not meet current code requirements, and if the reservoir is operating at overflow elevation during a seismic event there would likely be damage to the roof. Overall the reservoir appears to be in good condition from our ground assessment. We recommend recoating the exterior and providing flashing at the ballast ring and reservoir wall to prevent further water infiltration.

0.8 MG C1 Reservoir

0.8 MG C1 Reservoir – Wall Shell Plates

0.8 MG C1 Reservoir – Ballast Ring

1.0 MG C2 Reservoir

Condition Rating: 10
Seismic Performance Expectation: Good

Comments:

C2 is a 1.0 MG welded steel reservoir with a concrete foundation that was constructed in 2016. According to the provided as-builts, the reservoir was designed and constructed in conformance with the most current seismic code requirements. The reservoir appears to have 4 feet of freeboard which is in the range that we would expect for a reservoir designed to current seismic requirements. The foundation concrete, anchorage, exterior coating, and welds all appear to be in excellent condition. Overall the reservoir appears to be in excellent condition from our ground assessment.

1.0 MG C2 Reservoir

1.0 MG C2 Reservoir – Wall Shell Plates

1.0 MG C2 Reservoir – Anchors and Foundation

Summary

It is our understanding that the city wishes to use this data to develop an understanding of the potential seismic vulnerability of their facilities. We have identified a few facilities that are in generally poor condition and should be replaced soon. We understand that there may be some redundancy in the system and that a lesser level of expected seismic performance is acceptable for structures with redundancy and very low associated risk to life safety. We have identified some structures which we expect to perform poorly and some structures that are near the end of their service life – due either to wear and age or design and construction flaws.

There have been some significant changes in the code provisions for seismic design and detailing criteria that has occurred since most of these structures were designed. Many of the reservoirs were retrofitted to capture the more recent code provisions, but the anchorage for some of the pumps and other equipment likely does not meet current code. We noted a number of items that were not anchored for overturning against a seismic event, ranging from electrical to pipes and ducts. The degree to which it is necessary to address these issues is again related to the system redundancy and the risk to life-safety.

Thank you for the opportunity to serve the city, and please call if you have any questions. We are happy to provide further remediation guidance or investigation to facilities that are identified above as deficient and elsewhere as critical.

Sincerely,

Erik Peterson, P.E.

REGISTERED PROFESSIONAL ENGINEER
56275
OREGON
JULY 9, 2001
ERIK WILLIAM PETERSON
EXPIRES 12/31/18

Submitted via e-mail: Brian.Ginter@murraysmith.us

murraysmith

888 SW 5TH AVENUE, SUITE #1170
PORTLAND, OR 97204
www.murraysmith.us

Map 8-3: Local Street Plan

- - - - Local Street Connection

▬▬ Planning Area Boundary

Air Photo: Summer 2017

Note:
Future roadway alignments are approximate and subject to additional engineering and design.

TUALGIS