Hearings Examiner Meeting Agenda
Tuesday, May 25, 2021, 5:00 PM
REMOTE PARTICIPATION

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- https://zoom.us/j/97885740757
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1. Attendees may click the ***raise hand icon*** in the app and you will be called upon to comment for up to 3 minutes.
   - If listening by phone, hit *9 to "raise your hand" and you will be called upon to comment for up to 3 minutes.
2. Residents can send public comments to communitydevelopment@cityofcamas.us.

These will be entered into the meeting record. Emails received no later than one hour before the start of the meeting will be emailed to the Hearings Examiner prior to the meeting start time. Emails received within one hour and during the meeting and will be emailed to the Hearings Examiner no later than the end of the next business day. During the meeting, the clerk will read aloud the submitter's name, the subject, and the date/time it was received. The record will remain open for one week after the start of the meeting for public comment.

CALL TO ORDER

INTRODUCTIONS AND INSTRUCTIONS

HEARING ITEM

1. CJ Dens Subdivision (SUB20-02)
   Presenter: Lauren Hollenbeck, Senior Planner

ADJOURNMENT

LAND USE DECISION

STAFF REPORT

CJ DENS SUBDIVISION (File No. SUB20-02)

CONSOLIDATED FILES: SHORELINE SUBSTANTIAL DEVELOPMENT PERMIT, SHORELINE CONDITIONAL USE PERMIT AND SHORELINE VARIANCE (SHOR20-01); CRITICAL AREAS REVIEW (CA20-08); ARCHAEOLOGICAL REVIEW (ARCH20-08); TEMPORARY USE PERMIT (TUP20-05); STATE ENVIRONMENTAL POLICY ACT (SEPA20-17)

Type III

Staff Report Date: May 19, 2021

TO	Hearings Examiner	**HEARING DATE**	May 25, 2021
PROPOSAL	To subdivide 49.62 acres into 152 detached single-family residential lots.		
LOCATION	The site is located at 715 SE Leadbetter Road in the NE ¼ of Section 34, Northwest ¼ of Section 35, Township 2 North, Range 3 East, of the Willamette Meridian; and described as tax parcels 177906000, 178172000 and 178236000.		
APPLICANT	CJ Dens Lacamas II LLC PO Box 2239 Kalama, WA 98625	**CONTACT**	AKS Engineering & Forestry, LLC Michael Andreotti (360) 882-0419
APPLICATION SUBMITTED	November 25, 2020; Resubmitted January 8, 2021	**APPLICATION COMPLETE**	January 15, 2021
SEPA	The City issued a SEPA Mitigated Determination of Non-significance (MDNS) May 6, 2021, with a comment period that ends on May 20, 2021. The SEPA MDNS was mailed to property owners May 5, 2021 and published in the Post Record on May 6, 2021. Legal publication #548070.		
PUBLIC NOTICES	Notice of Application was mailed to property owners within 300 feet of the site on January 27, 2021 and published in the Post Record on January 28, 2021. Legal publication #503830. Notice of public hearing was mailed to property owners within 300 feet of the site on May 5, 2021 and published in the Post Record May 6, 2021. Legal publication #548270.		

APPLICABLE LAW: The application was submitted on November 25, 2020 and the applicable codes are those codes that were in effect at the date of application. Camas Municipal Code (CMC) Title 16 Environment, Title 17 Land Development, and Title 18, specifically (but not limited to): Chapter 18.11 - Parking, Chapter 18.13 - Landscaping, Chapter 18.18 - Site Plan Review, and Chapter 18.55 Administrative Procedures; Camas Shoreline Master Program (Ord. 15-007) and the Shoreline Management Act (RCW 90-58) (WAC 173-27).

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PROJECT SUMMARY

Application has been made to the City of Camas for preliminary plat approval for a single-family residential subdivision located at 715 SE Leadbetter Road in the R-7.5 Single-Family Residential zone with an Airport Overly Zone. The preliminary plat proposal would segregate 49.62-acres into 152 lots in three phases ranging in size from 5,508 square feet to 8,908 square feet, with an average lot size of 6,839 square feet. The proposal includes tracts for a trail, open spaces, critical areas, private access roads, parking, and stormwater facilities.

The subject property is bordered to the southeast by Deerhaven Phase 1 subdivision, the northeast by a single-family residence and to the north by City owned vacant land also zoned R-7.5. To the east is a single-family residence zoned Community Commercial (CC). To the west is a residence and the Camas Washougal Wildlife League clubhouse zoned Community Commercial (CC). SE Leadbetter Road borders the site on its south side where site access is also provided.

The site's topography varies with rock outcroppings, level plateaus, and steep slopes up to 80% that slope downwards towards SE Leadbetter road along Lacamas Lake. Lacamas Lake sits south of SE Leadbetter Road. Two streams and a wetland are located at the northern end of the site, with a small stream located at the southeast corner. Much of the site was previously logged in 2015 leaving stands of evergreen trees dispersed throughout the site, but primarily covered in shrubs and grass.

The project site's frontage also lies within the regulated shoreline of Lacamas Lake. The Camas Shoreline Master Program (SMP) classifies the shoreline of the property as "Urban Conservancy" shoreline environment. The subdivision of land requires a Shoreline Substantial Development permit as the total cost of the development exceeds $6,416.00 or as adjusted by the State Office of Financial Management per SMP section 2.3.2.1. Although project improvements are located above the ordinary high-water mark (OHWM) of Lacamas Lake, a public access road, utilities, a trail and residential lots are located within the "Urban Conservancy" shoreline environment. In the "Urban Conservancy" shoreline environment, the trail and residential structures are permitted outright with a 100-foot setback from the OHWM whereas public access roads and utility improvements are permitted subject to a Conditional Use Permit and require a 100-feet from the OHWM. The roadway site entrance and utility improvements will require Shoreline Variances for encroaching in the required setbacks.

The development is subject to review and approval of the following permits: Shoreline Substantial Development Permit (SDP), Shoreline Conditional Use Permit, Shoreline Variance, Critical Area permit, SEPA review, Archaeological review, Temporary Use Permit and Subdivision review. The staff report includes criteria for review for all these permit types.

FINDINGS

Shoreline Master Program (SHOR20-01)

SMP Standards for Evaluation

- **Shoreline Substantial Development Permits** must be consistent with the approved Shoreline Master Program (SMP) element goals, objectives, and general policies of the designated environment; policy statements for shoreline use activities; and with use activity regulations.
- **Shoreline Conditional Use Permits.** These provisions shall apply only when it can be shown that extraordinary circumstances exist and that the public interest would suffer no substantial detrimental effect. SMP Conditional Use Permits require final approval or disapproval from the Department of Ecology after final local action has been taken.
- **Shoreline Variances.** The applicant must demonstrate that the variance is the minimum necessary to afford relief and that it will not cause adverse effects to the environment. SMP Variances require final approval or disapproval from the Department of Ecology after final local action has been taken.

Master Program Goals and Policies — SMP Chapter 3

At page 3-1 of the SMP, the general goals of the program are to use the full potential of the shorelines in accordance with the surrounding areas, the natural resource values, and the unique aesthetic qualities; and develop an ordered and diversified physical environment that integrates water and shoreline uses while achieving a net gain of ecological function. Primarily, the subdivision supports the following shoreline goals:

SMP, Section 3.2 *Shorelines of Statewide Significance*, "Development should be focused in already pre-developed shoreline areas to reduce adverse environmental impacts and to preserve undeveloped shorelines."

SMP, Section 3.7 *Public Access and Recreation*, "The goal of public access and recreation is to increase the ability of the general public to enjoy the water's edge, travel on the waters of the state, and to view the water and the shoreline from adjacent locations."

SMP, Section 3.10 *Shoreline Use and Development*, "The goal for shoreline use and development is to balance the preservation and development of shorelines in a manner that allows for mutually compatible uses. Resulting in land use patterns will be compatible with shoreline designations and sensitive to and compatible with ecological systems and other shoreline resources. To help with this balance, shoreline and water areas with unique attributes for specific long term uses such as commercial, residential, industrial, water, wildlife, fisheries, recreational and open space shall be identified and reserved."

SMP, Section 3.11 *Transportation, Utilities, and Essential Public Facilities*, "The goal for transportation, utilities, and essential public facilities is to provide for these facilities in shoreline areas without adverse effects on existing shoreline use and development or shoreline ecological functions and/or processes."

FINDING: Staff finds that the project is consistent with the general policies of Chapter 3, given that the proposed location of improvements is within areas that are already developed and mitigated for in those areas that are impacted; promotes public access and recreation to the shorelines and waters of the state; and designed with large natural open space tracts in the shoreline to not adversely impact shoreline ecological functions.

Urban Conservancy Shoreline Designation — SMP Chapter 4

The management policies of the Urban Conservancy Shoreline Designation at SMP Section 4.3.3.4 are as follows:

1. **Uses that preserve the natural character of the area or promote preservation of open space or critical areas either directly or over the long term should be the primary allowed uses. Uses that result in restoration of ecological functions should be allowed if the use is otherwise compatible with the purpose of the Urban Conservancy shoreline designation and the setting.**

   FINDING: The project is consistent with the SMP designation of Urban Conservancy because most of the shoreline jurisdiction is located within proposed natural area tracts to help protect ecological function of the shoreline. The roadway site entrance, trail, utility improvements and portions of residential lots located within the shoreline jurisdiction will be compensated through restoration to achieve a no net loss of ecological function.

2. **Single family residential development shall ensure no net loss of shoreline ecological functions and preserve the existing character of the shoreline consistent with the purpose of this designation.**

   FINDING: Although a portion of proposed residential lots 1-5 and 31-32 are located within the Urban Conservancy shoreline jurisdiction, all the lots are located outside of the required 100-foot setback from the OHWM to ensure no net loss of shoreline ecological functions.

3. **Low-intensity public access and public recreation objectives should be implemented whenever feasible and when significant ecological impacts can be mitigated (e.g. trails).**

   FINDING: The project proposes public access and recreation improvements with the construction of a pedestrian pathway through proposed natural area tracts adjacent to SE Leadbetter Road.

4. **Thinning or removal of vegetation should be limited to that necessary to (1) remove noxious vegetation and invasive species; (2) provide physical or visual access to the shoreline; or (3) maintain or enhance an existing use consistent with critical areas protection and maintenance or enhancement of shoreline ecological functions.**

   FINDING: The majority of vegetation removal is limited to previously logged areas. Unavoidable impacts to native vegetation include the location of vehicular entrance road, utilities and the trail that will be mitigated with replanting within the natural area tracts.

5. **Low intensity water-oriented commercial uses may be permitted if compatible with surrounding uses.**

   FINDING: Water-oriented commercial uses are not proposed and therefore this criterion is not applicable.

General Shoreline Use and Development Regulations — SMP Chapter 5

The following general regulations of Chapter 5 Section 5.1 (beginning on page 5-1) are as follows:

1. **Shoreline uses and developments that are water-dependent shall be given priority.**

   FINDING: The development is not water-dependent and is separated from Lacamas Lake by SE Leadbetter Road, which will not interfere with other water-dependent uses.

2. **Shoreline uses and developments shall not cause impacts that require remedial action or loss of shoreline functions on other properties.**

   FINDING: The proposed development will not affect shoreline functions on other properties or require remedial action as Best Management Practices (i.e. erosion control, etc.) will be implemented throughout project construction.

3. **Shoreline uses and developments shall be located and designed in a manner such that shoreline stabilization is not necessary at the time of development and will not be necessary in the future for the subject property or other nearby shoreline properties unless it can be demonstrated that stabilization is the only alternative to protecting public safety and existing primary structures.**

   FINDING: The proposed development will not require shoreline stabilization at the time of the development or in the future.

4. **Land shall not be cleared, graded, filled, excavated or otherwise altered prior to issuance of the necessary permits and approvals for a proposed shoreline use or development to determine if environmental impacts have been avoided, minimized and mitigated to result in no net loss of ecological functions.**

   FINDING: The applicant has applied for proper permits and has not requested to begin work prior to receiving approvals.

5. **Single family residential development shall be allowed on all shorelines except the Aquatic and Natural shoreline designation, and shall be located, designed and used in accordance with applicable policies and regulations of this Program.**

   FINDING: Portions of seven (7) single-family residential lots are located within the "Urban Conservancy" Shoreline Designation and setback more than the required 100-feet from the OHWM.

6. **Unless otherwise stated, no development shall be constructed, located, extended, modified, converted, or altered or land divided without full compliance with CMC Title 17 Land Development and CMC Title 18 Zoning.**

   FINDING: The proposed development requires compliance with the applicable regulations from CMC Title 17 Land Development and CMC Title 18 Zoning.

7. **On navigable waters or their beds, all uses and developments should be located and designed to: (a) minimize interference with surface navigation; (b) consider impacts to public views; and (c) allow for the safe, unobstructed passage of fish and wildlife, particularly species dependent on migration.**

   FINDING: This criterion is not applicable as the proposed project is not on navigable waters or their beds.

8. **Hazardous materials shall be disposed of and other steps be taken to protect the ecological integrity of the shoreline area in accordance with the other policies and regulations of this**

Program as amended and all other applicable federal, state, and local statutes, codes, and ordinances.

FINDING: The application does not propose the use of hazardous materials and therefore this criterion is not applicable.

9. **In-water work shall be scheduled to protect biological productivity (including but not limited to fish runs, spawning, and benthic productivity). In-water work shall not occur in areas used for commercial fishing during a fishing season unless specifically addressed and mitigated for in the permit.**

   FINDING: This criterion is not applicable as in-water work is not proposed.

10. **The applicant shall demonstrate all reasonable efforts have been taken to avoid, and where unavoidable, minimize and mitigate impacts such that no net loss of critical area and shoreline function is achieved. Applicants must comply with the provisions of Appendix C with a particular focus on mitigation sequencing per Appendix C, Section 16.51.160 Mitigation Sequencing. Mitigation Plans must comply with the requirements of Appendix C, Section 16.51.170 Mitigation Plan Requirements, to achieve no net loss of ecological functions.**

    FINDING: The application includes critical area reports for fish and wildlife habitat conservation areas and geologically hazardous areas within shoreline jurisdiction with discussions of avoidance and minimization efforts. Further discussion is provided in Section 5.3 below.

11. **The effect of proposed in-stream structures on bank margin habitat, channel migration, and floodplain processes should be evaluated during permit review.**

    FINDING: This criterion is not applicable as no in-stream work is proposed.

12. **Within urban growth areas, Ecology may grant relief from use and development regulations in accordance with RCW 90.58.580, and requested with a shoreline permit application.**

    FINDING: The activity is in city limits and therefore this criterion is not applicable.

Archaeological, Cultural and Historic Resources — SMP Section 5.2

The application included an archaeological predetermination survey report that was sent to the Department of Archaeology and Historic Preservation and Tribal Representatives for review and comment. The report concluded that no further archaeological work is necessary.

FINDING: If an item of possible archaeological interest is discovered on site, work will immediately cease and notification of the findings will be sent to the appropriate parties.

Critical Areas Protection — SMP Section 5.3

The subject parcel includes the following critical areas and their associated buffers as located within the shoreline designation as regulated by the SMP: Geologically Hazardous Areas and Fish and Wildlife Habitat Conservations Areas. Critical area regulations are located within the SMP, Appendix C.

<u>Geologically Hazardous Areas – SMP Appendix C, Chapter 16.59</u>

Clark County GIS mapping identifies steep slopes at the southern portion of the property within the shoreline jurisdiction. As such, the applicant submitted a Geotechnical Engineering Report dated July 2016 prepared by Hart Crowser including a supplemental memorandum dated November 2020. The

reports indicated a northwest-trending slope abutting the north side of SE Leadbetter Road with variable landforms and gradients gentle to steep. The reports concluded surface or subsurface active landsliding was not observed, and the soils do not present a slope stability hazard to the proposed development, if designed in conformance with the recommendations in this report. The geohazard areas that are located within the shoreline designation are proposed to be placed in natural area tracts for preservation. A trail system is proposed to meander within in the natural area tracts.

Fish and Wildlife Conservation Areas- SMP Appendix C, Chapter 16.61

Clark County GIS identifies Lacamas Lake adjacent to or within (300-feet) of the subject property, which requires a 150-foot buffer per SMP Appendix C Section 16.61.040.D. However, per SMP Appendix C Section 5.3.2.c, "*Lacamas Lake buffers from OHWM shall not extend landward of NE Leadbetter Road*." Since NE Leadbetter is located along the project site's southern boundary line and separates the subject property and the Lake, the provisions of Chapter 16.61 are not applicable.

FINDING: Impacts to critical areas will be mitigated with Best Management Practices for erosion control construction and native re-vegetation measures to ensure no net loss of ecological functions to the shoreline area and maintain habitat connectivity to the shoreline. Staff finds the applicant will comply with the provisions of the Critical Areas regulations as conditioned.

Site Planning and Development — SMP Section 5.7

The regulations concerning Site Planning and Development at SMP Section 5.7 include the following applicable policies regarding the project proposal:

1. **Land disturbing activities such as grading and cut/fill shall be conducted in such a way as to minimize impacts to soils and native vegetation.**

   FINDING: Land disturbing activities in the shoreline are limited to accommodate the site access road, proposed trail, a portion of Lots 1-5, 31 and 32 and erosion control best management practices will be implemented. Vegetation removed for site improvements will be replanted with trees and native vegetation.

2. **Impervious surfaces shall be minimized to the extent feasible so as not to jeopardize public safety.**

   FINDING: Impervious surfaces are minimized to the greatest extent feasible to include the intersection of N Elk Drive, a trail, and a couple of driveways for residential lots 31 and 32, which will be mitigated via a stormwater system that will protect neighboring properties.

3. **When feasible, existing transportation corridors shall be utilized.**

   FINDING: The proposed roadway improvements will utilize the existing transportation corridor as much as possible via access from the existing SE Leadbetter Road at the site's frontage.

4. **Vehicle and pedestrian circulation systems shall be designed to minimize clearing, grading, alteration of topography and natural features, and designed to accommodate wildlife movement.**

   FINDING: The proposed roadway and trail design is the least impactful to the environment and will continue to accommodate wildlife movement.

5. **Parking, storage, and non-water dependent accessory structures and areas shall be located landward from the OHWM and landward of the water-oriented portions of the principle use.**

   FINDING: Parking, storage and non-water dependent accessory structures and areas associated with residential lots 1-5, 31 and 32 are located landward from the OHWM to the greatest extent practicable. There are no water-oriented uses proposed.

6. **Trails and uses near the shoreline shall be landscaped or screened to provide visual and noise buffering between adjacent dissimilar uses or scenic areas, without blocking visual access to the water.**

   FINDING: The proposed trail is buffered from NE Leadbetter Road via existing mature trees without blocking views of Lacamas Lake.

7. **Elevated walkways shall be utilized, as appropriate, to cross sensitive areas such as wetlands.**

   FINDING: The proposed project does not include crossing sensitive areas such as wetlands within the shoreline and therefore this criterion is not applicable.

8. **Fencing, walls, hedges, and similar features shall be designed in a manner that does not significantly interfere with wildlife movement.**

   FINDING: The portion of residential lots 1-5, 31 and 32 will have private fences at their property lines but will not interfere with wildlife movement within the adjacent proposed natural area tracts.

9. **Exterior lighting shall be designed, shielded and operated to: a) avoid illuminating nearby properties or public areas; b) prevent glare on adjacent properties, public areas or roadways; c) prevent land and water traffic hazards; and d) reduce night sky effects to avoid impacts to fish and wildlife.**

   FINDING: Proposed lighting within the development adjacent to the shoreline will be directed away and down lit to protect the night sky.

10. **Utilities shall be located within roadway and driveway corridors and rights-of-way wherever feasible.**

    FINDING: Proposed utilities within the shoreline jurisdiction will be located within the roadway where feasible. Sections of stormwater lines will be located within the shoreline to connect to the existing roadside ditch, which will be revegetated.

11. **A use locating near a legally established aquaculture enterprise, including an authorized experimental project, shall demonstrate that such use would not result in damage to destruction of the aquaculture enterprise, or compromise its monitoring or data collection.**

    FINDING: This criterion is not applicable as there is not aquaculture enterprise within the vicinity.

Specific Shoreline Use Regulations — SMP Chapter 6

The specific use regulations for recreational development begins at page 6-19 of the SMP.

SMP Section 6.3.11 Recreational Development

1. **Water-oriented recreational uses and developments are preferred.**

   FINDING: A multi-use regional trail is proposed along the site's frontage within natural area tracts.

2. **Trails shall be designed and constructed in substantial compliance with the standards of the *Camas Park, Recreation and Open Space Comprehensive Plan*, Design & Development Guidelines (2007, Appendix A), with the constructed width varying by trail type and critical area protection.**

FINDING: The PROS plan identifies the T-3 Multi-Use Regional Trail, a 12-foot wide paved trail, along SE Leadbetter Road at the site's frontage. Consistent with the PROS plan, the trail is proposed along the site's frontage within natural area tracts that contain steep slopes and existing trees. To minimize grading and the removal of trees, the proposed design of the trail will be a minimum 6-8ft. wide compact gravel surface.

3. **Recreation areas or facilities on the shoreline shall provide physical or visual public access in accordance with Section 5.5.**

   FINDING: The proposed T-3 multi-use regional trail will provide visual access to the Lacamas Lake shoreline.

4. **Parking areas that are accessory to recreational uses shall be located upland a minimum of the one hundred and fifty (150) feet away from the immediate shoreline, with pedestrian trails or walkways providing access to the water.**

   FINDING: Parking areas are not proposed for this section of T-3 multi-use regional trail and therefore this criterion is not applicable.

5. **All permanent, substantial, recreational structures and facilities shall be located outside officially mapped floodways.**

   FINDING: The proposed development is not located within mapped floodways.

6. **Parks and trailheads shall be provided with restrooms with hand washing facilities in accordance with public health standards and without adversely altering the natural features attractive for recreational uses.**

   FINDING: Parks and trailheads are not proposed and therefore this criterion is not applicable.

7. **Recreational facilities shall make adequate provisions, such as densely vegetated buffer strips, screening, fences, and signs, to protect the value and enjoyment of adjacent or nearby private properties and natural areas from trespass, overflow and other possible adverse impacts.**

   FINDING: The proposed T-3 multi-use regional trail will connect with the existing sidewalk at the east property line and directional signage will be provided for pedestrian traffic.

8. **Provisions shall be made for the proposed of water areas from drainage and surface runoff in all recreational development requiring the use of fertilizers and pesticides in areas adjacent to shorelines, such as in play fields and golf courses.**

   FINDING: Fertilizers and pesticides are not proposed for usage in the shoreline.

SMP Section 6.3.12 Residential Development

The specific use regulations for residential development begins at page 6-21 of the SMP. The applicant addresses the criteria of this section at page 21-22 of the narrative.

1. **Residential development shall include provisions to ensure preservation of native vegetation and control erosion during construction.**

   FINDING: The application proposes natural area tracts within the shoreline jurisdiction to protect native trees and vegetation. Erosion control measures and best management practices will be implemented to minimize erosion impacts as shown on the preliminary grading and erosion control plan.

2. **New residential construction shall be located so as not to require shoreline stabilization measures.**

FINDING: The residential lots are located north of NE Leadbetter Road, which separates the proposal from Lacamas Lake, and therefore will not require shoreline stabilization.

3. **New residential development shall be prohibited in, over, or floating on the water.**

   FINDING: This criterion is not applicable as residential development is not proposed in, over, or floating on the water.

4. **New residential development shall be located and designed that the bulk and density of structures minimizes view obstructions to and from the shoreline.**

   FINDING: The portion of residential lots within the shoreline are terraced up the hill and designed to comply with the required maximum 35-ft. height requirement. View impacts of the shoreline from properties to the north will be minimized.

5. **Clustering of residential units shall be allowed where appropriate to minimize physical and visual impacts on shorelines.**

   FINDING: Clustering of residential units is not proposed and therefore this criterion is not applicable.

6. **In those areas where only onsite sewage systems are available, density shall be limited to that which can demonstrably accommodate protection of surface and groundwater quality.**

   FINDING: No on-site sewage systems are proposed within this development and therefore this criterion is not applicable.

7. **New residential development, including sewage disposal systems, shall be prohibited in floodways and channel migration zones.**

   FINDING: The proposed project is not located in a floodway or a channel migration zone and therefore this criterion is not applicable.

8. **Appurtenances, accessory uses, and facilities serving a residential structure shall be located outside setbacks and critical areas and buffers unless otherwise allowed under this Program to promote community access and recreational opportunities.**

   FINDING: Appurtenances, accessory uses, and facilities are located outside setbacks and critical areas and therefore this criterion is not applicable.

9. **New residential units or lots created through land division in the shoreline shall be sized and configured in accordance with the city's zoning ordinance and shall only be permitted when the following standards are met:**
   a. **Flood hazard reduction measures are not required and will not be necessary during the life of the development or use in accordance with Appendix C, Chapter 16.55 Frequently Flooded Areas.**
   b. **Shoreline stabilization measures are not required.**

   FINDING: Portions of residential lots 1-5, 31 and 32 are located approximately 200-feet from the OHWM but outside of flood hazard areas. Therefore, flood hazard reduction measures and shoreline stabilization measures will not be necessary.

<u>SMP Section 6.3.14 Transportation Uses</u>

The specific use regulations for transportation begins at page 6-21 of the SMP. The applicant addresses the criteria of this section at page 23 of the narrative.

1. **All transportation facilities shall be constructed and maintained to cause the least possible adverse impacts on the land and water environments, shall respect the natural character of the shoreline and make every effort to preserve wildlife, aquatic life and their habitats.**

   FINDING: The proposed NE Elk Road roadway intersection improvements will take access from existing SE Leadbetter Road with no additional street frontage improvements. The roadway intersection improvements are designed to have the least possible impacts to the natural environment.

2. **New or expanded surface transportation facilities not related to and necessary for the support of shoreline activities shall be located outside the shoreline jurisdiction or set back from the ordinary high water mark far enough to make shoreline stabilization, such as rip rap, bulkheads or jetties, unnecessary.**

   FINDING: The roadway intersection improvements are on the north side of NE Leadbetter Road, which separates the site from Lacamas Lake, and landward from the ordinary high- water mark where shoreline stabilization is not necessary.

3. **Transportation facilities shall not adversely impact existing or planned water-dependent uses by impairing access to the shoreline.**

   FINDING: The proposed NE Elk Road roadway intersection improvements will increase access to the shoreline including the proposed trail to any potential future nearby water dependent uses.

4. **All roads shall be set back from waterbodies and shall provide buffer areas of compatible, self-sustaining native vegetation. Shoreline scenic drives and viewpoints may provide breaks in the vegetative buffers to allow open views of the water.**

   FINDING: The proposed NE Elk Road intersection improvements are on the north side of SE Leadbetter Road and the intersection is separated by Lacamas Lake from the road. The development includes two proposed natural area tracts with native vegetation along SE Leadbetter Road that include a proposed trail that offers viewspoints of Lacamas Lake.

5. **Transportation facilities that are allowed to cross over waterbodies and associated wetlands shall utilize elevated, open pile or pier structures whenever feasible to reduce shade impacts. All bridges shall be built high enough to allow the passage of debris and anticipated high water flows.**

   FINDING: The proposed project does not include transportation crossings over waterbodies or associated wetlands and therefore this criterion is not applicable.

6. **Fills for transportation facility development shall not be permitted in waterbodies or associated wetlands except when all structural or upland alternatives have proven infeasible and the transportation facilities are necessary to support uses consistent with this program.**

   FINDING: Fills in waterbodies or associated wetlands are not proposed as part of this project and therefore this criterion is not applicable.

7. **Transportation and utility facilities shall be required to make joint use of rights-of-way and to consolidate crossing of waterbodies where feasible.**

   FINDING: Proposed utilities will be located within the right-of-way where feasible. Crossing of waterbodies is not proposed.

<u>SMP Section 6.3.15 Utilities</u>

The specific use regulations for utilities begins at page 6-22 of the SMP. The applicant addresses the criteria of this section at page 23 of the narrative.

1. **Whenever feasible, all utility facilities shall be located outside shoreline jurisdiction. Where distribution and transmission lines (except electrical transmission lines) must be located in the shoreline jurisdiction they shall be located underground.**

   FINDING: Water, storm drainage lines including the power lines for street lighting will be located underground and within the right-of-way where feasible.

2. **Where overhead electrical transmission lines must parallel the shoreline, they shall be no closer than one hundred (100) feet from OHWM unless topography or safety factors would make it unfeasible, then a shoreline conditional use permit shall be required.**

   FINDING: Overhead electrical transmission lines are not proposed and therefore this criterion is not applicable.

3. **Utilities shall be designed, located and installed in such a way as to preserve the natural landscape, minimize impacts to scenic views, and minimize conflicts with present and planned land and shoreline uses.**

   FINDING: Proposed utilities within the shoreline jurisdiction will be placed underground within the proposed right-of-way of the new intersection, including upsizing two culverts under SE Leadbetter Road. Underground utilities outside of rights-of-way will be replanted with native vegetation.

4. **Transmission, distribution, and conveyance facilities shall be located in existing rights of way and corridors or shall cross shoreline jurisdictional areas by the shortest, most direct route feasible, unless such route would cause significant environmental damage.**

   FINDING: Proposed underground utilities will primarily be placed with right-of-way. Proposed underground utilities proposed outside of right-of-way are placed in the most direct, shortest routes and mitigated with native vegetation.

5. **Utility production and processing facilities, such as power plants and wastewater treatment facilities, or parts of those facilities that are nonwater-oriented shall not be allowed in the shoreline jurisdiction unless it can be demonstrated that no other feasible option is available, and will be subject to a shoreline conditional use permit.**

   FINDING: Utility production and processing facilities are not proposed and therefore this criterion is not applicable.

6. **Stormwater control facilities, limited to detention, retention, treatment ponds, media filtration facilities, and lagoons or infiltration basins, within the shoreline jurisdiction shall only be permitted when the following provisions are met.**

   a. **The stormwater facility is designed to mimic and resemble natural wetlands and meets the standards of CMC 14.02 Stormwater and the discharge meets state water quality standards;**
   b. **Low impact development approaches have been considered and implemented to the maximum extent feasible.**

   FINDING: There are no stormwater control, detention, or treatment facilities located within shoreline jurisdiction. Therefore, this criterion is not applicable.

7. **New and modifications to existing outfalls shall be designed and constructed to avoid impacts to existing native aquatic vegetation attached to or rooted in substrate. Diffusers or discharge points**

must be located offshore at a distance beyond the nearshore area to avoid impacts to those habitats.

FINDING: Stormwater will outfall through two existing culverts that cross under SE Leadbetter Road to Lacamas Lake that are proposed to be upsized and will likely need additional riprap at the discharge point. As such, mitigation for the impacts will be required to include invasive plant removal and/or the installation of native plant material around the culverts. Mitigation for the culvert improvements will need to be included in the final mitigation plan.

8. **Water reclamation discharge facilities (e.g. injection wells) are prohibited in the shoreline jurisdiction, unless the discharge water meets State Department of Ecology Class A reclaimed water standards…(excerpt)**

FINDING: This criterion is not applicable as no water reclamation facilities are proposed.

9. **Where allowed under this program, construction of underwater utilities or those within the wetland perimeter shall be scheduled to avoid major fish migratory runs or use construction methods that do not cause disturbance to the habitat or migration.**

FINDING: This criterion is not applicable as the construction of underwater utilities or those within the wetland perimeter are not proposed.

10. **All underwater pipelines transporting liquids intrinsically harmful to aquatic life or potentially detrimental to water quality shall provide automatic shut off valves.**

FINDING: This criterion is not applicable as no underwater pipelines are proposed.

11. **Upon completion of utility installation/maintenance projects on shorelines, banks shall, at a minimum, be restored to pre-project configuration, replanted and provided with maintenance care until the newly planted vegetation is fully established. Plantings at installation shall be at least 2" minimum caliper at breast height if trees, five-gallon size if shrubs, and ground cover shall be planted from flats at 12" spacing, unless other mitigation planting is recommended by a qualified biologist and approved by the Administrator.**

FINDING: This criterion is not applicable as utility installation/maintenance projects on the bank of the shoreline is not proposed. However, additional plantings are included in the natural area tracts as part of the project improvements in the shoreline.

Variances — SMP Appendix B Section IX

The proposed development includes setbacks for a public access road and utilities, which are not consistent with the SMP. As such, a variance is necessary to encroach into the required 100-foot right of way setback and underground utilities from the OHWM of the UC shoreline designation. The location for a portion of the roadway improvements and underground utilities, although closer than the required setbacks from the OHWM, are consistent with the SMP general policies as noted above at SMP Sections 3.2 *Shoreline of Statewide Significance* and 3.11 *Transportation, Utilities, and Essential Public Facilities* and SMP Section 5.7.10 *Site Planning*.

A. A request for a variance to a development may be authorized when the applicant can demonstrate all the following:

1. **That if the applicant complies with the provisions of the Program then they cannot make any reasonable use of the property. The fact that there is the possibility that the property might make a greater profit by using the property in a manner contrary to the intent of the Program is not a sufficient reason for a variance.**

FINDING: SE Leadbetter Road sits at the site's frontage and is currently located within shoreline jurisdiction. As such, direct access (i.e. N Elk Drive) to the site from SE Leadbetter Road is required and the proposed location of N Elk Drive is necessary to accommodate steep slopes and the retention of trees on site. Although utilities lines will be placed within roadways to the greatest extent practicable, small sections of the proposed stormwater lines will be placed in the shoreline jurisdiction to maintain existing stomwater drainage patterns. As such, the placement of the vehicular entrance to the site and utilities are the least impactful alternative to the shoreline.

2. **That the hardship is specifically related to unique conditions of the property (e.g. irregular lot shape, size or natural features) and not, for example, from deed restrictions or the applicant's own actions;**

   FINDING: The variance is necessary due to the existing location of SE Leadbetter Road in the shoreline designation, where vehicular access to the site is provided from, and the site is further constrained by existing steep slopes, trees, and stormwater drainage patterns.

3. **The variance requested is the minimum necessary to afford relief;**

   FINDING: The proposed improvements within the 100-foot shoreline setback are limited to the connection of approximately 16-feet of the N Elk Drive entrance to the site and associated underground utilities into SE Leadbetter Road, the installation of approximately 23-feet of stormwater pipe west of the existing pump station to connect to the existing stormwater line in SE Leadbetter Road, the replacement of existing stormwater culverts within improved areas, and the construction of a stormwater outfall to the existing roadside ditch. Relocating these improvements further west for example, would result in greater impacts to the shoreline area.

4. **That the variance will not constitute a grant of special privilege not enjoyed by other properties in the area;**

   FINDING: N Elk Drive entrance to the site and associated utilities are necessary for the proposed residential development as required by the municipal code. Most of the proposed subdivision is located outside of the shoreline jurisdiction.

5. **That the design of the project will be in harmony with the other authorized uses in the area, and the intent of the Program; and**

   FINDING: The land uses in the area are recreational, due to the proximity of Lacamas Lake, vacant park land and nearby residential. The proposed development is designed with natural area tracts that include tree retention and a trail system that will provide better public access to these recreational areas and nearby residential uses.

6. **That the public welfare and interest will be preserved; if more harm will be done to the area by granting the variance than would be done to the applicant by denying it, the variance will be denied.**

   FINDING: Providing a public access trail, a site access intersection (N Elk Drive) at a location with an existing road, including the construction of a stormwater outfall pipe and improvements to existing culverts, helps preserve the public welfare and interest through public recreational access, transportation circulation and stormwater management.

7. **If proposed waterward of the OHWM, then the public right of navigation and use will not be adversely affected.**

FINDING: No work is proposed in the water therefore this criterion is not applicable.

Conditional Use Permits **SMP Appendix B Section X**

As discussed throughout this report, the proposed activity is improvements to an arterial roadway in the "Urban Conservancy" shoreline environment, which is allowed as a conditional use per Table 6-1 of the SMP.

Pursuant to SMP, Appendix B, "*Conditional use approval may be granted only if the applicant can demonstrate all of the following":*

1. **The use will not cause significant adverse effects on the environment or other uses;**

   FINDING: No adverse effects are anticipated as two large natural area tracts for preservation are proposed within the shoreline area and proposed impacts are minimal, which will be restored to ensure no net loss of ecological functions.

2. **The use will not interfere with normal public use of public shorelines;**

   FINDING: No interference with the public use of the shoreline will occur as the intersection of N Elk Road connecting to the existing SE Leadbetter Road currently in the shoreline and the proposed underground utilities outside of right-of-way will be replanted with native vegetation. Furthermore, the additional trail improvements will enhance public access to the shoreline.

3. **Design of the development will be compatible with the surrounding authorized uses, the Program, and the comprehensive plan; and**

   FINDING: The proposed residential development has been designed with large natural area tracts to protect the shoreline and is compatible the existing surrounding recreational and residential uses. Construction is limited within the shoreline to N Elk Road entry road and associated utilities, water lines connecting to the existing roadside ditch in SE Leadbetter Road for stormwater management, new culvert crossings and a riprap outfall. The proposed development will provide no net loss to the function of the shoreline for Lacamas Lake, as well as providing a needed housing product to meet the housing needs of the comprehensive plan.

4. **The proposed use is consistent with the general intent of the Program, and the Act.**

   FINDING: As discussed throughout this report, the proposed project improvements in the shoreline is designed to minimize ecological impact and to protect existing ecological function of the shoreline by providing two natural open space tracts. Further, the project will not interfere with other shoreline uses and will improve public access to the shoreline. The project is in conformance with the general intent of the SMP.

FINDINGS

Title 16 Environment

STATE ENVIRONMENTAL POLICY ACT (SEPA20-17) CMC CHAPTER 16.07

A SEPA checklist was submitted and a Mitigated Determination of Non Significance (MDNS) was issued May 6, 2021 as the proposed development includes more than ten residential dwelling units per CMC 16.07.020.A.1. The mitigation measures identified in the SEPA MDNS will need to be complied with (See Exhibit 26). The comment period ends May 20, 2021. As of the writing of this staff report, SEPA comments were received from Southwest Clean Air Agency (Exhibit 31).

FINDING: Staff finds the mitigation measures identified in the SEPA MDNS will need to be complied with.

ARCHAEOLOGICAL RESOURCE PRESERVATION (ARCH20-08) CMC CHAPTER 16.31

An archaeological predetermination report was prepared for the site in 2010 for a larger residential subdivision development. A supplemental archaeological predetermination report was prepared in January 2021 for the current proposed residential development. Based on both reports, no further archaeological work is necessary at this time. The report and findings are not subject to the open public records act and as such, the city cannot disclose the results.

FINDING: Staff finds a condition of approval is warranted that if potential artifacts are discovered during the course of construction, work must immediately cease and both State Department of Archaeological and Historic Preservation and the City shall be notified.

CRITICAL AREAS (CA20-08) CMC CHAPTER 16.51

CMC Chapter 16.53 Wetlands

Clark County GIS mapping identified the subject property with a wetland at the northern boundary. A *Critical Areas Report & Buffer Mitigation Plan* prepared by Ecological Land Services (ELS) dated November 18, 2020 (Exhibit 9) identified one Category III depressional, forested wetland on the preliminary plat as Tract S (Wetland A). Wetland A (2.46-acres) at the northern portion of the site is to be adjacent to a high land use intensity (i.e. residential), where an 150-ft. buffer is required per CMC Table 16.53.040-3.

The applicant is proposing to reduce the required buffer width on the south side of Wetland A from 150-ft to 110-ft. as allowed per CMC 16.53.050.C.1.a where high intensity land uses can be reduced to those for moderate intensity land uses if a) an undisturbed vegetated corridor at least 100-ft side is protected between the wetland and other priority habitats and 2) measures to minimize impacts of the land use adjacent to the wetlands are applied. At pages 5 and 6 of the *Critical Areas Report & Buffer Mitigation Plan,* an existing heavily dense forested area exists approximately 450 feet wide from the wetland to the northern property line, which will be preserved in Tract S. Furthermore, stormwater from the residential lots on the south side of the wetland buffer will be discharged to maintain wetland hydrology, as well as existing trees will be retained that do not pose a hazard, and house lights and outdoor speakers will be directed away from the wetland. Staff finds a condition of approval is necessary to ensure that Lots 135-152 direct outdoor lighting and speakers away from the wetland.

Buffer averaging is also proposed by the applicant, which is permitted per CMC 16.53.050.C.2. The edge of the 110-ft. wetland buffer adjacent to Lots 151, 152 and Tract R is proposed to be reduced approximately 0.262 acres in an area that currently lacks vegetation. The west end of the buffer is proposed to be increased 0.262-acres in a more sensitive area. Further, the buffer width is reduced no less than 75 percent of the required 110-feet, which is 82.5-feet, and therefore in compliance with CMC 16.53.050.C.2.

Any trees removed within a critical area buffer are required to be replaced at a mitigation ratio of 2:1 per CMC 16.51.125.B and shown on the final mitigation plan to be conditioned as such.

CMC 16.61 Fish and Wildlife Habitat Conservation Areas

Clark County GIS mapping identified the subject property with fish and wildlife habitat conservation areas (i.e. streams and Lacamas Lake). The *Critical Areas Report & Buffer Mitigation Plan* prepared by

Ecological Land Services (ELS) dated November 18, 2020 (Exhibit 9) identified three small, non-fish bearing streams on the preliminary plat within Tract S (Stream 1 and 2) and Tract A (Stream 3). Stream 1 flows derives offsite at the northwest portion of the site, travels through Wetland A and exits the site to the west. Stream 2 begins at the northern portion of the site and travels off site in the northwest direction for approximately 1,000 feet before joining Stream 1. At the southeast corner of the site, Stream 3 flows in the southwest direction from the Deerhaven Subdivision. The applicant has provided a 25-ft. wide buffer for Streams 1 and 3 and a 50-ft. wide buffer for Stream 2 consistent with CMC 16.61.040.D. No impacts to Stream 1 and 2 buffers are proposed. Stream 3 impacts include a section of the T-3 Regional Trail via a culvert. Mitigation should be addressed in the final mitigation plan and conditioned as such.

CMC Chapter 16.51 General Provisions for Critical Areas

Staff recommends a condition of approval for the installation of temporary construction fencing prior to construction that clearly marks in the field the critical area buffers and fencing should remain throughout permitted construction activities. In addition, prior to final plat approval, permanent signs and fencing should be installed at the edge of the critical area buffers per CMC 16.51.210.B and C. Sign and fencing specifications should be submitted to the City for review and approval prior to installation.

Prior to final plat approval, a conservation covenant should be recorded with the County to ensure long-term preservation of the critical areas and their associated buffer, including maintenance of any mitigation actions, per CMC 16.51.240 and conditioned as such. Further, a copy of the recorded conservation covenant document must be submitted to the City prior to final plat approval.

The applicant will be required to post a mitigation bond in an amount deemed acceptable by the City to ensure the stream mitigation is fully functional per CMC 16.51.250.

> **FINDING:** Staff finds the project to be developable based on the findings in the *Critical Areas Report & Buffer Mitigation Plan* report prepared by Ecological Land Services (ELS) dated November 18, 2020. Staff finds a condition of approval is required that a final mitigation plan per CMC 16.53.050.E.3 submitted to the City for review and approval prior to final engineering plan approval.

CMC Chapter 16.59.060(C) Geotechnical Evaluation and Assessment

Clark County GIS mapping identified the subject property to contain geologically hazardous areas (i.e. steep slopes and landslide hazard areas). As such, the applicant submitted a Geotechnical Engineering Report dated July 2016 prepared by Hart Crowser including a supplemental memorandum dated November 2020. The reports indicated a northwest-trending slope abutting the north side of SE Leadbetter Road with variable landforms and slopes gentle to steep. At page 6 of the 2016 report, Hart Crowser found that "the soils do not present a slope stability hazard to the proposed development, if designed in conformance with the recommendations in this report" (See Exhibit __). The City's geotechnical consultant Earth Engineers, Inc. (EEI), performed a peer review of the geotechnical report and concurred that the report is in compliance with CMC 16.59.060 (Exhibit __).

> **FINDINGS:** Staff finds the property to be developable based on the findings and recommendations in the geotechnical reports. Staff finds a condition of approval is required that the geotechnical report recommendations in the Hart Crowser 2016 report and 2020 memo be complied with to minimize any potential hazards associated with construction.

Title 17 Land Development

SUBDIVISIONS (SUB20-02) CMC CHAPTER 17.11

CMC Chapter 17.11.030(D) Criteria for Preliminary Plat Approval:
The hearings examiner decision on application for preliminary plat approval shall be based on the following criteria:

1. The proposed subdivision is in conformance with the Camas Comprehensive Plan, Parks and Open Space Comprehensive Plan, Neighborhood Traffic Management Plan, and any other City adopted plans.

Comprehensive Plan
The subject property is designated as Single-Family Medium in the City's Comprehensive Plan, which includes the Single-Family Residential (R-7.5) zone designation. Citywide Housing Goal H-1 states, "Maintain the strength, vitality, and stability of all neighborhoods and promotes the development of a variety of housing choices that meet the needs of all members of the community." To facilitate alternative housing choices, affordable housing and ageing readiness within the City of Camas, accessory dwelling units (ADU's) are an allowed use within the residential zones under CMC 18.07.040 Table 2 and should not be precluded in CC&R's.

Further, Neighborhood Goal LU-3 states, "Create vibrant, stable and livable neighborhoods with a variety of housing choices that meet all stages in the life cycle and a range of affordability." The side building elevations on corner lots are highly visible from the street and should exhibit architectural variation similar to the front of the building façade, including landscaping, in order to avoid blank walls thereby supporting the city's goal of creating vibrant and livable neighborhoods in Camas.

The Natural Environment Comprehensive Plan Policy NE-1.7 states, "Limit clearing, grading, and soil disturbance outside building footprints in order to maintain the natural hydrologic functions of the site." Due to the steep slopes, multiple retaining walls are utilized throughout the site to create flat lots, and therefore site grading should be minimized to retain the natural contours of the land.

Overall, the 2035 City of Camas Comprehensive Plan supports the subdivision through a number of land use and transportation policies such as the following:

- LU Policy 1.3: Maintain compatible use and design with the surrounding built and natural environments when considering new development or redevelopment.
- LU Policy 1.4: Ensure the park and recreation opportunities are distributed equitably throughout the City and work to achieve park and continuous trail corridors from Green Mountain to the Columbia River.
- LU Policy 3.3: Encourage connectivity between neighborhoods (vehicular and pedestrian) to support citywide connectivity and pedestrian access.
- LU Policy 3.4: Camas residents are protective of the small-town ambiance and family-friendliness of the community. Discourage exclusive neighborhoods, privacy walls, and gated communities.
- LU Policy 3.5: Where neighborhoods adjoin natural areas or trails, ensure connections through neighborhoods to enhance access to recreation amenities.
- LU Goal 4: Develop an interconnected network of parks, trails, and open space to support wildlife corridors and natural resources and enhance the quality of life for Camas residents and visitors.
- LU Policy 4.3: Encourage regional trail connectivity and increased access throughout the City to support multi-modal transportation and physical activity.
- T Policy 1.3: Construct streets that are interconnected and avoid long cul-de-sacs or dead ends.

- T Policy 2.1: Enhance travel choices and provide pedestrian and bicycle routes designed especially for them, not simply along routes designed for cars. Route planning should seek shortcuts and other opportunities that give walking or biking advantages over the automobile.
- T Policy 2.5: Coordinate with schools and the community to designate safe pedestrian and bicycle routes between residential areas, schools and public facilities.

Parks and Open Space Comprehensive Plan

The City of Camas adopted and updated the Parks, Recreation, and Opens Space (PROS) plan in 2014. The subject site is located in an area identified by the PROS plan as requiring a trail connection, in particularly the T-3 Multi-Use Regional trail which connects to the east and west of the site. Per the PROS plan at page 4-5, "Proposed segments of the trail system are generalized to make connections or follow the direction of natural corridors. Final alignments are subject to change due to environmental conditions, development or alternate routes." Further, trails should be off-street as much as possible per Objective 4A of the PROS plan.

The conceptual trail connection was presented to the Parks and Recreation Commission on March 24, 2021. The general public accessible trail connection will be provided as shown on Preliminary Site Plan (Exhibit 8); a east-west trail through proposed Tracts A and B connecting the existing sidewalk at SE Leadbetter Road / NE Adams Street to the City owned parcel to the west.

The placement of the trail should avoid the removal of existing healthy trees. The PROS plan identifies the T-3 trail as a Regional trail with a 12-foot paved width. To minimize impacts to existing trees and grading, staff finds the T-3 trail may be reduced to a minimum 6-feet wide with 8-feet in width where feasible to accommodate for maintenance vehicles and to be comprised of compact gravel. Directional trail signage should be provided as approved by the City. The trail should be constructed prior to final acceptance of phase one. Easement to be provided for city ownership and maintenance and conditioned as such. Said easement should be dedicated with the final plat.

> **FINDING:** Staff finds that as conditioned the applicant can and will provide trail system consistent with the City's 2014 Parks, Recreation and Open Space Comprehensive Plan.

Neighborhood Traffic Management Plan

The City has a Neighborhood Traffic Management Plan (NTM). The NTM plan identifies the need for installation of acceptable traffic calming features when a proposed development will create 700 Average Daily Trips (ADT) or more. The submitted *Trip Update Letter* from Mackenzie, dated October 21, 2020, found the project is expected to generate approximately 1,528 Average Daily Trips (ADT) with 113 new AM peak hour trips and 152 PM peak hour trips.

Based on the projected number of ADTs noted in the October 21,2020 TIA, staff recommends a condition of approval that prior to final engineering plan approval, the following onsite and offsite locations for traffic calming measures, shall be shown on the final engineering plans.

- The intersection of N 48th Avenue and N Adams Street; and
- N Adams Street at the creek crossing in the Deerhaven subdivision.
- Additional onsite traffic calming measures may be required. Applicant shall discuss with staff prior to final engineering plan approval.

FINDING: Staff finds that this proposed project is subject to the requirements for traffic calming measures, and as conditioned, can and will meet the requirements as noted in the City's NTM plan.

2. Provisions have been made for water, storm drainage, erosion control and sanitary sewage disposal for the subdivision that are consistent with current standards and plans as adopted in the Camas Design Standard Manual.

Water: In accordance with CMC 17.19.040.C.4 Water System, each lot within a development shall be served by a water distribution system designed and installed in accordance with the city's *Design Standards Manual* (CDSM). There is an existing 12-inch ductile iron water main located in SE Leadbetter Road. The applicant has proposed to connect to the existing 12-inch water main and extend a 12-inch water transmission main to the northern most limits of the proposed development via N Elk Drive to the northeastern most end of N 50th Avenue in order to allow for the future extension of a water transmission main to serve the North Shore.

The applicant has proposed to construct the 8-inch water distribution system, which will be served from the new 12-inch transmission main via a pressure reducing vault to be located at the intersection of SE Leadbetter Road and N Elk Drive. The future 8-inch water distribution system will be for the benefit of the proposed development with water services provided to each dwelling unit as well as privately owned water services and meters for landscaping. The applicant will be required to extend the future 8-inch water distribution system to the limits of the proposed development at the dead-ends on N 49th Avenue and N 50th Avenue. Additionally, the applicant has proposed to connect to the existing 8-inch water main located at the existing dead-end on N Adams Street in the Deerhaven subdivision.

The applicant has proposed to construct a single trench for the 12-inch transmission main and the 8-inch water distribution main. Staff recommends a condition of approval that prior to final engineering plan approval, that the applicant should submit for review and approval the details for the shared waterline trench.

FINDINGS: Staff finds that adequate provisions for water, as conditioned, can or will be made.

Storm Drainage: In accordance with CMC 17.19.040.C.3 the storm drainage collection system shall meet the requirements of the city's stormwater standards and the city's *Design Standards Manual* (CDSM). There are existing road side ditches along the north side of SE Leadbetter Road which collects the surface runoff and discharges stormwater via a series of culverts crossing under SE Leadbetter Road to Lacamas Lake. The Deer Haven subdivision, located on the east side of the proposed development, has a creek that bisects the subdivision and flows northeast to southwest thru the future Tract A. This stream flows to the roadside ditch along SE Leadbetter Road and outfalls to Lacamas Lake via an existing culvert crossing. As stated in the preliminary stormwater report (TIR), Lacamas Lake is flow-control exempt per Volume 1, Chapter 3.4.7 of the 2019 edition of Ecology's *Stormwater Management Manual for Western Washington* (SWMMWW).

A preliminary stormwater report (TIR), dated November 2020, was prepared by AKS Engineering & Forestry. The preliminary TIR states that the stormwater from the proposed development will ultimately be directed to the existing ditch on the north side of SE Leadbetter Road and discharge to Lacamas Lake via existing culverts that cross under SE Leadbetter Road. The preliminary TIR did not provide verification that the existing culverts were sized to accommodate the combined flows from offsite and the proposed development. As Lacamas Lake is flow-control exempt, stormwater is not detained prior to release which would necessitate the need to verify the existing culverts. The applicant provided a memo, dated May 7, 2021, that addresses the upsizing of the culverts located within the Shoreline Jurisdiction. Staff recommends a condition of approval, that prior to final engineering plan approval, that the applicant should submit a final stormwater report (TIR) to the City for review and approval. The final TIR is to address the upsizing of the existing culverts located in the shoreline Jurisdiction.

The applicant has proposed to construct a stormwater collection system which will collect the majority of the site stormwater runoff via a series of catch basins, manholes, and conveyance piping. The proposed system will also provide a series of rear yard runoff collection systems for Lots 12-22 and Lots 135-152 that are to be located in private stormwater easements. Staff recommends a condition of approval that requires the private stormwater easements located on Lots 12-22 and Lots 135-152 to be owned and maintained by the HOA are to be shown on the final engineering plans and the final plat.

The applicant has proposed that the rear yard runoff from Lots 92-103 will be collected and dispersed onto neighboring properties, with the roof drains connected to storm laterals stubbed from the conveyance system in N Adams Court. Staff recommends a condition of approval that, prior to final engineering plan approval, the applicant should submit to the City, for review and approval a revised stormwater management plan for Lots 92-103. Said plan should ensure that adjacent parcels and downstream drainageways and/or properties will not be negatively affected, per Camas Municipal Code (CMC) 14.02 and 17.19.040.C as stated below:

- CMC 14.02 Stormwater Control:
  14.02.010.B.2 Minimize damage to property from increased runoff rates and volumes.
- CMC 17.19 Design and Improvement Standards:
  17.19.040.C.3 Storm Drainage - The storm drainage collection system shall meet the requirements of the city's officially adopted storm water standards.
  17.19.040.C.3.e - All lots shall provide drainage for stormwater runoff from roof and footing drains to an approved drainage system. Rear yard low point area drains and/or storm drain lateral stubs connected to an approved drainage system shall be provided to each lot as necessary to prevent stormwater runoff impacts to adjoining parcels as determined by the city.

Per CMC 17.19.040.C.a, storm drainage facilities shall be placed on their own tract or within an open space tract and are to be maintained by the homeowners with the development in accordance with city standards. The applicant has proposed to construct a stormwater facility, which will be located on Tract R between Lot 151 and Lot 152 which will collect a small portion of the site runoff and then discharge from the storm facility to the wetlands located on Tract S.

As Lacamas Lake is a flow-control exempt water body, the applicant is not required to provide stormwater detention; however, treatment for pollution-generating surfaces is required. The applicant has proposed to provide treatment in the form of mechanical filter catch basins located within the street right-of-way, which is contrary to CMC 17.19.040.C.3.a. Staff does not support this proposal. Staff recommends a condition of approval that the applicant should locate any form of stormwater treatment in a dedicated Tract per CMC 17.19.040.C.a. Said requirement should be addressed and identified prior to final engineering plan approval in the final engineering construction drawings and all new stormwater tracts are to be identified on the final plat.

> **FINDINGS:** Staff finds that adequate provisions for storm drainage, as conditioned, can or will be made.

Erosion Control: In accordance with CMC 14.06 Erosion Control, adequate erosion control measures are to be provided during the site improvements for the proposed development in accordance with the *Camas Design Standards Manual* (CDSM) and Ecology's *Stormwater Management Manual for Western Washington* (SWMMWW). Staff recommends a condition of approval that the applicant shall to submit the Erosion Sediment Control (ESC) plans, as a part of the site improvement plans, to the City for review and approval prior to final engineering plan approval.

In accordance with CMC 17.21.050.B.3 an erosion control bond, in the amount of 200% of the erosion control items is required for land-disturbing activities in excess of one acre. Staff recommends a condition of approval that the applicant should provide an Erosion Control Bond prior to final engineering plan approval and/or start of any land-disturbing activities.

Additionally, the applicant will provide a copy of both their *NPDES General Construction Stormwater Permit* (GCSWP) and their *Stormwater Pollution Prevention Plan* (SWPPP), which is a requirement of the NPDES GCSWP permit. The NPDES GCSWP permit is issued by the Washington State Department of Ecology for land-disturbing activities of am acre or more. The NPDES GCSW Permit and SWPPP are to be submitted to the City prior to start of any land-disturbing activities. Staff recommends a condition of approval that, prior to final engineering plan approval and/or start of any land-disturbing activities, a copy of the NPDES GCSW Permit and SWPPP are to be submitted to Engineering.

> **FINDINGS:** Staff finds that adequate provisions for erosion control, as conditioned, can or will be made.

Sanitary Sewage Disposal: In accordance with CMC 17.19.040.C.2, sanitary sewers shall be provided and designed in accordance with the city's *Design Standards Manual* (CDSM). There is an existing sanitary sewer pump station located on the north side of SE Leadbetter Road to the west of the proposed intersection of SE Leadbetter Road and N Elk Drive. This sanitary pump station discharges to the existing sanitary sewer force main located in SE Leadbetter Road.

The applicant is proposing to construct an 8-inch gravity sewer main to serve the proposed development, including sanitary sewer laterals provided to each lot. The applicant will be required to extend the future 8-inch gravity sewer system to the limits of the proposed development at the dead-ends on N 49th Avenue and N 50th Avenue. The 8-inch gravity sewer main that will be located in the southern portion of N 48th Avenue will leave the public right-of-way at Lot 74 and proceed east-to-west behind Lots 44 - 50 and tie into the 8-inch gravity sewer main in N Elk Drive at Lot 41. This segment of the 8-inch gravity sewer main is to be located in a 20-foot wide paved utility access road. Staff recommends a condition of approval that the applicant should provide an access and maintenance easement to the city over and under the sanitary sewer main located in the utility access road. Said easement should be dedicated with the final plat.

The proposed gravity sewer main will discharge into the sewer pump station. There will be a segment of the public gravity sewer main, including manholes, that will be constructed across Tract B south of Lot 1. As Tract B will be owned and maintained by the HOA, a 15-foot wide sewer access and maintenance easement across Tract B to the city's sewer pump station will be required. Staff recommends a condition of approval that the applicant should provide a minimum 15-foot wide access and maintenance easement to the city over and under the sanitary sewer main located in Tract B. Said easement should be dedicated with the final plat.

The applicant is proposing to extend the gravity sewer main to the end of the private roads located on Tracts E, K, L, and M for the benefit of the adjacent lots. Staff recommends a condition of approval that the applicant should provide an access and maintenance easement to the city over and under the sanitary sewer main located within Tracts E, K, L, and M. Said easement should be dedicated with the final plat.

> **FINDINGS:** Staff finds that adequate provisions for sanitary sewage disposal, as conditioned, can or will be made

Existing wells, septic tanks, and septic drain fields: CMC 17.19.020 (A 3) requires abandonment of existing wells, septic tanks, and septic drain fields. Any existing wells, septic tanks, and drain fields

should be properly abandoned and/or decommissioned in accordance with State and County guidelines prior to final plat approval. If applicable, any water rights associated with the abandoned well(s) shall be transferred to the City. Staff recommends a condition of approval that, if there are any existing wells or septic systems, documentation should be provided to engineering prior to final plat approval that said wells and/or septic systems have been properly abandoned and/or decommissioned in accordance with State and County guidelines.

3. Provisions have been made for road, utilities, street lighting, street trees and other improvements that are consistent with the Six-Year Street Plan, the Camas Design Standards Manual and other State adopted standards and plans;

Roads: Streets for the proposed development shall be designed in accordance with CMC 17.19.040.B Streets.

[Public Roads]: The applicant has proposed to construct the interior public roads in accordance with Table 17.19.040-2.A Minimum Public Street Standards requiring a 52-foot wide right-of-way, 28-foot paved surface, 5-foot wide detached sidewalks and planter strips on both sides, and no parking permitted on one side. The proposed public road section is supported by the city engineer.

Per 17.19.040.B.1 half-width street improvements along an existing roadway is required when it is determined to be appropriate by the city engineer. The applicant is not proposing to construct the half-width street improvements along the frontage abutting SE Leadbetter Road due to the following constraints: the existing roadway abuts Lacamas Lake on the south side and an abundance of large mature fir trees line the length of SE Leadbetter Road along the north side. The applicant is proposing to limit the frontage improvements to the intersection of SE Leadbetter Road and the future N Elk Drive. The proposed frontage improvements plan is supported by the city engineer.

[Private Roads]: Per Table 17.19.040-1 Minimum Private Street Standard A, access to four dwelling units or less requires a minimum tract width of 20-feet, a minimum 12-foot wide paved surface, and no parking on either side. Additionally, streets more than 150-feet, as measured from the centerline of the adjacent road, require a dead-end turnaround. The applicant has proposed four (4) private streets accessing four dwelling units or less as described in the following tracts:

a. Tract E provides access to future Lots 12 and 13 and is approximately 100-feet in length from the centerline of N 50th Avenue. The applicant proposed to meet Minimum Private Street Standard A. In order to provide for safe movement of emergency service workers, due to the private road sloping as much as 10% downhill from N 50th Avenue and the potential need for the use of fire truck outriggers, staff recommends the applicant should provide a 6-foot wide easement in addition to Minimum Private Street Standard A and conditioned as such. Said easement should be for emergency use.

b. Tract K, providing access to future Lots 85, 86, 87, and 88, is approximately 330-feet in length from the centerline of N 48th Avenue and is proposed to meet Minimum Private Street Standard A with a dead-end turnaround, per CDSM. Due to the length of the proposed private road and the private road sloping up to 8.25% downward from N 48th Avenue, staff recommends a condition of approval that the applicant should widen Tract K from 20-feet to 24-feet with a paved surface of 24-feet, beginning at the southern property line of Lot 89. The applicant should design and construct a dead-end turnaround per CDSM with guardrail along the downslope radius and end of the road. Said design should meet the weight requirements for a fire engine (38K pounds) and fire truck (62K pounds) fully loaded with water, equipment, and staff.

c. Tract L, providing access to future Lots 100, 101, and 102, is approximately 142-feet in length from the centerline of the cul-de-sac on N Adams Court with a retaining wall proposed between the western edge of the private access road and Lot 104. Tract L is proposed to meet Minimum Private Street Standard A. In order to provide for safe movement of emergency service workers, due to the adjacent Lot 104 being proposed at a lower elevation than the proposed street in Tract L, the proposed retaining wall being located on the property line between Lot 104 and the private street, and the potential need for the use of fire truck outriggers, staff recommends that the applicant should provide a minimum 20-foot wide tract with a minimum 18-foot paved surface, and that the design for the retaining wall adjacent to the road meet the weight requirements for a fire engine (38K pounds) and fire truck (62K pounds) fully loaded with water, equipment, and staff. Additionally, staff recommends a condition of approval that the applicant should provide a 6-foot wide easement in addition to Minimum Private Street Standard A, along the frontage of Lots 100 and 101 that allows for deployment of fire engine outriggers and safe movement around the engine. Said easement should be for emergency use.

d. Tract M, providing access to future Lots 109, 110, 111, and 112, is approximately 133-feet in length from the centerline of N 49th Avenue. Tract M is proposed to meet Minimum Private Street Standard A. In order to provide for safe movement of emergency service workers, staff recommends a condition of approval that prior to final engineering plan approval, the applicant should provide a minimum 20-foot wide tract, with a minimum 18-foot paved surface. Additionally, staff recommends that the applicant should provide a 6-foot wide easement along the frontage of Lots 109 and 110, that allows for deployment of fire engine outriggers and safe movement around the engine. Said easement should be for emergency use.

The minimum curb radii on a public street with a 52-foot right-of-way width and 28-feet of paved surface is 25-feet. The Fire Marshal has determined that access from a public road with 52-feet of right-of-way onto private roads, without a minimum 25-foot curb radius has caused damage to existing curbs and sidewalks. Staff recommends a condition of approval that prior to final engineering plan approval, that the applicant will be required to work with staff to provide a minimum 25-foot curb radius or other approved designed access approach with thickened sidewalks, at the transitions from public road to provide road as follows:

- Tract E: A 25-foot curb radius is required on the south side only adjacent to Lot 11.
- Tract K: A 25-foot curb radius is required on the east side only adjacent to Lot 89. The access to Tract K is adjacent to private parking Tract J on the west side, therefore, the applicant has proposed to construct a thickened driveway approach from the west side of Tract J to the east side of Tract K.
- Tract L is adjacent to Lot 104, which consists of a narrow radius frontage. As such, the 25-foot curb radius is waived between Tract L and Lot 104; however, the applicant has proposed to construct a continuous thickened driveway approach across Lot 104 to the south property line of Lot 100.
- Tract M: A 25-foot curb radius is required on both sides of the private road, adjacent to Lot 109 on the east side and Lot 113 on the west side.

Per CDSM Table 1 – Guidelines for Geometry of Private Roadways, private street Standard A prohibits parking on both sides of the road. Staff recommends a condition of approval, prior to final engineering plan approval, the applicant should provide no parking and towing signs (with phone numbers), for review and approval, as the city does not provide for towing on private roads.

Utilities, Street Lighting, Street Trees, and Other Improvements:
[Street lighting]: LED Street lighting will be installed along all street frontages in accordance with the Camas Design Standards Manual (CDSM). The locations for street lights are to be coordinated with the locations of other site features; such as street trees, driveways, and other utilities. Staff recommends a condition of approval that street light locations are to be shown on the engineering and landscape plans prior to final engineering plan approval. Additionally, staff recommends a condition of approval that draft electrical plans for street lighting are to be submitted for review and approval by the City prior to submittal to Clark Public Utilities. Additionally, any street lighting proposed for private streets is required to be metered separately and are to be owned and maintained by the HOA.

[Street trees and Landscaping]: CMC 17.19.030 (F 1) requires one 2-inch diameter street tree in the planter strip of the right-of-way for each dwelling unit. The proposed street tree locations are shown on the Preliminary Landscape Plan, Sheets 90.-9.2 (Exhibit 8) in compliance with this requirement. Additionally, prior to final engineering approval, the applicant is to show proposed driveway locations for each lot to ensure that street trees are not impacted.

The street tree plantings and other landscaping as discussed throughout this report, should be included on the landscaping plans with final engineering plan submittal for the site improvements. Staff finds a condition of approval is required that the applicant submit to the City for review and approval a final landscape plan consistent with the landscaping standards in CMC Chapter 18.13, in addition to CMC Chapter 17.19.030.F.6, and include plantings from the City's approved plant list. Landscaping adjacent to or within tracts should be installed prior to final acceptance per CMC 17.19.030.F.3. Street trees adjacent to lots should be installed prior to final occupancy or bonded for per CMC 17.19.030.F.4.

[Storm Facility Landscaping]: CMC 17.19.030.F.6 requires that storm drainage facilities within 30-feet from any street or accessory structure to be landscaped with a 10-foot L2 buffer. The proposed storm facility located in Tract R should be landscaped with a L2 buffer at its lot lines and should be shown on the final landscape plans.

[Parking]: The proposed average lot size falls below 7,400 square feet and as such, the applicant has provided 30 parking stalls within Tracts C, D, G, J, N, O and P in compliance with this requirement in CMC 17.19.040.B.10.e. Subject to the requirements of CMC 18.13.060.A and E, parking areas are to be landscaped at all perimeters and provide a minimum 5-foot width of planting space.

> **FINDING:** Staff finds that the applicant can or will make adequate provisions as conditioned for roads, utilities, street lighting, street trees, and other improvements that are consistent with the six-year street plan, the Camas Design Standard Manual and other state adopted standards and plans.

4. Provisions have been made for dedications, easements and reservations;

The applicant's submittal includes proposed private stormwater easements for the benefit of Lots 1 thru 12; Lots 74 thru 83; Lots 43 thru 62; Lots 88 thru 91; Lots 103 thru 108; Lots 112 thru 115; and within private road Tracts E, L, and M. Staff recommends a condition of approval that the applicant should show the private stormwater easements on the construction drawings and on the final plat. Additionally, a note is to be added to the face of the final plat stating that "the private stormwater easements, provided for the benefit of Lots 1 thru 12; Lots 74 thru 83; Lots 43 thru 62; Lots 88 thru 91; Lots 103 thru 108; Lots 112 thru 115; and within private road Tracts E, L, and M are to be owned and maintained by the applicable property owners." Said easement should be dedicated with the final plat.

The applicant is proposing to provide Internal public road to serve the development, with private roads that will provide access to several flag lots. Proposed Tracts E, K, L, and M are identified as private roads

(driveways) on the preliminary plat. Public sanitary sewer lines and private stormwater lines will be located within these private roads, as such the applicant is proposing to provide a blanket access and utility maintenance easement over the proposed private roads to the City of Camas at the time of final platting.

A homeowner's association (HOA) will be required and a copy of the CC&R's for the development will need to be submitted to the City for review and approval. Specifically, the applicant will need to make provisions in the CC&R's for ownership and maintenance of the storm drainage systems, fencing, walls, landscaping, irrigation, private roads, and tracts or easements outside of the City's right-of-way if applicable. Further, all necessary easements and dedications should be noted on the final plat.

> **FINDING:** Staff finds that adequate provisions for dedications, easements and reservations can or will be made by the applicant at the time of final platting.

5. The design, shape and orientation of the proposed lots are appropriate to the proposed use.

As shown on the preliminary plat, the proposed lots will have access onto a public or private street, have side lot lines that are generally perpendicular to the roadway they face and show building envelopes that are capable of site a square of 40 feet by 40 feet within the building envelope per CMC 17.19.030(D)(1-3).

[Density Transfer and Negotiated Preservation]: Proposed Tracts A and B on the preliminary plat is a natural area that includes a section of the T-3 Regional Trail as identified on the PROS plan and proposed Tract S contains wetlands and streams (i.e. critical areas), totaling approximately 16-acres. The applicant has the ability and has proposed to utilize the density transfer provisions per CMC 18.09.060.C when land is set aside in a tract for the protection of a critical area (i.e. wetlands and streams) or an approved recreational area (i.e. trails). As such, the City may provide additional or negotiated flexibility in lot sizes, lot width, lot depth, setback standards or lot coverage if the tract is a half-acre or more of contiguous land per CMC 18.09.060.D. Through negotiated preservation, the City has agreed to the applicant's request to reduce setbacks and increase lot coverage as discussed below provided the applicant incorporate in the plat a robust replanting plan in Tracts A and B and provide a natural play area or an active tot lot amenity centrally located within the plat.

At page 2 of the updated applicant's narrative (Exhibit 4) and as shown on preliminary plat plan sheets P9.0-P9.3 (Exhibit 8), a public overlook and a natural play area will be provided in Tract I in addition to a robust planting in open space tracts A and B.

[Lot sizes/dimensions]: The density of the overall site is well below the maximum allowed at 5.8 du/acre for the R-7.5 single-family residential zone. The density transfer provisions require a minimum lot size of 5,250 square feet and a maximum lot size of 9,000 square feet CMC 18.09.040.B Table 1. The proposed lots are between 5,900-9,000 square feet in size and meet the required minimum width of 60-feet and depth of 80-feet. Through negotiated preservation, the City agreed to the applicant's request to increase the lot coverage from 40 to 50%.

[Lot setbacks]: CMC 18.09.040.C- Table 2 specifies that "Setbacks are based on average lot sizes (not zone specific)". The average lot size for the proposed development falls under the 5,000 to 11,999 square foot range which requires a minimum 20-foot front yard setback, a 25-foot minimum rear yard setback, a 5-foot minimum side yard and corner rear yard setback and a 10-foot minimum side yard flanking a street setback. Through negotiated preservation, the City agreed to the applicant's request to 1) reduce the minimum front yard from 20 to 10-feet provided the garages are setback 20-feet from the right-of-way and setback 5-feet from the front of the dwelling per CMC 18.09.040-Table 2, Note 2 and 2) reduce the minimum rear yard from 25 to 15-feet. To allow for adequate sight distance, lots 31 and 32

will require larger front yard setbacks to include 15-feet to the house and 25-feet to the garage and will be conditioned as such. The minimum 40x40 building envelope and building setbacks should be shown on the final plat.

> **FINDINGS:** Through negotiated preservation, staff concurs with the applicant's proposed changes to lot coverage and yard setbacks. Staff finds a condition of approval and plat notes are required that show the building envelopes and setbacks as described above on the final plat. Prior to engineering plan approval, the applicant should submit a final landscape plan that includes robust planting in Tracts A and B and final plans and specifications for the amenities in Tract I.

6. The subdivision complies with the relevant requirements of the Camas land development and zoning codes, and all other relevant local regulations;

CMC Section 15.50.090 Clearing and Grading Standards:
CMC 15.50.090.A requires clearing and grading activities be conducted as to minimize potential adverse impacts to the vegetation, drainage and other natural features of the land. Clearing and grading should be conducted in a manner to preserve and enhance the city of Camas aesthetic character to include the preservation of unique landforms and natural features per CMC 15.50.090.E. Further, CMC 15.50.100.B requires the minimization of clearing and grading on slopes greater than 15%. Residential land development projects with steep slopes often include retaining walls for flatter lots, which may result in walls taller than 6-feet in height for lot design. To minimize clearing and grading and to further highlight the existing aesthetic landscape character of Camas, a revised clearing and grading plan with wall profiles and specifications should be submitted in compliance with CMC 18.17.060 *Retaining walls* prior to final engineering plan approval and conditioned as such.

CMC Section 18.07.030 Table 1 Sales Office Use
The application did not propose a sales office for the development. The absence of approval of a sales office consolidated with this Type III hearing, will limit sales office at the time of development to six months as a Temporary Use per CMC 17.07.040 Table 2 (Note 4). The applicant may provide for the contingency that a sales office use may be necessary for longer than six months. Staff finds that special conditions for the installation, use and removal of the sales office are appropriate, and are provided with this report if the applicant is in agreement.

> **FINDING:** Staff finds a condition of approval is required that the mode home/sales office should be closed upon construction of the last residential structure.

CMC Chapter 18.13 Landscaping – Tree survey/Tree density
A minimum of 20 tree units (TU) per net developable acre (exclusive of critical areas) is required for residential development per CMC 18.13.051(A) Table 1- Required Tree Density and should be incorporated into the overall landscape plan. Based on the approximately 43.90 net developable acreage as identified in the Arborist Report (Exhibit 13), 878 TU's are required. The development proposes a final TU value post construction of 1,465 TU's to include retaining approximately 295 existing trees, planting 336 street trees and 61 trees within open space tracts, which exceeds the minimum TU per net acre requirement as described in the Arborist Report (Exhibit 13). In addition, 93 trees will be planted in the large natural area tracts (Tracts A and B) as noted at page 6 in the Applicant's supplemental narrative (Exhibit 4). Per the tree survey and arborist report, approximately 113 will be removed due to a number of factors including tree health, hazardous trees or to accommodate on-site improvements.

> **FINDING:** Staff finds conditions of approval are required that trees identified for preservation and removal comply with the tree protection recommendations of the arborist report. Trees

proposed for retention on lots should install tree protection fencing on the outer perimeter of the critical root zone during construction. Preserved trees should be placed in a conservation easement or other permanent mechanism acceptable to the City. Any additional tree removal will require an updated arborist report for City review and approval from the City prior to removal. A note should be added on the face of the final plat that tree topping is prohibited.

CMC Chapter 18.34 Airport Overlay Zoning

The subject property is located within the Airport Overlay Zone C. An avigation easement is required to be recorded on the title that provides notice that the property is located within an air traffic area per CMC 18.34.020.B and included as a note on the final plat. Prior to building permit submittal, the applicant should consider construction techniques that would decrease the noise associated with the airport per CMC 18.34.080.A.

FINDINGS: Staff concurs that the proposed subdivision, as conditioned, can or will meet the requirements of Camas Municipal land development and zoning code including other relevant local regulations.

7. Appropriate provisions are made to address all impacts identified by the transportation impact study;

[Traffic Impact Analysis]: An original TIA, dated August 18, 2010, was prepared by Mackenzie with data from the 8th Edition (ITE) Manual and addressed the original CJ Dens preliminary plat application for 297 single-family lots. The revised CJ Dens preliminary plat application is for 152 single-family lots. The applicant submitted a *Trip Update Letter*, dated October 21, 2020, and prepared by Mackenzie, with data from the 10th Edition of the Institute of Transportation Engineer's (ITE) *Trip Generation Manual*, which addresses the trip generation changes between the 2010 TIA and the 2020 TIA.
The original 2010 TIA was prepared in accordance with a preliminary plat proposal for 297 single-family dwelling units, which resulted in 2,831 ADTs. Per *Table 1 – Trip Generation Comparison* of the 2020 TIA, there is a reduction of 105 fewer AM Peak Hour trips and 128 fewer PM Peak Hour trips, which results in a projected 1,528 ADTs with the revised preliminary plat proposal of 152 single-family dwelling units.

[Trip Distribution & Assignment]:The 2020 trip distribution assumed the same distribution as shown in the 2010 TIA with the exception that the number of access locations to the proposed development has been reduced from four to two. One access location is via SE Leadbetter Road and the second location is via the northern most end of N Adams Street, which was constructed with the Deerhaven subdivision.

[Sight Distance Analysis]: The posted speed limit on SE Leadbetter Road is 40 MPH. Per the 2010 TIA, speed studies were conducted near the proposed access which indicated that the 85th percentile speed was 49 to 50 MPH and based on AASHTO, using a design speed of 50 MPH, the minimum sight distances were 555-feet to the west for left-turns and 480-feet to the east for right-turns is recommend for vehicles exiting the subdivision onto SE Leadbetter.

The 2010 TIA reviewed the access location onto SE Leadbetter Road and states that adequate site distances can be provided within the vision clearance triangles at the proposed access location with vegetation management, limited sight grading, and signage locations in accordance with the City's code requirements as described in CMC 18.13 Landscaping and CMC 18.17 Supplement Development Standards.

[Turn Lane Warrants]: The City follows AASHTO recommendations for turn lanes on two-way local roadways, such as SE Leadbetter Road. Per the 2010 TIA, "except in special cases with exceptional volumes, AASHTO does not recommend turn lanes be provided on rural local roads … nor for urban local roads" except for in commercial areas. As the exceptions for urban and rural turn lanes do not apply for

the proposed development, dedicated turn lanes are not warranted on SE Leadbetter Road at the access location.

FINDING: Staff finds that this development can or will meet any impacts identified by the transportation impact study.

8. Appropriate provisions for maintenance of commonly owned private facilities have been made;

A Homeowner's Association (HOA) will be required for this development. Conditions, Covenants, and Restrictions (CC&Rs) are to be submitted to the city for approval, prior to final plat approval, in order to ensure there adequate and appropriate measures are in place for the perpetual maintenance of private trails, retaining walls, fencing, landscaping on all tracts and street trees, private parking areas, active and passive recreational amenities, private roads, and the stormwater detention/treatment systems.

Staff finds a condition of approval is required that plat notes be added to the face of the final plat outlining the responsibility for ownership and maintenance of Tracts A – T as follows:

- Tracts A, B, and S are 'Natural Area' Tracts that are to be owned by the HOA. These tracts are to remain in a natural state. Any maintenance activities within the natural area tracts, including removal of invasive species and dead or dying trees, will require prior approval from the City.
- An easement is hereby granted to the City of Camas for ownership and maintenance of the T-3 trail located in Tracts A and B.
- Tracts C, D, G, J, N, O, and P are Private Parking areas that are to be owned and maintained by the HOA.
- Tracts E, K, L, and M are Private Access Roads that are to be owned and maintained by the HOA.
- Tracts F, H, I, and Q are Open Space Tracts, which are intended for passive and recreational uses, and are to be owned and maintained by the HOA.
- Tract R is a Stormwater Facility Tract to be owned and maintained by the HOA, with right-of-entry granted to the City for inspection purposes.
- Tract T consists of right-of-way that is dedicated to the City of Camas for future roadway improvements.

FINDING: Staff finds the applicant should place notes on the face of the plat as describes above that identifies the specific ownership and maintenance responsibilities for all tracts. The applicant should also submit to the City for review and approval a copy of the CC&Rs prior to final plat approval.

9. Appropriate provisions in accordance with RCW 58.17.110, are made for (a) the public health, safety, and general welfare, and (b)The public use and interest will be served by the platting of such subdivision and dedication;

The applicant is proposing privately owned and maintained tracts for natural area tracts, landscaping, a stormwater facility and private roads. Furthermore, the applicant is providing adequate and appropriate utilities for stormwater, water, and sanitary sewer that will be dedicated to the public. The applicant will also provide sidewalks with the proposed street construction for adequate pedestrian mobility.

FINDINGS: As discussed throughout this report, staff finds that the subdivision can be conditioned to provide the appropriate provisions for public health, safety, general welfare include serving the public use and interest.

10. The application and plans shall be consistent with the applicable regulations of the adopted comprehensive plans, shoreline master plan, state and local environmental acts and ordinances in accordance with RCW36.70B.030.

FINDINGS: Staff concurs that the proposed subdivision, as conditioned, can or will meet the requirements of RCW 58.17 and other applicable state and local laws that are in at the time of final platting. The final plat will be processed in accordance with the requirements of CMC 17.21.060.

TEMPORARY USE PERMIT (TUP20-05) CMC CHAPTER 18.47

CMC Chapter 18.47.050 Criteria for Approval:

1. **The temporary use will not be materially detrimental to the public health, safety or welfare, not injurious to property or improvements in the immediate vicinity;**

   FINDINGS: Rock excavation is required as part of the site grading due to the existing shallow base rock. Opposed to hauling multiple truck loads of rock from the site, the applicant is proposing to use the excavated rocks for construction on site that requires the operation of a temporary mobile rock crusher. The temporary mobile rock crusher is proposed to be placed away from nearby residences and as such will not be materially detrimental to the public health, safety or welfare, nor injurious to property or improvements in the immediately vicinity. Prior to mobilization of the mobile rock crusher, the applicant should receive approval from Community Development Engineering for the placement of the equipment on site.

2. **The temporary use is compatible with the purpose and intent of this title, and the specific zoning district in which it will be located in accordance with Chapter 18.07 "Use Authorization";**

   FINDINGS: Although the temporary mobile rock crusher is not compatible with the residential zoning district and nearby properties, the temporary use will only be used during site construction and located away from residential properties.

3. **The temporary use is compatible in intensity and appearance with existing land uses in the immediate vicinity;**

   FINDINGS: Although the temporary mobile rock crusher is generally not compatible in intensity and appearance with existing land uses in the immediate vicinity, the temporary use will only be used during site construction and located away from residential properties.

4. **Structures proposed for the temporary use comply with the setback and vision clearance requirements of this title, and with applicable provisions of the Building and Fire codes;**

   FINDING: Structures are not proposed with the temporary mobile rock crusher. Therefore, this criterion is not applicable.

5. **Adequate parking is available to serve the temporary use, and if applicable, the temporary use does not occupy required off-street parking areas for adjacent or nearby uses;**

   FINDING: Parking will be available on-site during construction for the use of the temporary mobile rock crusher and will not occupy required off-street parking areas for nearby uses.

6. **Hours of operation of the temporary use are specified;**

   FINDING: The temporary mobile rock crusher will be used during site construction and may operate between the hours of 7am-7pm Monday-Friday and 7am-5pm Saturday, with no

operation on Sundays and Holidays, as outlined in CMC Chapter 9.32.050 or as approved by the City Engineer.

7. **The temporary use will not cause noise, light, or glare which adversely impacts surrounding land uses.**

   FINDINGS: The applicant indicated noise generated from the temporary mobile rock crusher will not be greater than noises to be expected during site construction and will be located away from nearby residences. The temporary mobile rock crusher will not generate any light or glare.

CMC Chapter 18.47.060 Time limitation:
A temporary use is valid for up to 180 days from the effective date of the permit, however, the community development director may establish a shorter time frame. The community development director may grant one extension not to exceed sixty days, upon the applicant showing compliance with all conditions of permit approval.

FINDING: Staff finds the temporary use is valid for 180 days. The applicant may request a 60-day extension per CMC 18.47.060. The temporary mobile rock crusher must be removed per CMC 18.47.080 at the expiration of the permit.

PUBLIC COMMENTS

As of the writing of this staff report, staff received one public comment concerning traffic impacts that were addressed by City Engineering (Exhibit 25).

CONCLUSION

Based on the above findings and discussion provided in this staff report, staff concludes that CJ Dens Subdivision (SUB20-02) should be approved, because it does comply with the applicable standards if all the conditions of approval are met.

RECOMMENDATION

Staff recommends APPROVAL of the preliminary plat of CJ Dens Subdivision (SUB20-02) subject to the following conditions of approval *in addition to* the conditions of the SEPA (SEPA20-17) permit:

CONDITIONS OF APPROVAL

Standard Conditions:

1. Engineering site improvement plans shall be prepared in accordance with the City of Camas Design Standards Manual (CDSM) and CMC 17.19.040.
2. The engineering site plans shall be prepared by a licensed civil engineer in Washington State and submitted to the City's Community Development (CDev) Engineering for review and approval.
3. Community Development (CDEV) Engineering shall collect a total 3% plan review and construction inspection (PR&CI) fee for the proposed development.
   a. A preliminary construction estimate shall be submitted to CDEV Engineering prior to, or with, submittal of plans for first review. Payment of the 1% plan review (PR) fee shall be due prior to the start of the plan review process.
   b. Payment of the 2% construction inspection (CI) fee shall be due prior to construction plan approval and release of approved plans to the applicant's consultant. Under no circumstances will the applicant be allowed to begin construction prior to construction plan approval.

4. Installation of public improvements shall be in accordance with CMC 17.21 Procedures for Public Improvements.
5. Existing water wells, septic tanks and septic drain fields shall be properly abandoned and/or decommissioned in accordance with State and County guidelines prior to final plat approval.
6. Any entrance structures or signs proposed or required for this project will be reviewed and approved by the City. All designs will be in accordance with applicable City codes. The maintenance of the entrance structure will be the responsibility of the homeowners.
7. The applicant will be responsible for ensuring that private utilities; underground power, telephone, gas, CATV, street lights, and associated appurtenances are installed.
8. A 6-foot private utility easement (PUE) shall be located outside of the right-of-way on public streets and outside of the tracts on private streets.
9. A draft street lighting plan shall be submitted for review prior to final plan submittal to Clark Public Utility.
10. The applicant will be required to purchase all permanent traffic control signs, street name signs, street lighting and traffic control markings and barriers for the improved subdivision.
11. Final plat and final as-built construction drawing submittals shall meet the requirements of the CMC 17.11.060, CMC 17.01.050, and the Camas Design Standards Manual.
12. The applicant shall remove all temporary erosion prevention and sediment control measures from the site at the end of the two-year warranty period, unless otherwise directed by the Public Works Director.
13. In the event any item of archaeological interest is uncovered during the course of a permitted ground disturbing action or activity, all ground disturbing activities shall immediately cease, and the applicant shall notify the City and the Department of Archaeology and Historic Preservation (DAHP).
14. A homeowner's association (HOA) will be required and a copy of the CC&Rs for the development will need to be submitted to the City for review and approval. Specifically, the applicant will need to make provisions in the CC&Rs for ownership and maintenance of the private storm drainage systems, open spaces, retaining walls, fencing, walls, landscaping, irrigation, private roads, and tracts or easements outside of the City's right-of-way if applicable. Further, all necessary easements and dedications should be noted on the final plat.
15. Accessory dwelling units shall not be precluded from CC&R's.
16. The applicant shall take appropriate measures to ensure landscaping success for a minimum of three years after issuance of Certificate of Occupancy. If planting fail to survive, the property owner shall promptly replace them.
17. Automatic fire sprinklers installed per NFPA 13D or 13R shall be required in all new residential structures.
18. Provisions for parking enforcement acceptable to the Fire Marshal shall be included in the CC&Rs at the time of final platting.
19. Building permits shall not be issued until this subdivision has been granted Final Acceptance and the Final Plat is approved and recorded by the Planning, Engineering, Building and Fire Departments.

Special Conditions:

Planning

20. The SEPA MDNS mitigation measures shall be complied with (city file no. SEPA20-17).
21. Best Management Practices (i.e. erosion control measures) shall be implemented throughout project construction.
22. Upon construction completion, areas of temporary disturbance shall be revegetated with native vegetation to pre-disturbance conditions.
23. Temporary construction fencing shall be installed prior to construction that clearly marks in the field the critical area buffers and remain in place throughout permitted construction activities.
24. Trees identified for preservation and removal shall comply with the recommendations of the Arborist Report.
25. Trees proposed for retention on lots shall install tree protection fencing on the outer perimeter of the critical root zone during construction.
26. Any additional tree removal shall require an updated arborist report for City review and approval prior to removal.
27. The model home/sales office shall be closed upon the construction of the last residential structure of each phase.
28. An avigation easement shall be recorded on the title that provides notice that the property is within an air traffic area.
29. Prior to rock blasting and crushing, the applicant shall contact the Fire Marshall's office for required permits.
30. Prior to mobilization of the mobile rock crusher, the applicant shall receive approval from Community Development Engineering for the placement of the mobile rock crushing equipment on site.
31. The temporary mobile rock crusher shall be removed per CMC 18.47.080 upon the expiration of the permit.

Prior to Final Engineering plan approval:

Planning

32. Prior to final engineering plan approval, the applicant shall submit to the City for review and approval a final mitigation plan per CMC 16.53.050.E.3 that also addresses the following:
    a. Any trees proposed for removal within a critical area buffer shall be replaced at a mitigation ratio of 2:1.
    b. Proposed mitigation for trail impacts to Stream 3.
    c. Proposed mitigation for the culvert stormwater improvements under SE Leadbetter Road that discharge Lacamas Lake.
33. The applicant shall comply with the geotechnical report recommendations to minimize any potential hazards associated with construction.

34. The T-3 public access trail shall be generally located within Tracts A and B as shown on the preliminary plat and installed in a manner to avoid the removal of existing healthy trees where feasible. The following trail features shall be shown on the engineering plans and the final plat:
    a. A 6-8 foot wide compact gravel trail with a maintenance vehicular turnaround at the west end of the trail.
    b. Directional trail signage shall be provided and approved by the City.
35. The applicant shall show the proposed driveway locations for each lot to ensure that street trees are not impacted.
36. Prior to engineering plan approval, a final landscape, tree and vegetation plan consistent with the landscaping standards in CMC 18.13 shall be submitted to the City for review and approval to include the following but not limited to:
    a. The stormwater facility located in Tract R shall be landscaped with a L2 landscape buffer at its lot lines.
    b. Parking lot areas shall be screened at all perimeters with a minimum 5-foot width of landscaping.
    c. Plants utilized shall be per the approved City's Tree list in the Camas Design Manual. Plants not on the approved City list, characteristic cards shall be submitted to the City for review and approval.
    d. The planting specifications and landscape notes in the Camas Design Manual shall be included on the final landscape plan.
    e. Irrigation shall be noted on the final landscape plan.
37. The applicant shall submit a final plan and specifications for the public outlook structure and play amenities in Tract I.
38. Prior to engineering plan approval, a revised clearing and grading plan with wall profiles and specifications shall be submitted in compliance with CMC 18.17.060 *Retaining walls*.

Engineering

39. Prior to final engineering plan approval, the applicant shall show the following onsite and offsite locations for traffic calming measures, on the final engineering plans.
    a. The intersection of N 48th Avenue and N Adams Street; and
    b. N Adams Street at the creek crossing in the Deerhaven subdivision.
    c. Additional onsite traffic calming measures may be required. Applicant shall discuss with staff prior to final engineering plan approval.
40. Prior to final engineering plan approval, that the applicant shall be required to submit for review and approval the details for the shared waterline trench.
41. Prior to engineering plan approval, the applicant shall submit a final stormwater report (TIR) to the City for review and approval. The final TIR is to address the upsizing of the existing culverts located in the shoreline Jurisdiction.
42. The private stormwater easements located on Lots 12-22 and Lots 135-152 shall be owned and maintained by the HOA and to be shown on the final engineering plans and the final plat.

43. The applicant shall submit to the City, for review and approval a revised stormwater management plan for Lots 92-103. Said plan shall ensure that adjacent parcels and downstream drainageways and/or properties will not be negatively affected, per Camas Municipal Code (CMC) 14.02 and 17.19.040.C.

44. The applicant shall be required to locate any form of stormwater treatment in a dedicated Tract per CMC 17.19.040.C.a. Said requirement shall be addressed and identified prior to final engineering plan approval in the final engineering construction drawings and all new stormwater tracts are to be identified on the final plat.

45. Prior to final engineering plan approval, the applicant shall be required to submit the Erosion Sediment Control (ESC) plans, as a part of the site improvement plans, to the City for review and approval.

46. The applicant shall be required to provide an Erosion Control Bond, prior to final engineering plan approval and/or start of any land-disturbing activities.

47. Prior to final engineering plan approval and/or start of any land-disturbing activities a copy of the NPDES GCSW Permit and SWPPP are required to be submitted to Engineering.

48. The applicant has proposed four (4) private streets as described in the following tracts:

    a. Tract E, the applicant shall provide a 6-foot wide easement in addition to Minimum Private Street Standard A. Said easement should be for emergency use.

    b. Tract K, the applicant shall widen Tract K from 20-feet to 24-feet with a paved surface of 24-feet, beginning at the southern property line of Lot 89. The applicant shall design and construct a dead-end turnaround per CDSM with guardrail along the downslope radius and end of the road. Said design shall meet the weight requirements for a fire engine (38K pounds) and fire truck (62K pounds) fully loaded with water, equipment, and staff.

    c. Tract L, the applicant shall provide a minimum 20-foot wide tract with a minimum 18-foot paved surface, and that the design for the retaining wall adjacent to the road meet the weight requirements for a fire engine (38K pounds) and fire truck (62K pounds) fully loaded with water, equipment, and staff. Additionally, staff recommends the applicant shall provide a 6-foot wide easement in addition to Minimum Private Street Standard A, along the frontage of Lots 100 and 101 that allows for deployment of fire engine outriggers and safe movement around the engine. Said easement shall be for emergency use.

    d. Tract M, the applicant shall provide a minimum 20-foot wide tract, with a minimum 18-foot paved surface. Additionally, staff recommends that the applicant shall provide a 6-foot wide easement along the frontage of Lots 109 and 110, that allows for deployment of fire engine outriggers and safe movement around the engine. Said easement shall be for emergency use.

49. Prior to final engineering plan approval, the applicant shall work with staff to provide a minimum 25-foot curb radius or other approved designed access approach with thickened sidewalks, at the transitions from public road to provide road as follows:

    a. Tract E: A 25-foot curb radius is required on the south side only adjacent to Lot 11.

    b. Tract K: A 25-foot curb radius is required on the east side only adjacent to Lot 89. The access to Tract K is adjacent to private parking Tract J on the west side, therefore, the

applicant has proposed to construct a thickened driveway approach from the west side of Tract J to the east side of Tract K.

c. Tract L: is adjacent to Lot 104, which consists of a narrow radius frontage. As such, the 25-foot curb radius is waived between Tract L and Lot 104, however the applicant has proposed to construct a continuous thickened driveway approach across Lot 104 to the south property line of Lot 100.

d. Tract M: A 25-foot curb radius is required on both sides of the private road, adjacent to Lot 109 on the east side and Lot 113 on the west side.

50. Prior to final engineering plan approval, the applicant shall provide no parking and towing signs (with phone numbers), for review and approval, as the city does not provide for towing on private roads.

51. Prior to final engineering plan approval, the applicant shall show the private stormwater easements on the construction drawings.

52. Street light locations shall be shown on the engineering and landscape plans prior to final engineering plan approval.

53. Draft electrical plans for street lighting shall be submitted to the city for review and approval, prior to submittal to Clark Public Utilities. Additionally, any street lighting proposed for private streets shall be metered separately and shall be owned and maintained by the HOA.

54. Street names shall be reviewed and approved by the Building Department prior to final engineering plan approval.

<u>Prior to Final Plat approval:</u>

Planning

55. A note shall be added to the face of the final plat that all required tree plantings shall be maintained in good health and shall be promptly replaced (within six months) if damaged or in poor health.

56. A note shall be added to the face of the final plat that Lots 135-152 shall direct outdoor lighting and speakers away from the wetland.

57. A note shall be added to the face of the final plat that tree topping is prohibited.

58. A conservation covenant shall be recorded with the County to ensure long-term preservation of the critical areas and their associated buffers, including maintenance of any mitigation actions per CMC 16.51.240, as well as trees to be retained on site. A copy of the recorded conservation covenant shall be submitted to the City prior to final plat approval.

59. A mitigation bond shall be posted in an amount deemed acceptable by the City to ensure the mitigation is fully functional per CMC 16.51.250.

60. The trail shall be constructed prior to final plat approval and owned and maintained by the City.

61. Building envelopes and setbacks shall be shown on the final plat.

62. A note shall be added to the face of the final plat that the lots within this subdivision are located within an air traffic area.

63. Notes shall be placed on the final plat that identifies the specific ownership and maintenance responsibilities for all tracts.

Engineering

64. The applicant shall provide an access and maintenance easement to the city over and under the sanitary sewer main located in the Utility Access Road located behind Lot 41 and Lots 44 thru 50. Said easement shall be dedicated with the final plat.
65. The applicant shall provide a minimum 15-foot wide access and maintenance easement to the city over and under the sanitary sewer main located in Tract B. Said easement shall be dedicated with the final plat.
66. The applicant shall provide an access and maintenance easement to the city over and under the sanitary sewer main located within Tracts E, K, L, and M. Said easement shall be dedicated with the final plat.
67. If there are any existing wells or septic systems, that prior to final plat approval, documentation be provided to engineering that said wells and/or septic systems have been properly abandoned.
68. The applicant shall provide private easements for stormwater lines. These easements shall be shown on the construction drawings and the final plat for recording.
69. The applicant shall submit to the City for review and approval a copy of the CC&R's.

Prior to Final Acceptance:

70. Permanent signs and fencing shall be installed at the edge of the critical area buffers per CMC 16.51.210.B and C. Sign and fencing specifications shall be submitted to the City for review and approval prior to installation.
71. Landscaping and irrigation adjacent to or within tracts shall be installed or bonded for as approved on the final landscape plans prior to final acceptance.

Prior to Building Permit approval:

72. The applicant shall consider construction techniques that would decrease the noise associated with the airport.

Prior to Final Occupancy:

73. Street trees with a minimum two-inch diameter at breast height and irrigation shall be installed or bonded for and located within the planter strip as approved on the final landscape plans prior to final occupancy. Specified trees shall be maintained in good health, and damaged or dying trees shall be promptly replaced (within six months) by the homeowner.
74. The applicant shall provide acceptable back flow device(s) (BFD) and yearly backflow testing for any private HOA irrigation service(s) proposed.
75. Prior to occupancy of each home with an irrigation system, the builder shall submit acceptable BFD testing for each irrigation meter installed and provide said testing results to the city.

Proposed Plat Notes

1. A homeowner's association (HOA) will be required for this development. Copies of the CC&R's shall be submitted and on file with the City of Camas.
2. The homeowner's association (HOA) is responsible for maintaining all private roads and associated infrastructure in this subdivision, including but not limited to the pavement, curbs, sidewalks, walls, landscaping, street lights and storm drainage utilities.

3. All costs associated with the installation of the step systems for individual lots will be the responsibility of said individual lot owners.
4. An access and utility maintenance easement is provided to the City over the private street tracts for the inspection, maintenance and operation of said public water lines.
5. A right of entry is hereby granted to the City of Camas for the repair and maintenance of the individual S.T.E.F systems located on the lots within the plat.
6. The following setbacks shall apply: Front yard 10-feet,Front yard garage setback 20-feet, Rear yard 15-feet, Side yard 5-feet, Corner rear yard 5-feet, Side yard flanking a street 10-feet. Garage setback from front of the dwelling is 5-feet. Lot coverage is 50%.
7. The following front yard setbacks shall apply to Lots 31 and 32: Front yard 15-feet, Front yard garage setback 25-feet.
8. No further short platting or subdividing will be permitted once the final plat has been recorded.
9. A final occupancy permit will not be issued by the Building Department until all subdivision improvements are completed and accepted by the City.
10. The lots in this subdivision are subject to traffic impact fees, school impact fees, and park/open space impact fees. Each new dwelling unit will be subject to the payment of appropriate impact fees at the time of building permit issuance or as otherwise provided by the city.
11. Prior to the Building Department issuing a Certificate of Occupancy, each lot shall install a minimum of one 2" caliper tree to be located in the planter strip as specified on the plat. Specified trees shall be maintained in good health, and damaged or dying trees shall be promptly replaced (within six months) by the homeowner.
12. Automatic fire sprinkler systems designed and installed in accordance with NFPA 13D are required in all structures.
13. Illegally parked vehicles may be subject to towing or other private parking enforcement measures in accordance with the provisions outlined in the HOA documents.
14. Prior to occupancy for each home with an irrigation system, the builder shall submit acceptable back flow device (BFD) testing for each irrigation meter installed and provide said testing results to the City.
15. Lots 135-152 shall direct outdoor lighting and speakers away from the wetland.
16. Tree topping is prohibited.
17. The lots within this subdivision are located within an air traffic area.
18. Tracts "A", "B", and "S" are Natural Area Tracts that are to be owned by the HOA. These tracts are to remain in a natural state. Any maintenance activities within the natural area tracts, including removal of invasive species and dead or dying trees, will require prior approval from the City.
19. An easement is hereby granted to the City of Camas for ownership and maintenance of the T-3 trail located in Tracts A and B.
20. Tracts C, D, G, J, N, O, and P are Private Parking areas to be owned and maintained by the HOA.
21. Tracts E, K, L, and M are Private Access Roads to be owned and maintained by the HOA.
22. Tracts "F", "H", "I" and "Q" are Open Space Tracts, which are intended for passive and recreational uses, to be owned and maintained by the HOA.
23. Tract "R" is a Stormwater Facility Tract to be owned and maintained by the HOA with right-of-entry granted to the City for inspection purposes.

24. Tract “T” consists of right-of-way that is dedicated to the City of Camas for future roadway improvements.
25. The private stormwater easements, provided for the benefit of Lots 1 thru 12; Lots 74 thru 83; Lots 43 thru 62; Lots 88 thru 91; Lots 103 thru 108; Lots 112 thru 115; and within private road Tracts E, L, and M are to be owned and maintained by the applicable property owners.

City of Camas WASHINGTON

Community Development Department | Planning
616 NE Fourth Avenue | Camas, WA 98607
(360) 817-1568
communitydevelopment@cityofcamas.us

General Application Form **Case Number:** SUB20-02

Applicant Information

Applicant/Contact:: CJ Dens Lacamas II LLC *Phone:* (360)606-6217

Address: PO Box 2239 carl@lawsoninvestments.com
Street Address *E-mail Address*
Kalama WA 98625
City *State* *ZIP Code*

Property Information

Property Address: 715 SE Leadbetter Road
Street Address *County Assessor # / Parcel #*
Camas WA 98607
City *State* *ZIP Code*

Zoning District Single-family Residential (R-7.5) Site Size 49.62 AC (2,161,423 SF)

Description of Project

Brief description:
The applicant proposes to subdivide three parcels (177906-000, 178172-000, and 178236-000) into 152 lots with open spaces and protected critical areas.

Are you requesting a consolidated review per CMC 18.55.020(B)? YES ☐ NO ☒

Permits Requested: ☐ Type I ☐ Type II ☒ Type III ☐ Type IV, BOA, Other

Property Owner or Contract Purchaser

Owner's Name: CJ Dens Lacamas II LLC *Phone:* (360)606-6217
Last *First*
PO Box 2239
Street Address *Apartment/Unit #*
E mail Address: Kalama WA 98625
carl@lawsoninvestments.com *City* *State* *Zip*

Signature

I authorize the applicant to make this application. Further, I grant permission for city staff to conduct site inspections of the property.

Signature: [signature] **Date:** 11/20/20

Note: If multiple property owners are party to the application, an additional application form must be signed by each owner. If it is impractical to obtain a property owner signature, then a letter of authorization from the owner is required.

Date Submitted: 11/25/20 Pre-Application Date:

Staff: LH Related Cases # PA20-09

☐ Electronic Copy Submitted

#590544
#49,233.00
Validation of Fees

ARCH20-08, CA20-07, SHOR20-01, TUP20-05

Revised: 01/22/2019

Application Checklist and Fees [updated on January 1, 2020]

◊ Annexation	$849 - 10% petition; $3,608. - 60% petition	001-00-345-890-00		$
◊ Appeal Fee		001-00-345-810-00	$392.00	$
◊ Archaeological Review		001-00-345-810-00	$135.00	$ 135.00 ARCH20-08
◊ Binding Site Plan	$1,848. + $24 per unit	001-00-345-810-00		$
◊ Boundary Line Adjustment		001-00-345-810-00	$101.00	$
◊ Comprehensive Plan Amendment		001-00-345-810-00	$5,729.00	$
◊ Conditional Use Permit				
Residential	$3,360 + $103 per unit	001-00-345-810-00		$
Non-Residential		001-00-345-810-00	$4,256.00	$
◊ Continuance of Public Hearing		001-00-345-810-00	$515.00	$
◊ Critical or Sensitive Areas (fee per type) x 4		001-00-345-810-00	$762.00	$ ~~762.00~~ 3,048.00 CA20-07
(wetlands, steep slopes or potentially unstable soils, streams and watercourses, vegetation removal, wildlife habitat)				
◊ Design Review				
Minor		001-00-345-810-00	$426.00	$
Committee		001-00-345-810-00	$2,335.00	$
◊ Development Agreement	$862 first hearing; $530 ea. add'l hearing/continuance	001-00-345-810-00		$
◊ Engineering Department Review - *Fees Collected at Time of Engineering Plan Approval*				
Construction Plan Review & Inspection	*(3% of approved estimated construction costs)*			TBD
Modification to Approved Construction Plan Review	*(Fee shown for information only)*		$415.00	
Single Family Residence (SFR) - Stormwater Plan Review	*(Fee shown for information only)*		$205.00	
Gates/Barrier on Private Street Plan Review	*(Fee shown for information only)*		$1,024.00	
◊ Fire Department Review				
Short Plat or other Development Construction Plan Review & Insp.		115-09-345-830-10	$280.00	$
Subdivision or PRD Construction Plan Review & Inspection		115-09-345-830-10	$348.00	$ 348.00
Commercial Construction Plan Review & Inspection		115-09-345-830-10	$416.00	$
◊ Home Occupation				
Minor - Notification (No fee)			$0.00	
Major		001-00-321-900-00	$68.00	$
◊ LI/BP Development	$4,256+ $40.00 per 1000 sf of GFA	001-00-345-810-00		$
◊ Minor Modifications to approved development		001-00-345-810-00	$340.00	$
◊ Planned Residential Development	$34 per unit + subdivision fees	001-00-345-810-00		$
◊ Plat, Preliminary				
Short Plat	4 lots or less: $1,904 per lot	001-00-345-810-00		$
Short Plat	5 lots or more: $7,055 + $246 per lot	001-00-345-810-00		$
Subdivision	$7,055 + $246 per lot	001-00-345-810-00		$ 44,447.00 SUB20-02
◊ Plat, Final:				
Short Plat		001-00-345-810-00	$197.00	$
Subdivision		001-00-345-810-00	$2,335.00	$
◊ Plat Modification/Alteration		001-00-345-810-00	$1,176.00	$
◊ Pre-Application (Type III or IV Permits)				
No fee for Type I or II				
General		001-00-345-810-00	$348.00	$
Subdivision (Type III or IV)		001-00-345-810-00	$896.00	$
◊ SEPA		001-00-345-890-00	$796.00	$
◊ Shoreline Permit		001-00-345-890-00	$1,176.00	$ 1,176.00 SHOR20-01
◊ Sign Permit				
General Sign Permit	(Exempt if building permit is required)	001.00.322.400.00	$40.00	$
Master Sign Permit		001.00.322.400.00	$124.00	$
◊ Site Plan Review				
Residential	$1,132 + $33 per unit	001-00-345-810-00		$
Non-Residential	$2,828 + $67 per 1000 sf of GFA	001-00-345-810-00		$
Mixed Residential/Non Residential	(see below)	001-00-345-810-00		$
	$3,987 + $33 per res unit + $67 per 1000 sf of GFA			
◊ Temporary Use Permit		001-00-321-990-00	$79.00	$ 79.00 TUP20-05
◊ Variance (Minor)		001-00-345-810-00	$683.00	$
◊ Variance (Major)		001-00-345-810-00	$1,273.00	$
◊ Zone Change (single tract)		001-00-345-810-00	$3,289.00	$

Adopted by RES 1023 AUG 2005; Revised by RES 1113 SEPT 2007; Revised by RES 1163 OCT 2009; Revised by RES 1204 NOV 2010; Revised by RES 15-001 JAN 2015; Revised by RES 15-007 MAY 2015; Revised by RES 15-018 DEC 2015; Revised by RES 16-019 NOV 2016; Revised by RES 17-015 NOV 2017; Revised by RES 18-003 APRIL 2018; Revised by RES 18-013 NOV 2018; Revised by RES 19-018 DEC 2019

Fees reviewed & approved by Planner: *Initial* 11/24/2020 *Date*

For office use only

Total Fees Due: $ ~~46,947.00~~ $49,233.00

G:\CDEV\PLANNING\Forms & Handouts\Forms\Planning Fee Schedule 010120

PRE-APPLICATION MEETING NOTES
CJ Dens East Subdivision
PA20-09

Thursday, February 20, 2020
2:30pm, City Hall
616 NE 4th Ave. Camas, WA. 98607

Applicant:	CJ Dens Lacamas I LLC Carl Lawson
City of Camas:	Lauren Hollenbeck, Senior Planner Madeline Sutherland, Assistant Planner Robert Maul, Planning Manager Anita Ashton, Engineering Ron Schumacher, Fire Dept.
Location:	715 SE Leadbetter Road Camas, WA 98607 Parcel Numbers: 177906-000, 178172-000, 178236-000
Zoning:	R-7.5 (Single-Family Residential)
Description:	The applicant is proposing a major plat amendment to the previously approved SUB10-03 to include subdividing 49.62 acres into 153 single-family residential lots

NOTICE: Notwithstanding any representation by City staff at a pre-application conference, staff is not authorized to waive any requirement of the City Code. Any omission or failure by staff to recite to an applicant all relevant applicable code requirements shall not constitute a waiver by the City of any standard or requirement. [CMC 18.55.060 (C)] This pre-application conference shall be valid for a period of 180 days from the date it is held. If no application is filed within 180 days of the conference or meeting, the applicant must schedule and attend another conference before the City will accept a permit application. [CMC 18.55.060 (D)] Any changes to the code or other applicable laws, which take effect between the pre-application conference and submittal of an application, shall be applicable. [CMC 18.55.060 (D)]. A link to the Camas Municipal Code (CMC) can be found on the City of Camas website, http://www.cityofcamas.us/ on the main page under "Business and Development".

PLANNING DIVISION **LAUREN HOLLENBECK (360) 817-7253**

Applicable codes for this proposal include Title 16 Environment, Title 17 Land Development and Title 18 Zoning of the Camas Municipal Code (CMC), which can be found on the city website, **in addition to the Development Agreement for CJ Dens**. Please note it remains the **applicant's responsibility** to review the CMC and address all applicable provisions. The following pre-application notes are based on application materials and site plan submitted to the City on January 31, 2020:

Application Requirements

Your proposal will need to comply with the general application requirements per **CMC Section 18.55.110** in addition to the specific applicable application requirements outlined in **CMC Section 17.11.030.B** for a preliminary subdivision plat. The following is an excerpt from the requirements of CMC Section17.11.030.B (see code section for full text):

1. A completed city application form and required fee(s);

Fees will be based on the adopted fees at the time of land use application submittal. The current fees include the following:	
1. Major Plat Amendment/Modification *(Option 1)*	$1,176.00
2. Preliminary Plat *(Option 2)*	$7,055 + $246 per lot
3. Shoreline Review *(if required)*	$1,176.00
4. Critical Areas Review *(for each type)*	$762.00
5. Archaeological Review *(if required)*	$135.00
6. Fire Department Review	$348.00
7. Building Permit and Plan Review	based on the valuation of the project
8. Engineering Review	3% of estimated construction costs

2. A completed and signed SEPA checklist;
3. Complete applications for other required land use proposals applicable to the proposal;
4. A vicinity map showing location of the site;
5. A survey of existing significant trees as required under CMC Section 18.13.045;
6. All existing conditions shall be delineated on the site plan per CMC Section 17.11.030.B.6(a-p);
7. A preliminary grading plan as slopes are greater than ten percent;
8. Preliminary stormwater plan and report;
9. A geotechnical report consistent with CMC Chapter 16.59 as development is proposed on slopes greater than ten percent
10. A copy of the Clark County assessor's map which show the location of each property within 300 feet of the subdivision;
11. One set of mailing labels for all property owners as provided in CMC Section 18.55.110;
12. A traffic study
13. A narrative addressing ownership and maintenance of open spaces, stormwater facilities, public trails and critical areas, and the applicable approval criteria (CMC Section 17.11.030.D) and standards of the Camas Municipal Code. It should also address any proposed building conditions or restrictions.
14. A development sign must be posted on site per CMC Section 18.55.110.H (1-5).
15. Necessary drawings- three sets and an electronic copy (send as a PDF by email or on a disc). All documents and reports must be submitted as separate pdf copies.

Major Plat Amendment/Modification or Preliminary Plat Review (2 Options)

An application for a major plat amendment to an approved preliminary plat is considered a Type III permit per CMC 18.55.270.A. Preliminary plats have a 7-year expiration date per CMC 17.11.060.A. Per CMC 18.55.270.D, an approval to a major plat amendment shall expire the same time as the original preliminary plat approval. In this case, the plat amendment would expire in September 2021. Otherwise, the applicant may elect to apply for the subdivision review process to allow for more time.

The following comments are based on the site plan materials submitted with this Pre Application:

1. The preliminary plat drawings must meet the density and dimensional standards for lots in a Single-Family Residential (R-7.5) zone, and infrastructure improvements (i.e. roads, easements, etc.).
2. Density transfer provisions per CMC 18.09.040.B Table 1 may be utilized if the development sets aside a tract for the protection of a critical area per CMC 18.09.060.C. As discussed at the meeting, the development proposal may be eligible for negotiated flexibility as provided in CMC 18.09.060.D. If you wish to pursue this process, a letter explaining the request shall be submitted to the City for consideration.
3. Per CMC 17.19.030.C.1, Buffer between uses. Where single-family residential lots are adjacent to commercial zones, buffer strips and/or solid fences shall be provided.
4. Building setback requirements are found at CMC 18.09.040-Table 2, which includes the requirement for setbacks to be drawn on the plat. Per Note 2, *"Garage setback is five feet behind the front of the dwelling."*
5. Building envelopes (setbacks) shall be shown on the preliminary and final plats. Per CMC Section 17.19.030.D.3.a, a 40ft. by 40ft. square dwelling should be able to fit within the building envelope.
6. Each dwelling unit within a new development shall be landscaped with at least one tree per CMC 17.19.030.F.
7. Lots 61 thru 77 are double frontage lots as those lots front an arterial/collector and have street frontage along two opposite lines. Double frontage lots shall comply with CMC 17.19.030.D.6 (a-d). Also refer to CMC Figure 17.19-1.
8. Per CMC 17.19.040.B.1.c, if the average lot size is less than 7,500 square feet, one additional off-street parking space is required for every 5 units and shall be located within a common tract.
9. Per CMC 17.19.040.B.10.a, a Circulation plan is required at application that includes the subject site and properties within six hundred feet showing topography, critical areas and existing and proposed streets, trails, etc. Streets shall extend to and connect with neighboring properties per CMC 17.19.040.B.6.a.
10. The location and height of any retaining walls shall be shown on the grading plan. Retaining wall height requirements are found in CMC 18.17.060.
11. Per CMC 17.19.030.E, the 2014 Parks, Recreation and Open Space plan identifies the T-3 trail along the southern boundary of the site. The proposed trail should be located within the proposed open space tracts adjacent to NE Leadbetter Road without the removal of trees. The conceptual trail plan will be presented to the Parks Ad Hoc Committee for feedback.
12. Per the City Comp. Plan North Shore Economic Development Policy ED-4.3, "**Encourage new development to include provisions for neighborhood parks that are within walking and biking distances to a person's home** or work to encourage greater physical activity, including shared-use paths (or trails) that link homes, work and commercial centers, public transit, and community facilities." Staff strongly encourages the applicant to include a small park with playground equipment (aka "tot lot"). This could be included in one of the currently proposed open space tracts such as Tract H or J.

Landscaping Regulations and Tree Retention
Landscaping standards shall apply to all new land divisions per CMC 18.13.020.B.1. A Landscape, Tree and Vegetation plan must be submitted pursuant to CMC 18.13.040.A. If trees are proposed for removal, a Tree Survey is required per CMC 18.13.040.B and must be prepared by a certified arborist or professional forester pursuant to the requirements outlined in CMC 18.13.045. A minimum 20-unit tree density per net acre is required and needs to be incorporated in the overall landscape plan per CMC 18.13.051.A.

SEPA
The applicant may utilize the existing SEPA checklist as fewer impacts are anticipated with this proposed development as opposed to the original development approval (SUB10-03).

Critical Areas Review
Critical areas such as wetlands, fish & wildlife habitat conservation areas (i.e. streams), geologically hazardous areas (i.e. steep slopes) have been identified on the subject property and critical area reports were prepared with the previously approved plat (SUB10-03).

- The prior geotechnical report will need to be updated as the surrounding site conditions have changed due to logging activities and to reflect the current development proposal.
- A memo addressing the wetland and fish & wildlife habitat conservation areas is sufficient if there are no new impacts. In addition, the previously approved reports should be submitted with the application materials.

Archaeological Review
Verify with the Department of Archaeology and Historic Preservation (DAHP) as to whether or not an updated predetermination report is required.

Shoreline Permit
Upon further review of the shoreline jurisdiction, it appears the project site **is** within shoreline jurisdiction and therefore a shoreline permit will be required. The location of the shoreline jurisdiction should be shown on the plat submittal for verification.

Temporary Use Permit
A temporary use permit is required for utilizing rock crushing equipment. Application submittal requirements are addressed in CMC 18.47.030. A narrative addressing the criteria of approval in CMC 18.47.050 shall be submitted with the application materials.

ENGINEERING DIVISION ANITA ASHTON (360) 817-7231 aashton@cityofcamas.us

General Requirements:

1. Civil plans shall be prepared by a licensed Washington State Engineer in accordance with *City of Camas Design Standards Manual (CSDM)* and CMC 17.19.040.
2. Construction plans and engineer's estimate are to be submitted to the Engineering department for review and approval. Submit 4 full size and 2 half size sets for 1st review.
3. A 3% plan review and construction inspection fee (PR&CI) will be required per resolution number 1023. The fee is based on an engineer's estimate or construction bid. The fee is due prior to release of approved construction drawings.
4. Regulations for installation of public improvements, improvement agreements, bonding, and final acceptance can be found at CMC 17.21.
5. The applicant will be responsible for ensuring that private utilities; underground power, telephone, gas, CATV, interior parking lot lighting, and associated appurtenances are installed.

Traffic/Transportation:

6. An updated transportation impact memo (TIA) is required and shall be prepared in accordance with the City's adopted *Traffic Impact Study Guidelines* as outlined in the *CDSM*.
7. The Applicant will be required to have a traffic engineer analyze the following:
    a. Site distance access at NW Leadbetter Drive and interior intersections.
    b. Address movement conflicts with any nearby intersections.
    c. Provide a circulation plan.
    d. Provide trip AM and PM Peak distribution to and from the site.
8. Updated memo to verify that the recommendations of the intersection analysis in original TIA are still relevant.

Streets:

9. The proposed development will access off NW Leadbetter Road. which is classified as an existing 2-lane local road without sidewalks or curb & gutter.
10. Per CMC 17.19.040 Street section for public roads shall consist of 60-foot right-of-way, 36-foot paved surface with sidewalks and planter strips on both sides, and no on-street parking.
11. The proposed modification to the plat shows a 52-foot right-of-way, 28-foot paved surface, 5-foot sidewalks and planter strips on both sides, which would require approval from the City Engineer. City Engineer would support this road section with verification of sufficient parking.
12. Per CDSM, Street Detail ST14, Note 5: max driveway throat width for a 2-car garage is 20-feet and for a 3-car garage is 30-feet, providing that the driveway throat does not exceed forty percent (40%) of the total lot frontage.
13. Per CMC 17.19.040.B.6.a, requires an integrated circulation system for vehicles, pedestrians, and bicycles.
14. The proposed modification does not meet the requirements of CMC 17.19.040.B.10.b.i-iii for cross-circulation, nor does it meet the requirements in the CDSM *Table 3 Access Spacing Standards*: local roads maximum spacing is 600-feet.
15. Proposed roadways within the development, with lot access, shall not exceed 12%.
16. An exception of up to 15%, on roads segments without lot access, may be granted.
17. Curb ramps and street crossings on new developments, shall meet ADA standards, and therefore shall not exceed 5% at uncontrolled street crossings and 2% at controlled street crossings.
18. Roads shall extend to the limits of the development and/or to existing streets, be signed for future extension at dead ends, and provide for dead end turnarounds.
19. Intersections that connect to existing public roads, shall be as near to a right angle as possible, but shall not exceed 15°.
20. Applicant shall provide ADA compliant pedestrian access throughout the site and out onto NW Leadbetter Road.
    a. In order to provide ADA compliant pedestrian ramps careful evaluation of street profile grades and site grading will be required.

Stormwater:

21. The applicant shall provide an updated stormwater report (TIR), using the current 2019 Ecology SWMMWW.
22. Per CMC 14.02 Stormwater Control, stormwater treatment and detention shall be designed in accordance with the latest edition of Ecology's *Stormwater Management Manual for Western Washington (2019 SWMMWW*).
23. Refer to Ecology's *Figure I-3.1 Flow Chart for Determining Requirements for New Development (Vol. I, Chapter 3)*.
    a. As the project results in 5,000 sf, or greater, of new plus replaced hard surface areas, Minimum Requirements (MR) #1- #9 will apply.

24. Stormwater facilities, including underground treatments, are to be placed in separate tracts. Landscaping and fencing may be required.
25. Maintenance of onsite stormwater facilities will be the responsibility of the Owner, per CMC 17.19.040 (C3).
26. A right-of-entry, for purposes of inspection, is to be granted to the City and is to be included as a plat note.
27. Storm easements, if required, are to be shown on the construction drawings.
28. Applicant is to indicate a lot/s as a designated concrete washout area (BMP C154, Vol. II, Chap. 3, pgs. 320-326), which is to be shown on the engineering plans and used by the homebuilders during homebuilding activities. The washout area/s is to be removed prior to issuance of the last final occupancy.

Erosion Control

29. The proposed development is over one acre in size, therefore the applicant will be required to obtain an NPDES Construction Stormwater General Permit from Ecology, which includes a SWPPP document. Copies of both are to be submitted to the City prior to construction.
30. An ESC bond, in the amount 200% of the engineer's estimate for ESC measures, is to be submitted prior to construction.

Water

31. There is an existing 12-inch water main located in NW Leadbetter Road.
32. The applicant shall construct a 12-inch DIP water transmission main from NW Leadbetter Road, up N Elk Street and N 50th Ave. to the northern most limits of the proposed development and shall install PRV vaults where applicable.
33. Applicant shall construct an 8-inch DIP water service main throughout the site and provide water services to each lot.
34. Individual PRVs may be required at some single family water meters.
35. A 10-foot separation shall be maintained between water and sanitary sewer lines.

Sanitary Sewer:

36. The applicant shall construct a minimum 8-inch PVC gravity sewer main throughout the development and provide min. 6-inch laterals to each lot.
37. A 10-foot separation shall be maintained between water and sanitary sewer lines.

Parks/Trails:

38. The 2014 Parks, Recreation, and Open Space Plan indicates that there is a proposed T-3 regional trail system that would transect proposed Tract L and Tract M of the proposed development.
39. Applicant is to work with the City to locate and construct the T-3 trail segments to the east and west.
    a. The T-3 segment thru Tract L is to run east and connect to the sidewalk along the Deerhaven subdivision frontage.
    b. The T-3 segment thru Tract M is to run to the western most property boundary.
    c. Construction of the T-3 trail segments is park/open space impact fee creditable.

Impact Fees:

40. Impact fees are collected at time of building permit approval.
41. 2020 Fees provided below:
    - Traffic Impact Fees – North District for TIF only
        - Single Family Detached - $8,990.00
    - School Impact Fees (SIF) (Camas) – $5,371.00
    - Park/Open Space Impact Fees (PIF) –$4,500.00
    - Fire Impact Fees (FIF) - $0.20 sf

System Development Charges (SDCs):

42. SDCs are collected at time of building permit application.
43. 2020 Fees provided below:
    - Water
      - 3/4" meter - $7,310.00 + $394.00 connection fee
    - Sewer – North District for Sewer SDC's only
      - Residential - $4,420.00

BUILDING DIVISION **BOB CUNNINGHAM (360) 817-7243**

1. Existing structures need an asbestos survey and demolition permit.
2. Decommissioning of septic tanks and drain fields through Clark County Department of Health
3. The structures will be reviewed under the most current building codes as adopted by The State of Washington.
4. The structural drawings and calculations shall be prepared and stamped by a Professional Engineer licensed by the State of Washington.
5. The placement of buildings and structures on or adjacent to slopes steeper than one-unit vertical in three units horizontal shall conform to Sections R403.1.7.1 through R403.1.7.4.
6. Geotechnical engineer's report may be required
7. The required fire distance between buildings and property line shall be in accordance with the International Building Codes.
8. The required fire suppression system shall be in accordance with IBC and other applicable codes standards and shall be reviewed by the Camas Fire Marshal's office.
9. Storm sewer disposal and connections shall be identified on the approved plans.
10. All lots shall be provided a storm drain lateral at the lowest practical location.
11. Developer shall provide a designated concrete wash out area.
12. Storm water from adjacent properties and existing developments should be taken into consideration.
13. System Development Charges and Impact fees shall be assessed prior to permits
14. An approved monument sign for posting addresses shall be provided at all Flag lots. The monument sign, location and design shall be noted on the Plat.
15. Any development located within a special flood hazard area shall be in accordance with CMC 16.57
16. Impact fees and System Development charges shall be applicable.

FIRE DEPARTMENT **RANDY MILLER (360) 834-6191**

No building or structure regulated by the building and/or fire code shall be erected, constructed, enlarged, altered, repaired, moved, converted or demolished unless a separate permit for each building or structure has first been obtained from the CWFMO Camas Municipal Code 15.04.030.D.12.a

Any inadvertent omission or failure to site or include any applicable codes or code language by the Fire Marshal's office or the City shall not be considered a waiver by the applicant.

1. Low Flow Life Safety Residential Fire Sprinklers (NFPA 13D) required in all new dwellings
2. The distance from a required fire hydrant may be doubled when Low Flow Life Safety Residential Fire Sprinklers are installed throughout a fully sprinklered subdivision. CMC 17.19.040.C.4.a.

3. An approved address sign, in accordance with the Camas Municipal Code, must be posted for each residence where the flag lot leaves the public road or access tract. This sign shall be of permanence in its design/installation and shall be approved prior to installation. Contact the FMO for approval. CMC 17.19.030.D.5.d
4. Underground oil tank removal requires a permit with the fire marshal's office following IFC (International Fire Code) 3404.2.14
5. Any existing structures that are scheduled to be torn down may be considered for fire department training. Contact the FMO for further information.
6. Private Streets require a plan for access obstruction per CMC, 17.19.040.A.9
7. Street signs to include the 100 block designation on the sign.
8. Witnessed Hydrant Flushing required contact the FMO to schedule.
9. Water line size installation from the meter into the house shall be determined with the fire sprinkler contractor and not the underground or plumbing contractor. If the Fire Sprinkler Contractor is not consulted, then a minimum 2-inch supply line is required.
10. If Installed CMC 12.36 Privacy Gate Permit required with the fire marshal's office and the public works department.
11. No parking signs required per city and fire codes.
12. Temporary fire department turn-around required at the end of N 50th Ave.
13. If blasting occurs a permit from our office is required.
14. For questions or to request inspections contact the Fire Marshal's Office via *Camas Connect*. Otherwise please call our inspection line at 360-891-6191 x1. or email at FMO@cityofcamas.us

A Land Use Narrative for CJ Dens Type III Subdivision

Date: November 2020

Submitted to: City of Camas
Community Development
616 NE 4th Avenue
Camas, WA 98607

Applicant: CJ Dens Lacamas II LLC
PO Box 2239
Kalama, WA 98625

AKS Job Number: 5504

AKS ENGINEERING & FORESTRY
9600 NE 126th Avenue, Suite 2520
Vancouver, WA 98682
(360) 882-0419

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Land Use Application for a Type III Subdivision

Submitted to:
City of Camas
Community Development
616 NE 4th Avenue
Camas, WA 98607

Applicant:
CJ Dens Lacamas II LLC
PO Box 2239
Kalama, WA 98625

Property Owners:
CJ Dens Lacamas II LLC
PO Box 2239
Kalama, WA 98625
Contact(s): Carl Lawson
Email: carl@lawsoninvestments.com
Phone: (360) 606-6217

Applicant's Consultant:
AKS Engineering & Forestry, LLC
9600 NE 126th Avenue, Suite 2520
Vancouver, WA 98682
Contact(s): Michael Andreotti
Email: andreottim@aks-eng.com
Phone: (360)-882-0419

Site Location:
715 SE Leadbetter Road
Camas, WA 98607
Parcel #s: 177906-000, 178172-000, and 178236-000

Site Size:
49.62 Acres (2,161,423 SF)

Land Use Districts:
Single-family Residential (R-7.5)

I. Executive Summary

Through this application, CJ Dens Lacamas II, LLC (Applicant) requests approval from the City of Camas (City) to subdivide the subject site, described below, into 152 single-family lots for the future construction of detached single-family homes. The site is located at the east end of Lacamas Lake, on the north side of SE Leadbetter Road and is addressed 715 SE Leadbetter Road, Camas, WA 98607. The site is identified as Clark County Parcels 177906-000, 178172-000, and 178236-000. The development will gain access from SE Leadbetter Road and N Adams Street and will provide access to the individual lots with an internal street network. Future circulation will be provided to the north, to connect to the future arterial in the City of Camas Six Year Transportation Improvement Program. The Applicant will also ensure protection of the existing critical areas on site, including two streams and a wetland, as well as the shoreline buffer for Lacamas Lake. The applicant will also provide a trail parallel to SE Leadbetter road, which is identified as a portion of the T-3 trail in the City of Camas Park, Recreation, and Open Space (PROS) Plan.

In addition to this narrative, the application package includes the materials necessary for the City to review and approve this submittal, including Preliminary Plans, Stormwater Technical Information Report (TIR), updated Geotechnical Site Investigation Report, updated Traffic Impact Study, updated Wetland and Habitat Report, Shoreline substantial development permit application, and an amended State Environmental Policy Act (SEPA) checklist.

The highlights of this project that will be discussed further in this narrative include:

- Platting of 152 single-family lots.
- Construction of the public internal street network for lot access and circulation.
- Construction of a multi-use path based on the PROS Plan.
- Protection of existing critical areas and central open space.
- Construction of an overlook to provide views of Lacamas Lake and the surrounding hills.
- Common parking areas throughout the development for additional guest parking.
- Construction of water, sanitary sewer, and stormwater utilities for the development.
- Construction of water transmission line from south boundary to north boundary.

The project is to be constructed in a maximum of 3 phases as follows:

- Phase 1 – Construct 51 lots with development access from SE Leadbetter Road, create the large central open space, construct the multi-use trail, and construct necessary roadways and utilities.
- Phase 2 – Construct 64 lots and the development access from N Adams Street, construct the overlook, and construct necessary roadways and utilities.
- Phase 3 – Construct 37 lots and the remaining roadways and utilities.

The written narrative includes findings of fact demonstrating that the application complies with all applicable approval criteria. These findings are supported by substantial evidence, including Preliminary Plans and other written documentation. This information, which is included in this application package, provides the basis for the City to approve the application.

II. Site Description/Setting

The subject site consists of three parcels and is ±49.62 acres in size. The site is addressed as 715 SE Leadbetter Road, Camas, WA 98607. The included properties are identified as Clark County Parcel Number 177906-000 of the northeast ¼ of Section 34 and Parcel Numbers 178172-000 and 178236-000 of the northwest ¼ of Section 35, Township 2 North, Range 3 East, Willamette Meridian. The site is zoned Residential – 7.5 (R-7.5) with an Airport Overlay. Neighboring properties are zoned R-7.5 and Business Park to the north, R-7.5 to the northeast and southeast, Community Commercial to the east and west, and Residential – 12 (R-12), Parks/Open Space (P/OS), and Water to the south. Properties to the north and northeast are vacant. The property to the east is in use as large-lot residential and the properties to the southeast are in use as single-family residential. One property to the south across SE Leadbetter Road is in use as large-lot residential, with the remaining parcels south of the site covered by Lacamas Lake. The property to the west is in use as large-lot residential and the Camas Washougal-Wildlife League clubhouse.

The site has frontage on SE Leadbetter Road along the south boundary and N Adams Street is stubbed to the site from the south, in the east portion of the site. SE Leadbetter road is classified as an existing 2-lane local road without sidewalk, curb, or gutter. Frontage improvements are not proposed for SE Leadbetter road because the City plans to close the road to vehicle traffic west of the site in the future. N Adams Street is classified as a 2 Lane Local/Sprinklered (52-foot right-of-way (ROW)) and will be extended into the site.

The site is hilly with steep slopes in the south and northeast portions of the site. The site generally slopes from north to south, with a small portion in the northwest sloping from southeast to northwest into a valley containing a wetland and stream. Shallow bedrock exists throughout the site, with a few rock outcroppings on site. The existing vegetation on site consists of stands of evergreen trees interspersed deciduous trees along the north, south, west, and portions of the east boundary, as well as a stand in the south-central portion of the site. Shrubs and grasses make up the remainder of the vegetation on site. A wetland in located in the northeast portion of the site and continues off site to the northwest. An unnamed stream, classified as a Type Np stream by the Washington State Department of Natural Resources (DNR) Water Typing System, flows through the wetland from the northeast to the southwest, and generally follows the north property line. There is also an unnamed Type Ns stream in the southeast corner of the site, flowing from off site, southwesterly across the site. Both streams cross under SE Leadbetter Road and drain to Lacamas Lake. The Clark County GIS archaeological predictive model ranges from Low-Moderate to High across the site. The site is not within a City of Camas mapped critical aquifer recharge area (CARA). All critical areas will be discussed in further detail later in this narrative.

III. Applicable Review Criteria

CITY OF CAMAS COMPREHENSIVE PLAN GOALS

Citywide Land Use Goal: Maintain a land use pattern that respects the natural environment and existing uses while accommodating a mix of housing and employment opportunities to meet the City's growth projections.

Response: The subject site is zoned for residential development (R-7.5). There is substantial demand for single-family housing in the City of Camas. The proposed subdivision provides the necessary infrastructure and supplies in-demand housing products at a density consistent with the site and surrounding zoning, while maintaining existing critical areas and

providing large natural area tracts on site. Therefore, the proposed development is consistent with the adopted comprehensive plan.

Neighborhood Goal: Create vibrant, stable, and livable neighborhoods with a variety of housing choices that meet all stages in the life cycle and the range of affordability.

Response: The proposed subdivision will provide a mix of lot sizes and provide single-story and two-story product, creating a neighborhood with a mix of single-family home options. The proposed lots meet the requirements of the R-7.5 zone, using the density transfer option for sites with critical areas, which provides housing types consistent with the overall comprehensive plan.

Natural Environment Goal: Develop and interconnected network of parks, trails, and open space to support wildlife corridors and natural resources and enhance the quality of life for Camas residents and visitors.

Response: The Applicant proposes to create three large natural area tracts that will maintain and protect the wetland and stream along the north portion of the site, as well as the stream in the southeast corner of the site. The tracts will also help protect existing trees along the south boundary of the site. The development will also provide a portion of the proposed T-3 trail as shown in the PROS Plan, along the southern portion of the site through two of the natural area tracts.

Citywide Housing Goal: Maintain the strength, vitality, and stability of all neighborhoods and promote the development of a variety of housing choices that meet the needs of all members of the community.

Response: The proposed subdivision will provide a mix of lot sizes and provide single-story and two-story product, creating a neighborhood with a mix of single-family home options. The proposed lots meet the requirements of the R-7.5 zone, using the density transfer option for sites with critical areas, which provides housing types consistent with the overall comprehensive plan.

Affordable Housing Goal: Create a diversified housing stock that meets the needs of all economic segments of the community through new developments, preservation, and collaborative partnerships.

Response: The proposed subdivision will provide a mix of lot sizes and provide single-story and two-story product, creating a neighborhood with a mix of single-family home options. The proposed lots meet the requirements of the R-7.5 zone, using the density transfer option for sites with critical areas, which provides housing types consistent with the overall comprehensive plan.

Environmental Stewardship Goal: To preserve Camas' natural environment by developing a sustainable urban environment and protecting habitat and vegetation corridors.

Response: The proposed subdivision will provide three large natural area tracts to protect the existing wetland and streams, as well as many of the existing trees on site. Along with these protections, trees will be planted in the central open space, street trees installed with the roads, and trees and shrubs installed in the smaller open space tracts to help create a sustainable urban environment. See the Tree Plan and Tree Report and Landscape Plans included with this application for more information.

Critical Area Goal: To preserve, maintain, and restore the City's critical area to protect their function and values.

Response: The proposed subdivision will provide two large natural area tracts to protect the existing wetland and streams. There will be no direct impact to the wetland or streams and all buffer impacts will be averaged or mitigated for on site.

Landscape Enhancement and Tree Preservation Goal: To protect Camas' native landscape and mature tree cover.

Response: The proposed subdivision will provide three large natural area tracts to protect the existing wetland, streams, and as much native vegetation as practicable. New trees will be planted in the central open space, street trees will be installed with the roads, and trees will be installed in the smaller open space tracts to replace tree cover removed with the development.

Street Goal: Street will function for all users including bicyclists, pedestrians, transit users, and motorists.

Response: All streets within the development will be designed to City standards and include sidewalks for pedestrians, and with the low traffic volume, bicyclists will be able to share the roadway with motorists. There is currently no public transit service to the area.

Walking, Bicycling, and ADA Mobility Goal: The needs of bicyclists, pedestrians, transit users, and accessibility (ADA-compliant) will be considered in all street improvements and will be integrated in all collector and arterial roadway projects, including regular safe street crossings.

Response: The subdivision is providing sidewalks along all streets within the development as well as a portion of the T-3 trail through the southern natural areas to connect to the future and existing City trail system.

Design and Low-Impact Development Goal: The transportation system will be designed to support community character and environmental policies.

Response: All roads within the development are proposed with a 52-foot-wide reduced ROW to help reduce impacts to the existing wetland, streams, and native vegetation. The reduced width will also help to calm traffic and create a neighborhood that supports walkability and community.

Safety and Traffic Calming Goal: Design and construct safe transportation facilities that meet applicable requirements.

Response: All roads within the subdivision are designed to City standards and proposed as 52-foot-wide roads with 28-foot pave surfaces. The road layout is somewhat curvilinear, and parking will be allowed on one side of the street. These design elements will help with traffic calming and create a safe transportation facility.

Transportation Demand Management Goal: Transportation planning will achieve the efficient use of transportation infrastructure, increase its person carrying capacity, and accommodate and facilitate future growth consistent with land use objectives.

Response: The subdivision proposes a road layout that will have carrying capacity for the proposed neighborhood, as well as allow for expansion and future circulation to the north.

Parks and Recreation Goal: Preserve and enhance the quality of life in Camas through the provision of parks, recreation programs, recreational facilities, trails, and open spaces.

Response: The proposed subdivision will construct a portion of the T-3 trail through the southern natural area tracts that will connect to the future and existing public trail systems around Lacamas Lake.

General Utility Goal: Provide utility services to all businesses, residents, and properties in the City limits. In urban area, eliminate private water and sewer/septic systems, including wells used only for irrigation.

Response: All new lots will be provided with public water and sewer service. The development will also construction a water transmission main from SE Leadbetter Road, to the north boundary to allow for future expansion of the City's water system.

CITY OF CAMAS MUNICIPAL CODE

Title 5 - BUSINESS TAXES, LICENSES AND REGULATIONS

Chapter 5.45 TELECOMMUNICATIONS (Article VII. - Conditions of Telecommunications Right-of-Way Use Authorizations, Telecommunications Franchises, and Facilities Leases)

5.45.365 Location of facilities.

Response: All electric, cable, or telecommunication lines installed with the development will be located underground. The final location of these utilities will be determined with final construction plans. This standard is met.

TITLE 12 – STREETS, SIDEWALKS AND PUBLIC PLACES

Chapter 12.24 Street Names

Response: The proposed streets have been named according to the City of Camas Street Naming Manual. N 48th Avenue, N 49th Avenue, and N 50th Avenue are the next numerical street names based on adjacent development to the east. N Adams Street is an extension of an existing road, and N Adams Court is a cul-de-sac at the end of N Adams Street that is less than four hundred feet long. N Elk Drive is named for native fauna and does not generally conform to the northerly-southerly or easterly-westerly grid. This standard is met.

TITLE 14 - OFFENSES AND MISCELLANEOUS PROVISIONS

Chapter 14.02 STORMWATER CONTROL

Response: Stormwater runoff generated by the proposed development will be collected on site. All pollution generating runoff will be treated by mechanical filters within the catch basins located in the streets. The majority of the treated stormwater will be conveyed and discharged directly to Lacamas Lake at existing discharge points using the large water body exemption for stormwater discharge. A small portion of the treated stormwater will be conveyed to a stormwater pond in Tract R for detention, prior to being released to Wetland A at rates permitted by Camas Municipal Code (CMC). The stormwater system is designed per the Stormwater Management Manual for Western Washington. See the Preliminary Stormwater Technical Information Report (TIR) and Preliminary Plan included with this application for more information. This standard is met.

TITLE 16 - ENVIRONMENT

Chapter 16.07 SEPA CATEGORICAL EXEMPTION AND THRESHOLD DETERMINATIONS

16.07.040 Environmental checklist.

Response: A SEPA checklist was submitted and received a Mitigated Determination of Non-significance on May 27, 2014 under permit SUB10-19. As stated in the pre-application meeting notes from the City of Camas, dated February, 20, 2020, "The applicant may utilize the existing SEPA checklist as fewer impacts are anticipated with this proposed development as opposed to the original development approval (SUB10-03)." However, the applicant is now proposing temporary on-site rock crushing during construction; therefore, an amended SEPA checklist has been provided with the application. This standard is met.

Chapter 16.31 ARCHAEOLOGICAL RESOURCE PRESERVATION

16.31.070 Predetermination report required.

Response: An archaeological predetermination was completed by Archaeological Investigations Northwest, Inc. (AINW) as part of the original application (SUB10-03). No further archaeological site work was required with the original land use approval and the proposed development will have significantly less impact to the site. Therefore, there is no new information that would require additional archaeological work and the original predetermination meets the requirements of this section. This standard is met.

Chapter 16.51 GENERAL PROVISIONS FOR CRITICAL AREAS

16.51.090 Applicability.

Response: This application is for a Type III Subdivision. Therefore, the standards of this section apply.

16.51.130 Review required.

Response: A Critical Areas Report and Buffer Modification Plan were completed by Ecological Land Services (ELS) and approved with the original application (SUB10-03). Since the original approval City code relating to wetlands has changed, ELS provided an updated Critical Areas Report and Buffer Modification Plan with this application. The report identified one wetland, a Type Np stream, and a Type Ns stream on site. It also identified a Type Ns stream northwest of the wetland off site, and a Type S shoreline for Lacamas Lake off site to the south. The wetland is identified as Wetland A. The Type Np stream on site is identified as Stream 1 and the Type Ns stream on site is identified as Stream 3. This standard is met.

16.51.160 Mitigation requirements.

A. The applicant shall avoid all impacts that degrade the functions and values of a critical area or areas. Unless otherwise provided in these provisions, if alteration to the critical area is necessary, all adverse impacts to or from critical areas and management zones resulting from a development proposal or alteration shall be mitigated in accordance with an approved critical area report and SEPA documents.

Response: This application proposes to have no impacts to the wetlands or streams. Buffer modifications are proposed for Wetland A buffers. The buffer modifications will include buffer reduction and buffer averaging, as allowed by CMC. See the Preliminary Plans and Critical Areas Report and Buffer Modification Plan included with this application for more information.

Chapter 16.53 WETLANDS

16.53.020 Rating system.

B. Wetland Rating System. Wetlands shall be rated according to the Washington State Department of Ecology (ecology) wetland rating system found in Washington State Wetland Rating System for Western Washington—2014 Update (Revised, Ecology Publication #14-06-029, October 2014) or most current edition. The rating system document contains the definitions and methods for determining if the criteria below are met:

1. Wetland Rating Categories.

Response: The site contains one wetland. Wetland A is a Category III sloped and depressional, forested wetland located in the northwest portion of the site. The wetland is ±2.46 acres in size with the main hydrology sources coming from hillside runoff, input from Stream 1, and precipitation. Stream 1 flows thorough Wetland A from the northeast to the southwest and forms a permanently flowing outlet for the wetland.

2. Date of Wetland Rating. Wetland rating categories shall be applied as the wetland exists on the date of adoption of the rating system by the local government, as the wetland naturally changes thereafter, or as the wetland changes in accordance with permitted activities. Wetland rating categories shall not change due to illegal modifications.

Response: A site visit and wetland rating was performed by Ecological Land Services (ELS) in August 2020. See the Critical Areas Report and Buffer Modification Plan included with this application for more information. This standard is met.

16.53.030 Critical area report—Additional requirements for wetlands.

Response: A Critical Areas Report meeting the requirements of this section was prepared by ELS on November 18, 2020. The report is included with this application. This standard is met.

16.53.040 - Standards.

B. Wetland Buffers.

Buffers. Wetland buffer widths shall be determined by the responsible official in accordance with the standards below:

1. All buffers shall be measured horizontally outward from the delineated wetland boundary or, in the case of a stream with no adjacent wetlands, the ordinary high water mark as surveyed in the field.

2. Buffer widths are established by comparing the wetland rating category and the intensity of land uses proposed on development sites per Tables 16.53.040-1, 16.53.040-2, 16.53.040-3 and 16.53.040-4. For Category IV wetlands, the required water quality buffers, per Table 16.53.040-1, are adequate to protect habitat functions.

Response: According to the Critical Areas Report, Wetland A has a habitat score of 7, requiring a high intensity land use buffer of 150 feet. This standard is met.

16.53.050 Wetland permits.

A. General.

Response: This application proposes modification to the Wetland A buffer. Therefore, a wetland permit is required. A Critical Areas Report and Buffer Modification Plan are included with this application. This standard is met.

B. Standards—General. Wetland permit applications shall be based upon a mitigation plan and shall satisfy the following general requirements:

1. The proposed activity shall not cause significant degradation of wetland functions;

2 The proposed activity shall comply with all state, local, and federal laws, including those related to sediment control, pollution control, floodplain restrictions, stormwater management, and on-site wastewater disposal.

Response: The proposed development activity will have no impact to the habitat within the wetlands or streams. There will be modifications to the buffers for Wetland A as allowed by CMC. The proposed modification will create zero net loss for the buffer functions on site. See the Buffer Modification Plan included with this application for more information. Erosion control plans will be included in the final construction plans for sediment and pollution control. A Preliminary Stormwater Plan is included with the application, detailing how the Applicant proposes to manage stormwater. No on-site wastewater will be disposed of in the wetlands. This standard is met.

C. Buffer Standards and Authorized Activities. The following additional standards apply for regulated activities in a wetland buffer to ensure no net loss of ecological functions and values:

1. Buffer Reduction Incentives. Standard buffer widths may be reduced under the following conditions, provided that functions of the post-project wetland are equal to or greater after use of these incentives.

a. Lower Impact Land Uses. The buffer widths recommended for proposed land uses with high-intensity impacts to wetlands can be reduced to those recommended for moderate-intensity impacts if both of the following criteria are met:

i. A relatively undisturbed, vegetated corridor at least one hundred feet wide is protected between the wetland and any other priority habitats that are present as defined by the Washington State Department of Fish and Wildlife; and

ii. Measures to minimize the impacts of the land use adjacent to the wetlands are applied, such as infiltration of stormwater, retention of as much native vegetation and soils as possible, direction of noise and light away from the wetland, and other measures that may be suggested by a qualified wetland professional.

Response: The high intensity land use buffer required for Wetland A is 150 feet. The Applicant is proposing to reduce the buffer on the south and east sides of the wetland to a moderate intensity 110-foot buffer by retaining native vegetation, directing noise and lights away from the wetlands, installing fences along property lines, and installing signs identifying the wetland buffer. See the Buffer Modification Plan included with this application for more information. This standard is met.

> 2. Buffer Averaging. Averaging buffers is allowed in conjunction with any of the other provisions for reductions in buffer width (listed in subsection (C)(1) of this section) provided that minimum buffer widths listed in subsection (C)(1)(c) of this section are adhered to. The community development department shall have the authority to average buffer widths on a case-by-case basis, where a qualified wetlands professional demonstrates, as part of a critical area report, that all of the following criteria are met:
>
> a. The total area contained in the buffer after averaging is no less than that contained within the buffer prior to averaging;
>
> b. Decreases in width are generally located where wetland functions may be less sensitive to adjacent land uses, and increases are generally located where wetland functions may be more sensitive to adjacent land uses, to achieve no net loss or a net gain in functions;
>
> c. The averaged buffer, at its narrowest point, shall not result in a width less than seventy-five percent of the required width, provided that minimum buffer widths shall never be less than fifty feet for all Category I, Category II, and Category III wetlands, and twenty-five feet for all Category IV wetlands; and
>
> d. Effect of Mitigation. If wetland mitigation occurs such that the rating of the wetland changes, the requirements for the category of the wetland after mitigation shall apply.

Response: The application proposes the use of buffer averaging as part of the project. As previously stated, only buffers on the south and east sides of the wetland will be reduced. The buffer will be reduced ±11,417, with this area replaced on site at the west end of the exiting wetland buffer. At no point will the buffer be reduced below the allowed minimum 82.5-foot-wide buffer. See the Buffer Modification Plan included with this application for more information. This standard is met.

> 3. Stormwater Facilities. Stormwater facilities are only allowed in buffers of wetlands with low habitat function (less than four points on the habitat section of the rating system form); provided, the facilities shall be built on the outer edge of the buffer and not degrade the existing buffer function, and are designed to blend with the natural landscape. Unless determined otherwise by the responsible official, the following activities shall be considered to degrade a wetland buffer when they are associated with the construction of a stormwater facility:

Response: The wetlands have a habitat rating of 7. Therefore, stormwater facilities are not allowed within the wetland buffers. No stormwater facilities are proposed within the wetland buffer. This standard is met.

4. Road and Utility Crossings. Crossing buffers with new roads and utilities is allowed provided all the following conditions are met:

a. Buffer functions, as they pertain to protection of the adjacent wetland and its functions, are replaced; and

b. Impacts to the buffer and wetland are minimized.

Response: No roads or utilities are proposed to cross the wetland or its buffer. This standard does not apply.

5. Other Activities in a Buffer. Regulated activities not involving stormwater management, road and utility crossings, or a buffer reduction via enhancement are allowed in the buffer if all the following conditions are met:

Response: As part of the tree survey conducted for the site, some hazard trees were identified along the south and east edge of the wetland buffer. Only hazard trees adjacent to future lots are proposed for removal. If feasible, cut trees will be left in place in the buffer to habitat creation. All other hazard trees are being proposed to remain as they are creating habitat and have value if retained within the wetland buffer No other activities are proposed within the wetland buffer. This standard is met.

Chapter 16.61 FISH AND WILDLIFE HABITAT CONSERVATION AREAS

16.61.010 Designation of fish and wildlife habitat conservation areas.

A. Fish and wildlife habitat conservation areas include:

5. Waters of the State. Waters of the state includes lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington, as classified in WAC 222-16-031, or its successor. This does not include man-made ditches or bio-swales that have been created from areas not meeting the definition of waters of the state. Furthermore, wetlands designation and protection are regulated under CMC Chapter 16.53.

Response: The Critical Areas Report completed by ELS identified Lacamas Lake, located south of the site across SE Leadbetter Road. Lacamas Lake is identified as a Type S water of the state with a riparian habitat buffer width of 150 feet and a shoreline jurisdiction of 200 feet. The riparian habitat buffer is functionally isolated by SE Leadbetter Road; therefore, no riparian habitat buffer of the lake is located on site. The shoreline is designated Urban Conservancy and a Shoreline Substantial Development Permit is included with this application. See the Critical Areas Report and Buffer Modification Plan included with this application for more information. This standard is met.

TITLE 17 LAND DEVELOPMENT

Chapter 17.11 SUBDIVISIONS

17.11.030 Preliminary subdivision plat approval.

A. Preapplication.

Response: A preapplication conference was held on February 20, 2020. The pre-application expired prior to submittal of this application; however, the Planning Director agreed to waive another pre-application conference as the design has not substantially changed since the original pre-application was submitted and coordination over the layout continued with the City between the pre-application and submittal of this land use package. An email showing this confirmation is included in this application package. This standard is met.

B. Application. In addition to those items listed in CMC 18.55.110, the following items are required, in quantities specified by community development department, for a complete application for preliminary subdivision approval. Items may be waived if, in the judgment of the community development director or designee, the items are not applicable to the particular proposal:

Response: The application submitted for preliminary subdivision plat approval contains all the required information listed in this section. This standard is met.

D. Criteria for Preliminary Plat Approval. The hearings examiner decision on an application for preliminary plat approval shall be based on the following criteria:

1. The proposed subdivision is in conformance with the Camas comprehensive plan, parks and open space comprehensive plan, neighborhood traffic management plan, and any other city adopted plans;

Response: As stated previously, the proposed subdivision meets all applicable goals of the Camas Comprehensive Plan. The development will construct a portion of the T-3 trail along the site frontage as shown in the Camas PROS plan, as well as provide a public overlook within the development to access views to the south. The development will provide traffic circulation by constructing a new access on SE Leadbetter Road, extending N Adams Street into the site, and providing for future circulation to the north when the planned arterial is constructed. This standard is met.

2. Provisions have been made for water, storm drainage, erosion control and sanitary sewage disposal for the subdivision that are consistent with current standards and plans as adopted in the Camas Design Standard Manual;

Response: The proposed subdivision will provide water and sanitary sewer connections for each proposed lot. The sanitary sewer will connect to the existing sanitary sewer pump station on SE Leadbetter Road. The water main will connect to the existing main in SE Leadbetter Road and the existing main in N Adams Street will be extended into the site. The development will also construct a separate high-pressure water transmission line from SE Leadbetter Road to the north site boundary. Stormwater will be collected and treated on site. The majority of the treated stormwater will be discharged to Lacamas Lake, with a small portion of the site detained in a wetpond prior to be discharged to the existing wetland and stream at approved rates. A preliminary erosion control plan is included with

this application. A more detailed and site-specific erosion control plan will be provided with final construction plans. This standard is met.

3. **Provisions have been made for road, utilities, street lighting, street trees and other improvements that are consistent with the six-year street plan, the Camas Design Standard Manual and other state adopted standards and plans;**

Response: The applicant proposes roads meeting the standards of the City and the design standard manual. Planting strips are provided for street trees and street lighting is included in the design. Provisions have been made for utilities as shown in the plans included with this application. This standard is met.

4. **Provisions have been made for dedications, easements and reservations;**

Response: All needed easements and reservations are shown on the plans submitted with this application. This standard is met.

5. **The design, shape and orientation of the proposed lots are appropriate to the proposed use;**

Response: As shown on the plans submitted with this application, all lots are oriented fronting a street or access tract and are shaped appropriately to allow home construction. This standard is met.

6. **The subdivision complies with the relevant requirements of the Camas land development and zoning codes, and all other relevant local regulations;**

Response: As shown in the plans and documents submitted with this application, the subdivision complies with all requirements of the CMC and other relevant regulations.

7. **Appropriate provisions are made to address all impacts identified by the transportation impact study;**

Response: The Applicant's Transportation Engineering Consultant, Mackenzie, prepared a Trip Update Letter for revision to the Traffic Impact Analysis (TIA) for the originally approved subdivision (SUB10-03). The original TIA was complete in August 2010 and determined that the 297-lot subdivision would generate 2,831 average daily trips with 218 a.m. peak hour trips and 280 p.m. peak hour trips. The Trip Update Letter states that the proposed 152-lot subdivision will generate 1,528 average daily trips with 113 a.m. peak hour trips and 152 p.m. peak hour trips. Therefore, the proposed development will generate 1,303 fewer average daily trips, 105 fewer a.m. peak hour trips, and 128 fewer p.m. peak hour trips than the originally approved subdivision. See the Trip Update Letter included with this application for additional information. This standard is met.

8. **Appropriate provisions for maintenance of commonly owned private facilities have been made;**

Response: The tracts included in the subdivision will be maintained by the homeowners' association. This standard is met.

9. Appropriate provisions, in accordance with RCW 58.17.110, are made for:

a. The public health, safety, and general welfare and for such open spaces, drainage ways, streets, or roads, alleys or other public ways, transit stops, potable water supplies, sanitary wastes, parks and recreation, playgrounds, schools and school grounds and all other relevant facts, including sidewalks and other planning features that assure safe conditions at schools bus shelter/stops, and for students who walk to and from school, and

b. The public use and interest will be served by the platting of such subdivision and dedication;

Response: As stated previously, the subdivision is providing for the development of an in-demand product in single-family housing. The development includes roads meeting the standards of the City, a multi-use path, and natural area tracts to protect the wetlands, streams, and native vegetation. Water and sanitary sewer are provided for each lot. A water transmission line to extend City service north and provisions for stormwater collection and treatment are also provided. This standard is met.

10. The application and plans shall be consistent with the applicable regulations of the adopted comprehensive plans, shoreline master plan, state and local environmental acts and ordinances in accordance with RCW 36.70B.030.

Response: The plans and documents submitted with this application meet the requirements of this section. This standard is met.

Chapter 17.19 DESIGN AND IMPROVEMENT STANDARDS

17.19.020 Improvements, supervision, inspections and permits required.

A. Required Improvements.

1. Every developer shall be required to grade and pave streets and alleys, install curbs and gutters, sidewalks, monuments, sanitary and storm sewers, water mains, fire hydrants, street lights and street name signs, underground transmission lines, provide and install centralized mail delivery boxes as determined by the U.S. Postal Service, together with all appurtenances in accordance with specifications and standards in the Camas Design Standards Manual, the six-year street plan, and other state and local adopted standards and plans as may be applicable.

2. Other improvements installed at the option of the developer shall conform to city requirements.

3. Existing wells, septic tanks and septic drain fields shall be abandoned, in accordance with state and county guidelines regardless of lots or properties served by such utility unless otherwise approved by public works director.

Response: The site is currently vacant, and no wells or septic systems exist on site. The developer will construct paved streets with curbs, gutters, and sidewalks. All required utilities, including a large water transmission line, and other improvements will be provided. See the plans included with this application for more information. This Standard is met.

17.19.030 - Tract, block and lot standards.

A. Environmental Considerations.

1. Critical Areas. Land that contains a critical area or its buffer as defined in Title 16 of this code, or is subject to the flood hazard regulations, shall be platted to show the standards and requirements of the critical areas.

Response: The critical areas on site are proposed to be platted and protected in large natural area tracts. This standard is met.

2. Vegetation. In addition to meeting the requirements of CMC Section 18.13.045, Tree Regulations, every reasonable effort shall be made to preserve existing significant trees and vegetation, and integrate them into the land use design.

Response: The subject site has groups of trees along the property boundary and surrounding the critical areas. There is also a grouping of trees in the south-central portion of the site. As many of the trees will be protected as practicable within the development area. After the initial tree removal during site grading, trees that are to remain will be re-evaluated to determine if additional hazard trees need to be removed. There will also be trees installed in the open space tracts, as well as street trees, to help replace some of the tree canopy that will be removed. See the Tree Plan and Tree Report included with this application for more information. This standard is met.

3. Density transfers may be applicable if developer preserves critical areas. See Chapter 18.09 of this code.

Response: The applicant proposes to create a ±16.00-acres of natural area tracts for the protection of critical areas and natural vegetation, making density transfer applicable. The application proposes the use of density transfer to reduce the front setback to 10 feet with an 18-foot garage setback; reduce the rear setback to 15 feet; and increase the lot coverage to 50%. As part of the negotiation, the City requested planting of trees in the natural area tracts and construction of the overlook, both of which will be provided with the development. This standard is met.

B. Blocks. Blocks shall be wide enough to allow two tiers of lots, except where abutting a major street or prevented by topographical conditions or size of the property, in which case the approval authority may approve a single tier.

Response: The proposed development is generally designed with blocks wide enough to provide two tiers of lots. Between N 49th Avenue and N 50th Avenue a small block of single tier lots are proposed. This single tier layout is necessary to provide lots meeting code requirements, while protecting critical areas and open space and avoiding shallow bed rock to the greatest extent practicable. Existing topography also dictated road location to ensure grade and Americans with Disabilities Act (ADA) requirements are met for roads and intersections. A 10-foot landscape tract is provided between the rear of the lots and the ROW for N 49th Avenue. This standard is met.

C. Compatibility with Existing Land Use and Plans.

1. Buffer Between Uses. Where single-family residential lots are to be adjacent to multiple-family, commercial or industrial land use districts, and where natural separation does not exist, adequate landscape buffer strips and/or solid fences for purposes of buffering sound, restricting access, pedestrian safety and privacy shall be provided.

Response: The single-family development will be adjacent to a commercial land use district along portions of east and west boundary. The Applicant proposes to construct 6-foot solid wood fences in these locations. This standard is met.

2. Conformity with Existing Plans. The location of all streets shall conform to any adopted plans for streets in the city. The proposed land use shall respond to and complement city ordinances, resolutions and comprehensive plans.

Response: The City has plans for an arterial to be located along the north boundary of the site. The arterial is identified as the North Shore East/West Arterial on the City's 2021-2026 Six Year Street Priorities Map. Tract O is proposed to be set aside for future ROW for the arterial and proposed N 50th Avenue will extend to the tract for connection to the future arterial. This standard is met.

D. Lots. The lot size, width, shape and orientation shall conform to zoning provisions and the following:

1. Each lot must have frontage and access onto a public street, except as may otherwise be provided (e.g., approved private roads, access tracts);

Response: All lots other than Lots 12-13, 85-88, 100-103, and 109-112 will have frontage onto the internal street network. The lots mentioned above will have frontage onto access tracts providing access to the public street network. All lots have a minimum width of 60 feet and minimum depth of 80 feet. All lots on a curve or cul-de-sac have minimum frontages of 30 feet. See the plans included with this application for more information. This standard is met.

2. Side Lot Lines. The side lines of lots shall run at right angles to the street upon which the lots face as far as practical, or on curved streets they shall be radial to the curve;

Response: All side lot lines are at right angles or radial to the curve of road rights-of-way. This standard is met.

3. Building Envelopes. No lot shall be created without a building envelope of a size and configuration suitable for the type of development anticipated:

a. For single-family residential zones, a suitable size and configuration generally includes a building envelope capable of siting a forty-foot by forty-foot square dwelling within the building envelope,

Response: All lots for this application are single-family lots. Each lot provides a building envelope capable of siting a minimum 40-foot by 40-foot building. The building envelopes are shown for reference only and proposed building envelopes will vary based on lot size and shape. This standard is met.

> c. Other factors in considering the suitability of the size and configuration of any residential lot include the presence of, or proximity to critical areas, adjoining uses or zones, egress and ingress, and necessary cuts and fills;

Response: This application proposes lots adjacent to a wetland. The design accounts for the shape of the wetland and averages or mitigates for buffer impacts, as allowed by CMC. This standard is met.

> 5. Flag lots, access tracts, and private roads may be permitted only when the community development director or designee finds the applicant meets the criteria listed hereinafter:

Response: This application does not propose any flag lots. Four access tracts are proposed to provide access to Lots 12-13, 85-88, 100-103, and 109-112. Each of these lots will provide a minimum of four on-site parking spaces (two garage and two driveway spaces) and have address signs as required by this section. This standard is met.

> 6. Double Frontage Lots. Residential lots which have street frontage along two opposite lot lines shall be avoided, except for double frontage lots adjacent to an arterial or collector, which must comply with the following design standards:

Response: The Applicant proposes 15 double frontage lots (Lots 23-30 and 116-122) with the development. Due to the location of critical areas, open space, and shallow bedrock, along with site topography, it is not feasible to avoid the double frontage lots. A landscape tract is proposed at the rear of the lots between the lot and ROW. This standard is met.

> 7. Corner Lots. Corner lots may be required to be platted with additional width to allow for the additional side yard requirements;

Response: This application proposes corner lots that have sufficient width and depth to allow for adequate vision clearance at the corners. See the Preliminary Plans included with this application for more information. This standard is met.

> 8. Restricted Corner Lots. Corner lots restricted from access on side yard flanking street shall be treated as interior lots and conform to front, side and rear yard interior setbacks of CMC Chapter 18.09; and

Response: No restricted corner lots are proposed with this application. This standard does not apply.

> 9. Redivision. In dividing tracts into large lots which at some future time are likely to be redivided, the location of lot lines and other details of the layout shall be such that redivision may readily take place without violating the requirements of these regulations and without interfering with the orderly development of streets. Restriction of building locations in relationship to future street right-of-way shall be made a matter of record if the approval authority considers it necessary.

Response: No redivision is anticipated with any lots or tracts proposed with this application. This standard does not apply.

> E. Tracts and Trails.
>
> 1. If land division is located in the area of an officially designated trail, in accordance with the current version of the parks, recreation and open space comprehensive plan, provisions shall be made for reservation of the right-of-way or for easements to the city for trail purposes including the construction of the trail. Trail standards for each trail type shall be as specified in appendix B of the parks, recreation and open space comprehensive plan or as amended.

Response: The Applicant proposes to construct a 5-foot-wide trail along the southern portion of the site, through the natural area tracts. This trail is a portion of the T-3 trail in the City PROS Plan. This standard is met.

> 4. Tracts and trails that are not dedicated to the city and are located within the subdivision, short plat or planned development are the responsibility of the homeowners association to maintain. Provisions must be in writing, such as in CC&Rs, informing the homeowners of the responsibility and outlining the maintenance procedures in accordance with city standards.

Response: The applicant will grant an easement for the trail to the City of Camas. The City will own and maintain the trail since it is a portion of the T-3 trail identified in the City PROS Plan. This standard does not apply.

> F. Landscaping.
>
> 1. Each dwelling unit within a new development shall be landscaped with at least one tree in the planting strip of the right-of-way, or similar location in the front yard of each dwelling unit, with the exception of flag lots and lots accessed by tracts. Required trees shall be a minimum two-inch diameter at breast height (dbh) to create a uniform streetscape (dbh is four and one-half feet above the ground as measured from upside of tree).

Response: The applicant proposed to plant one tree per lot in the plater strip. See the landscape plans included with this application for more information. This standard is met.

> 2. The city council finds that the existing mature landscaping of trees, and shrubs provide oxygen, filter the air, contribute to soil conservation and control erosion, as well as provide the residents with aesthetic and historic benefits. For these reasons, the city encourages the retention of existing trees that are not already protected as significant trees under the Camas Municipal Code. Generally, the city may allow the tree requirements under subsection (F)(1) of this section to be reduced at the request of the developer, by a ratio of two new trees in favor of one existing tree, provided such trees have been identified on approved construction plans.

Response: The applicant is proposing three large natural area tracts for the protection of critical areas and trees. Tree retention will be discussed in more detail later in this narrative. This standard is met.

3. Prior to final acceptance of any land development, the land developer shall install trees adjacent to or within all common areas and landscape tracts as specified in the Camas Design Standards Manual.

Response: Trees will be installed in landscape areas as required. See the landscape plans included with this application for more information. This standard is met.

4. Street trees adjacent to individual lots must be installed prior to final occupancy or secured or bonded, and installed prior to expiration of the two-year warranty period, whichever comes first.

Response: Street trees will be installed at the time of home construction on the adjacent lot. Street trees adjacent to tracts will be installed with construction of the roadway adjacent to the tract. See the Landscape Plans included with this application for more information. This standard is met.

5. Landscaping shall conform to plant criteria in the Camas Design Standards Manual. Any planting of trees or shrubs within the right-of-way or vision clearance area must be shown on the construction drawings for approval.

Response: As shown on the Landscape Plans submitted with this application, all planting material meets the requirements of the Camas Design Standards Manual. Vision clearance areas are shown on the plans for approval. This standard is met.

6. Storm drainage facilities, pump stations and other visible facilities shall be required to include a ten foot L2 landscaped buffering in accordance with criteria in the Camas Design Standards Manual if within thirty feet of any street or accessory structure.

Response: As shown on the Landscape Plans included with this application, a 10-foot L2 buffer is provided along the street frontage for the stormwater facility in Tract R. This standard is met.

G. Non-City Utility Easements. Easements for electric lines or other public utilities may be required. Easements for utilities shall be a minimum of six feet in width and centered on front or side lot lines.

Response: This application proposes a 6-foot-wide public utility easement along the lot frontages, behind the ROW. See the Preliminary Plans included with this application for more information. This standard is met.

H. Watercourse Easements. Where a development is traversed by a watercourse, drainageway, channel or stream, there shall be provided a stormwater easement or drainage right-of-way conforming substantially with the lines of such watercourse and such further width as will be adequate for the purpose. Streets parallel to major watercourses may be required.

Response: All streams that traverse the site are located in future natural area tracts. No road is required or proposed adjacent to these water courses. This standard is met.

I. Street Signs. The developer shall be responsible for the initial cost of any street name or number signs, or street markings, including installation thereof, that public works finds necessary for the development.

Response: The applicant will install all street signs associated with the project. This standard is met.

J. Lighting. Street lighting shall conform to the Clark public utility standards and approved by the city. The developer shall bear the cost of the design and installation of the lighting system.

Response: A preliminary Lighting Plan showing the location of all proposed streetlights is provided with this application and will be included in the final construction plans. This standard is met.

K. All residential streets shall conform to the guidelines and standards of the city neighborhood traffic management plan.

Response: All roads within the subdivision are designed to City standards and proposed as 52-foot-wide roads with 28-foot paved surfaces. The road layout is somewhat curvilinear, and parking will be allowed on one side of the street. These design elements will help with traffic calming and create a safe transportation facility. This standard is met.

17.19.040 - Infrastructure standards.

B. Streets

6. Extension. Proposed street systems shall extend existing streets at the same or greater width unless otherwise approved by the public works department and authorized by city council in approval of the plat.

a. Streets and pedestrian/bicycle paths shall be extended to the boundaries of the plat to ensure access to neighboring properties, unless the presence of critical areas or existing development render such extension infeasible. The design shall contribute to an integrated system of vehicular and pedestrian circulation.

b. Grading of steep topography may be necessary to achieve this objective.

Response: As shown on the plans submitted with the application, proposed N Adams Street extends into the site along the east boundary. The extension of N Adams Street will provide a second connection to SE Leadbetter Road. N 50th Avenue will extend to the north boundary of the site for connection to the future east-west arterial. N 49th Avenue will extend to the east boundary of the site for future circulation to the east. A section of the T-3 trail will be constructed along the south portion of the site and will extend from the east boundary to the west boundary of the site to connect to future sections of the T-3 trail. This standard is met.

8. Right-of-way, tract and pavement widths for streets shall be based on Table 17.19.040-1 and Table 17.19.040-2.

Table 17.19.040-2 Minimum Public Street Standards

Public Street	Right-of-Way	Pavement Width	Sidewalk
A. Street (by approval of City Engineer)[1]	52’	28’	Five foot detached sidewalk on both sides, with planter strip, no parking on one side.
B. Street (two lane)	60’	36’	Five foot detached sidewalks required on both sides of the street, with planter strip. Bike lanes required on collectors and arterials, no on-street parking.
C. Street (three lane)	74’	46' to include 12' median	Six foot detached sidewalks required on both sides of the street, with planter strip, bike lanes, no on-street parking.
D. Street (five lane)/Arterial	100’	74' to include 14' median	Six foot detached sidewalks required on both sides of the street, with planter strip, bike lanes, no on-street parking.

Table Notes:

1 All buildings abutting a street designed and constructed with less than 36 feet of pavement width shall have automatic fire sprinkler systems installed that comply with NFPA 13D or 13R.

Response: All roads in the development (N Elk Drive, N Benton Street, N Adams Street, N Adams Court, N 48th Avenue, N 49th Avenue, and N 50th Avenue) are designed as two-lane local streets with 52-foot, full-width rights-of-way, 28-foot of paved width, 7-foot planter strips, and 5-foot sidewalks on each side. All homes will have automatic fire sprinkler systems installed. This standard will be met.

10. Street Layout. Street layout shall provide for the most advantageous development of the land development, adjoining area, and the entire neighborhood. Evaluation of street layout shall take into consideration potential circulation solutions for vehicle, bicycle and pedestrian traffic, and, where feasible, street segments shall be interconnected.

Response: The street layout provides the most advantageous development of the land and overall neighborhood. N 49th Avenue is located to provide circulation to the east and NW 50th Avenue is located to provide circulation to the north when those properties develop. All Streets within the development are laid out to protect critical and natural areas while minimizing the grading required to construct the roads wand lots. A section of the T-3 trail will also be constructed to allow pedestrian and bicycle circulation to the east and west to connect future extensions of the T-3 trail. This standard is met.

a. Circulation Plan. Applicants shall submit a circulation plan at application which includes the subject site and properties within six hundred feet of the proposed development site. The plan shall incorporate the following features both on-site and off-site:

Response: A Circulation Plan is included with this application meeting the requirements of this section. This standard is met.

b. Cross-circulation shall be provided that meets the following:

i. Block lengths shall not exceed the maximum access spacing for the roadway class per the city's design standards manual.

Response: The maximum access spacing for local roads is 600 feet. Due to existing topography and the protection of critical and natural areas, there are block lengths that exceed 600 feet. Even with the extended block lengths, the street layout will provide for circulation within the development, as well as the surrounding properties. The table below shows block lengths greater than 600 feet and the reason this spacing is necessary.

Road	Block	Distance	Reason
N Elk Drive	SE Leadbetter Road to N 49th Avenue	951.82 feet	Existing topography and protection of natural area
N 48th Avenue	N Adams Street to N 49th Avenue	911.45 feet	Existing topography and protection of natural area
N 49th Avenue	N Elk Drive to N Benton Street	883.12 feet	Existing topography
N 49th Avenue	N 48th Avenue to N Adams Street	729.84 feet	Existing topography
N 50th Avenue	N Elk Drive to N Benton Street	911.65 feet	Existing topography and protection of critical areas
N 50th Avenue	N Benton Street to Future Arterial	999.29 feet	Existing topography and protection of critical areas

ii. Cul-de-sacs and permanent dead-end streets over three hundred feet in length may be denied unless topographic or other physical constraints prohibit achieving this standard. When cul-de-sacs or dead-end streets are permitted, a direct pedestrian or bicycle connection shall be provided to the nearest available street or pedestrian oriented use.

Response: This application proposes a cul-de-sac, N Adams Court, which is 125 feet long. The nearest available street is N 49th Avenue, and direct pedestrian and bicycle connections are provided to this street. See the Preliminary Plans included with this application for more information. This standard is met.

d. Where critical areas are impacted, the standards and procedures for rights-of-way in the critical areas overlay zone shall be followed.

Response: The roads are laid out to create no wetland or buffer impacts from roads. The lot layout also minimizes the impact to wetland buffers, and has no impact to wetlands. This standard is met.

e. When the proposed development's average lot size is seven thousand four hundred square feet or less, one additional off-street parking space shall be required for every five units, notwithstanding the requirements of CMC Chapter 18.11. These spaces are intended to be located within a common tract.

Response: This application proposes an average lot size of 6,839 square feet; therefore, additional off-street parking is required. The development proposed 152 lots requiring 30 off-street parking stalls. The application proposes 30 parking stalls dispersed throughout the development in Tracts C, D, G, J, N, O, P. This standard is met.

C. Utilities.

1. Generally. All utilities designed to serve the development shall be placed underground and, if located within a critical area, shall be designed to meet the standards of the critical areas ordinance.

a. Those utilities to be located beneath paved surfaces shall be installed, including all service connections, as approved by the public works department; such installation shall be completed and approved prior to application of any surface materials.

b. Easements may be required for the maintenance and operation of utilities as specified by the public works department.

Response: All proposed utilities are to be underground and located outside of critical areas. Some public utilities will cross private tracts, and in these cases, an easement will be granted to the City for these utilities. There are existing overhead powerlines along SE Leadbetter Road that will remain above ground since no frontage improvements are proposed and placing the powerlines underground would impact the existing mature trees along the site frontage. This standard is met.

2. Sanitary sewers shall be provided to each lot at no cost to the city and designed in accordance with city standards.

Response: Gravity sewer mains will be constructed in all roads within the development to serve most of the lots and will feed into the existing pump station located along SE Leadbetter Road. Due to site topography, some lots will require a private grinder pump to a pressure sewer main in the road. The pressure sewer mains will connect to the gravity mains prior to the pump station connection. Laterals will be provided for each lot, connecting to the mains in the street. This standard is met.

3. Storm Drainage. The storm drainage collection system shall meet the requirements of the city's officially adopted storm water standards.

Response: Stormwater runoff generated by the proposed development will be collected on site. All pollution generating runoff will be treated by mechanical filters within the catch basins located in the streets. The majority of the treated stormwater will be conveyed and discharge directly to Lacamas Lake at existing discharge points using the large water body exemption for discharge. A small portion of the treated stormwater will be conveyed to a stormwater pond in Tract R for detention, prior to being released to Wetland A at rates permitted by Camas Municipal Code (CMC). The stormwater system is designed per the

Stormwater Management Manual for Western Washington. See the Preliminary Stormwater Technical Information Report (TIR) and Preliminary Plan included with this application for more information. This standard is met.

4. Water System.

Response: Water mains will be constructed in all roads within the development. Each lot will be provided service from these water mains. The development will also construct a large water transmission main running from SE Leadbetter Road to Tract T to allow the City to expand their water system north of the site. No services will connect directly to the transmission line. The developer shall be refunded by the City for construction the transmission line. This standard is met.

Chapter 17.21 PROCEDURES FOR PUBLIC IMPROVEMENTS

17.21.030 - Land disturbing activities—Erosion prevention/ sediment control

Response: Preliminary erosion control plans are included with this application. A more detailed and site-specific erosion control plan will be provided with final construction plans for sediment and pollution control. This standard will be met.

Title 18 - ZONING

Chapter 18.09 DENSITY AND DIMENSIONS

18.09.040 Density and dimensions—Single-family residential zones.

Table 1—Density and Dimensions for Single-family Residential Zones[1]

Zone	R-6	R-7.5	R-10	R-12	R-15
A. Standard New Lots					
Maximum Density (dwelling units/net acre)	7.2	5.8	4.3	3.6	2.9
Average lot area (square feet)[4]	6,000	7,500	10,000	12,000	15,000
Minimum lot size (square feet)	4,800	6,000	8,000	9,600	12,000
Maximum lot size (square feet)[3]	9,000	12,000	14,000	18,000	24,000
Minimum lot width (feet)	60	70	80	90	100
Minimum lot depth (feet)	90	90	100	100	100
Maximum building lot coverage[5]	40%	40%	35%	30%	30%
Maximum building height (feet)[2]	35	35	35	35	35
B. Density Transfer Lots[1]					
Maximum Density (dwelling units/net acre)	7.2	5.8	4.3	3.6	2.9
Minimum lot size (square feet)	4,200	5,250	7,000	8,400	10,500
Maximum lot size (square feet)[3]	7,200	9,000	12,000	14,400	18,000

Zone	R-6	R-7.5	R-10	R-12	R-15
Minimum lot width (feet)	50	60	60	70	80
Minimum lot depth (feet)	80	80	90	90	100
Maximum building lot coverage[5]	40%	40%	40%	35%	35%
Maximum building height (feet)[2]	35	35	35	35	35

Table Notes:

1. For additional density and dimension provisions, see CMC Sections 18.09.060 through 18.09.180.
2. Maximum building height: three stories and a basement, not to exceed height listed.
3. For parcels with an existing dwelling, a one-time exception may be allowed to partition from the parent parcel a lot that exceeds the maximum lot size permitted in the underlying zone. Any further partitioning of the parent parcel or the oversized lot must comply with the lot size requirements of the underlying zone.
4. Average lot area is based on the square footage of all lots within the development or plat. The average lot size may vary from the stated standard by no more than five hundred square feet.
5. The maximum building lot coverage for single-story homes may be up to forty-five percent in R-6 and R-7.5 zones, and forty percent in R-10 and R-12 zones. To qualify for increased lot coverage, a single-story home cannot include a basement or additional levels.

Response: The proposed development contains critical areas. Therefore, the lot dimensions listed under (B) are being applied to this application. The gross site area is ±49.62 acres. There are ±15.93 acres of land being set aside for critical and natural areas and open space. The net site area is ±33.69 acres. The maximum allowed density for the site is 195 lots. The Applicant proposes 152 lots. The average lot area is 6,839 square feet, with a minimum lot area of 5,508 square feet and a maximum lot area of 8,908 square feet. All lots meet the minimum lot width of 60 feet and the minimum lot depth of 80 feet. Building lot coverage and building height requirements will be reviewed at the time of building permit application. This standard is met.

Table 2—Building Setbacks for Single-Family Residential Zones[1]

Lot Area	Up to 4,999 sq. ft.	5,000 to 11,999 sq. ft.	12,000 to 14,999 sq. ft.	15,000 or more sq. ft
Minimum front yard (feet)	20	20	25	30
Minimum side yard and corner lot rear yard (feet)	5	5	10	15
Minimum side yard flanking a street (feet)	15	20	25	30
Minimum rear yard (feet)	20	25	30	35
Minimum lot frontage on a cul-de-sac or curve (feet)	25	30	35	40

Table Notes:

1. Setbacks may be reduced to be consistent with the lot sizes of the development in which it is located. Notwithstanding the setbacks requirements of this chapter, setbacks and/or building envelopes clearly established on an approved plat or development shall be applicable.

Response: All lots will be required to meet the setbacks for 5,000 to 11,999 square foot lots. As part of the density transfer, the Applicant has requested flexibility in the setback requirement, which is discussed below in Section 18.09.060.D. See the Preliminary Plans included with this application for more detail. This standard is met.

18.09.060 Density transfers.

A. Purpose. To achieve the density goals of the comprehensive plan with respect to the urban area, while preserving environmentally sensitive lands and the livability of the single-family residential neighborhoods, while also maintaining compatibility with existing residences.

B. Scope. This section shall apply to new development in all residential (R) zoning districts.

Where a land division proposes to set aside a tract for the protection of a critical area, natural open space network, or network connector (identified in the City of Camas parks plan), or approved as a recreational area, lots proposed within the development may utilize the density transfer standards under CMC Section 18.09.040 Table-2.

D. Where a tract under "C" above, includes one-half acre or more of contiguous area, the city may provide additional or negotiated flexibility in lot sizes, lot width, or depth, or setback standards. In no case shall the maximum density of the overall site be exceeded. The City may, also provide the landowner with:

1. A credit against park and open space impact fees per Chapter 3.88; or

2. Cash from the parks and open space impact fee fund or other public fund.

Response: This application proposes the use of density transfer due to the presence of critical areas on site. The Applicant proposes three natural area tracts to protect the critical and natural areas on site, totaling ±10.28 acres in size. Using the setback standards flexibility allowed under 18.09.060(D), the applicant is proposing adjustments to the standards in Table 18.90.040 Table 1 and Table 2. The table below shows the requested modifications to the standards. As part of the requested modification, the City requested that the Applicant install additional trees within Tract A, as well as a passive recreational opportunity in Tract I, which the Applicant has provided. See the Preliminary Plans included in with this application for more information. This standard is met.

CJ Dens Subdivision Lot Standards (R-7.5)		
Standard	**18.09.040 Table 1**	**Proposed**
Maximum density (dwelling units/net acre)	5.8	No Change
Average lot area (square feet)	-*	-
Minimum lot size (square feet)	5,250	No Change
Maximum lot size (square feet)	9,000	No Change
Minimum lot width (feet)	60	No Change
Minimum lot depth (feet)	80	No Change
Maximum building lot coverage	40%	50%
Maximum building height (feet)	35	No Change
Standard	**18.09.040 Table 2**	**Proposed**
Minimum front yard (feet)	20	10
Minimum front yard – Garage	5 feet (from front of dwelling)	18 feet from right-of-way
Minimum side yard (feet)	5	No Change
Minimum side yard flanking a street and corner lot rear yard (feet)	10	No Change
Minimum rear yard (feet)	25	15
Minimum lot frontage on a cul-de-sac or curve (feet)	30	No Change

18.09.080 Lot sizes.

B. When creating new lots via short plats or subdivisions that are adjacent to a different residential zone designation, the new lots along that common boundary shall be the maximum lot size allowed for the zone designation of the new development (if a lower density adjacent zone), or the minimum lot size allowed for the zone designation of the new development (if a greater density adjacent zone), as based on CMC 18.09.040 Table 2, Section A. In applying this section, where a land division is required to increase the size of lots, the land division may utilize the density transfer provisions provided for in CMC Section 18.09.060.

Response: All adjacent residential zones are similarly zoned R-7.5, therefore this standard does not apply.

Chapter 18.13 LANDSCAPING

18.13.020 Scope.

A. Unless otherwise exempted, the standards of this chapter shall apply to any site to be developed. All applicable development activities shall be required to prepare a landscape plan and shall be required to meet the minimum tree density herein created.

B. The standards of this chapter shall apply to the following:

1. Commercial, industrial, governmental uses, and land divisions;

Response: This application is for a 152-lot subdivision and does not meet any of the exemptions listed in section 18.13.025 of the CMC. This chapter applies.

18.13.040 Procedure for landscape, tree and vegetation plans.

A. Applicants shall submit a detailed Landscape, Tree and Vegetation Plan with building and site improvement plans. Included in the plans (at a minimum) shall be type, size, and location of plants and materials.

B. A tree survey must be included for any applicable development proposing to remove trees.

Response: A detailed Landscape Plan and Tree Plan are included with this application. This standard is met.

8.13.045 Tree survey.

A. The applicant must submit a tree survey that is prepared by a certified arborist or professional forester.

Response: A tree survey (including plans and a Tree Report) has been prepared by a certified arborist with AKS Engineering and Forestry, LLC (AKS), and is included with this application. This standard is met.

B. A tree survey must contain the following:

1. Inventory.

a. Map of the site, with tree locations numbered

b. Include all significant trees that will be impacted by the proposed development, which may include trees off-site if canopies overhang the subject property. Open space tracts to be set aside for conservation purposes do not need to be included in survey.

c. Provide the common and scientific name of inventoried trees.

Response: A tree inventory has been completed by AKS as part of the tree survey. Trees that will be protected and impacted with the project are identified on the plans and in the report. Multiple tracts are proposed to protect as many of the existing trees as practicable with the development. After the initial tree removal during site grading, trees that are to remain will be re-evaluated to determine if additional hazard trees need to be removed.See the Preliminary Plans and Report included with this application for more information. This standard is met.

2. Assessment.

a. Size. Measure and provide the diameter at breast height (DBH).

b. Tree protection zone. (Refer to CMC 18.03.050 Environmental Definitions)

c. Tree health. An overall assessment of the trees structural stability and failure potential based on specific structural features (e.g. decay, conks, co-dominate trunks, abnormal lean) and rated as good, fair or poor.

d. Recommendation for preservation or removal. The recommendation will consider proposed grading, trenching, paving, fencing and other construction plans.

e. If hazardous, then an evaluation of hazardous trees will include a numerical value of hazard based on the following: failure potential; size of part most likely to fail; and distance to target (e.g. new residence).

Response: The tree survey included in this application contains all information required in this section. After the initial tree removal during site grading, trees that are to remain will be re-evaluated to determine if additional hazard trees need to be removed. See the report and plans included with this application for more detail. This standard is met.

18.13.050 - Standards for landscape, tree and vegetation plans.

B. Landscaping and trees shall be selected and located to deter sound, filter air contaminants, curtail erosion, minimize stormwater run-off, contribute to living privacy, reduce the visual impacts of large buildings and paved areas, screen, and emphasize or separate outdoor spaces of different uses or character.

Response: Existing trees and other vegetation are being preserved to the extent practicable to help with erosion, stormwater, and to help contribute to living privacy. Additional landscaping is proposed to help provide privacy and protect from erosion. This standard is met.

C. Landscape, Tree and Vegetation Plan must include a combination of trees, shrubs, and ground cover to achieve the purposes of this chapter.

1. Required landscaping shall be comprised of a minimum of sixty percent native vegetation (or adapted to northwest climate), or drought-tolerant vegetation, and fifty percent evergreen.

2. Deciduous trees shall have straight trunks, be fully branched, have a minimum caliper of two inches, be equivalent to a fifteen-gallon container size, and be adequately staked for planting.

3. Evergreen trees shall be a minimum of five feet in height, fully branched, and adequately staked for planting.

Response: Plants proposed in the landscape plan are either native or adapted to the northwest climate, as well as a majority being evergreen. All plant materials will meet the requirements of this section. See the Landscape Plan included with this application for more information. This standard is met.

D. Street trees will be required as part of the frontage improvements. Species, size and spacing of the trees must be consistent with the Design Standards Manual. Unless otherwise specified, trees must generally be spaced thirty feet apart. Substitute varieties are subject to approval by the City of Camas.

Response: Street trees are proposed with this application meeting the requirements of this section. See the Landscape Plan included with this application for more information. This standard is met.

E. Proposed vegetation cannot be an invasive species as listed within the most current edition of the Clark County Noxious Weed List (e.g. English Ivy cultivars).

Response: No proposed vegetation are invasive species. See the Landscape Plan included with this application for more information. This standard is met.

F. Shrubs shall be a minimum of five-gallon pot size. Upright shrubs shall have a minimum height at planting of eighteen inches. Spreading shrubs at planting shall have a minimum width of eighteen inches (smaller shrub sizes may be approved where it is more appropriate within a particular landscape plan).

Response: All plant materials proposed will meet the requirements of this section. See the Landscape Plan included with this application for more information. This standard is met.

G. Ground Cover, defined as living material and not including bark chips or other mulch, shall be from containers of one gallon or larger. Plants shall be planted and spaced in a triangular pattern which will result in eighty percent cover in three years. Lawn cannot be the primary ground cover within required landscape buffers unless approved for stormwater conveyance. Grass species, if used as ground cover, shall be native or drought-tolerant, and appropriate for the use of the area.

Response: All groundcover materials proposed will meet the requirements of this section. Proposed lawn is not located within any required buffer. See the Landscape Plan included with this application for more information. This standard is met.

> **H.** Appropriate measures shall be taken, e.g., installation of irrigation system, to assure landscaping success. If plantings fail to survive, it is the responsibility of the property owner to replace them.

Response: Landscaped areas will be irrigated with an automatic irrigation system or adequate manual irrigation system. All irrigation in landscape tracts will be installed with the landscape at the time of neighborhood construction and maintained by the homeowners' association. All irrigation in planting strips adjacent to private lots will be installed with the home construction on that lot and be maintained by that homeowner. All irrigation will be design-build by the landscape contractor. This standard is met.

> **I.** Required trees, as they grow, shall be pruned in accordance with the International Society of Arboriculture. The pruned tree will provide at least eight feet of clearance above sidewalks and twelve feet above street roadway surfaces.

Response: All trees will be pruned to the appropriate height per this section. This standard will be met.

> **J.** Existing trees may be used as street trees if there will be no damage from the development which will kill or weaken the tree. Sidewalks of variable width and elevation may be utilized to save existing street trees, subject to approval by the city.

Response: Existing trees on site will be retained to the greatest extent practicable, however, none of those trees will be used as street trees. This standard does not apply.

> **K.** Vision clearance hazards shall be prohibited.

Response: No vision clearance hazards will be created with the proposed landscape. See the Landscape Plans included with this application for more detail. This standard is met.

> **L.** Street trees and other required landscaping which dies or is removed, must be replaced within one year of death or removal. Replacement street trees may be an alternative species from the city's recommended tree list, and may be in a different location as approved by the city.

Response: All required plant material that dies or is removed will be replaced per this section. This standard will be met.

18.13.051 - Minimum tree density requirement.

> **A.** Tree Density. A minimum tree density per net acre is required and must be incorporated within the overall landscape plan. The tree density may consist of existing trees, replacement trees or a combination of existing and replacement trees, pursuant to the priority established in Section 18.13.052.

Table 1: Required Tree Density

Proposed Activity	Required Minimum Tree Density per Net Acre	Required Tree Replacement
New Development	20 Tree Units	20 Tree Units per acre
Residential	20 Tree Units	20 Tree Units per acre
Developed commercial and industrial properties	20 Tree Units	3 Tree Units for every 1 tree unit removed up to the minimum tree density per acre.

B. Tree Density Calculation. Specific instructions on how to perform tree density calculations are provided in the Design Standards Manual. "Tree Unit" is a unit of measurement based upon the size of the diameter of the tree measured at the breast height ("dbh"). New trees are given a value of one (1) Tree Unit, as they must be a minimum of 2" dbh when planted. Tree Unit values are summarized in the following Table:

Table 1: Required Tree Density

Diameter at Breast Height "dbh"	Tree Units	Diameter at Breast Height "dbh"	Tree Units
1" to 5"	1	31" to 32"	12
6" to 12"	2	33" to 34"	13
13" to 14"	3	35" to 36"	14
15" to 16"	4	37" to 38"	15
17" to 18"	5	39" to 40"	16
19" to 20"	6	41" to 42"	17
21" to 22"	7	43" to 44"	18
23" to 24"	8	45" to 46"	19
25" to 26"	9	47" to 48"	20
27" to 28"	10	49" to 50"	21
29" to 30"	11	For larger trees, allow a ½ tree unit for every additional inch of dbh	

Response: The total site area is ±49.62 acres. There are ±5.72 acres to be set aside as a natural area tract to protect the wetland and stream in the northwest portion of the site. As no development activity will occur in this tract, the area has not been used for tree unit calculations. Therefore, there are ±43.90 net acres of developable land used in the calculation of the required tree density. The application is for a residential development; the applicant is required to provide 20 tree units per acre, for a total of 878 tree units (43.90 x 20). There are 1,051 tree units that are to be retained on site, as well as 340 proposed street trees and 80 proposed open space trees, for a total of 1,471 tree units. See the Tree Report and Preliminary Plans included with this application for more detail. This standard is met.

18.13.052 Tree and native vegetation preservation.

A. When determining where to retain or plant trees, locations with healthy soils, native understory vegetation, and mature trees shall have priority when there are feasible alternative locations on site for proposed buildings and site improvements to achieve the minimum tree unit density per acre. This may require site redesign. Provided, where necessary, density transfer areas may be used to ensure protection and retention of trees.

Response: The majority of the trees proposed for retention are located in the proposed natural area tracts. The trees in these areas are mature trees with a mix of native understory vegetation. As many of the existing trees outside of the proposed critical area as practicable are proposed for retention. After the initial tree removal during site grading, trees that are to remain will be re-evaluated to determine if additional hazard trees need to be removed. This standard is met.

> **B.** In designing a development project and in meeting the required tree density, the applicant must provide a Landscape, Tree and Vegetation plan that retains healthy, wind firm trees in the following priority:
>
> 1. Trees located within critical area buffers. Trees must be identified within a protected tract.
> 2. Significant wildlife habitat, or areas adjacent and buffering habitat.
> 3. Significant trees that are greater than 36 inch dbh.
> 4. Groves of trees, or other individual healthy trees with the intent to retain must be located in separate tract if part of a land division, or other protective mechanism if other development type,
> 5. Trees, that if removed would cause trees on adjacent properties to become hazardous.

Response: Three natural area tracts are proposed that contain a large majority of the trees on site. None of the trees in the critical area are considered in the tree unit calculation for the project as they are outside of the actual project area. Outside of the critical area, trees were preserved to the greatest extent practicable within the area to be developed. Trees in groves were given priority. Some trees in the wetland buffer are noted in the Tree Report as being hazard trees. Only hazard trees adjacent to future lots are proposed for removal. All other hazard trees are being proposed to remain as they are creating habitat and have value if retained within the wetland buffer. This standard is met.

> **C.** Mitigation and Replacement. In areas where there are currently inadequate numbers of existing trees to meet minimum tree density, where the trees are inappropriate for preservation, the soils are poor, or there are significant invasive species, then mitigation shall be required to meet the minimum tree density. The applicant's proposed location for replacement trees or mitigation shall be subject to the city's approval of the Landscape Plan. Replacement trees shall be planted in the following priority:

Response: As previously discussed, there are enough existing trees being retained on site to meet the tree density requirements for the development. However, the Applicant will also be installing additional trees in the Tract A and B natural areas, as well as street trees and trees in the smaller open spaces on site. Tree locations shown for Tract A and B are preliminary and final placement will be determined during construction due to the presence of shallow bedrock on the site. See the Tree Report and Preliminary Plans included with this application for more information. This standard is met.

18.13.055 Landscape buffering standards.

Response: The proposed development is for 152 single-family lots. Therefore, based on 18.13.055 Table 1 – Landscape Buffers, there are no buffers required. This section does not apply.

Chapter 18.15 SIGNS

Response: No signs are proposed as part of this application. Any signs that will be installed will receive a sign permit prior to installation to ensure the sign meets the requirements of this chapter. This standard is met.

Chapter 18.47 TEMPORARY USE PERMITS

18.47.020 Permit required.

Response: The subject site has shallow base rock; therefore, rock excavation will occur as part of the site grading. The applicant would like to reuse the excavated rock on site for construction. In order to use the rock, it will need to be crushed. In order to reduce cost and truck trips to and from the site, the Applicant is requesting a temporary use permit to bring a mobile rock crusher on site to crush the excavated rock on site.

18.47.050 Criteria for approval.

A. The community development director may approve, or modify and approve an application for a temporary use permit if all of the application satisfies all of the following criteria:

1. The temporary use will not be materially detrimental to the public health, safety or welfare, nor injurious to property or improvements in the immediate vicinity;

Response: The mobile rock crusher will not be materially detrimental to the public health, safety, or welfare. While it will temporarily increase noise coming from the site during construction hours, it will reduce the number of truck trips that would be required if the rock were to be taken off site. The mobile rock crusher will be placed in a location that will be developed as part of the project and away from existing occupied buildings to keep noise to a minimum; therefore, it will not be injurious to property or improvements in the immediate vicinity. This standard is met.

2. The temporary use is compatible with the purpose and intent of this title, and the specific zoning district in which it will be located in accordance with the Chapter 18.07 "Use Authorization";

Response: The mobile rock crusher would generally not be compatible with the residential zoning of the site and surrounding properties. However, the temporary use will only be during site construction, located away from occupied structures, and is compatible with construction process of a residential development. This standard is met.

3. The temporary use is compatible in intensity and appearance with existing land uses in the immediate vicinity;

Response: The existing site is vacant and mostly cleared of vegetation. The surrounding properties are generally vacant or in use as large-lot residential and are forested. There are existing single-family residences abutting the southeast corner of the site. The mobile rock crusher would generally not be compatible with the use intensity and appearance of the site and surrounding properties. However, the temporary use will only be during site construction and is compatible with construction process of a residential development. The mobile rock crusher will also be located as far as possible from the adjacent residences. This standard is met.

4. Structures proposed for the temporary use comply with the setback and vision clearance area requirements of this title, and with applicable provisions of the Building and Fire Codes;

Response: The mobile rock crusher will not require any structures. However, it will be located outside of the required setbacks and will not be located near any intersection. This standard is met.

5. Adequate parking is available to serve the temporary use, and if applicable, the temporary use does not occupy required off-street parking areas for adjacent or nearby uses;

Response: The mobile rock crusher will be a use associated with the site construction. Parking will not be required specifically for the mobile rock crusher. Parking will be available on site during site construction. This standard is met.

6. Hours of operation of the temporary use are specified;

Response: The mobile rock crusher will be used during site grading and will operate during standard construction hours allowed by the City. This standard is met.

7. The temporary use will not cause noise, light, or glare which adversely impacts surrounding land uses.

Response: The mobile rock crusher will be used during site grading and will operate during standard construction hours. The mobile rock crusher will also be located as far as possible from the adjacent residences to minimize noise impact. The noised generated by the mobile rock crusher will not be greater than noises to be expected during site construction due to being located away from occupied structures. The mobile rock crusher will not generate any light or glare. This standard is met.

B. The community development director may authorize a temporary use permit for a use not specifically listed in Chapter 18.07 "Use Authorization."

Response: The mobile rock crusher is not a temporary use specifically listed in CMC Chapter 18.07. Therefore, the use will need to be authorized by the community development director. This standard is met.

18.47.060 Time limitation.

A temporary use is valid for up to one hundred eighty calendar days from the effective date of the permit, however, the community development director may establish a shorter time frame. The community development director may grant one extension not to exceed sixty days, upon the applicant showing compliance with all conditions of permit approval.

Response: The mobile rock crusher will be used during the site grading. Once rock cuts are complete and the mobile rock crusher will be removed from the site. The exact amount of time required to complete the rock crushing is unknown at this time due to project phasing, however, it is anticipated to be less than 180 total days. The applicant requests the full 180 days be approved to account for any delays that may come up during site grading, as well as possible extensions to account for project phasing.

18.47.080 Removal of a temporary use.

The community development director shall establish, as a condition of each temporary use permit, a time within which the use and all physical evidence of the use must be removed. If the applicant has not removed the use as required by the temporary use permit, the city may abate the use as provided in Section 18.47.090 of this chapter.

Response: As discussed above, the Applicant requests to have the 180 days allowed under Section 18.47.060. The Applicant also requests that the temporary use time frame not begin until the pre-construction meeting, after preliminary land use approval, to allow for the time to receive final engineering approval for construction. Rock crushing will be required for each phase; therefore, the Applicant also requests the ability to extend the permit if necessary, noting that the total active rock crushing days will be less than 180 days.

18.47.090 Abatement.

Prior to the approval of a temporary use permit, the applicant shall submit to the community development director an irrevocable, signed and notarized statement granting the city permission to summarily enter the applicant's property with reasonable notice and abate the temporary use, and all physical evidence of that use if it has not been removed as required by the terms of the permit. The statement shall also indicate that the applicant will reimburse the city for any expenses incurred in abating a temporary use under the authority of this chapter.

Response: Prior to land use approval, the Applicant will submit a statement granting the City permission to enter the property related to the temporary use. The statement will also state that the Applicant will reimburse the City as required in this section. This standard will be met.

IV. Conclusion

The Applicant is proposing a 152-lot, single-family subdivision meeting the requirements of the City of Camas R-7.5 zoning and other applicable portions of the Camas Municipal Code. The development will have wetland buffer impacts; however, a natural area tract will preserve the critical areas on site. Mitigation for the impacted wetland buffer will occur on site.

The submittal requirements have been met and the required finding made for all applicable approval criteria. These findings serve as the basis for the City to approve the application and are supported by substantial evidence in the application materials. Therefore, the Applicant respectfully requests approval of the proposed project (CJ Dens).

May 7, 2021

Lauren Hollenbeck
City of Camas Community Development
616 NE 4th Avenue,
Camas, WA 98607

RE: CJ Dens (SUB20-02) Land Use Application Document Updates

Dear First Name:

This letter is written to address updates to the plans and documents submitted for CJ Dens (SUB20-02) based on comments received from the City of Camas (City) on March 9, 2021 and April 16, 2021, as well as meetings with the City to discuss the comments on March 22, 2021 and March 26, 2021.

Land Use Narrative

Updates to the Land Use Narrative are below. The sections discussed below are intended to completely replace the corresponding section from the Land Use Narrative.

Chapter 16.31 ARCHAEOLOGICAL RESOURCE PRESERVATION

16.31.070 Predetermination report required.

Response: An archaeological predetermination was completed by Archaeological Investigations Northwest, Inc. (AINW) as part of the original application (SUB10-03). DAHP requested additional predetermination work be completed for the project. AINW completed the additional predetermination on January 27, 2021 and determined that no additional work would be required. This standard is met.

16.51.160 Mitigation requirements.

A. The applicant shall avoid all impacts that degrade the functions and values of a critical area or areas. Unless otherwise provided in these provisions, if alteration to the critical area is necessary, all adverse impacts to or from critical areas and management zones resulting from a development proposal or alteration shall be mitigated in accordance with an approved critical area report and SEPA documents.

Response: This application proposes to have no impacts to the Wetland A or Stream 1 in the northwest portion of the site. Buffer modifications are proposed for Wetland A buffers. The buffer modifications will include buffer reduction and buffer averaging, as allowed by CMC. A portion of the proposed T-3 trail will be required to cross Stream 3 in the southeast corner of the site. A culvert will be used to cross the stream. Mitigation will be provided for the impacts created by the crossing as described in the Mitigation Plan provide by ELS. See the Preliminary Plans, Critical Areas Report and Buffer Modification Plan, and Mitigation Plan included with this application for more information.

16.53.050 Wetland permits.

C. Buffer Standards and Authorized Activities. The following additional standards apply for regulated activities in a wetland buffer to ensure no net loss of ecological functions and values:

5. Other Activities in a Buffer. Regulated activities not involving stormwater management, road and utility crossings, or a buffer reduction via enhancement are allowed in the buffer if all the following conditions are met:

Response: As part of the tree survey conducted for the site, some dead and unhealthy trees were identified along the edge of the wetland buffer adjacent to the development. These trees will be reviewed during and after construction to ensure they do not become dangerous to the health, safety, and welfare of the residents and greater community. If it is determined at that time that removal of the tree is necessary, proper permitting will be obtained and mitigation will be provided per Camas Municipal Code (CMC). No other activities are proposed within the wetland buffer. This standard is met.

17.19.030 - Tract, block and lot standards.

A. Environmental Considerations.

2. Vegetation. In addition to meeting the requirements of CMC Section 18.13.045, Tree Regulations, every reasonable effort shall be made to preserve existing significant trees and vegetation, and integrate them into the land use design.

Response: The subject site has groups of trees along the property boundary and surrounding the critical areas. There is also a grouping of trees in the south-central portion of the site. Trees immediately impacted by grading and identified as posing an immediate risk to health, safety, and welfare are proposed to be removed. In the large open space and critical area tract, unhealthy and dead trees will be left with the initial tree removal effort. After the initial tree removal during site grading, trees that are to remain will be re-evaluated to determine if additional trees propose an immediate risk and need to be removed. If additional trees proposed for removal require permitting and mitigation, these will be obtained and provided with the tree removal. With the development, trees will be installed in the open space tracts, as well as street trees, to help replace some of the tree canopy that will be removed. See the Tree Plan and Tree Report included with this application for more information. This standard is met.

3. Density transfers may be applicable if developer preserves critical areas. See Chapter 18.09 of this code.

Response: The applicant proposes to create a ±16.00-acres of natural area tracts for the protection of critical areas and natural vegetation, making density transfer applicable. The application proposes the use of density transfer to reduce the front setback to 10 feet with a 20-foot garage setback; reduce the rear setback to 15 feet; and increase the lot coverage to 50%. The applicant also proposes to maintain the requirement that the garage be set back 5 feet from the front of the dwelling. As part of the negotiation, the City requested robust planting in the natural area tracts, construction of a public overlook, and construction of a play area. An overlook and play area are proposed in Tract I. Planting of trees, shrubs, and seed mixes, above code requirements, are proposed in all open space tracts to provide the robust planting requested. As part of the robust planting, the applicant is providing a total of 1,465 tree units (well above the required 878 tree units) between retained trees, open space trees, and street trees. Additionally, the tree unit number does not account for trees proposed in Tracts A and B (93 trees), as those trees

are proposed to have a smaller initial planting size to increase survivability. See the Preliminary Plans included with this application for more information. This standard is met.

> D. Lots. The lot size, width, shape and orientation shall conform to zoning provisions and the following:
>
> 1. Each lot must have frontage and access onto a public street, except as may otherwise be provided (e.g., approved private roads, access tracts);

Response: All lots other than Lots 12-13, 85-88, 100-102, and 109-112 will have frontage onto the internal street network. The lots mentioned above will gain access to the public street network through access tracts. All lots have a minimum width of 60 feet and minimum depth of 80 feet. All lots on a curve or cul-de-sac have minimum frontages of 30 feet. See the plans included with this application for more information. This standard is met.

> 5. Flag lots, access tracts, and private roads may be permitted only when the community development director or designee finds the applicant meets the criteria listed hereinafter:

Response: This application proposes one flag lot, Lot 103. The flagpole is 20 feet wide and will have a minimum 12-foot paved surface. Lot 103 will also have a minimum of four off-street parking spaces (two garage and two driveway spaces). Four access tracts are proposed to provide access to Lots 12-13, 85-88, 100-102, and 109-112. Each of these lots will provide a minimum of four on-site parking spaces (two garage and two driveway spaces) and have address signs as required by this section. This standard is met.

> E. Tracts and Trails.
>
> 1. If land division is located in the area of an officially designated trail, in accordance with the current version of the parks, recreation and open space comprehensive plan, provisions shall be made for reservation of the right-of-way or for easements to the city for trail purposes including the construction of the trail. Trail standards for each trail type shall be as specified in appendix B of the parks, recreation and open space comprehensive plan or as amended.

Response: The Applicant proposes to construct a 6-foot-wide gravel trail along the southern portion of the site, through the natural area tracts. This trail is a portion of the T-3 trail in the City PROS Plan. As requested by the Camas Parks and Recreation department, portions of the trail have been widened to 8 feet to provide for maintenance vehicle pull outs. The widened areas extend east and west from N Elk Drive, two widened section east of N Elk Drive, three widened sections spaced out west of Lot 1, and a turnaround at the west end of the site. This standard is met.

> 18.09.060 Density transfers.
>
> D. Where a tract under "C" above, includes one-half acre or more of contiguous area, the city may provide additional or negotiated flexibility in lot sizes, lot width, or depth, or setback standards. In no case shall the maximum density of the overall site be exceeded. The City may, also provide the landowner with:
>
> 1. A credit against park and open space impact fees per Chapter 3.88; or
>
> 2. Cash from the parks and open space impact fee fund or other public fund.

Response: This application proposes the use of density transfer due to the presence of critical areas on site. The Applicant proposes three natural area tracts to protect the critical and natural areas on site, totaling ±10.28 acres in size. Using the setback standards flexibility allowed under 18.09.060(D), the applicant is proposing adjustments to the standards in Table 18.90.040 Table 1 and Table 2. The table below shows the requested modifications to the standards. As part of the requested modification, the City requested that the Applicant install additional trees within Tract A, as well as a passive recreational opportunity in Tract I, and a play area, which the Applicant has provided. See the Preliminary Plans included in with this application for more information. This standard is met.

CJ Dens Subdivision Lot Standards (R-7.5)		
Standard	**18.09.040 Table 1**	**Proposed**
Maximum density (dwelling units/net acre)	5.8	No Change
Average lot area (square feet)	-	-
Minimum lot size (square feet)	5,250	No Change
Maximum lot size (square feet)	9,000	No Change
Minimum lot width (feet)	60	No Change
Minimum lot depth (feet)	80	No Change
Maximum building lot coverage	40%	50%
Maximum building height (feet)	35	No Change
Standard	**18.09.040 Table 2**	**Proposed**
Minimum front yard – Building (feet)	20	10
Minimum front yard – Garage (feet)	-	20
Garage from front of Dwelling (feet)	5	5
Minimum side yard (feet)	5	No Change
Minimum side yard flanking a street and corner lot rear yard (feet)	10	No Change
Minimum rear yard (feet)	25	15
Minimum lot frontage on a cul-de-sac or curve (feet)	30	No Change

18.13.045 Tree survey.

B. A tree survey must contain the following:

1. Inventory.

a. Map of the site, with tree locations numbered

b. Include all significant trees that will be impacted by the proposed development, which may include trees off-site if canopies overhang the subject property. Open space tracts to be set aside for conservation purposes do not need to be included in survey.

c. Provide the common and scientific name of inventoried trees.

Response: A tree inventory has been completed by AKS as part of the tree survey. Trees that will be protected and impacted with the project are identified on the plans and in the report. Multiple tracts are proposed to protect as many of the existing trees as practicable with the development. Trees immediately impacted by grading and identified as posing an immediate risk to health, safety, and welfare are proposed to be removed. In the large open space and critical area tract, unhealthy and dead trees will be left with the initial tree removal effort. After the initial tree removal during site grading, trees that are to remain will be re-evaluated to determine if additional trees propose an immediate risk and need to be removed. If additional trees proposed for removal require permitting and mitigation, these will be obtained and provided with the tree removal. See the Preliminary Plans and Report included with this application for more information. This standard is met.

18.13.050 - Standards for landscape, tree and vegetation plans.

C. Landscape, Tree and Vegetation Plan must include a combination of trees, shrubs, and ground cover to achieve the purposes of this chapter.

1. Required landscaping shall be comprised of a minimum of sixty percent native vegetation (or adapted to northwest climate), or drought-tolerant vegetation, and fifty percent evergreen.
2. Deciduous trees shall have straight trunks, be fully branched, have a minimum caliper of two inches, be equivalent to a fifteen-gallon container size, and be adequately staked for planting.
3. Evergreen trees shall be a minimum of five feet in height, fully branched, and adequately staked for planting.

Response: Plants proposed in the landscape plan are either native or adapted to the northwest climate, as well as a majority being evergreen. With the exception of trees proposed in Tracts A and B, all plant materials will meet the requirements of this section. Tree planted in Tracts A and B will be planted as one-gallon pots to have the best chance of survivability and healthy growth in the tracts. Given the potential of shallow bedrock and steep slopes, the survivability of trees planted at a larger size would be very low. See the Landscape Plan included with this application for more information. This standard is met.

18.13.051 - Minimum tree density requirement.

B. Tree Density Calculation. Specific instructions on how to perform tree density calculations are provided in the Design Standards Manual. "Tree Unit" is a unit of measurement based upon the size of the diameter of the tree measured at the breast height ("dbh"). New trees are given a value of one (1) Tree Unit, as they must be a minimum of 2" dbh when planted. Tree Unit values are summarized in the following Table:

Response: The total site area is ±49.62 acres. There are ±5.72 acres to be set aside as a natural area tract to protect the wetland and stream in the northwest portion of the site. As no development activity will occur in this tract, the significant number or protected trees and land area are not used for tree unit calculations. Therefore, there are ±43.90 net acres of developable land used in the calculation of the required tree density. The application is for a residential development; the applicant is required to provide 20 tree units per acre, for a total of 878 tree units (43.90 x 20). There are 1,068 tree units that are to be retained on site, as well as 338 proposed street trees and 59 proposed open space trees meeting

tree unit requirement, for a total of 1,465 tree units (67 percent more than required). There are also 93 trees proposed in the large open spaces to be planted at a size that does not meet tree unit requirements. Additionally, a significant number of existing trees are proposed in the northwest portion of the site that were not included in the calculation as previously noted. See the Tree Report and Preliminary Plans included with this application for more detail. This standard is met.

18.13.052 Tree and native vegetation preservation.

A. When determining where to retain or plant trees, locations with healthy soils, native understory vegetation, and mature trees shall have priority when there are feasible alternative locations on site for proposed buildings and site improvements to achieve the minimum tree unit density per acre. This may require site redesign. Provided, where necessary, density transfer areas may be used to ensure protection and retention of trees.

Response: As many of the existing trees as practicable on site are proposed to be protected and retained. The majority of the trees proposed for retention are located in one of three proposed natural area tracts. The trees in these areas are mature trees with a mix of native understory vegetation. Trees immediately impacted by grading and identified as posing an immediate risk to health, safety, and welfare will be removed. In the large open space and critical area tract, unhealthy and dead trees will be left with the initial tree removal effort. After the initial tree removal during site grading, trees that are to remain will be re-evaluated to determine if additional trees propose an immediate risk and need to be removed. If additional trees proposed for removal require permitting and mitigation, these will be obtained and provided with the tree removal. This standard is met.

B. In designing a development project and in meeting the required tree density, the applicant must provide a Landscape, Tree and Vegetation plan that retains healthy, wind firm trees in the following priority:

1. **Trees located within critical area buffers. Trees must be identified within a protected tract.**
2. **Significant wildlife habitat, or areas adjacent and buffering habitat.**
3. **Significant trees that are greater than 36 inch dbh.**
4. **Groves of trees, or other individual healthy trees with the intent to retain must be located in separate tract if part of a land division, or other protective mechanism if other development type,**
5. **Trees, that if removed would cause trees on adjacent properties to become hazardous.**

Response: Three natural area tracts are proposed that protect a large majority of the existing trees on site. All trees within the critical areas and buffers will be retained, with none of the trees in Tract S considered in the tree unit calculation for the project as they are outside of the actual development area. Trees located within the critical areas and their buffers will be protected. Outside of the critical area, trees were preserved to the greatest extent practicabl. Trees in groves were given priority and are located within the natural area tracts. In the large open space and critical area tracts, unhealthy and dead trees that do not pose an immediate risk will be left with the initial tree removal effort. After the initial tree removal during site grading, trees that are to remain will be re-evaluated to determine if additional trees propose an immediate risk and need to be removed. If

additional trees proposed for removal require permitting and mitigation, these will be obtained and provided with the tree removal. Significant wildlife habitat is projected in the three natural area tracts, included retention of dead trees, which provide additional habitat. Where feasible, trees over 36"DBH are proposed to be retained. Trees over 36" that will be removed are impacted by grading for the development. Trees immediately adjacent to the site were also evaluated to ensure they would not create a risk after removed of the on-site trees. See the Preliminary Plans and Tree Report included with this application for more information. This standard is met.

> C. **Mitigation and Replacement. In areas where there are currently inadequate numbers of existing trees to meet minimum tree density, where the trees are inappropriate for preservation, the soils are poor, or there are significant invasive species, then mitigation shall be required to meet the minimum tree density. The applicant's proposed location for replacement trees or mitigation shall be subject to the city's approval of the Landscape Plan. Replacement trees shall be planted in the following priority:**

Response: As previously discussed, there are enough existing trees being retained on site, outside of Tract S, to meet the tree density requirements for the development. Trees in Tract S will be protected but were not included in the tree unit calculation. However, the Applicant will also be installing additional trees in the Tract A and B natural areas, as well as street trees and trees in the smaller open space tracts on site. Trees proposed in Tracts A and B are proposed to be planted as one-gallon pots to have the best chance of survivability and healthy growth in the tracts. Given the potential of shallow bedrock and steep slopes, the survivability of trees planted at a larger size would be very low. Tree locations shown for Tract A and B are preliminary and final placement will be determined during construction, as near as possible to where they are proposed. See the Tree Report and Preliminary Plans included with this application for more information. This standard is met.

Preliminary Plans

A full new Preliminary Plan set has been submitted to ensure that all updates are shown on all applicable plan sheets and there is no confusion moving forward. Generally, the updates to the Preliminary Plans are listed below.

- A dead-end turnaround is provided at the end of Tract K.
- Tract L has been shortened to less than 150 feet, as measured from the center point of the cul-de-sac on N Adams Court.
- Tract 103 was modified to become a flag lot accessing from N 50th Avenue.
- Tract M has been shortened to less than 150 feet, as measured from the center line of N 49th Avenue.
- A dead-end turnaround is provided in Tract T adjacent to Lot 152.
- The trail has been widened to 6 feet wide, with portions widened to 8 feet. The trail has been modified to connect and cross at the intersection of N Elk Drive and SE Leadbetter Road.
- A play area has been added to Tract I.

- Additional trees have been proposed in Tracts A and B, as well as a seed mix in disturbed areas that will provide additional native understory plant material in areas disturbed by grading. Seed mix is noted on the plans, but not shown as final disturbed areas will be determined during final engineering.
- Additional plant materials were also added to Tracts A and B adjacent to rights-of-way to provide additional landscape near public use areas.
- The required L2 buffer for the storm facility in Tract R has been identified. Plantings will be provided with the final design.
- Retention of additional trees originally proposed for removal. Many of these trees are unhealthy or dead, however the City requested they remain as they are generally centrally located in the open spaces and could provide habitat. These trees will be review after grading to determine if they will pose a risk to health, safety, and welfare. If they are determined to pose a rise, they will be removed, as necessary.

Tree Report

The tree report has been updated to provide clarification on reasons for removal, to retain additional trees as mentioned above, and to update any information related to the additional tree retention. Many of the additional trees being retained are unhealthy or dead, however the City requested they remain as they are generally centrally located in the open spaces and could provide habitat. These trees will be review after grading to determine if they will pose a risk to health, safety, and welfare. If they are determined to pose a risk, they will be removed, as necessary. The updated tree report is included with this letter.

The City specifically requested we review the trees along the east boundary in the propose rear yards. After additional review, the majority of the trees proposed for removal are dead or in poor enough health to pose an immediate threat to the future homes. Where feasible, healthy trees along the east boundary are proposed to be retained.

Sincerely,

AKS ENGINEERING & FORESTRY, LLC

Michael Andreotti, RLA, Land Use Planner
9600 NE 126th Avenue, Suite 2520
Vancouver, WA 98662
(360) 882-0419 | andreottim@aks-eng.com

A Shoreline Substantial Development Permit Narrative for CJ Dens Subdivision

Date: November 2020

Submitted to: City of Camas
Community Development
616 NE 4th Avenue
Camas, WA 98607

Applicant: CJ Dens Lacamas II LLC
PO Box 2239
Kalama, WA 98625

AKS Job Number: 5504

AKS ENGINEERING & FORESTRY
9600 NE 126th Avenue, Suite 2520
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Shoreline Substantial Development Permit Application for CJ Dens Subdivision

Submitted to:
City of Camas
Community Development
616 NE 4th Avenue
Camas, WA 98607

Applicant:
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Kalama, WA 98625

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Contact(s): Michael Andreotti
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Site Location:
715 SE Leadbetter Road
Camas, WA 98607
Parcel #s: 177906-000, 178172-000, and 178236-000

Site Size:
49.62 Acres (2,161,423 SF)

Land Use Districts:
R-7.5 (Single-Family Residential

I. Executive Summary

Through this application, CJ Dens Lacamas II, LLC (Applicant) requests approval from the City of Camas (City) to subdivide the subject site, described below, into 152 single-family lots for the future construction of detached single-family homes. The site is located at the east end of Lacamas Lake, on the north side of SE Leadbetter Road and is addressed 715 SE Leadbetter Road, Camas, WA 98607. The site is identified as Clark County Parcels 177906-000, 178172-000, and 178236-000. The development will gain access from SE Leadbetter Road and N Adams Street and will provide access to the individual lots with an internal street network. Future circulation will be provided to the north, to connect to the future arterial in the City of Camas Six Year Transportation Improvement Program. The Applicant will also ensure protection of the existing critical areas on site, including two streams and a wetland, as well as the shoreline buffer for Lacamas Lake. The applicant will also provide a trail parallel to SE Leadbetter road, which is identified as a portion of the T-3 trail in the City of Camas Park, Recreation, and Open Space (PROS) Plan.

In addition to this narrative, the application package includes the materials necessary for the City to review and approve this submittal, including Preliminary Plans, Stormwater Technical Information Report (TIR), updated Geotechnical Site Investigation Report, updated Traffic Impact Study, updated Wetland and Habitat Report, and an amended State Environmental Policy Act (SEPA) checklist.

The highlights of this project that will be discussed further in this narrative include:

- Platting of 152 single-family lots.
- Construction of the public internal street network for lot access and circulation.
- Construction of a multi-use path based on the PROS Plan.
- Protection of existing critical areas and central open space.
- Construction of an overlook to provide views of Lacamas Lake and the surrounding hills.
- Common parking areas throughout the development for additional guest parking.
- Construction of water, sanitary sewer, and stormwater utilities for the development.
- Construction of water transmission line from south boundary to north boundary.

The project is to be constructed in a maximum of 3 phases as follows:

- Phase 1 – Construct 51 lots with development access from SE Leadbetter Road, create the large central open space, construct the multi-use trail, and construct necessary roadways and utilities.
- Phase 2 – Construct 64 lots and the development access from N Adams Street, construct the overlook, and construct necessary roadways and utilities.
- Phase 3 – Construct 37 lots and the remaining roadways and utilities.

The written narrative includes findings of fact demonstrating that the application complies with all applicable approval criteria. These findings are supported by substantial evidence, including Preliminary Plans and other written documentation. This information, which is included in this application package, provides the basis for the City to approve the application.

II. Site Description/Setting

The subject site consists of three parcels and is ±49.62 acres in size. The site is addressed as 715 SE Leadbetter Road, Camas, WA 98607. The included properties are identified as Clark County Parcel Number 177906-000 of the northeast ¼ of Section 34 and Parcel Numbers 178172-000 and 178236-000 of the northwest ¼ of Section 35, Township 2 North, Range 3 East, Willamette Meridian. The site is zoned Residential – 7.5 (R-7.5) with an Airport Overlay. Neighboring properties are zoned R-7.5 and Business Park to the north, R-7.5 to the northeast and southeast, Community Commercial to the east and west, and Residential – 12 (R-12), Parks/Open Space (P/OS), and Water to the south. Properties to the north and northeast are vacant. The property to the east is in use as large-lot residential and the properties to the southeast are in use as single-family residential. One property to the south across SE Leadbetter Road is in use as large-lot residential, with the remaining parcels south of the site covered by Lacamas Lake. The property to the west is in use as large-lot residential and the Camas Washougal-Wildlife League clubhouse.

The site has frontage on SE Leadbetter Road along the south boundary and N Adams Street is stubbed to the site from the south, in the east portion of the site. SE Leadbetter road is classified as an existing 2-lane local road without sidewalk, curb, or gutter. Frontage improvements are not proposed for SE Leadbetter road because the City plans to close the road to vehicle traffic west of the site in the future. N Adams Street is classified as a 2 Lane Local/Sprinklered (52-foot right-of-way (ROW)) and will be extended into the site.

The site is hilly with steep slopes in the south and northeast portions of the site. The site generally slopes from north to south, with a small portion in the northwest sloping from southeast to northwest into a valley containing a wetland and stream. Shallow bedrock exists throughout the site, with a few rock outcroppings on site. The existing vegetation on site consists of stands of evergreen trees interspersed deciduous trees along the north, south, west, and portions of the east boundary, as well as a stand in the south-central portion of the site. Shrubs and grasses make up the remainder of the vegetation on site. A wetland in located in the northeast portion of the site and continues off site to the northwest. An unnamed stream, classified as a Type Np stream by the Washington State Department of Natural Resources (DNR) Water Typing System, flows through the wetland from the northeast to the southwest, and generally follows the north property line. There is also an unnamed Type Ns stream in the southeast corner of the site, flowing from off site, southwesterly across the site. Both streams cross under SE Leadbetter Road and drain to Lacamas Lake. The Clark County GIS archaeological predictive model ranges from Low-Moderate to High across the site. The site is not within a City of Camas mapped critical aquifer recharge area (CARA).

III. Applicable Review Criteria

CITY OF CAMAS SHORELINE MASTER PROGRAM

CHAPTER 2 APPLICABILITY, SHORELINE PERMITS AND EXEMPTIONS

To be authorized, all uses and development activities in shorelines shall be carried out in a manner consistent with this Program and the policy of the Act as required by RCW 90.58.140(1), regardless of whether a shoreline permit, statement of exemption, shoreline variance, or shoreline conditional use is required.

2.1 Applicability

1. This Program shall apply to all of the shorelands and waters within the City of Camas that fall under the jurisdiction of RCW 90.58. Such shorelands shall include those lands extending two hundred (200) feet in all directions as measured on a horizontal plane from the ordinary high water mark (OHWM), floodways and contiguous floodplain areas landward two hundred feet from such floodways, associated wetlands, critical areas with associated buffer areas, river deltas associated with the streams, and lakes and tidal waters that are subject to the provisions of this program, as may be amended; the same to be designated as to location by Ecology, as defined by RCW 90.58.

   Within the City of Camas the following waters are considered "shorelines" and are subject to the provisions of this Program: Lacamas Creek; Fallen Leaf Lake; Lacamas Lake; and Round Lake. The Columbia and Washougal Rivers are further identified as shorelines of statewide significance. A copy of the *Camas Shoreline Designations Map* and its UGA is shown in Appendix A.

   The City is pre-designating shorelines within its adopted UGA. Until annexation occurs, all development in these areas will continue to be regulated by the Clark County Shoreline Master Program. The City's SMP will apply concurrent with annexation and no additional procedures are required by Ecology at the time of annexation (WAC 173-26-150) unless a re-designation is occurring as specified per Table 4-1 of this Program.

Response: The subject site is located on the north side of SE Leadbetter Road, across from Lacamas Lake, which is a shoreline of the state, and falls within the 200-foot Urban Conservancy shoreline. Therefore, the Shoreline Master Program applies.

2.2 Shoreline Substantial Development Permit Required

Response: This application is for a 152-lot subdivision on a site within the shoreline jurisdiction for Lacamas Lake. A Shoreline Substantial Development Permit is required.

CHAPTER 3 SHORELINE MASTER PROGRAM GOALS AND POLICIES

3.1 General Shoreline Goals

The general goals of this Program are to:

- Use the full potential of shorelines in accordance with the opportunities presented by their relationship to the surrounding area, their natural resource values, and their unique aesthetic qualities offered by water, topography, and views; and

Response: This application is for a 152-lot subdivision within the shoreline jurisdiction for Lacamas Lake. The site is on the opposite side of SE Leadbetter Road from the lake, creating a physical separation of the site from the lake. The shoreline does provide unique aesthetic qualities and views. The development also protects mature trees within the shoreline jurisdiction to maintain the natural separation of the neighborhood and the shoreline to maintain the aesthetic qualities of the shoreline and help maintain the views of the shoreline.

- Develop a physical environment that is both ordered and diversified and which integrates water and shoreline uses while achieving a net gain of ecological function.

Response: The Lacamas Lake shoreline along the site frontage contains existing SE Leadbetter Road and an existing sanitary sewer pump station, reducing ecological function of the shoreline. The development will provide two large natural area tracts along SE Leadbetter Road adjacent to the shoreline which while help protect the existing ecological function of the shoreline. The development will also construct a portion of the T-3 trails as identified in the City of Camas Parks, Recreation and Open Space (PROS) Plan. The trail section will provide additional access to the shorelines aesthetic value.

3.2 Shorelines of Statewide Significance

Within the City of Camas, the Columbia River and the Washougal River are designated shorelines of statewide significance (SSWS). Shorelines of statewide significance are of value to the entire state. In accordance with RCW 90.58.020, SSWS will be managed as follows:

Response: The site is not within the shoreline jurisdiction for the Columbia River or Washougal River, this section does not apply.

3.3 Archaeological, Historic, and Cultural Resources

3.3.1 Goal

The goal for archaeological, historic, and cultural resources is to preserve and prevent the destruction of or damage to any site having historic, cultural, scientific, or educational value. Such sites include those identified by affected Indian tribes, the Department of Archaeology and Historic Preservation, Clark County Historic Preservation Commission, and other appropriate authorities.

Response: Archaeological Investigations Northwest, Inc (AINW) completed an archaeological predetermination on site as part of the originally approved subdivision application (SUB10-03). As part of the predetermination it was determined that no additional archaeological work would be required on site. If additional archaeological materials are discovered during construction, appropriate measures to protect these resources will be taken.

3.4 Conservation

3.4.1 Goal

The goal of conservation is to protect shoreline resources, vegetation, important shoreline features, shoreline ecological functions and the processes that sustain them to the maximum extent practicable.

Response: The development will provide two large natural area tracts along SE Leadbetter Road adjacent to the shoreline which while help protect the existing ecological function of the shoreline. The development will also construct a portion of the T-3 trails as identified in the City of Camas Parks, Recreation and Open Space (PROS) Plan. The trail section will provide additional access to the shorelines aesthetic value.

3.5 Economic Development

3.5.1 Goal

The goal for economic development is to create and maintain an economic environment that is balanced with the natural and human environment.

Response: The proposed project will allow for the economic development of the site while provided tracts to protect critical areas and native mature vegetation on site and within the shoreline jurisdiction.

3.6 Flood Prevention and Flood Damage Minimization

3.6.1 Goal

The goal for flood hazards is to promote public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas.

Response: The proposed lots and roads are generally to be constructed outside of the shoreline jurisdiction and no portion of the site is within a flood plain. The development will also provide tracts to protect critical areas and mature native vegetation, as well as collecting, treating, and detaining stormwater to help prevent potential flooding.

3.7 Public Access and Recreation

3.7.1 Goal

The goal of public access and recreation is to increase the ability of the general public to enjoy the water's edge, travel on the waters of the state, and to view the water and the shoreline from adjacent locations.

Response: The development will provide two large natural area tracts along SE Leadbetter Road adjacent to the shoreline which while help protect the existing ecological function of the shoreline. The development will also construct a portion of the T-3 trails as identified in the City of Camas Parks, Recreation and Open Space (PROS) Plan. The trail section will provide additional access to the shorelines aesthetic value. No existing public or recreational access to the lake will be negatively impacted by the development.

3.8 Restoration

3.8.1 Goal

The goal of restoration is to re-establish, rehabilitate and/or otherwise improve impaired shoreline ecological functions and/or processes through voluntary and incentive-based public and private programs and actions that are consistent with the SMP Restoration Plan and other approved restoration plans.

Response: Restoration of the shoreline is not proposed with this project. The development will provide two large natural area tracts along SE Leadbetter Road adjacent to the shoreline which while help protect the existing ecological function of the shoreline.

3.9 Shoreline Modification and Stabilization

3.9.1 Goal

The goal for shoreline modification and stabilization is to avoid or minimize the need for shoreline armoring along shorelines of the state, and when it is necessary, achieve it in a way that best protects ecosystem processes, shoreline functions, and downstream properties. Shoreline stabilization activities should also be reviewed in balance with the provisions of Section 3.6 - Flood Prevention and Flood Damage Minimization of this Program.

Response: Restoration of the shoreline is not proposed with this project.

3.10 Shoreline Use and Development

3.10.1 Goal

The goal for shoreline use and development is to balance the preservation and development of shorelines in a manner that allows for mutually compatible uses. Resulting land use patterns will be compatible with shoreline designations and sensitive to and compatible with ecological systems and other shoreline resources. To help with this balance, shoreline and water areas with unique attributes for specific long term uses such as commercial, residential, industrial, water, wildlife, fisheries, recreational and open space shall be identified and reserved.

Response: The subject site is within the Urban Conservancy shoreline jurisdiction, which allows for the development of single family residential. The development will provide two large natural area tracts along SE Leadbetter Road adjacent to the shoreline which while help protect the existing ecological function of the shoreline. The development will also construct a portion of the T-3 trails as identified in the City of Camas Parks, Recreation and Open Space (PROS) Plan. The trail section will provide additional access to the shorelines aesthetic value.

3.11 Transportation, Utilities, and Essential Public Facilities

3.11.1 Goal

The goal for transportation, utilities, and essential public facilities is to provide for these facilities in shoreline areas without adverse effects on existing shoreline use and development or shoreline ecological functions and/or processes.

Response: SE Leadbetter Road runs through the Lacamas Lake shoreline jurisdiction and fronts the subject site. As part of the development, no improvements are proposed to SE Leadbetter Road because the City will be permanently closing the road to vehicle traffic at some point west of the subject site in the near future.

3.12 Views and Aesthetics

3.12.1 Goal

The goal for views and aesthetics is to assure that the public's opportunity to enjoy the physical and aesthetic qualities of shorelines of the state, including views of the water, is protected to the greatest extent feasible.

Response: The development will provide two large natural area tracts along SE Leadbetter Road adjacent to the shoreline which while help protect the existing ecological function of the shoreline. The development will also construct a portion of the T-3 trails as identified in the City of Camas Parks, Recreation and Open Space (PROS) Plan. The trail section will provide additional access to the shorelines aesthetic value.

3.13 Water Quality and Quantity

3.13.1 Goal

The goal for water quality and quantity is to protect and enhance the quality and quantity of the region's water resources to ensure there is safe, clean water for the public's needs and enjoyment; and protect wildlife habitat.

Response: The proposed lots and roads are generally to be constructed outside of the shoreline jurisdiction and no portion of the site is within a flood plain. The development will also provide tracts to protect critical areas and mature native vegetation, as well as collecting, treating, and detaining stormwater prior to releasing it.

CHAPTER 4 SHORELINE DESIGNATIONS

4.3 Shoreline Designations

The City classification system consists of shoreline designations that are consistent with and implement the Act (RCW 90.58), the Shoreline Master Program Guidelines (WAC 173-26) and the City of Camas Comprehensive Plan. These designations have been assigned consistent with the corresponding criteria provided for each shoreline designation. In delineating shoreline designations, the City aims to ensure that existing shoreline ecological functions are protected with the proposed pattern and intensity of development. Such designations should be consistent with the policies for restoration of degraded shorelines. The five shoreline designations are:

- Aquatic;
- Natural;
- Urban Conservancy;
- Medium Intensity; and
- High Intensity

4.3.3 Urban Conservancy Shoreline Designation

Response: According to the Camas Shoreline Designations Map dated August 24, 2012, the subject site is within the Urban Conservancy shoreline jurisdiction.

4.3.3.1 Purpose

The purpose of the "Urban Conservancy" shoreline designation is to protect and restore ecological functions of open space, floodplains, and other sensitive lands, where they exist in urban and developed settings, while allowing a variety of compatible uses.

Response: The Urban Conservancy shoreline jurisdiction allows for the development of single family residential. The development will provide two large natural area tracts along SE Leadbetter Road adjacent to the shoreline which while help protect the existing ecological function of the shoreline. The development will also construct a portion of the T-3 trails as identified in the City of Camas Parks, Recreation and Open Space (PROS) Plan. The trail section will provide additional access to the shorelines aesthetic value. The subject site is outside of the flood plain and SE Leadbetter Road is an existing road that separates the site from the Lacamas Lake shoreline.

CHAPTER 5 GENERAL SHORELINE USE AND DEVELOPMENT REGULATIONS

5.1 General Shoreline Use and Development Regulations

1. Shoreline uses and developments that are water-dependent shall be given priority.

Response: The shoreline for Lacamas Lake adjacent to the subject site is a steep slope immediate off the shoulder of SE Leadbetter road. No water access or water depended uses are available adjacent to the site. The development will construct a portion of the T-3 trail near SE Leadbetter Road that will provide views of the water from the subject site. This standard isw met.

2. Shoreline uses and developments shall not cause impacts that require remedial action or loss of shoreline functions on other properties.

Response: The shoreline is located on the south side of SE Leadbetter Road and the subject site is located on the north side. No impacts will be caused by the development. This standard is met.

3. Shoreline uses and developments shall be located and designed in a manner such that shoreline stabilization is not necessary at the time of development and will not be necessary in the future for the subject property or other nearby shoreline properties unless it can be demonstrated that stabilization is the only alternative to protecting public safety and existing primary structures.

Response: The shoreline is located on the south side of SE Leadbetter Road and the subject site is located on the north side. No shoreline stabilization will be required with this development. This standard is met.

4. Land shall not be cleared, graded, filled, excavated or otherwise altered prior to issuance of the necessary permits and approvals for a proposed shoreline use or development to determine if environmental impacts have been avoided, minimized and mitigated to result in no net loss of ecological functions.

Response: No work will be done within the shoreline jurisdiction prior to approval of this shoreline substantial development permit. This standard will be met.

5. Single family residential development shall be allowed on all shorelines except the Aquatic and Natural shoreline designation, and shall be located, designed and used in accordance with applicable policies and regulations of this Program.

Response: The proposed application is for the development of a 152-lot subdivision within the Urban Conservancy shoreline designation. The proposed project will meet the requirement of the City of Camas Shoreline Master Program. This standard is met.

6. Unless otherwise stated, no development shall be constructed, located, extended, modified, converted, or altered or land divided without full compliance with CMC Title 17 Land Development and CMC Title 18 Zoning.

Response: The proposed application will be reviewed and approved by the City following the Type III Subdivision review process to determine that the proposed project will meet the requirement of CMC Titles 17 and 18. This standard will be met.

7. On navigable waters or their beds, all uses and developments should be located and designed to: (a) minimize interference with surface navigation; (b) consider impacts to public views; and (c) allow for the safe, unobstructed passage of fish and wildlife, particularly species dependent on migration.

Response: Lacamas Lake is not designated as navigable water. This standard does not apply.

8. Hazardous materials shall be disposed of and other steps be taken to protect the ecological integrity of the shoreline area in accordance with the other policies and regulations of this Program as amended and all other applicable federal, state, and local statutes, codes, and ordinances.

Response: The proposed project does not contain any know hazardous materials. Any hazardous materials found on site during construction will be disposed on properly. Grading for the proposed project will require blasting of bed, which will follow all local, state, or federal regulations to ensure that no hazardous material leaves the site and is disposed of appropriately. This standard is met.

9. In-water work shall be scheduled to protect biological productivity (including but not limited to fish runs, spawning, and benthic productivity). In-water work shall not occur in areas used for commercial fishing during a fishing season unless specifically addressed and mitigated for in the permit.

Response: The propose project will not require any in-water work. This standard does not apply.

10. The applicant shall demonstrate all reasonable efforts have been taken to avoid, and where unavoidable, minimize and mitigate impacts such that no net loss of critical area and shoreline function is achieved. Applicants must comply with the provisions of Appendix C with a particular focus on mitigation sequencing per Appendix C, Section 16.51.160 *Mitigation Sequencing*. Mitigation Plans must comply with the requirements of Appendix C, Section 16.51.170 *Mitigation Plan Requirements*, to achieve no net loss of ecological functions.

Response: The application proposed three large natural area tracts to project on-site critical areas, include a wetland, Type Np stream, and Type Ns stream, and project existing native mature vegetation. A Critical Areas Report is included with this application for review and approval by the City. This standard is met.

11. The effect of proposed in-stream structures on bank margin habitat, channel migration, and floodplain processes should be evaluated during permit review.

Response: The project does not propose in-stream structures. This standard does not apply.

12. Within urban growth areas, Ecology may grant relief from use and development regulations in accordance with RCW 90.58.580, and requested with a shoreline permit application.

Response: No relief from development regulations are requested with this application.

5.2 Archaeological, Cultural and Historic Resources

When a shoreline use or development is in an area known or likely to contain archaeological artifacts as indicated on the *City of Camas Archaeological Probability* map, or as recorded at the state or county historical offices, then the applicant shall provide for a site inspection and evaluation by a professional archaeologist. Development permits may not be issued until the inspection and evaluation have been completed and the city has issued approval. If an item of possible archeological interest is discovered on site, all work shall immediately cease and notification of such a find will be sent to the City, the Office of Archaeology and Historic Preservation, and affected Native American tribes. Activities on site may resume only upon receipt of the City's approval.

Response: Archaeological Investigations Northwest, Inc (AINW) completed an archaeological predetermination on site as part of the originally approved subdivision application (SUB10-03). As part of the predetermination it was determined that no additional archaeological work would be required on site. If additional archaeological materials are discovered during construction, appropriate measures to protect these resources will be taken.

5.3 Critical Areas Protection

Critical Areas Regulations are found in Appendix C of this program, and are specifically at Chapters 16.51 through 16.61. Provisions of the Critical Areas Regulations that are not consistent with the Shoreline Management Act, RCW Chapter 90.58, and supporting Washington Administrative Code chapters shall not apply in shoreline jurisdiction. These regulations are integral and applicable to this Program, except that:

Response: The application proposed three large natural area tracts to project on-site critical areas, include a wetland, Type Np stream, and Type Ns stream, and project existing native mature vegetation. A Critical Areas Report is included with this application for review and approval by the City. This standard is met.

5.3.1 Applicable Critical Areas

For purposes of this Program, the following critical areas, as defined in Appendix C will be protected under this Program: Wetlands; Critical Aquifer Recharge Areas; Frequently Flooded Areas; Geologically Hazardous Areas; and Fish and Wildlife Habitat Conservation Areas.

Response: The application proposed three large natural area tracts to project on-site critical areas, include a wetland, Type Np stream, and Type Ns stream, and project existing native mature vegetation. A Critical Areas Report is included with this application for review and approval by the City. The subject site has historic landslide areas on site Multiple geotechnical reports are included in the application and a geotechnical engineer will be on site during construction to ensure slope stability. This standard is met.

5.3.2 General Provisions

1. **Shoreline uses, activities, developments and their associated structures and equipment shall be located, designed and operated to protect the ecological processes and functions of critical areas.**
2. **Provisions of the Critical Areas Regulations that are not consistent with the Shoreline Management Act Chapter, 90.85 RCW, and supporting Washington Administrative Code chapters shall not apply in shoreline jurisdiction.**
3. **Where appropriate, new or redevelopment proposals shall integrate protection of wetlands, fish and wildlife habitat, and flood hazard reduction with other stream management provisions, such as retention of channel migration zones, to the extent they are within the shoreline jurisdictional area to ensure no net loss of ecological functions.**
4. **Critical areas within the shoreline jurisdiction shall be regulated for any use, development or activity, as provided in accordance with this Program, and Appendix C, whether or not a permit or written statement of exemption is required.**
5. **If provisions of Appendix C and other parts of this Program conflict, the provisions most protective of ecological and historic resources shall apply.**

6. Unless otherwise stated, critical area buffers shall be protected and/or enhanced in accordance with this Program and Appendix C. These provisions do not extend the shoreline jurisdiction beyond the limits specified in this Program as defined in Section 2.1 Applicability.

7. In addition to compensatory mitigation, unavoidable adverse impacts may be addressed through restoration efforts.

Response: The application proposed three large natural area tracts to project on-site critical areas, include a wetland, Type Np stream, and Type Ns stream, and project existing native mature vegetation. The buffers for the wetland will be modified, as allowed by the Camas Municipal Code (CMC). A Critical Areas Report and Buffer Modification Plan are included with this application for review and approval by the City. This standard is met.

5.4 Flood Prevention and Flood Damage Minimization

Response: The subject site is not within the flood plain. This standard does not apply.

5.5 Public Access

1. Provisions for adequate public access shall be incorporated into all shoreline development proposals that involve public funding unless the proponent demonstrates public access is not feasible due to one or more of the provisions of Section 5.5 Regulation 2.a-e.

Response: The proposed project will not involve public funding. Direct public access cannot be provided to the shoreline due to the site being separated from the shoreline by SE Leadbetter Road. The development will construct a portion of the T-3 trail that will provide visual access to the shoreline and lake from the site. This standard is met.

2. Provisions for adequate public access shall be incorporated into all land divisions and other shoreline development proposals, unless this requirement is clearly inappropriate to the total proposal. The nexus, proportionality, need and support for such a connection shall be based on the policies of this Program. Public access will not be required where the proponent demonstrates one or more of the following:

Response: Direct public access cannot be provided to the shoreline due to the site being separated from the shoreline by SE Leadbetter Road. The development will construct a portion of the T-3 trail that will provide visual access to the shoreline and lake from the site. This standard is met.

3. Public access sites shall be connected to a barrier free route of travel and shall include facilities based on criteria within the Americans with Disabilities Act Accessibility Guidelines.

Response: Direct public access cannot be provided to the shoreline due to the site being separated from the shoreline by SE Leadbetter Road. The development will construct a portion of the T-3 trail that will provide visual access to the shoreline and lake from the site. The proposed trail will be designed to meet the requirements of the Americans with Disabilities Act (ADA). This standard is met.

4. Public access shall include provisions for protecting adjacent properties from trespass and other possible adverse impacts to neighboring properties.

Response: The proposed T-3 trail will connect to the existing sidewalk at the SE Leadbetter Road and N Adams Street on the east side of the project. The trail will temporarily end at the west site boundary and will eventually extend to the west on City owned property. The trail will be located downhill from all private property and will be separated by slopes that will help prevent trespass. Private properties will also have privacy fenced installed along the rear yard to provide separation. This standard is met.

5. A sign indicating the public's right of access to shoreline areas shall be installed and maintained in conspicuous locations.

Response: Direct public access cannot be provided to the shoreline due to the site being separated from the shoreline by SE Leadbetter Road. Therefore, signs will not be installed.

6. Required public access shall be developed at the time of occupancy of the use or activity.

Response: The T-3 trail will be constructed during subdivision construction as required by the City. This standard will be met.

7. Public access shall consist of a dedication of land or a physical improvement in the form of a walkway, trail, bikeway, corridor, viewpoint, park, deck, observation tower, pier, boat launching ramp, dock or pier area, or other area serving as a means of view and/or physical approach to public waters and may include interpretive centers and displays.

Response: Direct public access cannot be provided to the shoreline due to the site being separated from the shoreline by SE Leadbetter Road.

8. Public access easements and permit conditions shall be recorded on the deed of title and/or on the face of a plat or short plat as a condition running contemporaneous with the authorized land use, as a minimum. Said recording with the County Auditor's Office shall occur at the time of permit approval.

Response: The T-3 will be constructed within tracts that will be owned by the private homeowners' association. An easement will be granted to the City of camas for the trail that will provide public access to the trail and views of the shoreline. This standard is met.

9. Future actions by the applicant, successors in interest, or other parties shall not diminish the usefulness or value of the public access provided.

10. Maintenance of the public access facility shall be the responsibility of the owner unless otherwise accepted by a public or non-profit agency through a formal agreement approved by the Shoreline Administrator and recorded with the County Auditor's Office.

5.6 Restoration

Response: The proposed application will not have impacts to the existing shoreline. Therefore, there will be no restoration required related to the project. This standard does not apply.

5.7 Site Planning and Development

5.7.1 General

1. Land disturbing activities such as grading and cut/fill shall be conducted in such a way as to minimize impacts to soils and native vegetation.

Response: The Applicant will submit an Erosion Control plan for approval by the City and install approve erosion control best management practices (BMPs) prior to beginning site

grading. Grading near the shoreline jurisdiction will be kept as minimal as possible and generally be limited to grading for the T-3 trail and some home sites.

2. **Impervious surfaces shall be minimized to the extent feasible so as not to jeopardize public safety.**

Response: Impervious surfaces created by the development will included roads, sidewalks, houses, and driveways. The total impervious surface for the site will be ±20.90 acres, or 42% of the site. Large natural area tracks, landscape planter island, and open space tracts will help break up the impervious surfaces and stormwater collection, treatment, and detention systems will protect the home sites, neighboring properties, and the shoreline. This standard is met.

3. **When feasible, existing transportation corridors shall be utilized.**

Response: The subject site has frontage along, and will gain access from, existing SE Leadbetter Road. No frontage improvements are proposed for SE Leadbetter Road. The intersection of proposed N Elk Drive with SE Leadbetter Road and a small portion of N Elk Drive will be constructed within the shoreline jurisdiction to provide primary access to the site. This standard is met.

4. **Vehicle and pedestrian circulation systems shall be designed to minimize clearing, grading, alteration of topography and natural features, and designed to accommodate wildlife movement.**

Response: The intersection of N Elk Drive has been located to minimize the grading and vegetation removal for the site. The proposed T-3 trail section is located to minimize the grading required to construct the ADA trail. See the Preliminary Plans included with this application for more information. This standard is met.

5. **Parking, storage, and non-water dependent accessory structures and areas shall be located landward from the OHWM and landward of the water-oriented portions of the principle use.**

Response: Parking and storage will generally be located on individual private lots and not for public use. All these areas will be located landward of the shoreline to the greatest extent practicable. The majority of the lots are located outside of the shoreline jurisdiction. This standard is met.

6. **Trails and uses near the shoreline shall be landscaped or screened to provide visual and noise buffering between adjacent dissimilar uses or scenic areas, without blocking visual access to the water.**

Response: The proposed T-3 trail section will be screened from SE Leadbetter Road by existing mature trees along the north side of the road. The trail will also be located in large natural area tracts within the development and will be separated from the private lots with grade, fencing, and natural vegetation and this standard is met.

7. **Elevated walkways shall be utilized, as appropriate, to cross sensitive areas such as wetlands.**

Response: No elevated walkways are proposed with this application. This standard does not apply.

8. **Fencing, walls, hedges, and similar features shall be designed in a manner that does not significantly interfere with wildlife movement.**

Response: The proposed application will provide three large open space tracts that will have large open section that will allow for the movement of wildlife. Some fencing of the private lots will occur along portion of the natural areas but will not fully enclose any natural areas. This standard is met.

9. **Exterior lighting shall be designed, shielded and operated to: a) avoid illuminating nearby properties or public areas; b) prevent glare on adjacent properties, public areas or roadways; c) prevent land and water traffic hazards; and d) reduce night sky effects to avoid impacts to fish and wildlife.**

Response: Proposed lighting will be limited to required street lighting within the development and typical private lot residential lighting. All private lots adjacent to the shoreline will direct light away from the shorelines and shielded to prevent light pollution. This standard is met.

10. **Utilities shall be located within roadway and driveway corridors and rights-of-way wherever feasible.**

Response: Proposed utilities within the shoreline jurisdiction will be located within the roadway. Within the development, some utilities will run through private tracts due to grade restrictions, and easements will be granted to the City for these areas. This standard is met.

11. **A use locating near a legally established aquaculture enterprise, including an authorized experimental project, shall demonstrate that such use would not result in damage to or destruction of the aquaculture enterprise, or compromise its monitoring or data collection.**

Response: The subject site is not located adjacent to an aquaculture. This standard does not apply.

5.7.2 Clearing, Grading, Fill and Excavation

1. **Clearing and grading shall be scheduled to minimize adverse impacts, including but not limited to, damage to water quality and aquatic life.**

Response: The proposed project will provide appropriate erosion control BMPs will be in place during site grading and grading is anticipated to generally occur outside of the wet season. This standard is met.

2. **Clearing and grading shall not result in substantial changes to surface water drainage patterns off the project site and onto adjacent properties.**

Response: Currently, surface water drainage flow directly to the ditch along SE Leadbetter Road or to the wetland, which then drains to SE Leadbetter Road. Drainage from the ditch passes under SE Leadbetter Road into Lacamas Lake through culverts. The proposed development will collect and treat surface runoff on site, and either be released to the wetland or directly to Lacamas Lake under a large water body exemption as allowed by CMC, maintain the general predevelopment drainage pattern. This standard is met.

3. **Developments shall include provisions to control erosion during construction and to ensure preservation of native vegetation for bank stability.**

Response: The Applicant will submit an Erosion Control plan for approval by the City and install approved erosion control BMPs prior to beginning site grading. Erosion control BMPs will remain in place until site construction is complete. This standard is met.

4. Grading and grubbed areas shall be planted with a cover crop of native grasses until construction activities are completed.

Response: All grading areas will be seeded with native grass seed mix. This standard is met.

5. Clearing, filling, or excavation shall not be conducted where shoreline stabilization will be necessary to protect materials placed or removed. Disturbed areas shall be stabilized immediately and revegetated with native vegetation.

Response: No grading will occur in a location where shoreline stabilization will be necessary. This standard is met.

6. Fills shall be permitted only in conjunction with a permitted use, and shall be of the minimum size necessary to support that use. Speculative fills are prohibited.

Response: Some fill will occur within the shoreline jurisdiction for trail construction, lot grading, and construction of the N Elk Drive and SE Leadbetter Road intersection. No speculative fills are proposed. This standard is met.

7. Soil, gravel or other substrate transported to the site for fill shall be screened and documented that it is uncontaminated. Use of polluted dredge material or materials normally disposed of at a solid waste facility is prohibited.

Response: Fill areas will use on-site materials for fill. A temporary use permit will be obtained for a mobile rock crusher to crush on-site bed rock for use as gravel fill. If off-site materials are used, they will be screened as required by this section. This standard will be met.

8. Fills shall be designed and placed to allow surface water penetration into groundwater supplies where such conditions existed prior to filling.

Response: Currently, surface water does not generally penetrate into groundwater supplies due to shallow bedrock throughout the site. The on-site wetland and creeks will be protected, and natural water flows will be maintained within the critical areas. This standard is met.

9. Fills must protect shoreline ecological functions, including channel migration processes.

Response: No fill will impact the ecological functions of the shoreline or channel migration. This standard is met.

10. Fill waterward of OHWM shall only be allowed as a conditional use (except for beach nourishment or enhancement projects) and then only when necessary for the following activities: to support a water-dependent or public access use; cleanup and disposal of contaminated sediments as part of an interagency environmental clean-up plan; expansion or alteration of transportation facilities of statewide significance under specific circumstances; mitigation action; and environmental restoration.

Response: No fill will occur waterward of the ordinary high-water mark (OHWM). This standard does not apply.

11. Fills for beach nourishment or enhancement projects are subject to a substantial development permit. In the Columbia River, fills shall be prohibited between the OHWM and minus fifteen (-15) feet CRD, unless shallow water habitat will be created as mitigation.

Response: No fills for beach nourishment or enhancement are proposed with this project. This standard does not apply.

12. Excavation below the OHWM is considered dredging and subject to provisions under that section in Chapter 6.

Response: No excavation will occur below the OHWM. This standard does not apply.

13. Upon completion of construction, remaining cleared areas shall be replanted with native species as approved by the city. Replanted areas shall be maintained such that within three (3) years' time the vegetation is fully re-established.

Response: All cleared areas with be replanted with native species and maintained to ensure vegetation is established within three years. This standard is met.

14. For the purposes of this Program, preparatory work associated with the conversion of land to non-forestry uses and/or developments shall not be considered a forest practice and shall be reviewed in accordance with the provisions for the proposed non-forestry use, the general provisions of this Program, and shall be limited to the minimum necessary to accommodate an approved use.

Response: The site was previously converted from forestry land to residential land under a forest practices permit. All preparatory work will not be associated with forest practices. This standard is met.

5.7.3 Building Design

1. Structures shall be designed to conform to natural contours and minimize disturbance to soils and native vegetation

Response: The proposed development will provide homes that respond to the general grade of the site by using daylight basement houses, garage-under (up-slope) houses, and single-story houses. The development will also provide three large natural area tracts to protect native soils and vegetation. This standard is met.

2. Non-single family structures shall incorporate architectural features that provide compatibility with adjacent properties, enhance views of the landscape from the water, and reduce scale to the extent possible.

Response: All structures within the development will be single-family structures. This standard does not apply.

3. Building surfaces on or adjacent to the water shall employ materials that minimize reflected light.

Response: No buildings are proposed to be on or adjacent to the water. There will also be large native trees screening the proposed buildings from the water. This standard is met.

4. Façade treatments, mechanical equipment and windows in structures taller than two (2) stories, shall be designed and arranged to prevent bird collisions using the best available technology. Single-family residential structures shall be exempt from this provision.

Response: All structures within the development will be single-family structures. This standard does not apply.

5.8 Vegetation Conservation

1. Removal of native vegetation shall be avoided. Where removal of native vegetation cannot be avoided, it shall be minimized to protect ecological functions.

2. If native vegetation removal cannot be avoided it shall be minimized and mitigated as recommended by a qualified biologist within a Critical Area Report and shall result in no net loss of shoreline functions. Lost functions may be replaced by enhancing other functions provided that no net loss in overall functions is demonstrated and habitat connectivity is maintained. Mitigation shall be provided consistent with an approved mitigation plan per Appendix C.

Response: The proposed application will provide three large natural area tracts to protect as much native vegetation as practicable. Some native vegetation will need to be removed to construct the site access at N Elk Drive and SE Leadbetter Road and site grading. The majority of the existing native vegetation within the shoreline jurisdiction will be retained. This standard is met.

3. Clearing by hand-held equipment of invasive or non-native shoreline vegetation or plants listed on the State Noxious Weed List is permitted in shoreline locations if native vegetation is promptly re-established in the disturbed area.

Response: The proposed application does not propose the removal of vegetation in the shoreline. All vegetation removal will occur on the north site of SE Leadbetter Road. Native trees will be planted in the two large natural area tracts to replace the trees removed due to site grading within the natural areas. This standard is met.

4. If non-native vegetation is to be removed, then it shall be replaced with native vegetation within the shoreline jurisdiction.

Response: The proposed application does not propose the removal of vegetation in the shoreline. All vegetation removal will occur on the north site of SE Leadbetter Road. Native trees will be planted in the two large natural area tracts to replace the trees removed due to site grading within the natural areas. This standard is met.

5 Pruning of trees is allowed in compliance with the National Arborist Association pruning standards. Pruning must meet the following criteria:

6. Topping trees is prohibited.

Response: No trees are proposed to be pruned within the shoreline jurisdiction. No trees will be topped. This standard is met.

7. If the city determines that a tree is hazardous as verified by an arborist report, then only the hazardous portion shall be removed. Complete removal should be avoided to the extent possible. The remainder of the tree shall remain to provide habitat functions and slope stability. Mitigation may be required to compensate for reduced tree surface area coverage.

Response: AKS Engineering and Forestry has completed a Tree Report and Tree Plan as part of this application. The arborist identified some hazard trees within the shoreline jurisdiction that will need to be removed due to life-safety concerns. Mitigation measures for these hazard trees are included in the Tree Report. See the Tree Report and Tree Plan included with this application for more information. This standard is met.

8. Natural features such as snags, stumps, logs or uprooted trees, which do not intrude on the navigational channel or threaten or public safety, and existing structures and facilities, shall be left undisturbed.

Response: Any natural features within the shoreline jurisdiction that do not threaten public safety will be left in place. This standard is met.

9. Natural in-stream features such as snags, uprooted trees, or stumps should be left in place unless it can be demonstrated that they are not enhancing shoreline function or are a threat to public safety.

Response: The application does not propose to remove any features within the on-site streams or Lacamas Lake. This standard is met.

10 Aquatic weed control shall only occur to protect native plant communities and associated habitats or where an existing water-dependent use is restricted by the presence of weeds. Aquatic weed control shall occur in compliance with all other applicable laws and standards and shall be done by a qualified professional.

Response: No aquatic weed control is proposed with application. This standard does not apply.

5.9 Visual Access

Visual access shall be maintained, enhanced, and preserved as appropriate on shoreline street-ends, public utility rights-of-way above and below the ordinary high water mark. Any new or expanded building or structure over thirty-five (35) feet in height above average grade level that obstructs the shoreline view of a substantial number of residences that are adjoining shorelines shall not be allowed in accordance with RCW 90.58.320.

Response: The proposed project will construct a portion of the T-3 trail along the southern portion of the site that will provide visual access

5.10 Water Quality and Quantity

1. The location, design, construction, and management of all shoreline uses and activities shall protect the quality and quantity of surface and ground water adjacent to the site.

2. All shoreline development shall comply with the applicable requirements of CMC Chapter 14.02 Stormwater Control. 3. Best management practices (BMPs) for control of erosion and sedimentation shall be implemented for all shoreline development in substantial compliance with CMC Chapter 14.06 Erosion and Sediment Control.

Response: Stormwater runoff generated by the proposed development will be collected on site. All pollution generating runoff will be treated by mechanical filters within the catch basins located in the streets. The majority of the treated stormwater will be conveyed and discharged directly to Lacamas Lake at existing discharge points using the large water body exemption for stormwater discharge. A small portion of the treated stormwater will be conveyed to a stormwater pond in Tract R for detention, prior to being released to Wetland A at rates permitted by Camas Municipal Code (CMC). The stormwater system is designed per the Stormwater Management Manual for Western Washington. See the Preliminary Stormwater Technical Information Report (TIR) and Preliminary Plan included with this application for more information. Preliminary erosion control plans are included with this application. A more detailed and site-specific erosion control plan will be provided with final construction plans for sediment and pollution control. This standard is met.

4. Potentially harmful materials, including but not limited to oil, chemicals, tires, or hazardous materials, shall not be allowed to enter any body of water or wetland, or to be discharged onto the land except in accordance with CMC Chapter 14.04 Illicit Discharges, dumping and Illicit Connections. Potentially harmful materials shall be maintained in a safe and leak-proof condition

Response: No potentially harmful materials will enter any water body as a result of this project. This standard is met.

5 Herbicides, fungicides, fertilizers, and pesticides shall not be applied within twenty-five (25) feet of a waterbody, except by a qualified professional in accordance with state and federal laws. Further, pesticides subject to the final ruling in *Washington Toxics Coalition, et al., v. EPA* shall not be applied within sixty (60) feet for ground applications or within three hundred (300) feet for aerial applications of the subject water bodies and shall be applied by a qualified professional in accordance with state and federal law.

Response: This application does not propose the application of herbicides, pesticides, fungicides, or fertilizers within 25 feet of a water. This standard met.

6. Any structure or feature in the Aquatic shoreline designation shall be constructed and/or maintained with materials that will not adversely affect water quality or aquatic plants or animals. Materials used for decking or other structural components shall be approved by applicable state agencies for contact with water to avoid discharge of pollutants.

Response: No structure or feature are proposed in the Aquatic shoreline. This standard does not apply.

7 Conveyance of any substance not composed entirely of surface and stormwater directly to water resources shall be in accordance with CMC Chapter 14.02.

Response: The proposed application only proposed to discharge stormwater directly to Lacamas Lake as allowed by CMC. This standard is met.

8. Septic systems should be located as far landward of the shoreline and floodway as possible. Where permitted, new on-site septic systems shall be located, designed, operated, and maintained to meet all applicable water quality, utility, and health standards.

Response: No septic systems are proposed with this application. This standard does not apply.

CHAPTER 6 SPECIFIC SHORELINE USE REGULATIONS

Table 6-1 Shoreline Use, Modification and Development Standards

Abbreviations: X = Prohibited P = Permitted N/A = Not Applicable C = Conditional Use	**AQ**	**NT**	**US**	**MI**	**HI**
Shoreline Designation	**Aquatic**	**Natural**	**Urban Conservancy**	**Medium Intensity**	**High Intensity**
Shoreline Uses					
Residential Uses					
Primary structure/house	X	X	P	P	C
• Building Setback	N/A	N/A	100' [2]	35' [2]	35' [2]
• Building Height	N/A	N/A	35'	35'	45'
• Density	In accordance with the underlying zoning				
Accessory Structures					
• Building Setback	N/A	N/A	100' [2]	35' [2]	35' [2]
• Building Height	N/A	N/A	15'	25'	25'
• Density	In accordance with the underlying zoning				
Signs					
Interpretive/Educational or similar	P	P	P	P	P
Commercial/industrial-related	C	X	X	C	P
Transportation Uses					
Secondary/Public Access Roads	X	X	C	P	P
• Right-of-Way Setback	N/A	N/A	100'	50'	50'
Utility Uses					
Underground Utilities (perpendicular to shoreline)	C	X	C	C	C
• Right-of-Way Setback	0'	N/A	100'	50'	50'

6.3 Use-specific Development Regulations

Response: The proposed application is for a 152-lot residential subdivision within the Urban Conservancy shoreline jurisdiction. Per Table 6-1, the proposed us is permitted.

6.3.12 Residential Development

1. Residential developments shall include provisions to ensure preservation of native vegetation and control erosion during construction.

Response: The application proposes three natural area tracts to protects on-site critical areas and native mature vegetation. During construction appropriate erosion control BMPs will be in place to protect the existing vegetation and prevent soil erosion. This standard is met.

2. New residential construction shall be located so as not to require shoreline stabilization measures.

Response: The proposed development will occur on the north side of SE Lacamas Road, across the street from the Lacamas Lake shoreline. The proposed development will not require shoreline stabilization measures. This standard is met.

3. New residential development shall be prohibited in, over, or floating on the water.

Response: The proposed development will not occur in, over, or floating on the water. This standard is met.

4. New residential development shall be located and designed that the bulk and density of structures minimizes view obstructions to and from the shoreline.

5. Clustering of residential units shall be allowed where appropriate to minimize physical and visual impacts on shorelines.

Response: The proposed development will be located north of Lacamas Lake. Residential blocks will be terraced up the hill and houses will meet the 35-foot maximum height. A portion of the T-3 trail will also be constructed in the south portion of the development. Views of the shoreline will be maintained for the T-3 trail, as well as the proposed houses, and minimize view impacts to properties to the north of the development. This standard is met.

6. In those areas where only onsite sewage systems are available, density shall be limited to that which can demonstrably accommodate protection of surface and groundwater quality.

Response: No on-site sewage systems are proposed with this development. This standard does not apply.

7. New residential development, including sewage disposal systems, shall be prohibited in floodways and channel migration zones.

Response: The proposed project with outside of any floodway or channel migration zone. This standard is met.

8. Appurtenances, accessory uses, and facilities serving a residential structure shall be located outside setbacks and critical areas and buffers unless otherwise allowed under this Program to promote community access and recreational opportunities.

Response: All accessory structures, uses, and facilities will be located outside of setbacks and critical areas. This standard is met.

9. New residential units or lots created through land division in the shoreline shall be sized and configured in accordance with the city's zoning ordinance and shall only be permitted when the following standards are met:

   a. Flood hazard reduction measures are not required and will not be necessary during the life of the development or use in accordance with Appendix C, Chapter 16.55 Frequently Flooded Areas.

   b. Shoreline stabilization measures are not required.

Response: All proposed lots are outside flood hazard areas and will not require shoreline stabilization. This standard is met.

6.3.13 Signs

1. Free-standing signs shall be for informational purposes such as directional, navigational, educational/interpretive, and safety purposes, unless otherwise allowed under this Program and as specified in Table 6-1.

2. Signs for commercial purposes shall be limited to fascia or wall signs and as regulated by CMC Chapter 18.15 Signs, unless otherwise provided for in this chapter for specific uses.

3. All signs shall be located and designed to minimize interference with vistas, viewpoints, and visual access corridors to the shoreline.

4. Overwater signs or signs on floats or pilings shall be prohibited, except when related to navigation or a water-dependent use.

5. Illuminated signs shall be limited to informational, directional, navigational or safety purposes and shielded so as to eliminate glare when viewed from surrounding properties or watercourses.

Response: No signs are proposed as part of this application. Any signs proposed in the future will meet this requirement of this section and be approved by the City. This standard will be met.

6.3.14 Transportation Uses

Response: The subject site has frontage along SE Leadbetter Road, which runs through the shoreline jurisdiction. The site will gain access form SE Leadbetter Road; however, no frontage improvements are proposed for the road. The access intersection at proposed N Elk Drive will be constructed within the shoreline jurisdiction. The construction of N Elk Drive will not require shoreline stabilization. The proposed development will not adversely impact any water-dependent uses or access to the shoreline. The development provides two natural area tracts along SE Leadbetter Road that helps to buffer the development from the shoreline. No transportation construction work is proposed in, over, or immediately adjacent to the water. This standard is met.

6.3.15 Utilities Uses

Response: The proposed development will provide underground utilities that will generally be within the road rights-of-way. Proposed utilities will connect to the existing utilities in SE Leadbetter Road and at the terminus of N Adams Street. All utilities will be constructed outside of the shoreline jurisdiction with exception of the connections at the existing sanitary sewer pump station and the intersection of SE Leadbetter Road and N Elk Drive. Stormwater facilities to be constructed with the development will not be installed in the shoreline jurisdiction. Two culverts that run under SE Leadbetter Road will need to be upsized with the development to meet current stormwater regulations. The culvert upsizing will be constructed to avoid impacts to native aquatic vegetation. This standard is met.

V. 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 Camas Municipal Code and Shoreline Master Program. The evidence in the record is substantial and supports approval of the application. Therefore, the Applicant respectfully requests that the City approve this Shoreline Substantial Development Permit application.

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(360) 882-0419

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Date: 5/7/2021
To: Lauren Hollenbeck, Senior Planner
From: Michael Andreotti, RLA
Project Name: CJ Dens (SUB20-02)
AKS Job No.: **5504**
Project Site: 715 SE Leadbetter Road, Camas, WA 98607

Subject: **Culvert Upsizing within Shoreline Jurisdiction**

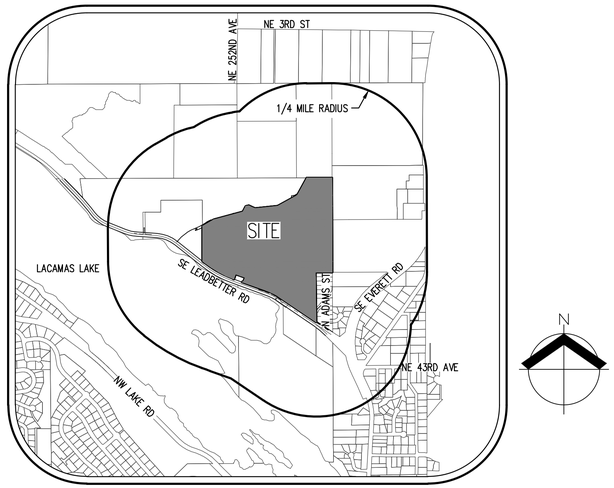
This memo is written to provide additional information regarding the upsizing of two stormwater culverts that cross under SE Leadbetter Road.

As stated in the narrative for the Shoreline Substantial Development permit, the Applicant is proposing to upsize two stormwater culverts that cross under SE Leadbetter Road that discharge stormwater to Lacamas Lake. As part of the improvements, additional riprap will likely be required at the discharge point for the upsized culverts, requiring mitigation for the shoreline. The final size of the culverts will be determined during the final engineering design process for the project. Due to the final size of the culvert not yet being determined, the full amount of riprap needed at the end of the culvert is unknown.

As the full impact cannot be determined at this time, the full amount of mitigation cannot be determined. The Applicant will provide mitigation for the impacts, likely in the form of invasive plant removal and/or the installation of native plant material around the culvert. Final mitigation will be determined during the final design process and a mitigation plan will be provided at that time.

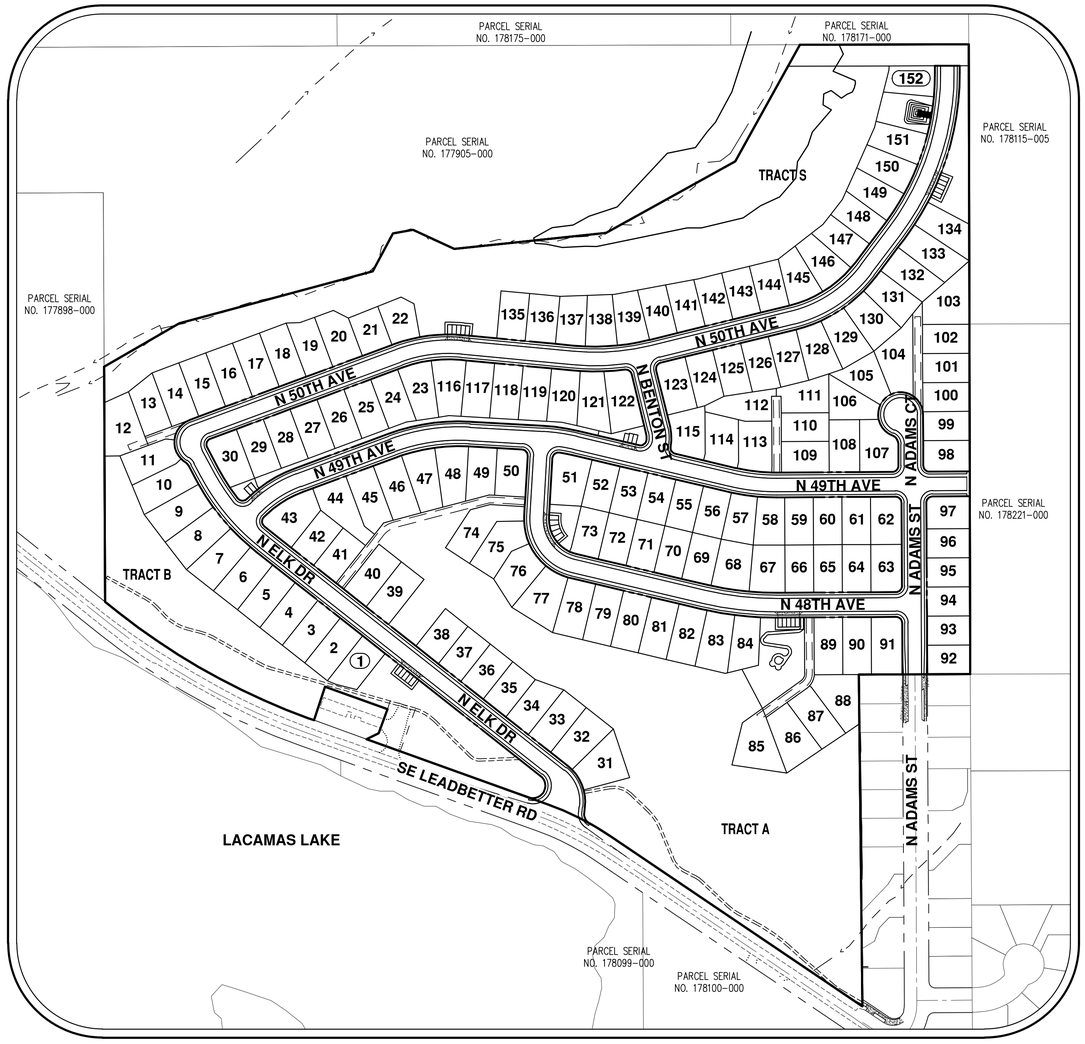
CJ DENS EAST SUBDIVISION

PRELIMINARY SUBDIVISION PLANS



VICINITY MAP

N.T.S.



SITE MAP

1"=150'

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P2.0 EXISTING CONDITIONS
P2.1 EXISTING CONDITIONS (SOUTH)
P2.2 EXISTING CONDITIONS (WEST)
P2.3 EXISTING CONDITIONS (NORTH)
P3.0 PRELIMINARY PLAT OVERVIEW
P3.1 PRELIMINARY PLAT – PHASE 1
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P7.0 PRELIMINARY STORMWATER PLAN
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P8.4 PRELIMINARY CIRCULATION PLAN
P9.0 PRELIMINARY LANDSCAPE AND LIGHTING PLAN (SOUTH)
P9.1 PRELIMINARY LANDSCAPE AND LIGHTING PLAN (WEST)
P9.2 PRELIMINARY LANDSCAPE AND LIGHTING PLAN (NORTH)

LEGEND

	EXISTING	PROPOSED		EXISTING	PROPOSED
DECIDUOUS TREE			STORM DRAIN CLEAN OUT		
CONIFEROUS TREE			STORM DRAIN CATCH BASIN		
FIRE HYDRANT			STORM DRAIN AREA DRAIN		
WATER BLOWOFF			STORM DRAIN MANHOLE		
WATER METER			GAS METER		
WATER VALVE			GAS VALVE		
DOUBLE CHECK VALVE			GUY WIRE ANCHOR		
AIR RELEASE VALVE			UTILITY POLE		
SANITARY SEWER CLEAN OUT			POWER VAULT		
SANITARY SEWER MANHOLE			POWER JUNCTION BOX		
SIGN			POWER PEDESTAL		
STREET LIGHT			COMMUNICATIONS VAULT		
MAILBOX			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	
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

APPLICANT/OWNER

CJ DENS LACAMAS II LLC
CONTACT: CARL LAWSON
PO BOX 2239
KALAMA, WA 98625

CONTACT:

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PH: 360-882-0419
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E-MAIL: ANDREOTTIM@AKS-ENG.COM

PROPERTY DESCRIPTION

LOCATED IN THE NORTHEAST 1/4 OF SECTION 34 & NORTHWEST 1/4 OF SECTION 35, TOWNSHIP 2 NORTH RANGE 3 EAST, WILLAMETTE MERIDIAN, CLARK COUNTY, WASHINGTON. PROPERTY SERIAL #'S 177906-000, 178172-000 AND 178236-000

EXISTING LAND USE

VACANT LAND ON 177906-000, 178236-000 AND 178172-000 ZONED R-7.5

PROJECT PURPOSE

SUBDIVIDE 3 PARCELS INTO 152 DETACHED SINGLE-FAMILY RESIDENTIAL LOTS WITH ASSOCIATED ROADS AND SITE IMPROVEMENTS.

SITE AREA

49.62 AC (2,161,423 SF)

VERTICAL DATUM

ELEVATIONS ARE BASED ON CLARK COUNTY BENCHMARK NO. 237 (BENCHMARK LACAMAS-13), STAMPED "24900-1992", LOCATED AT 24900 LEADBETTER ROAD, 20'W W PARK LOT ENT, 21'N CL, 8'SE END FNC. ELEVATION = 188.08 FEET (NGVD29 (47)).

AKS ENGINEERING & FORESTRY, LLC
9600 NE 126TH AVE, STE 2520
VANCOUVER, WA 98682
360.882.0419
WWW.AKS-ENG.COM

ENGINEERING · SURVEYING · NATURAL RESOURCES
FORESTRY · PLANNING · LANDSCAPE ARCHITECTURE

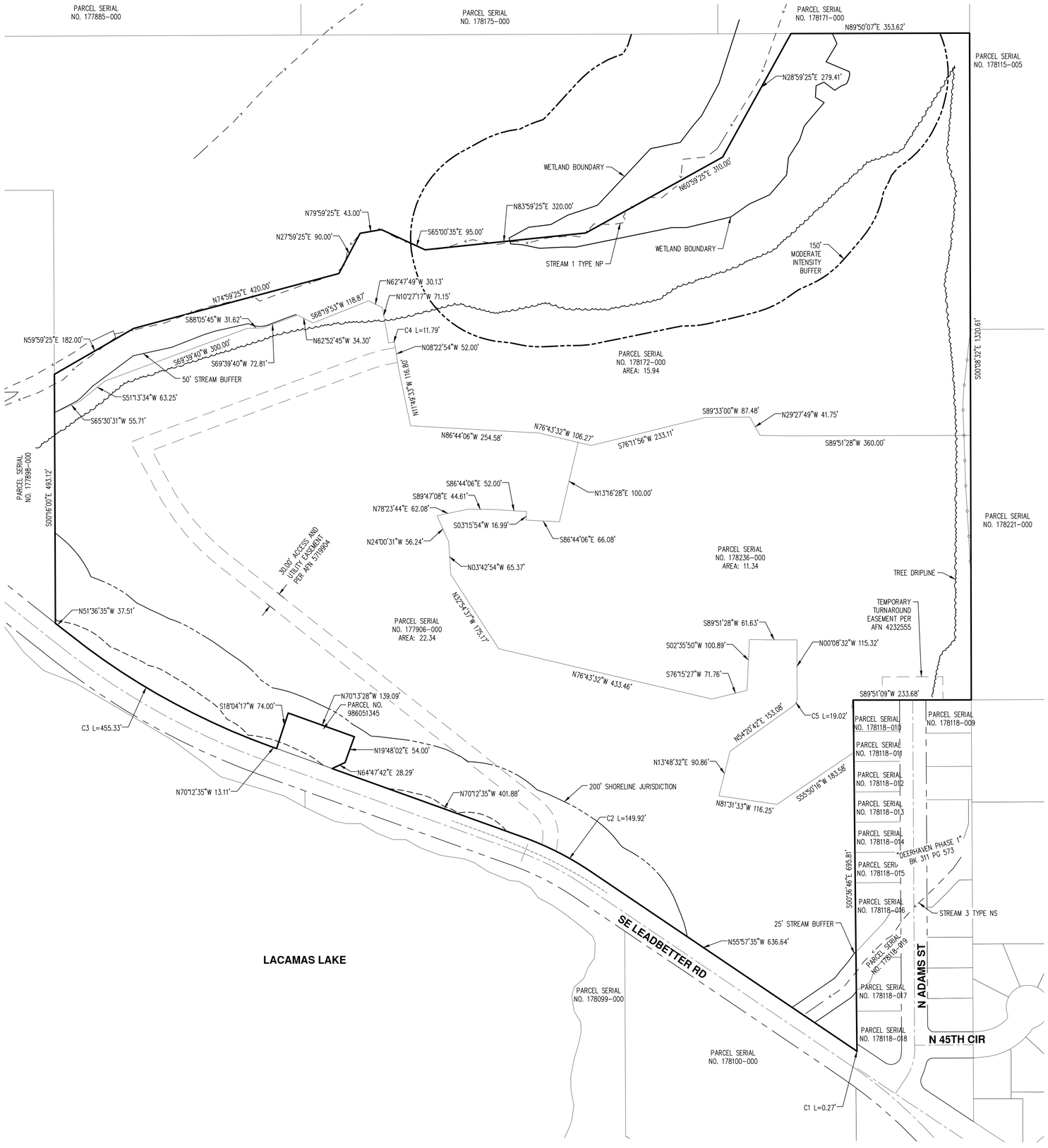
COVER SHEET
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

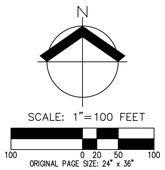
PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P1.0

AKS DRAWING FILE: 5504 P1.0 COVER.DWG | LAYOUT: P1.0





NOTES:

1. UTILITIES SHOWN ARE BASED ON UNDERGROUND UTILITY LOCATE MARKINGS AS PROVIDED BY OTHERS, PROVIDED PER UTILITY LOCATE TICKET NUMBERS 20253525, 20253535, AND 20253544. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND LOCATES REPRESENT THE ONLY UTILITIES IN THE AREA. CONTRACTORS ARE RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BEGINNING CONSTRUCTION.
2. THIS SURVEY INCLUDES TOPOGRAPHIC SURVEY DATA GATHERED BY HAGEDORN, INC IN 2010 AND AKS ENGINEERING AND FORESTRY, LLC JUNE 2019–AUGUST 2020, AND CITY OF CAMAS AS–BUILT CONSTRUCTION PLANS. AKS MAKES NO GUARANTEE REGARDING THE ACCURACY OF SURVEY DATA GATHERED BY OTHERS.
3. VERTICAL DATUM: ELEVATIONS ARE BASED ON CLARK COUNTY BENCHMARK NO. 237 LOCATED NEAR THE ENTRANCE FOR THE PARKING LOT FOR THE NORTH SHORE BOAT LAUNCH ON LACAMAS LAKE. ELEVATION = 188.08 FEET (NAVD 29(47)).
4. THIS MAP DOES NOT CONSTITUTE A PROPERTY BOUNDARY SURVEY.
5. SURVEY IS ONLY VALID WITH SURVEYOR'S STAMP AND SIGNATURE.
6. CONTOUR INTERVAL IS 2 FOOT.
7. WETLAND BOUNDARIES SHOWN WERE DELINEATED BY ELS IN WINTER 2009 AND SPRING 2013.

GENERAL NOTES:

1. REFERENCE TREE PLAN ON SHEETS P5.0–P5.5 FOR TREE INVENTORY AND NOTES.
2. ACCORDING TO CLARK COUNTY HEALTH DEPARTMENT, NO SEPTIC SYSTEMS EXIST ON–SITE.
3. ACCORDING TO CLARK COUNTY HEALTH DEPARTMENT, NO WELLS EXIST ON–SITE.

CURVE TABLE				
CURVE	RADIUS	DELTA	LENGTH	CHORD
C1	984.92'	0°00'56"	0.27'	N55°57'07"W 0.27'
C2	602.80'	14°15'00"	149.92'	N63°05'05"W 149.54'
C3	1402.62'	18°36'00"	455.33'	N60°54'35"W 453.34'
C4	326.00'	2°04'23"	11.79'	S80°34'54"W 11.79'
C5	20.00'	54°29'14"	19.02'	N27°06'05"E 18.31'

LEGEND

EXISTING		EXISTING	
DECIDUOUS TREE		STORM DRAIN CLEAN OUT	
CONIFEROUS TREE		STORM DRAIN CATCH BASIN	
FIRE HYDRANT		STORM DRAIN AREA DRAIN	
WATER BLOWOFF		STORM DRAIN MANHOLE	
WATER METER		GAS METER	
WATER VALVE		GAS VALVE	
DOUBLE CHECK VALVE		GUY WIRE ANCHOR	
AIR RELEASE VALVE		UTILITY POLE	
SANITARY SEWER CLEAN OUT		POWER VAULT	P
SANITARY SEWER MANHOLE		POWER JUNCTION BOX	
SIGN		POWER PEDESTAL	
STREET LIGHT		COMMUNICATIONS VAULT	C
MAILBOX	MB	COMMUNICATIONS JUNCTION BOX	
		COMMUNICATIONS RISER	

EXISTING	
RIGHT–OF–WAY LINE	
BOUNDARY LINE	
PROPERTY LINE	
CENTERLINE	
DITCH	
CURB	
EDGE OF PAVEMENT	
EASEMENT	
FENCE LINE	
GRAVEL EDGE	
POWER LINE	PWR
OVERHEAD WIRE	OHW
COMMUNICATIONS LINE	COM
FIBER OPTIC LINE	CFO
GAS LINE	GAS
STORM DRAIN LINE	STM
SANITARY SEWER LINE	SAN
WATER LINE	WAT

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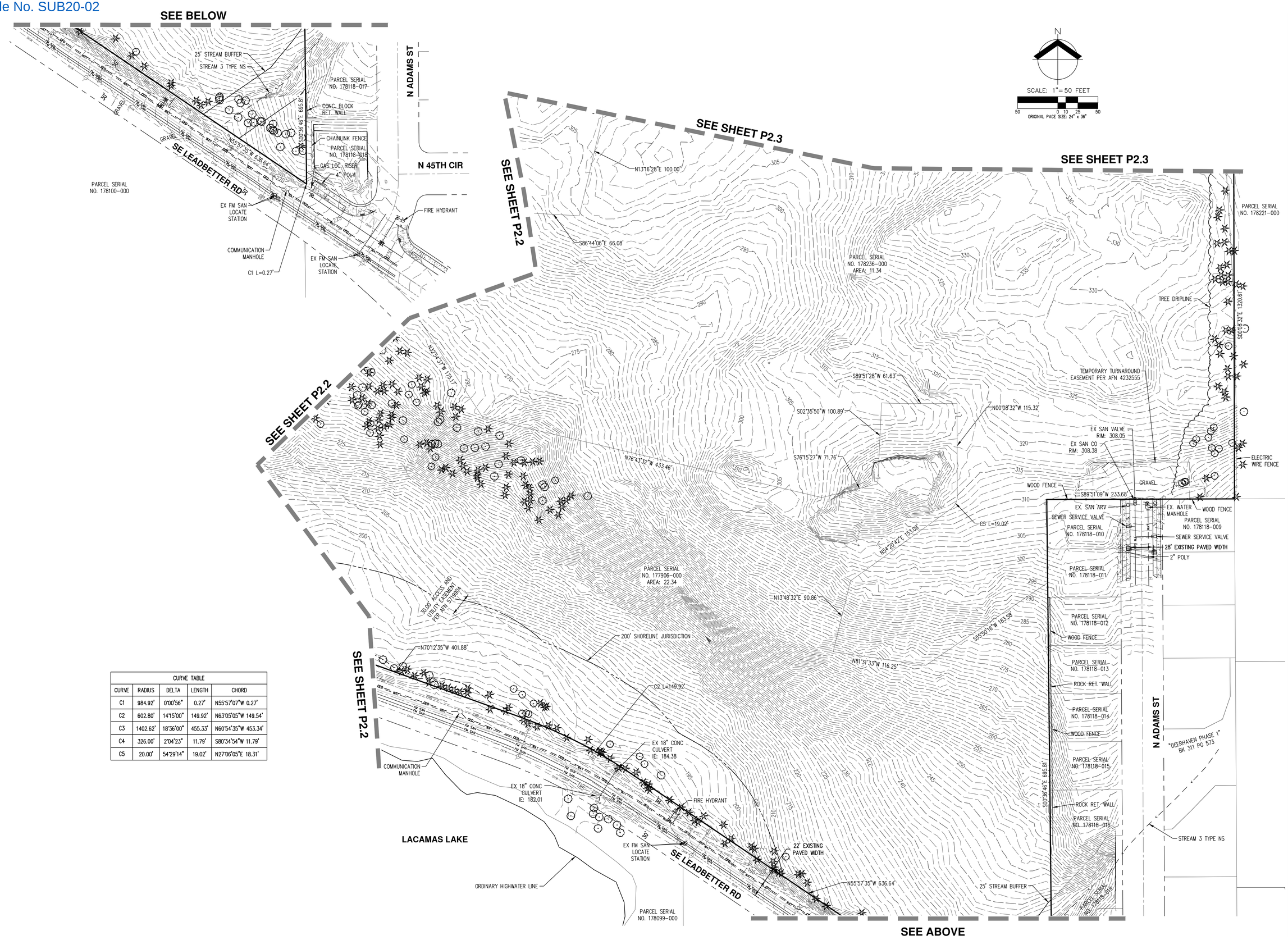
EXISTING CONDITIONS
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	
DRAWN BY:	CJC
CHECKED BY:	JOH

P2.0

AKS DRAWING FILE: 5504 P2.0 EX COND.DWG | LAYOUT: P2.0



CURVE TABLE				
CURVE	RADIUS	DELTA	LENGTH	CHORD
C1	984.92'	0°00'56"	0.27'	N55°57'07"W 0.27'
C2	602.80'	14°15'00"	149.92'	N63°05'05"W 149.54'
C3	1402.62'	18°36'00"	455.33'	N60°54'35"W 453.34'
C4	326.00'	2°04'23"	11.79'	S80°34'54"W 11.79'
C5	20.00'	54°29'14"	19.02'	N27°06'05"E 18.31'

N

SCALE: 1"=50 FEET

50 0 10 25 50

ORIGINAL PAGE SIZE: 24" x 36"

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EXISTING CONDITIONS (SOUTH)
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

JAMES O. HANSEN — EXPIRES 10/10/2021 — PROFESSIONAL LAND SURVEYOR

PRELIMINARY NOT FOR CONSTRUCTION

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DATE:	11/24/2020
DESIGNED BY:	
DRAWN BY:	CJC
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P2.1

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EXISTING CONDITIONS (WEST)
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

JAMES O. HANSEN — EXPIRES 9/29/2021 — REGISTERED PROFESSIONAL ENGINEER — CIVIL LAND SURVEYOR

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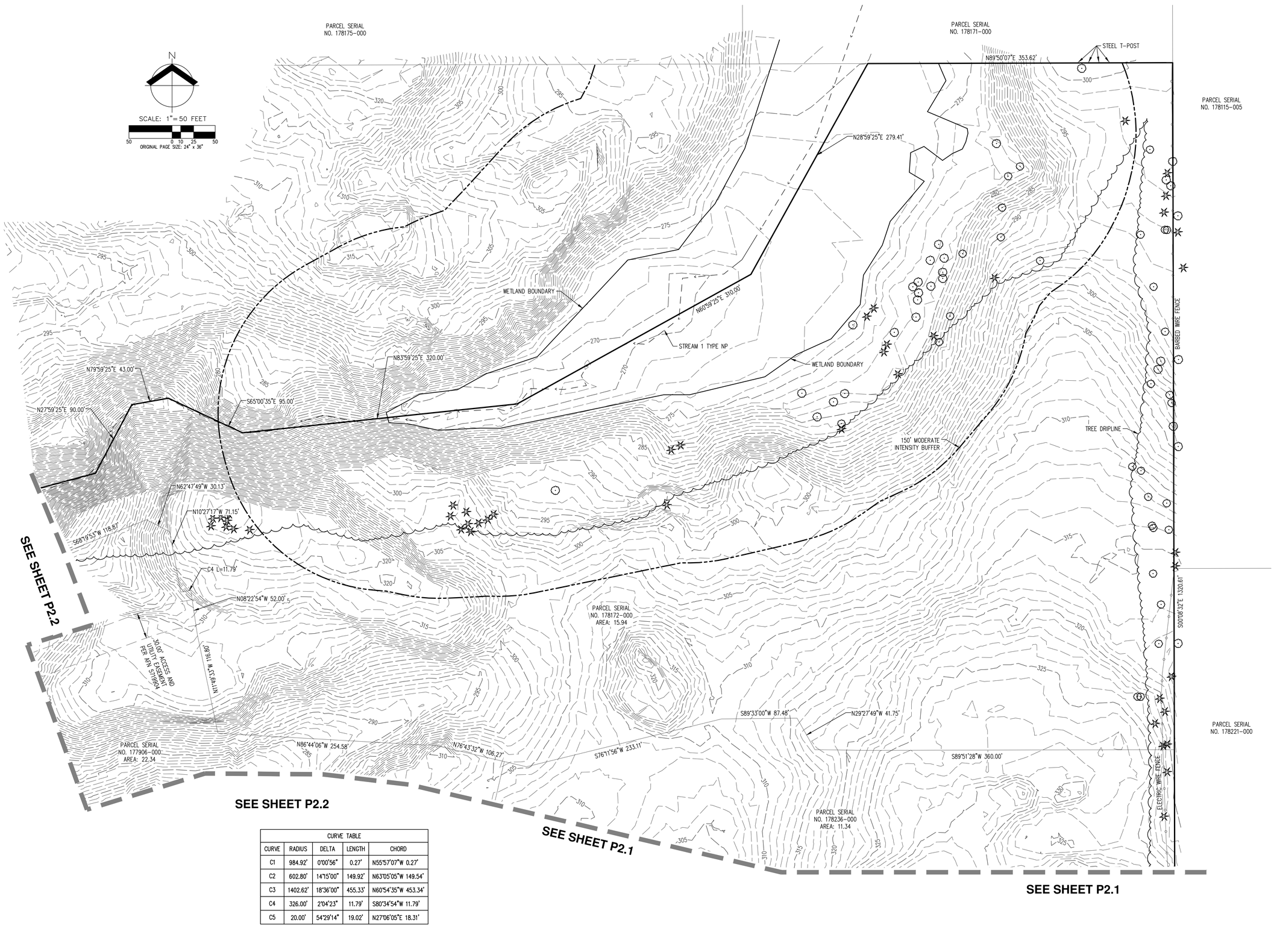
P2.2

AKS DRAWING FILE: 5504 P2.0 EX COND.DWG | LAYOUT: P2.2



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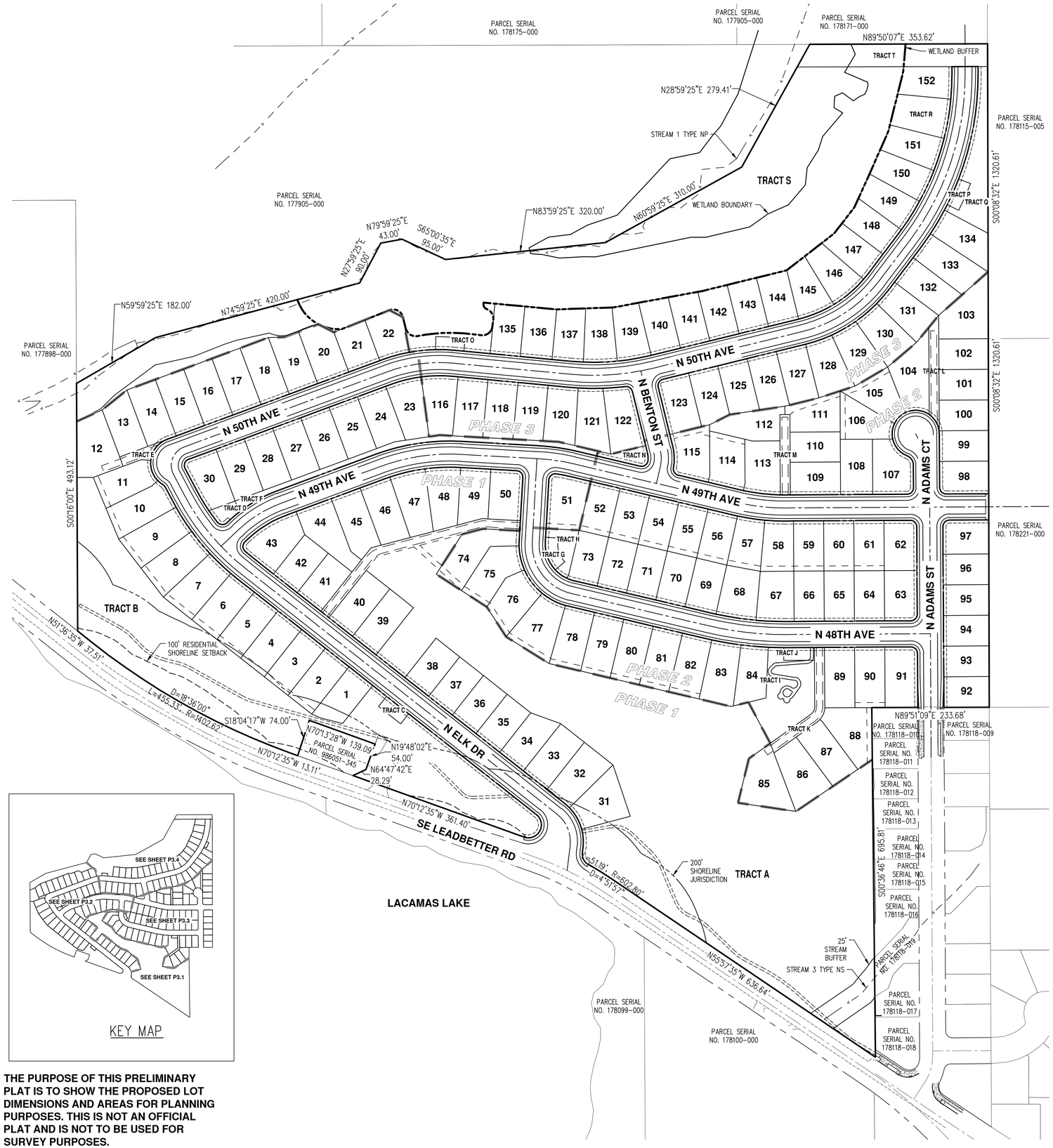

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APPLICANT/OWNER

CJ DENS LACAMAS II LLC
CONTACT: CARL LAWSON
PO BOX 2239
KALAMA WA, 98625

CONTACT:

AKS ENGINEERING & FORESTRY, LLC.
CONTACT: MICHAEL ANDREOTTI
9600 NE 126TH AVENUE, SUITE 2520
VANCOUVER, WA 98682
PH: 360-882-0419
FAX: 360-882-0426
E-MAIL: ANDREOTTIM@AKS-ENG.COM

PROPERTY DESCRIPTION

LOCATED IN THE NORTHEAST 1/4 OF SECTION 34 & NORTHWEST 1/4 OF SECTION 35, TOWNSHIP 2 NORTH RANGE 3 EAST, WILLAMETTE MERIDIAN, CLARK COUNTY, WASHINGTON. PROPERTY SERIAL #'S 177906-000, 178172-000 AND 178236-000

EXISTING LAND USE

VACANT LAND ON 177906-000, 178236-000 AND 178172-000
ZONED R-7.5

PROJECT PURPOSE

SUBDIVIDE 3 PARCELS INTO 152 DETACHED SINGLE-FAMILY RESIDENTIAL LOTS WITH ASSOCIATED ROADS AND SITE IMPROVEMENTS.

SITE AREA

49.62 AC (2,161,423 SF) CJ DENS

VERTICAL DATUM

ELEVATIONS ARE BASED ON CLARK COUNTY BENCHMARK NO. 237 (BENCHMARK LACAMAS-13), STAMPED "24900-1992", LOCATED AT 24900 LEADBETTER ROAD, 20'W W PARK LOT ENT, 21'N CL, 8'SE END FNC.
ELEVATION = 188.08 FEET (NGVD29 (47)).

GENERAL NOTES

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5. NATURAL AREA TRACTS A, B & S TO BE OWNED BY THE HOA.
6. FUTURE ROW DEDICATION TRACT T TO BE OWNED AND MAINTAINED BY THE CITY OF CAMAS.
7. BUILDING ENVELOPES SHALL BE PER DEVELOPMENT STANDARDS TABLE.
8. THERE ARE SIX PROPOSED INTERNAL PUBLIC ROADS TO SERVE THE DEVELOPMENT. THE ROADS ARE PROPOSED TO BE CONSTRUCTED TO THE 2 LANE LOCAL/SPRINKLERED SECTION (CITY OF CAMAS STANDARD DETAIL ST3).
9. ALL LOTS WILL BE SERVED WITH PUBLIC SANITARY SEWER AND WATER BY CITY OF CAMAS.
10. SURFACE MATERIAL FOR ALL PROPOSED ROADWAYS IS ASPHALT.
11. STORMWATER WILL EITHER BE DIRECTLY DISCHARGED TO A LARGE WATER BODY AFTER TREATMENT OR DETAINED, TREATED, AND DISCHARGED TO THE EXISTING WETLAND THROUGH TRACT B PER CITY OF CAMAS STANDARDS.
12. THERE ARE NO BICYCLE IMPROVEMENTS PROPOSED ON SITE.
13. NO FRONTAGE IMPROVEMENTS ARE PROPOSED FOR SE LEADBETTER ROAD.
14. 40' X 40' BUILDING FOOTPRINTS SHOWN PER CAMAS CODE 17.19.030.D.3. SEE SECTION ACTUAL BUILDING FOOT PRINTS WILL VARY AND BE DETERMINED AND REVIEWED WITH BUILDING PERMIT.
15. EXISTING ACCESS AND UTILITY EASEMENT PER AFN 5719904 TO BE RELINQUISHED WITH THIS PLAT. EXISTING TEMPORARY TURNAROUND EASEMENT PER AFN 4232555 TO BE RELINQUISHED WITH THIS PLAT.
16. PUBLIC ACCESS EASEMENT DIMENSIONS WILL BE DETERMINED WITH FINAL TRAIL DESIGN. EASEMENT WIDTHS WILL VARY TO INCLUDE TOP AND TOE OF SLOPES.

DEVELOPMENT STANDARDS

AVERAGE LOT AREA	NONE*
MINIMUM LOT SIZE	5,250 SQUARE FEET
MAXIMUM LOT SIZE	9,000 SQUARE FEET
MINIMUM LOT WIDTH	60 FEET
MINIMUM LOT DEPTH	80 FEET
MAXIMUM BUILDING LOT COVERAGE	50%**
MAXIMUM BUILDING HEIGHT	35 FEET
MINIMUM FRONT YARD SETBACK	10** FEET
MINIMUM FRONT YARD - GARAGE	18** FEET
MINIMUM SIDE YARD	5 FEET
MINIMUM STREET SIDE YARD	10 FEET
MINIMUM REAR YARD	15** FEET
MINIMUM LOT FRONTAGE ON CUL-DE-SAC	30 FEET

* THE PROPOSED DEVELOPED IS USING DENSITY TRANSFER STANDARDS. NO AVERAGE LOT AREA IS REQUIRED.

** THESE STANDARDS VARY FROM THE CODE AS ALLOWED BY CMC SECTION 18.09.060(D). THE CITY HAS APPROVED THESE VARIANCES IN PRINCIPLE, ASSUMING THE DEVELOPMENT PROVIDES SOME ACTIVE OPEN SPACE AND TREE MITIGATION PLANTINGS.

PHASING

PHASE 1:	51 LOTS
PHASE 2:	64 LOTS
PHASE 3:	37 LOTS

STATISTICS

TOTAL GROSS AREA:	2,161,423 SF (49.62 AC)
NATURAL AREA TRACTS:	693,826 SF (15.93 AC)
OPEN SPACE TRACTS:	38,118 SF (0.88 AC)
STORMWATER TRACT:	7,812 SF (0.18 AC)
ACCESS TRACTS:	18,091 SF (0.42 AC)
PARKING TRACTS:	11,255 SF (0.26 AC)
FUTURE RIGHT-OF-WAY:	16,477 SF (0.38 AC)
RIGHT-OF-WAY AREA:	336,268 SF (7.72 AC)
AVERAGE LOT AREA:	6,839 SF

DENSITY CALCULATIONS

TOTAL GROSS AREA:	2,161,423 SF (49.62 AC)
NATURAL & OPEN SPACE AREAS:	693,826 SF (15.93 AC)
NET SITE AREA:	1,467,597 SF (33.69 AC)
MAXIMUM LOTS ALLOWED (33.69 AC X 5.8):	195 LOTS
PROPOSED LOTS:	152 LOTS
PROPOSED DENSITY (152 LOTS / 33.69 AC):	4.51 LOTS/NET ACRE

TRACT AREA & PURPOSE

TRACT A:	316,739 SF	NATURAL AREA
TRACT B:	131,101 SF	NATURAL AREA
TRACT C:	1,428 SF	PARKING
TRACT D:	1,590 SF	PARKING
TRACT E:	1,535 SF	ACCESS
TRACT F:	7,978 SF	OPEN SPACE
TRACT G:	1,515 SF	PARKING
TRACT H:	3,150 SF	OPEN SPACE
TRACT I:	15,039 SF	OPEN SPACE
TRACT J:	1,557 SF	PARKING
TRACT K:	4,934 SF	ACCESS
TRACT L:	3,928 SF	ACCESS
TRACT M:	3,203 SF	ACCESS
TRACT N:	2,245 SF	PARKING
TRACT O:	1,460 SF	PARKING
TRACT P:	1,460 SF	PARKING
TRACT Q:	11,855 SF	OPEN SPACE
TRACT R:	7,812 SF	STORMWATER FACILITY
TRACT S:	249,086 SF	NATURAL AREA
TRACT T:	16,477 SF	FUTURE ROW DEDICATION

PARKING STATISTICS

REQUIRED PARKING:	1 SPACE/5 LOTS
PROPOSED PARKING:	30 SPACES (152 LOTS/5 LOTS/SPACE)
TRACT C:	5 SPACES
TRACT D:	2 SPACES
TRACT G:	5 SPACES
TRACT J:	5 SPACES
TRACT N:	3 SPACES
TRACT O:	5 SPACES
TRACT P:	5 SPACES

N

SCALE: 1"=100 FEET
100 0 20 50 100
ORIGINAL PAGE SIZE: 24" x 36"

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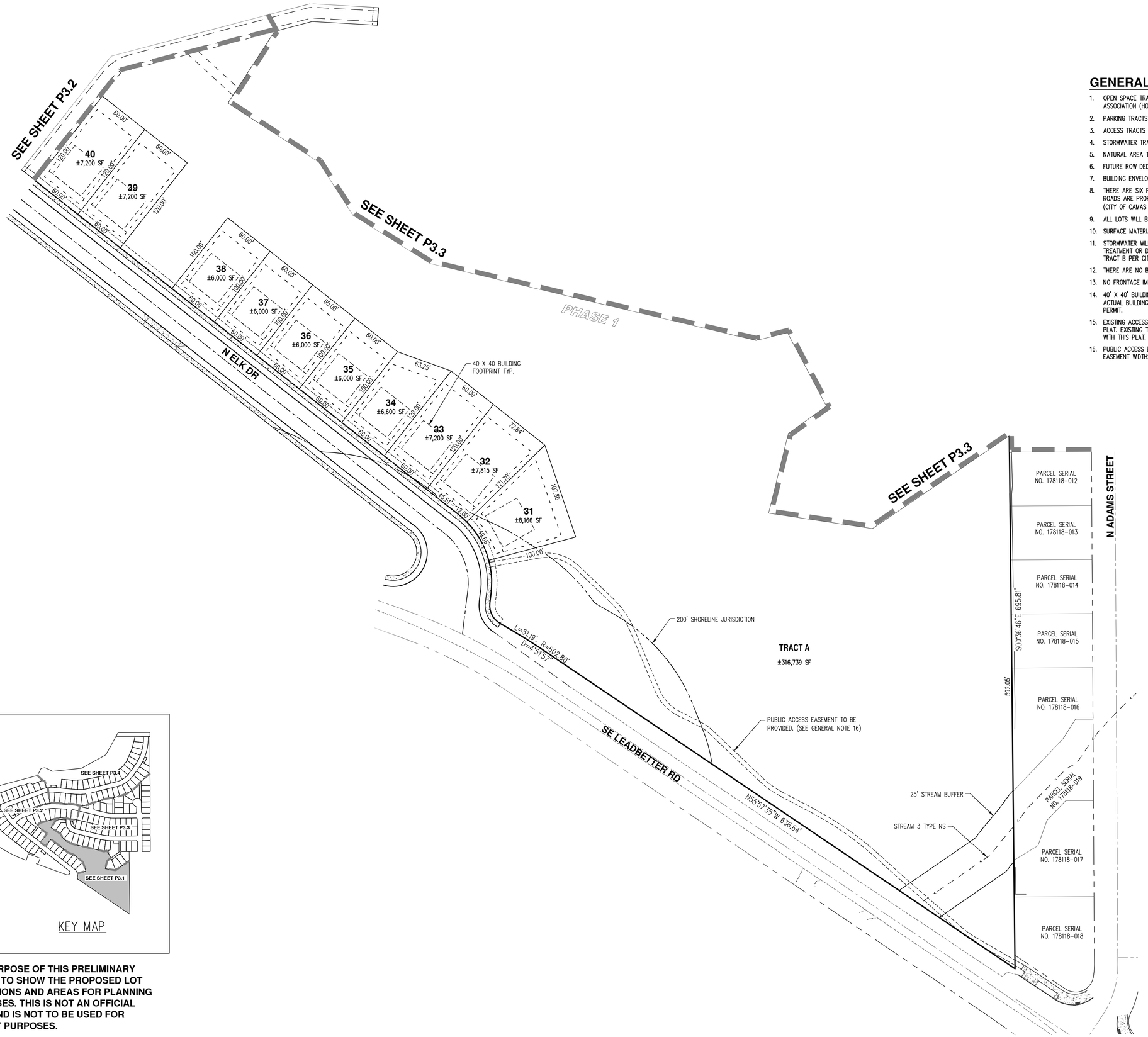
PRELIMINARY PLAT OVERVIEW
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

JOHN M. SCHOMAKER — STATE OF WASHINGTON — 19911 — REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY PLAT — NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P3.0

AKS DRAWING FILE: 5504 P3.0 PLATDWG | LAYOUT: P3.0



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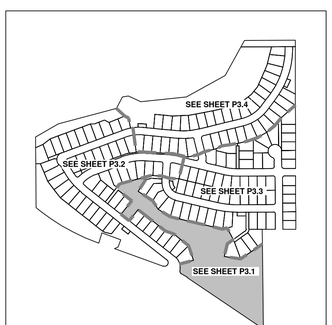

KEY MAP

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PRELIMINARY PLAT - PHASE 1
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CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

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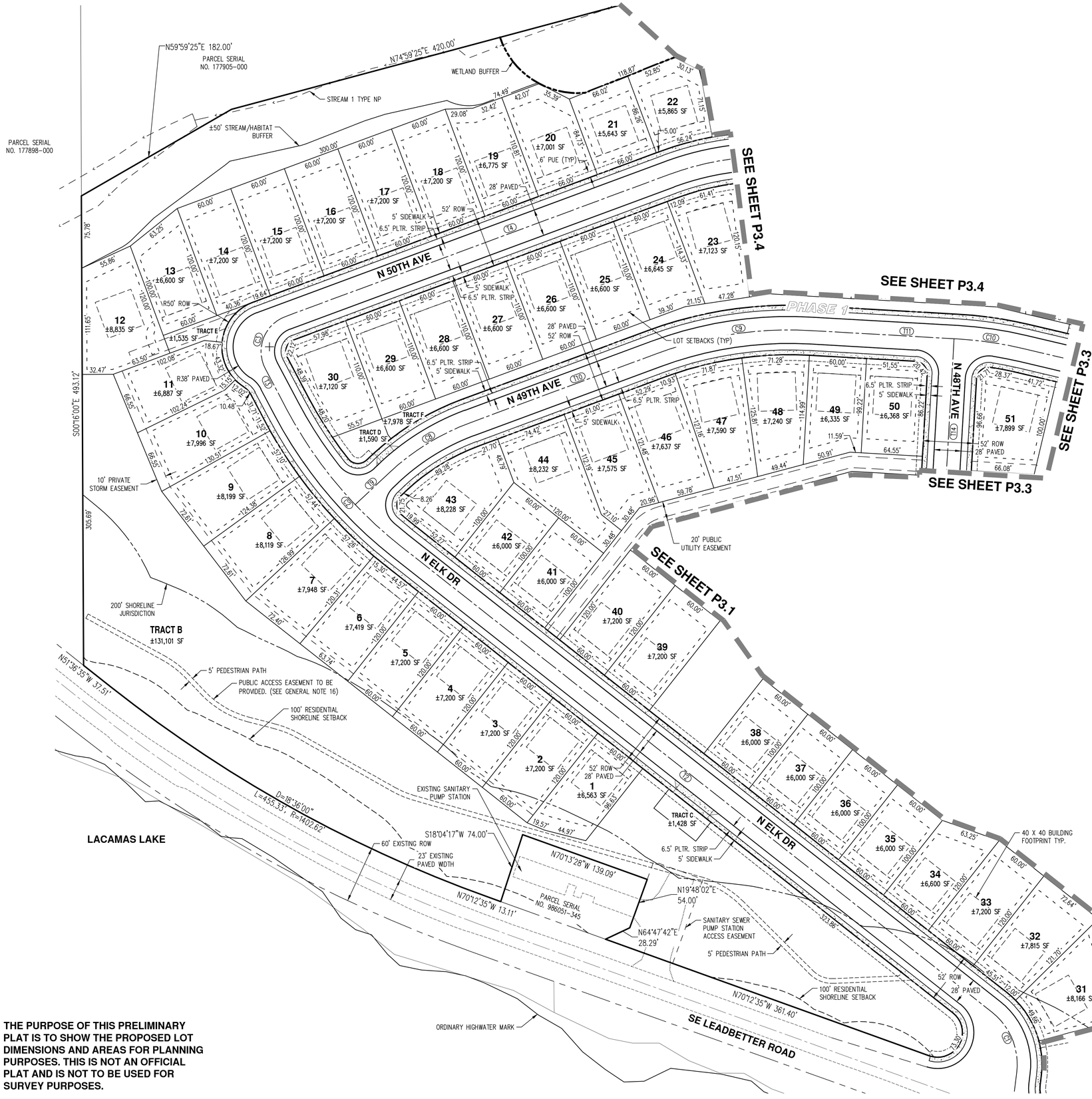

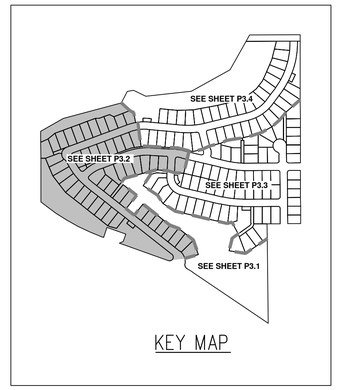

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CENTERLINE TANGENT TABLE		
LINE #	LENGTH	DIRECTION
T1	49.16	N6° 59' 29.61"E
T2	790.79	N51° 44' 06.88"W
T3	48.39	N27° 49' 37.22"W
T4	430.07	N69° 40' 14.28"E
T9	53.40	N46° 50' 02.89"E
T10	209.41	N69° 40' 14.28"E
T11	153.92	S86° 43' 31.24"E
T14	165.22	S3° 16' 28.76"W

CENTERLINE CURVE TABLE			
CURVE #	ARC LENGTH	DELTA	RADIUS
C1	71.75	58°43'36"	70.00
C2	187.77	23°54'30"	450.00
C3	66.36	97°29'52"	39.00
C8	99.64	22°50'11"	250.00
C9	164.79	23°36'14"	400.00
C10	69.88	10°00'34"	400.00

N

SCALE: 1"=50 FEET

50 0 10 25 50

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PRELIMINARY PLAT - PHASE 1
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CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

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P3.2

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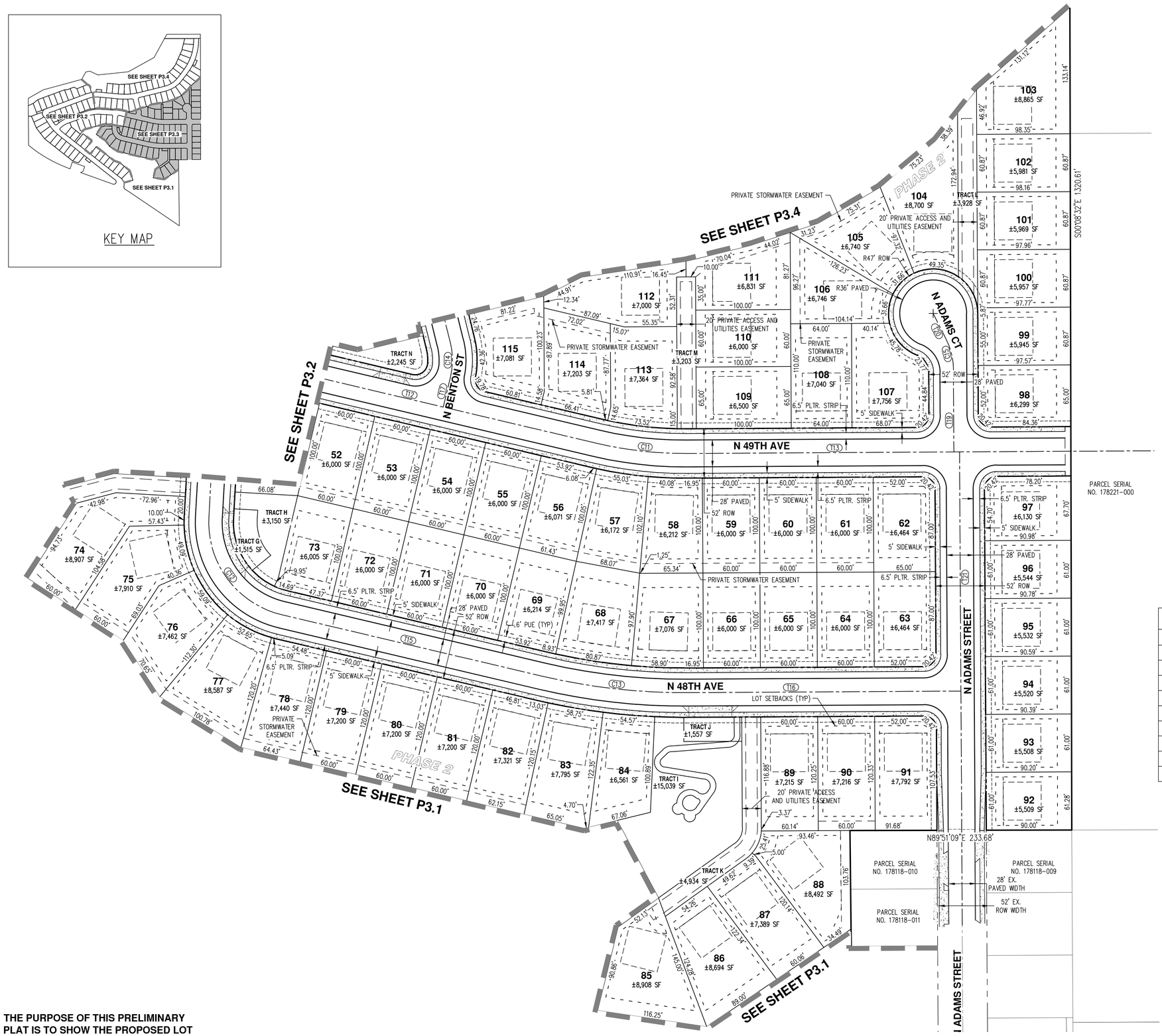

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9. ALL LOTS WILL BE SERVED WITH PUBLIC SANITARY SEWER AND WATER BY CITY OF CAMAS.
10. SURFACE MATERIAL FOR ALL PROPOSED ROADWAYS IS ASPHALT.
11. STORMWATER WILL EITHER BE DIRECTLY DISCHARGED TO A LARGE WATER BODY AFTER TREATMENT OR DETAINED, TREATED, AND DISCHARGED TO THE EXISTING WETLAND THROUGH TRACT B PER CITY OF CAMAS STANDARDS.
12. THERE ARE NO BICYCLE IMPROVEMENTS PROPOSED ON SITE.
13. NO FRONTAGE IMPROVEMENTS ARE PROPOSED FOR SE LEADBETTER ROAD.
14. 40' X 40' BUILDING FOOTPRINTS SHOWN PER CAMAS CODE 17.19.030.D.3. SEE SECTION ACTUAL BUILDING FOOT PRINTS WILL VARY AND BE DETERMINED AND REVIEWED WITH BUILDING PERMIT.
15. EXISTING ACCESS AND UTILITY EASEMENT PER AFN 5719904 TO BE RELINQUISHED WITH THIS PLAT. EXISTING TEMPORARY TURNAROUND EASEMENT PER AFN 4232555 TO BE RELINQUISHED WITH THIS PLAT.
16. PUBLIC ACCESS EASEMENT DIMENSIONS WILL BE DETERMINED WITH FINAL TRAIL DESIGN. EASEMENT WIDTHS WILL VARY TO INCLUDE TOP AND TOE OF SLOPES.

CENTERLINE TANGENT TABLE		
LINE #	LENGTH	DIRECTION
T12	335.64	S76° 42' 57.35"E
T13	405.23	N89° 40' 26.29"E
T14	165.22	S3° 16' 28.76"W
T15	281.29	S76° 42' 57.35"E
T16	287.95	N89° 40' 26.29"E
T17	33.47	N13° 17' 02.65"E
T19	87.44	N0° 19' 33.71"W
T20	30.49	N26° 51' 54.48"W
T21	398.61	S0° 19' 33.71"E

CENTERLINE CURVE TABLE			
CURVE #	ARC LENGTH	DELTA	RADIUS
C11	95.02	13°36'36"	400.00
C12	139.61	79°59'26"	100.00
C13	154.88	13°36'36"	652.00
C14	34.97	27°04'32"	74.00
C15	32.42	26°32'21"	70.00

N

SCALE: 1"=50 FEET

50 0 10 25 50

ORIGINAL PAGE SIZE: 24" x 36"

THE PURPOSE OF THIS PRELIMINARY PLAT IS TO SHOW THE PROPOSED LOT DIMENSIONS AND AREAS FOR PLANNING PURPOSES. THIS IS NOT AN OFFICIAL PLAT AND IS NOT TO BE USED FOR SURVEY PURPOSES.

AKS ENGINEERING & FORESTRY, LLC
9600 NE 126TH AVE, STE 2520
VANCOUVER, WA 98682
360.882.0419
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PRELIMINARY PLAT - PHASE 2
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

STATE OF WASHINGTON · JOSEPH M. JOHNSON · 22400 · REGISTERED PROFESSIONAL ENGINEER

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P3.3

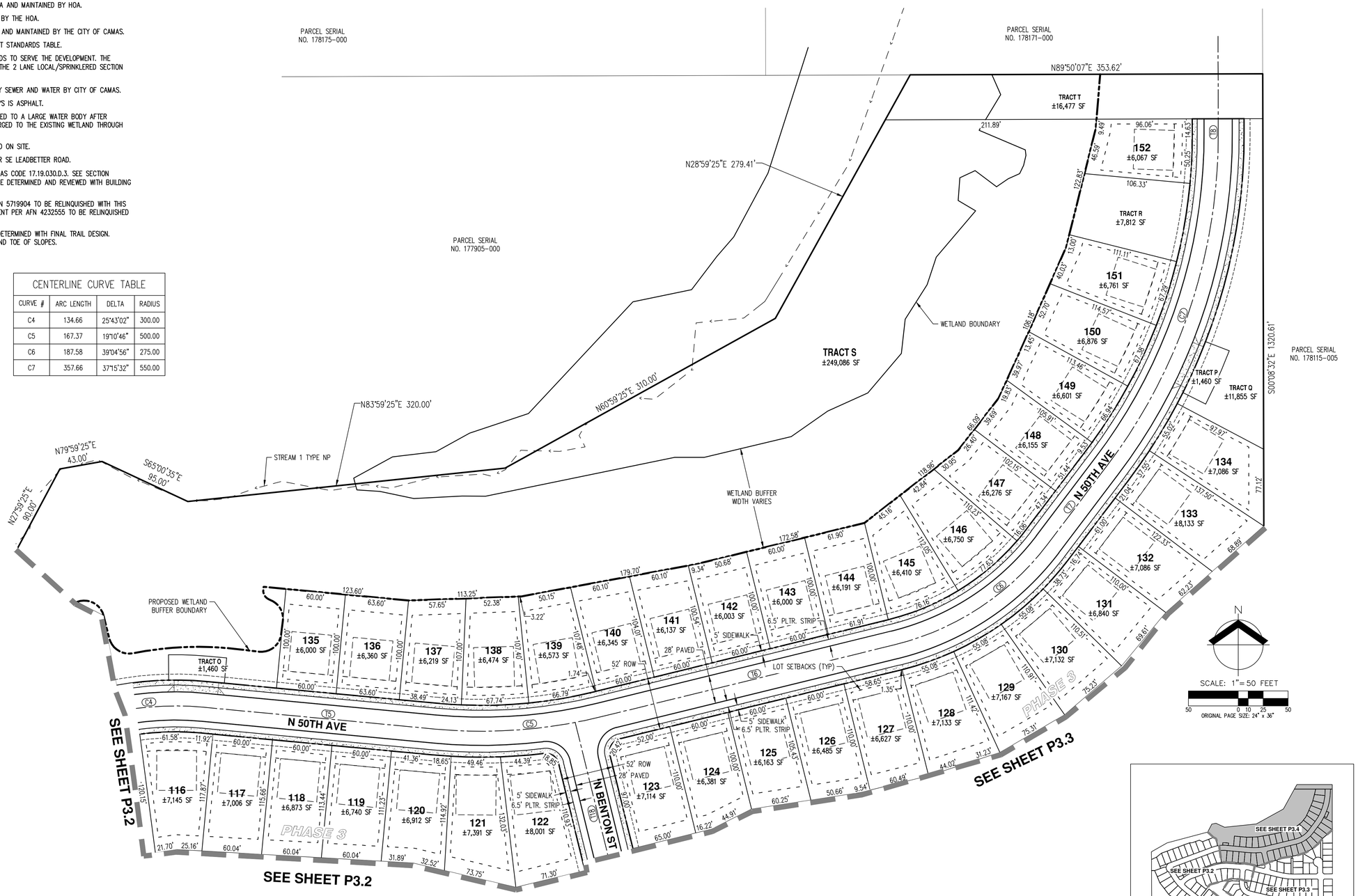
AKS DRAWING FILE: 5504 P3.0 PLAT.DWG | LAYOUT: P3.3

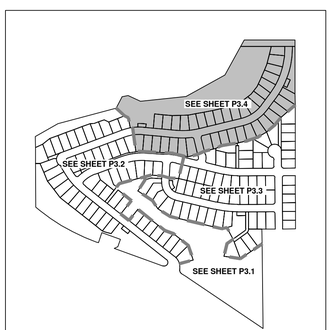
GENERAL NOTES

1. OPEN SPACE TRACTS F, H, I, & Q TO BE OWNED AND MAINTAINED BY THE HOME OWNERS ASSOCIATION (HOA).
2. PARKING TRACTS C, D, G, J, N, O, & P TO BE OWNED AND MAINTAINED BY THE HOA.
3. ACCESS TRACTS E, K, L, & M TO BE OWNED AND MAINTAINED BY THE HOA.
4. STORMWATER TRACT R TO BE OWNED BY THE HOA AND MAINTAINED BY HOA.
5. NATURAL AREA TRACTS A, B & S TO BE OWNED BY THE HOA.
6. FUTURE ROW DEDICATION TRACT T TO BE OWNED AND MAINTAINED BY THE CITY OF CAMAS.
7. BUILDING ENVELOPES SHALL BE PER DEVELOPMENT STANDARDS TABLE.
8. THERE ARE SIX PROPOSED INTERNAL PUBLIC ROADS TO SERVE THE DEVELOPMENT. THE ROADS ARE PROPOSED TO BE CONSTRUCTED TO THE 2 LANE LOCAL/SPRINKLERED SECTION (CITY OF CAMAS STANDARD DETAIL ST3).
9. ALL LOTS WILL BE SERVED WITH PUBLIC SANITARY SEWER AND WATER BY CITY OF CAMAS.
10. SURFACE MATERIAL FOR ALL PROPOSED ROADWAYS IS ASPHALT.
11. STORMWATER WILL EITHER BE DIRECTLY DISCHARGED TO A LARGE WATER BODY AFTER TREATMENT OR DETAINED, TREATED, AND DISCHARGED TO THE EXISTING WETLAND THROUGH TRACT B PER CITY OF CAMAS STANDARDS.
12. THERE ARE NO BICYCLE IMPROVEMENTS PROPOSED ON SITE.
13. NO FRONTAGE IMPROVEMENTS ARE PROPOSED FOR SE LEADBETTER ROAD.
14. 40' X 40' BUILDING FOOTPRINTS SHOWN PER CAMAS CODE 17.19.030.D.3. SEE SECTION ACTUAL BUILDING FOOT PRINTS WILL VARY AND BE DETERMINED AND REVIEWED WITH BUILDING PERMIT.
15. EXISTING ACCESS AND UTILITY EASEMENT PER AFN 5719904 TO BE RELINQUISHED WITH THIS PLAT. EXISTING TEMPORARY TURNAROUND EASEMENT PER AFN 4232555 TO BE RELINQUISHED WITH THIS PLAT.
16. PUBLIC ACCESS EASEMENT DIMENSIONS WILL BE DETERMINED WITH FINAL TRAIL DESIGN. EASEMENT WIDTHS WILL VARY TO INCLUDE TOP AND TOE OF SLOPES.

CENTERLINE TANGENT TABLE		
LINE #	LENGTH	DIRECTION
T5	233.27	S84° 36' 43.29"E
T6	303.65	N76° 12' 30.70"E
T7	98.78	N37° 07' 34.55"E
T8	14.94	N0° 07' 57.00"W
T18	161.43	N13° 47' 29.30"W

CENTERLINE CURVE TABLE			
CURVE #	ARC LENGTH	DELTA	RADIUS
C4	134.66	25°43'02"	300.00
C5	167.37	19°10'46"	500.00
C6	187.58	39°04'56"	275.00
C7	357.66	37°15'32"	550.00





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SCALE: 1"=50 FEET

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ORIGINAL PAGE SIZE: 24" x 36"

THE PURPOSE OF THIS PRELIMINARY PLAT IS TO SHOW THE PROPOSED LOT DIMENSIONS AND AREAS FOR PLANNING PURPOSES. THIS IS NOT AN OFFICIAL PLAT AND IS NOT TO BE USED FOR SURVEY PURPOSES.

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PRELIMINARY PLAT - PHASE 3
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

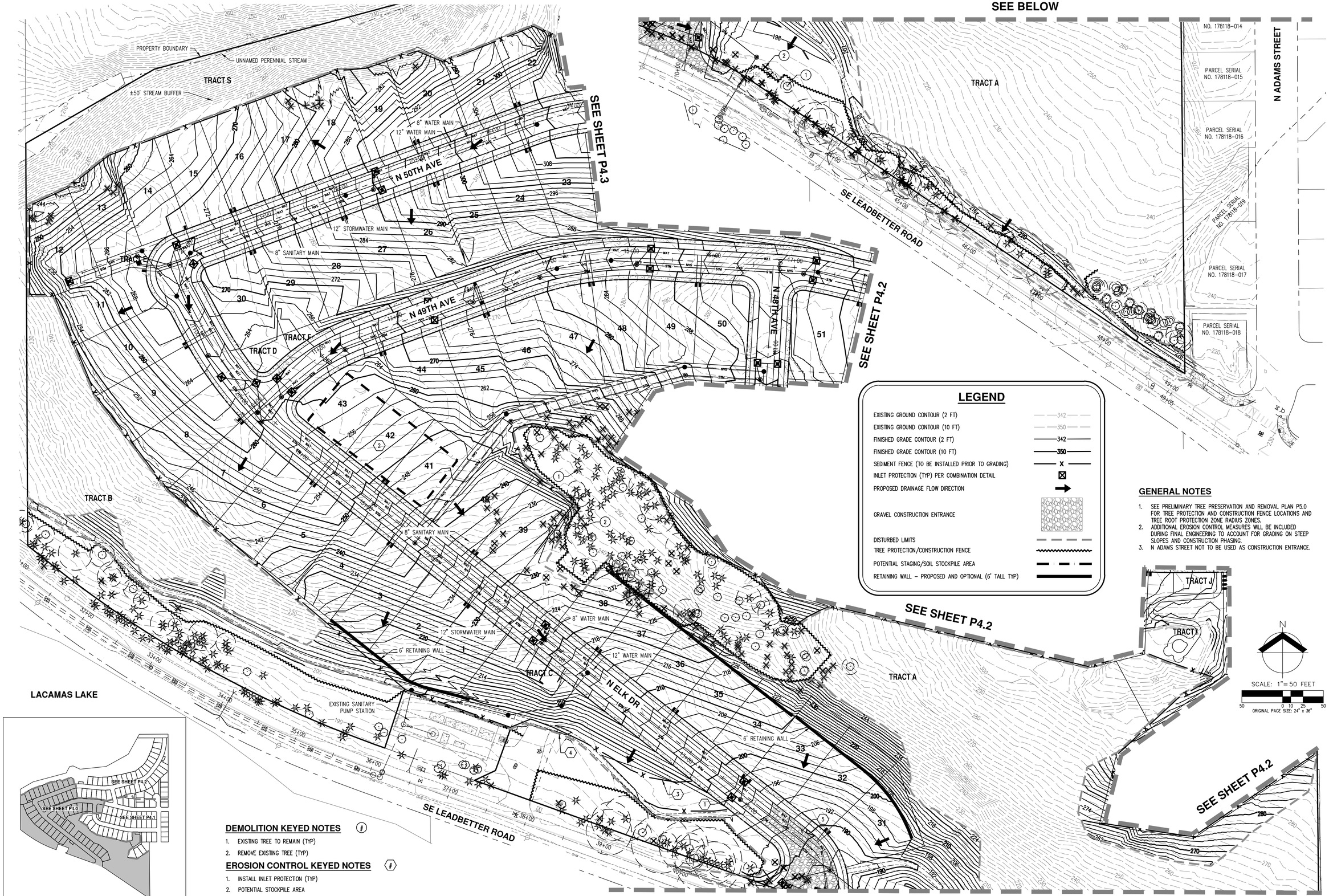
JOHN M. MAY — STATE OF WASHINGTON — 21911 — REGISTERED PROFESSIONAL ENGINEER

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P3.4

AKS DRAWING FILE: 5504 P3.0 PLATDWG | LAYOUT: P3.4



LEGEND

- EXISTING GROUND CONTOUR (2 FT)
- EXISTING GROUND CONTOUR (10 FT)
- FINISHED GRADE CONTOUR (2 FT)
- FINISHED GRADE CONTOUR (10 FT)
- SEDIMENT FENCE (TO BE INSTALLED PRIOR TO GRADING)
- INLET PROTECTION (TYP) PER COMBINATION DETAIL
- PROPOSED DRAINAGE FLOW DIRECTION
- GRAVEL CONSTRUCTION ENTRANCE
- DISTURBED LIMITS
- TREE PROTECTION/CONSTRUCTION FENCE
- POTENTIAL STAGING/SOIL STOCKPILE AREA
- RETAINING WALL – PROPOSED AND OPTIONAL (6' TALL TYP)

GENERAL NOTES

1. SEE PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN P5.0 FOR TREE PROTECTION AND CONSTRUCTION FENCE LOCATIONS AND TREE ROOT PROTECTION ZONE RADIUS ZONES.
2. ADDITIONAL EROSION CONTROL MEASURES WILL BE INCLUDED DURING FINAL ENGINEERING TO ACCOUNT FOR GRADING ON STEEP SLOPES AND CONSTRUCTION PHASING.
3. N ADAMS STREET NOT TO BE USED AS CONSTRUCTION ENTRANCE.

SCALE: 1"=50 FEET
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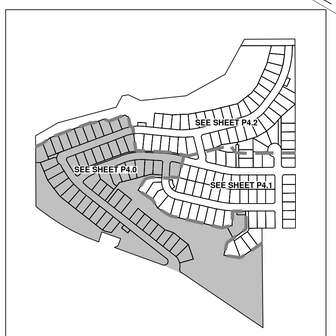
ORIGINAL PAGE SIZE: 24" x 36"



KEY MAP

DEMOLITION KEYED NOTES

1. EXISTING TREE TO REMAIN (TYP)
2. REMOVE EXISTING TREE (TYP)

EROSION CONTROL KEYED NOTES

1. INSTALL INLET PROTECTION (TYP)
2. POTENTIAL STOCKPILE AREA
3. INSTALL SEDIMENT FENCE (TYP)
4. DISTURBED LIMITS (TYP)
5. CONSTRUCTION ENTRANCE

PRELIMINARY GRADING QUANTITIES:

CUT: 150,000 C.Y.
FILL: 75,000 C.Y.

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9600 SW OAK AVE, STE 2520
VANCOUVER, WA 98662
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PRELIMINARY GRADING AND ESC PLAN - PHASE 1

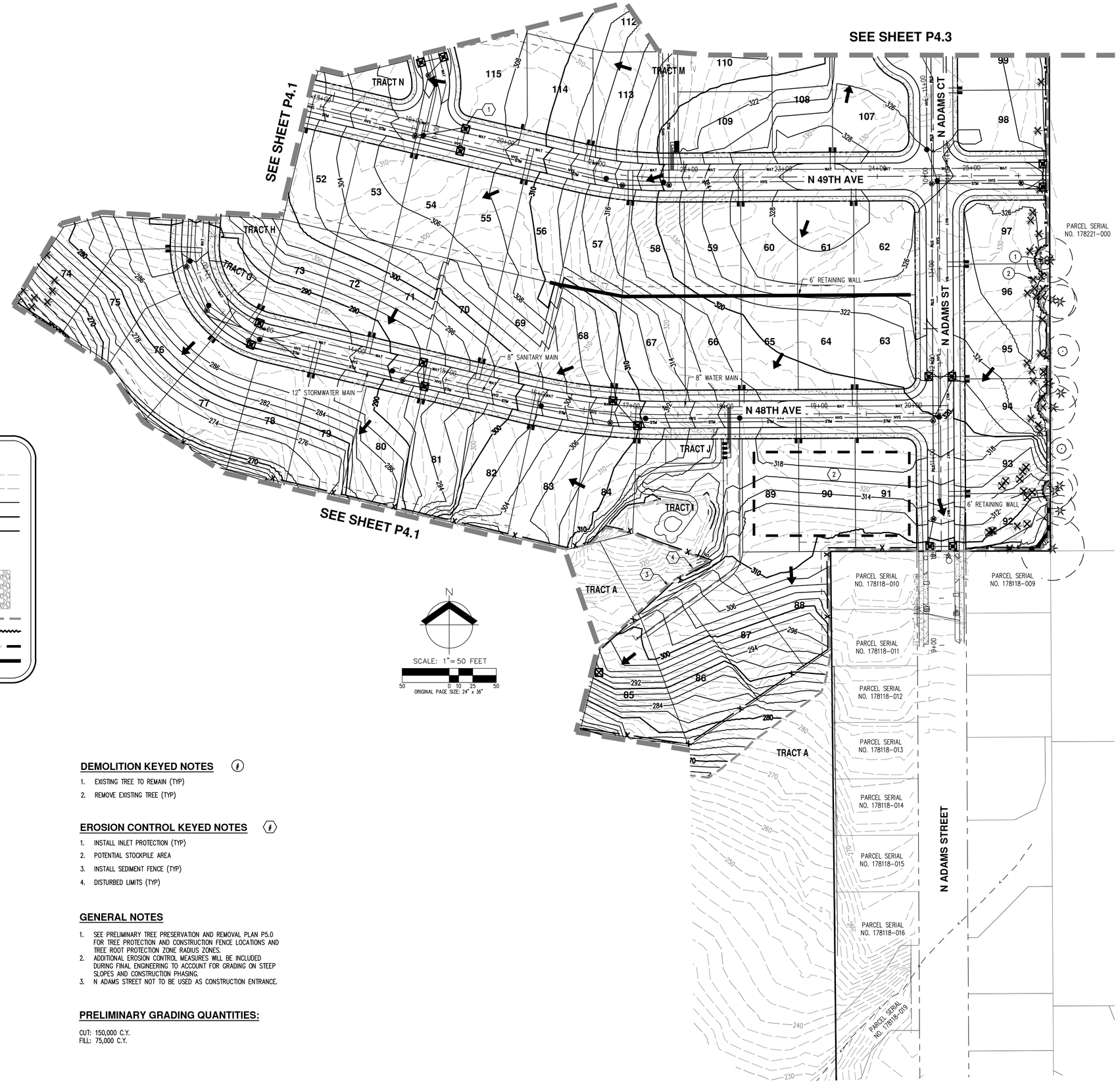
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P4.0

AKS DRAWING FILE: 5504 P4.0 GRD-ECO.DWG | LAYOUT: P4.0



LEGEND

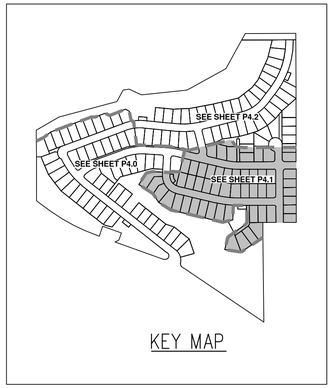
- EXISTING GROUND CONTOUR (2 FT) — 342
- EXISTING GROUND CONTOUR (10 FT) — 350
- FINISHED GRADE CONTOUR (2 FT) — 342
- FINISHED GRADE CONTOUR (10 FT) — 350
- SEDIMENT FENCE (TO BE INSTALLED PRIOR TO GRADING) — X
- INLET PROTECTION (TYP) PER COMBINATION DETAIL
- PROPOSED DRAINAGE FLOW DIRECTION
- GRAVEL CONSTRUCTION ENTRANCE
- DISTURBED LIMITS
- TREE PROTECTION/CONSTRUCTION FENCE
- POTENTIAL STAGING/SOIL STOCKPILE AREA
- RETAINING WALL – PROPOSED AND OPTIONAL (6' TALL TYP)

N

SCALE: 1"=50 FEET

50 0 10 25 50

ORIGINAL PAGE SIZE: 24" x 36"



KEY MAP

DEMOLITION KEYED NOTES

1. EXISTING TREE TO REMAIN (TYP)
2. REMOVE EXISTING TREE (TYP)

EROSION CONTROL KEYED NOTES

1. INSTALL INLET PROTECTION (TYP)
2. POTENTIAL STOCKPILE AREA
3. INSTALL SEDIMENT FENCE (TYP)
4. DISTURBED LIMITS (TYP)

GENERAL NOTES

1. SEE PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN P5.0 FOR TREE PROTECTION AND CONSTRUCTION FENCE LOCATIONS AND TREE ROOT PROTECTION ZONE RADIUS ZONES.
2. ADDITIONAL EROSION CONTROL MEASURES WILL BE INCLUDED DURING FINAL ENGINEERING TO ACCOUNT FOR GRADING ON STEEP SLOPES AND CONSTRUCTION PHASING.
3. N ADAMS STREET NOT TO BE USED AS CONSTRUCTION ENTRANCE.

PRELIMINARY GRADING QUANTITIES:

CUT: 150,000 C.Y.
FILL: 75,000 C.Y.

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PRELIMINARY GRADING AND ESC PLAN - PHASE 2

CJ DENS SUBDIVISION

CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

JOHN M. MCKENZIE — STATE OF WASHINGTON — 21,331 — REGISTERED PROFESSIONAL ENGINEER

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P4.1

AKS DRAWING FILE: 5504 P4.0 GRD-ECD.DWG | LAYOUT: P4.1

LEGEND

- EXISTING GROUND CONTOUR (2 FT) — 342
- EXISTING GROUND CONTOUR (10 FT) — 350
- FINISHED GRADE CONTOUR (2 FT) — 342
- FINISHED GRADE CONTOUR (10 FT) — 350
- SEDIMENT FENCE (TO BE INSTALLED PRIOR TO GRADING)
- INLET PROTECTION (TYP) PER COMBINATION DETAIL
- PROPOSED DRAINAGE FLOW DIRECTION
- GRAVEL CONSTRUCTION ENTRANCE
- DISTURBED LIMITS
- TREE PROTECTION/CONSTRUCTION FENCE
- POTENTIAL STAGING/SOIL STOCKPILE AREA
- RETAINING WALL – PROPOSED AND OPTIONAL (6' TALL TYP)

PARCEL SERIAL NO. 178175-000

PARCEL SERIAL NO. 178171-000

PARCEL SERIAL NO. 177905-000

PARCEL SERIAL NO. 178115-005

PROPOSED BOUNDARY

WETLAND BOUNDARY

STREAM 1 TYPE NP

TRACT T

TRACT R

TRACT Q

TRACT P

TRACT S

TRACT O

TRACT L

6' RETAINING WALL

8" SANITARY MAIN

8" WATER MAIN

12" WATER MAIN

12" STORMWATER MAIN

N 50TH AVE

N BENTON ST

SEE SHEET P4.1

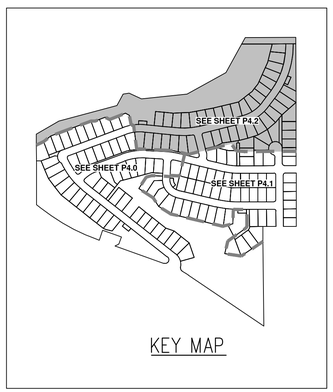
SEE SHEET P4.2

SEE SHEET P4.2

SEE SHEET P4.1

SCALE: 1"=50 FEET

ORIGINAL PAGE SIZE: 24" x 36"



KEY MAP

GENERAL NOTES

1. SEE PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN P5.0 FOR TREE PROTECTION AND CONSTRUCTION FENCE LOCATIONS AND TREE ROOT PROTECTION ZONE RADIUS ZONES.
2. ADDITIONAL EROSION CONTROL MEASURES WILL BE INCLUDED DURING FINAL ENGINEERING TO ACCOUNT FOR GRADING ON STEEP SLOPES AND CONSTRUCTION PHASING.
3. N ADAMS STREET NOT TO BE USED AS CONSTRUCTION ENTRANCE.

PRELIMINARY GRADING QUANTITIES:

CUT: 150,000 C.Y.
FILL: 75,000 C.Y.

DEMOLITION KEYED NOTES (#)

1. EXISTING TREE TO REMAIN (TYP)
2. REMOVE EXISTING TREE (TYP)

EROSION CONTROL KEYED NOTES (#)

1. INSTALL INLET PROTECTION (TYP)
2. POTENTIAL STOCKPILE AND ROCK CRUSHER AREA
3. INSTALL SEDIMENT FENCE (TYP)
4. DISTURBED LIMITS (TYP)
5. PERMANENT POND TO BE USED AS TEMPORARY SEDIMENT CONTROL POND DURING CONSTRUCTION.

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PRELIMINARY GRADING AND ESC PLAN - PHASE 3

CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P4.2

AKS DRAWING FILE: 5504 P4.0 GRD-ECO.DWG | LAYOUT: P4.2

SEE BELOW

SE LEADBETTER RD

TRAIL

PARCEL SERIAL NO. 178118-019

PARCEL SERIAL NO. 178118-017

CONC. BLOCK RET. WALL

PARCEL SERIAL NO. 178118-018

N ADAMS ST

N 45TH CIR

PARCEL SERIAL NO. 178100-000

SEE SHEET P5.1

SEE SHEET P5.2

N 49TH AVENUE

N 48TH AVENUE

TRACT H
OPEN SPACE

TRACT G
PARKING

TRACT J
PARKING

TRACT I
PARKING

TRACT K
ACCESS

TRACT C
PARKING

TRACT A
NATURAL AREA

TREE DRIPLINE

N ADAMS STREET

N ELK DRIVE

NE LEADBETTER RD

TRAIL

LACAMAS LAKE

PARCEL SERIAL NO. 178099-000

PARCEL SERIAL NO. 178118-009

PARCEL SERIAL NO. 178118-010

PARCEL SERIAL NO. 178118-011

PARCEL SERIAL NO. 178118-012

PARCEL SERIAL NO. 178118-013

ROCK RET. WALL

PARCEL SERIAL NO. 178118-014

PARCEL SERIAL NO. 178118-015

ROCK RET. WALL

PARCEL SERIAL NO. 178118-016

PARCEL SERIAL NO. 178118-019

"DEERHAVEN PHASE 1" BK 311 PG 573

SEE ABOVE

Sparse canopy

20"

Dead branches, unbalanced crown

56"

Habitat quality?

KEYED NOTE:

1. TREE REMOVAL ALONG PEDESTRIAN TRAIL TO BE DETERMINED AT TIME OF TRAIL CONSTRUCTION. TRAIL TO BE CONSTRUCTED TO LIMIT IMPACTS TO TREES, HOWEVER, SOME IMPACTS MAY BE NECESSARY AND REQUIRE TREE REMOVAL.

N

SCALE: 1"=50 FEET

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ORIGINAL PAGE SIZE: 24" x 36"

TREE PLAN

GROSS AREA:	49.62 AC
SITE AREA EXCLUDING TRACT S:	43.90 AC
TOTAL TREE UNITS REQUIRED (43.90 X 20):	878
EXISTING TREES RETAINED/(TREE UNITS):	238/(1048)
PROPOSED SITE TREES/(TREE UNITS):	420/(420)

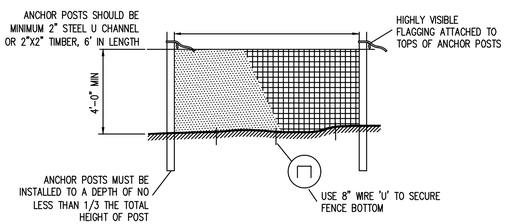
NOTE: SEE LANDSCAPING PLAN (P9.0) FOR PROPOSED TREE PLANTING PLAN

GENERAL NOTES:

1. A CERTIFIED ARBORIST SHALL BE PRESENT DURING EXCAVATION ACTIVITIES WITHIN TREE PROTECTION ZONE OF PRESERVED TREES. SEE TREE PROTECTION NOTES ON SHEET P5.1 FOR MORE INFORMATION.
2. A CERTIFIED ARBORIST SHALL BE PRESENT DURING ALL TREE REMOVAL ACTIVITIES BEHIND THE TREE PROTECTION FENCE.
3. SEE SHEET P5.1 FOR TREE PROTECTION NOTES.
4. 4. SEE SHEET P5.3–P5.5 FOR DETAILED INVENTORY TABLE.
5. TREE PROTECTION MEASURES SHALL BE INSTITUTED PRIOR TO ANY DEVELOPMENT ACTIVITIES, INCLUDING, BUT NOT LIMITED TO, CLEARING, GRADING, EXCAVATION OR DEMOLITION WORK, AND SHALL BE REMOVED ONLY AFTER COMPLETION OF ALL CONSTRUCTION ACTIVITY, INCLUDING LANDSCAPING AND IRRIGATION INSTALLATION. SEE TREE PROTECTION DETAIL ON THIS SHEET.
6. TREE PROTECTION FENCING SHALL BE FLUSH WITH THE INITIAL UNDISTURBED GRADE.
7. NO CONSTRUCTION ACTIVITY SHALL OCCUR WITHIN THE TREE PROTECTION ZONE, INCLUDING, BUT NOT LIMITED TO, DUMPING OR STORAGE OF MATERIALS SUCH AS BUILDING SUPPLIES, SOIL, WASTE ITEMS OR PARKED VEHICLES OR EQUIPMENT.
8. NO EXCAVATION, TRENCHING, GRADING, ROOT PRUNING OR OTHER ACTIVITIES SHALL OCCUR WITHIN THE TREE PROTECTION ZONE UNLESS DIRECTED BY AN ARBORIST PRESENT ON-SITE AND APPROVED BY THE CITY.
9. NOT ALL TREES WERE SURVEYED AND/OR INSPECTED WITHIN THE CRITICAL AREAS. ONLY TREES ADJACENT TO THE PROPOSED DEVELOPMENT ACTIVITIES WERE INSPECTED AND INCLUDED WITHIN THE TREE SURVEY.
10. FOLLOWING CLEARING AND GRADING ACTIVITIES, A CERTIFIED ARBORIST SHALL INSPECT RETAINED TREES FOR POTENTIALLY HAZARDOUS TREE CONDITIONS. COORDINATION WITH THE CITY SHALL OCCUR PRIOR TO ANY ADDITIONAL TREE REMOVALS FOR HAZARD ABATEMENT.

LEGEND

- EXISTING GROUND CONTOUR (2 FT)
- EXISTING GROUND CONTOUR (10 FT) — 150
- FINISHED GRADE CONTOUR (2 FT)
- FINISHED GRADE CONTOUR (10 FT) — 150
- EXISTING CONIFEROUS TREE
- EXISTING DECIDUOUS TREE
- TREE REMOVAL
- TREE PROTECTION/CONSTRUCTION FENCE (TREE PROTECTION AREA)
- OPTIMAL TREE PROTECTION ZONE (1-FT RADIUS PER 1-IN OF DBH)



TREE PROTECTION NOTES:

1. BLAZE ORANGE OR BLUE PLASTIC MESH FENCE FOR TREE PROTECTION DEVICE, ONLY.
2. BOUNDARIES OF PROTECTION AREA WILL BE ESTABLISHED IN THE FIELD BY THE ARBORIST PRIOR TO CONSTRUCTION
3. BOUNDARIES OF PROTECTION AREA SHOULD BE STAKED AND FLAGGED BY THE ARBORIST, OR UNDER THE SUPERVISION OF THE ARBORIST, PRIOR TO INSTALLING DEVICES.
4. AVOID DAMAGE TO CRITICAL ROOT ZONE. DO NOT DAMAGE OR SEVER LARGE ROOTS WHEN INSTALLING POSTS.
5. TREE PROTECTION TO BE INSTALLED PRIOR TO CONSTRUCTION AND REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETED.

PLASTIC MESH TREE PROTECTION FENCE

NOT TO SCALE

EXISTING TREE UNITS RETAINED EXCEEDS THE TOTAL TREE UNITS REQUIRED BY THE TREE CODE. ADDITIONAL TREE REMOVAL MAY BE RECOMMENDED DURING DESIGN AND/OR CONSTRUCTION. IF ADDITIONAL TREE REMOVAL IS TO OCCUR, COMPLIANCE WITH TREE RETENTION REQUIREMENTS WILL BE MAINTAINED.

AKS ENGINEERING & FORESTRY, LLC
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VANCOUVER, WA 98682
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WWW.AKS-ENG.COM

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PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN (SOUTH)

CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	BRK
CHECKED BY:	BDH

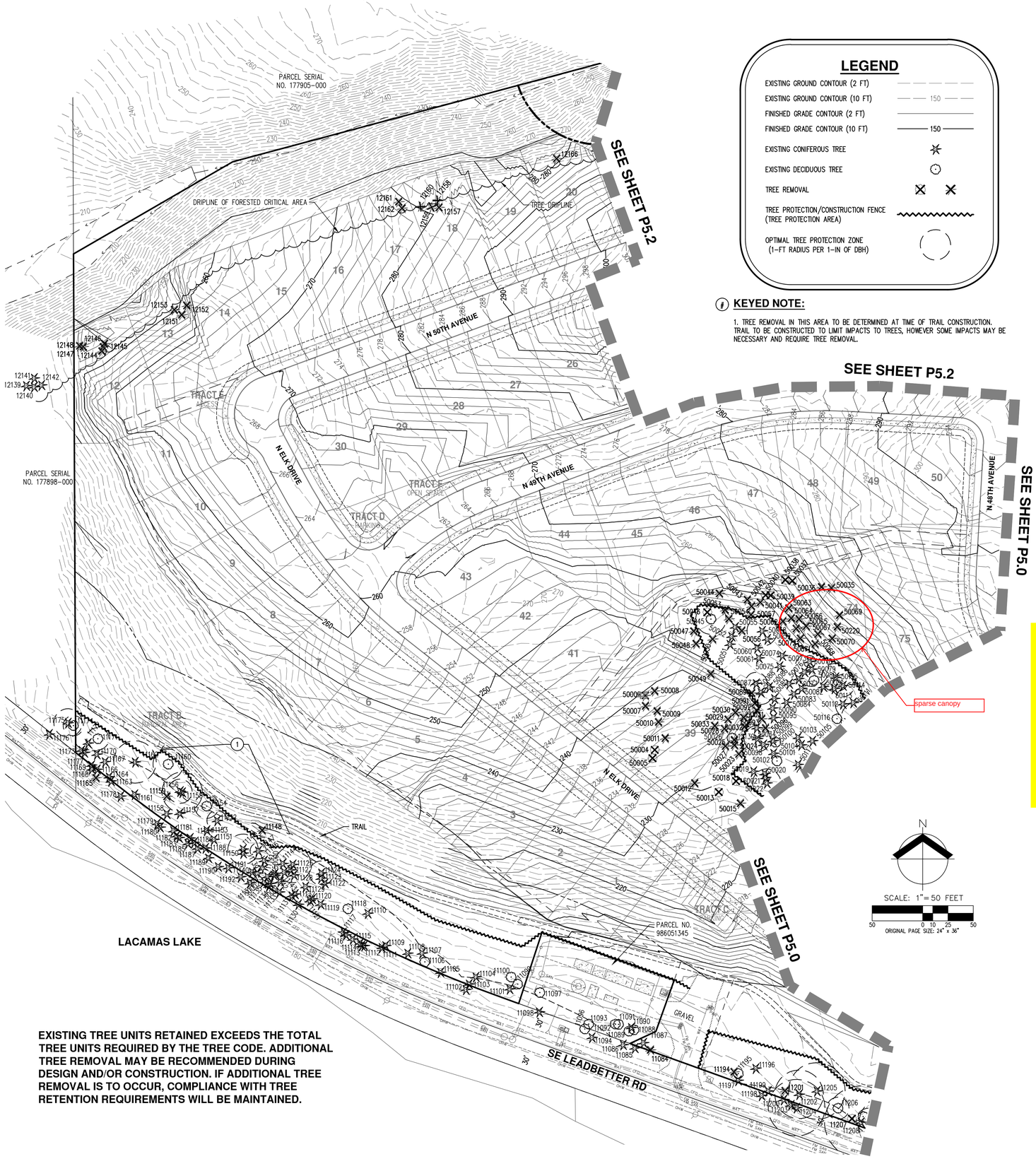
P5.0

PREPARED FOR INSPECTION

CERTIFIED ARBORIST ISA

BRYCE D. HANSON
CERTIFICATE NUMBER: PN 7504A
EXPIRATION DATE: 06/30/22

AKS DRAWING FILE: 5504 P5.0 TREE PLAN.DWG | LAYOUT: P5.0



LEGEND

- EXISTING GROUND CONTOUR (2 FT)
- EXISTING GROUND CONTOUR (10 FT) — 150
- FINISHED GRADE CONTOUR (2 FT)
- FINISHED GRADE CONTOUR (10 FT) — 150
- EXISTING CONIFEROUS TREE
- EXISTING DECIDUOUS TREE
- TREE REMOVAL
- TREE PROTECTION/CONSTRUCTION FENCE (TREE PROTECTION AREA)
- OPTIMAL TREE PROTECTION ZONE (1–FT RADIUS PER 1–IN OF DBH)

KEYED NOTE:

1. TREE REMOVAL IN THIS AREA TO BE DETERMINED AT TIME OF TRAIL CONSTRUCTION. TRAIL TO BE CONSTRUCTED TO LIMIT IMPACTS TO TREES, HOWEVER SOME IMPACTS MAY BE NECESSARY AND REQUIRE TREE REMOVAL.

N

SCALE: 1"=50 FEET

50 0 10 25 50

ORIGINAL PAGE SIZE: 24" x 36"

EXISTING TREE UNITS RETAINED EXCEEDS THE TOTAL TREE UNITS REQUIRED BY THE TREE CODE. ADDITIONAL TREE REMOVAL MAY BE RECOMMENDED DURING DESIGN AND/OR CONSTRUCTION. IF ADDITIONAL TREE REMOVAL IS TO OCCUR, COMPLIANCE WITH TREE RETENTION REQUIREMENTS WILL BE MAINTAINED.

TREE PROTECTION NOTES

A. PLACING MATERIALS NEAR TREES – NO PERSON MAY CONDUCT ANY ACTIVITY WITHIN THE PROTECTED AREA OF ANY TREE DESIGNATED TO REMAIN, INCLUDING, BUT NOT LIMITED TO, PARKING EQUIPMENT, PLACING SOLVENTS, STORING BUILDING MATERIALS AND SOIL DEPOSITS, DUMPING CONCRETE WASHOUT, ETC.

B. ATTACHMENTS TO TREES – DURING CONSTRUCTION, NO PERSON SHALL ATTACH ANY OBJECT TO ANY TREE DESIGNATED FOR PROTECTION.

C. PROTECTIVE BARRIER – BEFORE DEVELOPMENT, LAND CLEARING, FILLING OR ANY LAND ALTERATION FOR WHICH A TREE REMOVAL PERMIT IS REQUIRED, THE CONTRACTOR:

C.A. SHALL ERECT AND MAINTAIN READILY VISIBLE PROTECTIVE TREE FENCING ALONG THE OUTER EDGE AND COMPLETELY SURROUNDING THE PROTECTED AREA OF ALL PROTECTED TREES OR GROUP OF TREES. FENCES SHALL BE CONSTRUCTED PER THE DETAIL ON THIS SHEET.

C.B. MAY BE REQUIRED TO COVER WITH MULCH TO A DEPTH OF AT LEAST SIX (6) INCHES OR WITH PLYWOOD OR SIMILAR MATERIAL IN THE AREAS ADJOINING THE CRITICAL ROOT ZONE OF A TREE IN ORDER TO PROTECT ROOTS FROM DAMAGE CAUSED BY HEAVY EQUIPMENT.

C.C. SHALL PROHIBIT EXCAVATION OR COMPACTING OF EARTH OR OTHER POTENTIALLY DAMAGING ACTIVITIES WITHIN THE BARRIERS.

C.D. MAY BE REQUIRED TO MINIMIZE ROOT DAMAGE BY EXCAVATING A TWO (2) FOOT DEEP TRENCH, AT EDGE OF CRITICAL ROOT ZONE, TO CLEANLY SEVER THE ROOTS OF TREES TO BE RETAINED. ROOTS ONE (1) INCH DIAMETER OR GREATER SHALL BE CLEANLY CUT WITH A SAW OR PRUNERS.

C.E. MAY BE REQUIRED TO HAVE CORRECTIVE PRUNING PERFORMED ON PROTECTED TREES IN ORDER TO AVOID DAMAGE FROM MACHINERY OR BUILDING ACTIVITY. MAY BE REQUIRED TO MAINTAIN TREES THROUGHOUT THE CONSTRUCTION PERIOD BY WATERING AND FERTILIZING.

C.F. SHALL MAINTAIN THE PROTECTIVE BARRIERS IN PLACE UNTIL THE PROJECT ARBORIST AUTHORIZES THEIR REMOVAL OR A FINAL CERTIFICATE OF OCCUPANCY IS ISSUED, WHICHEVER OCCURS FIRST.

C.G. SHALL ENSURE THAT ANY LANDSCAPING DONE IN THE PROTECTED ZONE SUBSEQUENT TO THE REMOVAL OF THE BARRIERS SHALL BE ACCOMPLISHED WITH LIGHT MACHINERY OR HAND LABOR.

D. GRADE

D.A. THE GRADE SHALL NOT BE ELEVATED OR REDUCED WITHIN THE CRITICAL ROOT ZONE OF TREES TO BE PRESERVED WITHOUT THE PROJECT ARBORISTS'S AUTHORIZATION. THE PROJECT ARBORIST MAY ALLOW COVERAGE OF UP TO ONE HALF OF THE AREA OF THE TREE'S CRITICAL ROOT ZONE WITH LIGHT SOILS (NO CLAY) TO THE MINIMUM DEPTH NECESSARY TO CARRY OUT GRADING OR LANDSCAPING PLANS, IF IT WILL NOT IMPERIL THE SURVIVAL OF THE TREE. AERATION DEVICES MAY BE REQUIRED TO ENSURE THE TREE'S SURVIVAL.

D.B. IF THE GRADE ADJACENT TO A PRESERVED TREE IS RAISED SUCH THAT IT COULD SLOUGH OR ERODE INTO THE TREES CRITICAL ROOT ZONE, IT SHALL BE PERMANENTLY STABILIZED TO PREVENT SUFFOCATION OF THE ROOTS.

D.C. THE APPLICANT SHALL NOT INSTALL AN IMPERVIOUS SURFACE WITHIN THE CRITICAL ROOT ZONE OF ANY TREE TO BE RETAINED WITHOUT THE AUTHORIZATION OF THE PROJECT ARBORIST. THE PROJECT ARBORIST MAY REQUIRE SPECIFIC CONSTRUCTION METHODS AND/OR USE OF AERATION DEVICES TO ENSURE THE TREE'S SURVIVAL AND TO MINIMIZE THE POTENTIAL FOR ROOT INDUCED DAMAGE TO THE IMPERVIOUS SURFACE.

D.D. TO THE GREATEST EXTENT PRACTICAL, UTILITY TRENCHES SHALL BE LOCATED OUTSIDE OF THE CRITICAL ROOT ZONE OF TREES TO BE RETAINED. THE PROJECT ARBORIST MAY REQUIRE THAT UTILITIES BE TUNNELED UNDER THE ROOTS OF TREES TO BE RETAINED IF THE PROJECT ARBORIST DETERMINES THAT TRENCHING WOULD SIGNIFICANTLY REDUCE THE CHANCES OF THE TREE'S SURVIVAL.

D.E. TREE AND OTHER VEGETATION TO BE RETAINED SHALL BE PROTECTED FROM EROSION AND SEDIMENTATION. CLEARING OPERATIONS SHALL BE CONDUCTED SO AS TO EXPOSE THE SMALLEST PRACTICAL AREA OF SOIL TO EROSION FOR THE LEAST POSSIBLE TIME. TO CONTROL EROSION, SHRUBS, GROUND COVER, AND STUMPS SHALL BE MAINTAINED ON THE INDIVIDUAL LOTS, WHERE FEASIBLE. WHERE NOT FEASIBLE, APPROPRIATE EROSION CONTROL PRACTICES SHALL BE IMPLEMENTED PURSUANT TO CAMAS MUNICIPAL CODE CHAPTER 14.06.

E. DIRECTIONAL FELLING OF TREES SHALL BE USED TO AVOID DAMAGE TO TREES DESIGNATED FOR RETENTION.

F. ADDITIONAL REQUIREMENTS – THE PROJECT ARBORIST MAY REQUIRE ADDITIONAL TREE PROTECTION MEASURES WHICH ARE CONSISTENT WITH ACCEPTED URBAN FORESTRY PRACTICES.

G. ENCROACHMENT INTO THE ROOT PROTECTION ZONE IS ALLOWED WITH PROJECT ARBORIST APPROVAL AS DESCRIBED IN THE FOLLOWING NOTES:

G.A. EXCAVATION IN THE TOP 24 INCHES OF THE SOIL IN THE CRITICAL ROOT ZONE AREA SHOULD BEGIN AT THE EXCAVATION LINE THAT IS CLOSEST TO THE TREE.

G.B. THE EXCAVATION SHOULD BE DONE BY HAND/SHOVEL OR WITH A BACKHOE AND A MAN WITH A SHOVEL, PRUNING SHEARS, AND A PRUNING SAW.

G.C. IF DONE BY HAND, ALL ROOTS 1 INCH OR LARGER SHOULD BE PRUNED AT THE EXCAVATION LINE.

G.D. IF DONE WITH BACKHOE (MOST LIKELY SCENARIO), THEN THE OPERATOR SHALL START THE CUT AT THE EXCAVATION LINE AND CAREFULLY "FEEL" FOR ROOT/RESISTANCE. WHEN THERE IS RESISTANCE, THE MAN WITH THE SHOVEL HAND DIGS AROUND THE ROOTS AND PRUNES THE ROOTS LARGER THAN 1 INCH DIAMETER.

G.E. THE BACKHOE IS TO REMAIN OFF OF THE TREE ROOTS TO BE PRESERVED AT ALL TIMES.

G.F. ALL ROOTS SHALL BE CUT CLEANLY WITH PRUNING SHEARS OR A PRUNING SAW.

G.G. PROJECT ARBORIST MUST BE ONSITE DURING ANY WORK WITHIN THE TREE ROOT PROTECTION ZONE.

G.H. THE CITY PLANNER MUST BE CONTACTED 24 HOURS PRIOR TO WORKING WITHIN THE TREE ROOT PROTECTION ZONE.

H. TREE PROTECTION ZONE IS DEFINED AS ALL AREAS BOUND AND PROTECTING THE OPTIMAL TREE PROTECTION ZONE.

I. TIMELINE FOR CLEARING, GRADING, AND INSTALLATION OF TREE PROTECTION MEASURES: WORK WILL BEGIN IMMEDIATELY FOLLOWING FINAL APPROVAL BY THE CITY. TREE PROTECTION MEASURES WILL BE DONE DURING CLEARING AND ANY GRADING WILL FOLLOW.

J. PRUNING/TREE REMOVAL NOTES: THE WORK TO BE COMPLETED UNDER THIS PROJECT SHALL CONSIST OF TREE REMOVAL AND TREE TRIMMING AS LISTED.

J.A. THE CONTRACTOR SHALL PROVIDE ADEQUATE CREW OF MEN, EQUIPMENT AND MATERIALS TO SAFELY AND EFFICIENTLY COMPLETE THE ASSIGNED WORK. EACH SUCH CREW SHALL INCLUDE AN INDIVIDUAL WHO SHALL BE DESIGNATED AS THE CREW SUPERVISOR AND WHO SHALL BE RESPONSIBLE FOR THE CREW'S ACTIVITIES AND WHO SHALL RECEIVE INSTRUCTION FROM THE OWNER OR THE OWNER'S REPRESENTATIVE AND DIRECT THE CREW TO ACCOMPLISH SUCH WORK.

J.B. WHENEVER A TREE, WHICH IS NOT SCHEDULED TO BE REMOVED, MUST BE TRIMMED OR PRUNED, THE CONTRACTOR SHALL INSURE THAT SUCH TRIMMING AND PRUNING IS CARRIED OUT UNDER THE DIRECT SUPERVISION OF A LICENSED ARBORIST. ALL PRUNING AND TRIMMING SHALL BE PERFORMED IN ACCORDANCE WITH THE PROVISIONS OF ANSI A 300 "STANDARD PRACTICES FOR TREE, SHRUB AND OTHER WOODY PLANT MAINTENANCE".

J.C. THE CONTRACTOR SHALL BE REQUIRED TO CUT TREES TO A HEIGHT OF APPROXIMATELY 12". THE STUMPS AND ROOTS SHALL BE GROUND DOWN A MINIMUM OF TWELVE (12) INCHES BELOW NORMAL GROUND LEVEL.

J.D. THE CONTRACTOR SHALL PERFORM ALL WORK IN ACCORDANCE WITH THE LATEST GOVERNMENTAL SAFETY REGULATIONS. ALL WORK SHALL BE PERFORMED IN STRICT ACCORDANCE WITH ANSI Z133.1 "PRUNING, TRIMMING, REPAIRING, MAINTAINING AND REMOVING TREES AND CUTTING BRUSH–SAFETY REQUIREMENTS" WITH SPECIAL EMPHASIS GIVEN TO THE REQUIREMENT THAT ONLY QUALIFIED LINE–CLEARANCE TREE TRIMMERS BE ASSIGNED TO WORK WHERE A POTENTIAL ELECTRICAL HAZARD EXISTS.

J.E. THE CONTRACTOR SHALL MAKE ALL THE NECESSARY ARRANGEMENTS WITH ANY UTILITY THAT MUST BE PROTECTED OR RELOCATED IN ORDER TO ACCOMPLISH THE WORK. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE PROTECTION OF THE OPERATING CONDITION OF ALL ACTIVE UTILITIES WITHIN THE AREA OF CONSTRUCTION AND THEY SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO EXISTING UTILITIES.

J.F. ANY MATERIAL RESULTING FROM THE TRIMMING OR REMOVAL OF ANY TREES SHALL BECOME THE RESPONSIBILITY OF THE CONTRACTOR.

J.G. HAZARDOUS TREES–REPORTING – ANY PERSON ENGAGED IN TRIMMING OR PRUNING WHO BECOMES AWARE OF A TREE OF DOUBTFUL STRENGTH, THAT COULD BE DANGEROUS TO PERSONS AND PROPERTY, SHALL REPORT SUCH TREE(S) TO THE OWNER OR THE OWNERS REPRESENTATIVE. SUCH TREES SHALL INCLUDE THOSE THAT ARE OVER MATURE, DISEASED, OR SHOWING SIGNS OF DECAY OR OTHER STRUCTURAL WEAKNESS.

J.H. DAMAGES–ANY DAMAGE CAUSED BY THE CONTRACTOR, INCLUDING, BUT NOT LIMITED TO, BROKEN SIDEWALK, CURB, RUTTED LAWN, BROKEN WATER SHUT–OFFS, WIRE DAMAGE, BUILDING DAMAGE, STREET DAMAGE, ETC., WILL BE REPAIRED OR REPLACED IN A TIMELY MANNER, TO THE OWNER'S SATISFACTION, AND ALL COSTS PAID BY THE CONTRACTOR.

J.I. ANY BRUSH CLEARING REQUIRED WITHIN THE TREE PROTECTION ZONE SHALL BE ACCOMPLISHED WITH HAND OPERATED EQUIPMENT.

J.J. TREES TO BE REMOVED SHALL BE FELLED SO AS TO FALL AWAY FROM TREE ROOT PROTECTION ZONES AND TO AVOID PULLING AND BREAKING OF ROOTS TO REMAIN.

J.K. ALL DOWNED BRUSH AND TREES SHALL BE REMOVED FROM THE TREE PROTECTION ZONE EITHER BY HAND OR WITH EQUIPMENT SITTING OUTSIDE THE TREE ROOT PROTECTION ZONE. EXTRACTION SHALL OCCUR BY LIFTING THE MATERIAL OUT, NOT BY SKIDDING IT ACROSS THE GROUND.

J.L. IF TEMPORARY HAUL OR ACCESS ROADS MUST PASS OVER THE ROOT AREA OF TREES TO BE RETAINED A ROADBED OF 6 INCHES OF MULCH OR GRAVEL SHALL BE CREATED TO PROTECT THE SOIL. THE ROADBED MATERIAL SHALL BE REPLENISHED AS NECESSARY TO MAINTAIN A 6–INCH DEPTH.

J.M. PRUNING. TREES SHALL BE PRUNED PRIOR TO THE START OF CONSTRUCTION. TREES SHALL BE CROWN CLEANED TO REMOVE THE DEADWOOD 2 INCHES IN DIAMETER AND OVER. TREES SHALL BE CROWN THINNED BY 10–20% CROWNS MAY BE RAISED BY REMOVING BOTTOM BRANCHES AS NECESSARY UP TO 14 FEET HIGH TO GIVE CLEARANCE FOR ANY CONSTRUCTION TRAFFIC, ACTIVITIES, ETC. ALL WORK TO BE DONE IN ACCORDANCE WITH ANSI A300 PRUNING STANDARDS. REMOVE ANY LIMBS OF DOUBTFUL STRENGTH THAT COULD BE DANGEROUS TO PERSONS AND PROPERTY.

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.

AT THE COMPLETION OF CONSTRUCTION, ALL TREES MUST ONCE AGAIN BE REVIEWED TO EVALUATE THEIR HAZARD RATING. LAND CLEARING AND REMOVAL OF ADJACENT TREES CAN EXPOSE PREVIOUSLY UNSEEN DEFECTS AND OTHERWISE HEALTHY TREES CAN BE DAMAGED DURING CONSTRUCTION.

TREE INFORMATION GATHERED UNDER THE SUPERVISION OF BRYCE HANSON, CERTIFIED ARBORIST, WITH AKS ENGINEERING AND FORESTRY, LLC.

TREES SHOWN TO BE SAVED WILL BE EVALUATED BY THE PROJECT ARBORIST PRIOR TO, DURING, AND AFTER CONSTRUCTION. TREES ADVERSELY AFFECTED BY CONSTRUCTION AND/OR DETERMINED TO BE A SAFETY HAZARD WILL BE REMOVED.

GENERAL NOTES:

1. A CERTIFIED ARBORIST SHALL BE PRESENT DURING EXCAVATION ACTIVITIES WITHIN TREE PROTECTION ZONE OF PRESERVED TREES. SEE TREE PROTECTION NOTES ON THIS SHEET FOR MORE INFORMATION.
2. A CERTIFIED ARBORIST SHALL BE PRESENT DURING ALL TREE REMOVAL ACTIVITIES BEHIND THE TREE PROTECTION FENCE.
3. SEE SHEET THIS SHEET FOR TREE PROTECTION NOTES.
4. 4. SEE SHEET P5.3–P5.5 FOR DETAILED INVENTORY TABLE.
5. TREE PROTECTION MEASURES SHALL BE INSTITUTED PRIOR TO ANY DEVELOPMENT ACTIVITIES, INCLUDING, BUT NOT LIMITED TO, CLEARING, GRADING, EXCAVATION OR DEMOLITION WORK, AND SHALL BE REMOVED ONLY AFTER COMPLETION OF ALL CONSTRUCTION ACTIVITY, INCLUDING LANDSCAPING AND IRRIGATION INSTALLATION. SEE TREE PROTECTION DETAIL ON SHEET P5.0.
6. TREE PROTECTION FENCING SHALL BE FLUSH WITH THE INITIAL UNDISTURBED GRADE.
7. NO CONSTRUCTION ACTIVITY SHALL OCCUR WITHIN THE TREE PROTECTION ZONE, INCLUDING, BUT NOT LIMITED TO, DUMPING OR STORAGE OF MATERIALS SUCH AS BUILDING SUPPLIES, SOIL, WASTE ITEMS OR PARKED VEHICLES OR EQUIPMENT.
8. NO EXCAVATION, TRENCHING, GRADING, ROOT PRUNING OR OTHER ACTIVITIES SHALL OCCUR WITHIN THE TREE PROTECTION ZONE UNLESS DIRECTED BY AN ARBORIST PRESENT ON–SITE AND APPROVED BY THE CITY.
9. NOT ALL TREES WERE SURVEYED AND/OR INSPECTED WITHIN THE CRITICAL AREAS. ONLY TREES ADJACENT TO THE PROPOSED DEVELOPMENT ACTIVITIES WERE INSPECTED AND INCLUDED WITHIN THE TREE SURVEY.
10. FOLLOWING CLEARING AND GRADING ACTIVITIES, A CERTIFIED ARBORIST SHALL INSPECT RETAINED TREES FOR POTENTIALLY HAZARDOUS TREE CONDITIONS. COORDINATION WITH THE CITY SHALL OCCUR PRIOR TO ANY ADDITIONAL TREE REMOVALS FOR HAZARD ABATEMENT.
11. EXISTING TREE UNITS RETAINED EXCEEDS THE TOTAL TREE UNITS REQUIRED BY THE TREE CODE. ADDITIONAL TREE REMOVAL MAY BE RECOMMENDED DURING DESIGN AND/OR CONSTRUCTION. IF ADDITIONAL TREE REMOVAL IS TO OCCUR, COMPLIANCE WITH TREE RETENTION REQUIREMENTS WILL BE MAINTAINED.

CERTIFIED ARBORIST ISA

BRYCE D. HANSON
CERTIFICATE NUMBER: PN 7554A
EXPIRATION DATE: 06/30/22

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ENGINEERING · SURVEYING · NATURAL RESOURCES
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PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN (WEST)

CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	BRK
CHECKED BY:	BDH

P5.1

AKS DRAWING FILE: 5504 P5.0 TREE PLAN.DWG | LAYOUT: P5.1

GENERAL NOTES:

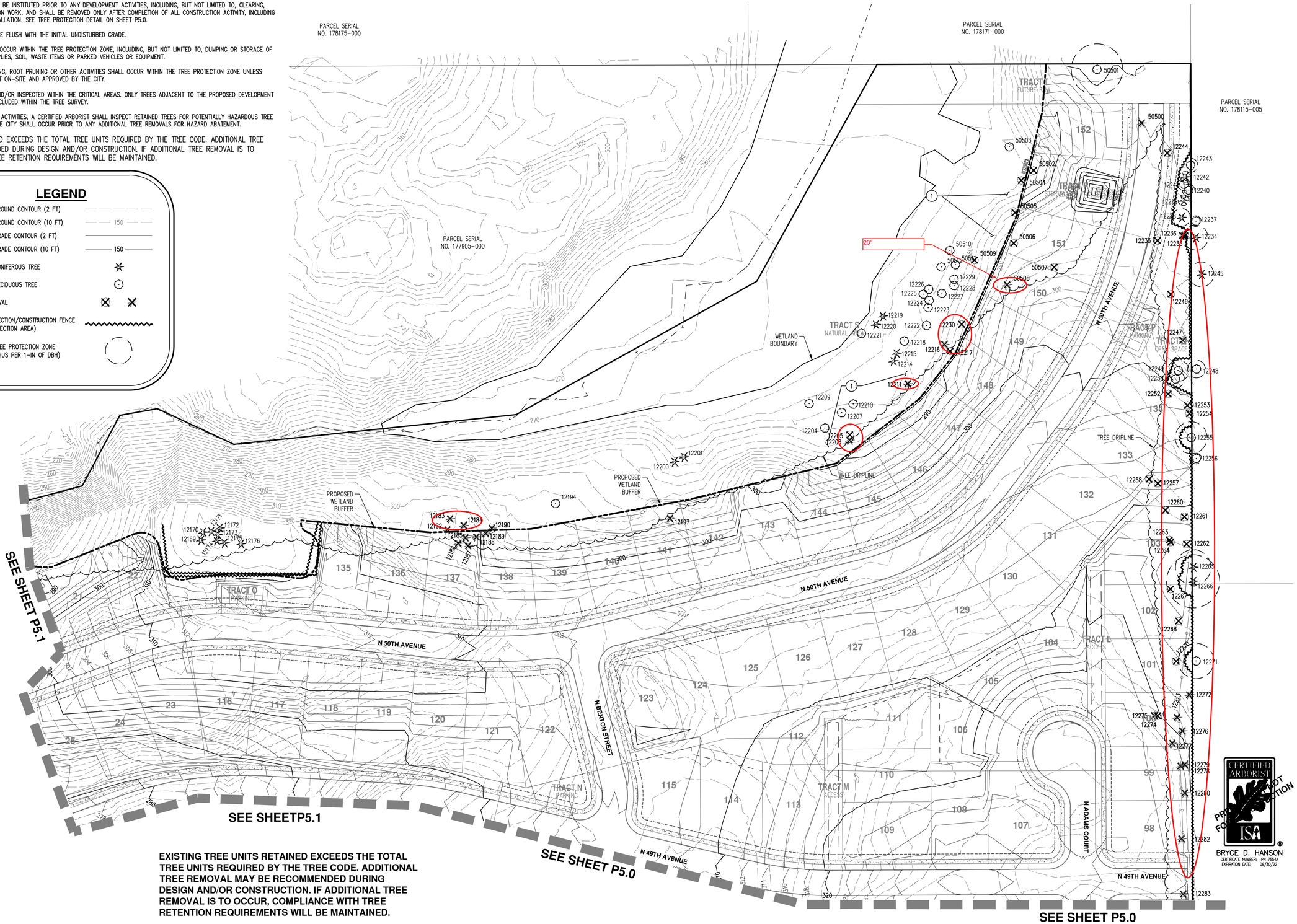
1. A CERTIFIED ARBORIST SHALL BE PRESENT DURING EXCAVATION ACTIVITIES WITHIN TREE PROTECTION ZONE OF PRESERVED TREES. SEE TREE PROTECTION NOTES ON SHEET P5.1 FOR MORE INFORMATION.
2. A CERTIFIED ARBORIST SHALL BE PRESENT DURING ALL TREE REMOVAL ACTIVITIES BEHIND THE TREE PROTECTION FENCE.
3. SEE SHEET P5.1 FOR TREE PROTECTION NOTES.
4. 4. SEE SHEET P5.3–P5.5 FOR DETAILED INVENTORY TABLE.
5. TREE PROTECTION MEASURES SHALL BE INSTITUTED PRIOR TO ANY DEVELOPMENT ACTIVITIES, INCLUDING, BUT NOT LIMITED TO, CLEARING, GRADING, EXCAVATION OR DEMOLITION WORK, AND SHALL BE REMOVED ONLY AFTER COMPLETION OF ALL CONSTRUCTION ACTIVITY, INCLUDING LANDSCAPING AND IRRIGATION INSTALLATION. SEE TREE PROTECTION DETAIL ON SHEET P5.0.
6. TREE PROTECTION FENCING SHALL BE FLUSH WITH THE INITIAL UNDISTURBED GRADE.
7. NO CONSTRUCTION ACTIVITY SHALL OCCUR WITHIN THE TREE PROTECTION ZONE, INCLUDING, BUT NOT LIMITED TO, DUMPING OR STORAGE OF MATERIALS SUCH AS BUILDING SUPPLIES, SOIL, WASTE ITEMS OR PARKED VEHICLES OR EQUIPMENT.
8. NO EXCAVATION, TRENCHING, GRADING, ROOT PRUNING OR OTHER ACTIVITIES SHALL OCCUR WITHIN THE TREE PROTECTION ZONE UNLESS DIRECTED BY AN ARBORIST PRESENT ON-SITE AND APPROVED BY THE CITY.
9. NOT ALL TREES WERE SURVEYED AND/OR INSPECTED WITHIN THE CRITICAL AREAS. ONLY TREES ADJACENT TO THE PROPOSED DEVELOPMENT ACTIVITIES WERE INSPECTED AND INCLUDED WITHIN THE TREE SURVEY.
10. FOLLOWING CLEARING AND GRADING ACTIVITIES, A CERTIFIED ARBORIST SHALL INSPECT RETAINED TREES FOR POTENTIALLY HAZARDOUS TREE CONDITIONS. COORDINATION WITH THE CITY SHALL OCCUR PRIOR TO ANY ADDITIONAL TREE REMOVALS FOR HAZARD ABATEMENT.
11. EXISTING TREE UNITS RETAINED EXCEEDS THE TOTAL TREE UNITS REQUIRED BY THE TREE CODE. ADDITIONAL TREE REMOVAL MAY BE RECOMMENDED DURING DESIGN AND/OR CONSTRUCTION. IF ADDITIONAL TREE REMOVAL IS TO OCCUR, COMPLIANCE WITH TREE RETENTION REQUIREMENTS WILL BE MAINTAINED.

LEGEND

- EXISTING GROUND CONTOUR (2 FT)
- EXISTING GROUND CONTOUR (10 FT) — 150
- FINISHED GRADE CONTOUR (2 FT)
- FINISHED GRADE CONTOUR (10 FT) — 150
- EXISTING CONIFEROUS TREE
- EXISTING DECIDUOUS TREE
- TREE REMOVAL
- TREE PROTECTION/CONSTRUCTION FENCE (TREE PROTECTION AREA)
- OPTIMAL TREE PROTECTION ZONE (1-FT RADIUS PER 1-IN OF DBH)

KEYED NOTES:

1. TREES SHOWN WITHIN WETLAND BUFFER ARE HAZARD TREES ONLY. TREE REMOVAL WITHIN THE WETLAND BUFFER SHALL BE CONDUCTED USING HAND TOOLS AND METHODS ONLY (NO HEAVY MACHINERY). TREES SHOWN FOR REMOVAL SHALL HAVE THEIR CROWNS REDUCED TO REDUCE THE TARGET ZONE AND MITIGATE RISK ASSOCIATED WITH POTENTIAL WHOLE TREE FAILURE. TREES MAY ALSO BE CUT AND LEFT IN PLACE. ARBORIST OBSERVATION RECOMMENDED FOR TREE REMOVAL WITHIN WETLAND BUFFER.



EXISTING TREE UNITS RETAINED EXCEEDS THE TOTAL TREE UNITS REQUIRED BY THE TREE CODE. ADDITIONAL TREE REMOVAL MAY BE RECOMMENDED DURING DESIGN AND/OR CONSTRUCTION. IF ADDITIONAL TREE REMOVAL IS TO OCCUR, COMPLIANCE WITH TREE RETENTION REQUIREMENTS WILL BE MAINTAINED.

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AKS DRAWING FILE: 5504 P5.0 TREE PLAN.DWG | LAYOUT: P5.2

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PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN (NORTH)

CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

CERTIFIED ARBORIST — PRELIMINARY NOT FOR CONSTRUCTION — ISA

BRYCE D. HANSON
CERTIFICATE NUMBER: PN 7554A
EXPIRATION DATE: 06/30/22

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	BRK
CHECKED BY:	BDH

P5.2

Detailed Tree Inventory for CJ Dens

AKS JOB NO. 5504 **Site Area = 43.90 acres**

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow Rating	Reason for Removal	Tree Units Retained
11084	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
11085	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Unbalanced crown, broken branches, Poor live crown ratio	B		0
11086	34	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Unbalanced crown, broken branches, Poor live crown ratio	B		0
11087	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, some branch dieback	B		2
11088	11	Bigleaf Maple (*Acer macrophyllum*)	0	Poor live crown ratio, broken branches	B		0
11089	13	Bigleaf Maple (*Acer macrophyllum*)	0	Deformed bole	B		0
11090	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Codominant top with inclided bark, sparse canopy	B		0
11091	17	Bigleaf Maple (*Acer macrophyllum*)	0	Unbalanced crown, some branch dieback	B		0
11092	8	Bigleaf Maple (*Acer macrophyllum*)	0	Healthy	C		0
11093	12	Bigleaf Maple (*Acer macrophyllum*)	0	Healthy	C		0
11094	20, 22	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, codominant base, deformed bole, lean, unbalanced crown	B		0
11096	12	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, dead	A		0
11097	10	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, Broken branches with decay, dead branches in crown	B		0
11098	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, dead	A		0
11099	13	Bigleaf Maple (*Acer macrophyllum*)	3	Bore holes, skiffing bark	B		3
11100	9	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11101	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Dead scaffold branches, sparse canopy	B		4
11102	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, broken top	A		0
11103	32	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, poor live crown ratio, branch dieback	B		0
11104	34	Douglas-fir (*Pseudotsuga menziesii*)	13	Some dead branches in crown	C		13
11105	28	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown, sweep	B		0
11106	12	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11107	22	Douglas-fir (*Pseudotsuga menziesii*)	7	Poor live crown ratio	B		7
11108	36	Douglas-fir (*Pseudotsuga menziesii*)	14	Healthy	C		14
11109	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown	B		6
11110	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown, dead branches in crown, crown cleaning recommended	B		6
11111	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, dead	A		0
11112	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11113	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown, poor live crown ratio	B		0
11114	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11115	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, suppressed, sparse canopy	B		0
11116	28	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11117	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11118	10	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11119	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Unbalanced crown	B		4
11120	21	Douglas-fir (*Pseudotsuga menziesii*)	7	Unbalanced crown	B		7
11121	8	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed	C		2
11122	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Sparse canopy, some branch dieback	B		4
11123	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy, some branch dieback	B		2
11124	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy, some branch dieback	B		2
11125	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Healthy	C		6
11127	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
11128	8	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, unbalanced crown	B		2
11129	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Dead branches in crown	C		5
11130	28	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11131	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown	B		6
11132	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Sparse canopy, some branch dieback	B		3
11133	22	Douglas-fir (*Pseudotsuga menziesii*)	7	Healthy	C		7
11134	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Healthy	C		4
11135	8,18	Douglas-fir (*Pseudotsuga menziesii*)	6	Codominant base	C		6
11137	18, 14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, codominant base, unbalanced crown	B		0
11139	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio	B		2
11140	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
11141	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, sparse canopy, some branch dieback	B		2
11142	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
11143	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, declining health	A		2
11144	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Healthy	C		3
11145	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, sparse canopy	B		2
11146	9	Douglas-fir (*Pseudotsuga menziesii*)	2	Deformed top	B		2
11147	8	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, sparse canopy, some branch dieback	B		2
11148	31	Douglas-fir (*Pseudotsuga menziesii*)	12	Healthy	C	Impacted by proposed path grading	0
11149	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11150	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Dead scaffold branches, crown cleaning recommended	B		2
11151	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11152	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11153	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11154	12	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11155	23	Douglas-fir (*Pseudotsuga menziesii*)	8	Poor live crown ratio	B		8
11156	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Unbalanced crown, epicormic sprouts	B		2
11157	24	Douglas-fir (*Pseudotsuga menziesii*)	8	Healthy	C		8
11158	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11159	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Several large conks up bole	A	Poor tree health	0
11160	15	Bigleaf Maple (*Acer macrophyllum*)	4	Lean	B		4
11161	40	Douglas-fir (*Pseudotsuga menziesii*)	16	Some bore holes	C		16
11162	21	Douglas-fir (*Pseudotsuga menziesii*)	7	Healthy	C		7
11163	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, deformed top, some dead branches in crown	B		0
11164	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Lean, sweep	B		4
11165	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, numerous conks up bole, recommend removal of city owned tree	A	Poor tree health	0
11166	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11167	7	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy	B		2
11168	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11169	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11170	28	Douglas-fir (*Pseudotsuga menziesii*)	10	Healthy	C		10
11171	12	Bigleaf Maple (*Acer macrophyllum*)	2	Cavity with decay in base	B		2
11172	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11173	42	Douglas-fir (*Pseudotsuga menziesii*)	17	Codominant top	B		17
11174	11	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, healthy	C		0
11175	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11176	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11177	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Healthy	C		3
11178	26	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, suppressed	B		0
11179	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11180	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11181	23	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11182	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11183	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, suppressed	B		0
11184	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, poor live crown ratio, unbalanced crown, dead branches in crown	B		0
11185	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, top lean, scars up bole	B		0
11186	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, dead branches in crown	C		0
11187	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11188	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11189	22	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11190	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11191	26	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11192	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11194	26	Douglas-fir (*Pseudotsuga menziesii*)	9	Large conks up bole, uneven canopy, poor live crown ratio	A	Poor tree health	0
11195	8	Bigleaf Maple (*Acer macrophyllum*)	2	Lean	B		2
11196	36	Douglas-fir (*Pseudotsuga menziesii*)	14	Poor live crown ratio, bore holes	B		14
11197	24	Douglas-fir (*Pseudotsuga menziesii*)	8	Unbalanced crown	B		8
11198	22	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, lean, codominant top with included bark, deformed bole	B		0
11199	35	Douglas-fir (*Pseudotsuga menziesii*)	14	Unbalanced crown	B		14
11200	35	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown, Some branch dieback, bore holes	B		0
11201	22	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
11202	28	Douglas-fir (*Pseudotsuga menziesii*)	10	Poor live crown ratio, some dead branches in crown	B		10
11203	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, dead	A		0
11204	28	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11205	28	Douglas-fir (*Pseudotsuga menziesii*)	10	Poor live crown ratio, some dead branches in crown	B		10
11206	13	Bigleaf Maple (*Acer macrophyllum*)	3	Healthy	C		3
11207	8	Bigleaf Maple (*Acer macrophyllum*)	0	Dead	A	Tree is dead	0
11208	36	Douglas-fir (*Pseudotsuga menziesii*)	14	Healthy	C		14

Detailed Tree Inventory for CJ Dens

AKS JOB NO. 5504 **Site Area = 43.90 acres**

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow Rating	Reason for Removal	Tree Units Retained
11209	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Healthy	C		3
11210	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11211	30	Douglas-fir (*Pseudotsuga menziesii*)	11	Poor live crown ratio	B		11
11212	20	Bigleaf Maple (*Acer macrophyllum*)	6	Deformed bole	B		6
11213	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown	B		6
11214	12	Bigleaf Maple (*Acer macrophyllum*)	2	Lean	B		2
11215	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Cavity with decay, some branch dieback	B		4
11216	41	Douglas-fir (*Pseudotsuga menziesii*)	17	Unbalanced crown	B		17
11217	28	Douglas-fir (*Pseudotsuga menziesii*)	10	Poor live crown ratio	B		10
11218	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Suppressed	C		5
11223	34	Douglas-fir (*Pseudotsuga menziesii*)	13	Healthy	C		13
11224	38	Douglas-fir (*Pseudotsuga menziesii*)	15	Healthy	C		15
11225	8	Douglas-fir (*Pseudotsuga menziesii*)	2	Sweep, codominant top	B		2
11226	6,7,10	Bigleaf Maple (*Acer macrophyllum*)	3	Dead codominant stems, scars, sparse canopy, branch dieback	B	Located within proposed road grading	0
11227	6	Bigleaf Maple (*Acer macrophyllum*)	2	Broken branches with decay, codominant top	B	Located within proposed road grading	0
11228	12	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C	Located within proposed road grading	0
11229	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Crooked bole, poor live crown ratio, branch dieback	B	Located within proposed road grading	0
11230	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy	B	Located within proposed road grading	0
11231	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
11232	12	Bigleaf Maple (*Acer macrophyllum*)	2	Decaying foliage, sparse canopy	B	Located within proposed road grading	0
11233	9	Bigleaf Maple (*Acer macrophyllum*)	2	Lean (S)	B	Located within proposed road grading	0
11234	11	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C	Located within proposed road grading	0
11235	36	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C	Located within proposed road grading	0
11236	24	Douglas-fir (*Pseudotsuga menziesii*)	8	Healthy	C	Located within proposed road grading	0
11237	34	Douglas-fir (*Pseudotsuga menziesii*)	13	Poor live crown ratio, dead scaffold branches	B	Located within proposed road grading	0
11238	17	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C	Located within proposed road grading	0
11239	27	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, poor live crown ratio, unbalanced crown	B	Located within proposed road grading	0
11240	15	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, sparse canopy, unbalanced crown	B	Located within proposed road grading	0
11241	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C	Located within proposed road grading	0
11242	22	Douglas-fir (*Pseudotsuga menziesii*)	7	Healthy	C	Located within proposed road grading	0
11243	50	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, bore holes, broken branches	C	Located within proposed road grading	0
11244	36	Douglas-fir (*Pseudotsuga menziesii*)	14	Healthy	C	Located within proposed road grading	0
11245	7	Grand Fir (*Abies grandis*)	0	Off site, healthy	C	Located within proposed road grading	0
11246	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
11247	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
11248	37	Douglas-fir (*Pseudotsuga menziesii*)	15	Unbalanced crown	B	Road grading greatly impacts root zone	0
11249	12	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C	Road grading greatly impacts root zone	0
11250	18	Grand Fir (*Abies grandis*)	0	Dead	A	Tree is dead	0
11251	28	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B	Road grading greatly impacts root zone	0
11252	30	Douglas-fir (*Pseudotsuga menziesii*)	11	Poor live crown ratio, some branch dieback	B	Road grading greatly impacts root zone	0
11253	7	Bigleaf Maple (*Acer macrophyllum*)	2	Sweep, lean (S)	B	Road grading greatly impacts root zone	0
11254	12	Bigleaf Maple (*Acer macrophyllum*)	2	Poor live crown ratio	B	Road grading greatly impacts root zone	0
11255	8,8	Bigleaf Maple (*Acer macrophyllum*)	2	Cavity with decay, top lean (S), codominant base	B		2
11256	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Sparse canopy	B		6
11257	22	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, conks up bole, branch die back, sparse canopy	A		0
11258	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio	B		4
11259	15	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, sparse canopy, branch dieback	B		0
11260	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11261	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11262	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11264	26	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11265	32	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11266	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11267	32	Douglas-fir (*Pseudotsuga menziesii*)	12	Healthy	C		12
11268	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11269	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11270	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11271	28	Douglas-fir (*Pseudotsuga menziesii*)	10	Healthy	C		10
11272	21	Douglas-fir (*Pseudotsuga menziesii*)	7	Broken scaffold branches	C		7
11273	9	Douglas-fir (*Pseudotsuga menziesii*)	2	Deformed bole, poor live crown ratio	B	Impacted by proposed path grading	0
11274	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11275	10	Bigleaf Maple (*Acer macrophyllum*)	0	Dead	A	Tree is dead	0
11276	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed	C		2
11277	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11278	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11279	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Broken branches, poor live crown ratio	B		6
11280	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11282	23	Douglas-fir (*Pseudotsuga menziesii*)	8	Healthy	C		8
11283	25	Douglas-fir (*Pseudotsuga menziesii*)	9	Healthy	C		9
11284	23	Douglas-fir (*Pseudotsuga menziesii*)	8	Deformed bole	B		8
11285	25	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11286	23	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11287	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Healthy	C	Impacted by proposed path grading	0
11288	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11289	8	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C	Impacted by proposed path grading	0
11290	30	Douglas-fir (*Pseudotsuga menziesii*)	11	Healthy	C		11
11291	25	Douglas-fir (*Pseudotsuga menziesii*)	9	Healthy	C		9
11292	8	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11293	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Healthy	C	Impacted by proposed path grading	0
11294	36	Douglas-fir (*Pseudotsuga menziesii*)	14	Broken top with weak leaders, significant decay	A	Poor tree health	0
11295	25	Douglas-fir (*Pseudotsuga menziesii*)	9	Healthy	C	Impacted by proposed path grading	0
11296	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Healthy	C		3
11297	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11298	7	Bigleaf Maple (*Acer macrophyllum*)	2	Sparse canopy	B		2
11300	6,12	Bigleaf Maple (*Acer macrophyllum*)	3	Dead scaffold branches, machete damage, crown cleaning recommended	B		3
11301	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Healthy	C		4
11302	14	Bigleaf Maple (*Acer macrophyllum*)	3	Dead scaffold branches, several cavities with decay	B		3
11303	6	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11304	7	Bigleaf Maple (*Acer macrophyllum*)	2	Dead scaffold branch	C		2
11305	8,10	Bigleaf Maple (*Acer macrophyllum*)	3	Dead scaffold branch	C		3
11306	6,6,6,6	Pacific Serviceberry (*Amelanchier alnifolia*)	2	Healthy	C		2
11307	7,9	Bigleaf Maple (*Acer macrophyllum*)	2	Several large cavities with decay	B		2
11308	8,10	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11309	7	Bigleaf Maple (*Acer macrophyllum*)	2	Deformed bole	B		2
11310	8	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11311	6	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11312	10	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11313	6,6	Bigleaf Maple (*Acer macrophyllum*)	2	Dead codominant stem	B		2
11314	8,8,9	Bigleaf Maple (*Acer macrophyllum*)	3	Codominant base with included bark, lean (S)	B		3
11315	6	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11316	7	Bigleaf Maple (*Acer macrophyllum*)	2	Lean (S)	B		2
11317	7	Bigleaf Maple (*Acer macrophyllum*)	2	Sparse canopy, dead scaffold branches	B		2
11318	6	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11319	8	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11320	7,7,8	Sweet Cherry (*Prunus avium*)	3	Codominant base, lean (S), crooked bole	B		3
11321	7	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
12130	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Unbalanced crown, dead branches in crown	B		3
12132	14	Coniferous	3	Not Evaluated by an Arborist	-	Lot grading greatly impacts root zone	0
12133	8	Deciduous	2	Not Evaluated by an Arborist	-	Lot grading greatly impacts root zone	0
12134	9	Coniferous	2	Not Evaluated by an Arborist	-	Lot grading greatly impacts root zone	0
12136	12,12,6,7	Deciduous	2	Not Evaluated by an Arborist	-		2
12139	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Poor Health	A		0
12140	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Poor Health	A		0
12141	11	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Poor Health	A		0
12142	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Poor Health	A		0
12144	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor tree health	0
12145	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor tree health	0
12146	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor tree health	0
12147	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor tree health	0
12148	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor tree health	0

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PRELIMINARY TREE PRESERVATION AND REMOVAL TABLE

CJ DENS SUBDIVISION

CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY
NOT FOR CONSTRUCTION

CERTIFIED ARBORIST
PRELIMINARY NOT FOR CONSTRUCTION
ISA

BRYCE D. HANSON
CERTIFICATE NUMBER: PN 7554A
EXPIRATION DATE: 06/30/22

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	BRK
CHECKED BY:	BDH

P5.3

AKS DRAWING FILE: 5504 P5.0 TREE TABLES.DWG | LAYOUT: 5.3

Detailed Tree Inventory for CJ Dens

AKS JOB NO. 5504 **Site Area = 43.90 acres**

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow Rating	Reason for Removal	Tree Units Retained
12151	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor tree health	0
12152	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor tree health	0
12153	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor tree health	0
12157	10	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor tree health	0
12158	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor tree health	0
12159	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor tree health	0
12160	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor tree health	0
12161	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor tree health	0
12162	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor tree health	0
12166	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor tree health	0
12169	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12170	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12171	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12172	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12173	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12174	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12175	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12176	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12182	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A	Poor tree health	0
12183	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A	Poor tree health	0
12184	11	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A	Poor tree health	0
12185	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor tree health	0
12186	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor tree health	0
12187	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor tree health	0
12188	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor tree health	0
12189	9	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor tree health	0
12190	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A	Poor tree health	0
12194	12	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12197	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor health	A	Poor tree health	0
12200	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12201	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12204	12,10	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12205	12	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A	Poor tree health	0
12206	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A	Poor tree health	0
12207	10	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12209	9	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12210	11	Bigleaf Maple (*Acer macrophyllum*)	0	Poor Health, located in Critical Area Tract S	A		0
12211	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A	Poor tree health	0
12214	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12215	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12216	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A	Poor tree health	0
12217	8	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A	Poor tree health	0
12218	8,6,6	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12219	23	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12220	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12221	14	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12222	12,12	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12223	12	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12224	8	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12225	8	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12226	6	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12227	10,10,8,8	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12228	12	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12229	12,10,10	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12230	12,8	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A	Poor tree health	0
12233	27,8,7,7	Bigleaf Maple (*Acer macrophyllium*)	11		C	Located within proposed road grading	0
12234	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, crooked bole	C		0
12235	7	Red Alder (*Alnus rubra*)	2	Dead top, in decline	A	Poor tree health	0
12236	7	Red Alder (*Alnus rubra*)	2	Dead top, in decline	A	Poor tree health	0
12237	6,6,6	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, evaluated behind fence, dead branches in canopy	B		0
12238	10	Douglas-fir (*Pseudotsuga menziesii*)	2		C		2
12239	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed	B		2
12240	7,7,7,7	Bigleaf Maple (*Acer macrophyllum*)	3		C		3
12241	7,7,7,7,7	Bigleaf Maple (*Acer macrophyllum*)	4		C		4
12242	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed	B		2
12243	8	Red Alder (*Alnus rubra*)	0	Off site, evaluated behind fence	C		0
12244	8,8,8,8,7	Bigleaf Maple (*Acer macrophyllum*)	5		C	Located within proposed road grading	0
12245	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated from property line, unbalanced crown	B		0
12246	6	Beaked Hazelnut (Corylus cornuta)	2	Clustered shrub, stem lean, broken top	A	Poor tree health	0
12247	6	Red Alder (*Alnus rubra*)	0	Snag	A	Tree is dead	0
12248	10	Red Alder (*Alnus rubra*)	0	Off site, Snag	A		0
12249	12	Bigleaf Maple (*Acer macrophyllium*)	2	Crooked bole, dead branches, unbalanced crown	B		2
12250	10,9	Bigleaf Maple (*Acer macrophyllium*)	3	Unbalanced crown	B		3
12252	9	Bigleaf Maple (*Acer macrophyllium*)	2		C	Lot grading greatly impacts root zone	0
12253	14	Bigleaf Maple (*Acer macrophyllium*)	0	Snag	A	Tree is dead	0
12254	14	Bigleaf Maple (*Acer macrophyllium*)	0	Snag	A	Tree is dead	0
12255	18	Bigleaf Maple (*Acer macrophyllium*)	5	Crooked bole, dead branches, dead foliage, epicormic sprouts	B		5
12256	6	Bigleaf Maple (*Acer macrophyllium*)	2	Lean, unbalanced crown	B		2
12257	7	Bigleaf Maple (*Acer macrophyllium*)	0	Snag	A	Tree is dead	0
12258	8	Bigleaf Maple (*Acer macrophyllium*)	2	Sparse canopy, crooked bole	B	Lot grading greatly impacts root zone	0
12260	12,11,10,10,9,9,9	Bigleaf Maple (*Acer macrophyllium*)	2	Dead top, in decline, sparse canopy	A	Poor tree health	0
12261	11	Bigleaf Maple (*Acer macrophyllium*)	2	crooked bole, sparse canopy, dead scaffold branches	B	Lot grading greatly impacts root zone	0
12262	9,8	Bigleaf Maple (*Acer macrophyllium*)	2	Dead top, in decline, sparse canopy	A	Poor tree health	0
12263	9	Bigleaf Maple (*Acer macrophyllium*)	0	Snag	A	Tree is dead	0
12264	6	Bigleaf Maple (*Acer macrophyllium*)	0	Snag	A	Tree is dead	0
12265	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Snag	A		0
12266	36	Douglas-fir (*Pseudotsuga menziesii*)	14		C		14
12267	11,10,10,8,7,6,6,6	Bigleaf Maple (*Acer macrophyllium*)	2	Dead tops, epicormic sprouts, dead limbs	A	Poor tree health	0
12268	9	Bigleaf Maple (*Acer macrophyllium*)	2	Dead branches, lopsided canopy	B	Lot grading greatly impacts root zone	0
12270	6	Bigleaf Maple (*Acer macrophyllium*)	2	Broken top, sparse canopy, many epicormic sprouts	A	Poor tree health	0
12271	20,20	Bigleaf Maple (*Acer macrophyllium*)	0	Off site, evaluated behind fence	C		0
12272	38	Douglas-fir (*Pseudotsuga menziesii*)	15	Evaluated behind fence	C	Lot grading greatly impacts root zone	0
12273	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, in decline	A	Poor tree health	0
12274	12	Bigleaf Maple (*Acer macrophyllium*)	2	Dead top	A	Poor tree health	0
12275	6	Bigleaf Maple (*Acer macrophyllium*)	2	Lean, sparse canopy, dead top	A	Poor tree health	0
12276	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Evaluated behind fence, Codominant top, dead branches in canopy	B	Lot grading greatly impacts root zone	0
12277	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed	B	Lot grading greatly impacts root zone	0
12278	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Evaluated behind fence, dead	A	Tree is dead	0
12279	26	Douglas-fir (*Pseudotsuga menziesii*)	9	Evaluated behind fence	C	Lot grading greatly impacts root zone	0
12280	9	Douglas-fir (*Pseudotsuga menziesii*)	2	Evaluated behind fence, Codominant top, epicormic sprouts, dead branches in canopy	B	Lot grading greatly impacts root zone	0
12282	30	Douglas-fir (*Pseudotsuga menziesii*)	11	Evaluated behind fence, Butt sweep, crooked top	B	Lot grading greatly impacts root zone	0
12283	19	Douglas-fir (*Pseudotsuga menziesii*)	6		C	Located within proposed road grading	0
12284	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Seepage, sparse canopy, epicormic sprouts	B	Lot grading greatly impacts root zone	0
12285	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Seepage, sparse canopy, epicormic sprouts	B	Lot grading greatly impacts root zone	0
12286	20	Douglas-fir (*Pseudotsuga menziesii*)	6		C	Lot grading greatly impacts root zone	0
12287	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12288	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12289	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Unbalanced crown, dead branches in canopy	B		2
12290	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence	C		0
12291	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12292	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12293	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12294	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, dead branches in canopy	C		0
12295	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12296	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12297	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12298	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12299	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Snag	A	Tree is dead	0
12300	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, unbalanced crown	B		0
12301	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Very sparse canopy, dead top, in decline	A	Poor tree health	0

Detailed Tree Inventory for CJ Dens

AKS JOB NO. 5504 **Site Area = 43.90 acres**

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow Rating	Reason for Removal	Tree Units Retained
12302	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12303	18	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, evaluated behind fence, pruned branches, dead scaffold branches	B		0
12305	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12306	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12307	10	Bigleaf Maple (*Acer macrophyllum*)	2		C	Lot grading greatly impacts root zone	0
12308	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12309	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, sparse canopy	B		2
12310	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence	C		0
12311	12	Douglas-fir (*Pseudotsuga menziesii*)	2		C	Lot grading greatly impacts root zone	0
12312	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, scar with seepage, lopsided canopy	B		0
12313	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12314	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12315	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12316	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
12318	12	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, evaluated behind fence	C		0
12319	9	Bigleaf Maple (*Acer macrophyllum*)	2	Lean, dead branches in canopy	B	Lot grading greatly impacts root zone	0
12320	13	Bigleaf Maple (*Acer macrophyllum*)	3	Codominant with included bark, dead branches in canopy	B	Lot grading greatly impacts root zone	0
12321	11	Bigleaf Maple (*Acer macrophyllum*)	2	Unbalanced crown, dead scaffold branches	B	Lot grading greatly impacts root zone	0
12322	7	Bigleaf Maple (*Acer macrophyllum*)	2	Many dead branches, sparse canopy, butt sweep, in decline	A	Poor tree health	0
12323	8	Bigleaf Maple (*Acer macrophyllum*)	2	Broken codominant stem with decay	B	Lot grading greatly impacts root zone	0
12324	10	Bigleaf Maple (*Acer macrophyllum*)	2	Unbalanced crown	B	Lot grading greatly impacts root zone	0
12325	12	Bigleaf Maple (*Acer macrophyllum*)	2		C	Lot grading greatly impacts root zone	0
12326	7	Cherry (*Prunus sp.*)	2	Lean	B	Lot grading greatly impacts root zone	0
12327	11	Cherry (*Prunus sp.*)	2	Exposed buttress roots, dead branches in crown	B	Lot grading greatly impacts root zone	0
12328	19	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, dead top, very sparse canopy, in decline	A		0
12329	19	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, dead	A		0
12330	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, dead	A		0
12331	56	Bigleaf Maple (*Acer macrophyllum*)	24	Weakly attached scaffold branches, codominant stem pruned leaving cavity	B	Lot grading greatly impacts root zone	0
12332	34	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated from property line	C		0
12334	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Unbalanced crown	B	Lot grading greatly impacts root zone	0
12335	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Codominant top with included bark	B	Lot grading greatly impacts root zone	0
12336	6	Cherry (*Prunus sp.*)	2	Sweep, lean	B	Lot grading greatly impacts root zone	0
12337	8	Cherry (*Prunus sp.*)	2		C	Lot grading greatly impacts root zone	0
12338	14	Bigleaf Maple (*Acer macrophyllum*)	3	Unbalanced crown	B	Lot grading greatly impacts root zone	0
12435	18	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12436	10	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12437	10	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12438	10	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12439	10	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12440	18	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12441	14	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12442	10,10	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12443	10,22	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
50000	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50001	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Sweep	C		2
50002	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50003	6	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
50004	12,8,13,10,11	Bigleaf Maple (*Acer macrophyllum*)	8	Dead scaffold branches, stem lean, some dead branches in crown	B	Lot grading greatly impacts root zone	0
50005	8,8,15	Bigleaf Maple (*Acer macrophyllum*)	6	Stem lean, dead scaffold branches, dead codominant stems, unbalanced crown	B	Lot grading greatly impacts root zone	0
50006	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50007	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50008	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50009	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50010	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Very sparse canopy, dead branches in crown, in decline	A	Tree is dead	0
50011	19	Douglas-fir (*Pseudotsuga menziesii*)	6	Exposed buttress roots, some dead branches in crown	C	Lot grading greatly impacts root zone	0
50012	12	Bigleaf Maple (*Acer macrophyllum*)	2		C	Lot grading greatly impacts root zone	0
50013	12	Oregon Ash (*Fraxinus latifolia*)	2	Crooked bole, codominant top, some broken branches	B	Lot grading greatly impacts root zone	0
50015	15	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead, significant lean, uprooted	A	Tree is dead	0
50016	17	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50017	8,10	Bigleaf Maple (*Acer macrophyllum*)	3	Shifting bark, codominant base, lean, dead top	A	Poor tree health	0
50018	17	Bigleaf Maple (*Acer macrophyllum*)	5	Other tree leaning on this tree	B	Lot grading greatly impacts root zone	0
50019	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50020	12	Douglas-fir (*Pseudotsuga menziesii*)	2		C		2
50021	19	Douglas-fir (*Pseudotsuga menziesii*)	6		C		6
50022	16	Douglas-fir (*Pseudotsuga menziesii*)	4		C		4
50023	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50024	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50025	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Some dead branches, poor live crown ratio	B	Lot grading greatly impacts root zone	0
50026	11	Bigleaf Maple (*Acer macrophyllum*)	2	Crooked bole	B		2
50027	6,10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50028	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50029	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50030	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead, uprooted	A	Tree is dead	0
50031	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, sparse canopy, unbalanced crown, epicormic sprouts	B	Lot grading greatly impacts root zone	0
50032	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, sparse canopy, unbalanced crown, epicormic sprouts	B	Lot grading greatly impacts root zone	0
50033	15	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50034	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, unbalanced crown	B		2
50035	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B	Lot grading greatly impacts root zone	0
50036	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Dead branches in crown, Crown cleaning recommended	C	Lot grading greatly impacts root zone	0
50037	8	Red Alder (*Alnus rubra*)	0	Dead	A	Tree is dead	0
50038	8,10	Red Alder (*Alnus rubra*)	2	Dead tops, codominant base, in decline	A	Poor tree health	0
50039	10	Bigleaf Maple (*Acer macrophyllum*)	2	Dead codominant stems, crooked	B	Lot grading greatly impacts root zone	0
50040	6,8	Bigleaf Maple (*Acer macrophyllum*)	2	Broken top, dead codominant stems	A	Poor tree health	0
50041	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio	B	Lot grading greatly impacts root zone	0
50042	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, sparse canopy	B	Lot grading greatly impacts root zone	0
50043	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Some dead branches in crown, Crown cleaning recommended	C	Lot grading greatly impacts root zone	0
50044	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown, sparse canopy, poor live crown ratio	B	Lot grading greatly impacts root zone	0
50045	6,6,7,12,12	Bigleaf Maple (*Acer macrophyllum*)	6	Dead codominant stems, unbalanced crown	B		6
50046	6,6,7,12,12	Bigleaf Maple (*Acer macrophyllum*)	6	Dead codominant stems, cavities	B	Lot grading greatly impacts root zone	0
50047	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50048	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Snag	A	Tree is dead	0
50049	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Sparse canopy, sap seepage	B	Lot grading greatly impacts root zone	0
50050	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50051	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Significant lean, sweep, dead branches, sparse canopy	A		2
50052	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy, poor live crown ratio, dead branches in crown	B		2
50053	19	Douglas-fir (*Pseudotsuga menziesii*)	6	Crown cleaning recommended	C	Lot grading greatly impacts root zone	0
50054	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Sparse canopy, poor live crown ratio, dead branches in crown	B	Lot grading greatly impacts root zone	0
50055	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown, poor live crown ratio	B		6
50056	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Very poor live crown ratio, sparse canopy	A	Poor tree health	0
50057	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy, poor live crown ratio	B	Lot grading greatly impacts root zone	0
50058	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Sparse canopy, poor live crown ratio	B		4
50059	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Sparse canopy, poor live crown ratio	B		5
50060	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50061	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50062	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Unbalanced crown, poor live crown ratio	B	Lot grading greatly impacts root zone	0
50063	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Sweep, very sparse canopy, very poor live crown ratio	A	Poor tree health	0
50064	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50065	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50066	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50067	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50068	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50069	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50070	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50071	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, Sparse canopy, unbalanced crown	B	Lot grading greatly impacts root zone	0
50072	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown	B	Lot grading greatly impacts root zone	0
50073	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50074	20	Douglas-fir (*Pseudotsuga menziesii*)	6		C		6
50075	18	Douglas-fir (*Pseudotsuga menziesii*)	5		C		5
50076	17	Douglas-fir (*Pseudotsuga menziesii*)	5		C		5
50077	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Very poor live crown ratio, sparse canopy	B		0

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PRELIMINARY TREE PRESERVATION AND REMOVAL TABLE (CON.)

CJ DENS SUBDIVISION

CJ DENS LACAMAS II LLC

CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

CERTIFIED ARBORIST PROFESSIONAL NOT FOR CONSTRUCTION ISA

BRYCE D. HANSON
CERTIFICATE NUMBER: PN 7564A
EXPIRATION DATE: 06/30/22

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	BRK
CHECKED BY:	BDH

P5.4

Detailed Tree Inventory for CJ Dens

AKS JOB NO. 5504 **Site Area = 43.90 acres**

AKS Reference #	Total DBH (In)	Tree Species: Common Name (*Scientific name*)	Tree Units: Initial	Condition/Comments	Windthrow Rating	Reason for Removal	Tree Units: Retained
50078	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Very poor live crown ratio, sparse canopy	B		4
50079	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Poor live crown ratio	B		6
50080	12	Bigleaf Maple (*Acer macrophyllum*)	0	Snag	A		0
50081	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, unbalanced crown	B		4
50082	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B		3
50083	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Very poor live crown ratio, sparse canopy	B		3
50084	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Very poor live crown ratio, sparse canopy	B		3
50085	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Very poor live crown ratio, sparse canopy	B		3
50086	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, sparse canopy	B		4
50087	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B		3
50088	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B		3
50089	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50090	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, sparse canopy	B		5
50091	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, very sparse canopy	A	Poor tree health	0
50092	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, very sparse canopy	A	Poor tree health	0
50093	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, very sparse canopy	A	Poor tree health	0
50095	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio	B		5
50096	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, dead branches in crown	B	Lot grading greatly impacts root zone	0
50098	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50099	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio	B		5
50100	10	Bigleaf Maple (*Acer macrophyllum*)	2	Dead scaffold branches, unbalanced crown	B		2
50101	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown, dead lower branches	B		5
50102	6	Bigleaf Maple (*Acer macrophyllum*)	2	dead branches in crown, Crown cleaning recommended	C		2
50103	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio	B		5
50104	22	Douglas-fir (*Pseudotsuga menziesii*)	7	Unbalanced crown	B		7
50105	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Unbalanced crown, dead branches in crown	B		3
50106	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Dead lower branches	C		6
50107	7	Bigleaf Maple (*Acer macrophyllum*)	2	Crooked bole, dead scaffold branches, shifting bark	B		2
50108	14	Douglas-fir (*Pseudotsuga menziesii*)	3	dead branches in crown, Crown cleaning recommended	C		3
50109	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown, codominant top	B		6
50110	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Unbalanced crown, dead branches in crown	B	Lot grading greatly impacts root zone	0
50111	17	Douglas-fir (*Pseudotsuga menziesii*)	5	dead branches in crown, Crown cleaning recommended	C		5
50112	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50113	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown, dead branches in crown	B		5
50114	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, sparse canopy	B		2
50115	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B		3
50116	8	Red Alder (*Alnus rubra*)	2	Epicormic sprouts, dead branches in crown, dead top	B		2
50117	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Sap seepage, dead lower branches	C		5
50118	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio	B	Lot grading greatly impacts root zone	0
50119	6,6,6,7	Bigleaf Maple (*Acer macrophyllum*)	3	Unbalanced crown, dead scaffold branches, dead codominant stems at base	B		3
50120	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio	B		2
50121	9	Bigleaf Maple (*Acer macrophyllum*)	2		C	Lot grading greatly impacts root zone	0
50122	6	Bigleaf Maple (*Acer macrophyllum*)	2	Sparse canopy, lean	B	Lot grading greatly impacts root zone	0
50123	6,6,8,8	Bigleaf Maple (*Acer macrophyllum*)	3	Lean	B	Lot grading greatly impacts root zone	0
50124	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio	B		2
50125	10	Bigleaf Maple (*Acer macrophyllum*)	2	Lean, unbalanced crown	B		2
50126	7,8	Bigleaf Maple (*Acer macrophyllum*)	2	In decline, lean, unbalanced crown, dead codominant stems	A	Poor tree health	0
50127	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50128	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, dead branches in crown	B	Lot grading greatly impacts root zone	0
50129	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Unbalanced crown	B	Lot grading greatly impacts root zone	0
50130	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Very sparse canopy, poor live crown ratio	A	Poor tree health	0
50131	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Dead lower branches	C	Lot grading greatly impacts root zone	0
50132	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio	B	Lot grading greatly impacts root zone	0
50133	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio	B		4
50134	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Unbalanced crown	B		4
50135	9	Cherry (*Prunus sp.*)	2	Dead top, epicormic sprouts, in decline	A		2
50137	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio	B		4
50138	19	Douglas-fir (*Pseudotsuga menziesii*)	6		C		6
50139	15	Douglas-fir (*Pseudotsuga menziesii*)	4		C		4
50140	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Unbalanced crown, poor live crown ratio	B		2
50141	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Dead lower branches, some dead branches in crown, Crown cleaning recommended	C		5
50142	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Unbalanced crown, poor live crown ratio	B		3
50143	6	Bigleaf Maple (*Acer macrophyllum*)	2	Dead top, in decline	A		2
50144	17	Douglas-fir (*Pseudotsuga menziesii*)	5		C		5
50145	8,10	Bigleaf Maple (*Acer macrophyllum*)	3	Codominant base	B		3
50146	10	Bigleaf Maple (*Acer macrophyllum*)	2	Crooked bole, sparse canopy	B	Lot grading greatly impacts root zone	0
50147	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Branch dieback; Sparse canopy, poor live crown ratio, unbalanced crown	A	Poor tree health	0
50148	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Dead branches in crown, Crown cleaning recommended	C		5
50149	17,18	Bigleaf Maple (*Acer macrophyllum*)	9	Cavities, dead codominant stem	B	Lot grading greatly impacts root zone	0
50150	19	Douglas-fir (*Pseudotsuga menziesii*)	6	Poor live crown ratio, branch dieback	B	Lot grading greatly impacts root zone	0
50151	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, branch dieback	B	Lot grading greatly impacts root zone	0
50152	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Dead branches in crown	B	Lot grading greatly impacts root zone	0
50153	6,8	Bigleaf Maple (*Acer macrophyllum*)	2	Dead codominant stems at base, sparse canopy	B	Lot grading greatly impacts root zone	0
50154	10	Douglas-fir (*Pseudotsuga menziesii*)	2	In significant decline	A	Poor tree health	0
50155	6	Bigleaf Maple (*Acer macrophyllum*)	2	Significant lean, broken codominant stems, in decline	A	Poor tree health	0
50156	10	Bigleaf Maple (*Acer macrophyllum*)	2	Cavity, crooked bole, poor live crown ratio	B		2
50157	6,9	Bigleaf Maple (*Acer macrophyllum*)	2		C		2
50158	7	Bigleaf Maple (*Acer macrophyllum*)	2	Lean, codominant top	B		2
50159	7,10	Bigleaf Maple (*Acer macrophyllum*)	2	Dead top, in decline	A		2
50160	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50161	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Unbalanced crown	B		4
50162	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Unbalanced crown, poor live crown ratio	B		4
50163	8	Bigleaf Maple (*Acer macrophyllum*)	2	Dead branches in crown, sparse canopy	B		2
50164	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50165	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown, dead branches in crown	B		6
50166	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio	B		3
50167	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, epicormic sprouts, dead branches	B		2
50168	23	Douglas-fir (*Pseudotsuga menziesii*)	8	Crooked bole, unbalanced crown	B		8
50169	12,13	Douglas-fir (*Pseudotsuga menziesii*)	5	Codominant base with included bark, sparse canopy	B	Lot grading greatly impacts root zone	0
50170	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50171	10	Cherry (*Prunus sp.*)	2	Sparse canopy, many dead branches, in decline	A	Poor tree health	0
50172	10	Cherry (*Prunus sp.*)	0	Dead	A	Tree is dead	0
50173	9	Cherry (*Prunus sp.*)	2	Sparse canopy, many dead branches, in decline	A	Poor tree health	0
50174	10	Bigleaf Maple (*Acer macrophyllum*)	2	Dead branches in crown, codominant base	B		2
50175	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Sweep, poor live crown ratio	B		4
50176	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, sparse canopy, epicormic sprouts	B		5
50178	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, dead branches in crown	B		4
50179	10	Bigleaf Maple (*Acer macrophyllum*)	2	Dead top	B		2
50180	6,9,9	Bigleaf Maple (*Acer macrophyllum*)	3	Branch dieback; sparse canopy	B		3
50181	6,6,7	Bigleaf Maple (*Acer macrophyllum*)	2	Branch dieback; sparse canopy; dead codominant stem	B		2
50183	7,7,9,10,10	Bigleaf Maple (*Acer macrophyllum*)	6	Clustered base, some branch dieback, dead scaffold branches	B		6
50184	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio	B		4
50185	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, sparse canopy	B		5
50186	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, sparse canopy	B		4
50187	8	Bigleaf Maple (*Acer macrophyllum*)	2	Sweep	B		2
50188	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50190	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50191	6,6,6,7,10,10	Bigleaf Maple (*Acer macrophyllum*)	6	Dead scaffold branches, cavities in base	B		6
50192	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50193	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50194	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50195	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, sparse canopy, dead branches in crown	B	Lot grading greatly impacts root zone	5
50196	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50197	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, sparse canopy, dead branches in crown	B	Lot grading greatly impacts root zone	5
50198	10,10	Bigleaf Maple (*Acer macrophyllum*)	2	Significant lean	A	Poor tree health	0
50199	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Tree leaning on	B		2
50200	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Lean	B		2
50201	6	Douglas-fir (*Pseudotsuga menziesii*)	2		C		2
50202	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Very poor live crown ratio, very sparse canopy, in decline	A	Poor tree health	0
50203	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Very poor live crown ratio, very sparse canopy, in decline	A	Poor tree health	0

Detailed Tree Inventory for CJ Dens

AKS JOB NO. 5504 **Site Area = 43.90 acres**

AKS Reference #	Total DBH (In)	Tree Species: Common Name (*Scientific name*)	Tree Units: Initial	Condition/Comments	Windthrow Rating	Reason for Removal	Tree Units: Retained
50204	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Very poor live crown ratio, very sparse canopy, in decline	A	Poor tree health	0
50205	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Snag	A	Tree is dead	0
50206	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50207	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Poor live crown ratio	B		6
50208	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50209	17	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50210	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50211	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50212	15	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Tree is dead	0
50213	6	Bigleaf Maple (*Acer macrophyllum*)	2	Lean	B		2
50214	6,6,6,10,10,10	Bigleaf Maple (*Acer macrophyllum*)	6	Dead branches, dead codominant stems	B		6
50215	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio	B		4
50216	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B		3
50217	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Snag	A	Tree is dead	0
50218	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Snag	A	Tree is dead	0
50219	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, sparse canopy	B	Lot grading greatly impacts root zone	0
50220	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, sparse canopy	B	Lot grading greatly impacts root zone	0
50221	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50222	14	Coniferous	3	Not Evaluated by an Arborist	-		3
50223	7	Deciduous	2	Not Evaluated by an Arborist	-		2
50500	8	Douglas-fir (*Pseudotsuga menziesii*)	2		C	Located within proposed road grading	0
50501	29	Bigleaf Maple (*Acer macrophyllum*)	11		C		11
50502	17	Red Alder (*Alnus rubra*)	0	Snag	A	Tree is dead	0
50503	18	Bigleaf Maple (*Acer macrophyllum*)	0	Large hollow in base with significant decay, located in Critical Area Tract S	A		0
50504	13	Red Alder (*Alnus rubra*)	0	Snag, located in Critical Area Tract S	A	Tree is dead	0
50505	17	Bigleaf Maple (*Acer macrophyllum*)	0	Sweep, deformed bole, located in Critical Area Tract S	B	Lot grading greatly impacts root zone	0
50506	12,11,10,6,6,6	Bigleaf Maple (*Acer macrophyllum*)	7	Cavity with decay in base, dead limbs	B	Lot grading greatly impacts root zone	0
50507	13,13,10,6	Bigleaf Maple (*Acer macrophyllum*)	7	Dead scaffold branches, broken Codominant stems	B	Lot grading greatly impacts root zone	0
50508	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Poor live crown ratio, located in Critical Area Tract S	B	Lot grading greatly impacts root zone	0
50509	13	Red Alder (*Alnus rubra*)	0	Dead top, poor live crown ratio, in decline., located in Critical Area Tract S	A	Poor tree health	0
50510	12	Bigleaf Maple (*Acer macrophyllum*)	0	Located in Critical Area Tract S	C		0
50511	14	Red Alder (*Alnus rubra*)	0	Dead branches., located in Critical Area Tract S	C		0
50512	15,6,6	Bigleaf Maple (*Acer macrophyllum*)	0	Located in Critical Area Tract S	C		0

NOTE: On site trees existed durinst the site visits performed on 07/06/2020 - 8/13/2020.

Total # of On Site Existing Trees= 408
Total On Site Existing Tree Units = 1699.0
Total # of On Site Trees Retained= 238
Total # of Tree Units Retained= 1048.0
Minimum Tree Units Required per City Code = 878
(43.90 acres * 20 trees/acre)
Minimum # Trees to replant= 0

Total # of Existing Trees Removed= 170
Total Existing Tree Units Removed= 651.0

Windthrow Rating:
A=Least windthrow resistant
B=Moderate windthrow resistant
C=Most windthrow resistant

Tree Root Protection Zone: The tree root protection zone for each tree is a circle with a radius equal to 1 foot per 1 inch DBH.

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.
At the completion of construction, all trees must once again be reviewed to evaluate their hazard rating. Land clearing and removal of adjacent trees can expose previously unseen defects and otherwise healthy trees can be damaged during construction. Additional tree removal may be recommended by the project arborist.

NOTE:
THIS PROJECT RESERVES THE RIGHT THE REMOVE ADDITIONAL TREES, AS DEEMED NECESSARY/RECOMMENDED BY THE PROJECT CERTIFIED ARBORIST, FOR HAZARD ABATEMENT PURPOSES. THIS CANNOT BE EVALUATED UNTIL AFTER CONSTRUCTION AS DISCUSSED WITHIN THE ARBORIST REPORT AND THESE PLANS. THE CITY WILL BE NOTIFIED OF SUCH REMOVALS AND WILL BE CONSULTED WITH IF A SIGNIFICANT AMOUNT OF TREES ARE RECOMMENDED FOR REMOVAL POST CONSTRUCTION ACTIVITIES.

CERTIFIED ARBORIST ISA
PRELIMINARY NOT FOR CONSTRUCTION
BRYCE D. HANSON
CERTIFICATE NUMBER: PN 7554A
EXPIRATION DATE: 06/30/22

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PRELIMINARY TREE PRESERVATION AND REMOVAL TABLE (CON.)

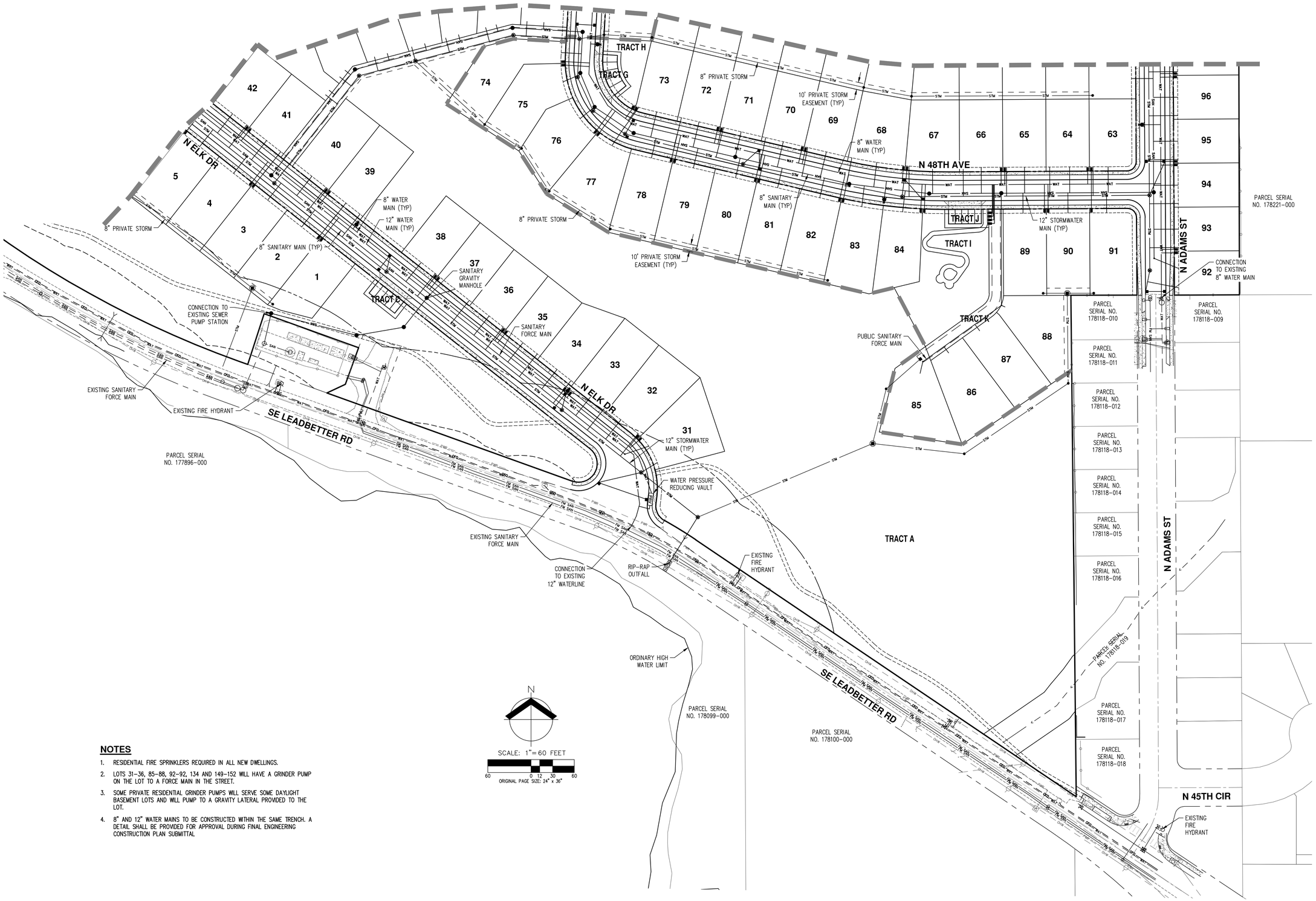
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	BRK
CHECKED BY:	BDH

P5.5

AKS DRAWING FILE: 5504 P5.0 TREE TABLES.DWG | LAYOUT: 5.5



NOTES

1. RESIDENTIAL FIRE SPRINKLERS REQUIRED IN ALL NEW DWELLINGS.
2. LOTS 31-36, 85-88, 92-92, 134 AND 149-152 WILL HAVE A GRINDER PUMP ON THE LOT TO A FORCE MAIN IN THE STREET.
3. SOME PRIVATE RESIDENTIAL GRINDER PUMPS WILL SERVE SOME DAYLIGHT BASEMENT LOTS AND WILL PUMP TO A GRAVITY LATERAL PROVIDED TO THE LOT.
4. 8" AND 12" WATER MAINS TO BE CONSTRUCTED WITHIN THE SAME TRENCH. A DETAIL SHALL BE PROVIDED FOR APPROVAL DURING FINAL ENGINEERING CONSTRUCTION PLAN SUBMITTAL

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PRELIMINARY COMPOSITE UTILITY PLAN (SOUTH)

CJ DENS SUBDIVISION

CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P6.0

AKS DRAWING FILE: 5504 P6.0 UTILITY PLAN.DWG | LAYOUT: P6.0

PARCEL SERIAL NO. 177885-000

PARCEL SERIAL NO. 178175-000

PARCEL SERIAL NO. 178171-000

PARCEL SERIAL NO. 177905-000

PARCEL SERIAL NO. 178115-005

PARCEL SERIAL NO. 178221-000

WETLAND BOUNDARY

WETLAND BOUNDARY

PROPOSED WETLAND BUFFER

WATER PRESSURE REDUCING VAULT

PUBLIC PRESSURE SANITARY MAIN

END OF GRAVITY MAIN, BEGIN GRINDER PUMP FORCE MAIN

TRACT T

TRACT R

TRACT S

TRACT P

TRACT Q

TRACT O

TRACT L

TRACT N

TRACT M

TRACT K

TRACT F

TRACT D

TRACT B

N 50TH AVE

N 49TH AVE

N 46TH AVE

N BENTON ST

N ADAMS CT

12" WATER MAIN (TYP)

8" WATER MAIN (TYP)

8" SANITARY MAIN (TYP)

12" STORMWATER MAIN (TYP)

8" PRIVATE STORM

10.00' PUBLIC STORM EASEMENT (TYP)

10' PRIVATE STORM EASEMENT (TYP)

NOTES

1. RESIDENTIAL FIRE SPRINKLERS REQUIRED IN ALL NEW DWELLINGS.
2. LOTS 31-36, 85-88, 92-92, 134 AND 149-152 WILL HAVE A GRINDER PUMP ON THE LOT TO A FORCE MAIN IN THE STREET.
3. SOME PRIVATE RESIDENTIAL GRINDER PUMPS WILL SERVE SOME DAYLIGHT BASEMENT LOTS AND WILL PUMP TO A GRAVITY LATERAL PROVIDED TO THE LOT.
4. 8" AND 12" WATER MAINS TO BE CONSTRUCTED WITHIN THE SAME TRENCH. A DETAIL SHALL BE PROVIDED FOR APPROVAL DURING FINAL ENGINEERING CONSTRUCTION PLAN SUBMITTAL

N

SCALE: 1"=60 FEET

60 0 12 30 60

ORIGINAL PAGE SIZE: 24" x 36"

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PRELIMINARY COMPOSITE UTILITY PLAN (NORTH)

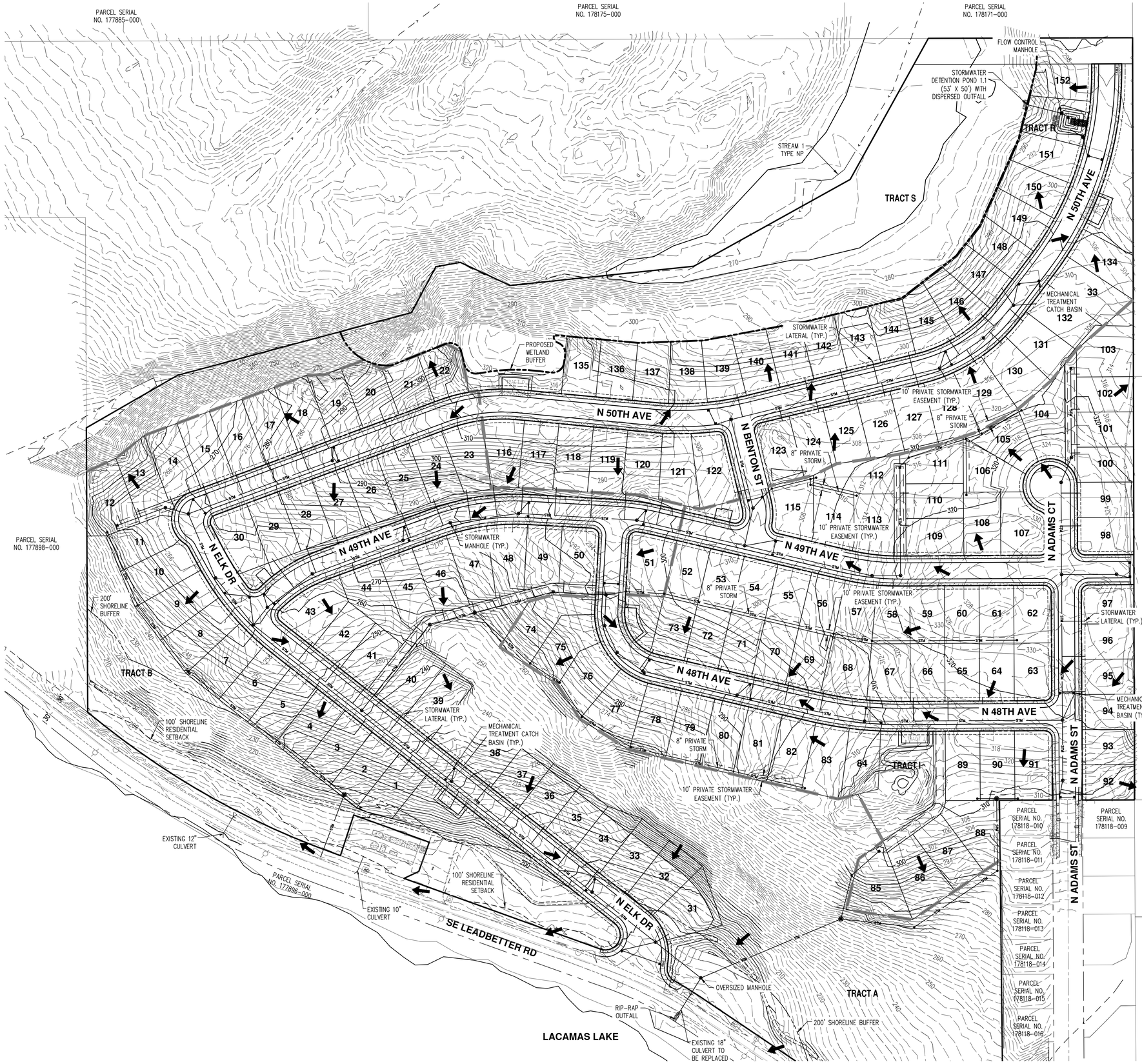
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P6.1

AKS DRAWING FILE: 5504 P6.0 UTILITY PLAN.DWG | LAYOUT: P6.1



LEGEND

- EXISTING GROUND CONTOUR (2 FT)
- EXISTING GROUND CONTOUR (10 FT) — 350
- FINISHED GRADE CONTOUR (2 FT)
- FINISHED GRADE CONTOUR (10 FT) — 350
- PHASE BOUNDARY
- STORMWATER FLOW ARROWS
- STORM FACILITY ACCESS

GENERAL NOTES

1. CONTOUR INTERVAL IS 2 FOOT.
2. TREES ARE NOT SHOWN.
3. STORMWATER DETENTION POND 1.1 ON TRACT R TO BE OWNED AND MAINTAINED BY THE HOA.
4. ACCORDING TO CLARK COUNTY GIS, THE SITE IS NOT WITHIN OR ADJACENT TO A 100-YEAR FLOODPLAIN.
5. THERE ARE NO KNOWN EXISTING ON-SITE STORMWATER FACILITIES.
6. NATIVE VEGETATION WITHIN TRACT A, TRACT B, TRACT S, AND THE CRITICAL AREAS WILL BE RETAINED AS MUCH AS POSSIBLE AND ENHANCED, AS NEEDED, PER THE WETLAND MITIGATION PLAN.
7. SOME OFF-SITE FLOW OCCURS FROM ADJACENT PARCELS. ANALYSIS OF OFF-SITE FLOW WAS NOT DONE AT THIS TIME AND WILL BE INCLUDED WITH THE FINAL STORMWATER PLAN.
8. REAR YARD RUNOFF FOR LOTS 12-22 AND 135-152 WILL BE COLLECTED AND DISPERSED INTO THE ADJACENT WETLAND BUFFER. ROOFS WILL DRAIN TO A STORMWATER LATERAL.
9. REAR YARD RUNOFF FOR LOTS 92-103 WILL BE COLLECTED AND DISPERSED INTO THE NEIGHBORING PROPERTY. ROOFS WILL DRAIN TO A STORMWATER LATERAL.

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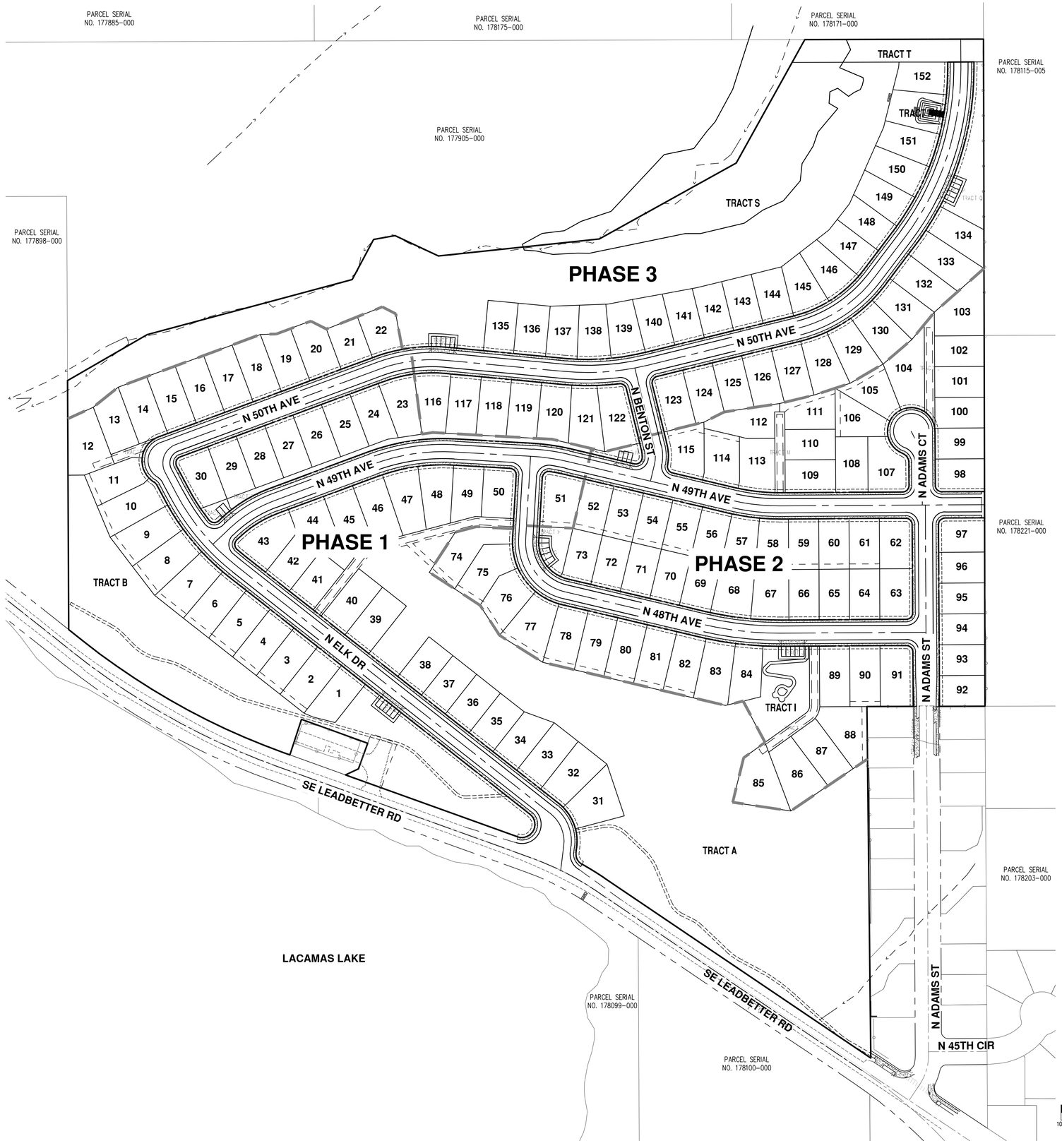
PRELIMINARY STORMWATER PLAN
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

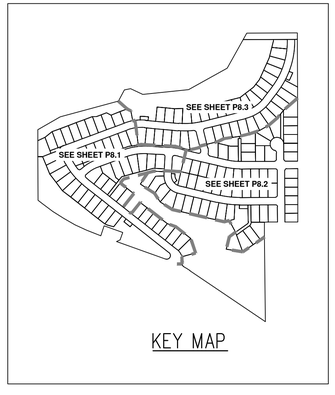
PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P7.0

AKS DRAWING FILE: 5504 P7.0 STM.DWG | LAYOUT: P7.0





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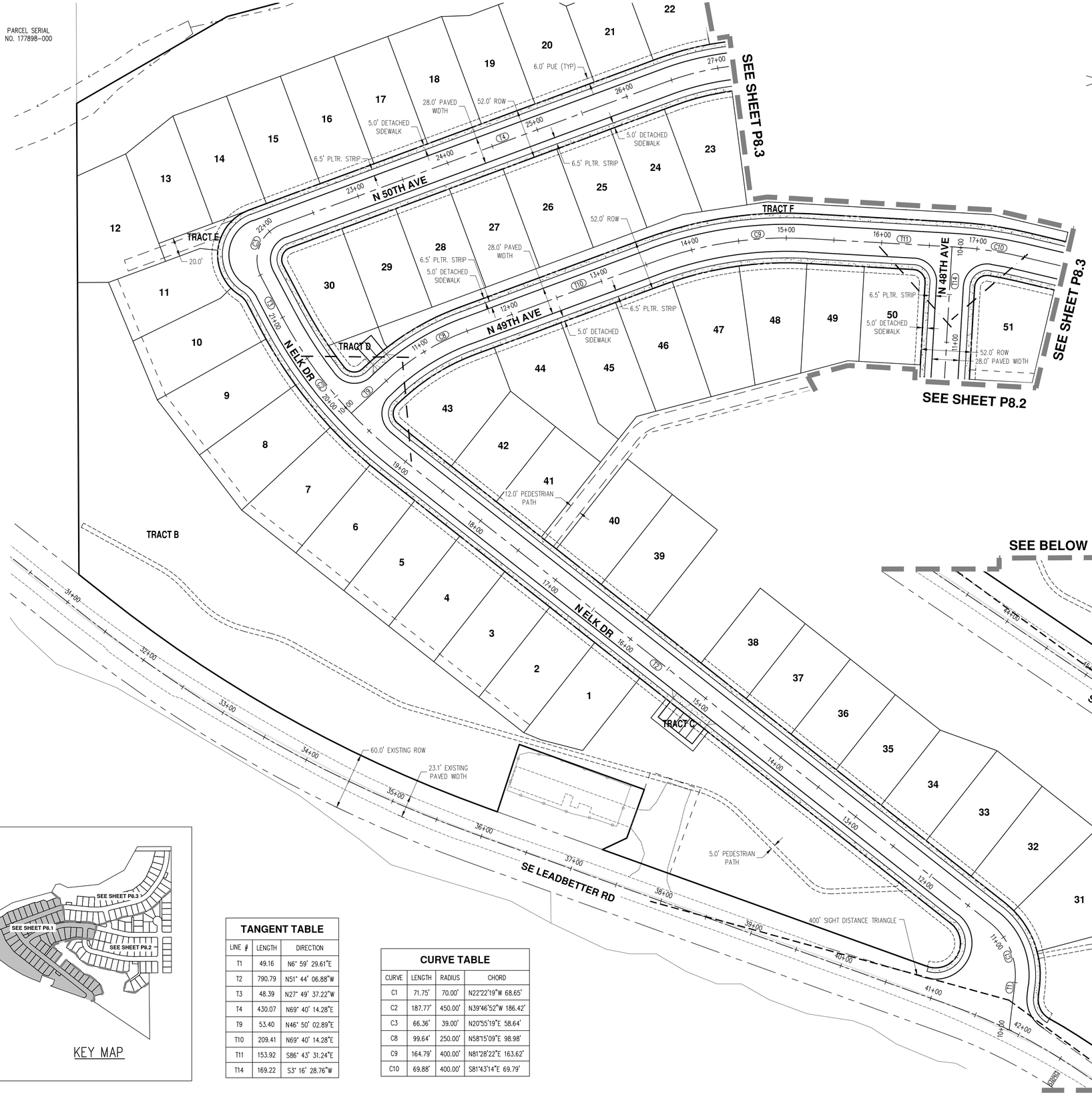
PRELIMINARY STREET PLAN
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

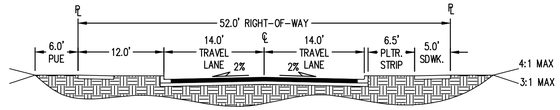
PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P8.0

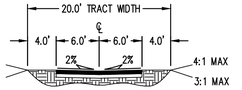
AKS DRAWING FILE: 5504 P8.0 STR.DWG | LAYOUT: P8.0



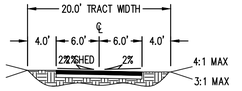


2 LANE LOCAL ROAD (ST3)

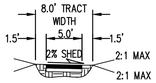
N ELK DR, N 48TH AVE, N49TH AVE, N 50TH AVE, N BENTON ST, N ADAMS ST, N ADAMS CT



PRIVATE ACCESS DRIVEWAY



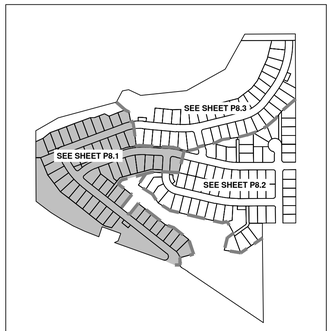
UTILITY ACCESS ROAD



PUBLIC PATH

GENERAL NOTES

1. THE PROPOSED DEVELOPMENT WILL ACCESS OFF SE LEADBETTER ROAD WHICH IS CLASSIFIED AS AN EXISTING 2-LANE LOCAL ROAD WITHOUT SIDEWALKS OR CURB AND GUTTER. NO IMPROVEMENTS ARE PROPOSED.



KEY MAP

TANGENT TABLE		
LINE #	LENGTH	DIRECTION
T1	49.16	N6° 59' 29.61"E
T2	790.79	N51° 44' 06.88"W
T3	48.39	N27° 49' 37.22"W
T4	430.07	N69° 40' 14.28"E
T9	53.40	N46° 50' 02.89"E
T10	209.41	N69° 40' 14.28"E
T11	153.92	S86° 43' 31.24"E
T14	169.22	S3° 16' 28.76"W

CURVE TABLE			
CURVE	LENGTH	RADIUS	CHORD
C1	71.75'	70.00'	N22°22'19"W 68.65'
C2	187.77'	450.00'	N39°46'52"W 186.42'
C3	66.36'	39.00'	N20°55'19"E 58.64'
C8	99.64'	250.00'	N58°15'09"E 98.98'
C9	164.79'	400.00'	N81°28'22"E 163.62'
C10	69.88'	400.00'	S81°43'14"E 69.79'

N

SCALE: 1"=50 FEET

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ORIGINAL PAGE SIZE: 24" x 36"

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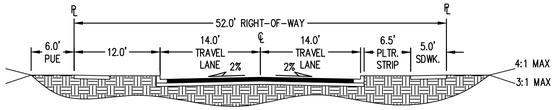
PRELIMINARY STREET PLAN - PHASE 1
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

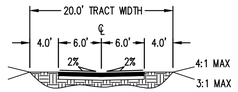
P8.1

AKS DRAWING FILE: 5504 P8.0 STR.DWG | LAYOUT: P8.1

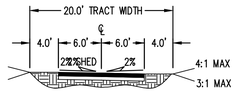


2 LANE LOCAL ROAD (ST3)

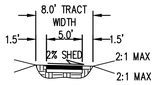
N ELK DR, N 48TH AVE, N49TH AVE,
N 50TH AVE, N BENTON ST, N ADAMS ST,
N ADAMS CT



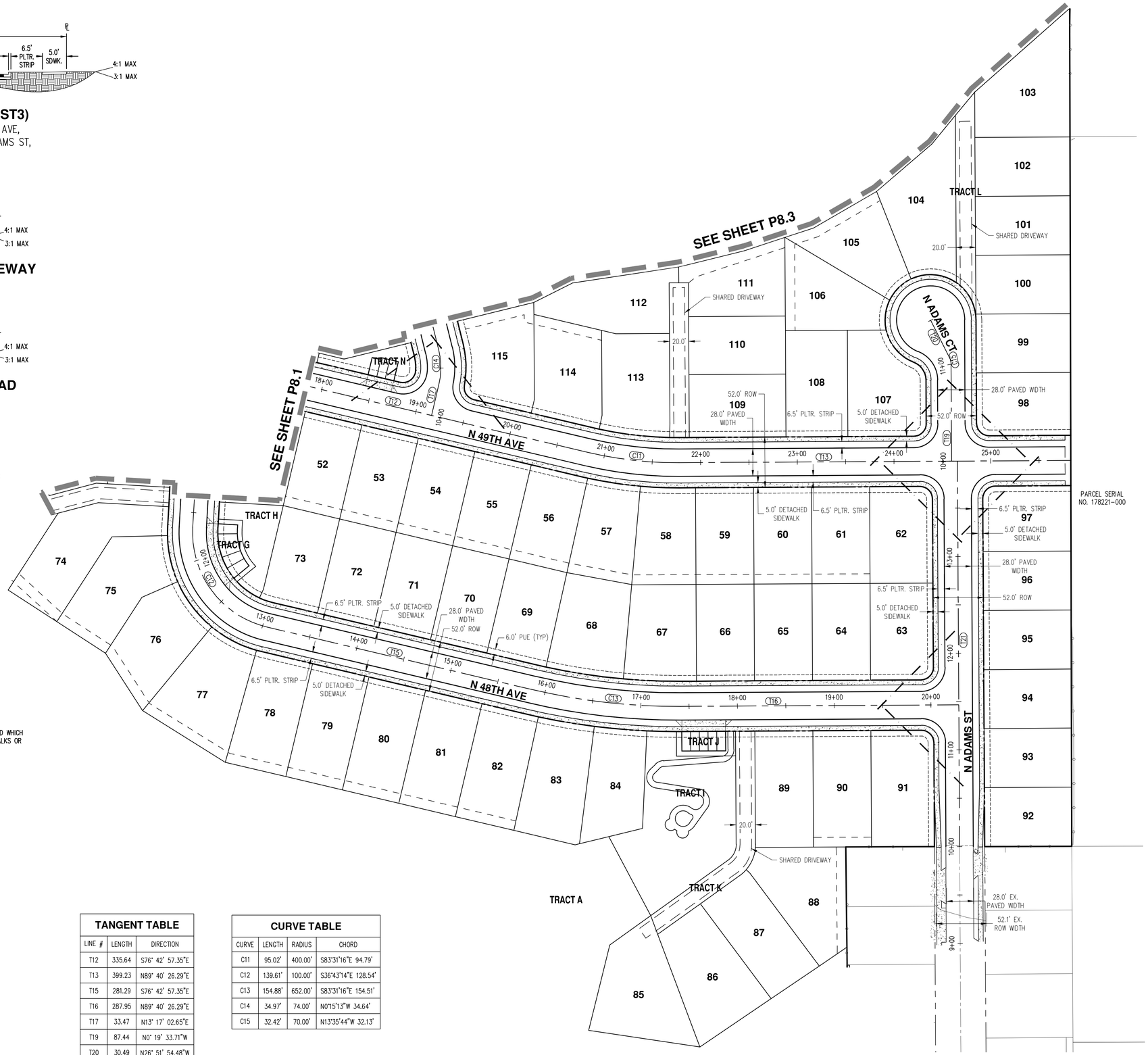
PRIVATE ACCESS DRIVEWAY



UTILITY ACCESS ROAD

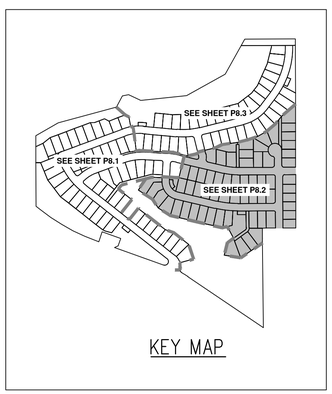


PUBLIC PATH



GENERAL NOTES

1. THE PROPOSED DEVELOPMENT WILL ACCESS OFF SE LEADBETTER ROAD WHICH IS CLASSIFIED AS AN EXISTING 2-LANE LOCAL ROAD WITHOUT SIDEWALKS OR CURB AND GUTTER. NO IMPROVEMENTS ARE PROPOSED.



KEY MAP

TANGENT TABLE		
LINE #	LENGTH	DIRECTION
T12	335.64	S76° 42' 57.35"E
T13	399.23	N89° 40' 26.29"E
T15	281.29	S76° 42' 57.35"E
T16	287.95	N89° 40' 26.29"E
T17	33.47	N13° 17' 02.65"E
T19	87.44	N0° 19' 33.71"W
T20	30.49	N26° 51' 54.48"W
T21	398.61	S0° 19' 33.71"E

CURVE TABLE			
CURVE	LENGTH	RADIUS	CHORD
C11	95.02'	400.00'	S83°31'16"E 94.79'
C12	139.61'	100.00'	S36°43'14"E 128.54'
C13	154.88'	652.00'	S83°31'16"E 154.51'
C14	34.97'	74.00'	N0°15'13"W 34.64'
C15	32.42'	70.00'	N13°35'44"W 32.13'

N

SCALE: 1"=50 FEET

50 0 10 25 50

ORIGINAL PAGE SIZE: 24" x 36"

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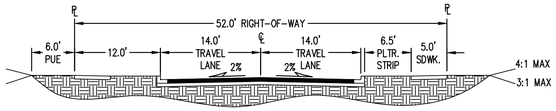
PRELIMINARY STREET PLAN - PHASE 2
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

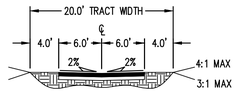
P8.2

AKS DRAWING FILE: 5504 P8.0 STR.DWG | LAYOUT: P8.2

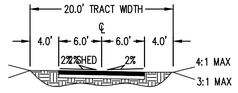


2 LANE LOCAL ROAD (ST3)

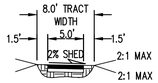
N ELK DR, N 48TH AVE, N49TH AVE,
N 50TH AVE, N BENTON ST, N ADAMS ST,
N ADAMS CT



PRIVATE ACCESS DRIVEWAY



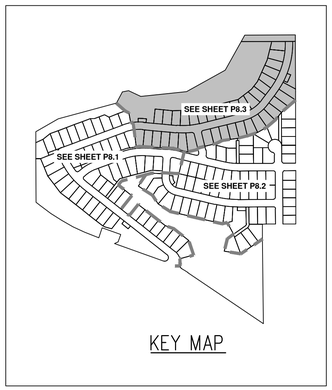
UTILITY ACCESS ROAD



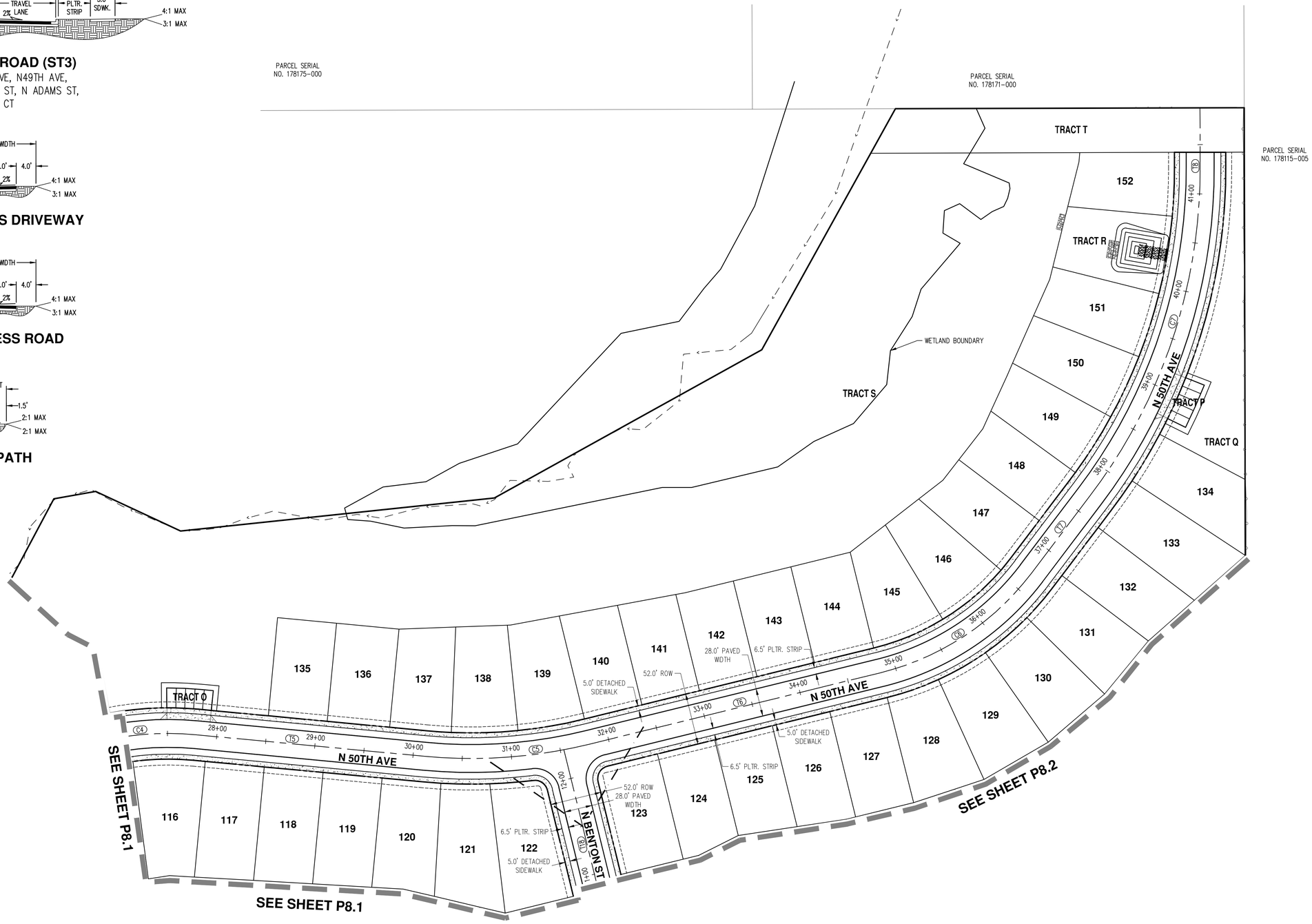
PUBLIC PATH

TANGENT TABLE		
LINE #	LENGTH	DIRECTION
T5	233.27	S84° 36' 43.29"E
T6	303.65	N76° 12' 30.70"E
T7	98.78	N37° 07' 34.55"E
T8	14.76	N0° 07' 57.00"W
T18	161.43	N13° 47' 29.30"W

CURVE TABLE			
CURVE	LENGTH	RADIUS	CHORD
C4	134.66'	300.00'	N82°31'45"E 133.53'
C5	167.37'	500.00'	N85°47'54"E 166.59'
C6	187.58'	275.00'	N56°40'03"E 183.97'
C7	357.66'	550.00'	N18°29'49"E 351.39'



KEY MAP



GENERAL NOTES

1. THE PROPOSED DEVELOPMENT WILL ACCESS OFF SE LEADBETTER ROAD WHICH IS CLASSIFIED AS AN EXISTING 2-LANE LOCAL ROAD WITHOUT SIDEWALKS OR CURB AND GUTTER. NO IMPROVEMENTS ARE PROPOSED.

SCALE: 1" = 50 FEET

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ORIGINAL PAGE SIZE: 24" x 36"

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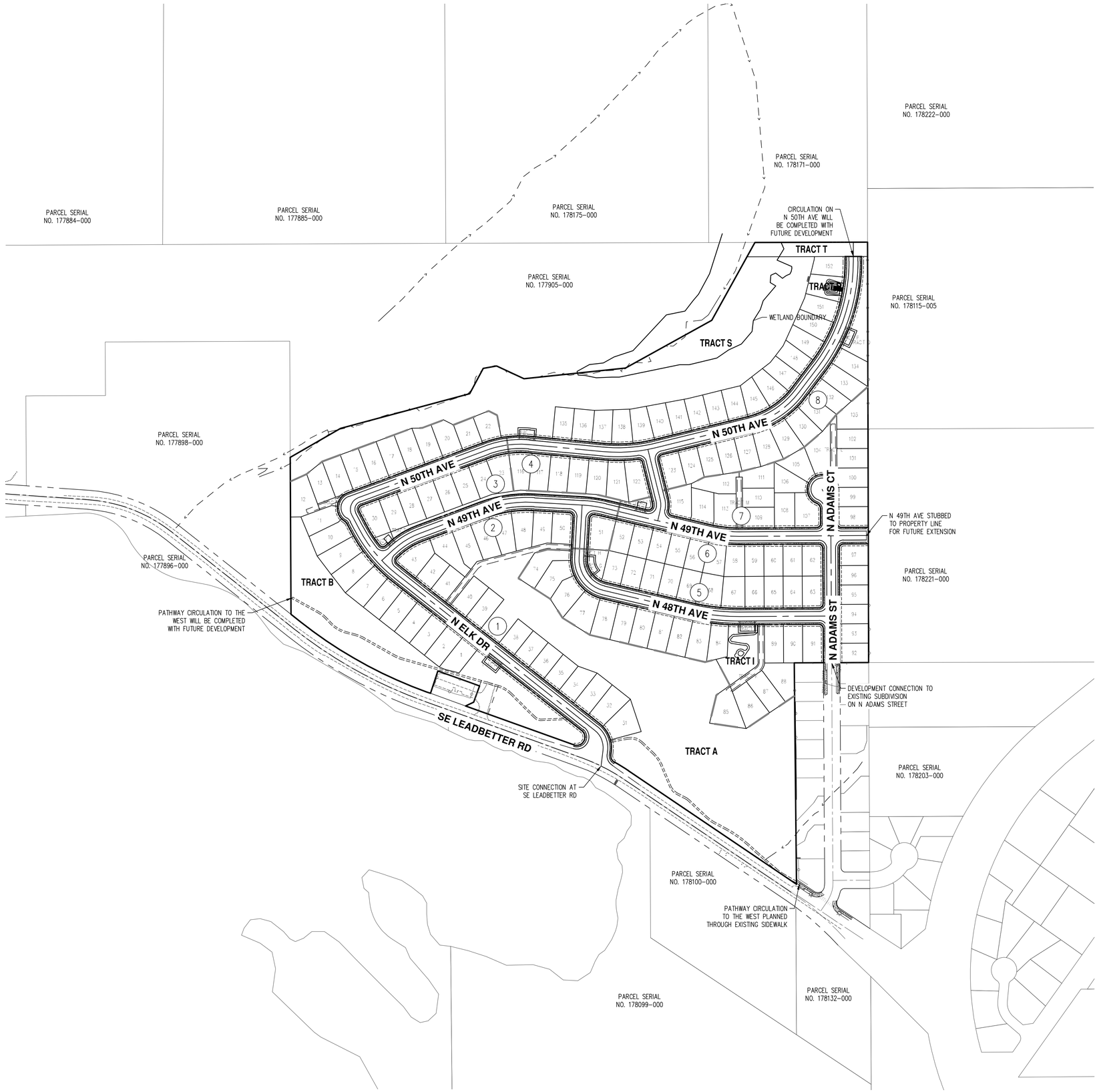
PRELIMINARY STREET PLAN - PHASE 3
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P8.3

AKS DRAWING FILE: 5504 P8.0 STR.DWG | LAYOUT: P8.3



KEYED NOTES

1. 951.82' MEASURED ROW TO ROW SPACING
2. 582.83' MEASURED ROW TO ROW SPACING
3. 883.12 MEASURED ROW TO ROW SPACING
4. 911.65' MEASURED ROW TO ROW SPACING
5. 911.55' MEASURED ROW TO ROW SPACING
6. 729.84' MEASURED ROW TO ROW SPACING
7. 471.45' MEASURED ROW TO ROW SPACING
8. 999.29' MEASURED ROW TO ROW SPACING

N

SCALE: 1"=150 FEET

150 0 30 75 150

ORIGINAL PAGE SIZE: 24" x 36"

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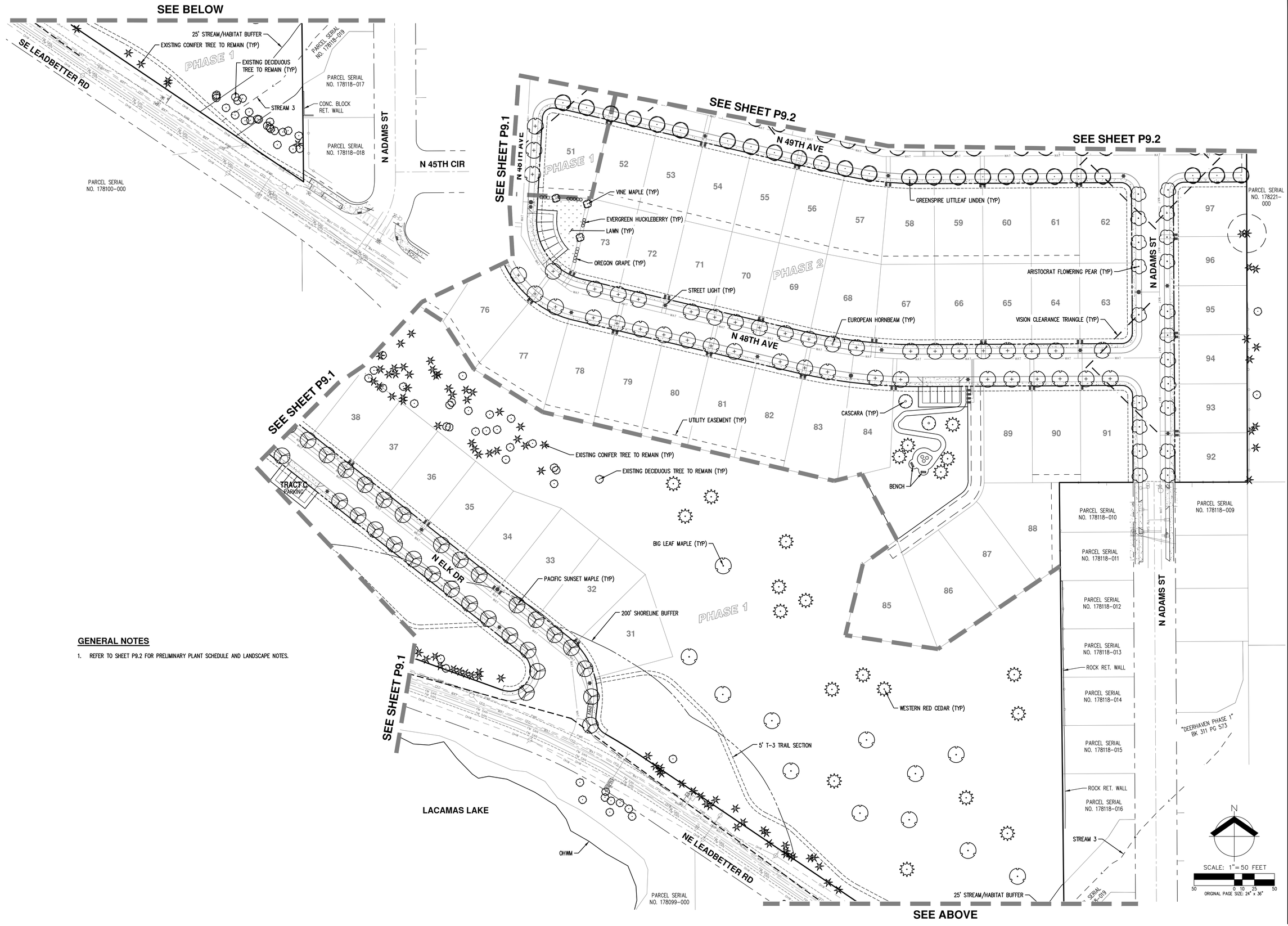
PRELIMINARY CIRCULATION PLAN
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P8.4

AKS DRAWING FILE: 5504 P8.0 STR.DWG | LAYOUT: P8.4



GENERAL NOTES

1. REFER TO SHEET P9.2 FOR PRELIMINARY PLANT SCHEDULE AND LANDSCAPE NOTES.

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PRELIMINARY LANDSCAPE AND LIGHTING PLAN (SOUTH)

CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

STATE OF WASHINGTON · TIMOTHY E. BOYCE · 22830 · REGISTERED LANDSCAPE ARCHITECT · EXP. 12/21/2021

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	TEB
DRAWN BY:	TEB
CHECKED BY:	JMM

P9.0

AKS DRAWING FILE: 5504 P9.0 LANDSCAPE.DWG | LAYOUT: P9.0

GENERAL NOTES

1. REFER TO SHEET P9.2 FOR PRELIMINARY PLANT SCHEDULE AND LANDSCAPE NOTES.

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PRELIMINARY LANDSCAPE AND LIGHTING PLAN (WEST)

CJ DENS SUBDIVISION

CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

STATE OF WASHINGTON
TIMOTHY E. BOYCE
LANDSCAPE ARCHITECT
EXP. 12/17/2021

PRELIMINARY
NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	TEB
DRAWN BY:	TEB
CHECKED BY:	JMM

P9.1

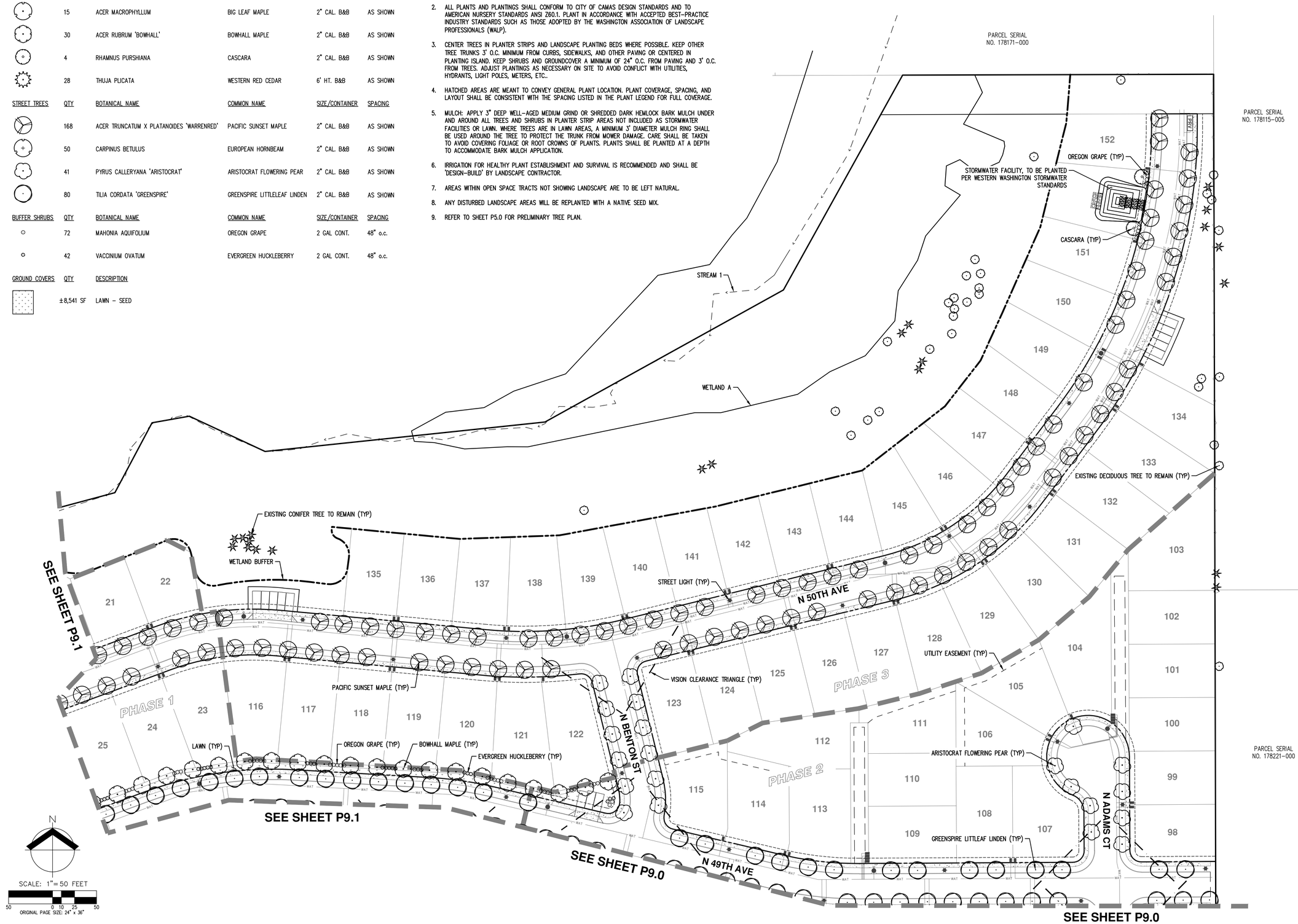
AKS DRAWING FILE: 5504 P9.0 LANDSCAPE.DWG | LAYOUT: P9.1

PRELIMINARY PLANT SCHEDULE

TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER	SPACING
	3	ACER CIRCINATUM	VINE MAPLE	6' HT. B&B	AS SHOWN
	15	ACER MACROPHYLLUM	BIG LEAF MAPLE	2" CAL. B&B	AS SHOWN
	30	ACER RUBRUM 'BOWHALL'	BOWHALL MAPLE	2" CAL. B&B	AS SHOWN
	4	RHAMNUS PURSHIANA	CASCARA	2" CAL. B&B	AS SHOWN
	28	THUJA PLICATA	WESTERN RED CEDAR	6' HT. B&B	AS SHOWN
STREET TREES	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE/CONTAINER**	**SPACING**
	168	ACER TRUNCATUM X PLATANOIDES 'WARRENRED'	PACIFIC SUNSET MAPLE	2" CAL. B&B	AS SHOWN
	50	CARPINUS BETULUS	EUROPEAN HORNBEAM	2" CAL. B&B	AS SHOWN
	41	PYRUS CALLERYANA 'ARISTOCRAT'	ARISTOCRAT FLOWERING PEAR	2" CAL. B&B	AS SHOWN
	80	TILIA CORDATA 'GREENSPIRE'	GREENSPIRE LITTLELEAF LINDEN	2" CAL. B&B	AS SHOWN
BUFFER SHRUBS	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE/CONTAINER**	**SPACING**
○	72	MAHONIA AQUIFOLIUM	OREGON GRAPE	2 GAL CONT.	48" o.c.
○	42	VACCINIUM OVATUM	EVERGREEN HUCKLEBERRY	2 GAL CONT.	48" o.c.
GROUND COVERS	**QTY**	**DESCRIPTION**			
	±8,541 SF	LAWN – SEED			

PRELIMINARY LANDSCAPE NOTES

1. LANDSCAPE PLAN IS PRELIMINARY AND INTENDED TO SHOW DESIGN INTENT ONLY. REVISIONS OR SUBSTITUTIONS, INCLUDING CHANGES TO PLANT LOCATION, QUANTITIES, TYPES, AND SIZES MAY BE NECESSARY PRIOR TO FINAL APPROVAL BASED ON PLANT AVAILABILITY, SITE CONDITIONS, UTILITY CONFLICTS, ETC. ALL SUBSTITUTIONS SHALL CONFORM TO CITY OF CAMAS LANDSCAPE DESIGN STANDARDS. STREET TREES WILL BE UPDATED TO AVOID FUTURE DRIVEWAY DROPS.
2. ALL PLANTS AND PLANTINGS SHALL CONFORM TO CITY OF CAMAS DESIGN STANDARDS AND TO AMERICAN NURSERY STANDARDS ANSI Z60.1. PLANT IN ACCORDANCE WITH ACCEPTED BEST–PRACTICE INDUSTRY STANDARDS SUCH AS THOSE ADOPTED BY THE WASHINGTON ASSOCIATION OF LANDSCAPE PROFESSIONALS (WALP).
3. CENTER TREES IN PLANTER STRIPS AND LANDSCAPE PLANTING BEDS WHERE POSSIBLE. KEEP OTHER TREE TRUNKS 3' O.C. MINIMUM FROM CURBS, SIDEWALKS, AND OTHER PAVING OR CENTERED IN PLANTING ISLAND. KEEP SHRUBS AND GROUNDCOVER A MINIMUM OF 24" O.C. FROM PAVING AND 3' O.C. FROM TREES. ADJUST PLANTINGS AS NECESSARY ON SITE TO AVOID CONFLICT WITH UTILITIES, HYDRANTS, LIGHT POLES, METERS, ETC..
4. HATCHED AREAS ARE MEANT TO CONVEY GENERAL PLANT LOCATION. PLANT COVERAGE, SPACING, AND LAYOUT SHALL BE CONSISTENT WITH THE SPACING LISTED IN THE PLANT LEGEND FOR FULL COVERAGE.
5. MULCH: APPLY 3" DEEP WELL–AGED MEDIUM GRIND OR SHREDDED DARK HEMLOCK BARK MULCH UNDER AND AROUND ALL TREES AND SHRUBS IN PLANTER STRIP AREAS NOT INCLUDED AS STORMWATER FACILITIES OR LAWN. WHERE TREES ARE IN LAWN AREAS, A MINIMUM 3' DIAMETER MULCH RING SHALL BE USED AROUND THE TREE TO PROTECT THE TRUNK FROM MOWER DAMAGE. CARE SHALL BE TAKEN TO AVOID COVERING FOLIAGE OR ROOT CROWNS OF PLANTS. PLANTS SHALL BE PLANTED AT A DEPTH TO ACCOMMODATE BARK MULCH APPLICATION.
6. IRRIGATION FOR HEALTHY PLANT ESTABLISHMENT AND SURVIVAL IS RECOMMENDED AND SHALL BE 'DESIGN–BUILD' BY LANDSCAPE CONTRACTOR.
7. AREAS WITHIN OPEN SPACE TRACTS NOT SHOWING LANDSCAPE ARE TO BE LEFT NATURAL.
8. ANY DISTURBED LANDSCAPE AREAS WILL BE REPLANTED WITH A NATIVE SEED MIX.
9. REFER TO SHEET P5.0 FOR PRELIMINARY TREE PLAN.



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SCALE: 1"=50 FEET

50 0 10 25 50

ORIGINAL PAGE SIZE: 24" x 36"

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VANCOUVER, WA 98682
360.882.0419
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PRELIMINARY LANDSCAPE AND LIGHTING PLAN (NORTH)

CJ DENS SUBDIVISION

CJ DENS LACAMAS II LLC

CAMAS, WASHINGTON

STATE OF WASHINGTON
TIMOTHY E. BOYCE
LANDSCAPE ARCHITECT
EXP. 12/21/2021

PRELIMINARY NOT FOR CONSTRUCTION

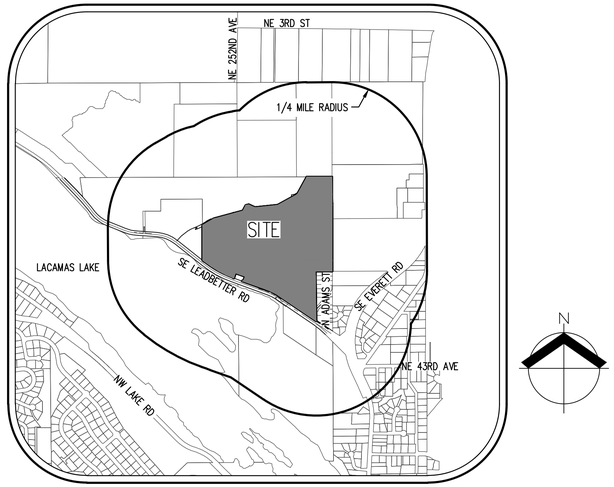
JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	TEB
DRAWN BY:	TEB
CHECKED BY:	JMM

P9.2

AKS DRAWING FILE: 5504 P9.0 LANDSCAPE.DWG | LAYOUT: P9.2

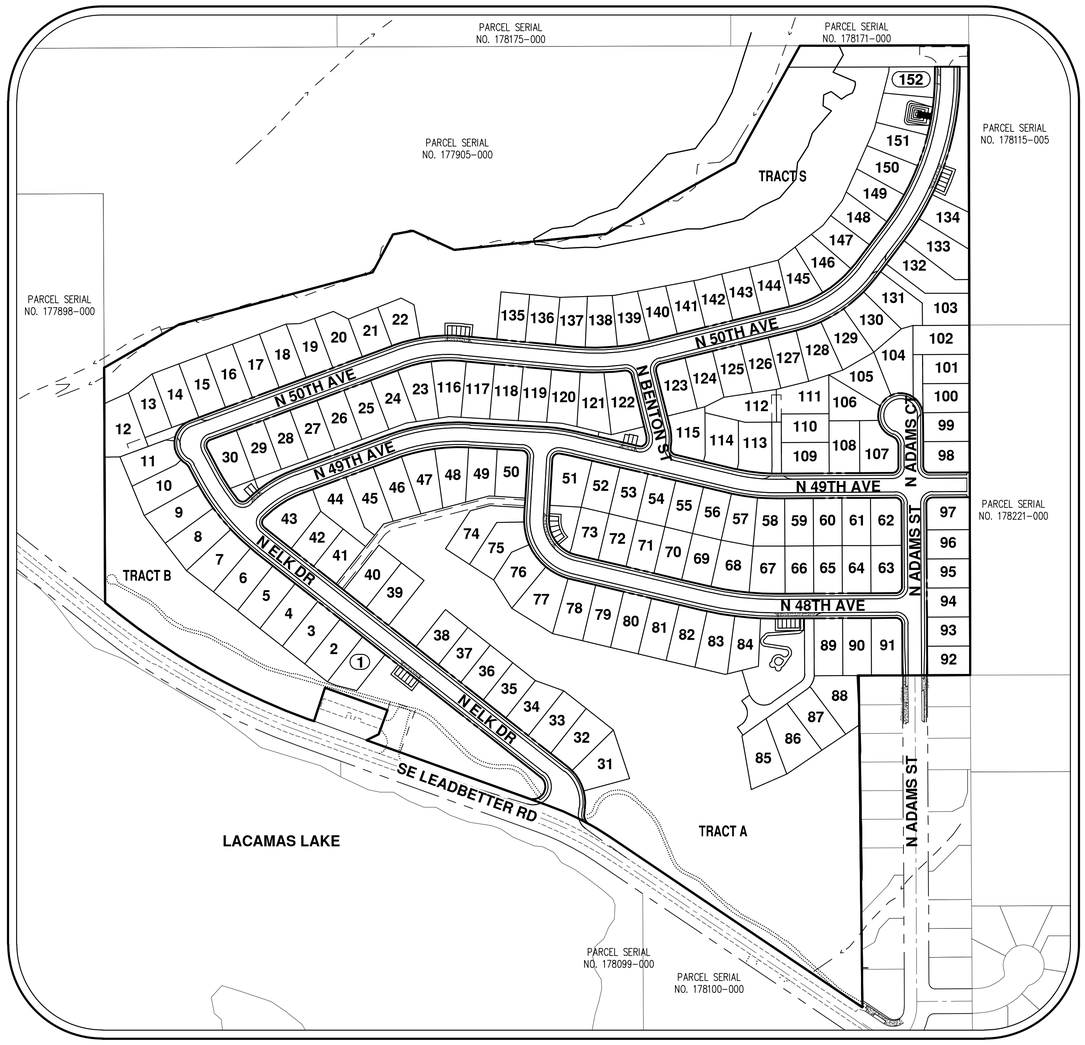
CJ DENS EAST SUBDIVISION

PRELIMINARY SUBDIVISION PLANS



VICINITY MAP

N.T.S.



SITE MAP

1"=150'

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P2.1 EXISTING CONDITIONS (SOUTH)
P2.2 EXISTING CONDITIONS (WEST)
P2.3 EXISTING CONDITIONS (NORTH)
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P3.3 PRELIMINARY PLAT – PHASE 2
P3.4 PRELIMINARY PLAT – PHASE 3
P4.0 PRELIMINARY GRADING AND ESC PLAN – PHASE 1
P4.1 PRELIMINARY GRADING AND ESC PLAN – PHASE 2
P4.2 PRELIMINARY GRADING AND ESC PLAN – PHASE 3
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P8.2 PRELIMINARY STREET PLAN – PHASE 2
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P9.3 PRELIMINARY TRACT I PARK PLANTING PLAN

N

LEGEND

	EXISTING	PROPOSED		EXISTING	PROPOSED
DECIDUOUS TREE			STORM DRAIN CLEAN OUT		
CONIFEROUS TREE			STORM DRAIN CATCH BASIN		
			STORM DRAIN AREA DRAIN		
FIRE HYDRANT			STORM DRAIN MANHOLE		
WATER BLOWOFF			GAS METER		
WATER METER			GAS VALVE		
WATER VALVE			GUY WIRE ANCHOR		
DOUBLE CHECK VALVE			UTILITY POLE		
AIR RELEASE VALVE			POWER VAULT	P	P
SANITARY SEWER CLEAN OUT			POWER JUNCTION BOX		
SANITARY SEWER MANHOLE			POWER PEDESTAL		
SIGN			COMMUNICATIONS VAULT	C	C
STREET LIGHT			COMMUNICATIONS JUNCTION BOX		
MAILBOX	MB	MB	COMMUNICATIONS RISER		

	EXISTING	PROPOSED
RIGHT-OF-WAY LINE		
BOUNDARY LINE		
PROPERTY LINE		
CENTERLINE		
DITCH		
CURB		
EDGE OF PAVEMENT		
EASEMENT		
FENCE LINE	XXX XXX XXX	
GRAVEL EDGE		
POWER LINE	PWR PWR	PWR PWR
OVERHEAD WIRE	OHW 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

APPLICANT/OWNER

CJ DENS LACAMAS II LLC
CONTACT: CARL LAWSON
PO BOX 2239
KALAMA, WA 98625

CONTACT:

AKS ENGINEERING & FORESTRY, LLC.
CONTACT: MICHAEL ANDREOTTI
9600 NE 126TH AVENUE, SUITE 2520
VANCOUVER, WA 98682
PH: 360-882-0419
FAX: 360-882-0426
E-MAIL: ANDREOTTIM@AKS-ENG.COM

PROPERTY DESCRIPTION

LOCATED IN THE NORTHEAST 1/4 OF SECTION 34 & NORTHWEST 1/4 OF SECTION 35, TOWNSHIP 2 NORTH RANGE 3 EAST, WILLAMETTE MERIDIAN, CLARK COUNTY, WASHINGTON. PROPERTY SERIAL #'S 177906-000, 178172-000 AND 178236-000

EXISTING LAND USE

VACANT LAND ON 177906-000, 178236-000 AND 178172-000 ZONED R-7.5

PROJECT PURPOSE

SUBDIVIDE 3 PARCELS INTO 152 DETACHED SINGLE-FAMILY RESIDENTIAL LOTS WITH ASSOCIATED ROADS AND SITE IMPROVEMENTS.

SITE AREA

49.62 AC (2,161,423 SF)

VERTICAL DATUM

ELEVATIONS ARE BASED ON CLARK COUNTY BENCHMARK NO. 237 (BENCHMARK LACAMAS-13), STAMPED "24900-1992", LOCATED AT 24900 LEADBETTER ROAD, 20'W W PARK LOT ENT, 21'N CL, 8'SE END FNC. ELEVATION = 188.08 FEET (NGVD29 (47)).

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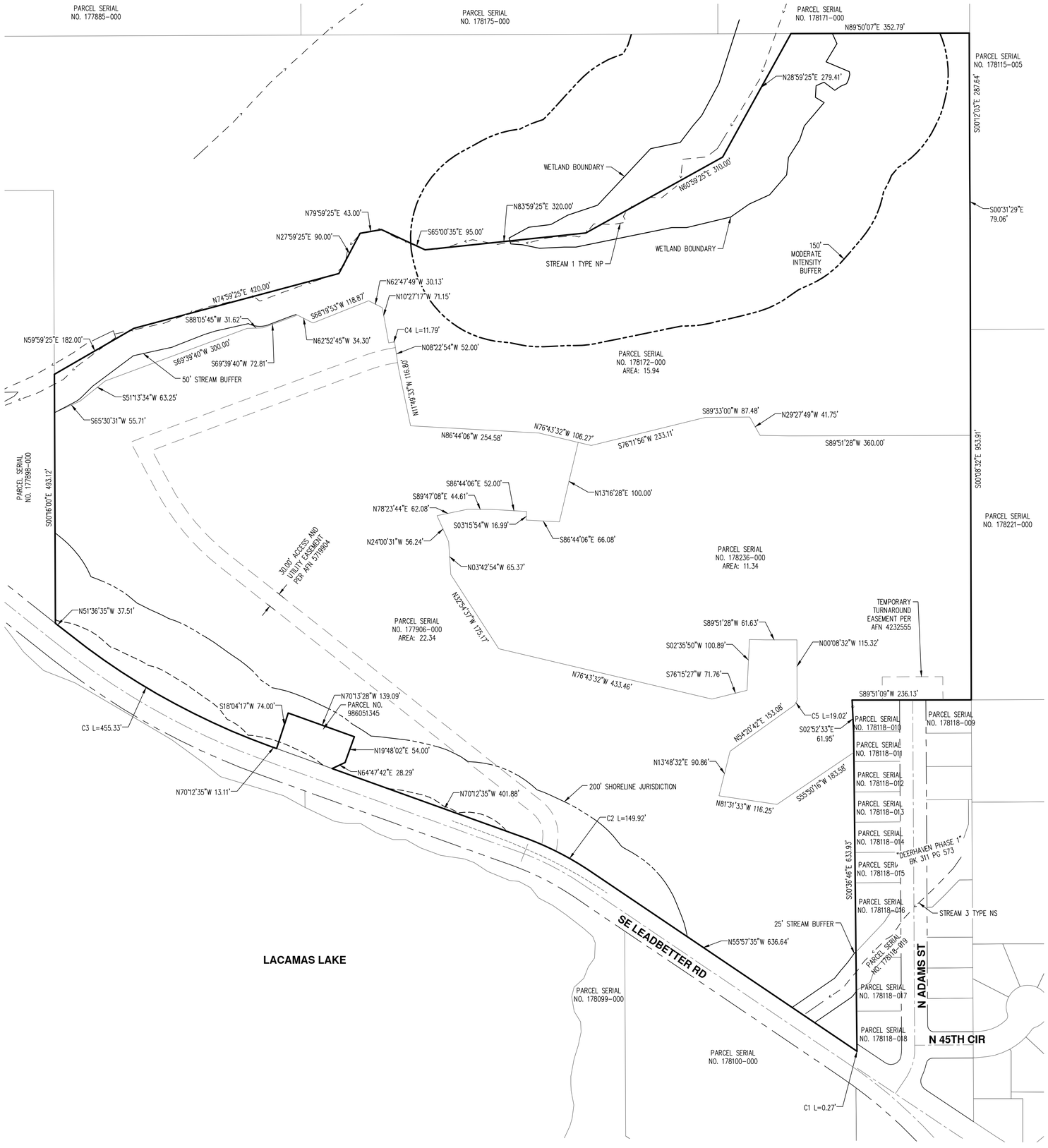
COVER SHEET
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P1.0

AKS DRAWING FILE: 5504 P1.0 COVERLDWG | LAYOUT: P1.0



NOTES:

1. UTILITIES SHOWN ARE BASED ON UNDERGROUND UTILITY LOCATE MARKINGS AS PROVIDED BY OTHERS, PROVIDED PER UTILITY LOCATE TICKET NUMBERS 20253525, 20253535, AND 20253544. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND LOCATES REPRESENT THE ONLY UTILITIES IN THE AREA. CONTRACTORS ARE RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BEGINNING CONSTRUCTION.
2. THIS SURVEY INCLUDES TOPOGRAPHIC SURVEY DATA GATHERED BY HAGEDORN, INC IN 2010 AND AKS ENGINEERING AND FORESTRY, LLC JUNE 2019–AUGUST 2020, AND CITY OF CAMAS AS–BUILT CONSTRUCTION PLANS. AKS MAKES NO GUARANTEE REGARDING THE ACCURACY OF SURVEY DATA GATHERED BY OTHERS.
3. VERTICAL DATUM: ELEVATIONS ARE BASED ON CLARK COUNTY BENCHMARK NO. 237 LOCATED NEAR THE ENTRANCE FOR THE PARKING LOT FOR THE NORTH SHORE BOAT LAUNCH ON LACAMAS LAKE. ELEVATION = 188.08 FEET (NAVD 29(47)).
4. THIS MAP DOES NOT CONSTITUTE A PROPERTY BOUNDARY SURVEY.
5. SURVEY IS ONLY VALID WITH SURVEYOR'S STAMP AND SIGNATURE.
6. CONTOUR INTERVAL IS 2 FOOT.
7. WETLAND BOUNDARIES SHOWN WERE DELINEATED BY ELS IN WINTER 2009 AND SPRING 2013.

GENERAL NOTES:

1. REFERENCE TREE PLAN ON SHEETS P5.0–P5.5 FOR TREE INVENTORY AND NOTES.
2. ACCORDING TO CLARK COUNTY HEALTH DEPARTMENT, NO SEPTIC SYSTEMS EXIST ON–SITE.
3. ACCORDING TO CLARK COUNTY HEALTH DEPARTMENT, NO WELLS EXIST ON–SITE.
4. THE SITE IS WITHIN THE NEHRP SITE CLASS B.
5. REFERENCE PROJECT GEOTECHNICAL REPORTS FOR ADDITIONAL INFORMATION ON GEOLOGICALLY HAZARDOUS AREAS.

CURVE TABLE				
CURVE	RADIUS	DELTA	LENGTH	CHORD
C1	984.92'	0°00'56"	0.27'	N55°57'07"W 0.27'
C2	602.80'	14°15'00"	149.92'	N63°05'05"W 149.54'
C3	1402.62'	18°36'00"	455.33'	N60°54'35"W 453.34'
C4	326.00'	2°04'23"	11.79'	S80°34'54"W 11.79'
C5	20.00'	54°29'14"	19.02'	N27°06'05"E 18.31'

LEGEND

EXISTING		EXISTING	
DECIDUOUS TREE		STORM DRAIN CLEAN OUT	
CONIFEROUS TREE		STORM DRAIN CATCH BASIN	
FIRE HYDRANT		STORM DRAIN AREA DRAIN	
WATER BLOWOFF		STORM DRAIN MANHOLE	
WATER METER		GAS METER	
WATER VALVE		GAS VALVE	
DOUBLE CHECK VALVE		GUY WIRE ANCHOR	
AIR RELEASE VALVE		UTILITY POLE	
SANITARY SEWER CLEAN OUT		POWER VAULT	P
SANITARY SEWER MANHOLE		POWER JUNCTION BOX	
SIGN		POWER PEDESTAL	
STREET LIGHT		COMMUNICATIONS VAULT	C
MAILBOX	MB	COMMUNICATIONS JUNCTION BOX	
		COMMUNICATIONS RISER	

EXISTING	
RIGHT–OF–WAY LINE	
BOUNDARY LINE	
PROPERTY LINE	
CENTERLINE	
DITCH	
CURB	
EDGE OF PAVEMENT	
EASEMENT	
FENCE LINE	
GRAVEL EDGE	
POWER LINE	PWR
OVERHEAD WIRE	OHW
COMMUNICATIONS LINE	COM
FIBER OPTIC LINE	CFO
GAS LINE	GAS
STORM DRAIN LINE	STM
SANITARY SEWER LINE	SAN
WATER LINE	WAT

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EXISTING CONDITIONS
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION
JAMES O. HAGEDORN 19900 REGISTERED PROFESSIONAL LAND SURVEYOR

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	
DRAWN BY:	CJC
CHECKED BY:	JOH

P2.0

AKS DRAWING FILE: 5504 P2.0 EX COND.DWG | LAYOUT: P2.0

SEE BELOW

SEE SHEET P2.3

SEE SHEET P2.2

SEE SHEET P2.2

SEE SHEET P2.3

SEE ABOVE

N

SCALE: 1"=50 FEET

50 0 10 25 50

ORIGINAL PAGE SIZE: 24" x 36"

N ADAMS ST

N 45TH CIR

SE LEADBETTER RD

25' STREAM BUFFER

STREAM 3 TYPE NS

PARCEL SERIAL NO. 178118-017

CONC. BLOCK RET. WALL

CHAINLINK FENCE

PARCEL SERIAL NO. 178118-016

GAS LOC. RISER

4" POLY

PARCEL SERIAL NO. 178100-000

EX FM SAN LOCATE STATION

FIRE HYDRANT

COMMUNICATION MANHOLE

C1 L=0.27'

N55°57'35"W 636.64'

GRAVEL

N13°16'28"E 100.00'

S86°44'06"E 66.08'

PARCEL SERIAL NO. 178236-000 AREA: 11.34

PARCEL SERIAL NO. 178221-000

TEMPORARY TURNAROUND EASEMENT PER AFN 4232555

S89°51'28"W 61.63'

S02°35'50"W 100.89'

N00°08'32"W 115.32'

EX SAN VALVE RIM: 308.05

EX SAN CO RIM: 308.38

WOOD FENCE

GRAVEL

S89°51'09"W 236.13'

EX. SAN ARV

SEWER SERVICE VALVE

EX. WATER MANHOLE

WOOD FENCE

PARCEL SERIAL NO. 178118-009

SEWER SERVICE VALVE

28' EXISTING PAVED WIDTH

2" POLY

PARCEL SERIAL NO. 178118-010

PARCEL SERIAL NO. 178118-011

PARCEL SERIAL NO. 178118-012

WOOD FENCE

PARCEL SERIAL NO. 178118-013

ROCK RET. WALL

PARCEL SERIAL NO. 178118-014

WOOD FENCE

PARCEL SERIAL NO. 178118-015

ROCK RET. WALL

PARCEL SERIAL NO. 178118-016

PARCEL SERIAL NO. 178118-017

"DEERHAVEN PHASE 1" BK 311 PG 573

STREAM 3 TYPE NS

S00°36'46"E 633.93'

N32°54'57"W 179.17'

N76°43'32"W 433.46'

S76°15'27"W 71.76'

C5 L=19.02'

N64°20'42"E 153.08'

S02°52'33"E 61.95'

N13°48'32"E 90.86'

S55°59'16"W 183.58'

N81°31'33"W 116.25'

PARCEL SERIAL NO. 177906-000 AREA: 22.34

30.00' ACCESS AND UTILITY EASEMENT PER AFN 3719904

200' SHORELINE JURISDICTION

N70°12'35"W 401.88'

C2 L=149.92'

EX 18" CONC CULVERT IE: 184.38

EX 18" CONC CULVERT IE: 182.01

COMMUNICATION MANHOLE

FIRE HYDRANT

EX FM SAN LOCATE STATION

22' EXISTING PAVED WIDTH

LACAMAS LAKE

ORDINARY HIGHWATER LINE

PARCEL SERIAL NO. 178099-000

N55°57'35"W 636.64'

25' STREAM BUFFER

PARCEL SERIAL NO. 178118-019

HATCH LEGEND

GEOLOGICALLY HAZARDOUS AREAS (SLOPES >40% & AREAS SUBJECT TO LANDSLIDES)

CURVE TABLE				
CURVE	RADIUS	DELTA	LENGTH	CHORD
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EXISTING CONDITIONS (SOUTH)
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

JAMES O. HAGAR — 19870 — REGISTERED PROFESSIONAL LAND SURVEYOR

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	
DRAWN BY:	CJC
CHECKED BY:	JOH

P2.1

AKS DRAWING FILE: 5504 P2.0 EX CONDITIONS | LAYOUT: P2.1

HATCH LEGEND

GEOLOGICALLY HAZARDOUS AREAS (SLOPES >40% & AREAS SUBJECT TO LANDSLIDES)

CURVE TABLE				
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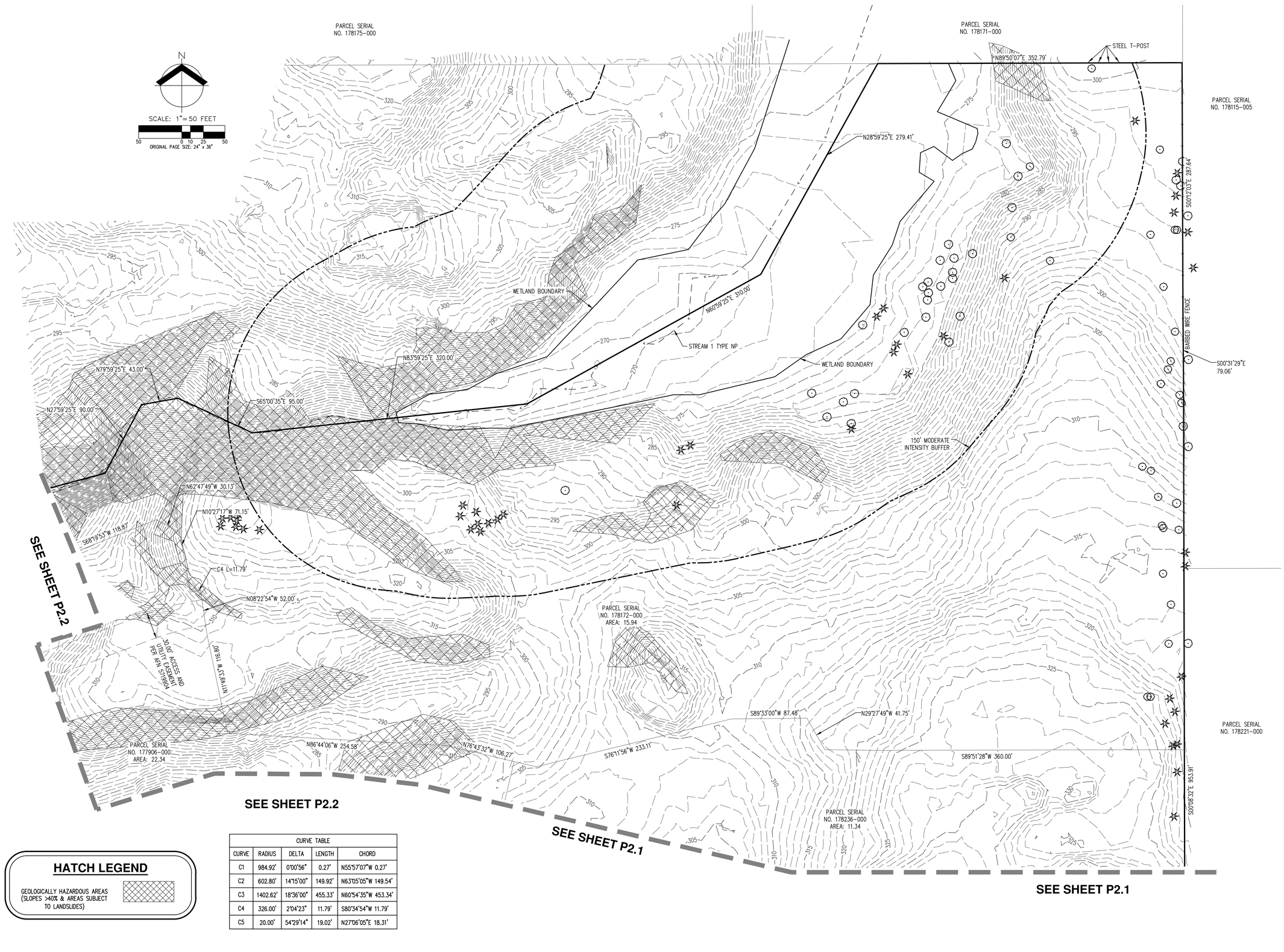
EXISTING CONDITIONS (WEST)
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

JAMES O. HANSEN — EXPIRES 10/10/2021 — REGISTERED PROFESSIONAL ENGINEER — CIVIL
PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	
DRAWN BY:	CJC
CHECKED BY:	JOH

P2.2

AKS DRAWING FILE: 5504 P2.0 EX COND.DWG | LAYOUT: P2.2



HATCH LEGEND

GEOLOGICALLY HAZARDOUS AREAS (SLOPES >40% & AREAS SUBJECT TO LANDSLIDES)

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ENGINEERING · SURVEYING · NATURAL RESOURCES
FORESTRY · PLANNING · LANDSCAPE ARCHITECTURE

EXISTING CONDITIONS (NORTH)
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

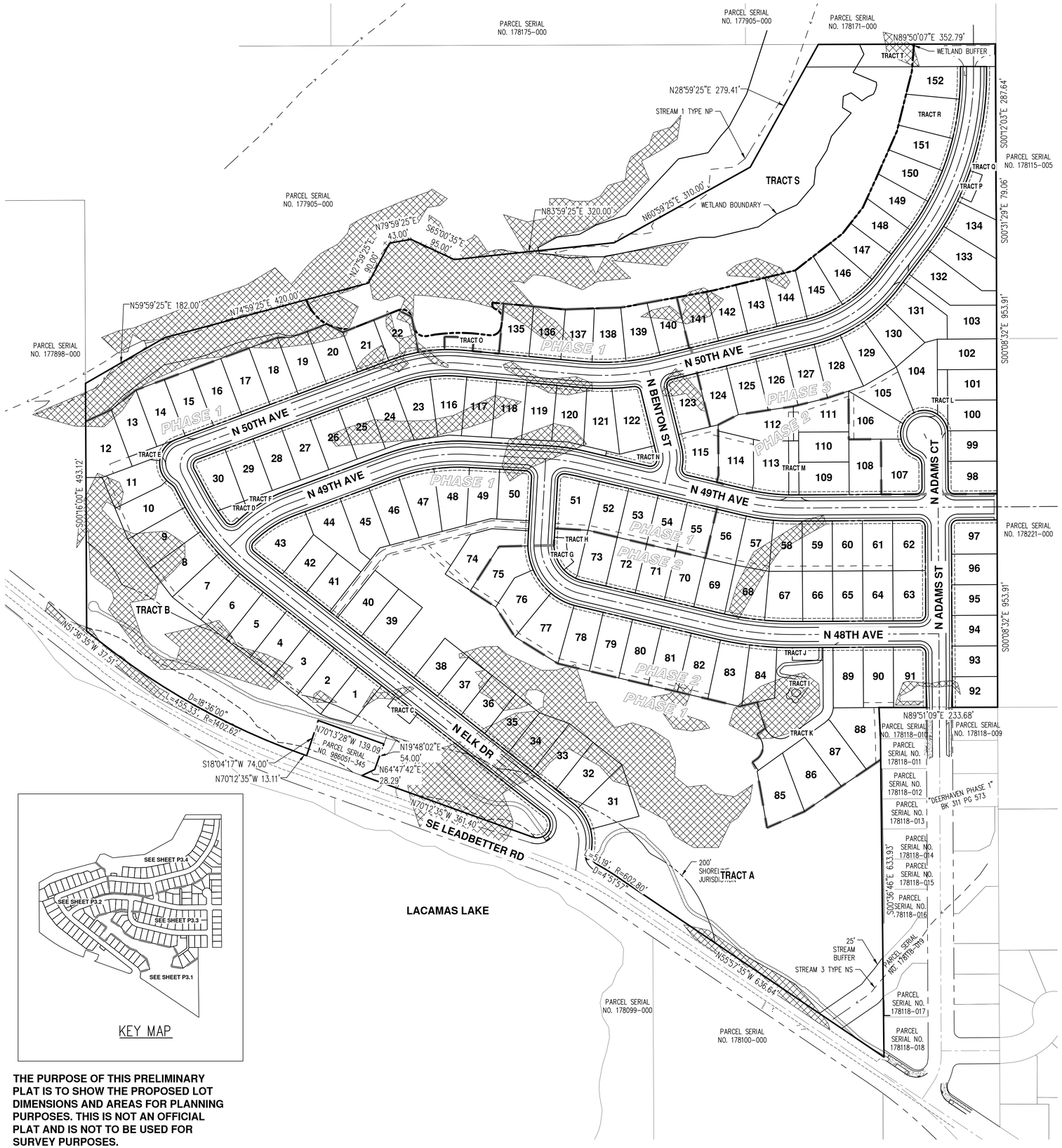
JAMES O. HAMMOND — 19910 — REGISTERED PROFESSIONAL ENGINEER — STATE OF WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	
DRAWN BY:	CJC
CHECKED BY:	JOH

P2.3

AKS DRAWING FILE: 5504 P2.0 EX CONDI.DWG | LAYOUT: P2.3



THE PURPOSE OF THIS PRELIMINARY PLAT IS TO SHOW THE PROPOSED LOT DIMENSIONS AND AREAS FOR PLANNING PURPOSES. THIS IS NOT AN OFFICIAL PLAT AND IS NOT TO BE USED FOR SURVEY PURPOSES.

APPLICANT/OWNER

CJ DENS LACAMAS II LLC
CONTACT: CARL LAWSON
PO BOX 2239
KALAMA WA, 98625

CONTACT:

AKS ENGINEERING & FORESTRY, LLC.
CONTACT: MICHAEL ANDREOTTI
9600 NE 126TH AVENUE, SUITE 2520
VANCOUVER, WA 98682
PH: 360-882-0419
FAX: 360-882-0426
E-MAIL: ANDREOTTIM@AKS-ENG.COM

PROPERTY DESCRIPTION

LOCATED IN THE NORTHEAST 1/4 OF SECTION 34 & NORTHWEST 1/4 OF SECTION 35, TOWNSHIP 2 NORTH RANGE 3 EAST, WILLAMETTE MERIDIAN, CLARK COUNTY, WASHINGTON. PROPERTY SERIAL #'S 177906-000, 178172-000 AND 178236-000

EXISTING LAND USE

VACANT LAND ON 177906-000, 178236-000 AND 178172-000
ZONED R-7.5

PROJECT PURPOSE

SUBDIVIDE 3 PARCELS INTO 152 DETACHED SINGLE-FAMILY RESIDENTIAL LOTS WITH ASSOCIATED ROADS AND SITE IMPROVEMENTS.

SITE AREA

49.62 AC (2,161,423 SF) CJ DENS

VERTICAL DATUM

ELEVATIONS ARE BASED ON CLARK COUNTY BENCHMARK NO. 237 (BENCHMARK LACAMAS-13), STAMPED "24900-1992", LOCATED AT 24900 LEADBETTER ROAD, 20'W W PARK LOT ENT, 21'N CL, 8'SE END FNC.
ELEVATION = 188.08 FEET (NGVD29 (47)).

HATCH LEGEND

GEOLOGICALLY HAZARDOUS AREAS (SLOPES >40% & AREAS SUBJECT TO LANDSLIDES)

GENERAL NOTES

1. OPEN SPACE TRACTS F, H, I, & Q TO BE OWNED AND MAINTAINED BY THE HOME OWNERS ASSOCIATION (HOA).
2. PARKING TRACTS C, D, G, J, N, O, & P TO BE OWNED AND MAINTAINED BY THE HOA.
3. ACCESS TRACTS E, K, L, & M TO BE OWNED AND MAINTAINED BY THE HOA.
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PROPOSED DEVELOPMENT STANDARDS

AVERAGE LOT AREA	NONE*
MINIMUM LOT SIZE	5,250 SQUARE FEET
MAXIMUM LOT SIZE	9,000 SQUARE FEET
MINIMUM LOT WIDTH	60 FEET
MINIMUM LOT DEPTH	80 FEET
MAXIMUM BUILDING LOT COVERAGE	50%**
MAXIMUM BUILDING HEIGHT	35 FEET
MINIMUM FRONT YARD SETBACK	10** FEET
MINIMUM FRONT YARD - GARAGE	20** FEET
GARAGE FROM FRONT OF DWELLING	5** FEET
MINIMUM SIDE YARD	5 FEET
MINIMUM STREET SIDE YARD	10 FEET
MINIMUM REAR YARD	15** FEET
MINIMUM LOT FRONTAGE ON CUL-DE-SAC	30 FEET

* THE PROPOSED DEVELOPED IS USING DENSITY TRANSFER STANDARDS. NO AVERAGE LOT AREA IS REQUIRED.
** THESE STANDARDS VARY FROM THE CODE AS ALLOWED BY CMC SECTION 18.09.060(D). THE CITY AND APPLICANT HAVE AGREED ON ADDITIONAL OPEN SPACE PLANTINGS, AN OVERLOOK, AND PLAY AREA AMENITIES TO ALLOW THE MODIFICATIONS.

N

SCALE: 1"=100 FEET
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ORIGINAL PAGE SIZE: 24" x 36"

PHASING

PHASE 1:	71 LOTS
PHASE 2:	48 LOTS
PHASE 3:	33 LOTS

STATISTICS

TOTAL GROSS AREA:	2,161,423 SF (49.62 AC)
NATURAL AREA TRACTS:	693,826 SF (15.93 AC)
OPEN SPACE TRACTS:	38,118 SF (0.88 AC)
STORMWATER TRACT:	7,812 SF (0.18 AC)
ACCESS TRACTS:	18,091 SF (0.42 AC)
PARKING TRACTS:	11,255 SF (0.26 AC)
FUTURE RIGHT-OF-WAY:	16,477 SF (0.38 AC)
RIGHT-OF-WAY AREA:	336,268 SF (7.72 AC)
AVERAGE LOT AREA:	6,839 SF

DENSITY CALCULATIONS

TOTAL GROSS AREA:	2,161,423 SF (49.62 AC)
NATURAL & OPEN SPACE AREAS:	693,826 SF (15.93 AC)
NET SITE AREA:	1,467,597 SF (33.69 AC)
MAXIMUM LOTS ALLOWED (33.69 AC X 5.8):	195 LOTS
PROPOSED LOTS:	152 LOTS
PROPOSED DENSITY (152 LOTS / 33.69 AC):	4.51 LOTS/NET ACRE

TRACT AREA & PURPOSE

TRACT A:	314,599 SF	NATURAL AREA
TRACT B:	131,101 SF	NATURAL AREA
TRACT C:	1,428 SF	PARKING
TRACT D:	1,590 SF	PARKING
TRACT E:	1,535 SF	ACCESS
TRACT F:	7,978 SF	OPEN SPACE
TRACT G:	1,515 SF	PARKING
TRACT H:	3,150 SF	OPEN SPACE
TRACT I:	15,414 SF	OPEN SPACE
TRACT J:	1,557 SF	PARKING
TRACT K:	7,360 SF	ACCESS
TRACT L:	2,012 SF	ACCESS
TRACT M:	2,156 SF	ACCESS
TRACT N:	2,245 SF	PARKING
TRACT O:	1,460 SF	PARKING
TRACT P:	1,460 SF	PARKING
TRACT Q:	9,690 SF	OPEN SPACE
TRACT R:	7,812 SF	STORMWATER FACILITY
TRACT S:	249,086 SF	NATURAL AREA
TRACT T:	16,441 SF	FUTURE ROW DEDICATION

PARKING STATISTICS

REQUIRED PARKING:	1 SPACE/5 LOTS
PROPOSED PARKING:	30 SPACES (152 LOTS/5 LOTS/SPACE)
TRACT C:	5 SPACES
TRACT D:	2 SPACES
TRACT G:	5 SPACES
TRACT J:	5 SPACES
TRACT N:	3 SPACES
TRACT O:	5 SPACES
TRACT P:	5 SPACES

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PRELIMINARY PLAT OVERVIEW
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

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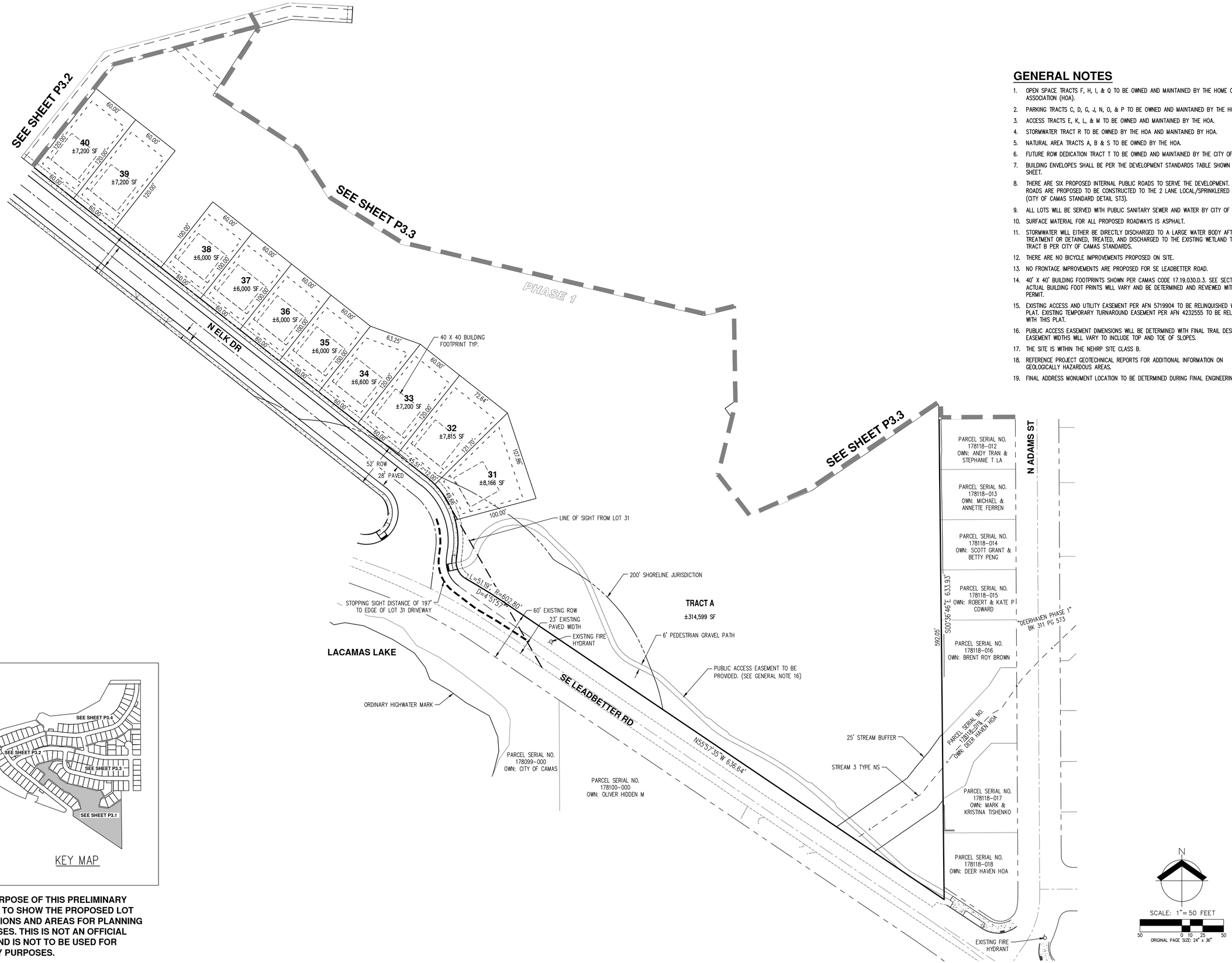
P3.0

AKS DRAWING FILE: 5504 P3.0 PLATDWG | LAYOUT: P3.0



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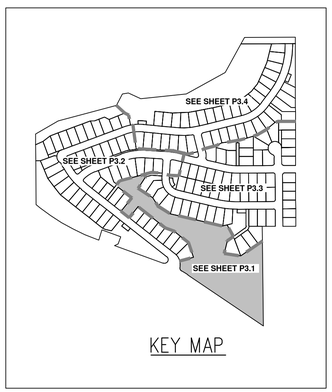

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P3.1

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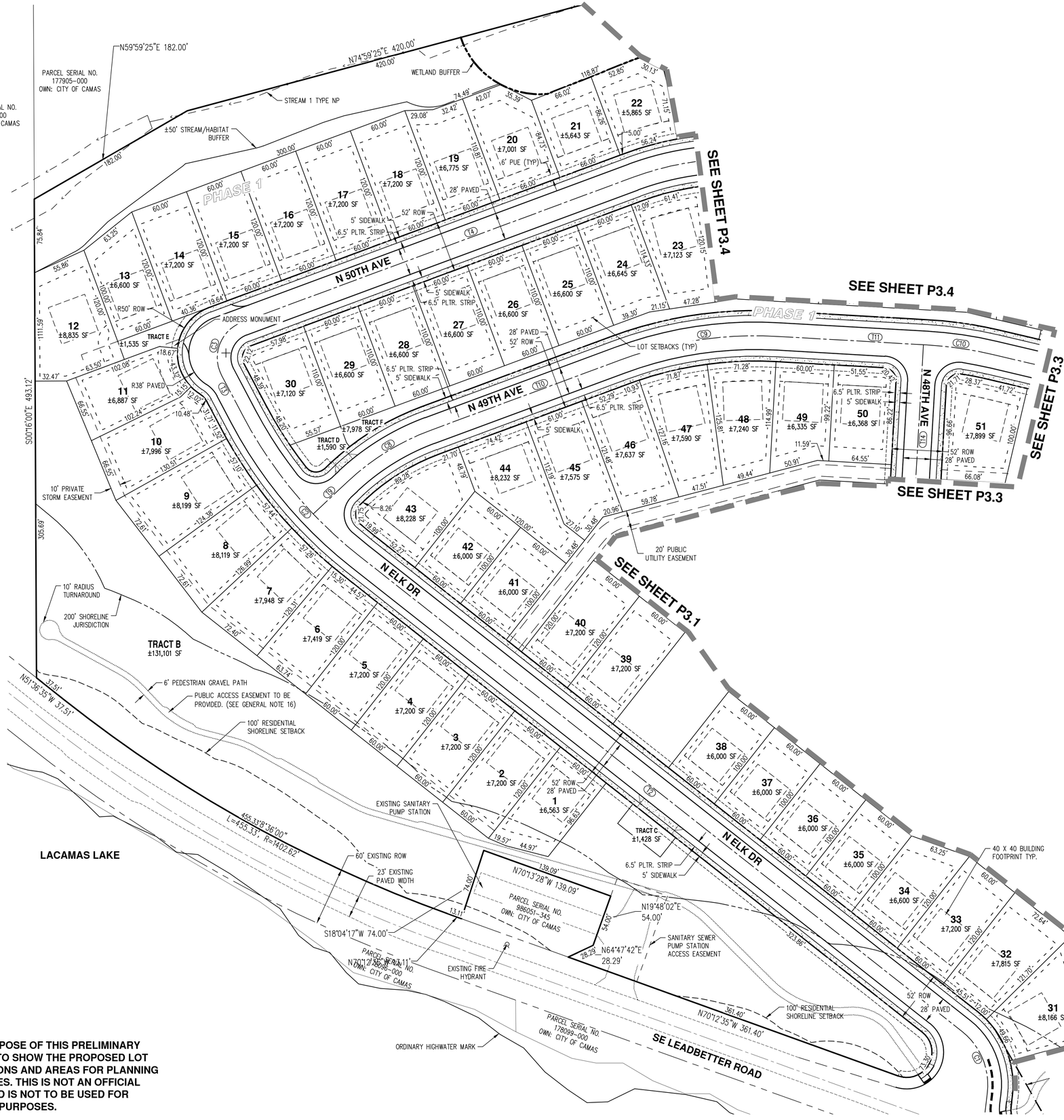

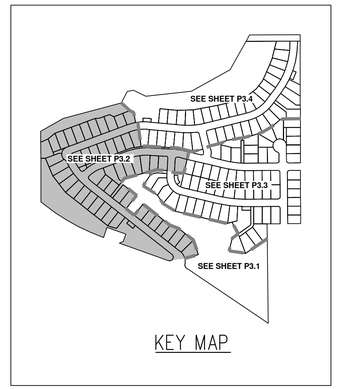

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CENTERLINE TANGENT TABLE		
LINE #	LENGTH	DIRECTION
T1	49.16	N6° 59' 29.61"E
T2	790.79	N51° 44' 06.88"W
T3	48.39	N27° 49' 37.22"W
T4	430.07	N69° 40' 14.28"E
T9	53.40	N46° 50' 02.89"E
T10	209.41	N69° 40' 14.28"E
T11	153.92	S86° 43' 31.24"E
T14	165.22	S3° 16' 28.76"W

CENTERLINE CURVE TABLE			
CURVE #	ARC LENGTH	DELTA	RADIUS
C1	71.75	58°43'36"	70.00
C2	187.77	23°54'30"	450.00
C3	66.36	97°29'52"	39.00
C8	99.64	22°50'11"	250.00
C9	164.79	23°36'14"	400.00
C10	69.88	10°00'34"	400.00

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P3.2

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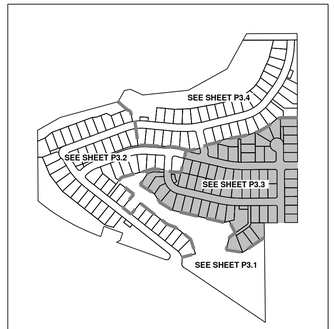
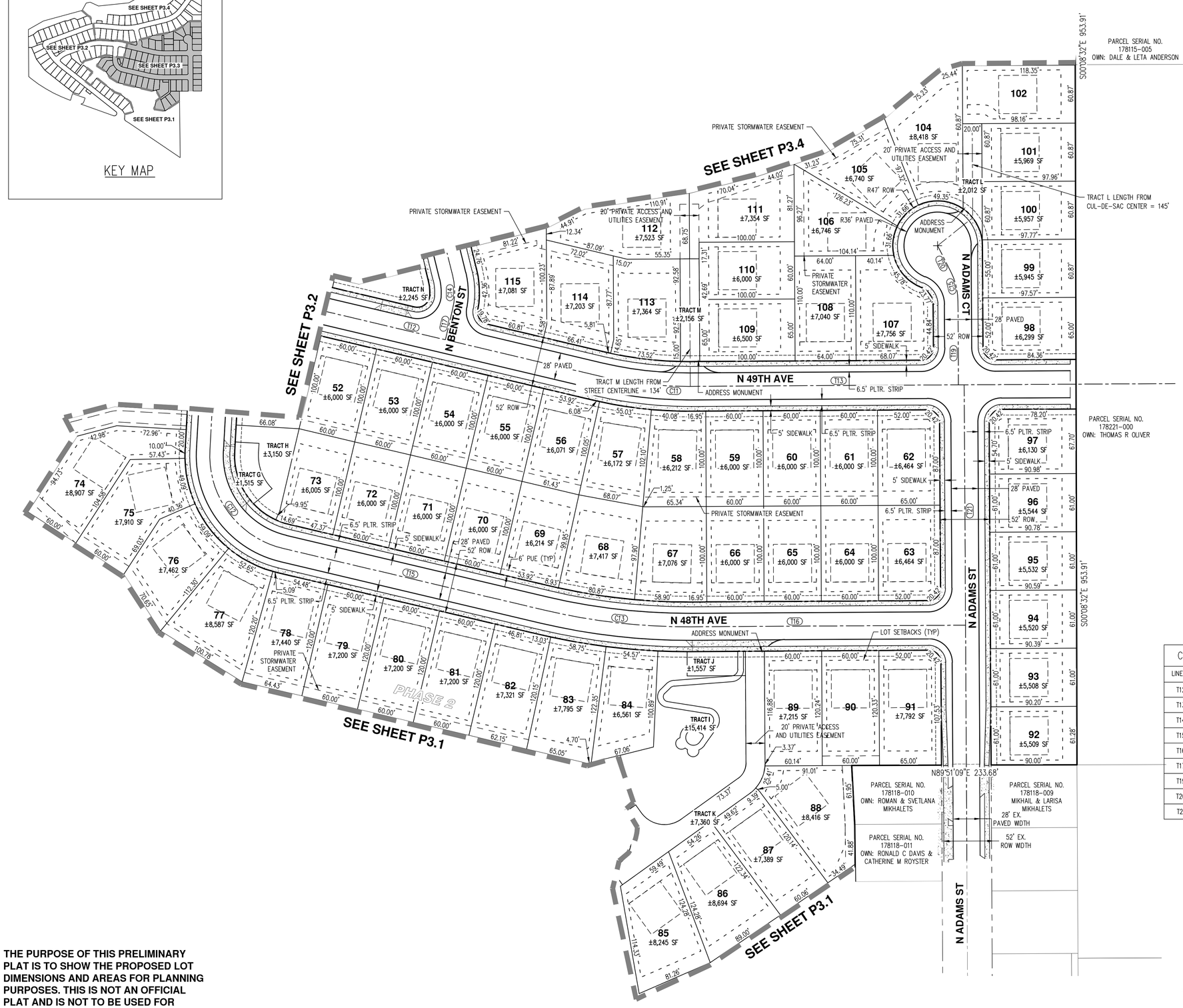


KEY MAP



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T13	405.23	N89° 40' 26.29"E
T14	165.22	S3° 16' 28.76"W
T15	281.29	S76° 42' 57.35"E
T16	287.95	N89° 40' 26.29"E
T17	33.47	N13° 17' 02.65"E
T19	87.44	N0° 19' 33.71"W
T20	30.49	N26° 51' 54.48"W
T21	398.61	S0° 19' 33.71"E

CENTERLINE CURVE TABLE			
CURVE #	ARC LENGTH	DELTA	RADIUS
C11	95.02	13°36'36"	400.00
C12	139.61	79°59'26"	100.00
C13	154.88	13°36'36"	652.00
C14	34.97	27°04'32"	74.00
C15	32.42	26°32'21"	70.00

N

SCALE: 1"=50 FEET

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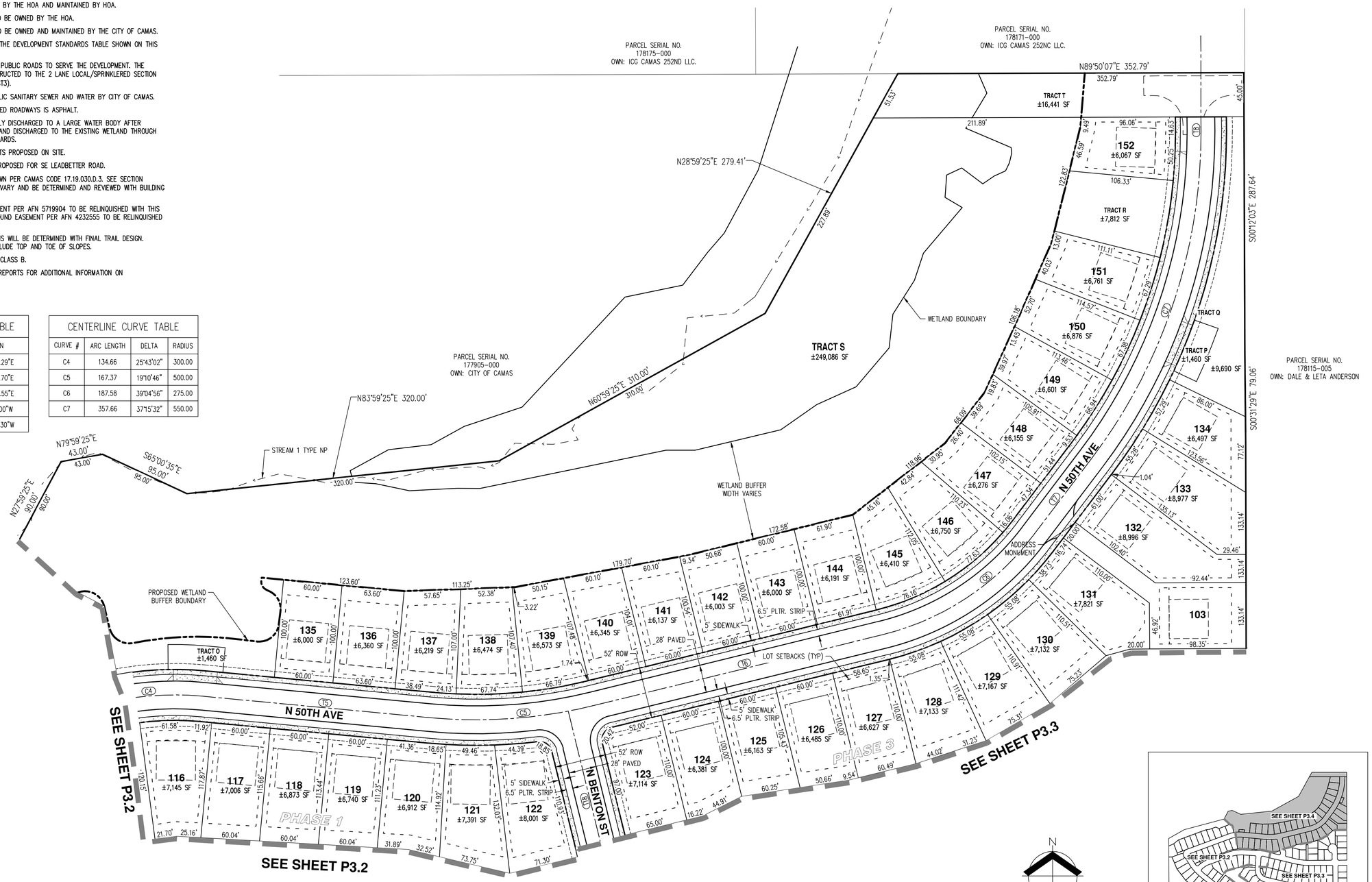
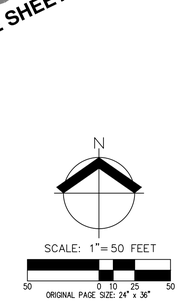
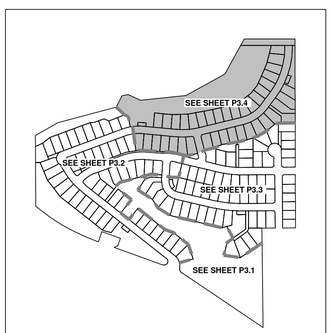
T6	303.65	N76° 12' 30.70"E
T7	98.78	N37° 07' 34.55"E
T8	14.94	N0° 07' 57.00"W
T18	161.43	N13° 47' 29.30"W

CENTERLINE CURVE TABLE			
CURVE #	ARC LENGTH	DELTA	RADIUS
C4	134.66	25°43'02"	300.00
C5	167.37	19°10'46"	500.00
C6	187.58	39°04'56"	275.00
C7	357.66	37°15'32"	550.00







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DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P3.4

AKS DRAWING FILE: 5504 P3.0 PLAT.DWG | LAYOUT: P3.4

LEGEND

- EXISTING GROUND CONTOUR (2 FT) — 342
- EXISTING GROUND CONTOUR (10 FT) — 350
- FINISHED GRADE CONTOUR (2 FT) — 342
- FINISHED GRADE CONTOUR (10 FT) — 350
- SEDIMENT FENCE (TO BE INSTALLED PRIOR TO GRADING) — X
- INLET PROTECTION (TYP) PER COMBINATION DETAIL
- PROPOSED DRAINAGE FLOW DIRECTION
- GRAVEL CONSTRUCTION ENTRANCE
- DISTURBED LIMITS
- TREE PROTECTION/CONSTRUCTION FENCE
- POTENTIAL STAGING/SOIL STOCKPILE AREA
- RETAINING WALL – PROPOSED AND OPTIONAL (6' MAX. TALL TYP)

GENERAL NOTES

1. SEE PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN P5.0 FOR TREE PROTECTION AND CONSTRUCTION FENCE LOCATIONS AND TREE ROOT PROTECTION ZONE RADIUS ZONES.
2. ADDITIONAL EROSION CONTROL MEASURES WILL BE INCLUDED DURING FINAL ENGINEERING TO ACCOUNT FOR GRADING ON STEEP SLOPES AND CONSTRUCTION PHASING.
3. N ADAMS STREET NOT TO BE USED AS CONSTRUCTION ENTRANCE.

N

SCALE: 1" = 50 FEET

50 0 10 25 50

ORIGINAL PAGE SIZE: 24" x 36"

KEY MAP

DEMOLITION KEYED NOTES

1. EXISTING TREE TO REMAIN (TYP)
2. REMOVE EXISTING TREE (TYP)

EROSION CONTROL KEYED NOTES

1. INSTALL INLET PROTECTION (TYP)
2. POTENTIAL STOCKPILE AREA
3. INSTALL SEDIMENT FENCE (TYP)
4. DISTURBED LIMITS (TYP)
5. CONSTRUCTION ENTRANCE

PRELIMINARY GRADING QUANTITIES:

CUT: 150,000 C.Y.
FILL: 75,000 C.Y.

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PORTLAND, OR 97225
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PRELIMINARY GRADING AND ESC PLAN

CJ DENS SUBDIVISION

CJ DENS LACAMAS II LLC

CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
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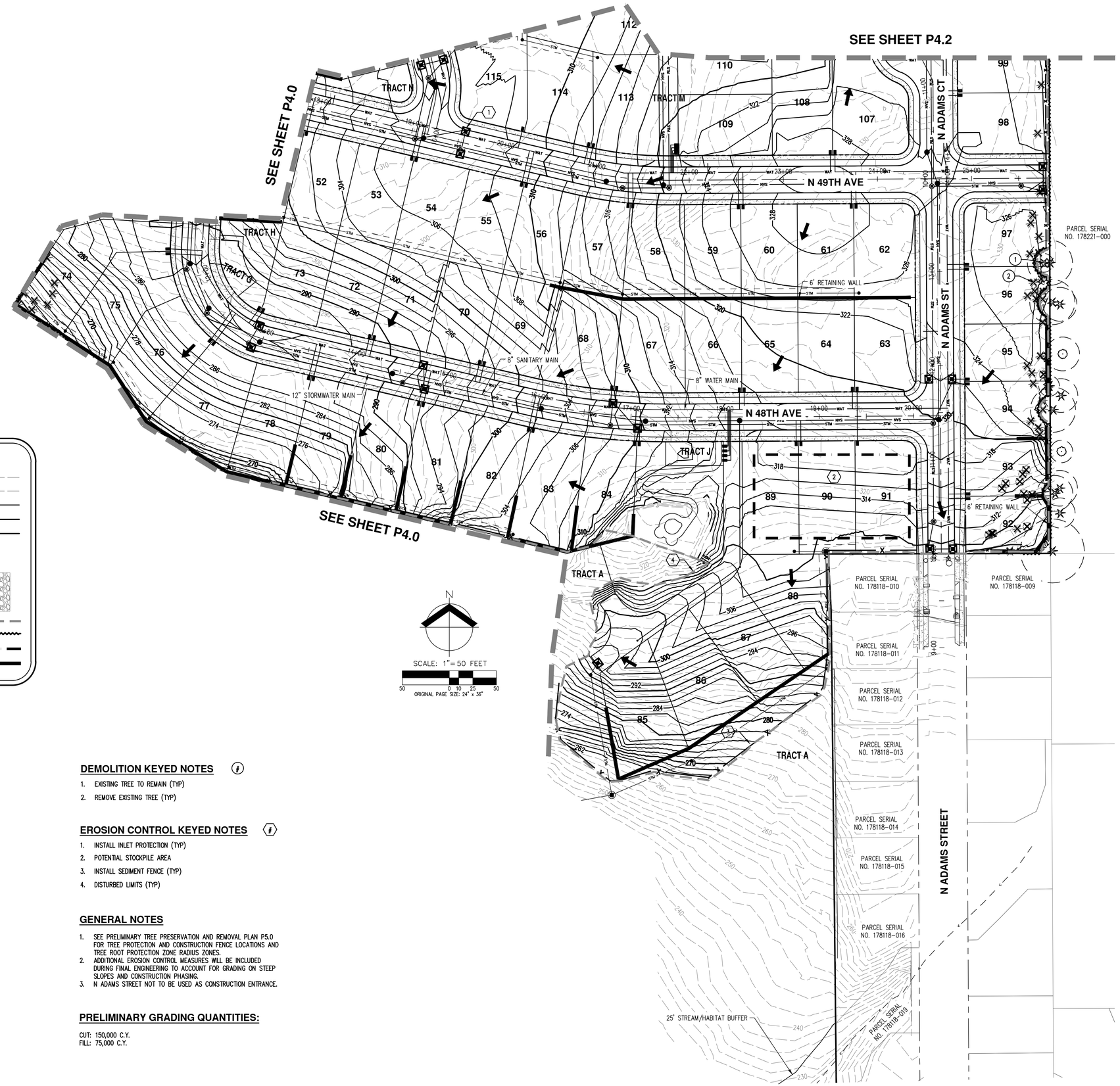
P4.0

AKS DRAWING FILE: 5504 P4.0 GRD-ECDWG | LAYOUT: P4.0



LEGEND

- EXISTING GROUND CONTOUR (2 FT) — 342
- EXISTING GROUND CONTOUR (10 FT) — 350
- FINISHED GRADE CONTOUR (2 FT) — 342
- FINISHED GRADE CONTOUR (10 FT) — 350
- SEDIMENT FENCE (TO BE INSTALLED PRIOR TO GRADING) — X
- INLET PROTECTION (TYP) PER COMBINATION DETAIL
- PROPOSED DRAINAGE FLOW DIRECTION
- GRAVEL CONSTRUCTION ENTRANCE
- DISTURBED LIMITS
- TREE PROTECTION/CONSTRUCTION FENCE
- POTENTIAL STAGING/SOIL STOCKPILE AREA
- RETAINING WALL – PROPOSED AND OPTIONAL (6' MAX. TALL TYP)

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SCALE: 1"=50 FEET

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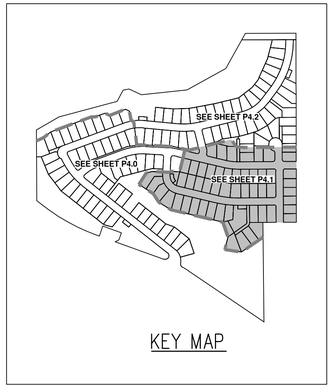
ORIGINAL PAGE SIZE: 24" x 36"



KEY MAP

DEMOLITION KEYED NOTES

1. EXISTING TREE TO REMAIN (TYP)
2. REMOVE EXISTING TREE (TYP)

EROSION CONTROL KEYED NOTES

1. INSTALL INLET PROTECTION (TYP)
2. POTENTIAL STOCKPILE AREA
3. INSTALL SEDIMENT FENCE (TYP)
4. DISTURBED LIMITS (TYP)

GENERAL NOTES

1. SEE PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN P5.0 FOR TREE PROTECTION AND CONSTRUCTION FENCE LOCATIONS AND TREE ROOT PROTECTION ZONE RADIUS ZONES.
2. ADDITIONAL EROSION CONTROL MEASURES WILL BE INCLUDED DURING FINAL ENGINEERING TO ACCOUNT FOR GRADING ON STEEP SLOPES AND CONSTRUCTION PHASING.
3. N ADAMS STREET NOT TO BE USED AS CONSTRUCTION ENTRANCE.

PRELIMINARY GRADING QUANTITIES:

CUT: 150,000 C.Y.
FILL: 75,000 C.Y.

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PRELIMINARY GRADING AND ESC PLAN

CJ DENS SUBDIVISION

CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

JOHN M. MCKAY — STATE OF WASHINGTON — 21,000 — REGISTERED PROFESSIONAL ENGINEER

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P4.1

AKS DRAWING FILE: 5504 P4.0 GRD-ECO.DWG | LAYOUT: P4.1

LEGEND

- EXISTING GROUND CONTOUR (2 FT) — 342
- EXISTING GROUND CONTOUR (10 FT) — 350
- FINISHED GRADE CONTOUR (2 FT) — 342
- FINISHED GRADE CONTOUR (10 FT) — 350
- SEDIMENT FENCE (TO BE INSTALLED PRIOR TO GRADING) — X
- INLET PROTECTION (TYP) PER COMBINATION DETAIL
- PROPOSED DRAINAGE FLOW DIRECTION
- GRAVEL CONSTRUCTION ENTRANCE
- DISTURBED LIMITS
- TREE PROTECTION/CONSTRUCTION FENCE
- POTENTIAL STAGING/SOIL STOCKPILE AREA
- RETAINING WALL – PROPOSED AND OPTIONAL (6' MAX. TALL TYP)

PARCEL SERIAL NO. 178175-000

PARCEL SERIAL NO. 178171-000

PARCEL SERIAL NO. 177905-000

PARCEL SERIAL NO. 178115-005

PROPOSED BOUNDARY

WETLAND BOUNDARY

STREAM 1 TYPE NP

6' RETAINING WALL

8" SANITARY MAIN

8" WATER MAIN

12" WATER MAIN

12" STORMWATER MAIN

N 50TH AVE

N BENTON ST

TRACT O

TRACT Q

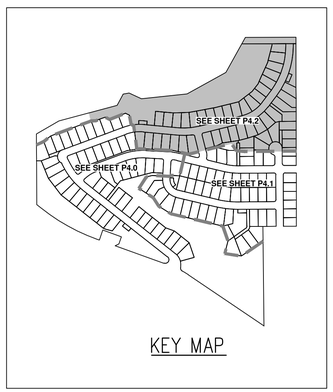
TRACT R

TRACT S

TRACT T

SEE SHEET P4.0

SEE SHEET P4.1



KEY MAP

N

SCALE: 1"=50 FEET

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ORIGINAL PAGE SIZE: 24" x 36"

GENERAL NOTES

1. SEE PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN P5.0 FOR TREE PROTECTION AND CONSTRUCTION FENCE LOCATIONS AND TREE ROOT PROTECTION ZONE RADIUS ZONES.
2. ADDITIONAL EROSION CONTROL MEASURES WILL BE INCLUDED DURING FINAL ENGINEERING TO ACCOUNT FOR GRADING ON STEEP SLOPES AND CONSTRUCTION PHASING.
3. N ADAMS STREET NOT TO BE USED AS CONSTRUCTION ENTRANCE.

PRELIMINARY GRADING QUANTITIES:

CUT: 150,000 C.Y.
FILL: 75,000 C.Y.

DEMOLITION KEYED NOTES

1. EXISTING TREE TO REMAIN (TYP)
2. REMOVE EXISTING TREE (TYP)

EROSION CONTROL KEYED NOTES

1. INSTALL INLET PROTECTION (TYP)
2. POTENTIAL STOCKPILE AND ROCK CRUSHER AREA
3. INSTALL SEDIMENT FENCE (TYP)
4. DISTURBED LIMITS (TYP)
5. PERMANENT POND TO BE USED AS TEMPORARY SEDIMENT CONTROL POND DURING CONSTRUCTION.

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PRELIMINARY GRADING AND ESC PLAN
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

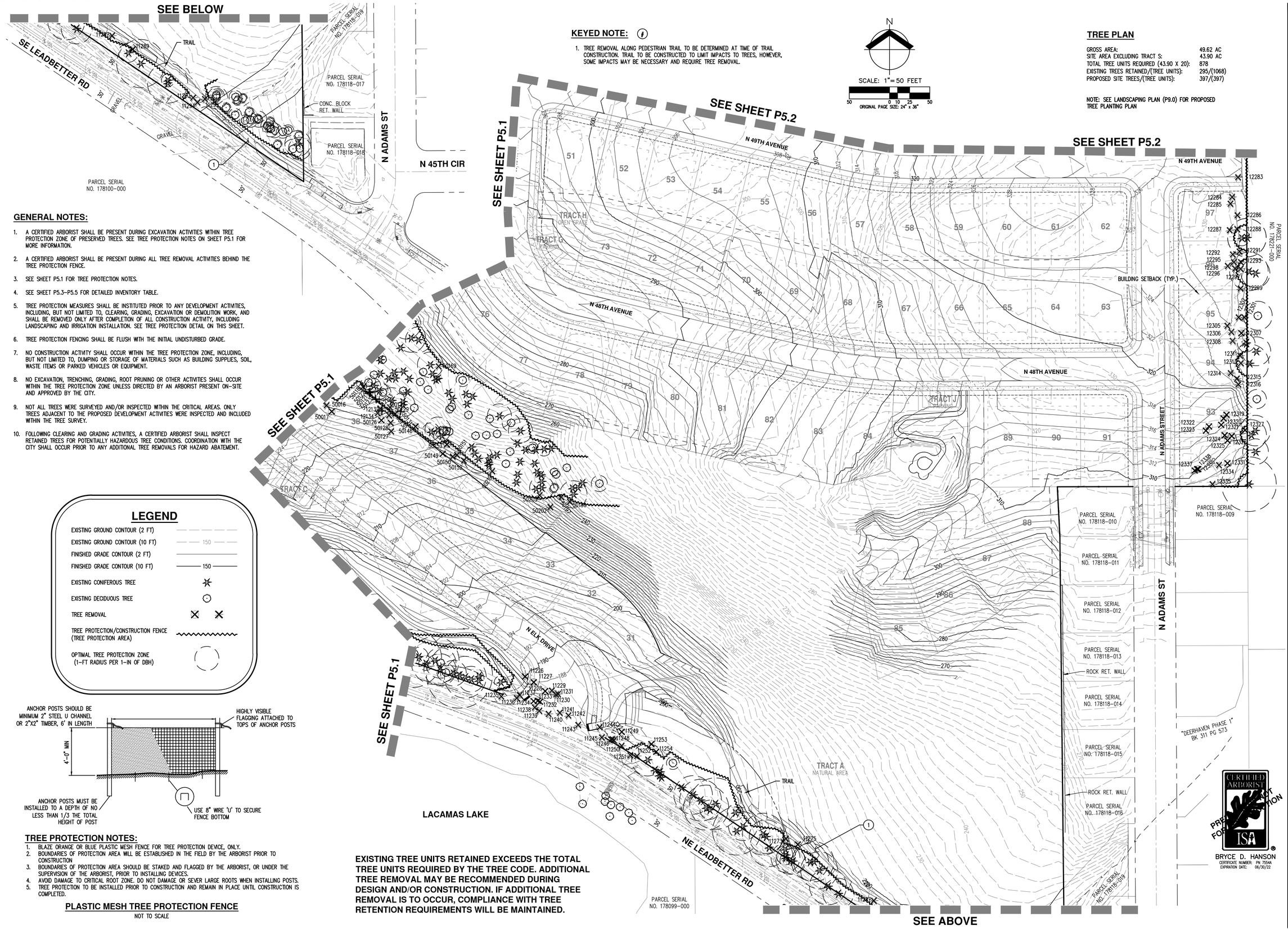
STATE OF WASHINGTON — JOHN M. MYERS — 22331 — REGISTERED PROFESSIONAL ENGINEER

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P4.2

AKS DRAWING FILE: 5504 P4.0 GRD-ECO.DWG | LAYOUT: P4.2



KEYED NOTE: (1)

1. TREE REMOVAL ALONG PEDESTRIAN TRAIL TO BE DETERMINED AT TIME OF TRAIL CONSTRUCTION. TRAIL TO BE CONSTRUCTED TO LIMIT IMPACTS TO TREES, HOWEVER, SOME IMPACTS MAY BE NECESSARY AND REQUIRE TREE REMOVAL.

N

SCALE: 1"=50 FEET

50 0 10 25 50

ORIGINAL PAGE SIZE: 24" x 36"

TREE PLAN

GROSS AREA:	49.62 AC
SITE AREA EXCLUDING TRACT S:	43.90 AC
TOTAL TREE UNITS REQUIRED (43.90 X 20):	878
EXISTING TREES RETAINED/(TREE UNITS):	295/(1068)
PROPOSED SITE TREES/(TREE UNITS):	397/(397)

NOTE: SEE LANDSCAPING PLAN (P9.0) FOR PROPOSED TREE PLANTING PLAN

GENERAL NOTES:

1. A CERTIFIED ARBORIST SHALL BE PRESENT DURING EXCAVATION ACTIVITIES WITHIN TREE PROTECTION ZONE OF PRESERVED TREES. SEE TREE PROTECTION NOTES ON SHEET P5.1 FOR MORE INFORMATION.
2. A CERTIFIED ARBORIST SHALL BE PRESENT DURING ALL TREE REMOVAL ACTIVITIES BEHIND THE TREE PROTECTION FENCE.
3. SEE SHEET P5.1 FOR TREE PROTECTION NOTES.
4. SEE SHEET P5.3–P5.5 FOR DETAILED INVENTORY TABLE.
5. TREE PROTECTION MEASURES SHALL BE INSTITUTED PRIOR TO ANY DEVELOPMENT ACTIVITIES, INCLUDING, BUT NOT LIMITED TO, CLEARING, GRADING, EXCAVATION OR DEMOLITION WORK, AND SHALL BE REMOVED ONLY AFTER COMPLETION OF ALL CONSTRUCTION ACTIVITY, INCLUDING LANDSCAPING AND IRRIGATION INSTALLATION. SEE TREE PROTECTION DETAIL ON THIS SHEET.
6. TREE PROTECTION FENCING SHALL BE FLUSH WITH THE INITIAL UNDISTURBED GRADE.
7. NO CONSTRUCTION ACTIVITY SHALL OCCUR WITHIN THE TREE PROTECTION ZONE, INCLUDING, BUT NOT LIMITED TO, DUMPING OR STORAGE OF MATERIALS SUCH AS BUILDING SUPPLIES, SOIL, WASTE ITEMS OR PARKED VEHICLES OR EQUIPMENT.
8. NO EXCAVATION, TRENCHING, GRADING, ROOT PRUNING OR OTHER ACTIVITIES SHALL OCCUR WITHIN THE TREE PROTECTION ZONE UNLESS DIRECTED BY AN ARBORIST PRESENT ON-SITE AND APPROVED BY THE CITY.
9. NOT ALL TREES WERE SURVEYED AND/OR INSPECTED WITHIN THE CRITICAL AREAS. ONLY TREES ADJACENT TO THE PROPOSED DEVELOPMENT ACTIVITIES WERE INSPECTED AND INCLUDED WITHIN THE TREE SURVEY.
10. FOLLOWING CLEARING AND GRADING ACTIVITIES, A CERTIFIED ARBORIST SHALL INSPECT RETAINED TREES FOR POTENTIALLY HAZARDOUS TREE CONDITIONS. COORDINATION WITH THE CITY SHALL OCCUR PRIOR TO ANY ADDITIONAL TREE REMOVALS FOR HAZARD ABATEMENT.

LEGEND

- EXISTING GROUND CONTOUR (2 FT)
- EXISTING GROUND CONTOUR (10 FT) — 150
- FINISHED GRADE CONTOUR (2 FT)
- FINISHED GRADE CONTOUR (10 FT) — 150
- EXISTING CONIFEROUS TREE
- EXISTING DECIDUOUS TREE
- TREE REMOVAL
- TREE PROTECTION/CONSTRUCTION FENCE (TREE PROTECTION AREA)
- OPTIMAL TREE PROTECTION ZONE (1-FT RADIUS PER 1-IN OF DBH)

TREE PROTECTION NOTES:

1. BLAZE ORANGE OR BLUE PLASTIC MESH FENCE FOR TREE PROTECTION DEVICE, ONLY.
2. BOUNDARIES OF PROTECTION AREA WILL BE ESTABLISHED IN THE FIELD BY THE ARBORIST PRIOR TO CONSTRUCTION
3. BOUNDARIES OF PROTECTION AREA SHOULD BE STAKED AND FLAGGED BY THE ARBORIST, OR UNDER THE SUPERVISION OF THE ARBORIST, PRIOR TO INSTALLING DEVICES.
4. AVOID DAMAGE TO CRITICAL ROOT ZONE. DO NOT DAMAGE OR SEVER LARGE ROOTS WHEN INSTALLING POSTS.
5. TREE PROTECTION TO BE INSTALLED PRIOR TO CONSTRUCTION AND REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETED.

PLASTIC MESH TREE PROTECTION FENCE

NOT TO SCALE

EXISTING TREE UNITS RETAINED EXCEEDS THE TOTAL TREE UNITS REQUIRED BY THE TREE CODE. ADDITIONAL TREE REMOVAL MAY BE RECOMMENDED DURING DESIGN AND/OR CONSTRUCTION. IF ADDITIONAL TREE REMOVAL IS TO OCCUR, COMPLIANCE WITH TREE RETENTION REQUIREMENTS WILL BE MAINTAINED.

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PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN (SOUTH)

CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

PREPARED FOR CERTIFICATION

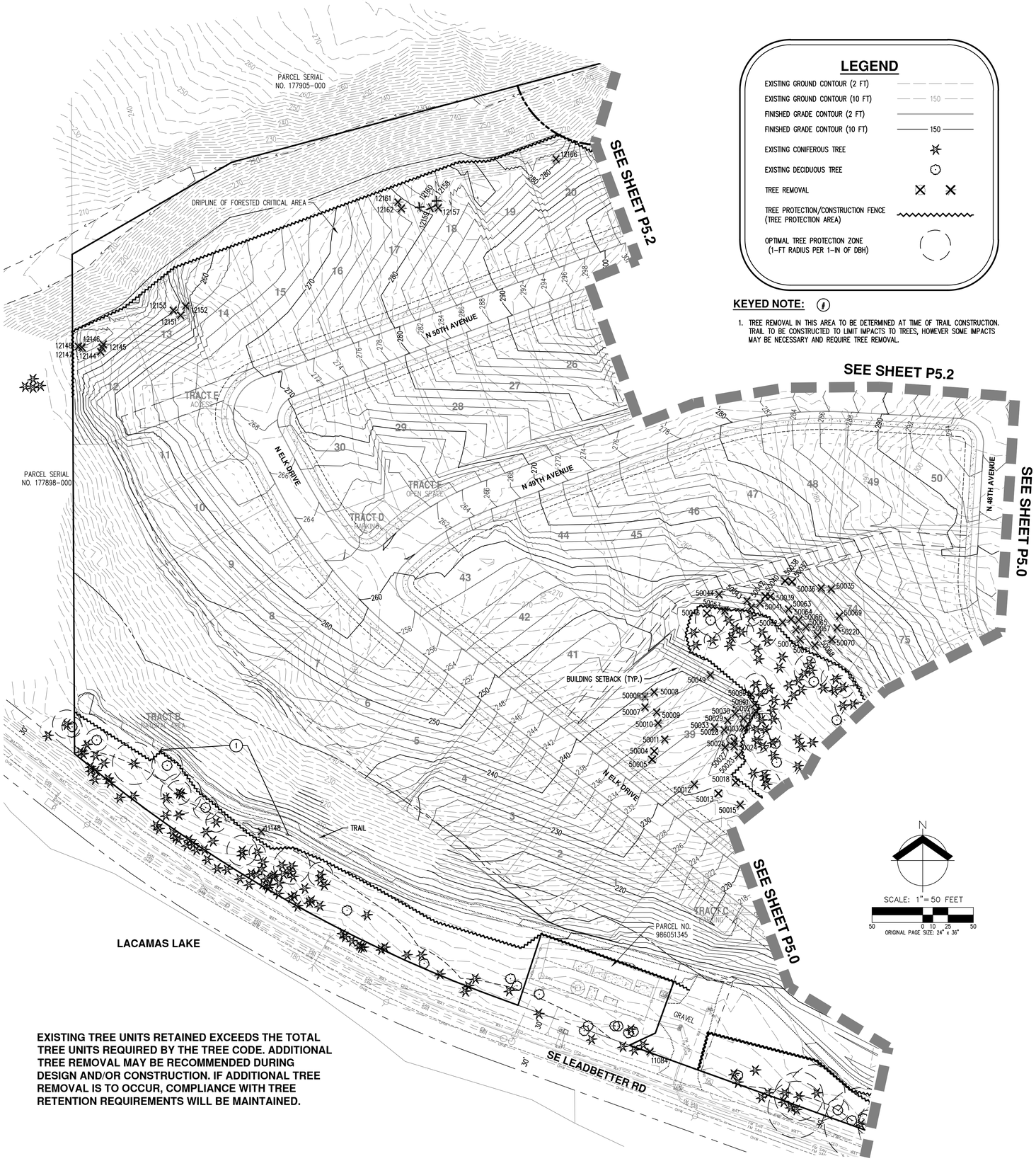
CERTIFIED ARBORIST ISA

BRYCE D. HANSON
CERTIFICATE NUMBER: PN 7504A
EXPIRATION DATE: 06/30/22

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	CJS
DRAWN BY:	BRK
CHECKED BY:	BDH

P5.0

AKS DRAWING FILE: 5504 P5.0 TREE PLAN.DWG | LAYOUT: P5.0



LEGEND

- EXISTING GROUND CONTOUR (2 FT)
- EXISTING GROUND CONTOUR (10 FT)
- FINISHED GRADE CONTOUR (2 FT)
- FINISHED GRADE CONTOUR (10 FT)
- EXISTING CONIFEROUS TREE
- EXISTING DECIDUOUS TREE
- TREE REMOVAL
- TREE PROTECTION/CONSTRUCTION FENCE (TREE PROTECTION AREA)
- OPTIMAL TREE PROTECTION ZONE (1-FT RADIUS PER 1-IN OF DBH)

KEYED NOTE: (1)

1. TREE REMOVAL IN THIS AREA TO BE DETERMINED AT TIME OF TRAIL CONSTRUCTION. TRAIL TO BE CONSTRUCTED TO LIMIT IMPACTS TO TREES, HOWEVER SOME IMPACTS MAY BE NECESSARY AND REQUIRE TREE REMOVAL.

EXISTING TREE UNITS RETAINED EXCEEDS THE TOTAL TREE UNITS REQUIRED BY THE TREE CODE. ADDITIONAL TREE REMOVAL MAY BE RECOMMENDED DURING DESIGN AND/OR CONSTRUCTION. IF ADDITIONAL TREE REMOVAL IS TO OCCUR, COMPLIANCE WITH TREE RETENTION REQUIREMENTS WILL BE MAINTAINED.

TREE PROTECTION NOTES

A. PLACING MATERIALS NEAR TREES – NO PERSON MAY CONDUCT ANY ACTIVITY WITHIN THE PROTECTED AREA OF ANY TREE DESIGNATED TO REMAIN, INCLUDING, BUT NOT LIMITED TO, PARKING EQUIPMENT, PLACING SOLVENTS, STORING BUILDING MATERIALS AND SOIL DEPOSITS, DUMPING CONCRETE WASHOUT, ETC.

B. ATTACHMENTS TO TREES – DURING CONSTRUCTION, NO PERSON SHALL ATTACH ANY OBJECT TO ANY TREE DESIGNATED FOR PROTECTION.

C. PROTECTIVE BARRIER – BEFORE DEVELOPMENT, LAND CLEARING, FILLING OR ANY LAND ALTERATION FOR WHICH A TREE REMOVAL PERMIT IS REQUIRED, THE CONTRACTOR:

C.A. SHALL ERECT AND MAINTAIN READILY VISIBLE PROTECTIVE TREE FENCING ALONG THE OUTER EDGE AND COMPLETELY SURROUNDING THE PROTECTED AREA OF ALL PROTECTED TREES OR GROUP OF TREES. FENCES SHALL BE CONSTRUCTED PER THE DETAIL ON THIS SHEET.

C.B. MAY BE REQUIRED TO COVER WITH MULCH TO A DEPTH OF AT LEAST SIX (6) INCHES OR WITH PLYWOOD OR SIMILAR MATERIAL IN THE AREAS ADJOINING THE CRITICAL ROOT ZONE OF A TREE IN ORDER TO PROTECT ROOTS FROM DAMAGE CAUSED BY HEAVY EQUIPMENT.

C.C. SHALL PROHIBIT EXCAVATION OR COMPACTING OF EARTH OR OTHER POTENTIALLY DAMAGING ACTIVITIES WITHIN THE BARRIERS.

C.D. MAY BE REQUIRED TO MINIMIZE ROOT DAMAGE BY EXCAVATING A TWO (2) FOOT DEEP TRENCH, AT EDGE OF CRITICAL ROOT ZONE, TO CLEANLY SEVER THE ROOTS OF TREES TO BE RETAINED. ROOTS ONE (1) INCH DIAMETER OR GREATER SHALL BE CLEANLY CUT WITH A SAW OR PRUNERS.

C.E. MAY BE REQUIRED TO HAVE CORRECTIVE PRUNING PERFORMED ON PROTECTED TREES IN ORDER TO AVOID DAMAGE FROM MACHINERY OR BUILDING ACTIVITY. MAY BE REQUIRED TO MAINTAIN TREES THROUGHOUT THE CONSTRUCTION PERIOD BY WATERING AND FERTILIZING.

C.F. SHALL MAINTAIN THE PROTECTIVE BARRIERS IN PLACE UNTIL THE PROJECT ARBORIST AUTHORIZES THEIR REMOVAL OR A FINAL CERTIFICATE OF OCCUPANCY IS ISSUED, WHICHEVER OCCURS FIRST.

C.G. SHALL ENSURE THAT ANY LANDSCAPING DONE IN THE PROTECTED ZONE SUBSEQUENT TO THE REMOVAL OF THE BARRIERS SHALL BE ACCOMPLISHED WITH LIGHT MACHINERY OR HAND LABOR.

D. GRADE

D.A. THE GRADE SHALL NOT BE ELEVATED OR REDUCED WITHIN THE CRITICAL ROOT ZONE OF TREES TO BE PRESERVED WITHOUT THE PROJECT ARBORISTS'S AUTHORIZATION. THE PROJECT ARBORIST MAY ALLOW COVERAGE OF UP TO ONE HALF OF THE AREA OF THE TREE'S CRITICAL ROOT ZONE WITH LIGHT SOILS (NO CLAY) TO THE MINIMUM DEPTH NECESSARY TO CARRY OUT GRADING OR LANDSCAPING PLANS, IF IT WILL NOT IMPERIL THE SURVIVAL OF THE TREE. AERATION DEVICES MAY BE REQUIRED TO ENSURE THE TREE'S SURVIVAL.

D.B. IF THE GRADE ADJACENT TO A PRESERVED TREE IS RAISED SUCH THAT IT COULD SLOUGH OR ERODE INTO THE TREES CRITICAL ROOT ZONE, IT SHALL BE PERMANENTLY STABILIZED TO PREVENT SUFFOCATION OF THE ROOTS.

D.C. THE APPLICANT SHALL NOT INSTALL AN IMPERVIOUS SURFACE WITHIN THE CRITICAL ROOT ZONE OF ANY TREE TO BE RETAINED WITHOUT THE AUTHORIZATION OF THE PROJECT ARBORIST. THE PROJECT ARBORIST MAY REQUIRE SPECIFIC CONSTRUCTION METHODS AND/OR USE OF AERATION DEVICES TO ENSURE THE TREE'S SURVIVAL AND TO MINIMIZE THE POTENTIAL FOR ROOT INDUCED DAMAGE TO THE IMPERVIOUS SURFACE.

D.D. TO THE GREATEST EXTENT PRACTICAL, UTILITY TRENCHES SHALL BE LOCATED OUTSIDE OF THE CRITICAL ROOT ZONE OF TREES TO BE RETAINED. THE PROJECT ARBORIST MAY REQUIRE THAT UTILITIES BE TUNNELED UNDER THE ROOTS OF TREES TO BE RETAINED IF THE PROJECT ARBORIST DETERMINES THAT TRENCHING WOULD SIGNIFICANTLY REDUCE THE CHANCES OF THE TREE'S SURVIVAL.

D.E. TREE AND OTHER VEGETATION TO BE RETAINED SHALL BE PROTECTED FROM EROSION AND SEDIMENTATION. CLEARING OPERATIONS SHALL BE CONDUCTED SO AS TO EXPOSE THE SMALLEST PRACTICAL AREA OF SOIL TO EROSION FOR THE LEAST POSSIBLE TIME. TO CONTROL EROSION, SHRUBS, GROUND COVER, AND STUMPS SHALL BE MAINTAINED ON THE INDIVIDUAL LOTS, WHERE FEASIBLE. WHERE NOT FEASIBLE, APPROPRIATE EROSION CONTROL PRACTICES SHALL BE IMPLEMENTED PURSUANT TO CAMAS MUNICIPAL CODE CHAPTER 14.06.

E. DIRECTIONAL FELLING OF TREES SHALL BE USED TO AVOID DAMAGE TO TREES DESIGNATED FOR RETENTION.

F. ADDITIONAL REQUIREMENTS – THE PROJECT ARBORIST MAY REQUIRE ADDITIONAL TREE PROTECTION MEASURES WHICH ARE CONSISTENT WITH ACCEPTED URBAN FORESTRY PRACTICES.

G. ENCROACHMENT INTO THE ROOT PROTECTION ZONE IS ALLOWED WITH PROJECT ARBORIST APPROVAL AS DESCRIBED IN THE FOLLOWING NOTES:

G.A. EXCAVATION IN THE TOP 24 INCHES OF THE SOIL IN THE CRITICAL ROOT ZONE AREA SHOULD BEGIN AT THE EXCAVATION LINE THAT IS CLOSEST TO THE TREE.

G.B. THE EXCAVATION SHOULD BE DONE BY HAND/SHOVEL OR WITH A BACKHOE AND A MAN WITH A SHOVEL, PRUNING SHEARS, AND A PRUNING SAW.

G.C. IF DONE BY HAND, ALL ROOTS 1 INCH OR LARGER SHOULD BE PRUNED AT THE EXCAVATION LINE.

G.D. IF DONE WITH BACKHOE (MOST LIKELY SCENARIO), THEN THE OPERATOR SHALL START THE CUT AT THE EXCAVATION LINE AND CAREFULLY "FEEL" FOR ROOT/RESISTANCE. WHEN THERE IS RESISTANCE, THE MAN WITH THE SHOVEL HAND DIGS AROUND THE ROOTS AND PRUNES THE ROOTS LARGER THAN 1 INCH DIAMETER.

G.E. THE BACKHOE IS TO REMAIN OFF OF THE TREE ROOTS TO BE PRESERVED AT ALL TIMES.

G.F. ALL ROOTS SHALL BE CUT CLEANLY WITH PRUNING SHEARS OR A PRUNING SAW.

G.G. PROJECT ARBORIST MUST BE ONSITE DURING ANY WORK WITHIN THE TREE ROOT PROTECTION ZONE.

G.H. THE CITY PLANNER MUST BE CONTACTED 24 HOURS PRIOR TO WORKING WITHIN THE TREE ROOT PROTECTION ZONE.

H. TREE PROTECTION ZONE IS DEFINED AS ALL AREAS BOUND AND PROTECTING THE OPTIMAL TREE PROTECTION ZONE.

I. TIMELINE FOR CLEARING, GRADING, AND INSTALLATION OF TREE PROTECTION MEASURES: WORK WILL BEGIN IMMEDIATELY FOLLOWING FINAL APPROVAL BY THE CITY. TREE PROTECTION MEASURES WILL BE DONE DURING CLEARING AND ANY GRADING WILL FOLLOW.

J. PRUNING/TREE REMOVAL NOTES: THE WORK TO BE COMPLETED UNDER THIS PROJECT SHALL CONSIST OF TREE REMOVAL AND TREE TRIMMING AS LISTED.

J.A. THE CONTRACTOR SHALL PROVIDE ADEQUATE CREW OF MEN, EQUIPMENT AND MATERIALS TO SAFELY AND EFFICIENTLY COMPLETE THE ASSIGNED WORK. EACH SUCH CREW SHALL INCLUDE AN INDIVIDUAL WHO SHALL BE DESIGNATED AS THE CREW SUPERVISOR AND WHO SHALL BE RESPONSIBLE FOR THE CREW'S ACTIVITIES AND WHO SHALL RECEIVE INSTRUCTION FROM THE OWNER OR THE OWNER'S REPRESENTATIVE AND DIRECT THE CREW TO ACCOMPLISH SUCH WORK.

J.B. WHENEVER A TREE, WHICH IS NOT SCHEDULED TO BE REMOVED, MUST BE TRIMMED OR PRUNED, THE CONTRACTOR SHALL INSURE THAT SUCH TRIMMING AND PRUNING IS CARRIED OUT UNDER THE DIRECT SUPERVISION OF A LICENSED ARBORIST. ALL PRUNING AND TRIMMING SHALL BE PERFORMED IN ACCORDANCE WITH THE PROVISIONS OF ANSI A 300 "STANDARD PRACTICES FOR TREE, SHRUB AND OTHER WOODY PLANT MAINTENANCE".

J.C. THE CONTRACTOR SHALL BE REQUIRED TO CUT TREES TO A HEIGHT OF APPROXIMATELY 12". THE STUMPS AND ROOTS SHALL BE GROUND DOWN A MINIMUM OF TWELVE (12) INCHES BELOW NORMAL GROUND LEVEL.

J.D. THE CONTRACTOR SHALL PERFORM ALL WORK IN ACCORDANCE WITH THE LATEST GOVERNMENTAL SAFETY REGULATIONS. ALL WORK SHALL BE PERFORMED IN STRICT ACCORDANCE WITH ANSI Z133.1 "PRUNING, TRIMMING, REPAIRING, MAINTAINING AND REMOVING TREES AND CUTTING BRUSH–SAFETY REQUIREMENTS" WITH SPECIAL EMPHASIS GIVEN TO THE REQUIREMENT THAT ONLY QUALIFIED LINE–CLEARANCE TREE TRIMMERS BE ASSIGNED TO WORK WHERE A POTENTIAL ELECTRICAL HAZARD EXISTS.

J.E. THE CONTRACTOR SHALL MAKE ALL THE NECESSARY ARRANGEMENTS WITH ANY UTILITY THAT MUST BE PROTECTED OR RELOCATED IN ORDER TO ACCOMPLISH THE WORK. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE PROTECTION OF THE OPERATING CONDITION OF ALL ACTIVE UTILITIES WITHIN THE AREA OF CONSTRUCTION AND THEY SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO EXISTING UTILITIES.

J.F. ANY MATERIAL RESULTING FROM THE TRIMMING OR REMOVAL OF ANY TREES SHALL BECOME THE RESPONSIBILITY OF THE CONTRACTOR.

J.G. HAZARDOUS TREES–REPORTING – ANY PERSON ENGAGED IN TRIMMING OR PRUNING WHO BECOMES AWARE OF A TREE OF DOUBTFUL STRENGTH, THAT COULD BE DANGEROUS TO PERSONS AND PROPERTY, SHALL REPORT SUCH TREE(S) TO THE OWNER OR THE OWNERS REPRESENTATIVE. SUCH TREES SHALL INCLUDE THOSE THAT ARE OVER MATURE, DISEASED, OR SHOWING SIGNS OF DECAY OR OTHER STRUCTURAL WEAKNESS.

J.H. DAMAGES–ANY DAMAGE CAUSED BY THE CONTRACTOR, INCLUDING, BUT NOT LIMITED TO, BROKEN SIDEWALK, CURB, RUTTED LAWN, BROKEN WATER SHUT–OFFS, WIRE DAMAGE, BUILDING DAMAGE, STREET DAMAGE, ETC., WILL BE REPAIRED OR REPLACED IN A TIMELY MANNER, TO THE OWNER'S SATISFACTION, AND ALL COSTS PAID BY THE CONTRACTOR.

J.I. ANY BRUSH CLEARING REQUIRED WITHIN THE TREE PROTECTION ZONE SHALL BE ACCOMPLISHED WITH HAND OPERATED EQUIPMENT.

J.J. TREES TO BE REMOVED SHALL BE FELLED SO AS TO FALL AWAY FROM TREE ROOT PROTECTION ZONES AND TO AVOID PULLING AND BREAKING OF ROOTS TO REMAIN.

J.K. ALL DOWNED BRUSH AND TREES SHALL BE REMOVED FROM THE TREE PROTECTION ZONE EITHER BY HAND OR WITH EQUIPMENT SITTING OUTSIDE THE TREE ROOT PROTECTION ZONE. EXTRACTION SHALL OCCUR BY LIFTING THE MATERIAL OUT, NOT BY SKIDDING IT ACROSS THE GROUND.

J.L. IF TEMPORARY HAUL OR ACCESS ROADS MUST PASS OVER THE ROOT AREA OF TREES TO BE RETAINED A ROADBED OF 6 INCHES OF MULCH OR GRAVEL SHALL BE CREATED TO PROTECT THE SOIL. THE ROADBED MATERIAL SHALL BE REPLENISHED AS NECESSARY TO MAINTAIN A 6–INCH DEPTH.

J.M. PRUNING. TREES SHALL BE PRUNED PRIOR TO THE START OF CONSTRUCTION. TREES SHALL BE CROWN CLEANED TO REMOVE THE DEADWOOD 2 INCHES IN DIAMETER AND OVER. TREES SHALL BE CROWN THINNED BY 10–20% CROWNS MAY BE RAISED BY REMOVING BOTTOM BRANCHES AS NECESSARY UP TO 14 FEET HIGH TO GIVE CLEARANCE FOR ANY CONSTRUCTION TRAFFIC, ACTIVITIES, ETC. ALL WORK TO BE DONE IN ACCORDANCE WITH ANSI A300 PRUNING STANDARDS. REMOVE ANY LIMBS OF DOUBTFUL STRENGTH THAT COULD BE DANGEROUS TO PERSONS AND PROPERTY.

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.

AT THE COMPLETION OF CONSTRUCTION, ALL TREES MUST ONCE AGAIN BE REVIEWED TO EVALUATE THEIR HAZARD RATING. LAND CLEARING AND REMOVAL OF ADJACENT TREES CAN EXPOSE PREVIOUSLY UNSEEN DEFECTS AND OTHERWISE HEALTHY TREES CAN BE DAMAGED DURING CONSTRUCTION.

TREE INFORMATION GATHERED UNDER THE SUPERVISION OF BRYCE HANSON, CERTIFIED ARBORIST, WITH AKS ENGINEERING AND FORESTRY, LLC.

TREES SHOWN TO BE SAVED WILL BE EVALUATED BY THE PROJECT ARBORIST PRIOR TO, DURING, AND AFTER CONSTRUCTION. TREES ADVERSELY AFFECTED BY CONSTRUCTION AND/OR DETERMINED TO BE A SAFETY HAZARD WILL BE REMOVED.

GENERAL NOTES:

1. A CERTIFIED ARBORIST SHALL BE PRESENT DURING EXCAVATION ACTIVITIES WITHIN TREE PROTECTION ZONE OF PRESERVED TREES. SEE TREE PROTECTION NOTES ON THIS SHEET FOR MORE INFORMATION.
2. A CERTIFIED ARBORIST SHALL BE PRESENT DURING ALL TREE REMOVAL ACTIVITIES BEHIND THE TREE PROTECTION FENCE.
3. SEE SHEET THIS SHEET FOR TREE PROTECTION NOTES.
4. SEE SHEET P5.3–P5.5 FOR DETAILED INVENTORY TABLE.
5. TREE PROTECTION MEASURES SHALL BE INSTITUTED PRIOR TO ANY DEVELOPMENT ACTIVITIES, INCLUDING, BUT NOT LIMITED TO, CLEARING, GRADING, EXCAVATION OR DEMOLITION WORK, AND SHALL BE REMOVED ONLY AFTER COMPLETION OF ALL CONSTRUCTION ACTIVITY, INCLUDING LANDSCAPING AND IRRIGATION INSTALLATION. SEE TREE PROTECTION DETAIL ON SHEET P5.0.
6. TREE PROTECTION FENCING SHALL BE FLUSH WITH THE INITIAL UNDISTURBED GRADE.
7. NO CONSTRUCTION ACTIVITY SHALL OCCUR WITHIN THE TREE PROTECTION ZONE, INCLUDING, BUT NOT LIMITED TO, DUMPING OR STORAGE OF MATERIALS SUCH AS BUILDING SUPPLIES, SOIL, WASTE ITEMS OR PARKED VEHICLES OR EQUIPMENT.
8. NO EXCAVATION, TRENCHING, GRADING, ROOT PRUNING OR OTHER ACTIVITIES SHALL OCCUR WITHIN THE TREE PROTECTION ZONE UNLESS DIRECTED BY AN ARBORIST PRESENT ON–SITE AND APPROVED BY THE CITY.
9. NOT ALL TREES WERE SURVEYED AND/OR INSPECTED WITHIN THE CRITICAL AREAS. ONLY TREES ADJACENT TO THE PROPOSED DEVELOPMENT ACTIVITIES WERE INSPECTED AND INCLUDED WITHIN THE TREE SURVEY.
10. FOLLOWING CLEARING AND GRADING ACTIVITIES, A CERTIFIED ARBORIST SHALL INSPECT RETAINED TREES FOR POTENTIALLY HAZARDOUS TREE CONDITIONS. COORDINATION WITH THE CITY SHALL OCCUR PRIOR TO ANY ADDITIONAL TREE REMOVALS FOR HAZARD ABATEMENT.
11. EXISTING TREE UNITS RETAINED EXCEEDS THE TOTAL TREE UNITS REQUIRED BY THE TREE CODE. ADDITIONAL TREE REMOVAL MAY BE RECOMMENDED DURING DESIGN AND/OR CONSTRUCTION. IF ADDITIONAL TREE REMOVAL IS TO OCCUR, COMPLIANCE WITH TREE RETENTION REQUIREMENTS WILL BE MAINTAINED.

BRYCE D. HANSON
CERTIFICATE NUMBER: PN 7554A
EXPIRATION DATE: 06/30/22

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
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WWW.AKS-ENG.COM

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FORESTRY · PLANNING · LANDSCAPE ARCHITECTURE

PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN (WEST)

CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	CJS
DRAWN BY:	BRK
CHECKED BY:	BDH

P5.1

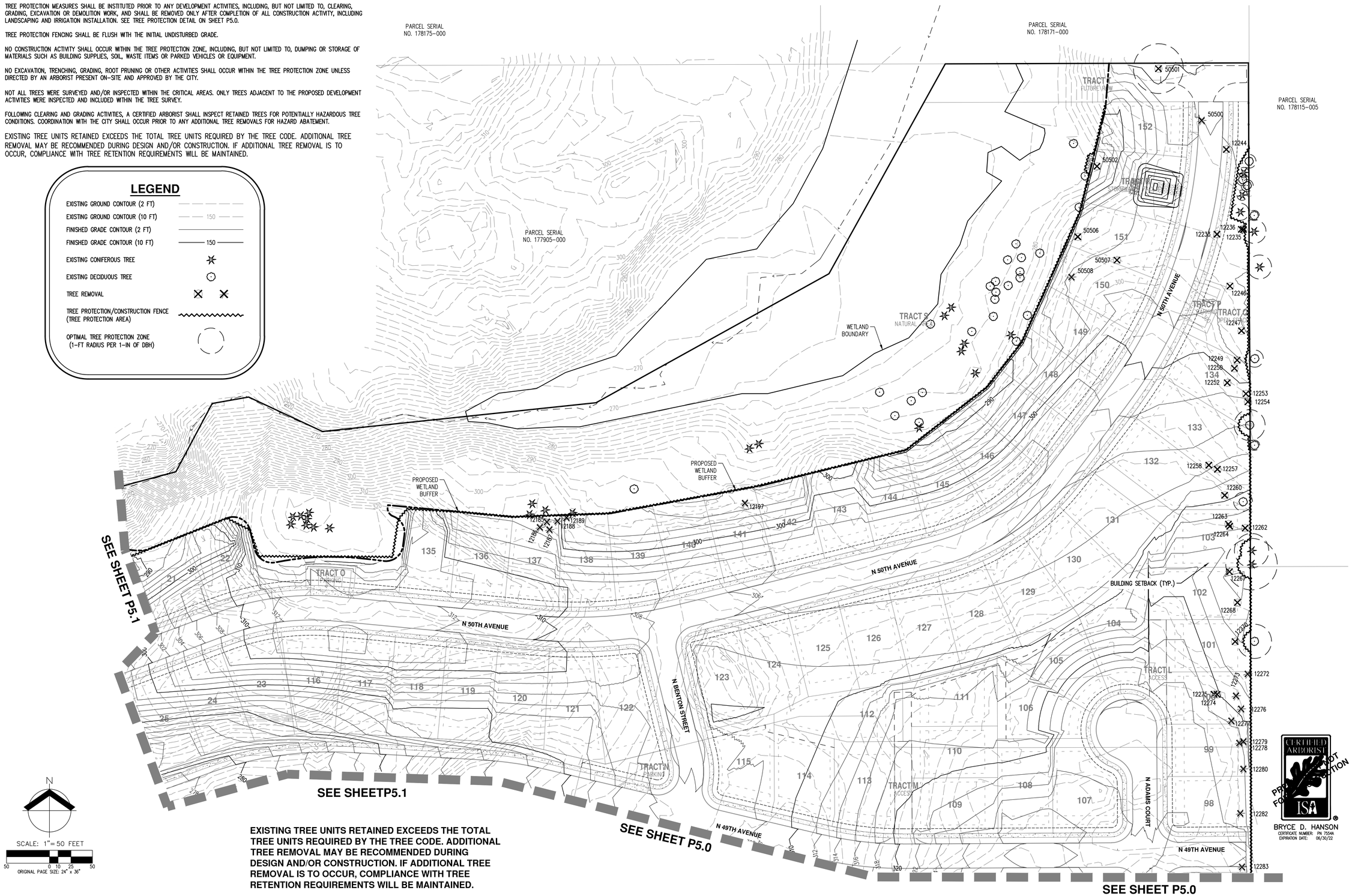
AKS DRAWING FILE: 5504 P5.0 TREE PLAN.DWG | LAYOUT: P5.1

GENERAL NOTES:

1. A CERTIFIED ARBORIST SHALL BE PRESENT DURING EXCAVATION ACTIVITIES WITHIN TREE PROTECTION ZONE OF PRESERVED TREES. SEE TREE PROTECTION NOTES ON SHEET P5.1 FOR MORE INFORMATION.
2. A CERTIFIED ARBORIST SHALL BE PRESENT DURING ALL TREE REMOVAL ACTIVITIES BEHIND THE TREE PROTECTION FENCE.
3. SEE SHEET P5.1 FOR TREE PROTECTION NOTES.
4. SEE SHEET P5.3–P5.5 FOR DETAILED INVENTORY TABLE.
5. TREE PROTECTION MEASURES SHALL BE INSTITUTED PRIOR TO ANY DEVELOPMENT ACTIVITIES, INCLUDING, BUT NOT LIMITED TO, CLEARING, GRADING, EXCAVATION OR DEMOLITION WORK, AND SHALL BE REMOVED ONLY AFTER COMPLETION OF ALL CONSTRUCTION ACTIVITY, INCLUDING LANDSCAPING AND IRRIGATION INSTALLATION. SEE TREE PROTECTION DETAIL ON SHEET P5.0.
6. TREE PROTECTION FENCING SHALL BE FLUSH WITH THE INITIAL UNDISTURBED GRADE.
7. NO CONSTRUCTION ACTIVITY SHALL OCCUR WITHIN THE TREE PROTECTION ZONE, INCLUDING, BUT NOT LIMITED TO, DUMPING OR STORAGE OF MATERIALS SUCH AS BUILDING SUPPLIES, SOIL, WASTE ITEMS OR PARKED VEHICLES OR EQUIPMENT.
8. NO EXCAVATION, TRENCHING, GRADING, ROOT PRUNING OR OTHER ACTIVITIES SHALL OCCUR WITHIN THE TREE PROTECTION ZONE UNLESS DIRECTED BY AN ARBORIST PRESENT ON-SITE AND APPROVED BY THE CITY.
9. NOT ALL TREES WERE SURVEYED AND/OR INSPECTED WITHIN THE CRITICAL AREAS. ONLY TREES ADJACENT TO THE PROPOSED DEVELOPMENT ACTIVITIES WERE INSPECTED AND INCLUDED WITHIN THE TREE SURVEY.
10. FOLLOWING CLEARING AND GRADING ACTIVITIES, A CERTIFIED ARBORIST SHALL INSPECT RETAINED TREES FOR POTENTIALLY HAZARDOUS TREE CONDITIONS. COORDINATION WITH THE CITY SHALL OCCUR PRIOR TO ANY ADDITIONAL TREE REMOVALS FOR HAZARD ABATEMENT.
11. EXISTING TREE UNITS RETAINED EXCEEDS THE TOTAL TREE UNITS REQUIRED BY THE TREE CODE. ADDITIONAL TREE REMOVAL MAY BE RECOMMENDED DURING DESIGN AND/OR CONSTRUCTION. IF ADDITIONAL TREE REMOVAL IS TO OCCUR, COMPLIANCE WITH TREE RETENTION REQUIREMENTS WILL BE MAINTAINED.

LEGEND

- EXISTING GROUND CONTOUR (2 FT)
- EXISTING GROUND CONTOUR (10 FT) — 150
- FINISHED GRADE CONTOUR (2 FT)
- FINISHED GRADE CONTOUR (10 FT) — 150
- EXISTING CONIFEROUS TREE
- EXISTING DECIDUOUS TREE
- TREE REMOVAL
- TREE PROTECTION/CONSTRUCTION FENCE (TREE PROTECTION AREA)
- OPTIMAL TREE PROTECTION ZONE (1-FT RADIUS PER 1-IN OF DBH)



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SCALE: 1"=50 FEET

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EXISTING TREE UNITS RETAINED EXCEEDS THE TOTAL TREE UNITS REQUIRED BY THE TREE CODE. ADDITIONAL TREE REMOVAL MAY BE RECOMMENDED DURING DESIGN AND/OR CONSTRUCTION. IF ADDITIONAL TREE REMOVAL IS TO OCCUR, COMPLIANCE WITH TREE RETENTION REQUIREMENTS WILL BE MAINTAINED.

CERTIFIED ARBORIST ISA

BRYCE D. HANSON
CERTIFICATE NUMBER: PN 7564A
EXPIRATION DATE: 06/30/22

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PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN (NORTH)

CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	CJS
DRAWN BY:	BRK
CHECKED BY:	BDH

P5.2

AKS DRAWING FILE: 5504 P5.0 TREE PLAN.DWG | LAYOUT: P5.2

Detailed Tree Inventory for CJ Dens

AKS JOB NO. 5504 **Site Area = 43.90 acres**

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow Rating	Reason for Removal	Tree Units Retained
11084	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, immediate risk to pump station, future trail	0
11085	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Unbalanced crown, broken branches, Poor live crown ratio	B		0
11086	34	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Unbalanced crown, broken branches, Poor live crown ratio	B		0
11087	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, some branch dieback	B		2
11088	11	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, Poor live crown ratio, broken branches	B		0
11089	13	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, Deformed bole	B		0
11090	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Codominant top with included bark, sparse canopy	B		0
11091	17	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, Unbalanced crown, some branch dieback	B		0
11092	8	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, Healthy	C		0
11093	12	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, Healthy	C		0
11094	20, 22	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, codominant base, deformed bole, lean, unbalanced crown	B		0
11096	12	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, dead	A		0
11097	10	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, Broken branches with decay, dead branches in crown	B		0
11098	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, dead	A		0
11099	13	Bigleaf Maple (*Acer macrophyllum*)	3	Bore holes, shffing bark	B		3
11100	9	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11101	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Dead scaffold branches, sparse canopy	B		4
11102	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, broken top	A		0
11103	32	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, poor live crown ratio, branch dieback	B		0
11104	34	Douglas-fir (*Pseudotsuga menziesii*)	13	Some dead branches in crown	C		13
11105	28	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown, sweep	B		0
11106	12	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11107	22	Douglas-fir (*Pseudotsuga menziesii*)	7	Poor live crown ratio	B		7
11108	36	Douglas-fir (*Pseudotsuga menziesii*)	14	Healthy	C		14
11109	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown	B		6
11110	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown, dead branches in crown, crown cleaning recommended	B		6
11111	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, dead	A		0
11112	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11113	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown, poor live crown ratio	B		0
11114	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11115	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, suppressed, sparse canopy	B		0
11116	28	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11117	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11118	10	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11119	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Unbalanced crown	B		4
11120	21	Douglas-fir (*Pseudotsuga menziesii*)	7	Unbalanced crown	B		7
11121	8	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed	C		2
11122	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Sparse canopy, some branch dieback	B		4
11123	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy, some branch dieback	B		2
11124	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy, some branch dieback	B		2
11125	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Healthy	C		6
11127	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
11128	8	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, unbalanced crown	B		2
11129	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Dead branches in crown	C		5
11130	28	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11131	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown	B		6
11132	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Sparse canopy, some branch dieback	B		3
11133	22	Douglas-fir (*Pseudotsuga menziesii*)	7	Healthy	C		7
11134	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Healthy	C		4
11135	8,18	Douglas-fir (*Pseudotsuga menziesii*)	6	Codominant base	C		6
11137	18, 14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, codominant base, unbalanced crown	B		0
11139	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio	B		2
11140	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
11141	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, sparse canopy, some branch dieback	B		2
11142	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
11143	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, declining health	A		2
11144	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Healthy	C		3
11145	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, sparse canopy	B		2
11146	9	Douglas-fir (*Pseudotsuga menziesii*)	2	Deformed top	B		2
11147	8	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, sparse canopy, some branch dieback	B		2
11148	31	Douglas-fir (*Pseudotsuga menziesii*)	12	Healthy	C	Impacted by proposed path grading	0
11149	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11150	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Dead scaffold branches, crown cleaning recommended	B		2
11151	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11152	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11153	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11154	12	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11155	23	Douglas-fir (*Pseudotsuga menziesii*)	8	Poor live crown ratio	B		8
11156	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Unbalanced crown, epicormic sprouts	B		2
11157	24	Douglas-fir (*Pseudotsuga menziesii*)	8	Healthy	C		8
11158	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11159	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Several large conks up bole	A		0
11160	15	Bigleaf Maple (*Acer macrophyllum*)	4	Lean	B		4
11161	40	Douglas-fir (*Pseudotsuga menziesii*)	16	Some bore holes	C		16
11162	21	Douglas-fir (*Pseudotsuga menziesii*)	7	Healthy	C		7
11163	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, deformed top, some dead branches in crown	B		0
11164	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Lean, sweep	B		4
11165	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, numerous conks up bole, recommend removal of city owned tree	A		0
11166	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11167	7	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy	B		2
11168	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11169	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11170	28	Douglas-fir (*Pseudotsuga menziesii*)	10	Healthy	C		10
11171	12	Bigleaf Maple (*Acer macrophyllum*)	2	Cavity with decay in base	B		2
11172	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11173	42	Douglas-fir (*Pseudotsuga menziesii*)	17	Codominant top	B		17
11174	11	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, healthy	C		0
11175	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11176	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11177	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Healthy	C		3
11178	26	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, suppressed	B		0
11179	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11180	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11181	23	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11182	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11183	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, suppressed	B		0
11184	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, poor live crown ratio, unbalanced crown, dead branches in crown	B		0
11185	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, top lean, scars up bole	B		0
11186	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, dead branches in crown	C		0
11187	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11188	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11189	22	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11190	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11191	26	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11192	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11194	26	Douglas-fir (*Pseudotsuga menziesii*)	9	Large conks up bole, uneven canopy, poor live crown ratio	A		0
11195	8	Bigleaf Maple (*Acer macrophyllum*)	2	Lean	B		2
11196	36	Douglas-fir (*Pseudotsuga menziesii*)	14	Poor live crown ratio, bore holes	B		14
11197	24	Douglas-fir (*Pseudotsuga menziesii*)	8	Unbalanced crown	B		8
11198	22	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, lean, codominant top with included bark, deformed bole	B		0
11199	35	Douglas-fir (*Pseudotsuga menziesii*)	14	Unbalanced crown	B		14
11200	35	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown, Some branch dieback, bore holes	B		0
11201	22	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
11202	28	Douglas-fir (*Pseudotsuga menziesii*)	10	Poor live crown ratio, some dead branches in crown	B		10
11203	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, dead	A		0
11204	28	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11205	28	Douglas-fir (*Pseudotsuga menziesii*)	10	Poor live crown ratio, some dead branches in crown	B		10
11206	13	Bigleaf Maple (*Acer macrophyllum*)	3	Healthy	C		3
11207	8	Bigleaf Maple (*Acer macrophyllum*)	0	Dead	A		0
11208	36	Douglas-fir (*Pseudotsuga menziesii*)	14	Healthy	C		14

Detailed Tree Inventory for CJ Dens

AKS JOB NO. 5504 **Site Area = 43.90 acres**

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow Rating	Reason for Removal	Tree Units Retained
11209	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Healthy	C		3
11210	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11211	30	Douglas-fir (*Pseudotsuga menziesii*)	11	Poor live crown ratio	B		11
11212	20	Bigleaf Maple (*Acer macrophyllum*)	6	Deformed bole	B		6
11213	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown	B		6
11214	12	Bigleaf Maple (*Acer macrophyllum*)	2	Lean	B		2
11215	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Cavity with decay, some branch dieback	B		4
11216	41	Douglas-fir (*Pseudotsuga menziesii*)	17	Unbalanced crown	B		17
11217	28	Douglas-fir (*Pseudotsuga menziesii*)	10	Poor live crown ratio	B		10
11218	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Suppressed	C		5
11223	34	Douglas-fir (*Pseudotsuga menziesii*)	13	Healthy	C		13
11224	38	Douglas-fir (*Pseudotsuga menziesii*)	15	Healthy	C		15
11225	8	Douglas-fir (*Pseudotsuga menziesii*)	2	Sweep, codominant top	B		2
11226	6,7,10	Bigleaf Maple (*Acer macrophyllum*)	3	Dead codominant stems, scars, sparse canopy, branch dieback	B	Located within proposed road grading	0
11227	6	Bigleaf Maple (*Acer macrophyllum*)	2	Broken branches with decay, codominant top	B	Located within proposed road grading	0
11228	12	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C	Located within proposed road grading	0
11229	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Crooked bole, poor live crown ratio, branch dieback	B	Located within proposed road grading	0
11230	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy	B	Located within proposed road grading	0
11231	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Located within proposed road grading	0
11232	12	Bigleaf Maple (*Acer macrophyllum*)	2	Decaying foliage, sparse canopy	B	Located within proposed road grading	0
11233	9	Bigleaf Maple (*Acer macrophyllum*)	2	Lean (S)	B	Located within proposed road grading	0
11234	11	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C	Located within proposed road grading	0
11235	36	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C	Located within proposed road grading	0
11236	24	Douglas-fir (*Pseudotsuga menziesii*)	8	Healthy	C	Located within proposed road grading	0
11237	34	Douglas-fir (*Pseudotsuga menziesii*)	13	Poor live crown ratio, dead scaffold branches	B	Located within proposed road grading	0
11238	17	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C	Located within proposed road grading	0
11239	27	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, poor live crown ratio, unbalanced crown	B	Located within proposed road grading	0
11240	15	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, sparse canopy, unbalanced crown	B	Located within proposed road grading	0
11241	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C	Located within proposed road grading	0
11242	22	Douglas-fir (*Pseudotsuga menziesii*)	7	Healthy	C	Located within proposed road grading	0
11243	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, bore holes, broken branches	C	Located within proposed road grading	0
11244	36	Douglas-fir (*Pseudotsuga menziesii*)	14	Healthy	C	Located within proposed road grading	0
11245	7	Grand Fir (*Abies grandis*)	0	Off site, healthy	C	Located within proposed road grading	0
11246	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Road grading greatly impacts root zone	0
11247	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Road grading greatly impacts root zone	0
11248	37	Douglas-fir (*Pseudotsuga menziesii*)	15	Unbalanced crown	B	Road grading greatly impacts root zone	0
11249	12	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C	Road grading greatly impacts root zone	0
11250	18	Grand Fir (*Abies grandis*)	0	Dead	A	Dead, Road grading greatly impacts root zone	0
11251	28	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B	Road grading greatly impacts root zone	0
11252	30	Douglas-fir (*Pseudotsuga menziesii*)	11	Poor live crown ratio, some branch dieback	B	Road grading greatly impacts root zone	0
11253	7	Bigleaf Maple (*Acer macrophyllum*)	2	Sweep, lean (S)	B	Road grading greatly impacts root zone	0
11254	12	Bigleaf Maple (*Acer macrophyllum*)	2	Poor live crown ratio	B	Road grading greatly impacts root zone	0
11255	8,8	Bigleaf Maple (*Acer macrophyllum*)	2	Cavity with decay, top lean (S), codominant base	B		2
11256	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Sparse canopy	B		6
11257	22	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, conks up bole, branch die back, sparse canopy	A		0
11258	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio	B		4
11259	15	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, sparse canopy, branch dieback	B		0
11260	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11261	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11262	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11264	26	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11265	32	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11266	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11267	32	Douglas-fir (*Pseudotsuga menziesii*)	12	Healthy	C		12
11268	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11269	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11270	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11271	28	Douglas-fir (*Pseudotsuga menziesii*)	10	Healthy	C		10
11272	21	Douglas-fir (*Pseudotsuga menziesii*)	7	Broken scaffold branches	C		7
11273	9	Douglas-fir (*Pseudotsuga menziesii*)	2	Deformed bole, poor live crown ratio	B	Impacted by proposed path grading	0
11274	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11275	10	Bigleaf Maple (*Acer macrophyllum*)	0	Dead	A	Dead, Impacted by proposed path grading	0
11276	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed	C		2
11277	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11278	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11279	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Broken branches, poor live crown ratio	B		6
11280	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11282	23	Douglas-fir (*Pseudotsuga menziesii*)	8	Healthy	C		8
11283	25	Douglas-fir (*Pseudotsuga menziesii*)	9	Healthy	C		9
11284	23	Douglas-fir (*Pseudotsuga menziesii*)	8	Deformed bole	B		8
11285	25	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11286	23	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11287	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Healthy	C	Impacted by proposed path grading	0
11288	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11289	8	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C	Impacted by proposed path grading	0
11290	30	Douglas-fir (*Pseudotsuga menziesii*)	11	Healthy	C		11
11291	25	Douglas-fir (*Pseudotsuga menziesii*)	9	Healthy	C		9
11292	8	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11293	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Healthy	C	Impacted by proposed path grading	0
11294	36	Douglas-fir (*Pseudotsuga menziesii*)	14	Broken top with weak leaders, significant decay	A	Poor Health, impacted by proposed path grading	0
11295	25	Douglas-fir (*Pseudotsuga menziesii*)	9	Healthy	C	Impacted by proposed path grading	0
11296	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Healthy	C		3
11297	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11298	7	Bigleaf Maple (*Acer macrophyllum*)	2	Sparse canopy	B		2
11300	6,12	Bigleaf Maple (*Acer macrophyllum*)	3	Dead scaffold branches, machete damage, crown cleaning recommended	B		3
11301	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Healthy	C		4
11302	14	Bigleaf Maple (*Acer macrophyllum*)	3	Dead scaffold branches, several cavities with decay	B		3
11303	6	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11304	7	Bigleaf Maple (*Acer macrophyllum*)	2	Dead scaffold branch	C		2
11305	8,10	Bigleaf Maple (*Acer macrophyllum*)	3	Dead scaffold branch	C		3
11306	6,6,6,6	Pacific Serviceberry (*Amelanchier alnifolia*)	2	Healthy	C		2
11307	7,9	Bigleaf Maple (*Acer macrophyllum*)	2	Several large cavities with decay	B		2
11308	8,10	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11309	7	Bigleaf Maple (*Acer macrophyllum*)	2	Deformed bole	B		2
11310	8	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11311	6	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11312	10	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11313	6,6	Bigleaf Maple (*Acer macrophyllum*)	2	Dead codominant stem	B		2
11314	8,8,9	Bigleaf Maple (*Acer macrophyllum*)	3	Codominant base with included bark, lean (S)	B		3
11315	6	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11316	7	Bigleaf Maple (*Acer macrophyllum*)	2	Lean (S)	B		2
11317	7	Bigleaf Maple (*Acer macrophyllum*)	2	Sparse canopy, dead scaffold branches	B		2
11318	6	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11319	8	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11320	7,7,8	Sweet Cherry (*Prunus avium*)	3	Codominant base, lean (S), crooked bole	B		3
11321	7	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
12130	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Unbalanced crown, dead branches in crown	B		3
12132	14	Coniferous	3	Not Evaluated by an Arborist	-	Lot grading greatly impacts root zone	0
12133	8	Deciduous	2	Not Evaluated by an Arborist	-	Lot grading greatly impacts root zone	0
12134	9	Coniferous	2	Not Evaluated by an Arborist	-	Lot grading greatly impacts root zone	0
12136	12,12,6,7	Deciduous	2	Not Evaluated by an Arborist	-		2
12139	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Poor Health	A		0
12140	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Poor Health	A		0
12141	11	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Poor Health	A		0
12142	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Poor Health	A		0
12144	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12145	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12146	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12147	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12148	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0

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PRELIMINARY TREE PRESERVATION AND REMOVAL TABLE

CJ DENS SUBDIVISION

CJ DENS LACAMAS II LLC

CAMAS, WASHINGTON

PRELIMINARY
NOT FOR CONSTRUCTION

CERTIFIED ARBORIST
PROTECTION NOT FOR CONSTRUCTION
ISA

BRYCE D. HANSON
CERTIFICATE NUMBER: PN 7554A
EXPIRATION DATE: 06/30/22

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	CJS
DRAWN BY:	BRK
CHECKED BY:	BDH

P5.3

AKS DRAWING FILE: 5504 P5.0 TREE TABLES.DWG | LAYOUT: 5.3

Detailed Tree Inventory for CJ Dens

AKS JOB NO. 5504 **Site Area = 43.90 acres**

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow Rating	Reason for Removal	Tree Units Retained
12151	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12152	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12153	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12157	10	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12158	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12159	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12160	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12161	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12162	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12166	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12169	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12170	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12171	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12172	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12173	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12174	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12175	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12176	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12182	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12183	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12184	11	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12185	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12186	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12187	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12188	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12189	9	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12190	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12194	12	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12197	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12200	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12201	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12204	12,10	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12205	12	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12206	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12207	10	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12209	9	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12210	11	Bigleaf Maple (*Acer macrophyllum*)	0	Poor Health, located in Critical Area Tract S	A		0
12211	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12214	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12215	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12216	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12217	8	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12218	8,6,6	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12219	23	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12220	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12221	14	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12222	12,12	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12223	12	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12224	8	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12225	8	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12226	6	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12227	10,10,8,8	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12228	12	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12229	12,10,10	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12230	12,8	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12233	27,8,7,7	Bigleaf Maple (*Acer macrophyllum*)	11		C	Located within proposed road grading	0
12234	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, crooked bole	C		0
12235	7	Red Alder (*Alnus rubra*)	2	Dead top, in decline	A	Poor tree health	0
12236	7	Red Alder (*Alnus rubra*)	2	Dead top, in decline	A	Poor tree health	0
12237	6,6,6	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, evaluated behind fence, dead branches in canopy	B		0
12238	10	Douglas-fir (*Pseudotsuga menziesii*)	2		C		2
12239	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed	B		2
12240	7,7,7,7	Bigleaf Maple (*Acer macrophyllum*)	3		C		3
12241	7,7,7,7,7	Bigleaf Maple (*Acer macrophyllum*)	4		C		4
12242	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed	B		2
12243	8	Red Alder (*Alnus rubra*)	0	Off site, evaluated behind fence	C		0
12244	8,8,8,8,7	Bigleaf Maple (*Acer macrophyllum*)	5		C	Located within proposed road grading	0
12245	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated from property line, unbalanced crown	B		0
12246	6	Beaked Hazelnut (Corylus cornuta)	2	Clustered shrub, stem lean, broken top	A	Poor health, Parking grading impacts root zone	0
12247	6	Red Alder (*Alnus rubra*)	0	Snag	A	Dead, Parking and lot grading impacts root zone	0
12248	10	Red Alder (*Alnus rubra*)	0	Off site, Snag	A		0
12249	12	Bigleaf Maple (*Acer macrophyllum*)	2	Crooked bole, dead branches, unbalanced crown	B	Lot grading greatly impacts root zone	0
12250	10,9	Bigleaf Maple (*Acer macrophyllum*)	3	Unbalanced crown	B	Lot grading greatly impacts root zone	0
12252	9	Bigleaf Maple (*Acer macrophyllum*)	2		C	Lot grading greatly impacts root zone	0
12253	14	Bigleaf Maple (*Acer macrophyllum*)	0	Snag	A	Dead, Lot grading greatly impacts root zone	0
12254	14	Bigleaf Maple (*Acer macrophyllum*)	0	Snag	A	Dead, Lot grading greatly impacts root zone	0
12255	18	Bigleaf Maple (*Acer macrophyllum*)	5	Crooked bole, dead branches, dead foliage, epicormic sprouts	B		5
12256	6	Bigleaf Maple (*Acer macrophyllum*)	2	Lean, unbalanced crown	B		2
12257	7	Bigleaf Maple (*Acer macrophyllum*)	0	Snag	A	Dead, Lot grading greatly impacts root zone	0
12258	8	Bigleaf Maple (*Acer macrophyllum*)	2	Sparse canopy, crooked bole	B	Lot grading greatly impacts root zone	0
12260	12,11,10,10,9,9,9	Bigleaf Maple (*Acer macrophyllum*)	2	Dead top, in decline, sparse canopy	A		2
12261	11	Bigleaf Maple (*Acer macrophyllum*)	2	crooked bole, sparse canopy, dead scaffold branches	B	Lot grading greatly impacts root zone	0
12262	9,8	Bigleaf Maple (*Acer macrophyllum*)	2	Dead top, in decline, sparse canopy	A	Poor health, Lot grading greatly impacts root zone	0
12263	9	Bigleaf Maple (*Acer macrophyllum*)	0	Snag	A	Dead, Lot grading greatly impacts root zone	0
12264	6	Bigleaf Maple (*Acer macrophyllum*)	0	Snag	A	Dead, Lot grading greatly impacts root zone	0
12265	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Snag	A		0
12266	36	Douglas-fir (*Pseudotsuga menziesii*)	14		C		14
12267	11,10,10,8,7,6,6,6	Bigleaf Maple (*Acer macrophyllum*)	2	Dead tops, epicormic sprouts, dead limbs	A	Poor health, Lot grading greatly impacts root zone	0
12268	9	Bigleaf Maple (*Acer macrophyllum*)	2	Dead branches, lopsided canopy	B	Lot grading greatly impacts root zone	0
12270	6	Bigleaf Maple (*Acer macrophyllum*)	2	Broken top, sparse canopy, many epicormic sprouts	A	Poor health, Lot grading greatly impacts root zone	0
12271	20,20	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, evaluated behind fence	C		0
12272	38	Douglas-fir (*Pseudotsuga menziesii*)	15	Evaluated behind fence	C	Lot grading greatly impacts root zone	0
12273	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, in decline	A	Poor healt, Lot grading greatly impacts root zone	0
12274	12	Bigleaf Maple (*Acer macrophyllum*)	2	Dead top	A	Poor healt, Lot grading greatly impacts root zone	0
12275	6	Bigleaf Maple (*Acer macrophyllum*)	2	Lean, sparse canopy, dead top	A	Poor healt, Lot grading greatly impacts root zone	0
12276	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Evaluated behind fence, Codominant top, dead branches in canopy	B	Lot grading greatly impacts root zone	0
12277	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed	B	Lot grading greatly impacts root zone	0
12278	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Evaluated behind fence, dead	A	Dead, Lot grading greatly impacts root zone	0
12279	26	Douglas-fir (*Pseudotsuga menziesii*)	9	Evaluated behind fence	C	Lot grading greatly impacts root zone	0
12280	9	Douglas-fir (*Pseudotsuga menziesii*)	2	Evaluated behind fence, Codominant top, epicormic sprouts, dead branches in canopy	B	Lot grading greatly impacts root zone	0
12282	30	Douglas-fir (*Pseudotsuga menziesii*)	11	Evaluated behind fence, Butt sweep, crooked top	B	Lot grading greatly impacts root zone	0
12283	19	Douglas-fir (*Pseudotsuga menziesii*)	6		C	Located within proposed road grading	0
12284	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Seepage, sparse canopy, epicormic sprouts	B	Lot grading greatly impacts root zone	0
12285	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Seepage, sparse canopy, epicormic sprouts	B	Lot grading greatly impacts root zone	0
12286	20	Douglas-fir (*Pseudotsuga menziesii*)	6		C	Lot grading greatly impacts root zone	0
12287	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12288	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12289	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Unbalanced crown, dead branches in canopy	B		2
12290	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence	C		0
12291	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12292	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12293	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12294	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, dead branches in canopy	C		0
12295	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12296	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12297	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12298	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12299	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Snag	A	Dead, Lot grading greatly impacts root zone	0
12300	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, unbalanced crown	B		0
12301	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Very sparse canopy, dead top, in decline	A	Poor health, Lot grading greatly impacts root zone	0

Detailed Tree Inventory for CJ Dens

AKS JOB NO. 5504 **Site Area = 43.90 acres**

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow Rating	Reason for Removal	Tree Units Retained
12302	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12303	18	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, evaluated behind fence, pruned branches, dead scaffold branches	B		0
12305	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12306	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12307	10	Bigleaf Maple (*Acer macrophyllum*)	2		C	Lot grading greatly impacts root zone	0
12308	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12309	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, sparse canopy	B		2
12310	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence	C		0
12311	12	Douglas-fir (*Pseudotsuga menziesii*)	2		C	Lot grading greatly impacts root zone	0
12312	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, scar with seepage, lopsided canopy	B		0
12313	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12314	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12315	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12316	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12318	12	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, evaluated behind fence	C		0
12319	9	Bigleaf Maple (*Acer macrophyllum*)	2	Lean, dead branches in canopy	B	Lot grading greatly impacts root zone	0
12320	13	Bigleaf Maple (*Acer macrophyllum*)	3	Codominant with included bark, dead branches in canopy	B	Lot grading greatly impacts root zone	0
12321	11	Bigleaf Maple (*Acer macrophyllum*)	2	Unbalanced crown, dead scaffold branches	B	Lot grading greatly impacts root zone	0
12322	7	Bigleaf Maple (*Acer macrophyllum*)	2	Many dead branches, sparse canopy, butt sweep, in decline	A	Poor health, Lot grading greatly impacts root zone	0
12323	8	Bigleaf Maple (*Acer macrophyllum*)	2	Broken codominant stem with decay	B	Lot grading greatly impacts root zone	0
12324	10	Bigleaf Maple (*Acer macrophyllum*)	2	Unbalanced crown	B	Lot grading greatly impacts root zone	0
12325	12	Bigleaf Maple (*Acer macrophyllum*)	2		C	Lot grading greatly impacts root zone	0
12326	7	Cherry (*Prunus sp.*)	2	Lean	B	Lot grading greatly impacts root zone	0
12327	11	Cherry (*Prunus sp.*)	2	Exposed buttress roots, dead branches in crown	B	Lot grading greatly impacts root zone	0
12328	19	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, dead top, very sparse canopy, in decline	A		0
12329	19	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, dead	A		0
12330	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, dead	A		0
12331	56	Bigleaf Maple (*Acer macrophyllum*)	24	Weakly attached scaffold branches, codominant stem pruned leaving cavity	B	Lot grading greatly impacts root zone	0
12332	34	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated from property line	C		0
12334	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Unbalanced crown	B	Lot grading greatly impacts root zone	0
12335	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Codominant top with included bark	B	Lot grading greatly impacts root zone	0
12336	6	Cherry (*Prunus sp.*)	2	Sweep, lean	B	Lot grading greatly impacts root zone	0
12337	8	Cherry (*Prunus sp.*)	2		C	Lot grading greatly impacts root zone	0
12338	14	Bigleaf Maple (*Acer macrophyllum*)	3	Unbalanced crown	B	Lot grading greatly impacts root zone	0
12435	18	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12436	10	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12437	10	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12438	10	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12439	10	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12440	18	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12441	14	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12442	10,10	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12443	10,22	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
50000	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50001	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Sweep	C		2
50002	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50003	6	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
50004	12,8,13,10,11	Bigleaf Maple (*Acer macrophyllum*)	8	Dead scaffold branches, stem lean, some dead branches in crown	B	Lot grading greatly impacts root zone	0
50005	8,8,15	Bigleaf Maple (*Acer macrophyllum*)	6	Stem lean, dead scaffold branches, dead codominant stems, unbalanced crown	B	Lot grading greatly impacts root zone	0
50006	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50007	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50008	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50009	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50010	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Very sparse canopy, dead branches in crown, in decline	A	Dead, Lot grading greatly impacts root zone	0
50011	19	Douglas-fir (*Pseudotsuga menziesii*)	6	Exposed buttress roots, some dead branches in crown	C	Lot grading greatly impacts root zone	0
50012	12	Bigleaf Maple (*Acer macrophyllum*)	2		C	Lot grading greatly impacts root zone	0
50013	12	Oregon Ash (*Fraxinus latifolia*)	2	Crooked bole, codominant top, some broken branches	B	Lot grading greatly impacts root zone	0
50015	15	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead, significant lean, uprooted	A	Dead, Lot grading greatly impacts root zone	0
50016	17	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50017	8,10	Bigleaf Maple (*Acer macrophyllum*)	3	Shifting bark, codominant base, lean, dead top	A	Poor health, Lot grading greatly impacts root zone	0
50018	17	Bigleaf Maple (*Acer macrophyllum*)	5	Other tree leaning on this tree	B	Lot grading greatly impacts root zone	0
50019	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50020	12	Douglas-fir (*Pseudotsuga menziesii*)	2		C		2
50021	19	Douglas-fir (*Pseudotsuga menziesii*)	6		C		6
50022	16	Douglas-fir (*Pseudotsuga menziesii*)	4		C		4
50023	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, impacts from lot grading	0
50024	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50025	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Some dead branches, poor live crown ratio	B	Lot grading greatly impacts root zone	0
50026	11	Bigleaf Maple (*Acer macrophyllum*)	2	Crooked bole	B		2
50027	6,10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50028	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50029	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50030	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead, uprooted	A	Dead, Lot grading greatly impacts root zone	0
50031	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, sparse canopy, unbalanced crown, epicormic sprouts	B	Lot grading greatly impacts root zone	0
50032	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, sparse canopy, unbalanced crown, epicormic sprouts	B	Lot grading greatly impacts root zone	0
50033	15	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50034	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, unbalanced crown	B		2
50035	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B	Lot grading greatly impacts root zone	0
50036	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Dead branches in crown, Crown cleaning recommended	C	Lot grading greatly impacts root zone	0
50037	8	Red Alder (*Alnus rubra*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50038	8,10	Red Alder (*Alnus rubra*)	2	Dead tops, codominant base, in decline	A	Poor health, Lot grading greatly impacts root zone	0
50039	10	Bigleaf Maple (*Acer macrophyllum*)	2	Dead codominant stems, crooked	B	Lot grading greatly impacts root zone	0
50040	6,8	Bigleaf Maple (*Acer macrophyllum*)	2	Broken top, dead codominant stems	A	Poor health, Lot grading greatly impacts root zone	0
50041	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio	B	Lot grading greatly impacts root zone	0
50042	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, sparse canopy	B	Lot grading greatly impacts root zone	0
50043	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Some dead branches in crown, Crown cleaning recommended	C	Lot grading greatly impacts root zone	0
50044	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown, sparse canopy, poor live crown ratio	B	Lot grading greatly impacts root zone	0
50045	6,6,7,12,12	Bigleaf Maple (*Acer macrophyllum*)	6	Dead codominant stems, unbalanced crown	B		6
50046	6,6,7,12,12	Bigleaf Maple (*Acer macrophyllum*)	6	Dead codominant stems, cavities	B	Lot grading greatly impacts root zone	0
50047	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50048	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Snag	A		0
50049	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Sparse canopy, sap seepage	B	Lot grading greatly impacts root zone	0
50050	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50051	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Significant lean, sweep, dead branches, sparse canopy	A		2
50052	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy, poor live crown ratio, dead branches in crown	B		2
50053	19	Douglas-fir (*Pseudotsuga menziesii*)	6	Crown cleaning recommended	C	Lot grading greatly impacts root zone	0
50054	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Sparse canopy, poor live crown ratio, dead branches in crown	B		3
50055	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown, poor live crown ratio	B		6
50056	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Very poor live crown ratio, sparse canopy	A		2
50057	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy, poor live crown ratio	B		2
50058	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Sparse canopy, poor live crown ratio	B		4
50059	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Sparse canopy, poor live crown ratio	B		5
50060	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50061	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50062	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Unbalanced crown, poor live crown ratio	B	Lot grading greatly impacts root zone	0
50063	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Sweep, very sparse canopy, very poor live crown ratio	A	Poor health, Lot grading greatly impacts root zone	0
50064	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50065	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50066	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50067	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50068	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50069	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50070	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50071	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, Sparse canopy, unbalanced crown	B	Lot grading greatly impacts root zone	0
50072	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown	B	Lot grading greatly

Detailed Tree Inventory for CJ Dens

AKS JOB NO. 5504 **Site Area = 43.90 acres**

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow Rating	Reason for Removal	Tree Units Retained
50078	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Very poor live crown ratio, sparse canopy	B		4
50079	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Poor live crown ratio	B		6
50080	12	Bigleaf Maple (*Acer macrophyllum*)	0	Snag	A		0
50081	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, unbalanced crown	B		4
50082	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B		3
50083	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Very poor live crown ratio, sparse canopy	B		3
50084	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Very poor live crown ratio, sparse canopy	B		3
50085	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Very poor live crown ratio, sparse canopy	B		3
50086	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, sparse canopy	B		4
50087	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B		3
50088	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B		3
50089	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50090	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, sparse canopy	B		5
50091	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, very sparse canopy	A	Poor health, Lot grading greatly impacts root zone	0
50092	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, very sparse canopy	A	Poor health, Lot grading greatly impacts root zone	0
50093	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, very sparse canopy	A		3
50095	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio	B		5
50096	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, dead branches in crown	B		4
50098	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50099	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio	B		5
50100	10	Bigleaf Maple (*Acer macrophyllum*)	2	Dead scaffold branches, unbalanced crown	B		2
50101	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown, dead lower branches	B		5
50102	6	Bigleaf Maple (*Acer macrophyllum*)	2	dead branches in crown, Crown cleaning recommended	C		2
50103	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio	B		5
50104	22	Douglas-fir (*Pseudotsuga menziesii*)	7	Unbalanced crown	B		7
50105	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Unbalanced crown, dead branches in crown	B		3
50106	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Dead lower branches	C		6
50107	7	Bigleaf Maple (*Acer macrophyllum*)	2	Crooked bole, dead scaffold branches, shiffing bark	B		2
50108	14	Douglas-fir (*Pseudotsuga menziesii*)	3	dead branches in crown, Crown cleaning recommended	C		3
50109	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown, codominant top	B		6
50110	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Unbalanced crown, dead branches in crown	B		4
50111	17	Douglas-fir (*Pseudotsuga menziesii*)	5	dead branches in crown, Crown cleaning recommended	C		5
50112	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50113	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown, dead branches in crown	B		5
50114	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, sparse canopy	B		2
50115	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B		3
50116	8	Red Alder (*Alnus rubra*)	2	Epicormic sprouts, dead branches in crown, dead top	B		2
50117	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Sap seepage, dead lower branches	C		5
50118	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio	B	Lot grading greatly impacts root zone	0
50119	6,6,6,7	Bigleaf Maple (*Acer macrophyllum*)	3	Unbalanced crown, dead scaffold branches, dead codominant stems at base	B		3
50120	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio	B		2
50121	9	Bigleaf Maple (*Acer macrophyllum*)	2		C	Lot grading greatly impacts root zone	0
50122	6	Bigleaf Maple (*Acer macrophyllum*)	2	Sparse canopy, lean	B	Lot grading greatly impacts root zone	0
50123	6,6,8,8	Bigleaf Maple (*Acer macrophyllum*)	3	Lean	B	Lot grading greatly impacts root zone	0
50124	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio	B		2
50125	10	Bigleaf Maple (*Acer macrophyllum*)	2	Lean, unbalanced crown	B		2
50126	7,8	Bigleaf Maple (*Acer macrophyllum*)	2	In decline, lean, unbalanced crown, dead codominant stems	A	Poor health, Lot grading greatly impacts root zone	0
50127	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50128	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, dead branches in crown	B	Lot grading greatly impacts root zone	0
50129	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Unbalanced crown	B	Lot grading greatly impacts root zone	0
50130	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Very sparse canopy, poor live crown ratio	A	Poor health, Lot grading greatly impacts root zone	0
50131	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Dead lower branches	C	Lot grading greatly impacts root zone	0
50132	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio	B	Lot grading greatly impacts root zone	0
50133	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio	B		4
50134	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Unbalanced crown	B		4
50136	9	Cherry (*Prunus sp.*)	2	Dead top, epicormic sprouts, in decline	A		2
50137	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio	B		4
50138	19	Douglas-fir (*Pseudotsuga menziesii*)	6		C		6
50139	15	Douglas-fir (*Pseudotsuga menziesii*)	4		C		4
50140	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Unbalanced crown, poor live crown ratio	B		2
50141	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Dead lower branches, some dead branches in crown, Crown cleaning recommended	C		5
50142	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Unbalanced crown, poor live crown ratio	B		3
50143	6	Bigleaf Maple (*Acer macrophyllum*)	2	Dead top, in decline	A		2
50144	17	Douglas-fir (*Pseudotsuga menziesii*)	5		C		5
50145	8,10	Bigleaf Maple (*Acer macrophyllum*)	3	Codominant base	B		3
50146	10	Bigleaf Maple (*Acer macrophyllum*)	2	Crooked bole, sparse canopy	B	Lot grading greatly impacts root zone	0
50147	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Branch dieback, Sparse canopy, poor live crown ratio, unbalanced crown	A		2
50148	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Dead branches in crown, Crown cleaning recommended	C		5
50149	17,18	Bigleaf Maple (*Acer macrophyllum*)	9	Cavities, dead codominant stem	B	Lot grading greatly impacts root zone	0
50150	19	Douglas-fir (*Pseudotsuga menziesii*)	6	Poor live crown ratio, branch dieback	B	Lot grading greatly impacts root zone	0
50151	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, branch dieback	B	Lot grading greatly impacts root zone	0
50152	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Dead branches in crown	B	Lot grading greatly impacts root zone	0
50153	6,8	Bigleaf Maple (*Acer macrophyllum*)	2	Dead codominant stems at base, sparse canopy	B	Lot grading greatly impacts root zone	0
50154	10	Douglas-fir (*Pseudotsuga menziesii*)	2	In significant decline	A		2
50155	6	Bigleaf Maple (*Acer macrophyllum*)	2	Significant lean, broken codominant stems, in decline	A		2
50156	10	Bigleaf Maple (*Acer macrophyllum*)	2	Cavity, crooked bole, poor live crown ratio	B		2
50157	6,9	Bigleaf Maple (*Acer macrophyllum*)	2		C		2
50158	7	Bigleaf Maple (*Acer macrophyllum*)	2	Lean, codominant top	B		2
50159	7,10	Bigleaf Maple (*Acer macrophyllum*)	2	Dead top, in decline	A		2
50160	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50161	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Unbalanced crown	B		4
50162	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Unbalanced crown, poor live crown ratio	B		4
50163	8	Bigleaf Maple (*Acer macrophyllum*)	2	Dead branches in crown, sparse canopy	B		2
50164	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50165	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown, dead branches in crown	B		6
50166	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio	B		3
50167	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, epicormic sprouts, dead branches	B		2
50168	23	Douglas-fir (*Pseudotsuga menziesii*)	8	Crooked bole, unbalanced crown	B		8
50169	12,13	Douglas-fir (*Pseudotsuga menziesii*)	5	Codominant base with included bark, sparse canopy	B	Lot grading greatly impacts root zone	0
50170	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50171	10	Cherry (*Prunus sp.*)	2	Sparse canopy, many dead branches, in decline	A		2
50172	10	Cherry (*Prunus sp.*)	0	Dead	A		0
50173	9	Cherry (*Prunus sp.*)	2	Sparse canopy, many dead branches, in decline	A		2
50174	10	Bigleaf Maple (*Acer macrophyllum*)	2	Dead branches in crown, codominant base	B		2
50175	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Sweep, poor live crown ratio	B		4
50176	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, sparse canopy, epicormic sprouts	B		5
50178	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, dead branches in crown	B		4
50179	10	Bigleaf Maple (*Acer macrophyllum*)	2	Dead top	B		2
50180	6,9,9	Bigleaf Maple (*Acer macrophyllum*)	3	Branch dieback, sparse canopy	B		3
50181	6,6,7	Bigleaf Maple (*Acer macrophyllum*)	2	Branch dieback, sparse canopy, dead codominant stem	B		2
50183	7,7,9,10,10	Bigleaf Maple (*Acer macrophyllum*)	6	Clustered base, some branch dieback, dead scaffold branches	B		6
50184	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio	B		4
50185	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, sparse canopy	B		5
50186	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, sparse canopy	B		4
50187	8	Bigleaf Maple (*Acer macrophyllum*)	2	Sweep	B		2
50188	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50190	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50191	6,6,6,7,10,10	Bigleaf Maple (*Acer macrophyllum*)	6	Dead scaffold branches, cavities in base	B		6
50192	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50193	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50194	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50195	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, sparse canopy, dead branches in crown	B		5
50196	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50197	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, sparse canopy, dead branches in crown	B	Lot grading greatly impacts root zone	5
50198	10,10	Bigleaf Maple (*Acer macrophyllum*)	2	Significant lean	A		2
50199	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Tree leaning on	B		2
50200	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Lean	B		2
50201	6	Douglas-fir (*Pseudotsuga menziesii*)	2		C		2
50202	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Very poor live crown ratio, very sparse canopy, in decline	A	Poor health, Lot grading greatly impacts root zone	0
50203	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Very poor live crown ratio, very sparse canopy, in decline	A	Poor health, Lot grading greatly impacts root zone	0

Detailed Tree Inventory for CJ Dens

AKS JOB NO. 5504 **Site Area = 43.90 acres**

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow Rating	Reason for Removal	Tree Units Retained
50204	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Very poor live crown ratio, very sparse canopy, in decline	A		4
50205	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Snag	A		0
50206	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50207	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Poor live crown ratio	B		6
50208	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50209	17	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50210	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50211	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50212	15	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50213	6	Bigleaf Maple (*Acer macrophyllum*)	2	Lean	B		2
50214	6,6,6,10,10,10	Bigleaf Maple (*Acer macrophyllum*)	6	Dead branches, dead codominant stems	B		6
50215	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio	B		4
50216	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B		3
50217	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Snag	A		0
50218	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Snag	A		0
50219	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, sparse canopy	B	Lot grading greatly impacts root zone	0
50220	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, sparse canopy	B	Lot grading greatly impacts root zone	0
50221	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50222	14	Coniferous	3	Not Evalnated by an Arborist	-		3
50223	7	Deciduous	2	Not Evalnated by an Arborist	-		2
50500	8	Douglas-fir (*Pseudotsuga menziesii*)	2		C	Located within proposed road grading	0
50501	29	Bigleaf Maple (*Acer macrophyllum*)	11		C	Construction activities impact root zone	0
50502	17	Red Alder (*Alnus rubra*)	0	Snag	A	Dead, Lot grading greatly impacts root zone	0
50503	18	Bigleaf Maple (*Acer macrophyllum*)	0	Large hollow in base with significant decay, located in Critical Area Tract S	A		0
50504	13	Red Alder (*Alnus rubra*)	0	Snag, located in Critical Area Tract S	A		0
50505	17	Bigleaf Maple (*Acer macrophyllum*)	0	Sweep, deformed bole, located in Critical Area Tract S	B		0
50506	12,11,10,6,6,6	Bigleaf Maple (*Acer macrophyllum*)	7	Cavity with decay in base, dead limbs	B	Lot grading greatly impacts root zone	0
50507	13,13,10,6	Bigleaf Maple (*Acer macrophyllum*)	7	Dead scaffold branches, broken Codominant stems	B	Lot grading greatly impacts root zone	0
50508	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Poor live crown ratio	B	Lot grading greatly impacts root zone	0
50509	13	Red Alder (*Alnus rubra*)	0	Dead top, poor live crown ratio, in decline, , located in Critical Area Tract S	A		0
50510	12	Bigleaf Maple (*Acer macrophyllum*)	0	Located in Critical Area Tract S	C		0
50511	14	Red Alder (*Alnus rubra*)	0	Dead branches, , located in Critical Area Tract S	C		0
50512	15,6,6	Bigleaf Maple (*Acer macrophyllum*)	0	Located in Critical Area Tract S	C		0

NOTE: On site trees existed during the site visits performed on 07/06/2020 - 8/13/2020.

Total # of On Site Existing Trees= 408
Total On Site Existing Tree Units = 1699.0
Total # of On Site Trees Retained= 295
Total # of Tree Units Retained= 1068.0
Minimum Tree Units Required per City Code = 878
(43.90 acres * 20 trees/acre)
Minimum # Trees to replant= 0

Total # of Existing Trees Removed= 113
Total Existing Tree Units Removed= 631.0

Windthrow Rating:
A=Least windthrow resistant
B=Moderate windthrow resistant
C=Most windthrow resistant

Tree Root Protection Zone: The tree root protection zone for each tree is a circle with a radius equal to 1 foot per 1 inch DBH.

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.
At the completion of construction, all trees must once again be reviewed to evaluate their hazard rating. Land clearing and removal of adjacent trees can expose previously unseen defects and otherwise healthy trees can be damaged during construction. Additional tree removal may be recommended by the project arborist.

NOTE:
THIS PROJECT RESERVES THE RIGHT THE REMOVE ADDITIONAL TREES, AS DEEMED NECESSARY/RECOMMENDED BY THE PROJECT CERTIFIED ARBORIST, FOR HAZARD ABATEMENT PURPOSES. THIS CANNOT BE EVALUATED UNTIL AFTER CONSTRUCTION AS DISCUSSED WITHIN THE ARBORIST REPORT AND THESE PLANS. THE CITY WILL BE NOTIFIED OF SUCH REMOVALS AND WILL BE CONSULTED WITH IF A SIGNIFICANT AMOUNT OF TREES ARE RECOMMENDED FOR REMOVAL POST CONSTRUCTION ACTIVITIES.

CERTIFIED ARBORIST PRELIMINARY NOT FOR CONSTRUCTION ISA

BRYCE D. HANSON
CERTIFICATE NUMBER: PN 7564A
EXPIRATION DATE: 06/30/22

AKS ENGINEERING & FORESTRY, LLC
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PRELIMINARY TREE PRESERVATION AND REMOVAL TABLE (CON.)

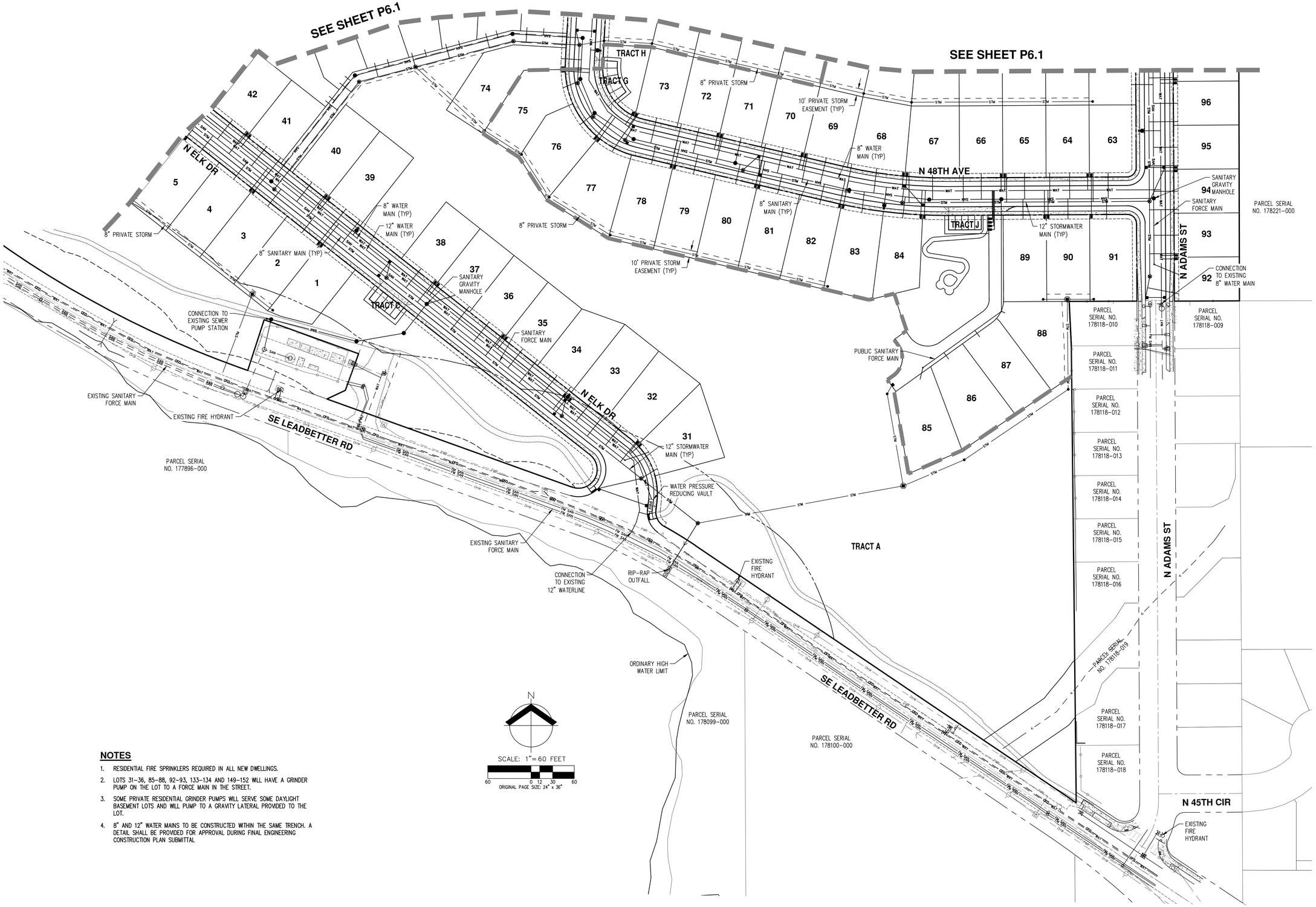
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	CJS
DRAWN BY:	BRK
CHECKED BY:	BDH

P5.5

AKS DRAWING FILE: 5504 P5.0 TREE TABLES.DWG | LAYOUT: 5.5



NOTES

1. RESIDENTIAL FIRE SPRINKLERS REQUIRED IN ALL NEW DWELLINGS.
2. LOTS 31-36, 85-88, 92-93, 133-134 AND 149-152 WILL HAVE A GRINDER PUMP ON THE LOT TO A FORCE MAIN IN THE STREET.
3. SOME PRIVATE RESIDENTIAL GRINDER PUMPS WILL SERVE SOME DAYLIGHT BASEMENT LOTS AND WILL PUMP TO A GRAVITY LATERAL PROVIDED TO THE LOT.
4. 8" AND 12" WATER MAINS TO BE CONSTRUCTED WITHIN THE SAME TRENCH. A DETAIL SHALL BE PROVIDED FOR APPROVAL DURING FINAL ENGINEERING CONSTRUCTION PLAN SUBMITTAL

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PRELIMINARY COMPOSITE UTILITY PLAN (SOUTH)

CJ DENS SUBDIVISION

CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P6.0

AKS DRAWING FILE: 5504 P6.0 UTILITY PLAN.DWG | LAYOUT: P6.0

PARCEL SERIAL NO. 177885-000

PARCEL SERIAL NO. 178175-000

PARCEL SERIAL NO. 178171-000

PARCEL SERIAL NO. 177905-000

PARCEL SERIAL NO. 178115-005

PARCEL SERIAL NO. 178221-000

TRACT T

WATER PRESSURE REDUCING VAULT

TRACT R

TRACT S

TRACT P

TRACT Q

TRACT O

TRACT L

TRACT N

TRACT M

TRACT C

TRACT F

TRACT D

TRACT B

WETLAND BOUNDARY

PROPOSED WETLAND BUFFER

PUBLIC PRESSURE SANITARY MAIN

END OF GRAVITY MAIN, BEGIN GRINDER PUMP FORCE MAIN

N 50TH AVE

N 49TH AVE

N 46TH AVE

N BENTON ST.

N ADAMS CT

12" WATER MAIN (TYP)

8" WATER MAIN (TYP)

8" SANITARY MAIN (TYP)

12" STORMWATER MAIN (TYP)

8" PRIVATE STORM

10.00' PUBLIC STORM EASEMENT (TYP)

10' PRIVATE STORM EASEMENT (TYP)

SEE SHEET P6.0

SEE SHEET P6.0

NOTES

1. RESIDENTIAL FIRE SPRINKLERS REQUIRED IN ALL NEW DWELLINGS.
2. LOTS 31-36, 85-88, 92-93, 133-134 AND 149-152 WILL HAVE A GRINDER PUMP ON THE LOT TO A FORCE MAIN IN THE STREET.
3. SOME PRIVATE RESIDENTIAL GRINDER PUMPS WILL SERVE SOME DAYLIGHT BASEMENT LOTS AND WILL PUMP TO A GRAVITY LATERAL PROVIDED TO THE LOT.
4. 8" AND 12" WATER MAINS TO BE CONSTRUCTED WITHIN THE SAME TRENCH. A DETAIL SHALL BE PROVIDED FOR APPROVAL DURING FINAL ENGINEERING CONSTRUCTION PLAN SUBMITTAL

N

SCALE: 1"=60 FEET

60 0 12 30 60

ORIGINAL PAGE SIZE: 24" x 36"

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PRELIMINARY COMPOSITE UTILITY PLAN (NORTH)

CJ DENS SUBDIVISION

CJ DENS LACAMAS II LLC

CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P6.1

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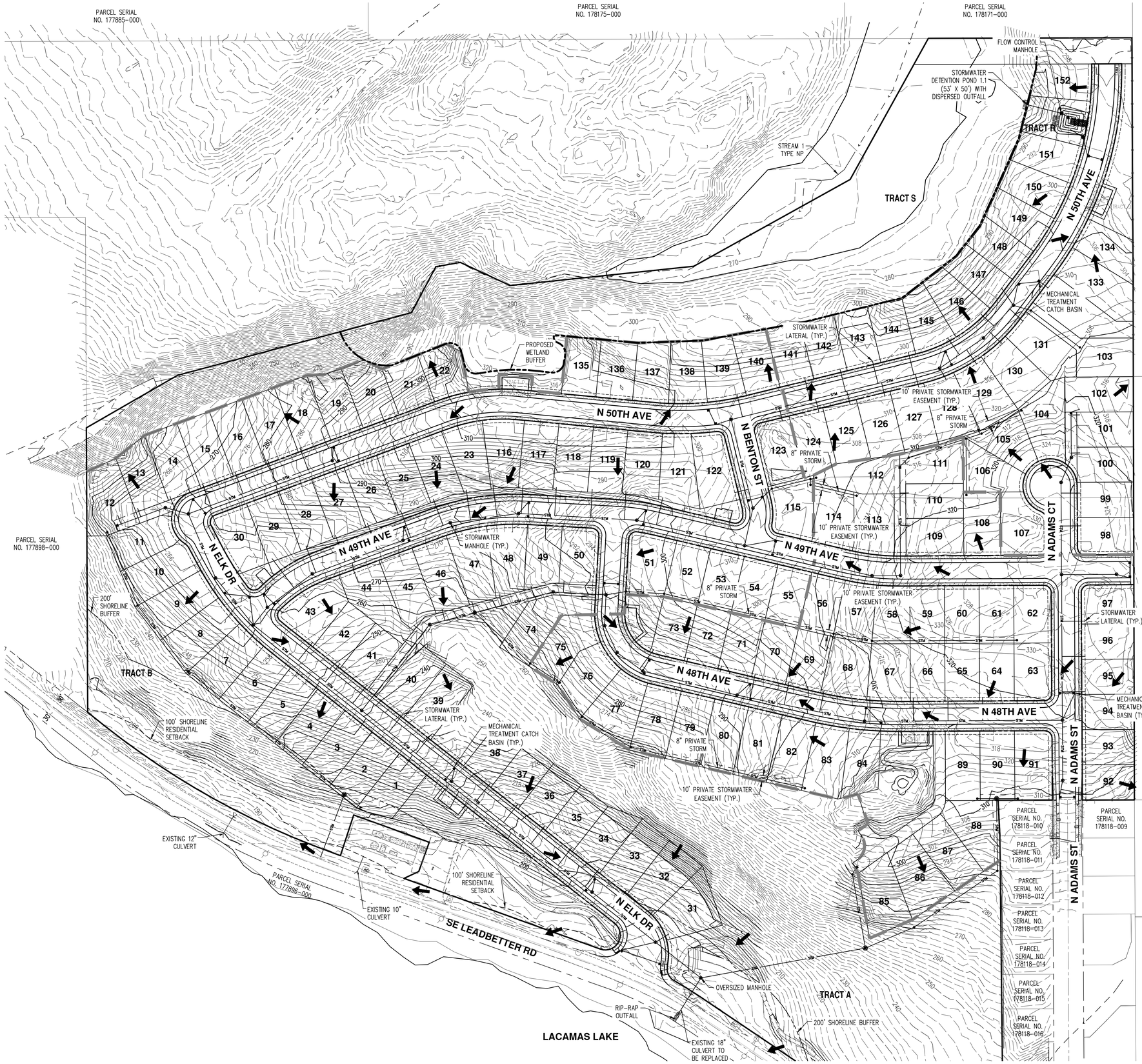

LEGEND

- EXISTING GROUND CONTOUR (2 FT)
- EXISTING GROUND CONTOUR (10 FT) — 350
- FINISHED GRADE CONTOUR (2 FT)
- FINISHED GRADE CONTOUR (10 FT) — 350
- PHASE BOUNDARY
- STORMWATER FLOW ARROWS
- STORM FACILITY ACCESS

GENERAL NOTES

1. CONTOUR INTERVAL IS 2 FOOT.
2. TREES ARE NOT SHOWN.
3. STORMWATER DETENTION POND 1.1 ON TRACT R TO BE OWNED AND MAINTAINED BY THE HOA.
4. ACCORDING TO CLARK COUNTY GIS, THE SITE IS NOT WITHIN OR ADJACENT TO A 100-YEAR FLOODPLAIN.
5. THERE ARE NO KNOWN EXISTING ON-SITE STORMWATER FACILITIES.
6. NATIVE VEGETATION WITHIN TRACT A, TRACT B, TRACT S, AND THE CRITICAL AREAS WILL BE RETAINED AS MUCH AS POSSIBLE AND ENHANCED, AS NEEDED, PER THE WETLAND MITIGATION PLAN.
7. SOME OFF-SITE FLOW OCCURS FROM ADJACENT PARCELS. ANALYSIS OF OFF-SITE FLOW WAS NOT DONE AT THIS TIME AND WILL BE INCLUDED WITH THE FINAL STORMWATER PLAN.
8. REAR YARD RUNOFF FOR LOTS 12-22 AND 135-152 WILL BE COLLECTED AND DISPERSED INTO THE ADJACENT WETLAND BUFFER. ROOFS WILL DRAIN TO A STORMWATER LATERAL.
9. REAR YARD RUNOFF FOR LOTS 92-103 WILL BE COLLECTED AND DISPERSED INTO THE NEIGHBORING PROPERTY. ROOFS WILL DRAIN TO A STORMWATER LATERAL. SEE PRELIMINARY TIR FOR BASIN MAP DESCRIBING EXISTING ON-SITE FLOWS.

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PRELIMINARY STORMWATER PLAN
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CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P7.0

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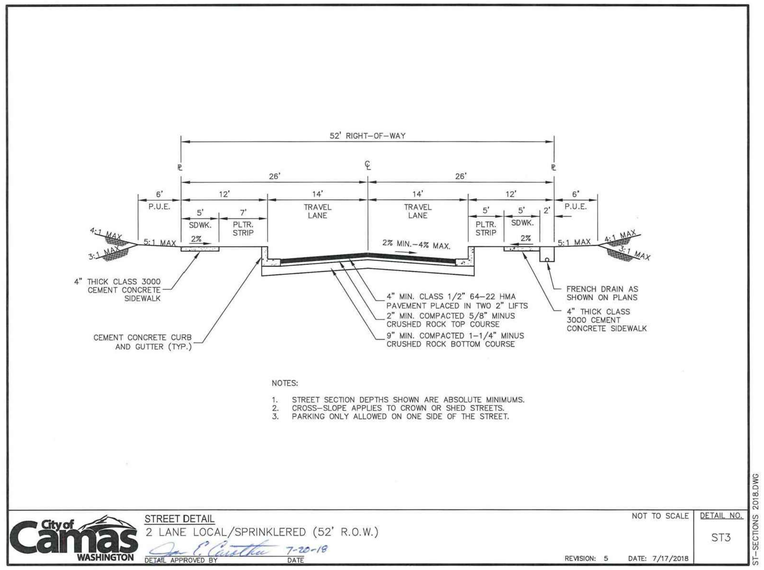
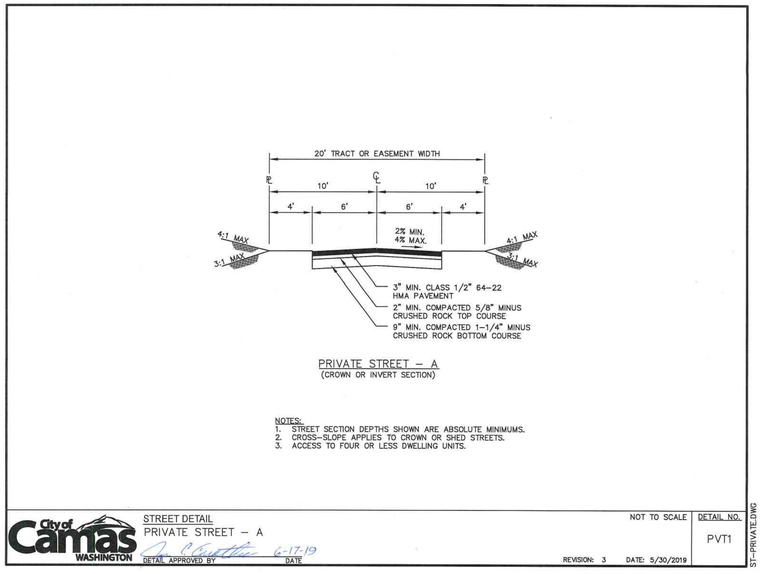
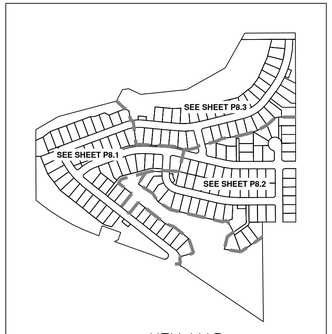
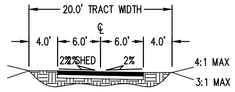


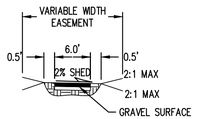




KEY MAP



UTILITY ACCESS ROAD



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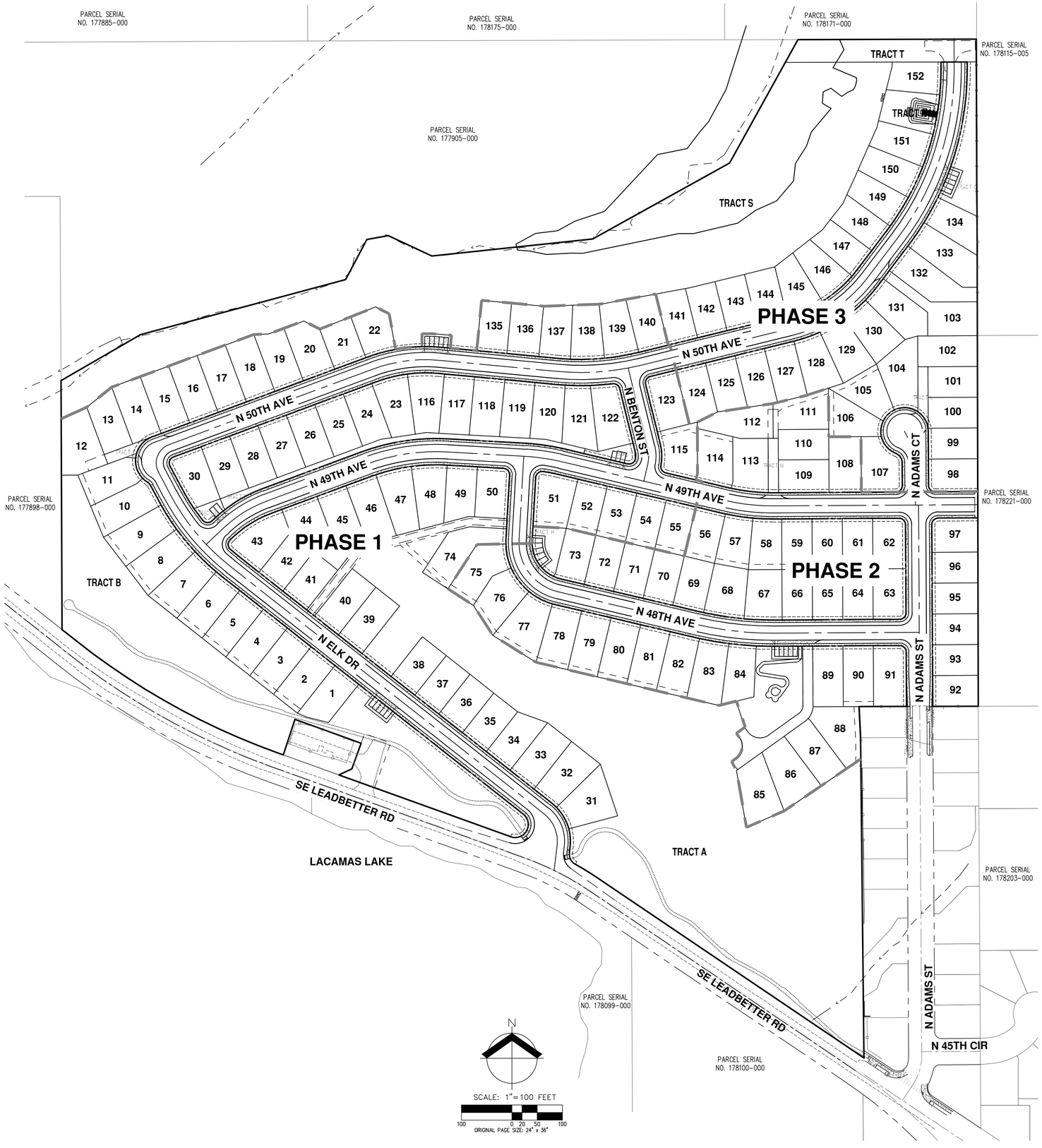

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PRELIMINARY STREET PLAN
CJ DENS SUBDIVISION
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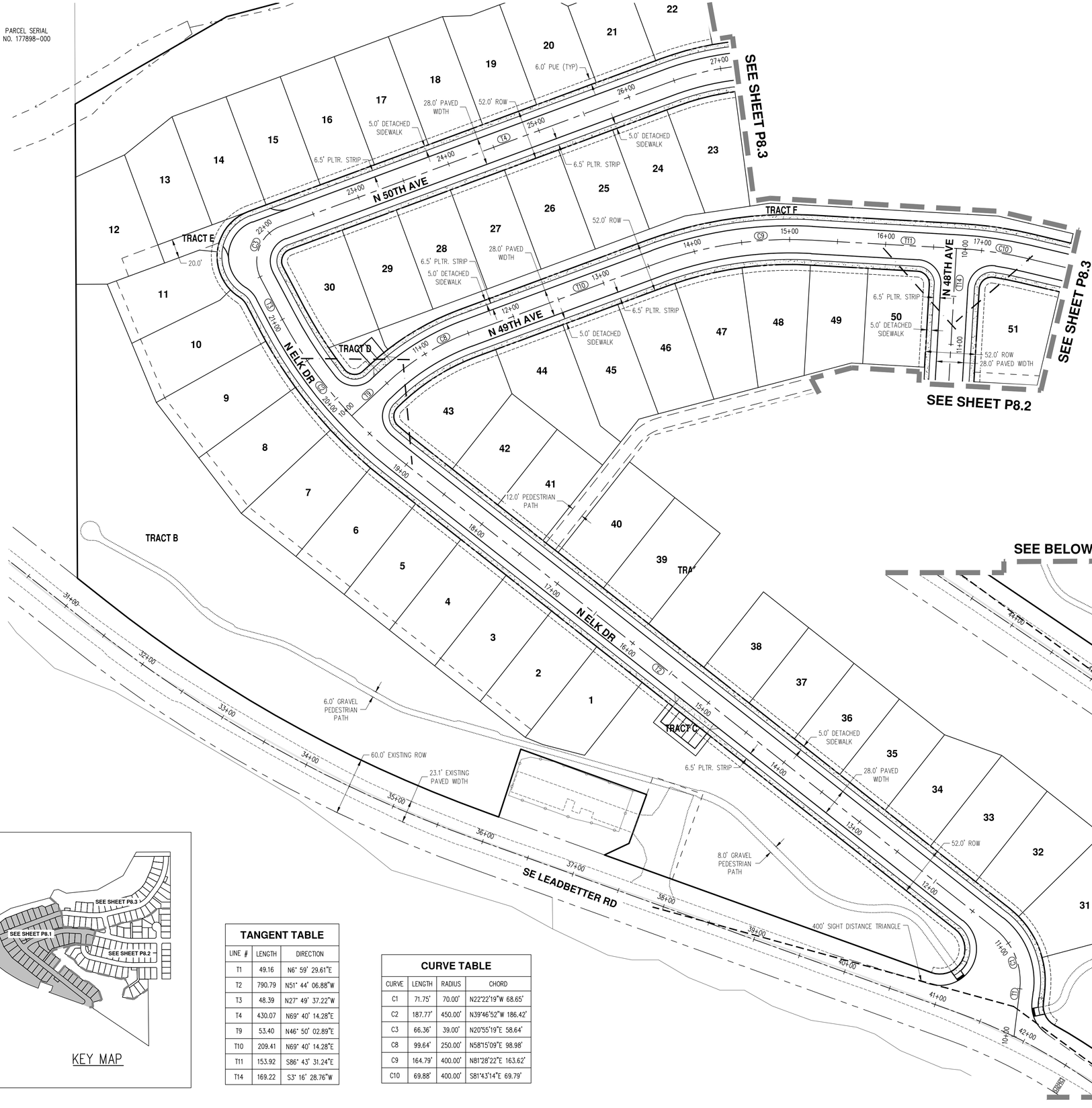
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	5/7/2021
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P8.0

AKS DRAWING FILE: 5504 P8.0 STR.DWG | LAYOUT: P8.0



KEY MAP

TANGENT TABLE		
LINE #	LENGTH	DIRECTION
T1	49.16	N6° 59' 29.61"E
T2	790.79	N51° 44' 06.88"W
T3	48.39	N27° 49' 37.22"W
T4	430.07	N69° 40' 14.28"E
T9	53.40	N46° 50' 02.89"E
T10	209.41	N69° 40' 14.28"E
T11	153.92	S86° 43' 31.24"E
T14	169.22	S3° 16' 28.76"W

CURVE TABLE			
CURVE	LENGTH	RADIUS	CHORD
C1	71.75'	70.00'	N22°22'19"W 68.65'
C2	187.77'	450.00'	N39°46'52"W 186.42'
C3	66.36'	39.00'	N20°55'19"E 58.64'
C8	99.64'	250.00'	N58°15'09"E 98.98'
C9	164.79'	400.00'	N81°28'22"E 163.62'
C10	69.88'	400.00'	S81°43'14"E 69.79'

GENERAL NOTES

1. THE PROPOSED DEVELOPMENT WILL ACCESS OFF SE LEADBETTER ROAD WHICH IS CLASSIFIED AS AN EXISTING 2-LANE LOCAL ROAD WITHOUT SIDEWALKS OR CURB AND GUTTER. NO IMPROVEMENTS ARE PROPOSED.

SCALE: 1"=50 FEET

ORIGINAL PAGE SIZE: 24" x 36"

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PRELIMINARY STREET PLAN
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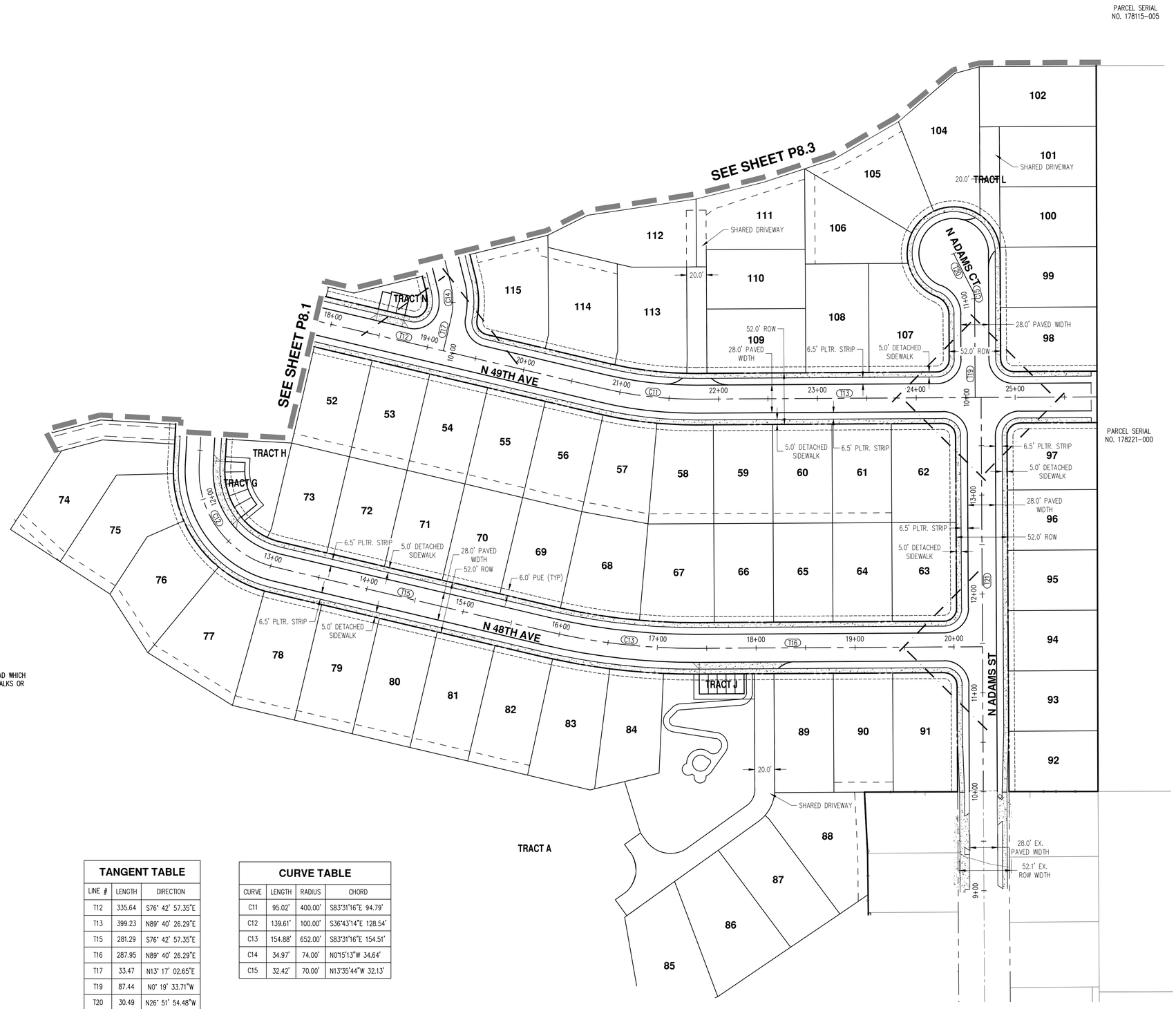
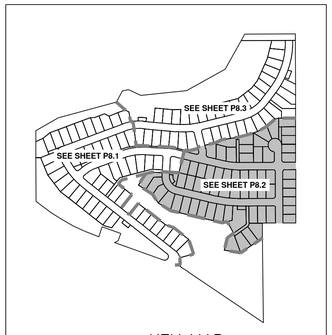
AKS DRAWING FILE: 5504 P8.0 STR.DWG | LAYOUT: P8.1



GENERAL NOTES

1. THE PROPOSED DEVELOPMENT WILL ACCESS OFF SE LEADBETTER ROAD WHICH IS CLASSIFIED AS AN EXISTING 2-LANE LOCAL ROAD WITHOUT SIDEWALKS OR CURB AND GUTTER. NO IMPROVEMENTS ARE PROPOSED.



KEY MAP

TANGENT TABLE		
LINE #	LENGTH	DIRECTION
T12	335.64	S76° 42' 57.35"E
T13	399.23	N89° 40' 26.29"E
T15	281.29	S76° 42' 57.35"E
T16	287.95	N89° 40' 26.29"E
T17	33.47	N13° 17' 02.65"E
T19	87.44	N0° 19' 33.71"W
T20	30.49	N26° 51' 54.48"W
T21	398.61	S0° 19' 33.71"E

CURVE TABLE			
CURVE	LENGTH	RADIUS	CHORD
C11	95.02'	400.00'	S83°31'16"E 94.79'
C12	139.61'	100.00'	S36°43'14"E 128.54'
C13	154.88'	652.00'	S83°31'16"E 154.51'
C14	34.97'	74.00'	N0°15'13"W 34.64'
C15	32.42'	70.00'	N13°35'44"W 32.13'

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CAMAS, WASHINGTON

JOHN M. MAY — STATE OF WASHINGTON — 21,000 — REGISTERED PROFESSIONAL ENGINEER

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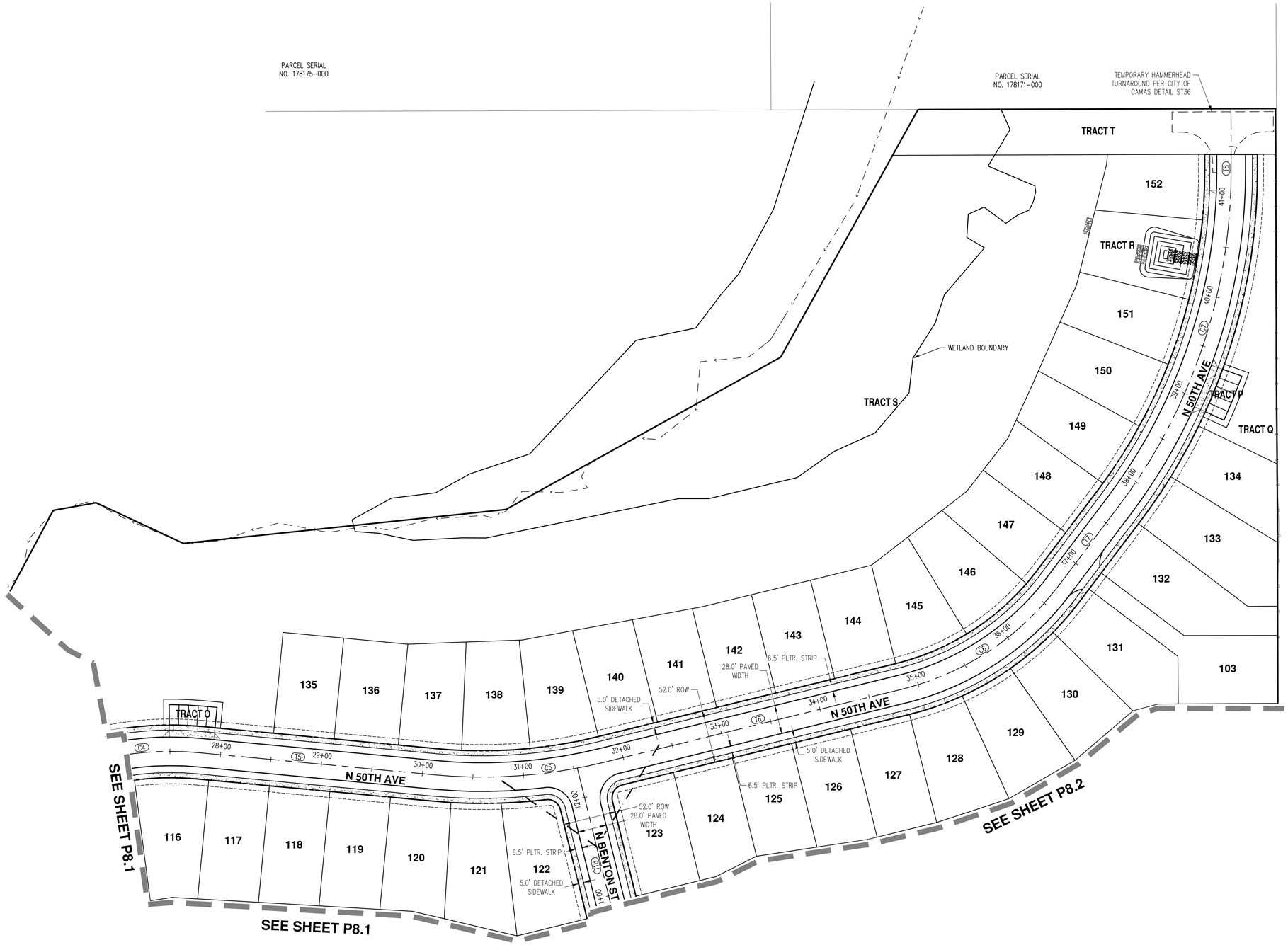
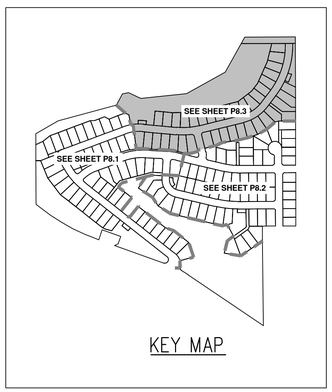


TANGENT TABLE		
LINE #	LENGTH	DIRECTION
T5	233.27	S84° 36' 43.29"E
T6	303.65	N76° 12' 30.70"E
T7	98.78	N37° 07' 34.55"E
T8	14.76	N0° 07' 57.00"W
T18	161.43	N13° 47' 29.30"W

CURVE TABLE			
CURVE	LENGTH	RADIUS	CHORD
C4	134.66'	300.00'	N82°31'45"E 133.53'
C5	167.37'	500.00'	N85°47'54"E 166.59'
C6	187.58'	275.00'	N56°40'03"E 183.97'
C7	357.66'	550.00'	N18°29'49"E 351.39'



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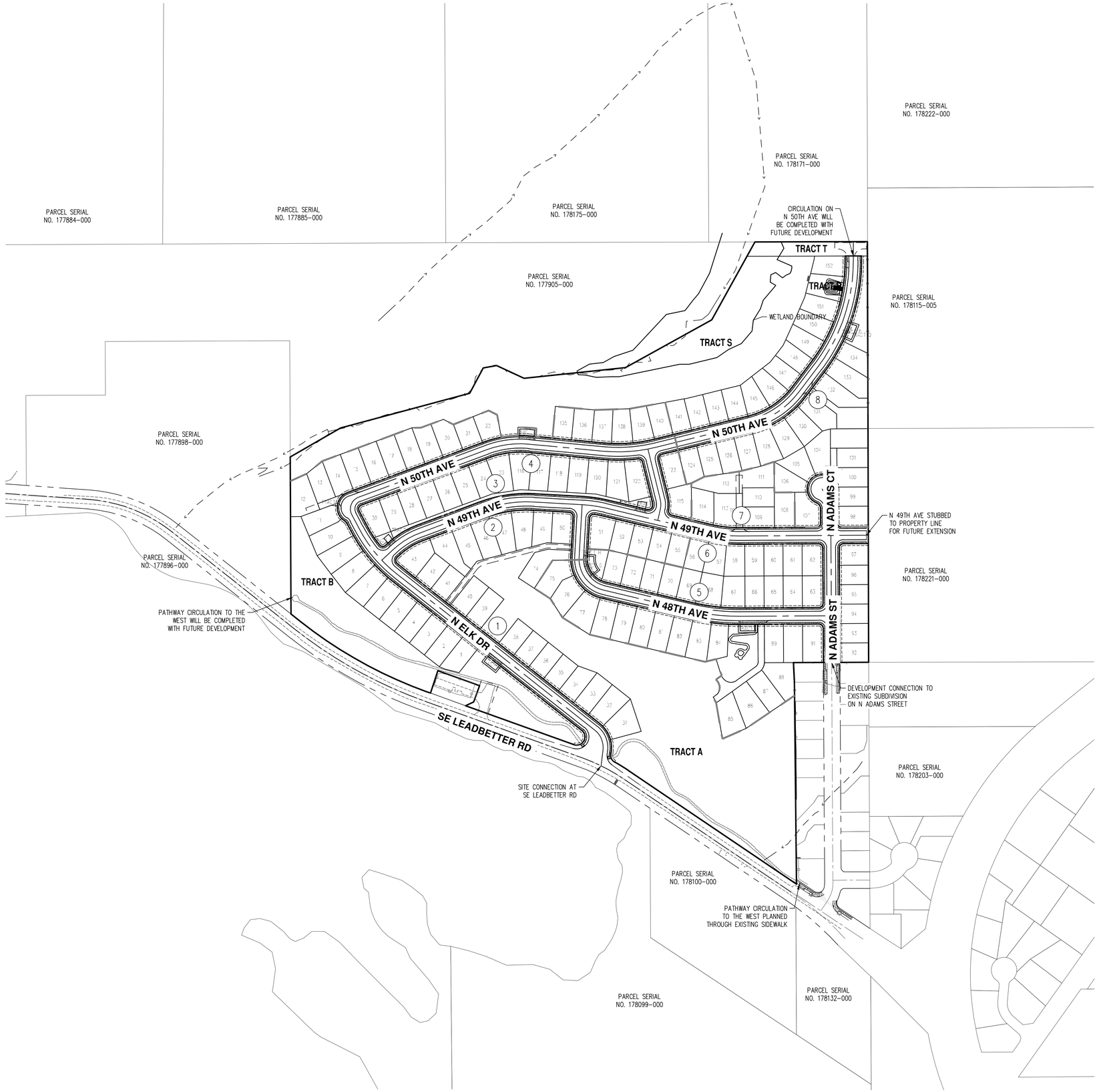

KEYED NOTES

1. 951.82' MEASURED ROW TO ROW SPACING
2. 582.83' MEASURED ROW TO ROW SPACING
3. 883.12 MEASURED ROW TO ROW SPACING
4. 911.65' MEASURED ROW TO ROW SPACING
5. 911.55' MEASURED ROW TO ROW SPACING
6. 729.84' MEASURED ROW TO ROW SPACING
7. 471.45' MEASURED ROW TO ROW SPACING
8. 999.29' MEASURED ROW TO ROW SPACING

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CAMAS, WASHINGTON

STATE OF WASHINGTON · JAMES M. MCCORMICK · 22331 · REGISTERED PROFESSIONAL ENGINEER

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SEE BELOW

SE LEADBETTER RD

PHASE 1

25' STREAM/HABITAT BUFFER

PARCEL SERIAL NO. 178118-019

SEE PRELIMINARY MITIGATION PLAN

PARCEL SERIAL NO. 178118-017

CONC. BLOCK RET. WALL

STREAM 3

EXISTING CONIFER TREE TO REMAIN (TYP)

EXISTING DECIDUOUS TREE TO REMAIN (TYP)

PARCEL SERIAL NO. 178118-018

N ADAMS ST

N 45TH CIR

PARCEL SERIAL NO. 178100-000

SEE SHEET P9.1

N 48TH AVE

SEE SHEET P9.2

N 49TH AVE

SEE SHEET P9.2

PHASE 1

TRACT H OPEN SPACE

TRACT G PARKING

VINE MAPLE (TYP)

EVERGREEN HUCKLEBERRY (TYP)

LAWN (TYP)

OREGON GRAPE (TYP)

GREENSPIRE LITTLEAF LINDEN (TYP)

PARCEL SERIAL NO. 178221-000

ARISTOCRAT FLOWERING PEAR (TYP)

N ADAMS ST

PHASE 2

STREET LIGHT (TYP)

EUROPEAN HORNBEAM (TYP)

VISION CLEARANCE TRIANGLE (TYP)

N 48TH AVE

TRACT J PARKING

CASCARA (TYP)

BENCH

UTILITY EASEMENT (TYP)

EXISTING CONIFER TREE TO REMAIN (TYP)

EXISTING DECIDUOUS TREE TO REMAIN (TYP)

SEE SHEET P9.1

TRACT C PARKING

N ELK DR

NATIVE SHRUB SEED MIX TO BE APPLIED TO DISTURBED AREAS IN TRACTS A AND B (TYP)

PACIFIC SUNSET MAPLE (TYP)

200' SHORELINE BUFFER

PHASE 1

6' T-3 TRAIL SECTION

CASCARA (TYP)

BIG LEAF MAPLE (TYP)

WESTERN RED CEDAR (TYP)

TRACT A NATURAL AREA

LACAMAS LAKE

OHWM

NE LEADBETTER RD

PARCEL SERIAL NO. 178099-000

SEE ABOVE

PARCEL SERIAL NO. 178118-010

PARCEL SERIAL NO. 178118-011

PARCEL SERIAL NO. 178118-012

PARCEL SERIAL NO. 178118-013

ROCK RET. WALL

PARCEL SERIAL NO. 178118-014

PARCEL SERIAL NO. 178118-015

ROCK RET. WALL

PARCEL SERIAL NO. 178118-016

STREAM 3

PARCEL SERIAL NO. 178118-009

"DEERHAVEN PHASE 1" BK 311 PG 573

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GENERAL NOTES

1. REFER TO SHEET P9.2 FOR PRELIMINARY PLANT SCHEDULE AND LANDSCAPE NOTES.
2. ROBUST PLANTING IS PROVIDED THROUGHOUT THE DEVELOPMENT BY PROVIDING PLANTINGS IN OPEN SPACE TRACTS ABOVE CODE REQUIREMENTS. SPECIFICALLY, ADDITIONAL PLANTINGS IN TRACTS A AND B WILL PROVIDE 93 NEW TREES AND A NATIVE SHRUB SEED MIX TO HELP RE-ESTABLISH UNDERSTORY PLANTS IN AREAS DISTURBED BY CONSTRUCTION.

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PRELIMINARY LANDSCAPE AND LIGHTING PLAN (SOUTH)

CJ DENS SUBDIVISION

CJ DENS LACAMAS II LLC

CAMAS, WASHINGTON

STATE OF WASHINGTON
TIMOTHY E. BOYD
2009
REGISTERED LANDSCAPE ARCHITECT
EXP. 12/21/2022

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PRELIMINARY LANDSCAPE AND LIGHTING PLAN (WEST)

CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

STATE OF WASHINGTON
TIMOTHY E. BOYCE
PRELIMINARY
NOT FOR CONSTRUCTION
DESIGNED LANDSCAPE ARCHITECT
EXP. 12/21/2021

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P9.1

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PRELIMINARY PLANT SCHEDULE

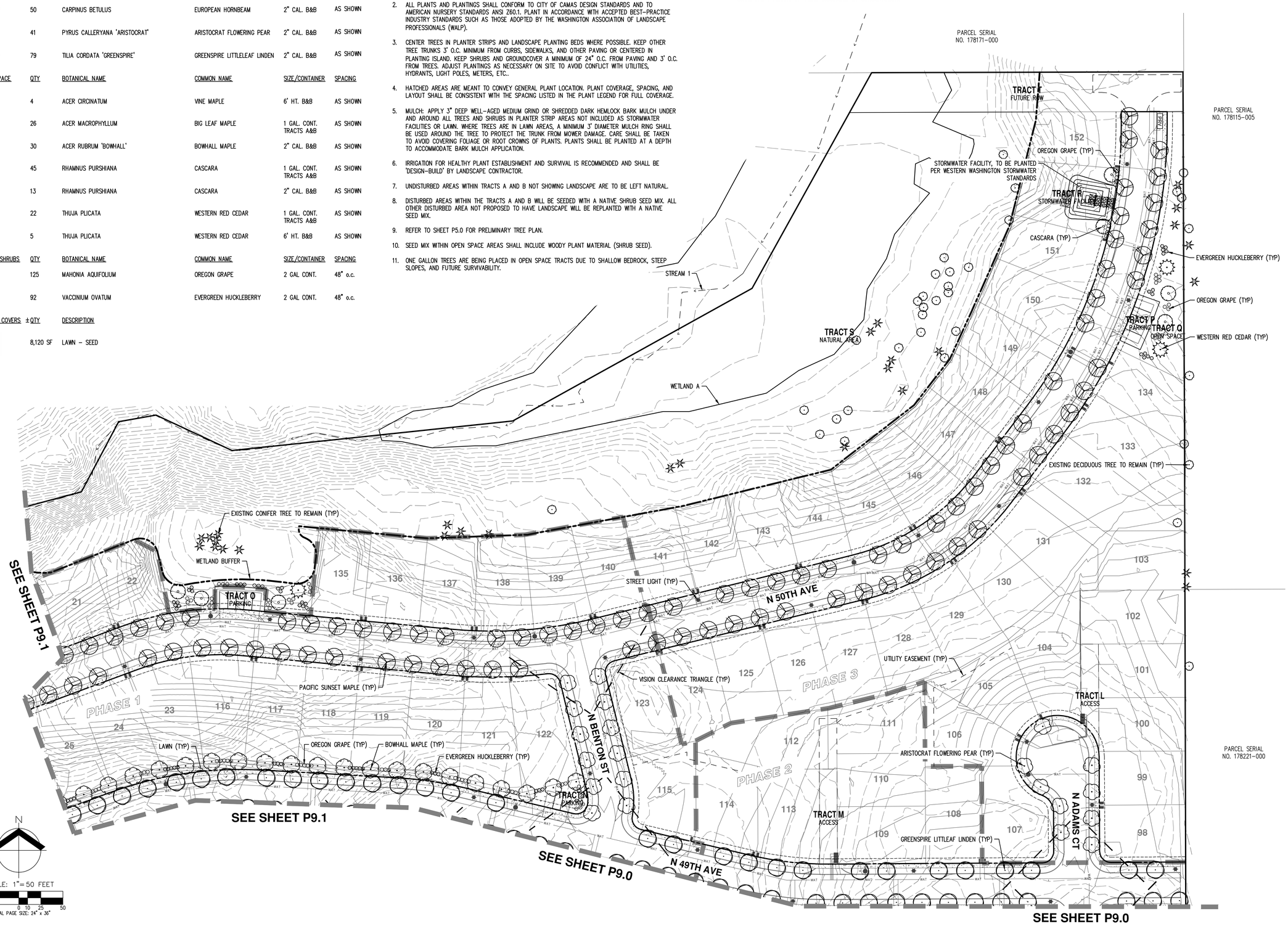
STREET TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER	SPACING
	166	ACER TRUNCATUM X PLATANOIDES 'WARRENRED'	PACIFIC SUNSET MAPLE	2" CAL. B&B	AS SHOWN
	50	CARPINUS BETULUS	EUROPEAN HORNBEAM	2" CAL. B&B	AS SHOWN
	41	PYRUS CALLERYANA 'ARISTOCRAT'	ARISTOCRAT FLOWERING PEAR	2" CAL. B&B	AS SHOWN
	79	TILIA CORDATA 'GREENSPIRE'	GREENSPIRE LITTLELEAF LINDEN	2" CAL. B&B	AS SHOWN
OPEN SPACE TREES	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE/CONTAINER**	**SPACING**
	4	ACER CIRCINATUM	VINE MAPLE	6' HT. B&B	AS SHOWN
	26	ACER MACROPHYLLUM	BIG LEAF MAPLE	1 GAL. CONT. TRACTS A&B	AS SHOWN
	30	ACER RUBRUM 'BOWHALL'	BOWHALL MAPLE	2" CAL. B&B	AS SHOWN
	45	RHAMNUS PURSHIANA	CASCARA	1 GAL. CONT. TRACTS A&B	AS SHOWN
	13	RHAMNUS PURSHIANA	CASCARA	2" CAL. B&B	AS SHOWN
	22	THUJA PLICATA	WESTERN RED CEDAR	1 GAL. CONT. TRACTS A&B	AS SHOWN
	5	THUJA PLICATA	WESTERN RED CEDAR	6' HT. B&B	AS SHOWN
BUFFER SHRUBS	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE/CONTAINER**	**SPACING**
	125	MAHONIA AQUIFOLIUM	OREGON GRAPE	2 GAL CONT.	48" o.c.
	92	VACCINIUM OVATUM	EVERGREEN HUCKLEBERRY	2 GAL CONT.	48" o.c.
GROUND COVERS	**±QTY**	**DESCRIPTION**			
	8,120 SF	LAWN – SEED			

PRELIMINARY LANDSCAPE NOTES

1. LANDSCAPE PLAN IS PRELIMINARY AND INTENDED TO SHOW DESIGN INTENT ONLY. REVISIONS OR SUBSTITUTIONS, INCLUDING CHANGES TO PLANT LOCATION, QUANTITIES, TYPES, AND SIZES MAY BE NECESSARY PRIOR TO FINAL APPROVAL BASED ON PLANT AVAILABILITY, SITE CONDITIONS, UTILITY CONFLICTS, ETC. ALL SUBSTITUTIONS SHALL CONFORM TO CITY OF CAMAS LANDSCAPE DESIGN STANDARDS. STREET TREES WILL BE UPDATED TO AVOID FUTURE DRIVEWAY DROPS.
2. ALL PLANTS AND PLANTINGS SHALL CONFORM TO CITY OF CAMAS DESIGN STANDARDS AND TO AMERICAN NURSERY STANDARDS ANSI Z60.1. PLANT IN ACCORDANCE WITH ACCEPTED BEST-PRACTICE INDUSTRY STANDARDS SUCH AS THOSE ADOPTED BY THE WASHINGTON ASSOCIATION OF LANDSCAPE PROFESSIONALS (WALP).
3. CENTER TREES IN PLANTER STRIPS AND LANDSCAPE PLANTING BEDS WHERE POSSIBLE. KEEP OTHER TREE TRUNKS 3' O.C. MINIMUM FROM CURBS, SIDEWALKS, AND OTHER PAVING OR CENTERED IN PLANTING ISLAND. KEEP SHRUBS AND GROUNDCOVER A MINIMUM OF 24" O.C. FROM PAVING AND 3' O.C. FROM TREES. ADJUST PLANTINGS AS NECESSARY ON SITE TO AVOID CONFLICT WITH UTILITIES, HYDRANTS, LIGHT POLES, METERS, ETC..
4. HATCHED AREAS ARE MEANT TO CONVEY GENERAL PLANT LOCATION. PLANT COVERAGE, SPACING, AND LAYOUT SHALL BE CONSISTENT WITH THE SPACING LISTED IN THE PLANT LEGEND FOR FULL COVERAGE.
5. MULCH: APPLY 3" DEEP WELL-AGED MEDIUM GRIND OR SHREDDED DARK HEMLOCK BARK MULCH UNDER AND AROUND ALL TREES AND SHRUBS IN PLANTER STRIP AREAS NOT INCLUDED AS STORMWATER FACILITIES OR LAWN. WHERE TREES ARE IN LAWN AREAS, A MINIMUM 3' DIAMETER MULCH RING SHALL BE USED AROUND THE TREE TO PROTECT THE TRUNK FROM MOWER DAMAGE. CARE SHALL BE TAKEN TO AVOID COVERING FOLIAGE OR ROOT CROWNS OF PLANTS. PLANTS SHALL BE PLANTED AT A DEPTH TO ACCOMMODATE BARK MULCH APPLICATION.
6. IRRIGATION FOR HEALTHY PLANT ESTABLISHMENT AND SURVIVAL IS RECOMMENDED AND SHALL BE 'DESIGN-BUILD' BY LANDSCAPE CONTRACTOR.
7. UNDISTURBED AREAS WITHIN TRACTS A AND B NOT SHOWING LANDSCAPE ARE TO BE LEFT NATURAL.
8. DISTURBED AREAS WITHIN THE TRACTS A AND B WILL BE SEEDED WITH A NATIVE SHRUB SEED MIX. ALL OTHER DISTURBED AREA NOT PROPOSED TO HAVE LANDSCAPE WILL BE REPLANTED WITH A NATIVE SEED MIX.
9. REFER TO SHEET P5.0 FOR PRELIMINARY TREE PLAN.
10. SEED MIX WITHIN OPEN SPACE AREAS SHALL INCLUDE WOODY PLANT MATERIAL (SHRUB SEED).
11. ONE GALLON TREES ARE BEING PLACED IN OPEN SPACE TRACTS DUE TO SHALLOW BEDROCK, STEEP SLOPES, AND FUTURE SURVIVABILITY.

GENERAL NOTES

1. REFER TO THIS SHEET FOR PRELIMINARY PLANT SCHEDULE AND LANDSCAPE NOTES.
2. ROBUST PLANTING IS PROVIDED THROUGHOUT THE DEVELOPMENT BY PROVIDING PLANTINGS IN OPEN SPACE TRACTS ABOVE CODE REQUIREMENTS. SPECIFICALLY, ADDITIONAL PLANTINGS IN TRACTS A AND B WILL PROVIDE 93 NEW TREES AND A NATIVE SHRUB SEED MIX TO HELP RE-ESTABLISH UNDERSTORY PLANTS IN AREAS DISTURBED BY CONSTRUCTION.



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PRELIMINARY LANDSCAPE AND LIGHTING PLAN (NORTH)

CJ DENS SUBDIVISION

CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

STATE OF WASHINGTON · TIMOTHY E. BOYCE · 22393 · REGISTERED LANDSCAPE ARCHITECT · EXP. 12/14/2021

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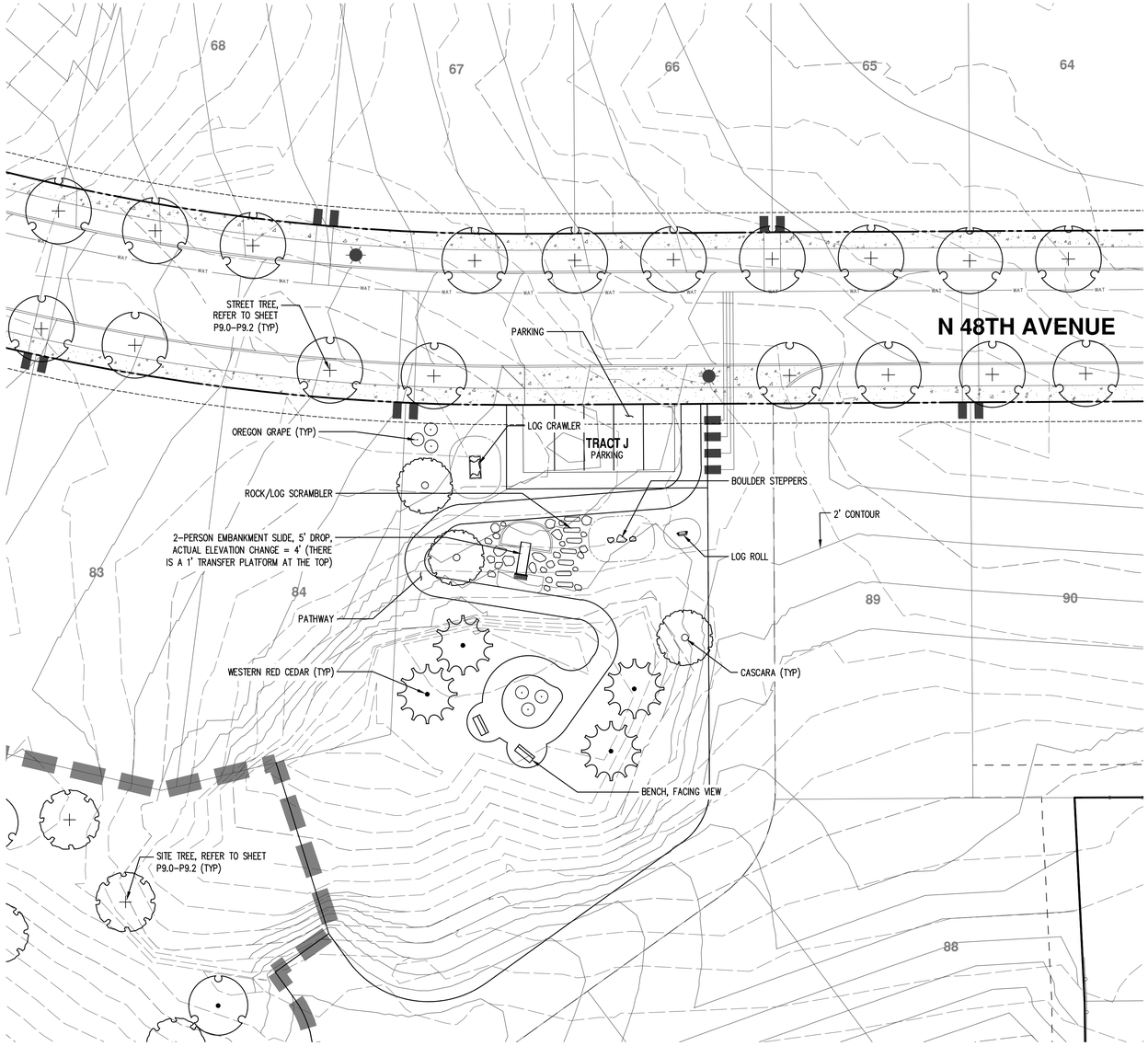

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PLANT SCHEDULE - TRACT I PARK

SITE TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER	SPACING
	3	RHAMNUS PURSHIANA	CASCARA	2" CAL. B&B	AS SHOWN
	4	THUJA PLICATA	WESTERN RED CEDAR	6' HT. B&B	AS SHOWN
BUFFER SHRUBS	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE/CONTAINER**	**SPACING**
	6	MAHONIA AQUIFOLIUM	OREGON GRAPE	2 GAL CONT.	48" o.c.

GENERAL NOTES

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PRELIMINARY TRACT I PARK PLANTING PLAN
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CAMAS, WASHINGTON

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CRITICAL AREAS REPORT & BUFFER MODIFICATION PLAN

November 18, 2020

Leadbetter Road

Camas, Washington

Prepared for

CJ Dens Land Company
PO Box 2429
Vancouver, Washington 98668

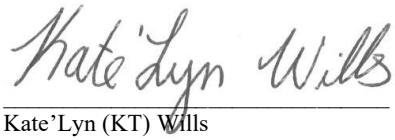
Prepared by

Ecological Land Services

1157 3rd Avenue, Suite 220A • Longview, WA 98632
(360) 578-1371 • Project Number 1795.03

SIGNATURE PAGE

The information in this report was compiled and prepared under the supervision and direction of the undersigned.



Kate'Lyn (KT) Wills
Biologist/Environmental Scientist IV

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LIMITATIONS 7
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Figure 2 Existing Conditions
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Figure 4 NRCS Soil Survey Map
Figure 5 National & Clark County Wetlands Inventories
Figure 6 150’ Offset Wetland Rating Figure
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Figure 8 303(d) Listed Waters and TMDLs Maps

APPENDIX A

Wetland Determination Data Forms

APPENDIX B

Wetland Rating Form

INTRODUCTION

Ecological Land Services, Inc. (ELS) has completed this critical areas report and buffer modification plan on behalf of CJ Dens Land Company for the development of a residential subdivision. The site consists of Clark County Tax Parcels 177905000, 178172000, 178236000, and 177906000 located off SE Leadbetter Road in Camas, Washington., within a portion of Sections 34 & 35, Township 2 North, and Range 3 East of the Willamette Meridian (Figure 1). This report summarizes the findings of critical areas onsite in accordance with the Camas Code of Ordinances (CCO) *Title 16.5 Critical Areas* (2020).

SITE DESCRIPTION

The approximately 82-acre site is zoned as Residential (R-7.5) and is currently vacant of structures. The adjacent property to the southeast consists of a residential subdivision. SE Leadbetter Road forms the southern property boundary with Lacamas Lake just to the south. The remaining adjacent properties to the north and east consist of undeveloped, forested hillslopes. The topography of the site varies, with gradual to steep slopes, deep ravines, and level plateaus (Figure 1). The site contains three small, non-fish bearing streams and a depressional, forested wetland (Wetland A). Stream 1 is a perennial stream (Type Np) that originates approximately 800 feet offsite to the north and flows south/southwest through Wetland A in the northeastern corner of the site. Once Stream 1 leaves Wetland A it flows southwest through a narrow ravine for approximately 1,200 feet before flowing through a culvert under SE Ledbetter Road and into Lacamas Lake. Stream 2 is a small seasonal stream (Type Ns) that originates in the northern central portion of the site and flows northeast for approximately 1,000 feet before converging with Stream 1. Stream 3 is also a small seasonal stream (Type Ns) that originates offsite and flows through the southeastern corner of the site and into a roadside ditch along the north side of SE Leadbetter Road (Figure 2). The area south of Stream 1 was logged in 2015 leaving herbaceous species with a few scattered shrubs. The area north of Stream 1 and the western portion of the site are forested with a mix of mature coniferous and deciduous trees with a dense understory of shrubs and herbaceous vegetation.

METHODOLOGY

ELS biologists originally delineated Wetland A and the three streams on the subject property in 2013. In order to update the expired critical areas delineation, ELS biologists conducted a redelineation of the property on August 10, 2020 to determine if the boundaries of mapped critical areas had changed. Prior to conducting the site visit, ELS reviewed current and historic aerial photographs dating back to 1990 and reviewed online database information regarding soils, topography, wetlands, and shoreline areas.

The wetland delineation followed the Routine Determination Method according to the U.S. Army Corps of Engineers, *Wetland Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)* (U.S. Army Engineer Research and Development Center 2010).

The Routine Determination Method examines three parameters—vegetation, soils, and hydrology—to determine if wetlands exist in a given area. Hydrology is critical in determining

what is wetland but is often difficult to assess because hydrologic conditions can change periodically (hourly, daily, or seasonally). Consequently, it is necessary to determine if hydrophytic vegetation and hydric soils are present, which would indicate that water is present for long enough duration to support a wetland plant community. By definition, wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are regulated as "Waters of the United States" by the U.S. Army Corps of Engineers (Corps), as "Waters of the State" by the Washington Department of Ecology (Ecology), and locally by CCO *16.5.*

During the site visit, vegetation, soils, and hydrology information was verified along the wetland boundary and two new test plots were taken along a small portion of the wetland boundary that ELS biologists determined had changed since the original delineation in 2013. The two new wetland determination data sheets from these additional two test plots can be found in Appendix A.

VEGETATION

The upland vegetation within the wetland buffer was dominated by big leaf maple (*Acer macrophyllum*, FACU), western brackenfern (*Pteridium aquilinum*, FACU), western swordfern (*Polystichum munitum*, FACU), trailing blackberry (*Rubus ursinus*, FACU), Himalayan blackberry (*Rubus armeniacus*, FAC), salmonberry (*Rubus spectabilis*, FAC), and reed canarygrass (*Phalaris arundinacea,* FACW). The vegetation within Wetland A was primarily hydrophytic consisting of Oregon ash (*Fraxinus latifolia*, FACW), red-osier dogwood (*Cornus sericea*, FACW), panicled bulrush (*Scirpus microcarpus*, OBL), Himalayan blackberry, and reed canarygrass.

The indicator status, following the scientific names, indicates the likelihood of the species to be found in wetlands. Listed from most likely to least likely to be found in wetlands, the indicator status categories are:

- **OBL** (obligate wetland) - occur almost always under natural conditions in wetlands.
- **FACW** (facultative wetland) - usually occur in wetlands, but occasionally found in non-wetlands.
- **FAC** (facultative) - equally likely to occur in wetlands or non-wetlands.
- **FACU** (facultative upland) - usually occur in non-wetlands, but occasionally found in wetlands.
- **UPL** (obligate upland) - occur almost always under natural conditions in non-wetlands.
- **NI** (no indicator) - insufficient data to assign to an indicator category.

SOILS

As referenced on the U.S.D.A. Natural Resources Conservation Service (NRCS) website, the onsite soils are mapped as (OID) Olympic clay loam, 8 to 20 percent slopes, (OmE) Olympic stoney clay loam, 3 to 30 percent slopes, (ThA) Tisch silt loam, 0 to 3 percent slopes, (VaB) Vader silt loam, 3 to 8 percent slopes, and (VaC) Vader silt loam, 8 to 15 percent slopes (NRCS 2020) (Figure 4). Olympic clay loam and Olympic stoney clay loam are characterized as well-drained soils formed from residuum and colluvioum from igneous rock on mountain terraces. Tisch silt

loam is characterized as poorly drained formed from volcanic ash, alluvium and diatomaceous earth in depressions. Vader silt loams are characterized as well-drained formed from residuum and colluvioum from sandstone with a mixture of volcanic ash in the upper part. NRCS rates all soils onsite as non-hydric except for (ThA) Tisch silt loam which is rated as a hydric soil (NRCS 2019). Mapped hydric soils do not necessarily mean that an area is or is not a wetland—hydrology, hydrophytic wetland vegetation, and hydric soils must all be present to classify an area as a wetland. Wetland soils onsite met hydric soil indicator (F6) Redox Dark Surface.

HYDROLOGY

Wetland A lies in a depressional valley that slopes from north to south with Stream 1 flowing through the center. Once Stream 1 leaves Wetland A it flows southwest through a narrow ravine for approximately 1,200 feet before flowing through a culvert under SE Ledbetter Road and into Lacamas Lake. Stream 2 also provides input to Wetland A as it originates in the north central portion of the site and flows northeast for approximately 1,000 feet before converging with Stream 1 (Figure 2). Although Wetland A slopes from north to south and drainage is unidirectional, there are depressions that total more than 10 percent of the wetland unit. Wetland hydrology likely comes from hillside runoff, input from both Streams 1 and 2, and precipitation. Hydroperiods of the wetland include seasonally flooded and saturated only. Due to the site visit occurring during the dry season, hydrology indicators present within Wetland A consisted of only secondary indicators; (B10) Drainage Patterns, (D2) Geomorphic Position, and (D5) FAC-Neutral Test. The two new wetland determination data sheets can be found in Appendix A.

NATIONAL AND LOCAL WETLAND INVENTORIES

The National Wetland Inventory (NWI) does not depict wetlands onsite however, Clark County GIS indicates the presence of wetlands in the vicinity of Wetland A (Figure 5). ELS agrees with the Clark County mapping. Wetland inventory maps are typically used to gather wetland information about a region and due to the large scale necessary for regional mapping are limited in accuracy for localized analyses.

CRITICAL AREAS SUMMARY

Wetland A

Wetland A is a Category III, sloped and depressional, forested wetland totaling approximately 2.46 acres in the northeastern portion of the site (Figure 2). The wetland was bordered by an obvious change in elevation and vegetation. The vegetation within Wetland A was primarily hydrophytic consisting of Oregon ash, red-osier dogwood, panicled bulrush, Himalayan blackberry, and reed canarygrass. Wetland hydrology likely comes from hillside runoff, input from both Streams 1 and 2, and precipitation. Hydroperiods of the wetland include seasonally flooded and saturated only. Stream 1 also forms an unconstricted, permanently flowing outlet to the wetland.

Wetland A had originally been rated by ELS in 2013 as a Category II, riverine wetland using the 2004 wetland rating system. The current rating of Wetland A based on the Department of Ecology's 2014 *Wetland Rating System for Western Washington* (Rating System), using the depressional hydrogeomorphic (HGM) classification, is a Category III scoring a total of 18 points; 7 points for water quality functions, 4 points for hydrologic functions, and 7 points for habitat

functions (Appendix B). According to the CCO *Table 16.53.040-3*, the designated buffer width for a proposed high land use intensity for a Category III wetland with a habitat score of 7 is 150 feet.

Streams

Stream 1 is an unnamed non fish-bearing perennial stream (Type Np) that originates in the offsite portion of the wetland to the north and runs in a southwesterly direction through the site to a culvert located under SE Leadbetter Road and into Lacamas Lake. The stream channel was approximately four inches wide and contained three inches of water at the time of the site visit. Stream 2 is an unnamed non fish-bearing seasonal stream (Type Ns) that originates at the central northern boundary of the site and flows northeast for approximately 1,000 feet before flowing into Stream 1. Stream 3 is an unnamed non fish-bearing seasonal stream (Type Ns) that originates offsite and flows through the southeastern corner of the property and into a roadside ditch along the northside of SE Leadbetter Road. According to CCO *16.61.040(D)*, Type Np streams have a 50-foot buffer, while Type Ns streams have a 25-foot buffer.

Lacamas Lake

Lacamas Lake is located just south of SE Leadbetter Road. Lacamas Lake is a Type S Water of the State and according to CCO *16.61.040(D)* the standard riparian habitat buffer width is 150 feet however, the buffer is entirely functionally isolated from the site by SE Leadbetter Road. As a Type S Water, Lacamas Lake is a shoreline of the state and is subject to the regulations of the *Camas Shoreline Master Program* (SMP 2015). Shoreline jurisdiction extends for 200 feet landward from the ordinary high water mark (OHWM) of Lacamas Lake (Figure 2). The shoreline area is designated as Urban Conservancy (UC). According to *Table 6-1* of the SMP, residential structures are permitted, and secondary or public access roads are permitted as a conditional use. The proposed project will require a Shoreline Substantial Development Permit (SSDP) to address development within shoreline jurisdiction.

Table 1. Summary of Critical Areas Onsite.

Critical Area	Designation	Buffer Width (feet)
Wetland A	Category III[1]/Forested, Emergent[2]/Depressional[3]	150[4]
[illegible]	[illegible]	[5]
		[5]
		[5]
Lacamas Lake	Type S (Shoreline) Water of the State	150[5] Shoreline Jurisdiction – 200[6]

[1]*Hruby 2014*
[2]*Cowardin et al. 1979*
[3]*NRCS 2008*
[4]*CCO Table 16.53.040-3*
[5]*CCO 16.61.040(D)*
[6]*SMP 2.1(1)*

BUFFER MODIFICATIONS

Buffer Reduction

According to CCO *16.53.050(C)(1)(a)*, wetland buffers recommended for high intensity land uses can be reduced to those recommended for moderate intensity land uses if certain criteria are met.

The applicant is proposing to reduce the standard buffer width on the southern side of the wetland in the vicinity of the proposed subdivision from the high intensity land use width of 150 feet to the moderate intensity land use width of 110 feet as listed in CCO *Table 16.53.040-3*. The following is an excerpt from the code listing the criteria required to authorize buffer reduction in italics with a description of how the criteria will be met in regular font.

16.53.050(C)
1. Buffer Reduction Incentives. Standard buffer widths may be reduced under the following conditions, provided that functions of the post-project wetland are equal to or greater after use of these incentives.
Wetland functions will not be reduced by the proposed project; see below.

a. Lower Impact Land Uses. The buffer widths recommended for proposed land uses with high-intensity impacts to wetlands can be reduced to those recommended for moderate-intensity impacts if both of the following criteria are met:

i. A relatively undisturbed, vegetated corridor at least one hundred feet wide is protected between the wetland and any other priority habitats that are present as defined by the Washington State Department of Fish and Wildlife; and
Only the buffer on the southern and eastern sides of the wetland are proposed for reduction leaving the northwestern buffer untouched. Stream 1 flows through the center of Wetland A with its 50-foot designated riparian habitat buffer being entirely encompassed within the wetland. The remaining area of buffer to the south and east of the wetland, Wetland A, and the 150 foot buffer on the northwestern side of the wetland measure an average of approximately 400 feet across for the length of Wetland A (~750 feet). This area will remain vegetated and undisturbed which will protect the wetland functions that currently exist. The buffer boundary adjacent to the proposed subdivision will be protected by fencing that is a minimum of 42 inches in height and comprised of either vinyl-coated chain link or wooden split rail as approved by the City of Camas (City). Furthermore, signs measuring 12 by 18 inches reading, "Wetland and Buffer Area – Retain in a natural state." will be posted along the fencing on 6-foot high green steel posts at an interval of one per lot per CCO *16.53.040(C)(2)*. Additionally, the area between Wetland A and Stream 2 will be entirely avoided by this proposed project. This area is heavily forested by a mix of mature deciduous and coniferous trees with a dense understory of upland shrubs and extends for at least 750 feet from Wetland A to Stream 2 for at least 450 feet from the northern property boundary to Stream 1 (Figure 3). Due to the size of the remaining undisturbed, vegetated corridor comprised of Wetland A, Stream 1, and Stream 2, exceeding 100 feet in width in all directions, this criterion is met.

ii. Measures to minimize the impacts of the land use adjacent to the wetlands are applied, such as infiltration of stormwater, retention of as much native vegetation and soils as possible, direction of noise and light away from the wetland, and other measures that may be suggested by a qualified wetland professional.
The majority of the stormwater that is created by residential lots will be directed to the proposed stormwater pond for detention and treatment before being discharged to a dispersion trench along the outer edge of the wetland buffer. Lots directly adjacent to the wetland buffer will infiltrate directly to the dispersion trenches. All stormwater will be

discharged at pre-development rates so that the wetland does not lose hydrology. The area proposed for buffer reduction was previously logged in 2015 so the native vegetation that remains consists primarily of herbaceous species with a few scattered shrubs. All remaining mature trees that do not propose hazards to the residential dwellings will be retained. No foreign soils will be brought in during site prep. Additionally, street and house lights and any outdoor speakers will be directed away from the wetland to the greatest extent practicable. Due to the application of these measures, this criterion is met.

Buffer Averaging

According to CCO *16.53.050(C)(2)*, wetland buffers can be averaged as well as reduced to further avoid impacts. The applicant is proposing buffer averaging to further reduce the 110-foot buffer width on the southern side of the wetland in the vicinity of the proposed subdivision and increase the buffer width at the westernmost portion of the wetland. The following is an excerpt from the code listing the criteria required to authorize buffer averaging in italics with a description of how the criteria will be met in regular font.

16.53.050(C)

2. Buffer Averaging. Averaging buffers is allowed in conjunction with any of the other provisions for reductions in buffer width (listed in subsection (C)(1) of this section) provided that minimum buffer widths listed in subsection (C)(1)(c) of this section are adhered to. The community development department shall have the authority to average buffer widths on a case-by-case basis, where a qualified wetlands professional demonstrates, as part of a critical area report, that all of the following criteria are met:

a. The total area contained in the buffer after averaging is no less than that contained within the buffer prior to averaging;

The area of buffer to be decreased on the southeastern side of Wetland A totals 0.262 acres (11,417 square feet). The area of buffer to be increased on the westernmost portion of Wetland A totals the same amount, 0.262 acres (11,417 square feet) (Figure 3). Since the total area contained in the buffer after averaging is no less than that within the buffer prior to averaging, this criterion is met.

b. Decreases in width are generally located where wetland functions may be less sensitive to adjacent land uses, and increases are generally located where wetland functions may be more sensitive to adjacent land uses, to achieve no net loss or a net gain in functions; and

The area proposed for buffer decrease was previously logged in 2015 so the native vegetation that remains consists primarily of herbaceous species with a few scattered shrubs. Due to the lack of vegetation in this area, it is less sensitive to adjacent residential lands uses. The area proposed for buffer increase is relatively undisturbed consisting of mature trees. The location of this increased buffer area will also protect the riparian functions of Stream 1 by creating a wider vegetated corridor between Wetland A and Stream 1 (Figure 3). This area would be much more sensitive to functional loss if residential development were to encroach. The decreased and increased buffer areas were located to achieve a net gain in habitat function; therefore, this criterion is met.

c. The averaged buffer, at its narrowest point, shall not result in a width less than seventy-five percent of the required width, provided that minimum buffer widths shall never be less than fifty feet for all Category I, Category II, and Category III wetlands, and twenty-five feet for all Category IV wetlands.

The required buffer width after reduction is 110 feet. 75 percent of 110 feet would be 82.5 feet. The averaged buffer at its narrowest point is 82.5 feet (Figure 3). Due to the averaged buffer not resulting in a width less than 75 percent required width, this criterion is met.

LIMITATIONS

ELS bases the above listed determinations and conclusions on standard scientific methodology and best professional judgment. In our opinion, local, state, and federal regulatory agencies should agree with the conclusions of this report. However, this should be considered a preliminary report and should be used at your own risk until it has been reviewed and approved in writing by the appropriate regulatory agencies.

REFERENCES

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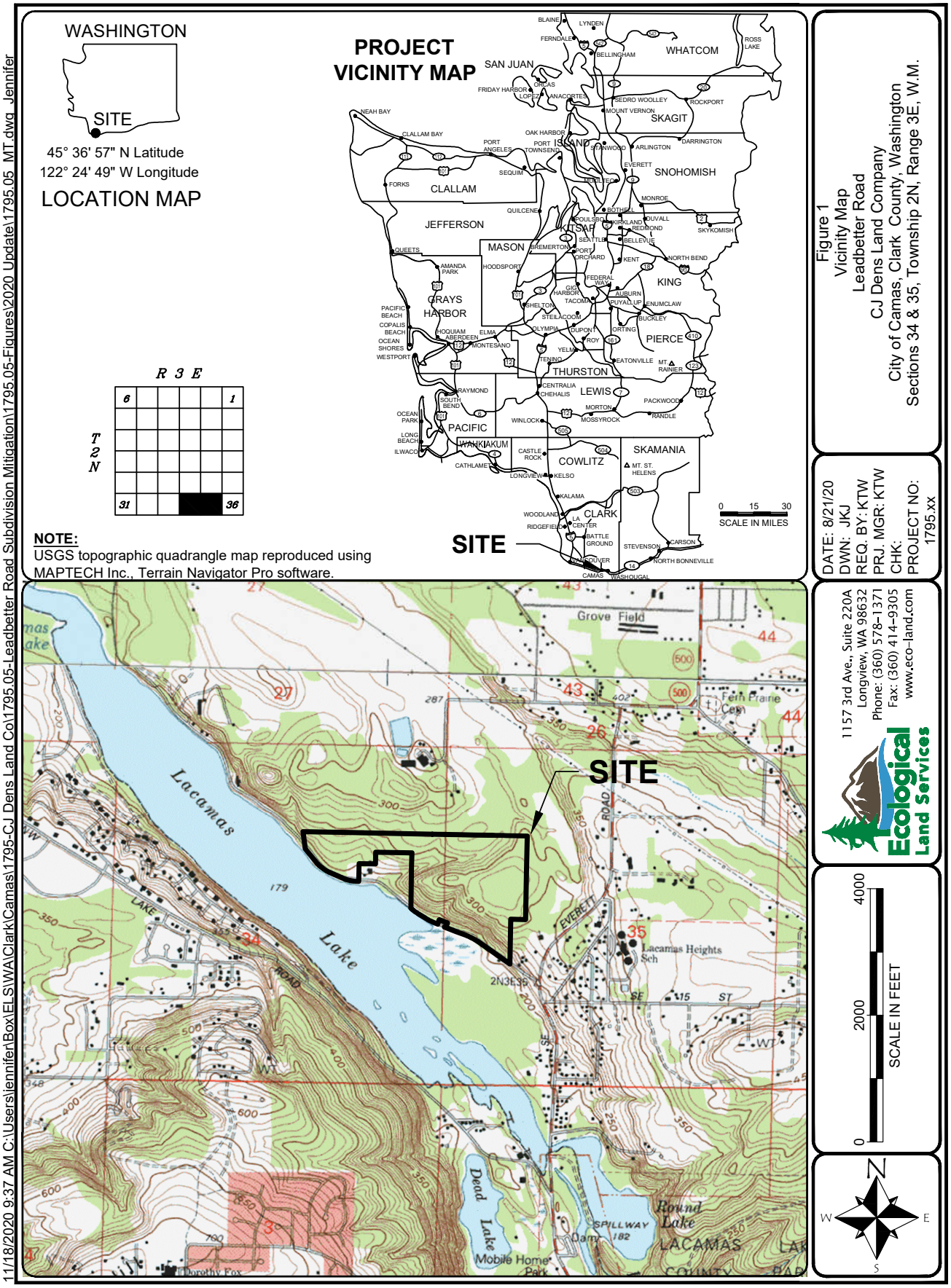
FIGURES & PHOTOPLATES



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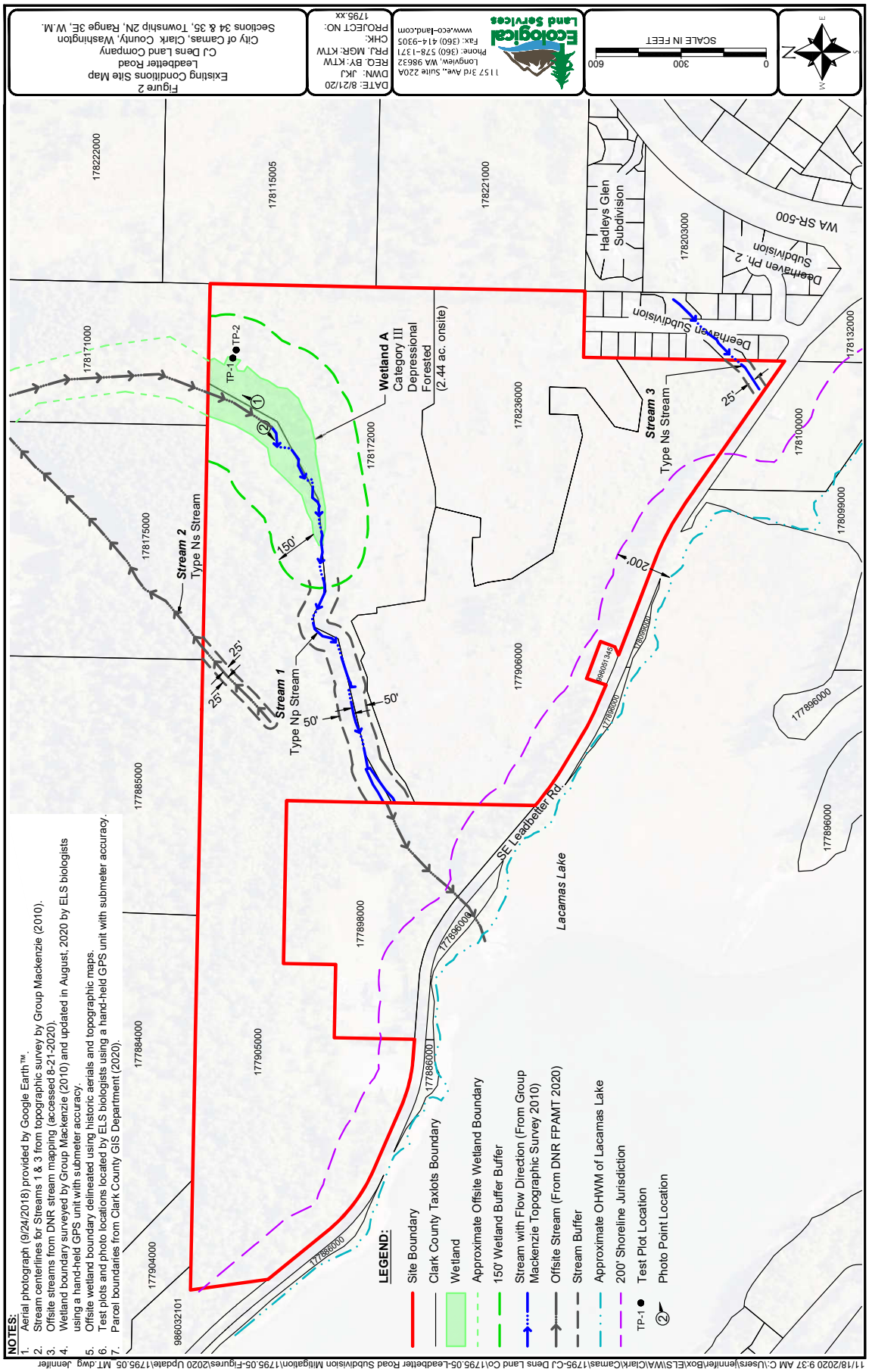
Figure 2
Existing Conditions Site Map
Leadbetter Road
CJ Dens Land Company
City of Camas, Clark County, Washington
Sections 34 & 35, Township 2N, Range 3E, W.M.
DATE: 8/21/20
DWN: JKJ
REQ. BY: KTW
PRJ. MGR: KTW
CHK:
PROJECT NO: 1795.xx
Ecological Land Services
1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305
www.eco-land.com
SCALE IN FEET
0 300 600
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NOTES:
1. Aerial photograph (9/24/2018) provided by Google Earth™.
2. Stream centerlines for Streams 1 & 3 from topographic survey by Group Mackenzie (2010).
3. Offsite streams from DNR stream mapping (accessed 8-21-2020).
4. Wetland boundary surveyed by Group Mackenzie (2010) and updated in August, 2020 by ELS biologists using a hand-held GPS unit with submeter accuracy.
5. Offsite wetland boundary delineated using historic aerials and topographic maps.
6. Test plots and photo locations located by ELS biologists using a hand-held GPS unit with submeter accuracy.
7. Parcel boundaries from Clark County GIS Department (2020).
LEGEND:
Site Boundary
Clark County Taxlots Boundary
Wetland
Approximate Offsite Wetland Boundary
150' Wetland Buffer Buffer
Stream with Flow Direction (From Group Mackenzie Topographic Survey 2010)
Offsite Stream (From DNR FPAMT 2020)
Stream Buffer
Approximate OHWM of Lacamas Lake
200' Shoreline Jurisdiction
TP-1 Test Plot Location
Photo Point Location
Wetland A
Category III
Depressional
Forested
(2.44 ac. onsite)
Stream 1
Type Np Stream
Stream 2
Type Ns Stream
Stream 3
Type Ns Stream
Lacamas Lake
SE Leadbetter Rd
Deerhaven Subdivision
Deerhaven Ph. 2 Subdivision
Hadleys Glen Subdivision
WA SR-500
150'
200'
50'
25'
TP-1
TP-2
178222000
178115005
178221000
178171000
178175000
178172000
178236000
178203000
178132000
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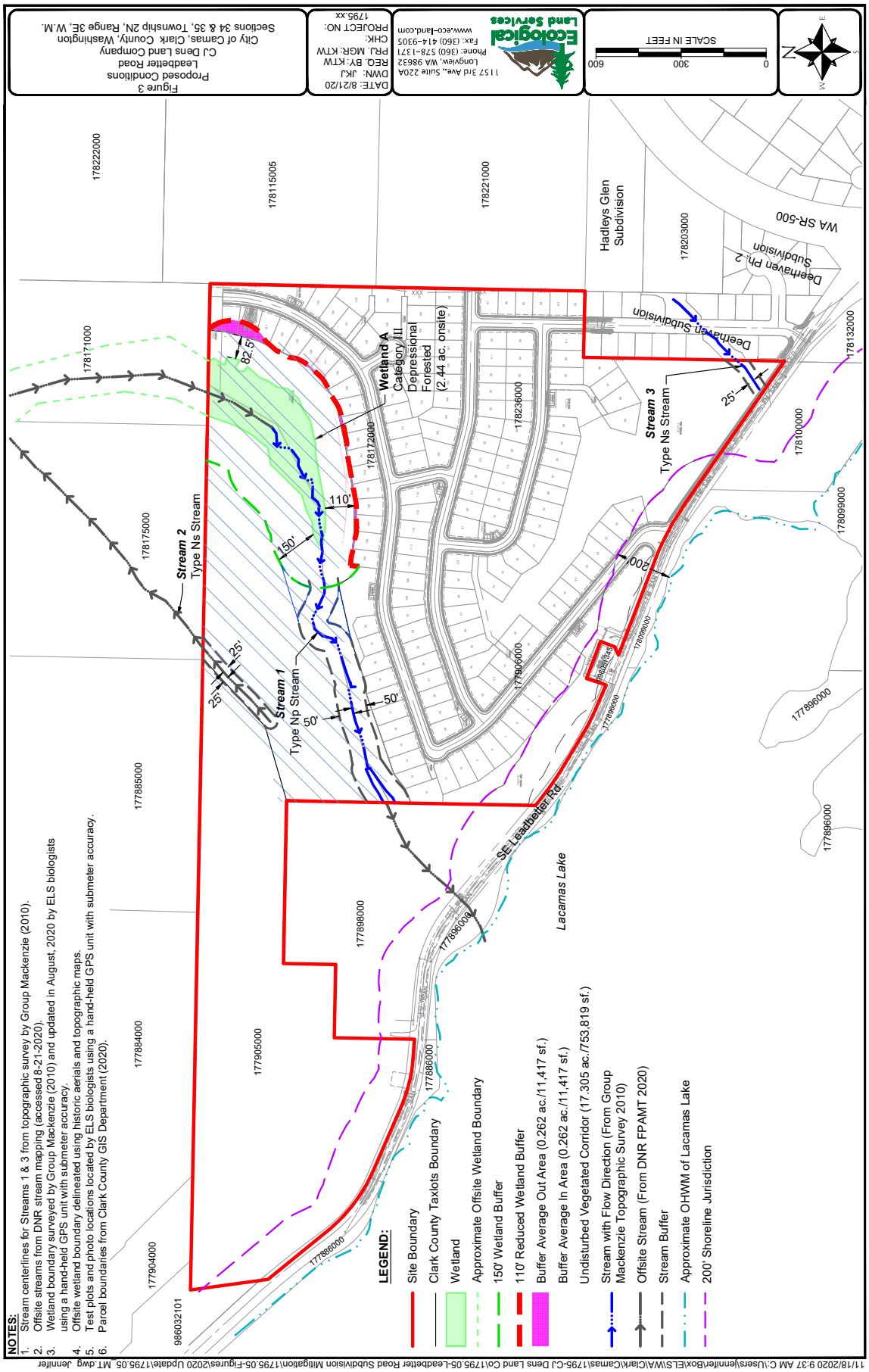
Figure 3
Proposed Conditions
Leadbetter Road
CJ Dens Land Company
City of Camas, Clark County, Washington
Sections 34 & 35, Township 2N, Range 3E, W.M.
DATE: 8/21/20
DWN: JKJ
REQ. BY: KTW
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SCALE IN FEET
0 300 600
N
Wetland A
Category III
Depressional
Forested
(2.44 ac. onsite)
Stream 1
Type Np Stream
Stream 2
Type Ns Stream
Stream 3
Type Ns Stream
82.5'
110'
150'
25'
50'
200'
Hadleys Glen Subdivision
Deerhaven Subdivision
Deerhaven Ph. 2 Subdivision
WA SR-500
SE Leadbetter Rd
Lacamas Lake
NOTES:
1. Stream centerlines for Streams 1 & 3 from topographic survey by Group Mackenzie (2010).
2. Offsite streams from DNR stream mapping (accessed 8-21-2020).
3. Wetland boundary surveyed by Group Mackenzie (2010) and updated in August, 2020 by ELS biologists using a hand-held GPS unit with submeter accuracy.
4. Offsite wetland boundary delineated using historic aerials and topographic maps.
5. Test plots and photo locations located by ELS biologists using a hand-held GPS unit with submeter accuracy.
6. Parcel boundaries from Clark County GIS Department (2020).
LEGEND:
Site Boundary
Clark County Taxlots Boundary
Wetland
Approximate Offsite Wetland Boundary
150' Wetland Buffer
110' Reduced Wetland Buffer
Buffer Average Out Area (0.262 ac./11,417 sf.)
Buffer Average In Area (0.262 ac./11,417 sf.)
Undisturbed Vegetated Corridor (17.305 ac./753,819 sf.)
Stream with Flow Direction (From Group Mackenzie Topographic Survey 2010)
Offsite Stream (From DNR FPAMT 2020)
Stream Buffer
Approximate OHWM of Lacamas Lake
200' Shoreline Jurisdiction
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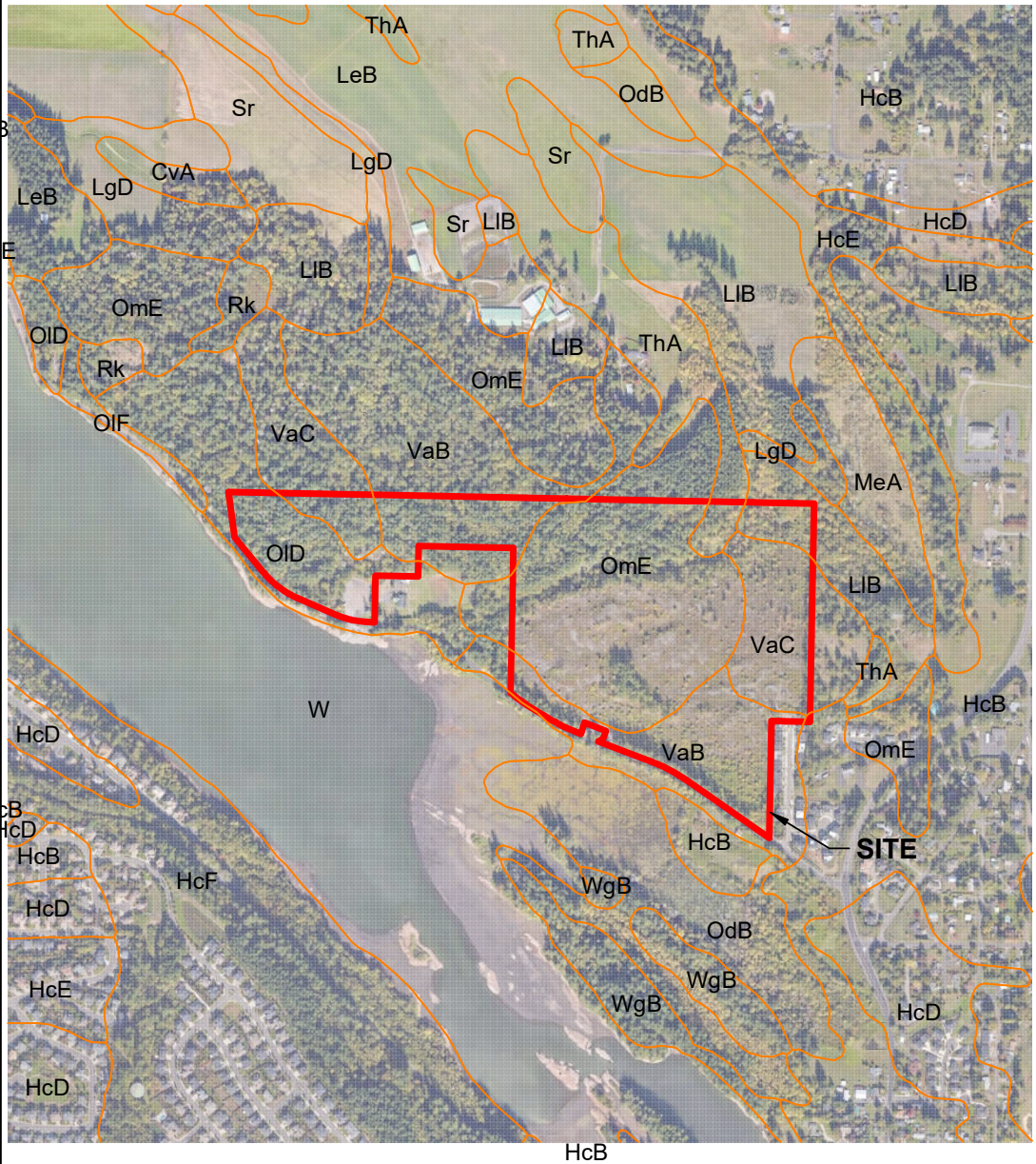

Figure 4
NRCS Soil Survey Map
Leadbetter Road
CJ Dens Land Company
City of Camas, Clark County, Washington
Sections 34 & 35, Township 2N, Range 3E, W.M.

DATE: 10/31/20
DWN: JKJ
REQ. BY: KTW
PRJ. MGR: KTW
CHK:
PROJECT NO: 1795.xx

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Ecological Land Services

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N W E S

LEGEND:

- Site Boundary
- **OID** Olympic clay loam, 8 to 20 percent slopes. Not hydric.
- **OmE** Olympic stoney clay loam, 3 to 30 percent slopes. Not hydric.
- **ThA** Tisch silt loam, 0 to 3 percent slopes. **Hydric.**
- **VaB** Vader silt loam, 3 to 8 percent slopes. Not hydric.
- **VaC** Vader silt loam, 8 to 15 percent slopes. Not hydric.

NOTE(S):

1. Map provided online by NRCS at web address: *https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey*

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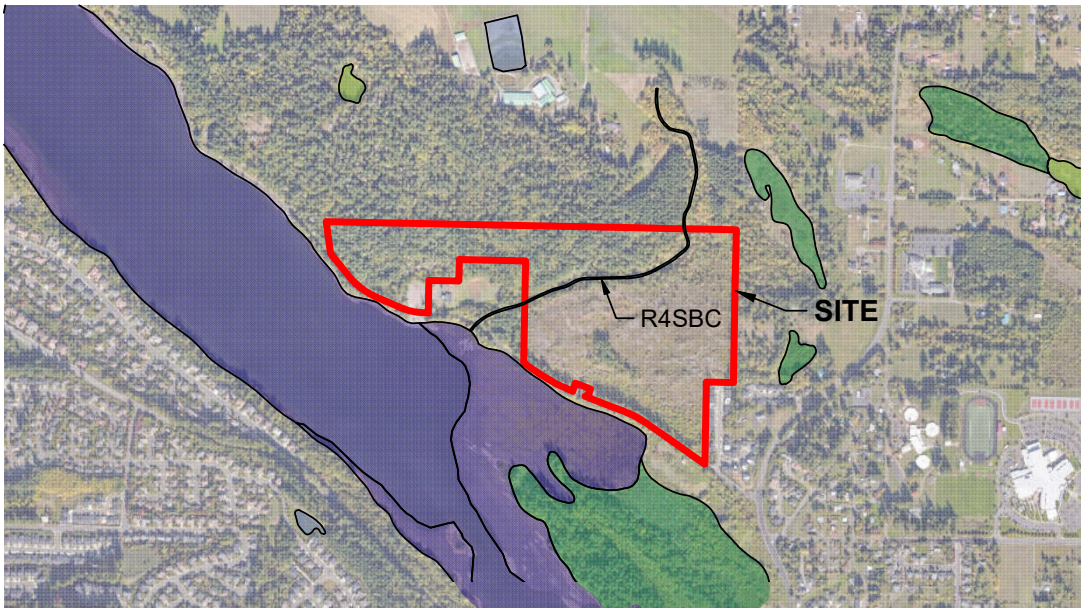


Mapped wetlands indicated onsite by US Fish & Wildlife Service.

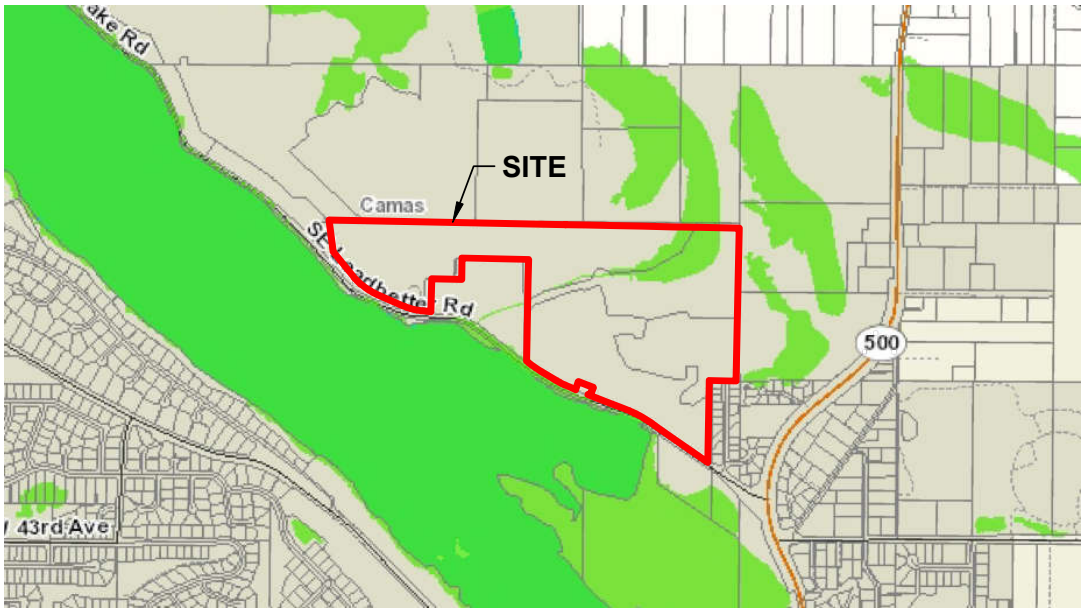
LEGEND:

- Site Boundary
- Riverine
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake

R4SBC Riverine, intermittent, streambed, seasonally flooded.

NOTE(S):

1. Map provided online by US Fish & Wildlife Service at web address: *https://www.fws.gov/wetlands/data/Mapper.html*



Mapped wetlands indicated onsite by Clark County.

LEGEND:

- Site Boundary
- Wetlands Presence

NOTE: Map provided online by Clark County, Washington at web address: *https://gis.clark.wa.gov/mapsonline/*

Figure 5
National & Clark County Wetlands Inventories
Leadbetter Road
CJ Dens Land Company
City of Camas, Clark County, Washington
Sections 34 & 35, Township 2N, Range 3E, W.M.

DATE: 10/31/20
DWN: JKJ
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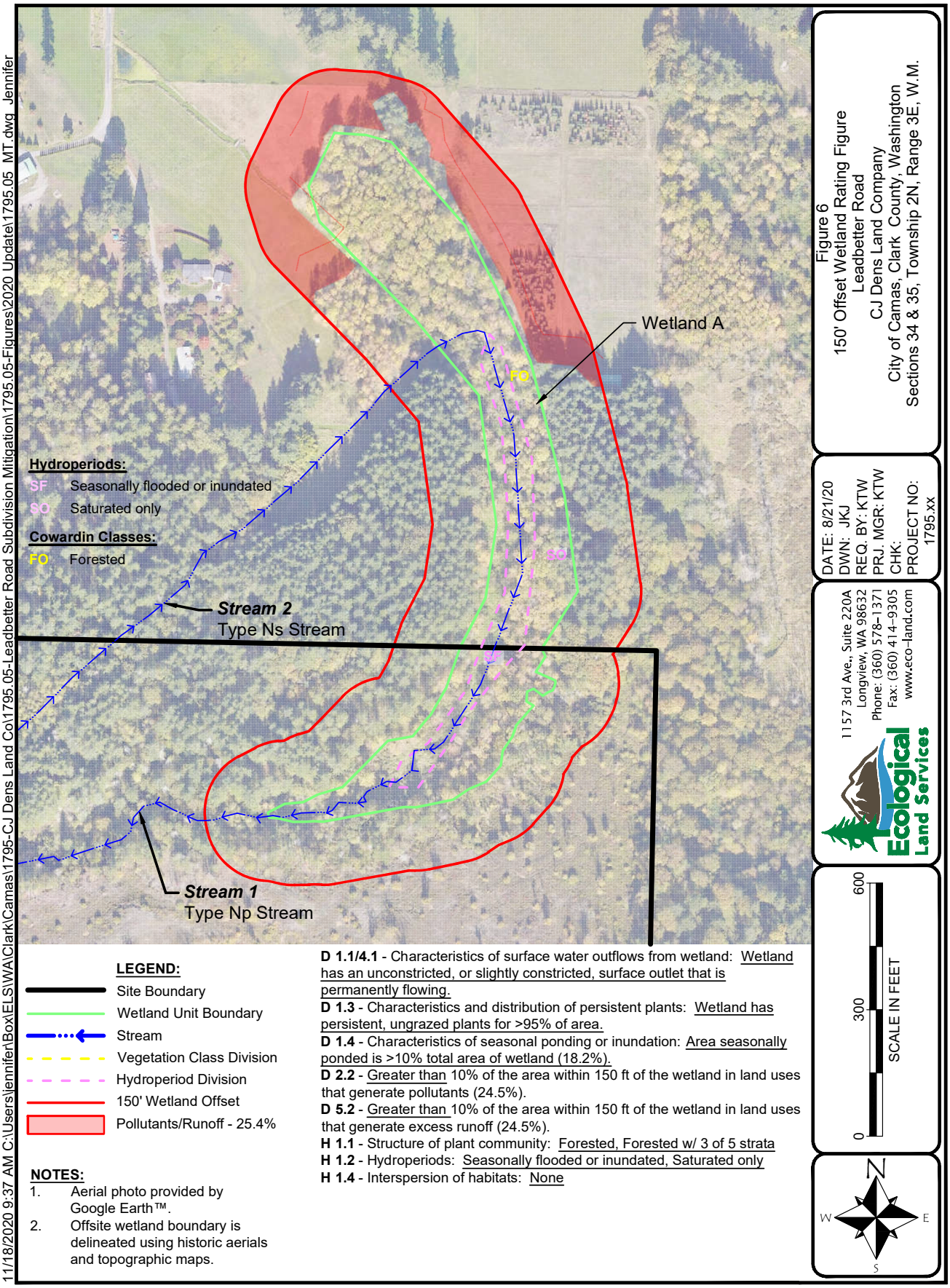
Wetland A
FO
SO
Hydroperiods:
SF Seasonally flooded or inundated
SO Saturated only
Cowardin Classes:
FO Forested
Stream 2
Type Ns Stream
Stream 1
Type Np Stream
LEGEND:
Site Boundary
Wetland Unit Boundary
Stream
Vegetation Class Division
Hydroperiod Division
150' Wetland Offset
Pollutants/Runoff - 25.4%
NOTES:
1. Aerial photo provided by Google Earth™.
2. Offsite wetland boundary is delineated using historic aerials and topographic maps.
D 1.1/4.1 - Characteristics of surface water outflows from wetland: Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing.
D 1.3 - Characteristics and distribution of persistent plants: Wetland has persistent, ungrazed plants for >95% of area.
D 1.4 - Characteristics of seasonal ponding or inundation: Area seasonally ponded is >10% total area of wetland (18.2%).
D 2.2 - Greater than 10% of the area within 150 ft of the wetland in land uses that generate pollutants (24.5%).
D 5.2 - Greater than 10% of the area within 150 ft of the wetland in land uses that generate excess runoff (24.5%).
H 1.1 - Structure of plant community: Forested, Forested w/ 3 of 5 strata
H 1.2 - Hydroperiods: Seasonally flooded or inundated, Saturated only
H 1.4 - Interspersion of habitats: None
Figure 6
150' Offset Wetland Rating Figure
Leadbetter Road
CJ Dens Land Company
City of Camas, Clark County, Washington
Sections 34 & 35, Township 2N, Range 3E, W.M.
DATE: 8/21/20
DWN: JKJ
REQ. BY: KTW
PRJ. MGR: KTW
CHK:
PROJECT NO: 1795.xx
1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305
www.eco-land.com
Ecological Land Services
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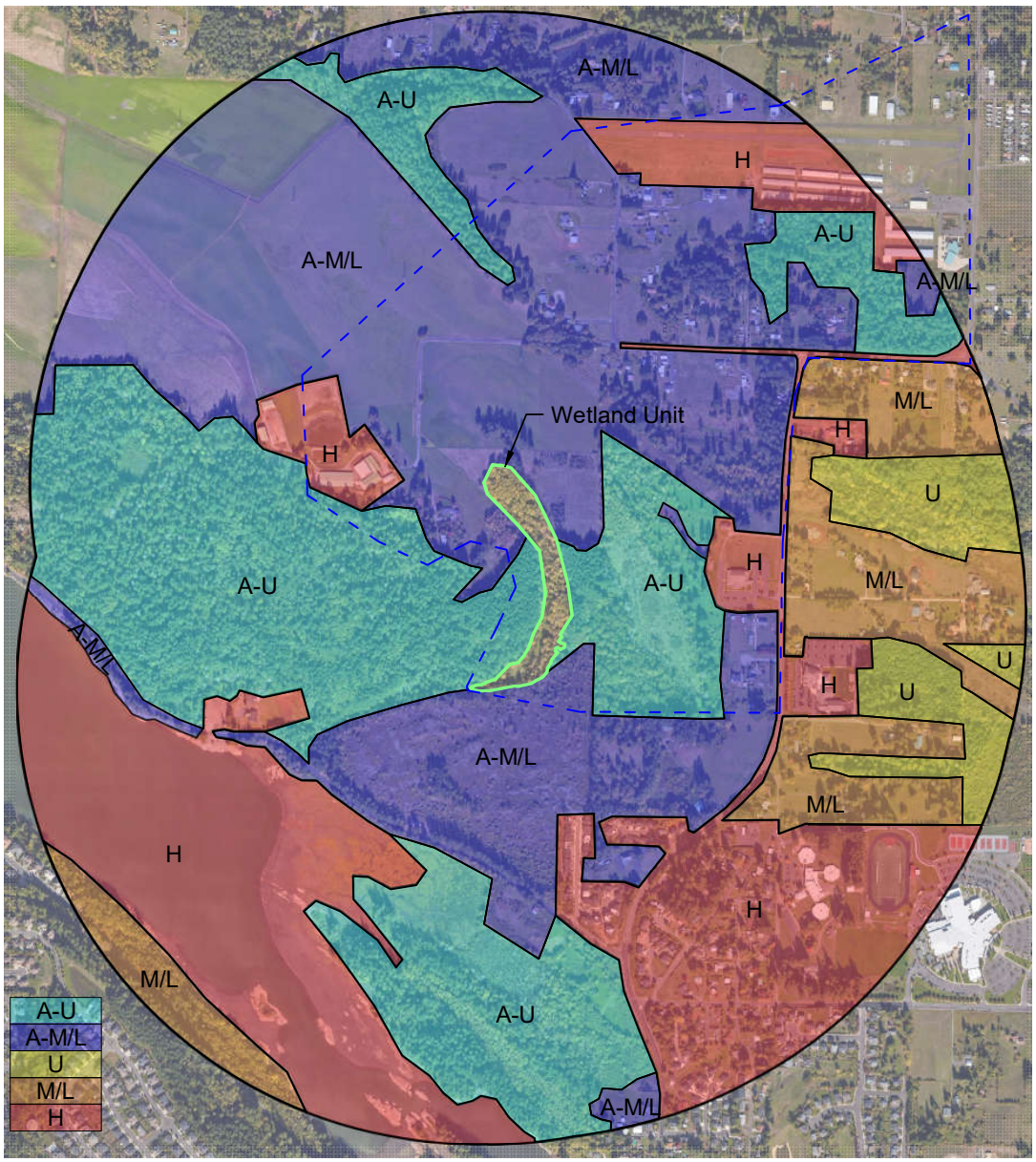

Figure 7
1 KM Offset Wetland Rating Figure
Leadbetter Road
CJ Dens Land Company
City of Camas, Clark County, Washington
Sections 34 & 35, Township 2N, Range 3E, W.M.

DATE: 8/21/20
DWN: JKJ
REQ. BY: KTW
PRJ. MGR: KTW
CHK:
PROJECT NO: 1795.xx

1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305
www.eco-land.com
Ecological Land Services

SCALE IN FEET
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1200
2400

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W
E
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NOTE: Aerial photo provided by Google Earth™.

LEGEND:

- Wetland Unit Boundary
- Contributing Basin 37x area of wetland

H2.1 Accessible Habitat

- A-U — A-U (25.3%)
- A-M/L — A-M/L (37.1%)

H2.2 Undisturbed Habitat

- U — U (3.6%)
- M/L — M/L (8.6%)

H2.3 Land Use Intensity

- H — H (25.3%)

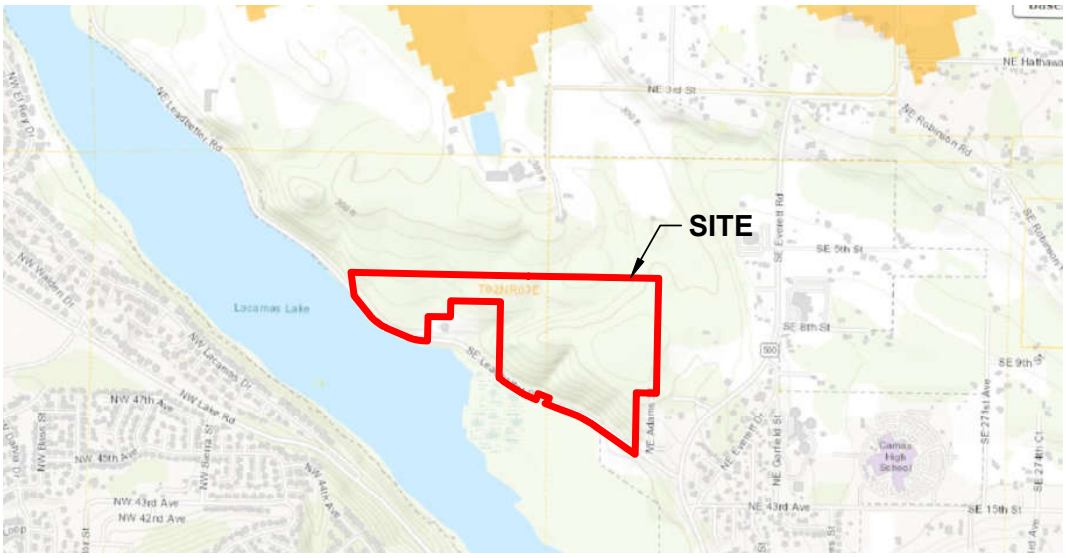
D 4.3 - The area of the basin in 10 to 100 times the area of the unit (37x).
D 5.3 - Less than 25% of the contributing basin covered with intensive human land uses (14%).
H 2.1 - Accessible habitat is > ⅓ (33.3%) of 1 km Polygon (43.9%).
H 2.2 - Undisturbed habitat > 50% of Polygon (51.8%).
H 2.3 - ≤ 50% of 1 km Polygon is high intensity land use (25.3%).

H 2.1. Accessible Habitat Equation

25.3% A-U habitat + [(**37.1%** A-M/L intensity land uses)/2] **18.6%** = **43.9%**

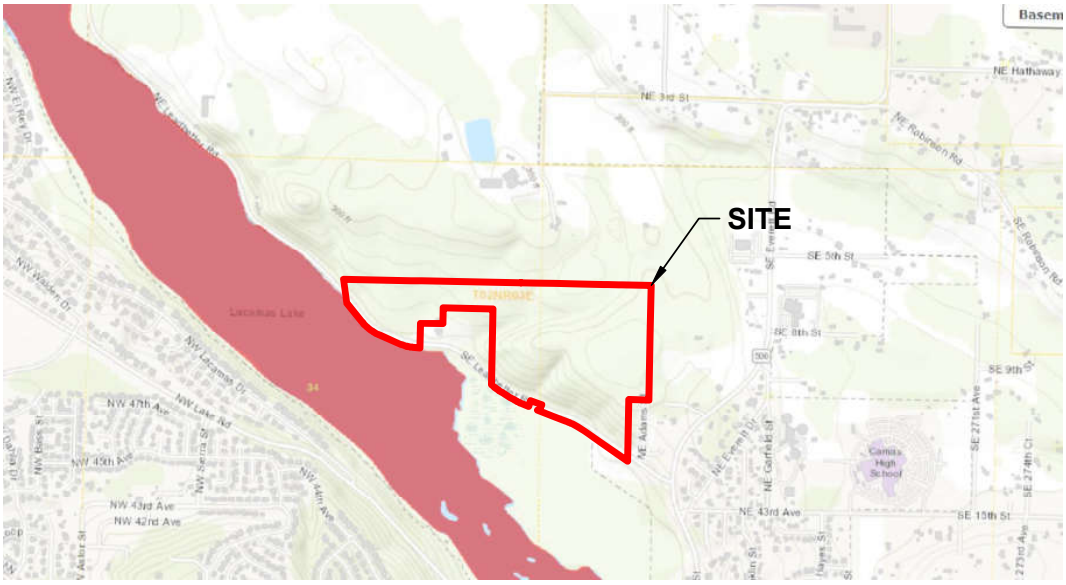
H 2.2. Total Undisturbed Habitat Equation

25.3% A-U + **3.6%** U habitat + [(**37.1%** A-M/L + **8.6%** M/L land uses)/2] **22.9%** = **51.8%**



WQ Improvement Projects

- Approved
- In Development



Assessed Waters/Sediment

Water	Sediment
Category 5 - 303d	Category 5 - 303d
Category 4C	Category 4C
Category 4B	Category 4B
Category 4A	Category 4A
Category 2	Category 2
Category 1	Category 1

NOTE(S):

1. Map provided on-line by Washington State Department of Ecology at web address: *https://fortress.wa.gov/ecy/waterqualityatlas/map.aspx?*

Figure 8
303(d) Listed Waters and TMDLs Maps
Leadbetter Road
CJ Dens Land Company
City of Camas, Clark County, Washington
Sections 34 & 35, Township 2N, Range 3E, W.M.

DATE: 10/31/20
DWN: JKJ
REQ. BY: KTW
PRJ. MGR: KTW
CHK:
PROJECT NO: 1795.xx

1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305
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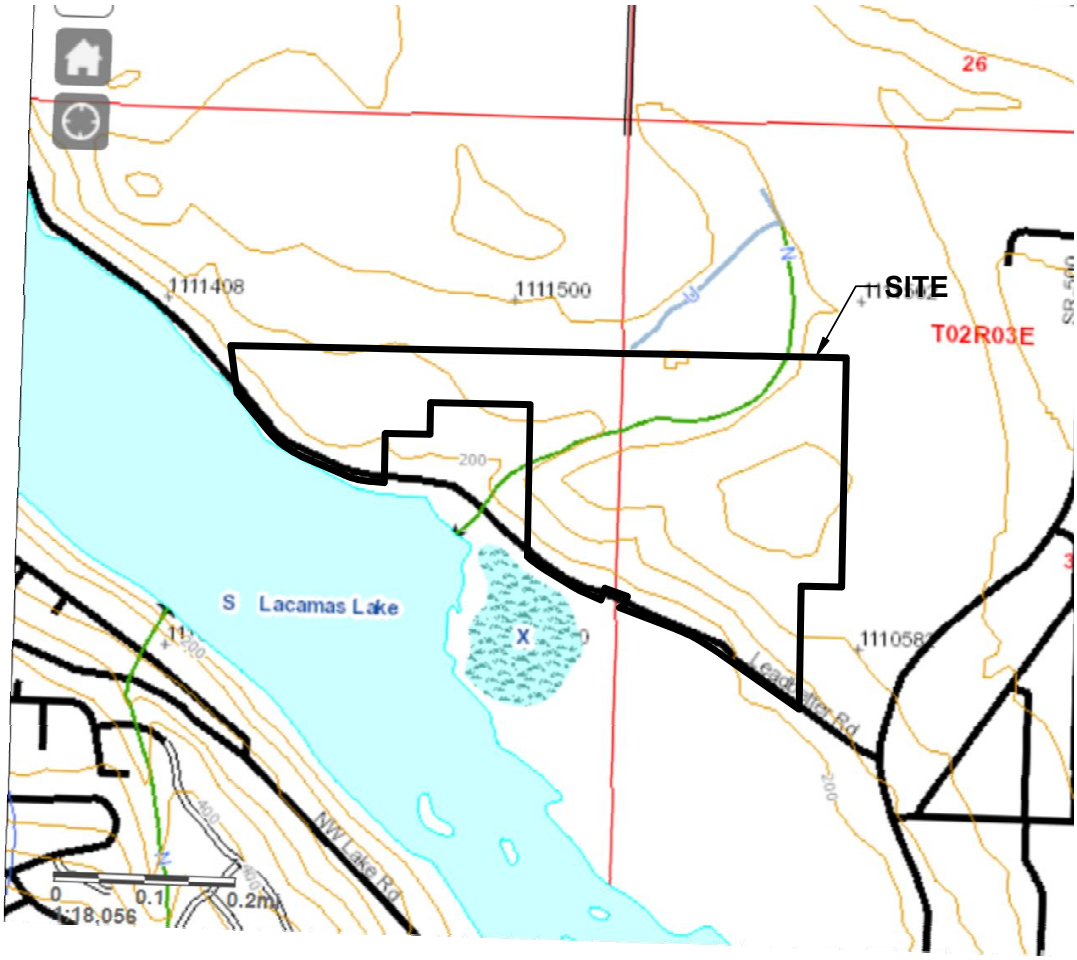

Mapped streams indicated onsite by the Washington State Department of Natural Resources (DNR).

LEGEND:

Site Boundary

Streams

Streams

- Type S
- Type F
- Type N, Np, Ns
- U, unknown
- X, non-typed per WAC 222-16

NOTE: Map provided online by Washington State Department of Natural Resources at web address: *https://fortress.wa.gov/dnr/protectiongis/fpamt/index.html*

Figure 9
DNR Stream Type Map
Leadbetter Road
CJ Dens Land Company
City of Camas, Clark County, Washington
Sections 34 & 35, Township 2N, Range 3E, W.M.

DATE: 11/17/20
DWN: JKJ
REQ. BY: KTW
PRJ. MGR: KTW
CHK:
PROJECT NO: 1795.xx

1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305
www.eco-land.com
Ecological Land Services

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SCALE IN FEET

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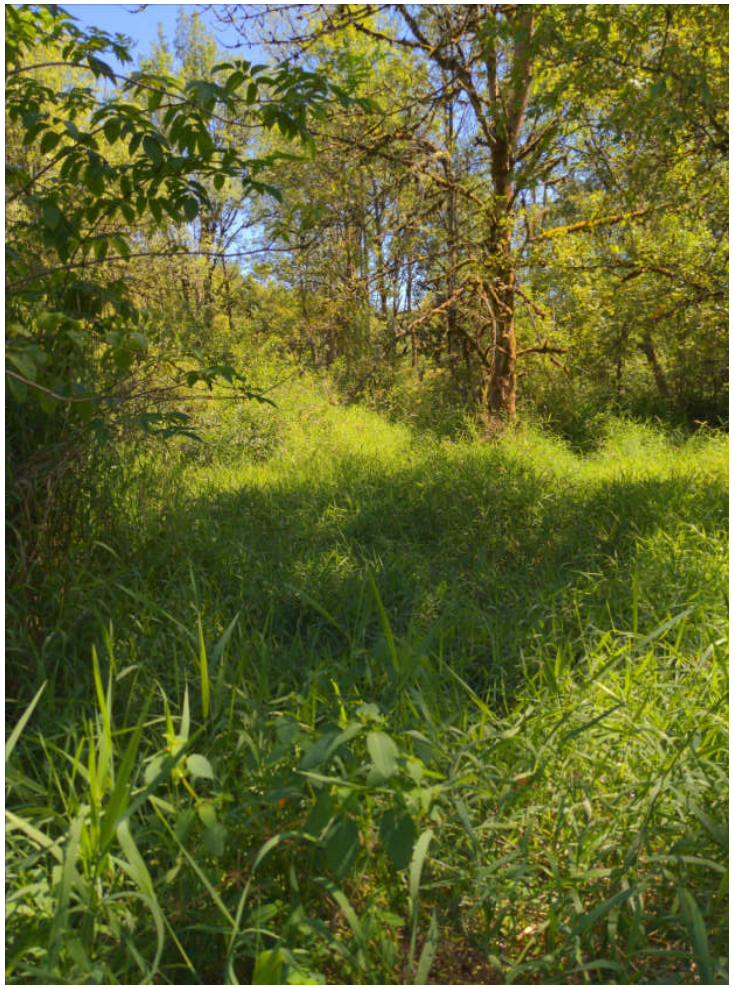


Photo 1. This photo depicts the portion of Wetland A that was added during the 2020 delineation. Facing east from the centerline of Stream 1.

Photo 2. Taken from near Stream 1 facing upstream to the northwest. The red arrows represent the steam with flow direction.

Ecological Land Services

1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305

DATE: 9/30/20
DWN: KT
PRJ. MGR: KT
PROJ.#: 1795.03

Photoplate 1
Site Photos
Leadbetter Road
Camas, Washington

APPENDIX A: WETLAND DETERMINATION DATA FORMS

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Leadbetter Road City/County: Lawson State: WA Sampling Date: Sampling Point: TP-1
Investigator(s): Section, Township, Range: 35, 2N, 3E
Terraces Local relief: Concave %
Subregion (LRR): Lat: 45.618 -122.411 Datum: NAD83
Lauren very gravelly loam, 0 to 8 percent slopes NWI classification: None
year? Yes☒ No☐ (If no, explain Remarks.)
☐, Soil☐, or Hydrology☐ ☒ No☐
☐, Soil☐, or Hydrology☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS **Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes ☒	No ☐	**Is the Sampled Area within a Wetland?** **Yes☒ No☐**
Hydric Soils Present?	Yes ☒	No ☐	
Wetland Hydrology Present?	Yes ☒	No ☐	

Remarks: This test plot was located in the northeastern portion of the site within Parcel #17817200. This wetland test plot was located along the northeastern boundary of Wetland A onsite. The vegetation in this test plot consisted of trees, scrub/shrub, herbaceous, and woody vine species. This test plot met all three wetland indicators with 100% hydrophytic vegetation, soils with a Redox Dark Surface (F6), and the presence of secondary hydrologic indicators; Drainage Patterns (B10), Geomorphic Position (D2), and a positive FAC-Neutral Test (D5).

VEGETATION (*Use scientific names*)

	Absolute % Cover	Dominant Species?	Indicator Status
(Plot size:30 ft radius)			
1. *Fraxinus latifolia*	40%	yes	FACW
2.	%		
3.	%		
4.	%		
Total Cover:	40%		
Sapling/Shrub Stratum (Plot size: 5 ft. radius)			
1. *Cornus sericea*	25%	yes	FACW
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	25%		
Herb Stratum (Plot size: 5 ft radius)			
1. *Phalaris arundinacea*	90%	yes	FACW
2.	%		
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
Total Cover:	90%		
(Plot size: 30 ft radius)			
1. *Rubus armeniacus*	15%	yes	FAC
2.	%		
Total Cover:	15%		

% Bare Ground in Herb Stratum %

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC 100 (A/B)

Prevalence Index worksheet

Total % Cover of:	Multiply by:
OBL species	
FACW species	
FAC species	=
FACU species	
UPL species	
Column Totals:	(B)

Prevalence Index = B/A=

Hydrophytic Vegetation Indicators:

☐ 1 Rapid Test for Hydrophytic Vegetation
☒ 2 Dominance Test is >50%
☐ 3 - Prevalence Index is 3.0[1]
☐ 4 - Morphological Adaptations (Provide supporting data In Remarks or on a separate sheet)
☐ Wetland Non-Vascular Plants
☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes☒ No☐**

Remarks: The hydrophytic vegetation criterion is met due to 100% of the dominant vegetation within the test plot having either OBL, FACW, or FAC indicator statuses.

Sampling Point: TP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type	Loc	Texture	Remarks
0-6	10YR 3/2	98%	10YR 4/6	2%	C	PL	silt loam	
6-15	10YR 3/1	93%	10YR 4/6	7%	C	PL	clay loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. Location: PL=Pore Lining, M=Matrix

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☒ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: ____

Depth (inches):

Hydric Soil Present? **Yes☒ No☐**

Remarks: The hydric soil indicator Redox Dark Surface (F6) was met due to a matrix value of 3 and a chroma of 1 with more than 2 percent redox concentrations found as soft masses.

HYDROLOGY

Wetland Hydrology Indicators:

condary Indicators
or more required)

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, & 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)
- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☒ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D4)

☐ No ☒ Depth (Inches):
☐ No ☒ Depth (Inches):
☐ No ☒ Depth (Inches):

Wetland Hydrology Present? **Yes ☒ No ☐**

aerial photos, previous inspections), if available:

The following secondary indicators were present within the t
utral Test (D5).

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Leadbetter Road City/County: Sampling Date:
Lawson State: WA Sampling Point: TP-2
Investigator(s): Section, Township, Range: 35, 2N, 3E
Terraces Local relief: Convex %
Subregion (LRR): Lat: 45.618 -122.410 Datum: NAD83
Lauren very gravelly loam, 0 to 8 percent slopes NWI classification: None
year? Yes☒ No☐ (If no, explain Remarks.)
☐, Soil☐, or Hydrology☐ ☒ No☐
☐, Soil☐, or Hydrology☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS **Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes ☐	No ☒	**Is the Sampled Area within a Wetland?** Yes☐ No☒
Hydric Soils Present?	Yes ☐	No ☒	
Wetland Hydrology Present?	Yes ☐	No ☒	

Remarks: This test plot was located in the northeastern portion of the site within Parcel #17817200. This upland test plot was located along the northeastern boundary of Wetland A onsite. The vegetation in this test plot consisted of trees, scrub/shrub, herbaceous, and woody vine species. This test plot did not meet any of the wetland indicators, therefore it does not meet the criteria of being wetland.

VEGETATION (*Use scientific names*)

	Absolute % Cover	Dominant Species?	Indicator Status
(Plot size:30 ft radius)			
1.	25%	yes	FACU
2.	%		
3.	%		
4.	%		
Total Cover:	25%		
Sapling/Shrub Stratum (Plot size: 5 ft. radius)			
1. *Acer macrophyllum*	20%	yes	FACU
2. Rubus spectabilis	10%	yes	FAC
3.	%		
4.	%		
5.	%		
Total Cover:	30%		
Herb Stratum (Plot size: 5 ft radius)			
1. *Rubus ursinus*	30%	yes	FACU
2. *Polystichum munitum*	20%	yes	FACU
3. *Phalaris arundinacea*	15%	no	FACW
4. *Scirpus microcarpus*	10%	no	OBL
5. *Pteridium aquilinum*	10%	no	FACU
6.	%		
7.	%		
8.	%		
Total Cover:	85%		
(Plot size: 30 ft radius)			
1. *Rubus armeniacus*	15%	yes	FAC
2.	%		
Total Cover:	15%		

% Bare Ground in Herb Stratum %

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC 33 (A/B)

Prevalence Index worksheet

Total % Cover of:	Multiply by:
OBL species	
FACW species	
FAC species	=
FACU species	
UPL species	
Column Totals:	(B)

Prevalence Index = B/A=

Hydrophytic Vegetation Indicators:

☐ 1 Rapid Test for Hydrophytic Vegetation
☐ 2 Dominance Test is >50%
☐ 3 - Prevalence Index is 3.0
☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
☐ Wetland Non-Vascular Plants
☐ Problematic Hydrophytic Vegetation (Explain)

Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes☐ No☒

Remarks: The hydrophytic vegetation criterion is NOT met due to only 33% of the dominant vegetation within the test plot having either OBL, FACW, or FAC indicator statuses.

Sampling Point: TP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type	Loc	Texture	Remarks
0-6	10YR 3/3	100%		%			loam	
6-15	10YR 3/3	50%		%			loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. Location: PL=Pore Lining, M=Matrix

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: ____

Depth (inches):

Hydric Soil Present? **Yes**☐ **No**☒

Remarks: There was no evidence of hydric soils within this test plot.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, & 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

condary Indicators
or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D4)

☐ No ☒ Depth (Inches):
☐ No ☒ Depth (Inches):
☐ No ☒ Depth (Inches):

Wetland Hydrology Present? **Yes** ☐ **No** ☒

APPENDIX B: WETLAND RATING FORM

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Wetland A Date of site visit: August 10, 2020
Rated by KT Wills Trained by Ecology? Yes Date of training 9/2016
HGM Class used for rating Depressional Wetland has multiple HGM classes? X Y N

NOTE: **Form is not complete without the figures requested** *(figures can be combined)*.
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions X or special characteristics)

1. Category of wetland based on FUNCTIONS

_____**Category I** – Total score = 23 – 27
_____**Category II** – Total score = 20 – 22
X **Category III** – Total score = 16 – 19
_____**Category IV** – Total score = 9 – 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	TOTAL
	Circle the appropriate ratings			
Site Potential	H (M) L	H M (L)	H M (L)	
Landscape Potential	H (M) L	H (M) L	(H) M L	
Value	(H) M L	H M (L)	(H) M L	
Score Based on Ratings	**7**	**4**	**7**	**18**

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	I II
Wetland of High Conservation Value	I
Bog	I
Mature Forest	I
Old Growth Forest	I
Coastal Lagoon	I II
Interdunal	I II III IV
None of the above	(N/A)

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

1 km Polygon: Area that extends 1 km from entire wetland edge - including	I 2.1, H 2.2, H 2.3	4

Riverine Wetlands

Ponded depressions	1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	2.4	
Plant cover of trees, shrubs, and herbaceous plants	1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	4.1	
Map of the contributing basin	2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	I 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	3.2, R 3.3	

Lake Fringe Wetlands

Map of:	o answer questions:	re #
Cowardin plant classes	1.1, L 4.1, H 1.1, H 1.4	
polygons for accessible habitat and undisturbed habitat		

Slope Wetlands

can be added to figure above)		

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

(NO – go to 2) **YES** – the wetland class is **Tidal Fringe** – go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**

*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

(NO – go to 3) **YES** – The wetland class is **Flats**

*If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?

___The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;

___At least 30% of the open water area is deeper than 6.6 ft (2 m).

(NO – go to 4) **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?

_X_The wetland is on a slope (*slope can be very gradual*),

_X_The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,

___The water leaves the wetland **without being impounded**.

(NO – go to 5) **YES –** The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?

____The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,

___The overbank flooding occurs at least once every 2 years.

NO – go to 6 **YES** – The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
within boundary of depression	
class of freshwater wetland	ESTUARINE

*If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.*

Water Quality Functions - Indicators that the site functions to improve water quality	
D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1	**1**
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions).* Yes = 4 No = 0	
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area points = 5 Wetland has persistent, ungrazed, plants > ½ of area points = 3 Wetland has persistent, ungrazed plants > 1/10 of area points = 1 Wetland has persistent, ungrazed plants < 1/10 of area points = 0	**5**
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	**0**
Total for D 1 Add the points in the boxes above	**5**

Rating of Site Potential If score is: ___**12-16 = H** __**X**__**6-11 = M** ___**0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	**0**
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	**1**
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 0	**0**
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source Yes = 1 No = 0	**0**
Total for D 2 Add the points in the boxes above	**1**

Rating of Landscape Potential If score is: ___**3 or 4 = H** __**X**__**1 or 2 = M** ___**0 = L** *Record the rating on the first page*

D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	**1**
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2 No = 0	**0**
Total for D 3 Add the points in the boxes above	

Rating of Value If score is: __**X**__**2-4 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) points = 4 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet points = 2 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch points = 1 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 0	**0**
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 The wetland is a "headwater" wetland points = 3 Wetland is flat but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 in) points = 0	**0**
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 Entire wetland is in the Flats class points = 5	**3**
Total for D 4 Add the points in the boxes above	3

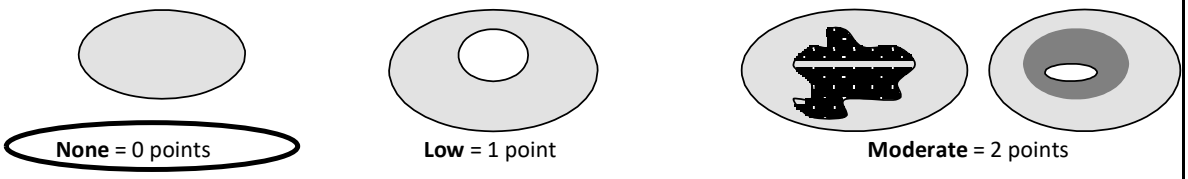
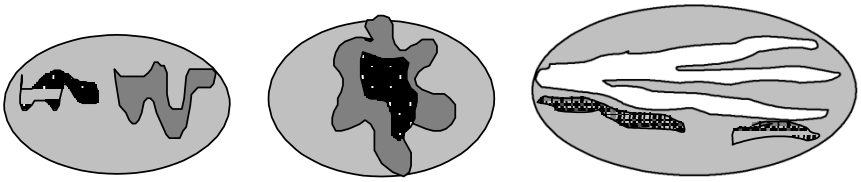
Rating of Site Potential If score is: **___12-16 = H ___6-11 = M __X__0-5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0	**0**
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1 No = 0	**0**
Total for D 5 Add the points in the boxes above	1

Rating of Landscape Potential If score is: **___3 = H __X__1 or 2 = M ___0 = L** *Record the rating on the first page*

[illegible]	
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): • Flooding occurs in a sub-basin that is immediately down-gradient of unit. points = 2 • Surface flooding problems are in a sub-basin farther down-gradient. points = 1 Flooding from groundwater is an issue in the sub-basin. points = 1 The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* _____ points = 0 There are no problems with flooding downstream of the wetland. points = 0	**0**
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan?	**0**
Total for D 6 Add the points in the boxes above	

Rating of Value If score is: **___2-4 = H ___1 = M __X__0 = L** *Record the rating on the first page*

- Indicators that site functions to provide important habitat	
H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.* ____Aquatic bed — 4 structures or more: points = 4 ____Emergent — 3 structures: points = 2 ____Scrub-shrub (areas where shrubs have > 30% cover) — 2 structures: points = 1 __X__Forested (areas where trees have > 30% cover) — 1 structure: points = 0 *If the unit has a Forested class, check if:* __X__The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	**1**
H 1.2. Hydroperiods Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*). ____Permanently flooded or inundated — 4 or more types present: points = 3 __X__Seasonally flooded or inundated — 3 types present: points = 2 ____Occasionally flooded or inundated — 2 types present: points = 1 __X__Saturated only — 1 type present: points = 0 ____Permanently flowing stream or river in, or adjacent to, the wetland ____Seasonally flowing stream in, or adjacent to, the wetland ____**Lake Fringe wetland** — **2 points** ____**Freshwater tidal wetland** — **2 points**	**1**
H 1.3. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold and you do not have to name the species.* ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle*** If you counted: > 19 species — points = 2 5 - 19 species — points = 1 < 5 species — points = 0	**2**
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **HIGH** = 3points 	**0**

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* __X__Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long). __X__Standing snags (dbh > 4 in) within the wetland ____Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet weathered where wood is exposed)* ____At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)* ____Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	**2**
Total for H 1 Add the points in the boxes above	**6**

Rating of Site Potential If score is:___**15-18 = H** ___**7-14 = M** __**X**__**0-6 = L** *Record the rating on the first page*

H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat25.3**+**[(% moderate and low intensity land uses)37.1/2]18.55 **= 43.85**% If total accessible habitat is: > 1/3 (33.3%) of 1 km Polygon points = 3 20-33% of 1 km Polygon points = 2 10-19% of 1 km Polygon points = 1 < 10% of 1 km Polygon points = 0	**3**
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* % undisturbed habitat28.9**+**[(% moderate and low intensity land uses)45.7/2]22.85**= 51.75**% Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10-50% and in 1-3 patches points = 2 Undisturbed habitat 10-50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	**3**
H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 1 km Polygon is high intensity points = 0	**0**

Rating of Landscape Potential If score is: __**X**__**4-6 = H** ___**1-3 = M** ___**< 1 = L** *Record the rating on the first page*

H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: points = 2 X It has 3 or more priority habitats within 100 m (see next page) — It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) — It is mapped as a location for an individual WDFW priority species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats (listed on next page) within 100 m points = 1 Site does not meet any of the criteria above points = 0	**2**

Rating of Value If score is: __**X**__**2 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE:*** *This question is independent of the land use between the wetland unit and the priority habitat.*

____**Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

____**Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

____**Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

____**Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

____**Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

__X__**Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

____**Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

__X__**Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

____**Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*

____**Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

____**Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

____**Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

__X__**Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	egory
SC 1.0. Estuarine wetlands Does the wetland meet the following criteria for Estuarine wetlands? — The dominant water regime is tidal, — Vegetated, and — With a salinity greater than 0.5 ppt Yes –Go to **SC 1.1** (No= **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? Yes = **Category I** No - Go to **SC 1.2**	**Cat. I**
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina*, see page 25) — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? Yes **–** Go to **SC 2.2** (No – Go to **SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? Yes **= Category I** No **= Not a WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf Yes **– Contact WNHP/WDNR and go to SC 2.4** (No = **Not a WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? Yes **= Category I** No **= Not a WHCV**	**Cat. I**
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? Yes – Go to **SC 3.3** (No – Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? Yes – Go to **SC 3.3** (No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? Yes = **Is a Category I bog** No – Go to **SC 3.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? Yes = **Is a Category I bog** No **= Is not a bog**	**Cat. I**

SC 4.0. Forested Wetlands Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.*** — **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more. — **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm). Yes = **Category I** No = **Not a forested wetland for this section**	**Cat. I**
SC 5.0. Wetlands in Coastal Lagoons Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? — The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks — The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* Yes – Go to **SC 5.1** No = **Not a wetland in a coastal lagoon** SC 5.1. Does the wetland meet all of the following three conditions? — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100). — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland is larger than $^{1}/_{10}$ ac (4350 ft^2) Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 6.0. Interdunal Wetlands Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.*** In practical terms that means the following geographic areas: — Long Beach Peninsula: Lands west of SR 103 — Grayland-Westport: Lands west of SR 105 — Ocean Shores-Copalis: Lands west of SR 115 and SR 109 Yes – Go to **SC 6.1** No = **not an interdunal wetland for rating** SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? Yes = **Category I** No – Go to **SC 6.2** SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger? Yes = **Category II** No – Go to **SC 6.3** SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac? Yes = **Category III** No = **Category IV**	**Cat I** **Cat. II** **Cat. III** **Cat. IV**
If you answered No for all types, enter "Not Applicable" on Summary Form	N/A

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HARTCROWSER
A division of Haley & Aldrich

MEMORANDUM

DATE: November 23, 2020

TO: CJ Dens Lacamas I, LLC
Attention: Mr. Carl Lawson

FROM: Daniel J. Trisler, PE
Russell Rosenberg, GIT

RE: **Geotechnical Report Addendum #1 - Supplemental Design Support**
CJ Dens East Subdivision – Leadbetter Road
Camas, Washington
15948-02

CC: AKS Engineering & Forestry – John Meier, PE

Hart Crowser, a division of Haley & Aldrich, Inc., is pleased to submit this addendum to CJ Dens Lacamas I, LLC (CJ Dens) summarizing our updated geotechnical findings and recommendations, as applicable, for the CJ Dens East Subdivision in Camas, Washington. This memorandum and all attachments supersede or should be considered supplemental to our geotechnical report titled "Report of Geotechnical Engineering Services, CJ Dens Subdivision, Camas, Washington," dated July 6, 2016 (Geotechnical Report).

Our specific scope of work for the addendum was detailed in our contract change agreement with you, dated August 24, 2020, and generally included reviewing the updated development (grading) plans, reviewing our past reports, reviewing supplemental test pit explorations completed in November 2017, conducting limited geotechnical analysis to evaluate rock slope stability, and preparing this addendum summarizing our findings and any updated recommendations.

Amended or updated sections from the Geotechnical Report are shown with the relevant section numbers. The header titles for new sections are numbered and underlined.

We updated figures from the Geotechnical Report and added a new figure showing the depth to rock across the site. These updated figures are attached. We have also updated Attachment A-1 providing logs of explorations completed in 2015 and Attachment A-2 providing logs of explorations completed on the site since 2016. Attachment A-2 includes new explorations (TP-43 to TP-114) not included in the Geotechnical Report. All supplemental explorations in Attachment A-2 were completed using the procedures outline in Appendix A of the Geotechnical Report for TP-1 to TP-22.

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Vancouver, Washington 98660-2927
360.448.4189

We note that this update does not address the portion of the original development that was designated Phase II and was generally located in the northern and western portions of the site. The area was addressed in a geotechnical report titled "Report of Geotechnical Engineering Services, CJ Dens Subdivision (Phase II), Camas, Washington," dated July 31, 2017.

2.0 Project Description

We understand that since the Geotechnical Report was prepared, the northwest portion of the original property, or the former "Phase II" area of the project has been sold and is no longer part of the project, as shown on Figure 1. Therefore, we understand the currently proposed development to consist of approximately 200 lots on the remaining eastern portion of original property.

As stated in our original report, we understand that conventional one- to three-story, single-family residences supported on shallow foundations will be constructed on each lot. We anticipate the buildings will be constructed with wood frames and will be relatively lightly loaded with strip loads up to 2.5 kips per lineal foot and column loads of 75 kips.

Infrastructure, such as roadways and utilities, will also be constructed. We understand that mass cuts and fills of up to approximately 20 feet deep will be required for site grading. Finished cut and fill slopes up to approximately 40 feet tall will be created by this mass earthwork. Figure 3 shows preliminary mass grading for the development.

4.1 Geologic and Soils Mapping

In additional to the geologic and soils mapping described in *Section 4.1* of the Geotechnical Report, we further reviewed the available geologic mapping (Evarts and O'Connor 2008) for orientation measurements of the basaltic andesite and/or volcaniclastic rocks. No orientation data were available within the project area; however, rock attitude measurements in the basaltic andesite closer to the Washougal River indicate a generally 15- to 30-degree dip to the southeast within the basaltic andesite to the southeast of the site.

4.3 Subsurface Conditions

The following material completely replaces *Section 4.3* of the Geotechnical Report.

4.3.1 General

Soil and rock conditions interpreted from geologic maps and our explorations, in conjunction with soil and rock properties inferred from field observations and laboratory tests, formed the basis for the conclusions and recommendations in this report. Test pit locations relative to the existing and proposed site plans are shown on Figures 2 and 3, and the depth to bedrock encountered in each test pit is shown

on Figure 4. Appendix A describes our field exploration procedures and presents field data and logs. Appendix B (not replicated herein) describes our laboratory soil testing procedures and results.

We completed exploration of the site by observing the advancement of 102 test pits to depths ranging from approximately zero feet bgs (refusal on strong bedrock at the surface) to 15 feet bgs. Nine test pits, designated TP-1a through TP-9a were completed on November 23, 2015, 22 test pits, designated TP-1 through TP-22, were completed on May 27, 2016, and 71 tests pits, designated TP-43 to TP-114 were completed between October 26 and 30, 2017. Additional test pit and hand auger explorations were completed within the former Phase II area of the project in 2016 and 2017; however, we do not discuss them further or include logs of these explorations in this memorandum.

The project area is typically mantled with colluvium and residual soil overlying moderately weathered to fresh basaltic andesite and slightly weathered to highly weathered volcaniclastic breccia to the maximum depths explored. Soil thickness (or depth to bedrock in feet bgs) ranged from approximately 0 to 13 feet. The average soil thickness for the site was approximately 2.6 feet. Most of the site consists of upland and mild hillslope areas, which typically had thin soil thicknesses of approximately 0 to 4 feet, with occasional areas of up to approximately 6 feet of soil and up to approximately 7.8 feet of soil at TP-1. Soil thickness within drainages and on, or at the base, of taller slopes was greater and typically ranged from approximately 4 to 9 feet and was up to 13 feet. The most consistent areas of thicker soil cover were encountered in northeast and southern portions of the property. Descriptions of the soil and rock units encountered are provided below.

4.3.2 Soil and Rock Conditions

4.3.2.1 Colluvium

Colluvium was encountered on or at the bottom of hillslopes at the site and is interpreted as slope wash deposits. The colluvium consisted of silty sand, sandy silt, silt with sand, elastic silt and lean clay with sand with varying percentages of fine, subrounded to subangular gravel. Colluvium up to 12 feet thick was encountered in test pit TP-8, but typically ranged from approximately 1 to 5 feet thick and was thicker at the bottom of slopes. The colluvium was typically covered with approximately 6 to 12 inches of rooted topsoil. Based on the backhoe action and pocket penetrometer tests in the sidewalls of the excavations, we estimate the consistency of the fine-grained colluvium to be soft to medium stiff and the relative density of the coarse-grained colluvium to be loose to medium dense.

Moisture contents in the colluvium varied from approximately 25 to 42 percent based on 12 tests. Atterberg limit testing was conducted on two samples of fine-grained colluvium yielding liquid limits of 43 to 48 and plastic limits of 23 to 34 indicating silt to lean clay soil classifications.

4.3.2.2 Residual Soil

Materials interpreted as residual soil consisting of silty sand, sandy silt, and lean clay with varying percentages of sand and fine gravel was encountered at the surface or underlying colluvium at the site. Residual soils are completely weathered and decomposed in-place bedrock that has experienced minimal transport by water or other means. Residual soil was encountered at the ground surface in most of our explorations but was encountered underlying colluvium at depths ranging from approximately 4 to 12 feet bgs in test pits TP-1a, TP-5a, TP-6a, TP-8, and TP-14. The residual soil extends to the maximum depths explored in test pit TP-8 (13 feet bgs), TP-83 (11 feet bgs), TP-84 (10 feet bgs), TP-85 (10 feet bgs), and TP-108 (10 feet bgs). Based on the backhoe action during test pit excavation, we estimate the consistency of the fine-grained residual soil is soft to very stiff and the relative density of the coarse-grained residual soil is loose to dense.

Moisture contents in the residual soil varied from 20 to 38 percent based on six tests. Atterberg limits testing was conducted on two samples of fine-grained residual soil yielding liquid limits of 46 to 49 and plastic limits of 26 to 31 indicating a soil classification of silt.

4.3.2.3 Oligocene Basaltic Andesite of Elkhorn Mountain

Bedrock interpreted as Oligocene-age Basaltic Andesite of Elkhorn Mountain was observed in numerous outcrops across the site and was encountered in most of our test pits either near the surface or at depths of up to approximately 8 feet bgs. The basaltic andesite varied from fresh to highly weathered, moderately weak to strong (R2-R4), with closely to moderately spaced fractures. The basaltic andesite was typically rippable with a toothed bucket to between 1 to 2 feet below top of rock with moderate effort; however, in approximately 40 test pits less than approximately 0.5 feet from the top of the basaltic andesite was rippable. Moisture contents in the basaltic andesite varied 9.0 to 9.4 percent based on two tests.

4.3.2.4 Oligocene Volcaniclastic Sedimentary Rock

Volcaniclastic breccia, interpreted as Oligocene-age Volcaniclastic Sedimentary Rock, was encountered at depths ranging from approximately 3 to 13 feet bgs in test pits TP-1a through TP-6a, TP-9a, TP-6, TP-7, TP-19, and TP-20. Volcaniclastic breccia was encountered in the northwest and southern limits of our explorations and stratigraphically underlies the basaltic andesite; no outcrops of volcaniclastic breccia were observed at the surface during our explorations. The breccia consists of angular, medium sand to coarse gravel-sized fragments of igneous rocks in a weakly-cemented, fine-grained matrix. The breccia was typically moderately to highly weathered, thin-bedded, gray-brown to red-brown, and very weak to moderately weak (R1-R2), with closely spaced fractures. The breccia was typically rippable to at least 1 foot below top of rock with minimal effort.

We did not directly observe the contact between the basaltic andesite and the volcaniclastic rocks during our explorations and reconnaissance and were therefore unable to measure the orientation directly. However, based on the elevations where we encountered the top of the volcaniclastic rock, we anticipate the contact between the overlying basaltic andesite to be either relatively flat lying or up to approximately 5 to 6 degrees (approximately 10 percent) with a south to southeast dip direction.

4.3.3 Groundwater

Subsurface water seepage was encountered in test pit TP-1 at a depth of approximately 7.5 feet bgs, and in TP-52 at approximately 6.4 feet bgs. No other test pits encountered seepage during our explorations. Based on local well logs that are primarily screened in the basaltic andesite and volcaniclastic breccia, we anticipate regional groundwater levels to be approximately 50 to 100 feet bgs at the site. We anticipate shallowly infiltrating precipitation and surface runoff can become perched within the upper soils at the site during the wetter months of the year and may approach the ground surface during periods of heavy rain.

4.3.4 Limitations

The subsurface information used for this study represents conditions at discrete locations within the project site. Actual conditions in other areas could vary. The nature and extent of any variations in subsurface conditions may not become evident until construction begins. If significant variations are observed at that time, we may need to modify our conclusions and recommendations accordingly to reflect actual site conditions.

7.4 Retaining Structures

In addition to the wall systems discussed in the Geotechnical Report , we understand that gabion baskets/cribbing may be used as facing for MSE walls. In this case, the design recommendations from *Section 7.4.2 MSE Wall Design Parameters* of the Geotechnical Report remain valid.

Gabion facing should meet the specifications provided in Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge, and Municipal Construction (WSS) WSS 8-24.3(3) – Gabion Cribbing and be filled with stone meeting the specifications provided in WSS 9-27.3(6) - Stone or alternative materials as discussed below in *Gabion Fill and Construction.*

8.0 Earthwork Recommendations

The following presents supplemental recommendations in addition to those described in *Section 8.0* of the Geotechnical Report.

8.3.1 Rock Excavations and Cuts

In addition to the general earthwork and excavation recommendations provided in *Sections 8.0* and *8.3* of the Geotechnical Report, the following specific considerations may be necessary for excavations and cuts into bedrock. We note that the two bedrock materials encountered at the site, basaltic andesite, that are pervasive throughout most of the site and volcaniclastic sedimentary rock that is in the southern and far northern portion of the site will behave very differently from one another. The basaltic andesite will typical be represented by a hard basalt bedrock; whereas, the volcaniclastic sedimentary rock will act more like a stiff soil. The following discussion primarily relates to the basaltic andesite, except where specifically noted.

8.3.1.1 Rock Excavation

The basaltic andesite bedrock is hard and expected to be very difficult to excavate. During excavation of test pits TP-43 to TP-114 with a relatively large excavator (roughly 45,000-pound Komatsu PC-200), the excavator could only rip 0.5 to 2 feet into the rock. We anticipate the rock will not be easily excavated beyond this upper surface, and that large dozers with rippers, rock hammers and blasting will be required to excavate the rock below those depths.

The volcaniclastic rocks are generally very weak and are expected to be minimally to moderately difficult to excavate. During excavation of test pits TP-1a to TP-9a with a medium-sized, steel-track excavator, the excavator encountered refusal at some, but not all, of the test pit sites after ripping approximately 0.5 to 3 feet into the rock. However, minimal effort was required in other test pits. We anticipate that in some locations, large dozers with rippers may be required to excavate this unit below several feet.

8.3.1.2 Permanent Rock Cuts

Based on our understanding of the subsurface conditions and review of the preliminary grading plans, which shows cuts at a 2 horizontal to 1 vertical (2H:1V) inclination, proposed permanent cuts into bedrock at that inclination will be globally stable and will be suitable for construction according to the proposed plans and the recommendations in this report. We also anticipate that steeper permanent cuts into basaltic andesite bedrock, up to near vertical, may be globally stable. However, steeper cuts should be evaluated on a case-by-case basis to verify their global stability, but also to evaluate local stability (e.g., rockfall hazard). Furthermore, non-geotechnical considerations, such as trip-and-fall hazards, maintenance access, etc. should also be evaluated by the project team in concert with Hart Crowser.

For planning purposes, it is reasonable to assume that from a geotechnical perspective permanent cuts up to 1H:1V are globally stable when excavated into basaltic andesite bedrock. However, permanent cuts into bedrock that are steeper than 2H:1V may locally expose areas of lower quality rock, which could require additional reinforcement, such as rock bolting, and should be evaluated on a case-by-case basis. Additionally, refer to *Section 8.3.1.4 Volcaniclastic Sedimentary Rock Excavations* for discussion regarding cuts in the southeast portion of the site (near Lots #149 to #153), where the basaltic andesite bedrock may not be encountered.

8.3.1.3 Temporary Rock Cuts

Temporary cuts into basaltic andesite bedrock that will be permanently buttressed by retaining walls (e.g., houses with daylight basements) are likely to be stable at inclinations ranging from 1H:1V to near vertical. However, the stability of such cuts should be evaluated on a case-by-case basis during construction.

For planning purposes, it is reasonable to assume that from a geotechnical perspective temporary cuts up to 1/2H:1V are globally stable when excavated into basaltic andesite bedrock.

8.3.1.4 Volcaniclastic Sedimentary Rock Excavations

If mass grading exposes the contact between the basaltic andesite and the underlying volcaniclastic rocks at an adverse (out of slope) orientation, then these cuts may have the potential for global instability and should be further evaluated by Hart Crowser. Based on our subsurface explorations and review of the most recent proposed grading plan (Figure 3), most of the project area is unlikely to encounter this condition; however, as outlined above in our addendum to *Section 4.3.2.4 Oligocene Volcaniclastic Sedimentary Rock*, we anticipate the contact between the basaltic andesite and the underlying volcaniclastic rocks to be either relatively flat lying or up to approximately 5 to 6 degrees (approximately 10 percent) with a south to southeast dip direction, which has the potential to create adverse orientations within large cut slopes.

Specifically, we anticipate the potential for cuts to expose this stratigraphic condition near the south to southeast portion of the project area near lots #149 to #153 in cuts proposed to be generally 5 to 10 feet, but up to approximately 13 feet tall. Based on our explorations, the stratigraphic contact between the two geologic units also has the potential to be exposed near the north end of the (approximately lot #38 and northward); however, if exposed, we do not anticipate an adverse orientation in this location.

For planning purposes, we recommend permanent cuts in this area be kept at a 2H:1V inclination.

8.4.1 On-Site Soils and Bedrock Spoils

8.4.1.1 On-Site Soils

In general, the overburden native materials in the project area consist of fine-grained materials. During periods of dry weather, the native soils may be used as fill, provided they are properly moisture conditioned and oversized materials (greater than 6 inches) are removed.

We note that the *in situ* moisture contents of the site soils (colluvium and residual soil) varied from approximately 20 to 42 percent. The Atterberg limits of these same materials indicated liquid limits of 43 to 49 and plastic limits of 23 to 34. Some of the natural moisture contents were near the liquid limits, which would indicate the soil was too wet to place as fill, as it would tend to pump and rut. Therefore, regardless of the weather it may be necessary to dry the site soils prior to placing as fill. Also, during periods of wet weather, it will likely be infeasible to use the native soil as a structural fill. The earthwork contractor should plan accordingly.

8.4.1.2 On-Site Soils and Bedrock Spoils

Bedrock spoils from excavations may be used as structural fill, provided they are processed/crushed to a gradation appropriate for their planned use, per the WSS. We note that depending upon usage some changes to the WSS gradational tolerances may potentially be feasible if the design of the project element is adjusted to account for any changes. For example, if crushed rock larger than typically allowed for MSE backfill is used, then increased geogrid reinforcement strength may be required to account for greater installation damage. These sorts of the design changes based on the actual material gradations produced in the field will need to be evaluated on a case-by-case basis.

For use as general fill, bedrock materials should generally be processed to a well-graded crushed material with nominal sizes between 1 and 6 inches, and/or meeting the gradations of the materials described in S*ection 8.4.2 Imported Select Structural Fill* of the Geotechnical Report.

8.4.8 Gabion Fill and Construction

Gabion baskets for MSE wall facings should be constructed to meet the specifications of WSS 8-24.3(3) – Gabion Cribbing and should be filled with stone with a degradation factor of at least 30, a minimum fracture percentage of 75 percent and meet the gradation specifications provided in WSS 9-27.3(6) – Stone. The material should have nominal sizes between 4 and 8 inches. Additionally, the gabion baskets should be filled in lifts not exceeding 14 inches thick and following the general recommendations of *Section 8.5 Fill Placement and Compaction* of our original report. The unit weight of the filled gabion baskets must be at least 100 pounds per cubic foot (pcf) as described in WSS 8-24.3(3)F.

Other gradations of gabion rock may be acceptable provided that they meet the minimum unit weight noted above and are approved by our office. Special measures, such as separation fabrics, may be required to prevent the migration of fines, and sand- and gravel-sized particle.

Limitations

We have prepared this addendum for the exclusive use of CJ Dens Lacamas I, LLC and their authorized agents for the CJ Dens East Subdivision in Camas, Washington. This memorandum is intended to summarize our updated geotechnical findings and recommendations for the proposed subdivision based on additional explorations and analysis following our original report. However, conditions can vary between exploration locations and our conclusions should not be construed as a warranty or guarantee of subsurface conditions.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this memorandum was prepared. No warranty, express or implied, should be understood.

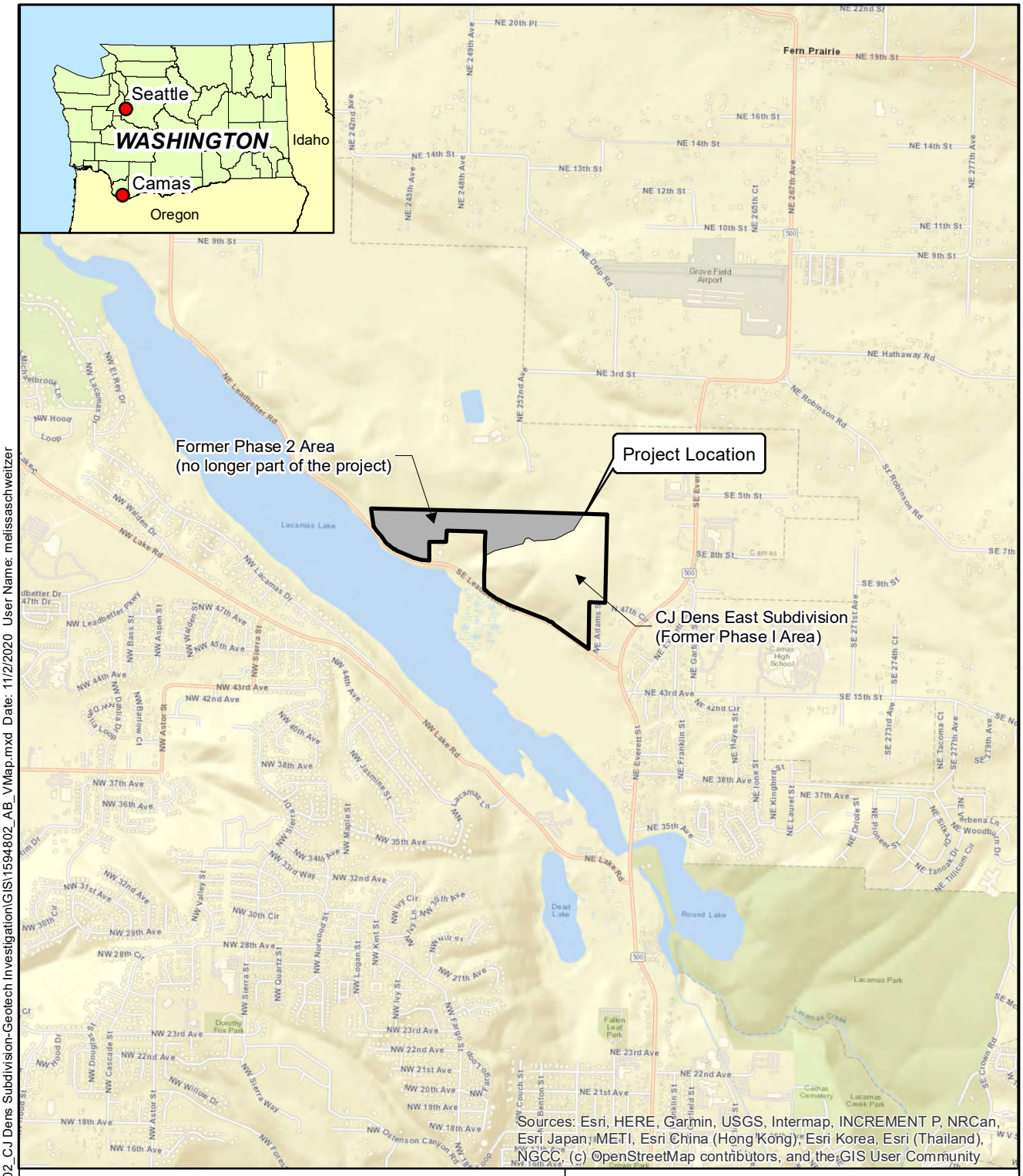
Any electronic form, facsimile, or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by Hart Crowser and will serve as the official document of record.

Attachments:
Figure 1 – Vicinity Map
Figure 2 – Existing Site Plan
Figure 3 – Proposed Site Plan
Figure 4 – Depth to Rock
Figure 5 – Generalized Subsurface Conditions Cross Section A-A’
Figure 6 – Generalized Subsurface Conditions Cross Section B-B’
Figure 7 – Generalized Subsurface Conditions Cross Section C-C’
Figure 8 – Typical Cut and Fill Slope Cross Section
Attachment A-1 – 2015 Field Explorations
Attachment A-2 – 2016 and later Field Explorations

References

Evarts, R.C. and J.E. O'Connor 2008. Geologic map of the Camas quadrangle, Clark County, Washington, and Multnomah County, Oregon: U.S. Geological Survey Scientific Investigations Map 3017, 31 p., 1:24,000 scale.

Washington State Department of Transportation (WSDOT) 2020. *Standard Specifications for Road, Bridge, and Municipal Construction*, Publication M 41-10.



0 1,000 2,000 4,000 Feet

N

CJ Dens East Subdivision
Camas, Washington

Vicinity Map

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Figure
1

Document Path: F:\Notebooks\1594802_CJ Dens Subdivision-Geotech Investigation\GIS\1594802_AB_VMap.mxd Date: 11/2/2020 User Name: melissaschweitzer

LEGEND
Test Pit (October 2017)
Test Pit (May 2016)
Test Pit (November 2015)
Phase 2 Hand Auger Boring
Phase 2 Test Pit
Cross Section
Former Phase II Area (No Longer Included in Project)
Bedrock Outcrop and Talus
Existing Contour
0 150 300 600 Feet
N
Note: Feature locations are approximate.
Source: Aerial photograph provided by Hexagon Imagery Program Data.
Lacamas Lake
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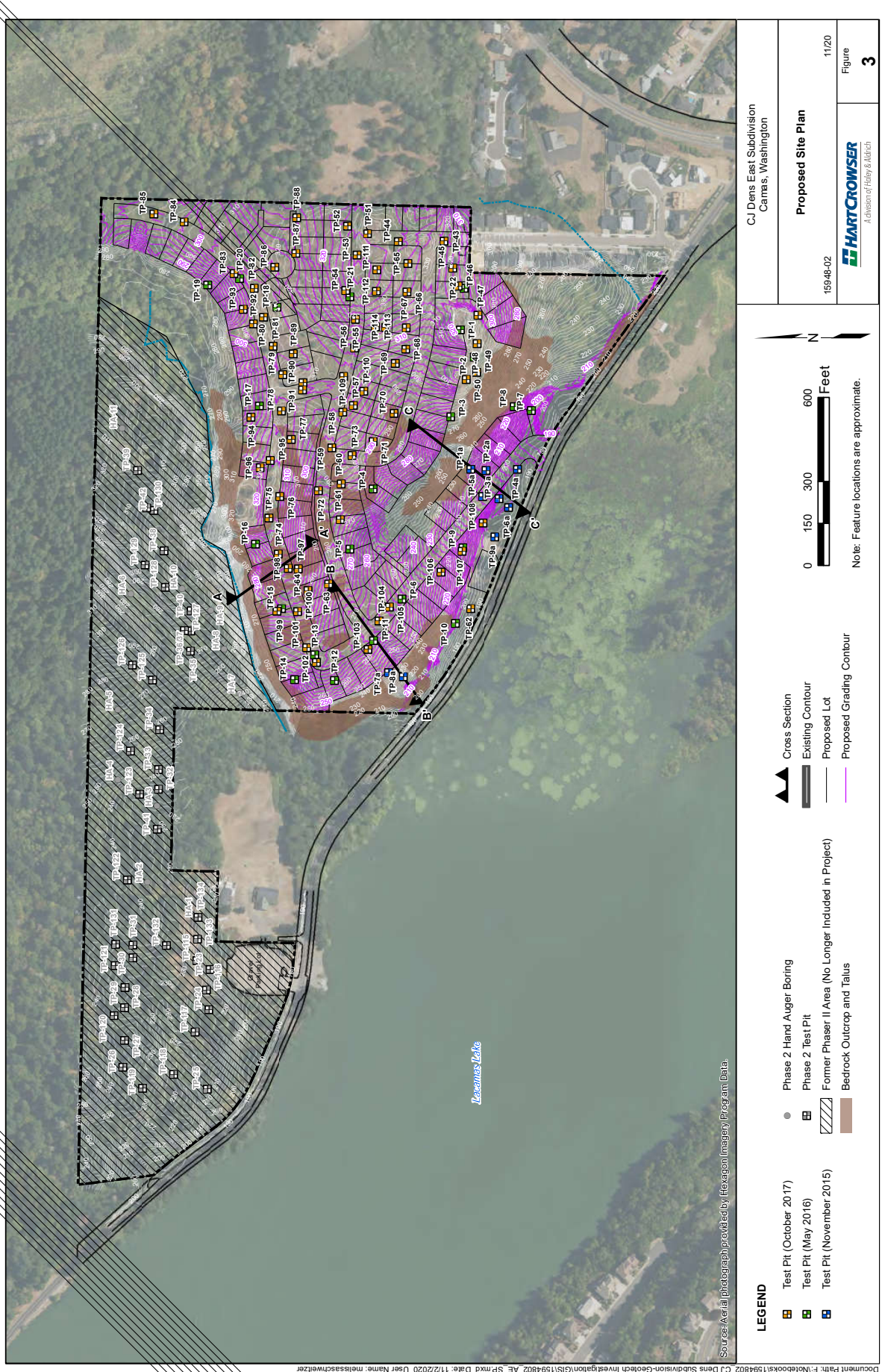
CJ Dens East Subdivision
Camas, Washington
Existing Site Plan
11/20
15948-02
HARTCROWSER
A division of Hatley & Aldrich
Figure
2


LEGEND
Test Pit (October 2017)
Test Pit (May 2016)
Test Pit (November 2015)
Phase 2 Hand Auger Boring
Phase 2 Test Pit
Former Phaser II Area (No Longer Included in Project)
Bedrock Outcrop and Talus
Cross Section
Existing Contour
Proposed Lot
Proposed Grading Contour
0 150 300 600 Feet
N
Note: Feature locations are approximate.
Source: Aerial photograph provided by Hexagon Imagery Program Data.
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CJ Dens East Subdivision
Camas, Washington
Proposed Site Plan
15948-02
11/20
HARTCROWSER
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Figure
3

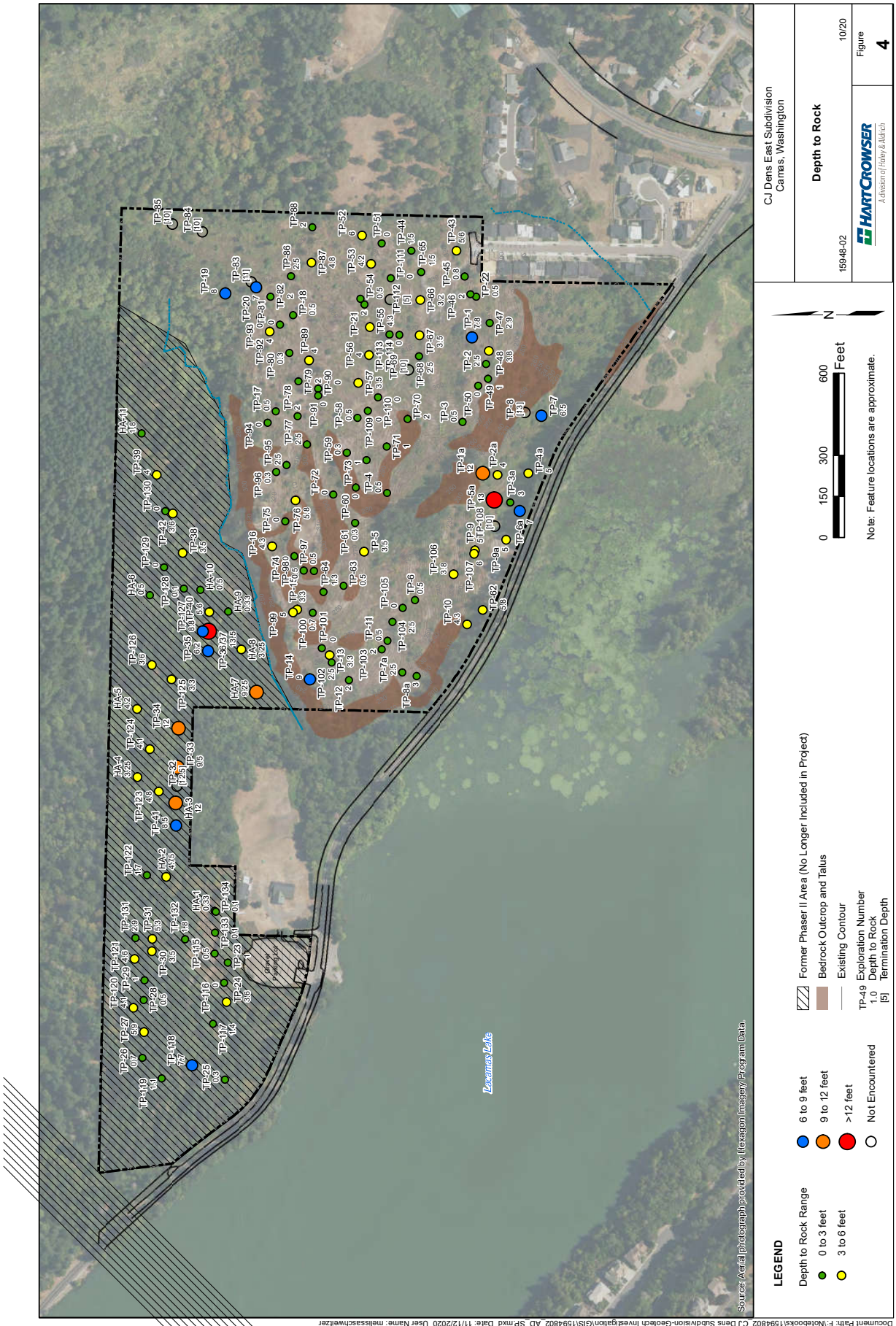
LEGEND
Depth to Rock Range
0 to 3 feet
3 to 6 feet
6 to 9 feet
9 to 12 feet
>12 feet
Not Encountered
Former Phaser II Area (No Longer Included in Project)
Bedrock Outcrop and Talus
Existing Contour
TP-49 Exploration Number
1.0 Depth to Rock
[5] Termination Depth
Lacamas Lake
Source: Aerial photograph provided by Hexagon Imagery Program Data.
0 150 300 600 Feet
N
Note: Feature locations are approximate.
CJ Dens East Subdivision
Camas, Washington
Depth to Rock
10/20
15948-02
HARTCROWSER
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Figure
4
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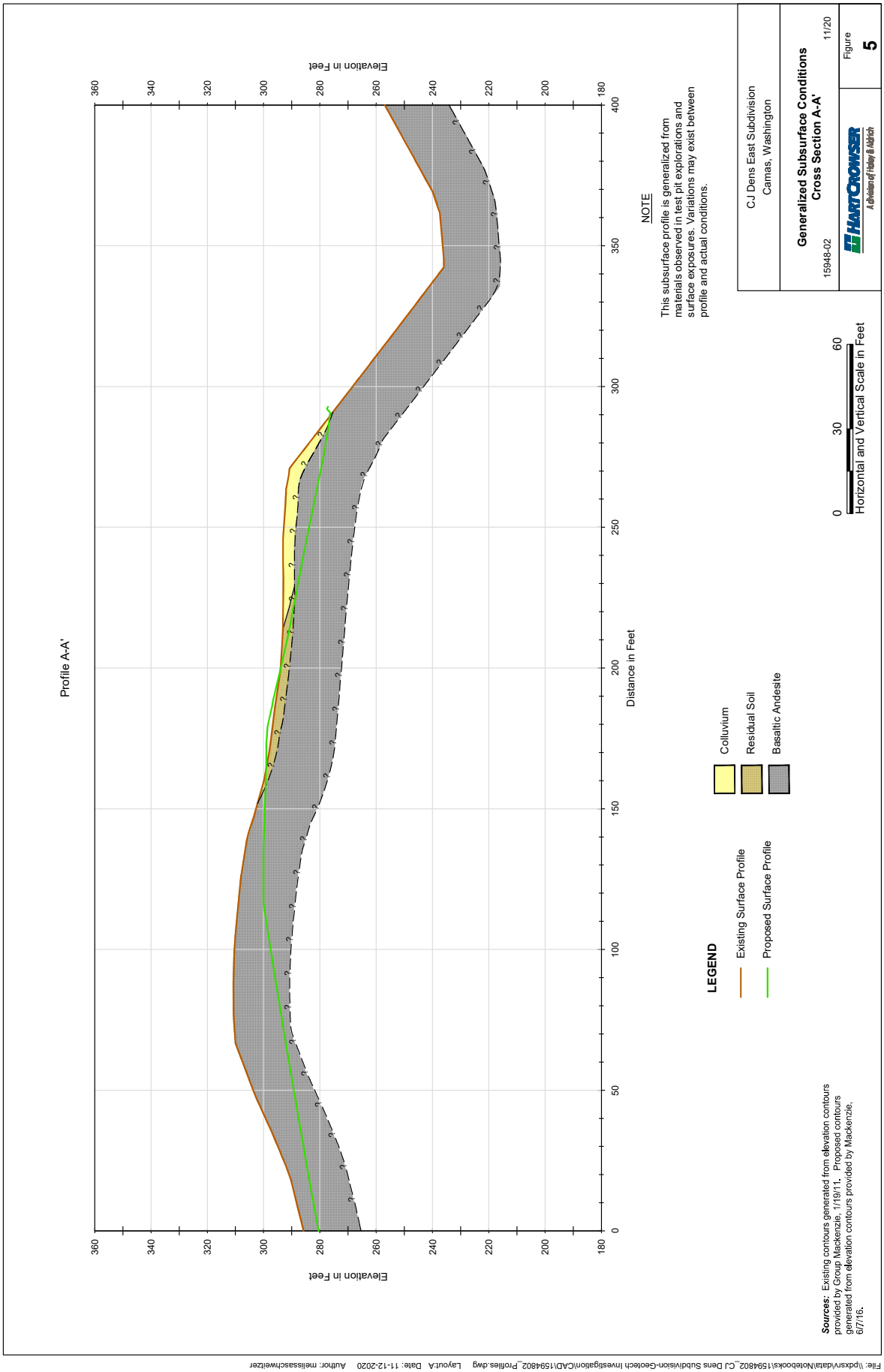
Profile A-A'
Elevation in Feet
Distance in Feet
LEGEND
Existing Surface Profile
Proposed Surface Profile
Colluvium
Residual Soil
Basaltic Andesite
NOTE
This subsurface profile is generalized from materials observed in test pit explorations and surface exposures. Variations may exist between profile and actual conditions.
Horizontal and Vertical Scale in Feet
0
30
60
CJ Dens East Subdivision
Camas, Washington
Generalized Subsurface Conditions
Cross Section A-A'
15948-02
11/20
Figure
5
Sources: Existing contours generated from elevation contours provided by Group Mackenzie, 1/19/11. Proposed contours generated from elevation contours provided by Mackenzie, 6/7/16.
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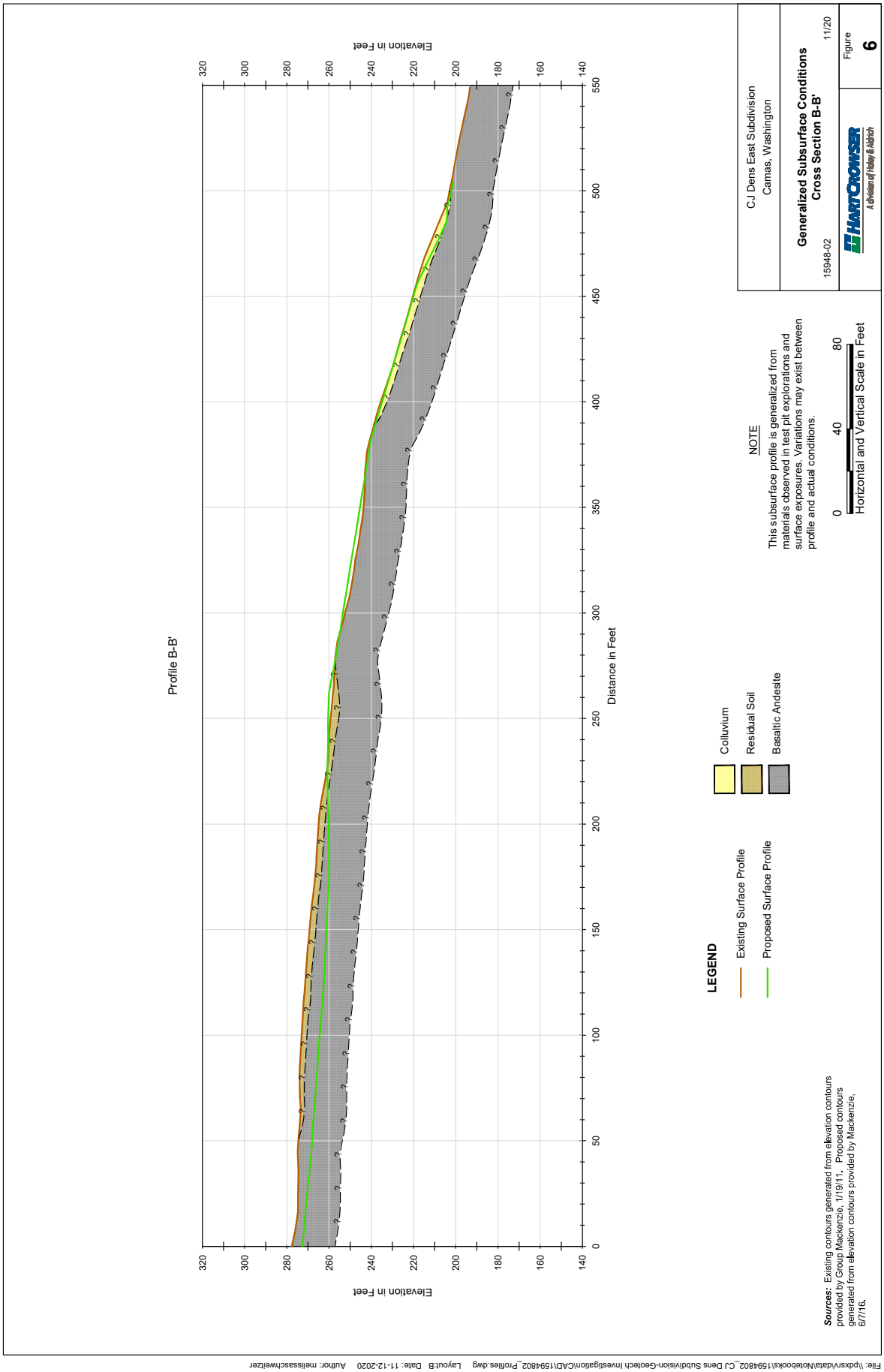
Profile B-B'
Elevation in Feet
Distance in Feet
LEGEND
Existing Surface Profile
Proposed Surface Profile
Colluvium
Residual Soil
Basaltic Andesite
NOTE
This subsurface profile is generalized from materials observed in test pit explorations and surface exposures. Variations may exist between profile and actual conditions.
0 40 80
Horizontal and Vertical Scale in Feet
CJ Dens East Subdivision
Camas, Washington
Generalized Subsurface Conditions
Cross Section B-B'
15948-02
11/20
Figure
6
Sources: Existing contours generated from elevation contours provided by Group Mackenzie, 1/19/11. Proposed contours generated from elevation contours provided by Mackenzie, 6/7/16.
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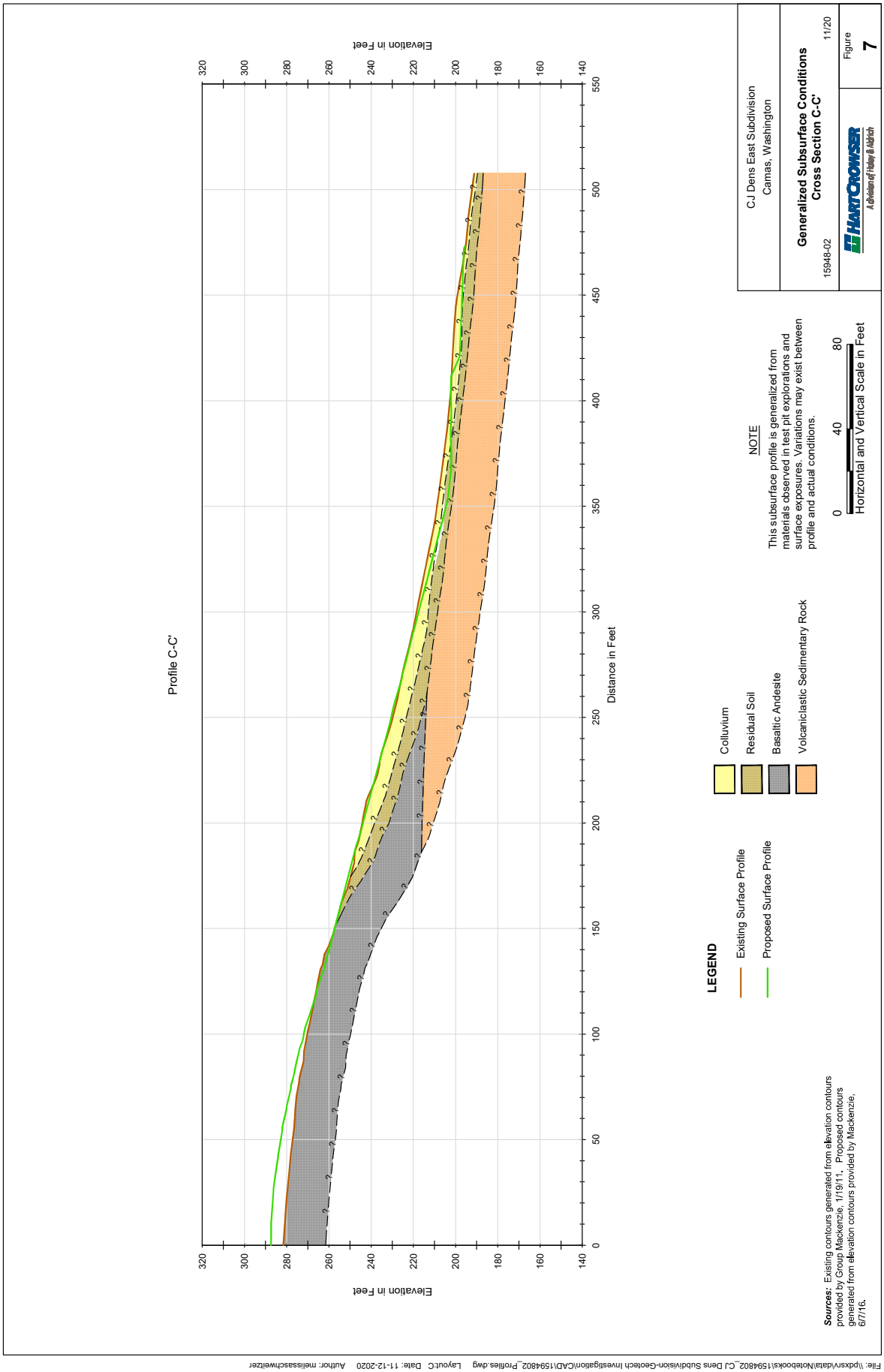
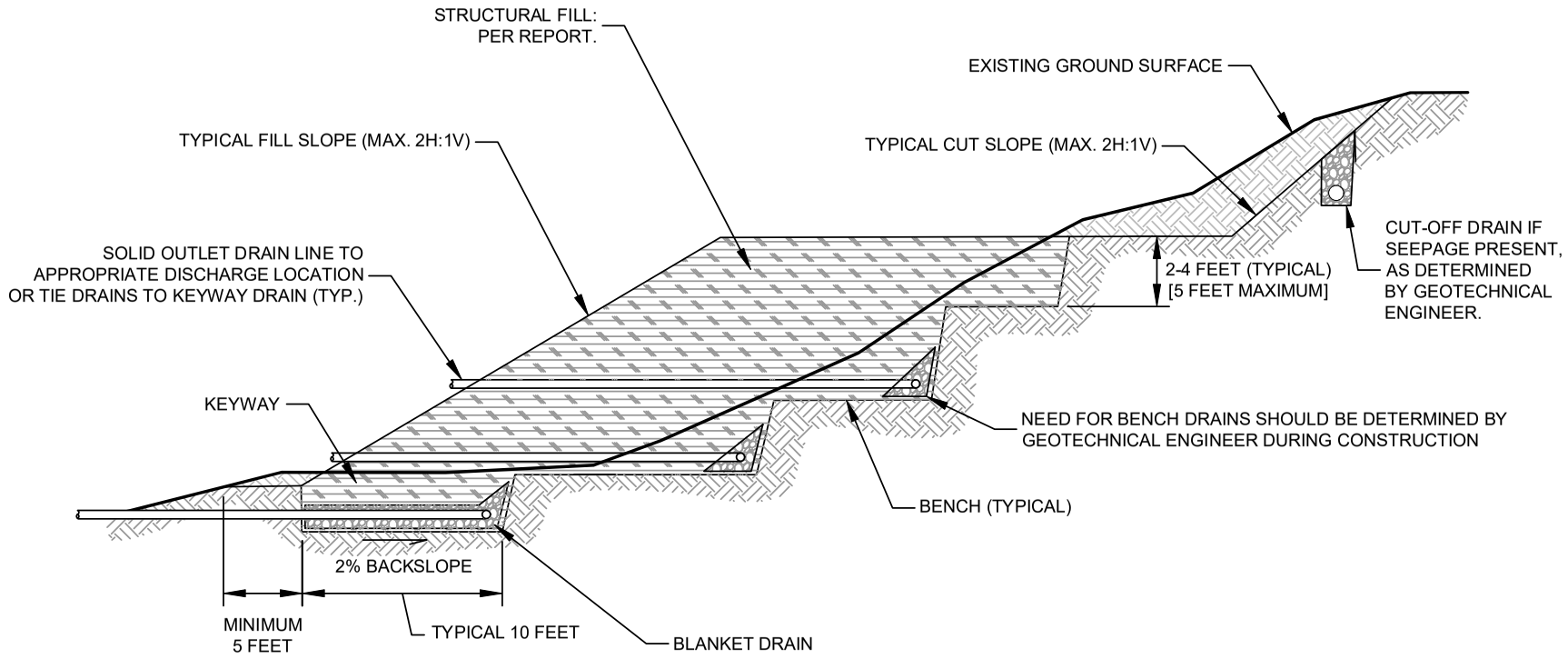
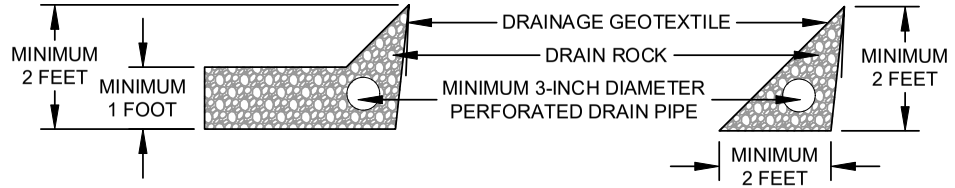

Profile C-C'
Elevation in Feet
Distance in Feet
LEGEND
Existing Surface Profile
Proposed Surface Profile
Colluvium
Residual Soil
Basaltic Andesite
Volcaniclastic Sedimentary Rock
NOTE
This subsurface profile is generalized from materials observed in test pit explorations and surface exposures. Variations may exist between profile and actual conditions.
0
40
80
Horizontal and Vertical Scale in Feet
CJ Dens East Subdivision
Camas, Washington
Generalized Subsurface Conditions
Cross Section C-C'
15948-02
11/20
HARTCROWSER
Figure
7
Sources: Existing contours generated from elevation contours provided by Group Mackenzie, 1/19/11. Proposed contours generated from elevation contours provided by Mackenzie, 6/7/16.
File: \\pdxsrv\data\Notebooks\159480 2_CJ Dens Subdivision-Geotech Investigation\CAD\159480 2_Profiles.dwg Layout:C Date: 11-12-2020 Author: melissaschweitzer



NOTES:
1. DRAWING IS NOT TO SCALE.
2. SLOPES AND PROFILES SHOWN ARE SCHEMATIC.
3. DRAWING REPRESENTS TYPICAL FILL AND CUT SLOPE SECTION, AND IS NOT SITE-SPECIFIC.

TYPICAL DRAIN SECTION DETAIL



CJ Dens East Subdivision
Camas, Washington

Typical Cut and Fill Slope Cross-Section

15948-02 11/20

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Figure
8

ATTACHMENT A-1
2015 Field Explorations

KEY TO EXPLORATION LOGS

HARTCROWSER

SOIL CLASSIFICATION CHART

MATERIAL TYPES	MAJOR DIVISIONS		GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	GW	WELL-GRADED GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES, >12% FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	SW	WELL-GRADED SAND
			SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	CL	LEAN CLAY
			ML	SILT
		ORGANIC	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	CH	FAT CLAY
			MH	ELASTIC SILT
		ORGANIC	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS			PT	PEAT

Note: Multiple symbols are used to indicate borderline or dual classifications

OTHER MATERIAL SYMBOLS

- Concrete
- Asphalt
- Topsoil

MOISTURE MODIFIERS

- Dry - Absence of moisture, dusty, dry to the touch
- Moist - Damp, but no visible water
- Wet - Visible free water or saturated, usually soil is obtained from below the water table

SEEPAGE MODIFIERS

- None -
- Slow - < 1 gpm
- Moderate - 1-3 gpm
- Heavy - > 3 gpm

CAVING MODIFIERS

- None -
- Minor - isolated
- Moderate - frequent
- Severe - general

MINOR CONSTITUENTS

- Trace - < 5% (silt/clay)
- Occasional - < 15% (sand/gravel)
- With - 5-15% (silt/clay) in sand or gravel
  15-30% (sand/gravel) in silt or clay

SAMPLE TYPES

- Dames & Moore
- Standard Penetration Test (SPT)
- Shelby Tube
- Bulk or Grab

LABORATORY/ FIELD TESTS

- ATT - Atterberg Limits
- CP - Laboratory Compaction Test
- CA - Chemical Analysis (Corrosivity)
- CN - Consolidation
- DD - Dry Density
- DS - Direct Shear
- HA - Hydrometer Analysis
- OC - Organic Content
- PP - Pocket Penetrometer (TSF)
- P200 - Percent Passing No. 200 Sieve
- SA - Sieve Analysis
- SW - Swell Test
- TV - Torvane Shear
- UC - Unconfined Compression

GROUNDWATER SYMBOLS

- Water Level (at time of drilling)
- Water Level (at end of drilling)
- Water Level (after drilling)

STRATIGRAPHIC CONTACT

- Distinct contact between soil strata or geologic units
- Gradual or approximate change between soil strata or geologic units

Notes:

Blowcount (N) is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted) per ASTM D-1586. See exploration log for hammer weight and drop.

When the Dames & Moore (D&M) sampler was driven with a 140-pound hammer (denoted on logs as D+M 140), the field blow counts (N-value) shown on the logs have been reduced by 50% to approximate SPT N-values.

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

Refer to the report text and exploration logs for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the exploration locations at the time the explorations were made. The logs are not warranted to be representative of the subsurface conditoins at other locations or times.

KEY TO EXPLORATION LOGS - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:48 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Figure A-1

KEY TO BEDROCK TERMS (1 of 2)
(WSDOT, 2014)

HARTCROWSER
8910 SW Gemini Drive
Beaverton, Oregon 97008

Weathered State of Rock

Term	Description	Grade
Fresh	No visible signs of rock material weathering; perhaps slight discoloration in major discontinuity surfaces.	I
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering, and may be somewhat weaker externally than in its fresh condition.	II
Moderately Weathered	Less than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as a continuous framework or as corestones.	III
Highly Weathered	More than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as discontinuous framework or as corestone.	IV
Completely Weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.	V
Residual Soil	All rock material is converted to soil. The mass structure and material fabric is destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI

Relative Rock Strength

Grade	Description	Field Identification	Uniaxial Compressive Strength
R0	Extremely Weak	Indented by thumbnail.	0.04 to 0.15 ksi
R1	Very Weak	Specimen crumbles under sharp blow with point of geological hammer, and can be cut with a pocket knife.	0.15 to 3.6 ksi
R2	Moderately Weak	Shallow cuts or scrapes can be made in a specimen with a pocket knife. Geological hammer point indents deeply with firm blow.	3.6 to 7.3 ksi
R3	Moderately Strong	Specimen cannot be scraped or cut with a pocket knife, shallow indentation can be made under firm blows from a hammer point.	7.3 to 15 ksi
R4	Strong	Specimen breaks with one firm blow from the hammer end of a geological hammer.	15 to 29 ksi
R5	Very Strong	Specimen requires many blows of a geological hammer to break intact sample.	Greater than 29 ksi

Discontinuities

Discontinuity Spacing		Discontinuity Condition	
Description	**Spacing**	**Condition**	**Description**
Very Widely Spaced	Greater than 10 feet.	Excellent Condition	Very rough surfaces, no separation, hard discontinuity wall.
Widely Spaced	3 to 10 feet.	Good Condition	Slightly rough surfaces, separation less than 0.05 inches, hard discontinuity wall.
Moderately Spaced	1 to 3 feet.	Fair Condition	Slightly rough surface, separation greater than 0.05 inches, soft discontinuity wall.
Closely Spaced	2 to 12 inches	Poor Condition	Slickensided surfaces, or soft gouge less than 0.2 inches thick, or open discontinuities 0.05 to 0.2 inches.
Very Closely Spaced	Less than 2 inches	Very Poor Condition	Soft gouge greater than 0.2 inches, or open discontinuities greater than 0.2 inches.

Figure A-2

KEY TO BEDROCK TERMS (2 of 2)
(WSDOT, 2014)

HARTCROWSER
8910 SW Gemini Drive
Beaverton, Oregon 97008

Grain Size

Grain Size	Description	Criteria
Less than 0.04 inches	Fine grained	Few crystal boundaries/ grains distinguishable in the field or with a hand lens.
0.04 to 0.2 inches	Medium grained	Most crystal boundaries/ grains distinguishable with the aid of a hand lens.
Greater than 0.2 inches	Coarse grained	Most crystal boundaries/ grains distinguishable with the naked eye.

Igneous Rock Textures

Texture	Grain Size
Pegmatitic	Very large; diameters greater than 0.8 in.
Phaneritic	Can be seen with the naked eye
Porphyritic	Grained of two widely different sizes
Aphanitic	Cannot be seen with the naked eye
Glassy	No grains present

Pyroclastic Rocks

Rock Name	Characteristics
Pyroclastic Breccia	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which *angular* pyroclasts predominate.
Agglomerate	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which *rounded* pyroclasts predominate.
Lapilli Tuff	Pyroclastic rock whose average pyroclast size is 0.08 to 2.5 inches.
Ash Tuff	Pyroclastic rock whose average pyroclast size is less than 0.08 inches.

Degree of Vesicularity

Designation	Percentage of Cavities (by volume) of Total Sample
Slightly Vesicular	5 to 10 Percent
Moderately Vesicular	10 to 25 Percent
Highly Vesicular	25 to 50 Percent
Scoriaceous	Greater than 50 Percent

OTHER TERMS:

Core Recover (CR) = the ratio of core recovered to the core run length expressed as a percentage.

Rock Quality Designation (RQD) = the percentage of rock core recovered in intact pieces of 4 inches or more in length in the length of a core run. Does not include mechanical breaks caused by drilling.

Fracture Frequency (FF) = the number of natural fractures per foot in the length of core recovered.

REFERENCE:

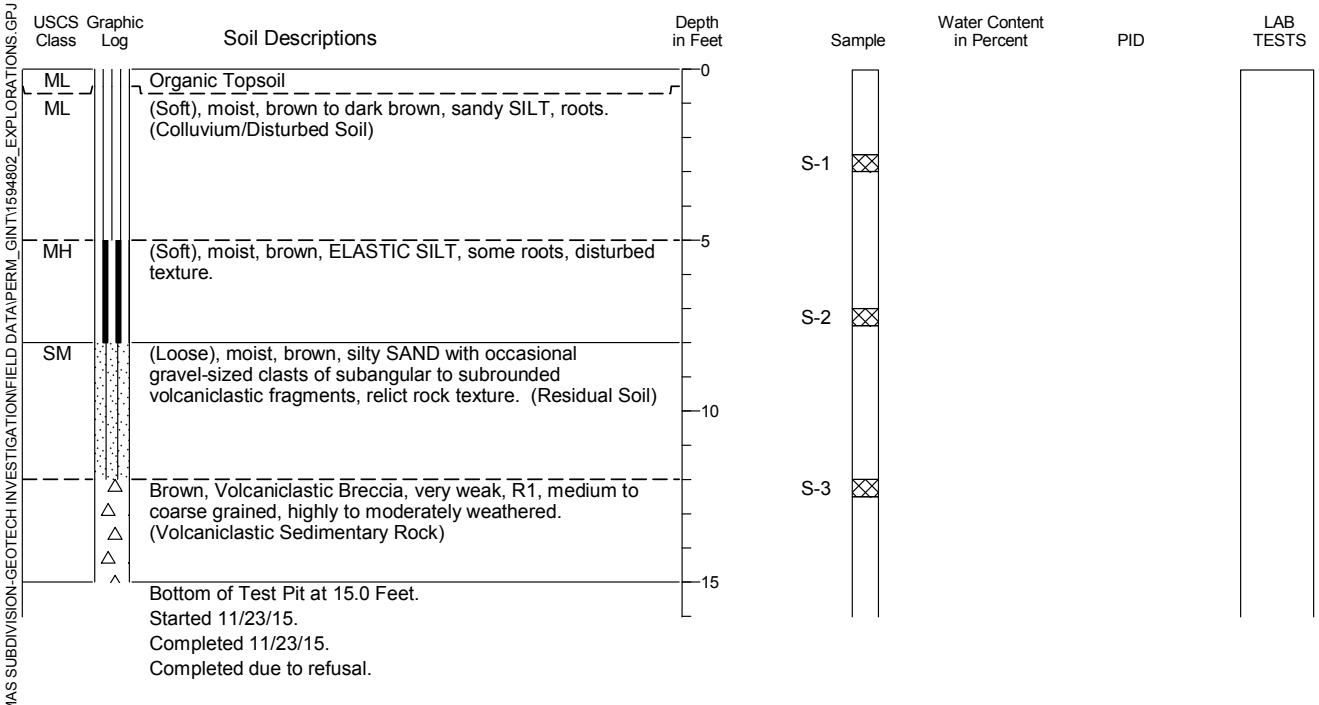
Washington State Department of Transportation (WSDOT), 2014. *Geotechnical Design Manual*, Publication M 46-03.02, August, 2014.

Figure A-2

Test Pit Log TP-1a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

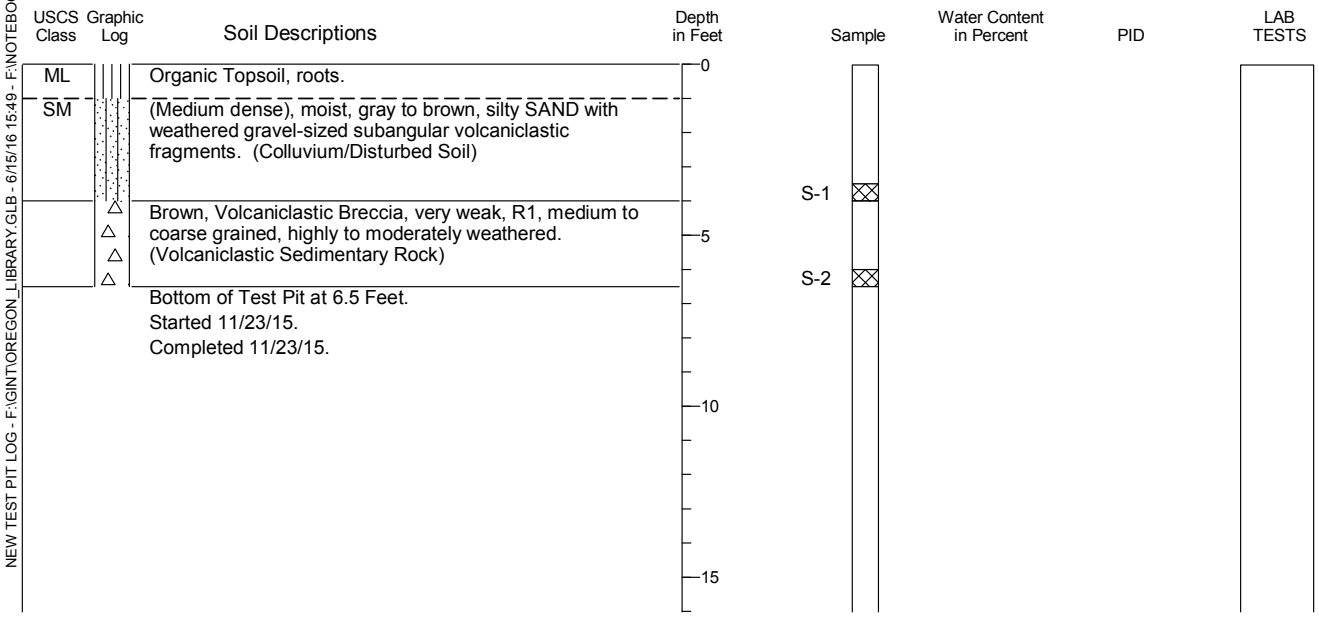
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-2a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

15948-02 *12/15*

Figure A-3

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-3a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
ML		Organic Topsoil, roots.	0				
ML		(Stiff), moist, brown, SILT with sand, disturbed texture. (Colluvium/Disturbed Soil)		S-1			
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)	5	S-2			
		Bottom of Test Pit at 5.5 Feet. Started 11/23/15. Completed 11/23/15.	10				
			15				

Test Pit Log TP-4a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
ML		Organic Topsoil	0				
ML		(Stiff), moist, brown, SILT with sand, roots, disturbed texture. (Colluvium/Disturbed Soil)		S-1			
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)	5	S-2			
		Bottom of Test Pit at 6.5 Feet. Started 11/23/15. Completed 11/23/15.	10				
			15				

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-4

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-5a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
ML		Organic Topsoil, roots, dark brown.	0				
SM		(Loose), moist, brown to dark brown, silty SAND, roots, weathered residual soil fragments in fine-grained matrix. (Colluvium/Disturbed Soil)					
CL		(Medium stiff), moist, brown, LEAN CLAY with sand.		S-1			
			5				
SM		(Loose), moist, brown, silty SAND with hard gravel-sized clasts of subangular to subrounded volcaniclastic fragments, relict rock texture. (Residual Soil)		S-2			
			10				
				S-3			
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)		S-4			
		Bottom of Test Pit at 13.5 Feet.	15				
		Started 11/23/15.					
		Completed 11/23/15.					
		Completed due to refusal.					

Test Pit Log TP-6a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM/ML		(Loose to medium stiff), dark brown, moist, silty SAND to sandy SILT, roots.	0				
ML		(Medium stiff), moist, brown, SILT with sand, small roots, disturbed texture. (Colluvium/Disturbed Soil)					
		Abundant roots and rootlets from 3.0 to 4.0 feet.		S-1			
SM		(Medium dense to dense), moist, light brown to brown, silty SAND, relict rock texture. (Residual Soil)	5				
				S-2			
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)		S-3			
		Bottom of Test Pit at 9.5 Feet.	10				
		Started 11/23/15.					
		Completed 11/23/15.					
		Completed due to refusal.					
			15				

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

15948-02 12/15

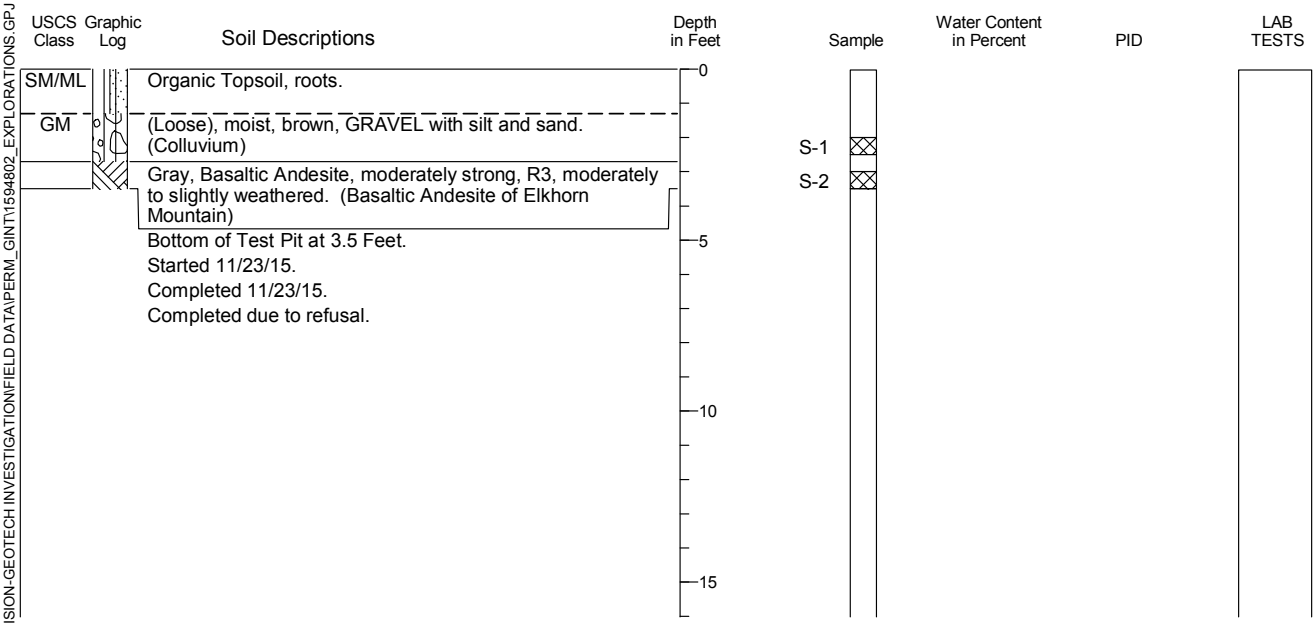
Figure A-5

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-7a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

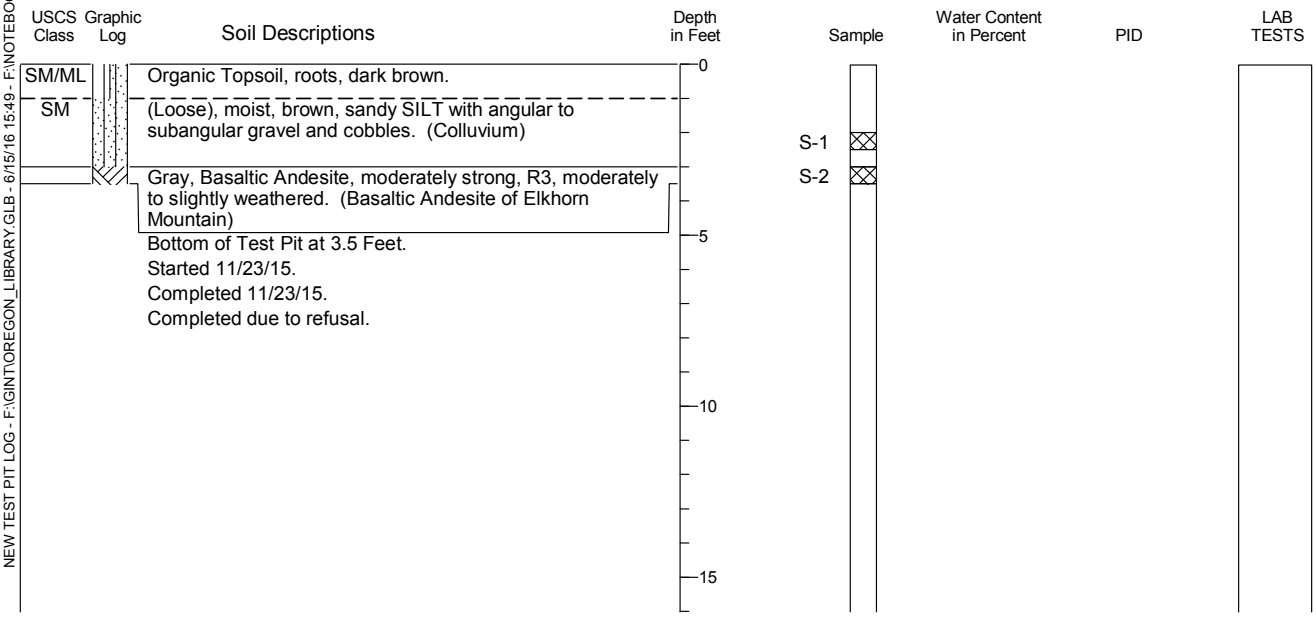
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-8a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

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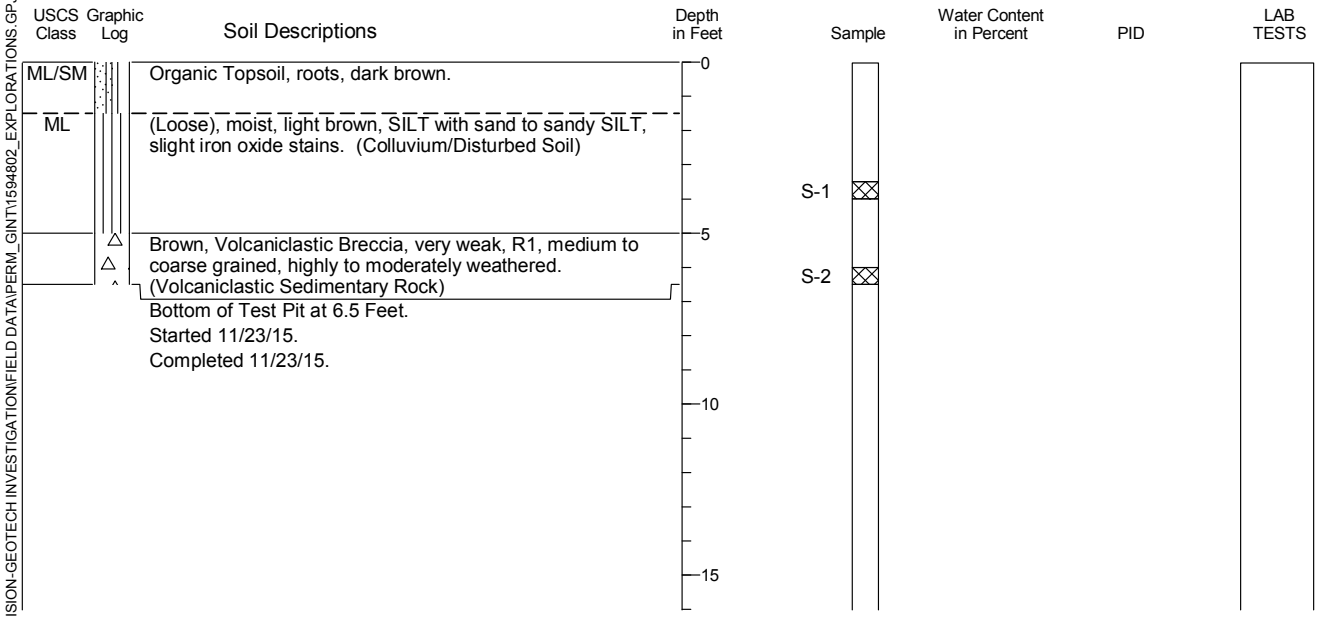
Figure A-6

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-9a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

15948-02 *12/15*

Figure A-7

ATTACHMENT A-2
2016 and later Field Explorations

Sample Description

Identification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. ASTM D 2488 visual-manual identification methods were used as a guide. Where laboratory testing confirmed visual-manual identifications, then ASTM D 2487 was used to classify the soils.

Relative Density/Consistency

Soil density/consistency in borings is related primarily to the standard penetration resistance (N). Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

SAND or GRAVEL Relative Density	N (Blows/Foot)	SILT or CLAY Consistency	N (Blows/Foot)
Very loose	0 to 4	Very soft	0 to 1
Loose	5 to 10	Soft	2 to 4
Medium dense	11 to 30	Medium stiff	5 to 8
Dense	31 to 50	Stiff	9 to 15
Very dense	>50	Very stiff	16 to 30
		Hard	>30

Moisture

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

USCS Soil Classification Chart (ASTM D 2487)

Major Divisions			Symbols Graph	Symbols USCS	Typical Descriptions
Coarse Grained Soils: More than 50% of Material Retained on No. 200 Sieve	Gravel and Gravelly Soils: More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravels (<5% fines)		GW	Well-Graded Gravel; Well-Graded Gravel with Sand
				GP	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Gravels (5-12% fines)		GW-GM	Well-Graded Gravel with Silt; Well-Graded Gravel with Silt and Sand
				GW-GC	Well-Graded Gravel with Clay; Well-Graded Gravel with Clay and Sand
				GP-GM	Poorly Graded Gravel with Silt; Poorly Graded Gravel with Silt and Sand
				GP-GC	Poorly Graded Gravel with Clay; Poorly Graded Gravel with Clay and Sand
		Gravels with Fines (>12% fines)		GM	Silty Gravel; Silty Gravel with Sand
				GC	Clayey Gravel; Clayey Gravel with Sand
	Sand and Sandy Soils: More than 50% of Coarse Fraction Passing No. 4 Sieve	Sands with few Fines (<5% fines)		SW	Well-Graded Sand; Well-Graded Sand with Gravel
				SP	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Sands (5-12% fines)		SW-SM	Well-Graded Sand with Silt Well-Graded Sand with Silt and Gravel
				SW-SC	Well-Graded Sand with Clay; Well-Graded Sand with Clay and Gravel
				SP-SM	Poorly Graded Sand with Silt; Poorly Graded Sand with Silt and Gravel
				SP-SC	Poorly Graded Sand with Clay; Poorly Graded Sand with Clay and Gravel
		Sands with Fines (>12% fines)		SM	Silty Sand; Silty Sand with Gravel
				SC	Clayey Sand; Clayey Sand with Gravel
Fine Grained Soils: More than 50% of Material Passing No. 200 Sieve	Silts			ML	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
				MH	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
	Silty Clay (based on Atterberg Limits)			CL-ML	Silty Clay; Silty Clay with Sand or Gravel; Gravelly or Sandy Silty Clay
	Clays			CL	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
				CH	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
	Organics			OL/OH	Organic Soil; Organic Soil with Sand or Gravel; Sandy or Gravelly Organic Soil
Highly Organic (>50% organic material)				PT	Peat - Decomposing Vegetation - Fibrous to Amorphous Texture

Minor Constituents

	Estimated Percentage
Sand, Gravel	
Trace	<5
Few	5 - 15
Cobbles, Boulders	
Trace	<5
Few	5 - 10
Little	15 - 25
Some	30 - 45

Soil Test Symbols

%F	Percent Passing No. 200 Sieve
AL	Atterberg Limits (%)
	Liquid Limit (LL)
	Water Content (WC)
	Plastic Limit (PL)
CA	Chemical Analysis
CAUC	Consolidated Anisotropic Undrained Compression
CAUE	Consolidated Anisotropic Undrained Extension
CBR	California Bearing Ratio
CIDC	Consolidated Drained Isotropic Triaxial Compression
CIUC	Consolidated Isotropic Undrained Compression
CK0DC	Consolidated Drained k0 Triaxial Compression
CK0DSS	Consolidated k0 Undrained Direct Simple Shear
CK0UC	Consolidated k0 Undrained Compression
CK0UE	Consolidated k0 Undrained Extension
CRSCN	Constant Rate of Strain Consolidation
DS	Direct Shear
DSS	Direct Simple Shear
DT	In Situ Density
GS	Grain Size Classification
HYD	Hydrometer
ILCN	Incremental Load Consolidation
K0CN	k0 Consolidation
kc	Constant Head Permeability
kf	Falling Head Permeability
MD	Moisture Density Relationship
OC	Organic Content
OT	Tests by Others
P	Pressuremeter
PID	Photoionization Detector Reading
PP	Pocket Penetrometer
SG	Specific Gravity
TRS	Torsional Ring Shear
TV	Torvane
UC	Unconfined Compression
UUC	Unconsolidated Undrained Triaxial Compression
VS	Vane Shear
WC	Water Content (%)

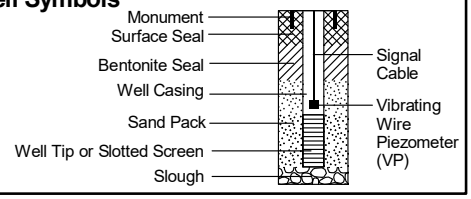
Groundwater Indicators

- Groundwater Level on Date or At Time of Drilling (ATD)
- Groundwater Level on Date Measured in Piezometer
- Groundwater Seepage (Test Pits)

Sample Symbols

- 1.5" I.D. Split Spoon
- 3.25" O.D. Split Spoon
- Modified California Sampler
- Rock Core Run
- Sonic Core
- Thin-walled Sampler
- Grab
- Cuttings
- Push Probe

Well Symbols



KEY TO EXP LOGS (SOIL ONLY) - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:32 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Key to Exploration Logs

Figure **A-8**
Sheet **1 of 1**

KEY TO EXP LOGS (SOIL/ROCK) WSDOT-2 - F:\GINT\HC_LIBRARY.GLB - 11/2/20 19:29 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Weathered State of Rock

Term	Description	Grade
Fresh	No visible signs of rock material weathering; perhaps slight discoloration in major discontinuity surfaces.	I
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering, and may be somwhat weaker externally than in its fresh condition	II
Moderately Weathered	Less than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as a continuous framework or as corestones.	III
Highly Weathered	More than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as discontinuous framework or as corestone.	IV
Completely Weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.	V
Residual Soil	All rock material is converted to soil. The mass structure and material fabric is destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI

Relative Rock Strength

Grade	Description	Field Identification	Uniaxial Compressive Strength
R0	Extremely Weak	Indented by thumbnail.	0.04 to 0.15 ksi
R1	Very Weak	Specimen crumbles under sharp blow with point of geological hammer, and can be cut with a pocket knife.	0.15 to 3.6 ksi
R2	Moderately Weak	Shallow cuts or scrapes can be made in a specimen with a pocket knife. Geological hammer point indents deeply with firm blow.	3.6 to 7.3 ksi
R3	Moderately Strong	Specimen cannot be scraped or cut with a pocket knife, shallow indentation can be made under firm blows from a hammer point.	7.3 to 15 ksi
R4	Strong	Specimen breaks with one firm blow from the hammer end of a geological hammer.	15 to 29 ksi
R5	Very Strong	Specimen requires many blows of a geological hammer to break intact sample.	Greater than 29 ksi

Discontinuities

Discontinuity Spacing		Discontinuity Condition	
Description	**Spacing**	**Condition**	**Description**
Very Widely Spaced	Greater than 10 feet	Excellent Condition	Very rough surfaces, no separation, hard discontinuity wall.
Widely Spaced	3 to 10 feet	Good Condition	Slightly rough surfaces, separation less than 0.05 inches, hard discontinuity wall.
Moderately Spaced	1 to 3 feet	Fair Condition	Slightly rough surface, separation greater than 0.05 inches, soft discontinuity wall.
Closely Spaced	2 to 12 inches	Poor Condition	Slickensided surfaces, or soft gouge less than 0.2 inches thick, or open discontinuities 0.05 to 0.2 inches.
Very Closely Spaced	Less than 2 inches	Very Poor Condition	Soft gouge greater than 0.2 inches, or open discontinuities greater than 0.2 inches.

KEY TO EXP LOGS (SOIL/ROCK) WSDOT-3 - F:\GINT\HC_LIBRARY.GLB - 11/2/20 19:30 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Grain Size

Grain Size	Description	Criteria
Less than 0.04 inches	Fine grained	Few crystal boundaries/grains distinguishable in the field or with a hand lens.
0.04 to 0.2 inches	Medium grained	Most crystal boundaries/ grains distinguishable with the aid of a hand lens.
Greater than 0.2 inches	Coarse grained	Most crystal boundaries/ grains distinguishable with the naked eye.

Igneous Rock Textures

Texture	Grain Size
Pegmatitic	Very large; diameters greater than 0.8 in.
Phaneritic	Can be seen with the naked eye
Porphyritic	Grained of two widely different sizes
Aphanitic	Cannot be seen with the naked eye
Glassy	No grains present

Pyroclastic Rocks

Rock Name	Characteristics
Pyroclastic Breccia	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which angular pyroclasts predominate.
Agglomerate	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which rounded pyroclasts predominate.
Lapilli Tuff	Pyroclastic rock whose average pyroclast size is 0.08 to 2.5 inches.
Ash Tuff	Pyroclastic rock whose average pyroclast size is less than 0.08 inches.

Degree of Vesicularity

Designation	Percentage of Cavities (by volume) of Total Sample
Slightly Vesicular	5 to 10 Percent
Moderately Vesicular	10 to 25 Percent
Highly Vesicular	25 to 50 Percent
Scoriaceous	Greater than 50 Percent

Other Terms:

Core Recover (CR) = the ratio of core recovered to the core run length expressed as a percentage.

Rock Quality Designation (RQD) = the percentage of rock core recovered in intact pieces of 4 inches or more in length in the length of a core run. Does not include mechanical breaks caused by drilling.

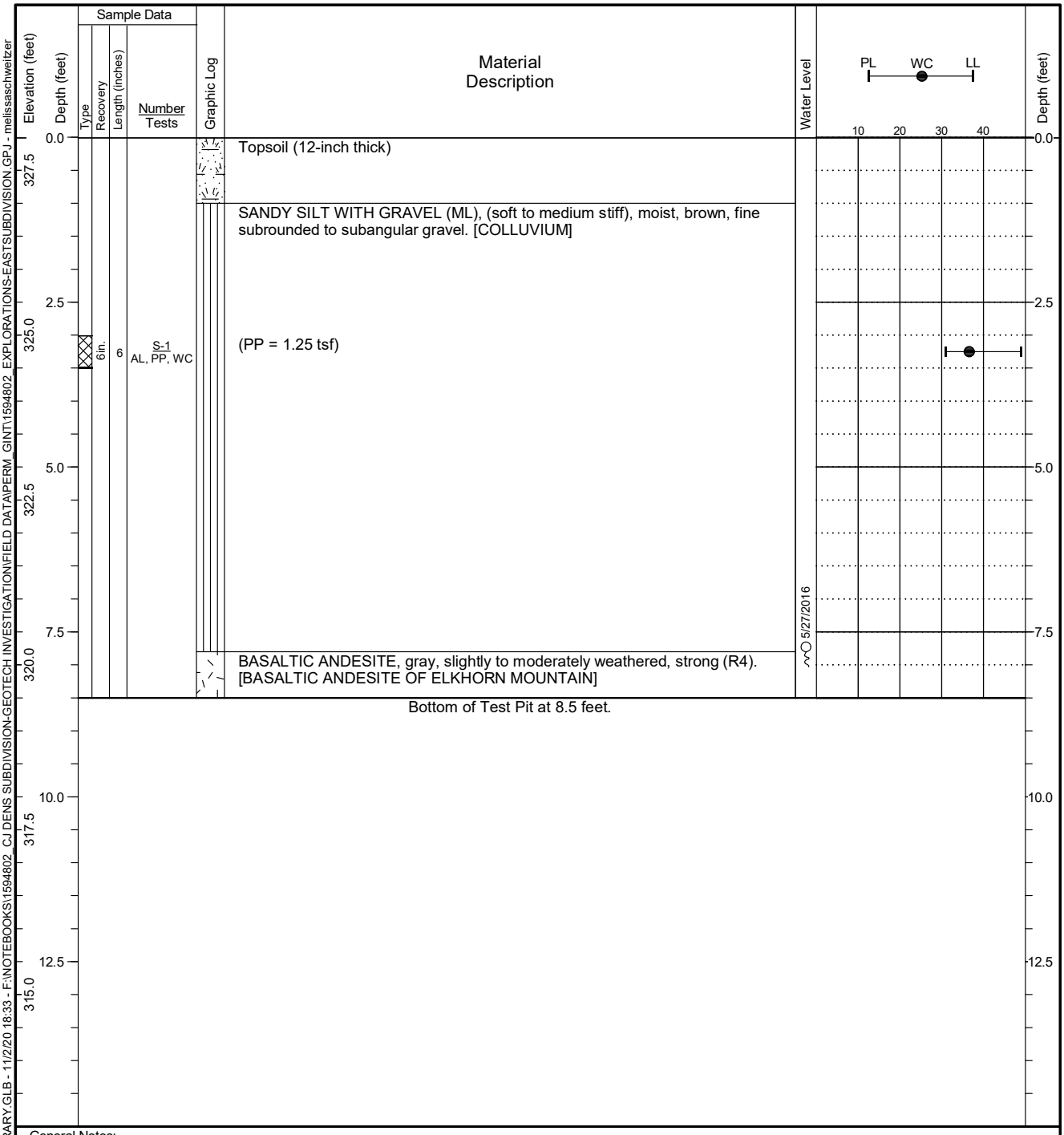
Fracture Frequency (FF) = the number of natural fractures per foot in the length of core recovered.

Reference:

Washington State Department of Transportation (WSDOT), 2014. *Geotechnical Design Manual*, Publication M 46-03.10, August, 2014.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	**Key to Exploration Logs**	Figure **A-8** Sheet **3 of 3**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614371 Long: -122.410712 (WGS 84) Total Depth: 8.5 feet Depth to Seepage: 7.8 feet
Ground Surface Elevation: 328 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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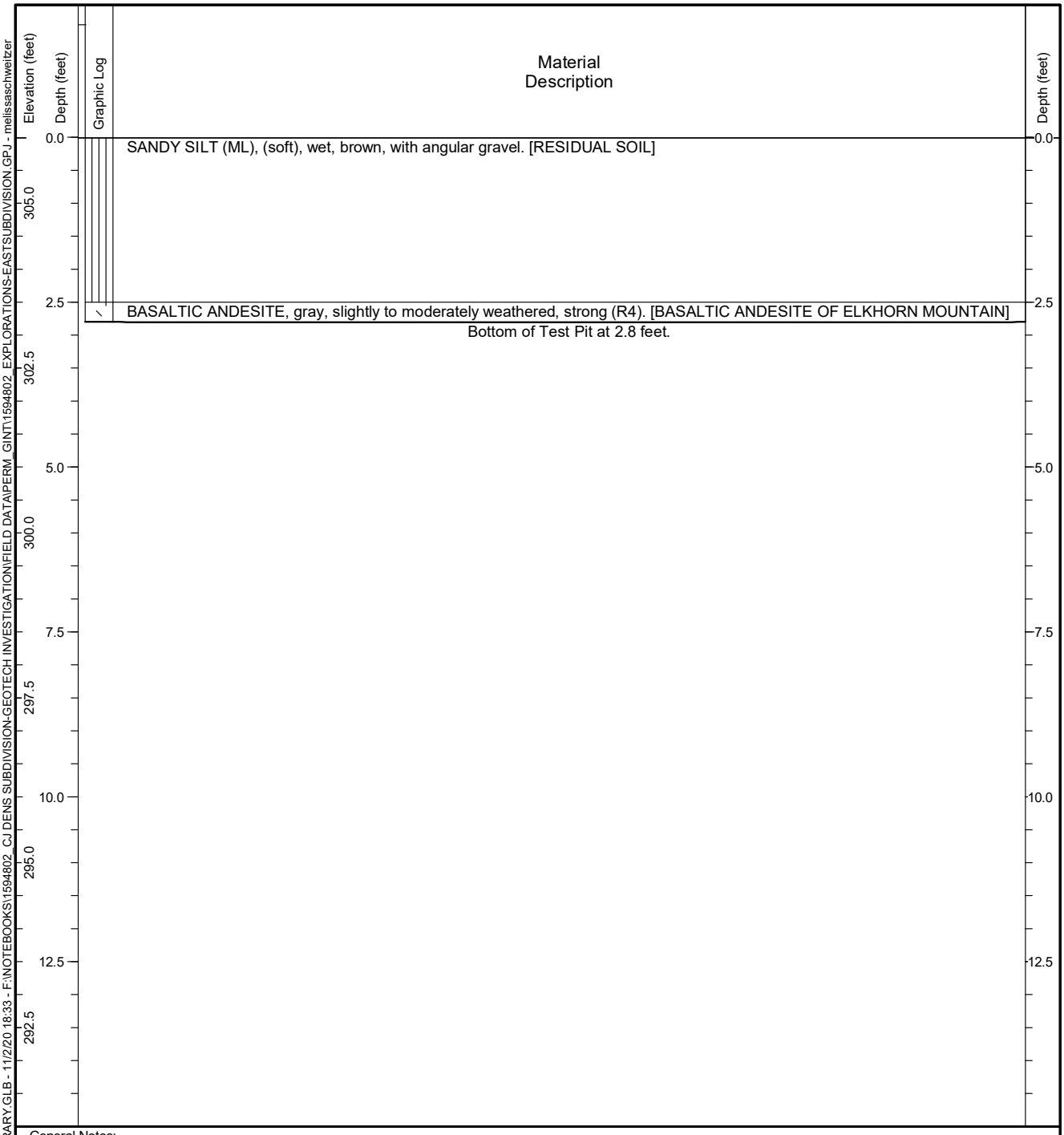
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-1

Figure **A-9**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614228 Long: -122.411086 (WGS 84) Total Depth: 2.8 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 306 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-2**	Figure **A-10** Sheet **1 of 1**

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Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614445 Long: -122.411925 (WGS 84) Total Depth: 3 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 280 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	WC (10 20 30 40)	Depth (feet)
280.0	0.0						Topsoil (6-inch thick)		0.0
							BASALTIC ANDESITE, gray, slightly to moderately weathered, strong (R4), closely spaced discontinuities, highly fractured from 0.5 to 1.0 feet. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]		
277.5	2.5	6in.	6		S-1 WC			●	2.5
							Bottom of Test Pit at 3.0 feet.		
275.0	5.0								5.0
272.5	7.5								7.5
270.0	10.0								10.0
267.5	12.5								12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-3

Figure **A-11**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615186 Long: -122.412964 (WGS 84) Total Depth: 2.6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 282 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
282.0	0.0		Topsoil (6-inch thick)	0.0
280.0	2.5		BASALTIC ANDESITE, gray, slightly to moderately weathered, strong (R4), moderately spaced discontinuities, highly fractured from 0.5 to 1.0 feet. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
			Bottom of Test Pit at 2.6 feet.	
277.5	5.0			5.0
275.0	7.5			7.5
272.5	10.0			10.0
270.0	12.5			12.5
267.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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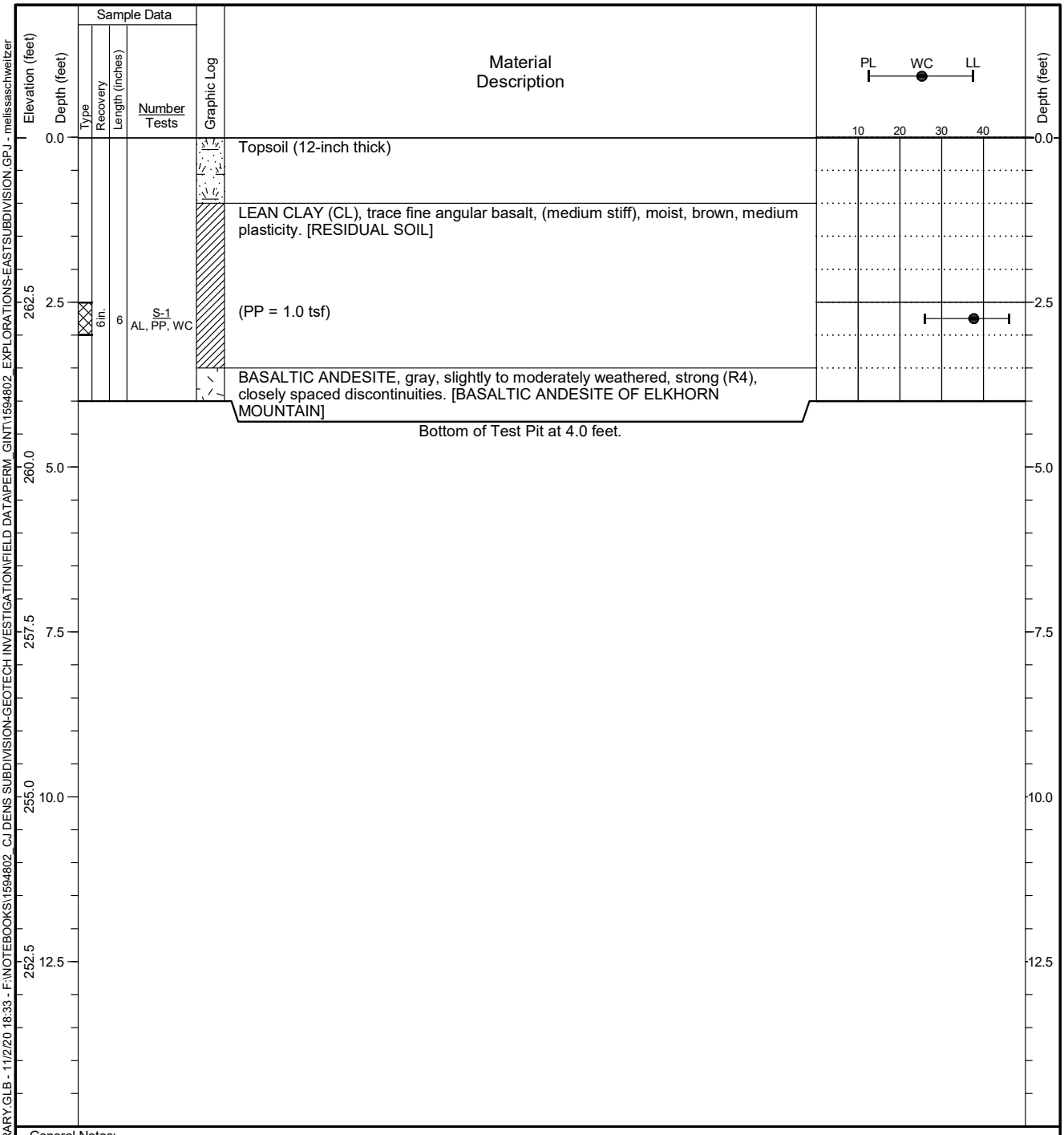
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-4

Figure **A-12**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615400 Long: -122.413806 (WGS 84) Total Depth: 4 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 265 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-5**	Figure **A-13** Sheet **1 of 1**

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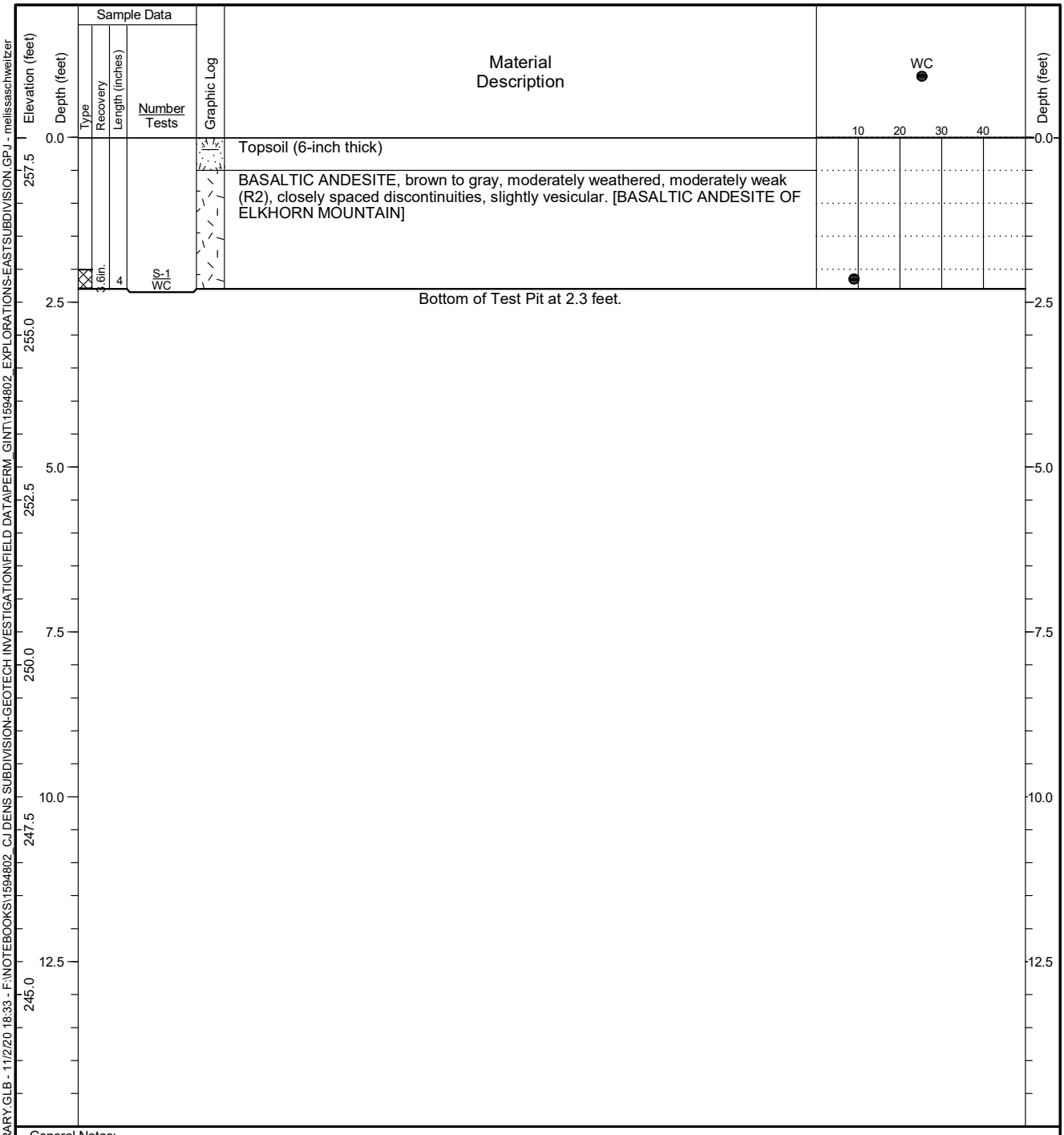
Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614879 Long: -122.414485 (WGS 84) Total Depth: 2.3 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 258 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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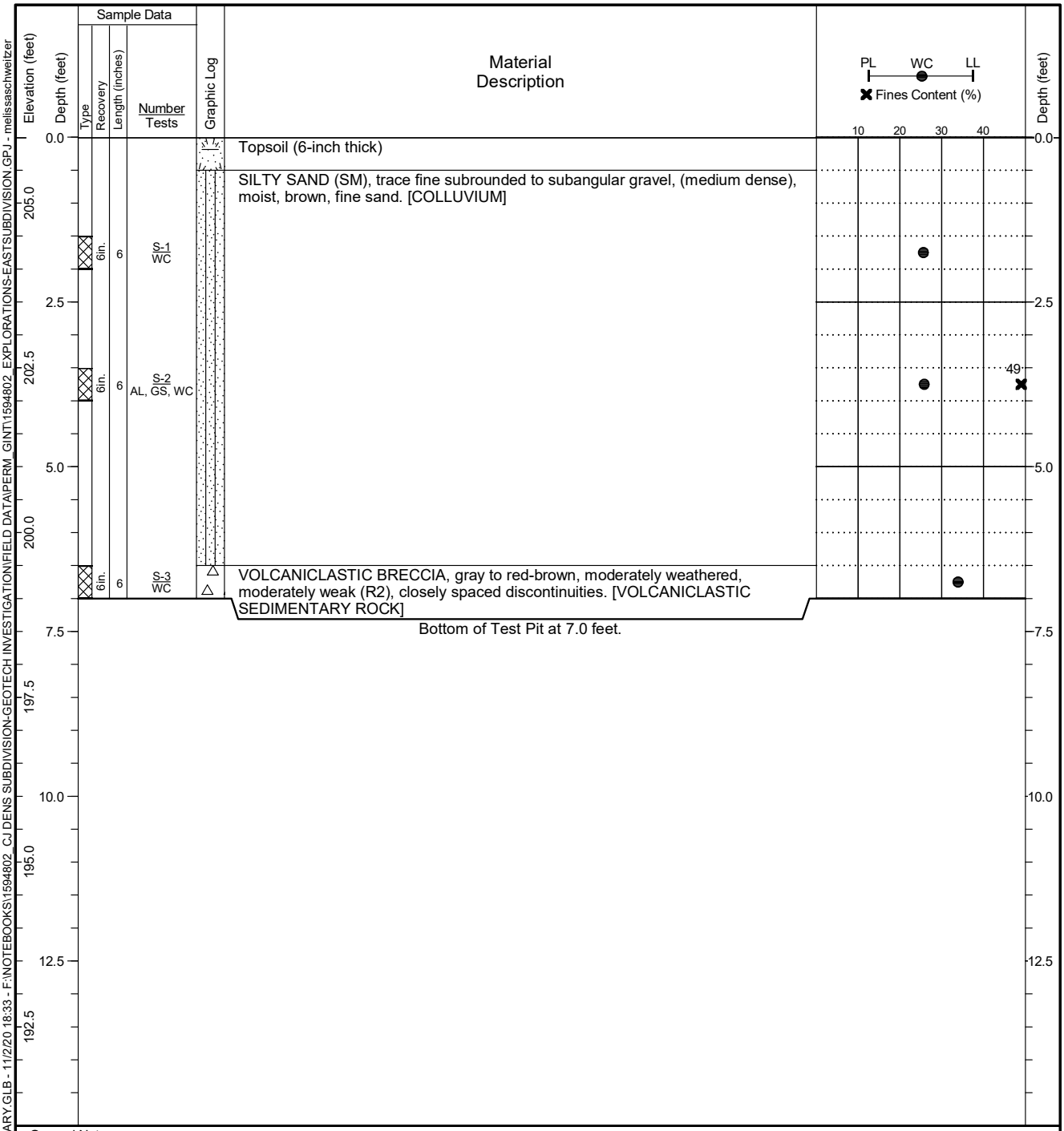
HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-6**	Figure **A-14** Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.613657 Long: -122.411810 (WGS 84) Total Depth: 7 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 206 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-7

Figure **A-15**
Sheet **1 of 1**

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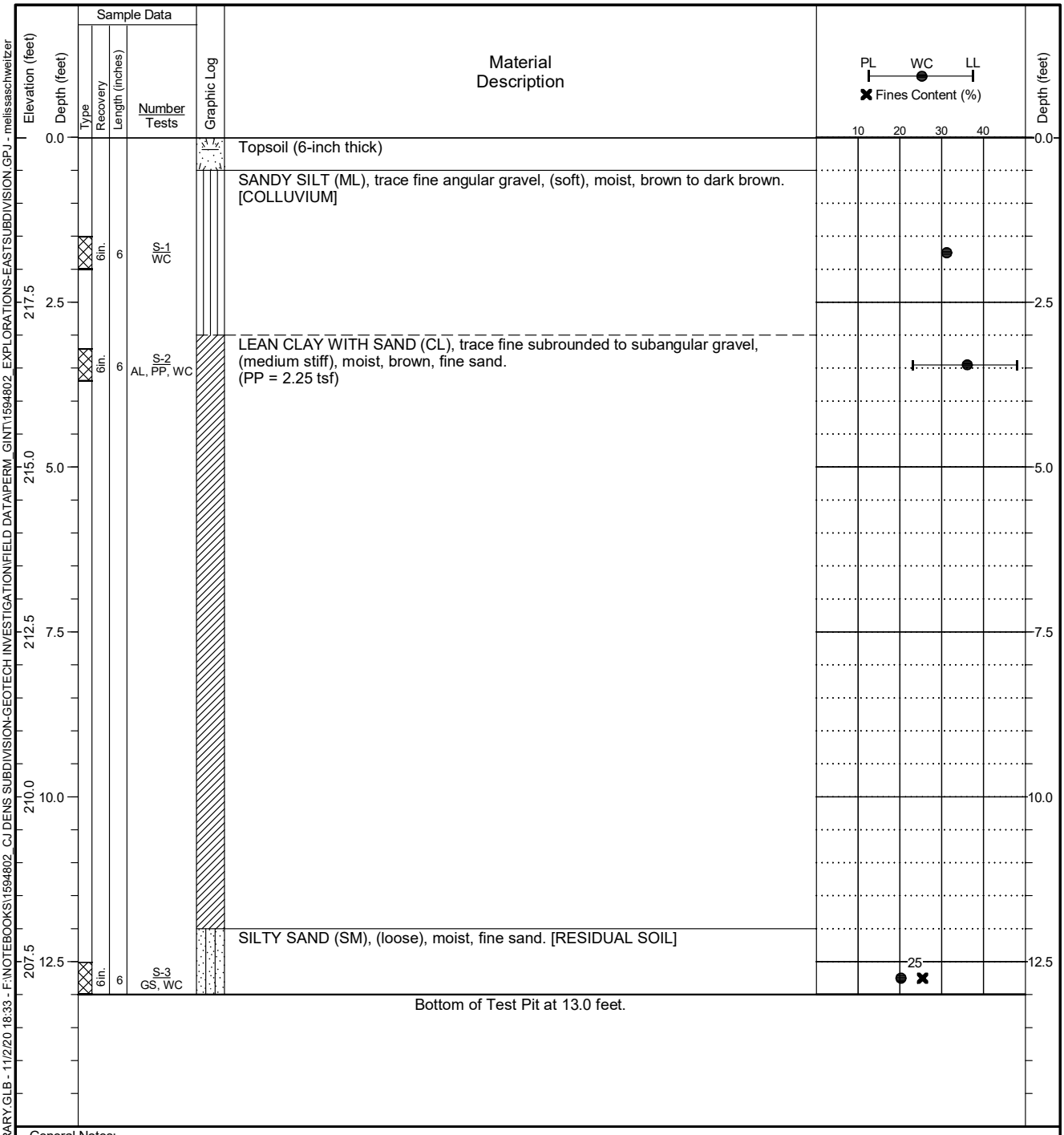
Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.613824 Long: -122.411764 (WGS 84) Total Depth: 13 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 220 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-8

Figure **A-16**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614293 Long: -122.413752 (WGS 84) Total Depth: 7 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 204 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	WC (10 20 30 40)	Depth (feet)
204.0	0.0						Topsoil (6-inch thick)		0.0
202.5	2.5						SILT WITH SAND (ML), trace angular gravel, (soft), moist, brown, fine sand, low plasticity. [COLLUVIUM]		2.5
200.0	5.0		6in.	6	S-1 WC		BASALTIC ANDESITE, gray to brown, moderately weathered, moderately weak (R2), closely spaced discontinuities. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]		5.0
197.5			6in.	6	S-2				
							Bottom of Test Pit at 7.0 feet.		
195.0	7.5								7.5
192.5	10.0								10.0
190.0	12.5								12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-9

Figure **A-17**
Sheet **1 of 1**

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Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614351 Long: -122.414811 (WGS 84) Total Depth: 4.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 202 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
202.0	0.0		Topsoil (6-inch thick)	0.0
			SANDY SILT (ML), trace angular gravel, (soft), moist, brown. [COLLUVIUM]	
200.0	2.5			2.5
197.5	5.0		BASALT, gray, slightly weathered to fresh, strong (R4), closely spaced discontinuities. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	5.0
			Bottom of Test Pit at 4.5 feet.	
195.0	7.5			7.5
192.5	10.0			10.0
190.0	12.5			12.5
187.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-10

Figure **A-18**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615146 Long: -122.415074 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 258 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
257.5	0.0		Topsoil (6-inch thick)	0.0
			BASALTIC ANDESITE, gray, fresh to slightly weathered, strong (R4), closely spaced discontinuities. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
			Bottom of Test Pit at 2.0 feet.	
255.0	2.5			2.5
252.5	5.0			5.0
250.0	7.5			7.5
247.5	10.0			10.0
245.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-11

Figure **A-19**
Sheet **1 of 1**

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Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615521 Long: -122.415646 (WGS 84) Total Depth: 2.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 264 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Recovery Length (inches)	Number Tests	Graphic Log	Material Description	Depth (feet)
264.0	0.0					Topsoil (6-inch thick)	0.0
						SILTY GRAVEL WITH SAND (GM), (dense), moist. [RESIDUAL SOIL]	
262.5		6in.	6	S-1		BASALTIC ANDESITE, gray, slightly weathered to fresh, strong (R4), closely spaced discontinuities. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
	2.5					Bottom of Test Pit at 2.5 feet.	2.5
260.0	5.0						5.0
257.5	7.5						7.5
255.0	10.0						10.0
252.5	12.5						12.5
250.0							

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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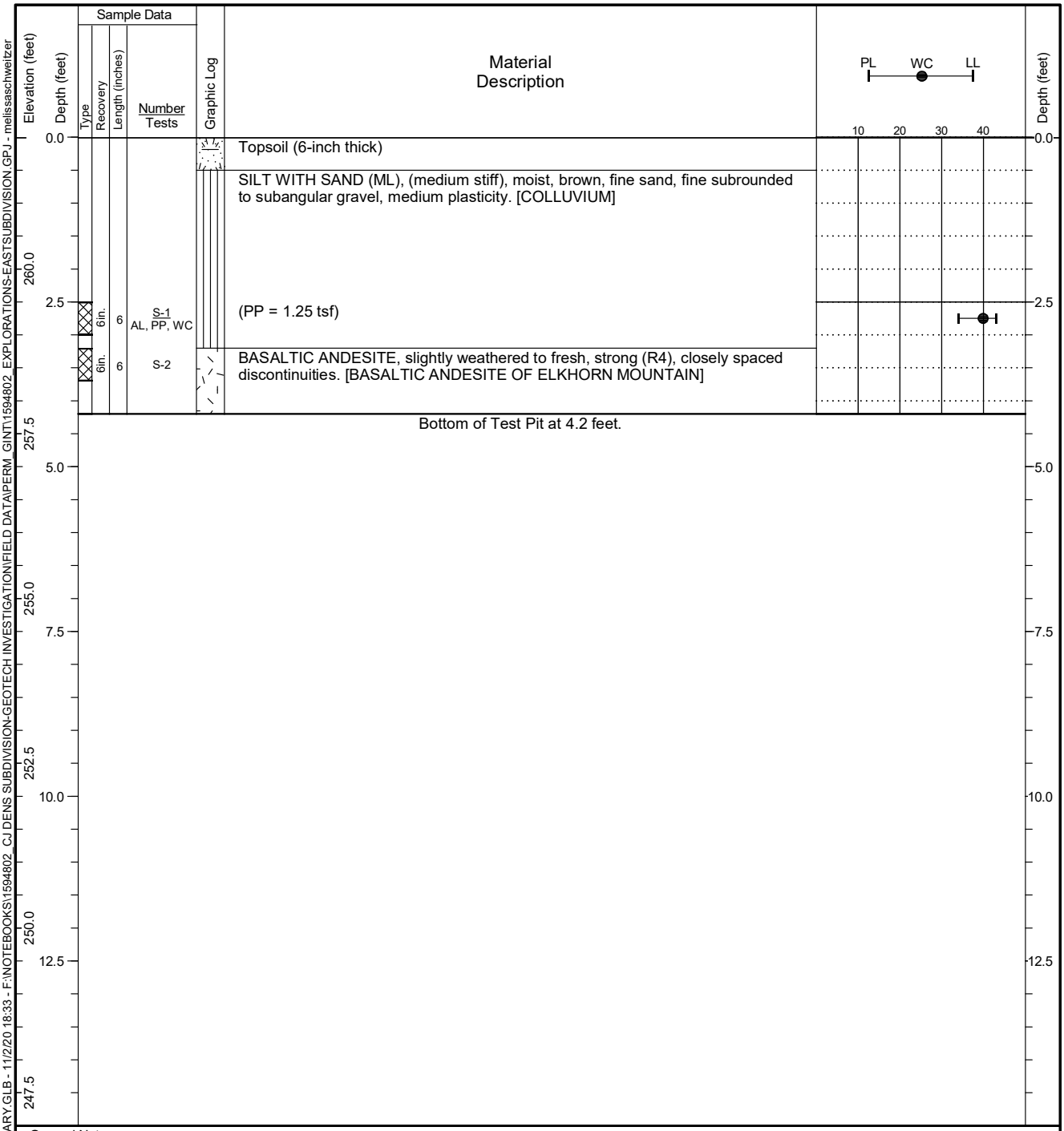
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-12

Figure **A-20**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615721 Long: -122.415296 (WGS 84) Total Depth: 4.2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 262 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-13

Figure **A-21**
Sheet **1 of 1**

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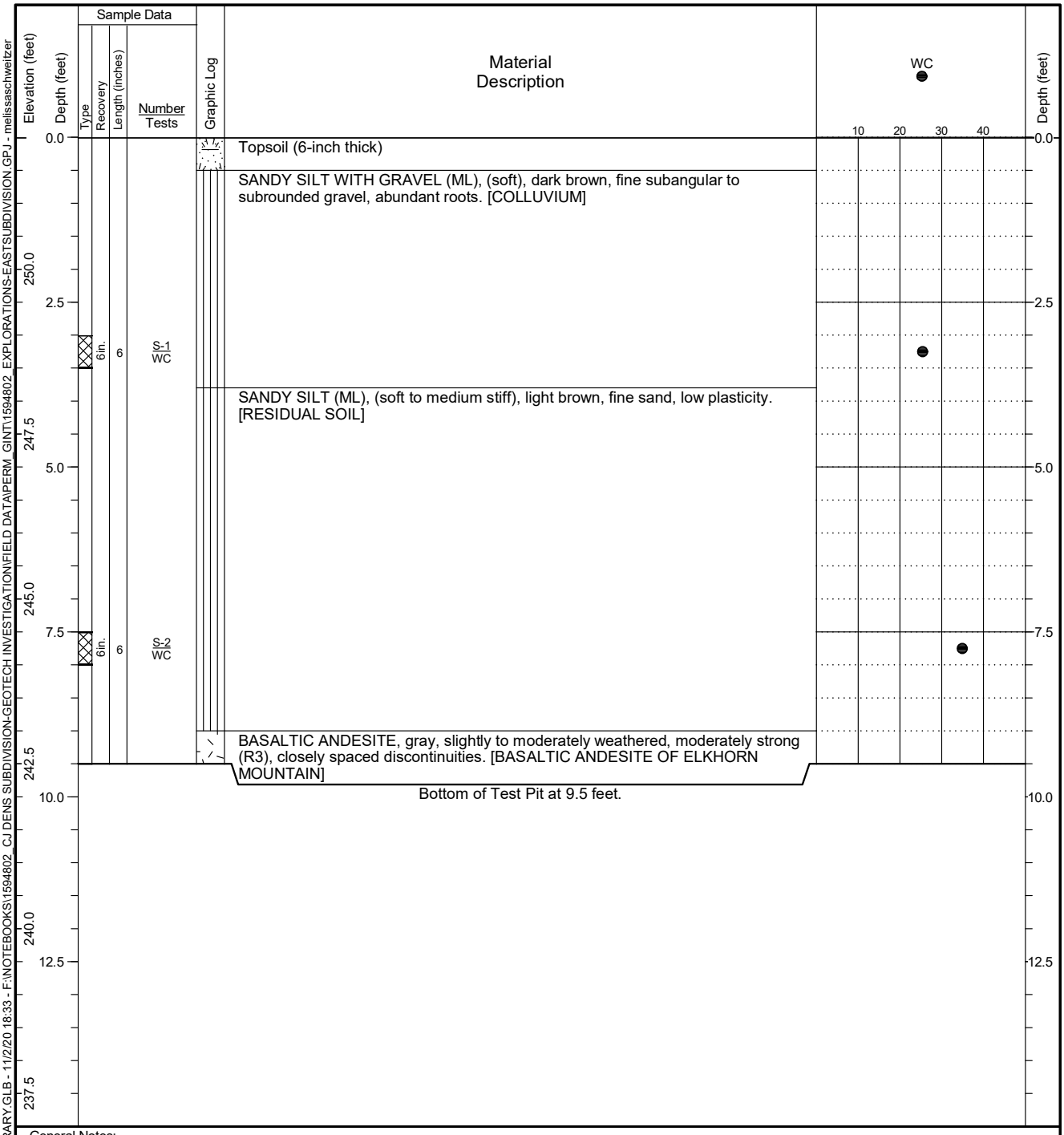
Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615912 Long: -122.415649 (WGS 84) Total Depth: 9.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 252 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-14**	Figure **A-22** Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616057 Long: -122.414660 (WGS 84) Total Depth: 4 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 285 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	WC (10 20 30 40)	Depth (feet)
285.0	0.0						Topsoil (6-inch thick)		0.0
							SANDY SILT (ML), trace fine subangular to subrounded gravel, (soft), moist, brown. [COLLUVIUM]		
282.5	2.5		6in.	6	S-1 / WC			•	2.5
			6in.	6	S-2		BASALTIC ANDESITE, gray, fresh to slightly weathered, moderately strong (R3), closely spaced discontinuities. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]		
							Bottom of Test Pit at 4.0 feet.		
280.0	5.0								5.0
277.5	7.5								7.5
275.0	10.0								10.0
272.5	12.5								12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-15

Figure **A-23**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616324 Long: -122.413767 (WGS 84) Total Depth: 6.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 298 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	WC (10 20 30 40)	Depth (feet)
297.5	0.0						Topsoil (6-inch thick)		0.0
							SILTY SAND WITH GRAVEL (SM), (loose), moist, brown, fine subrounded to subangular gravel. [COLLUVIUM]		
295.0	2.5		6in.	6	S-1 / WC			•	2.5
							BASALTIC ANDESITE, gray, slightly to moderately weathered, moderately strong (R3), closely spaced discontinuities. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]		
292.5	5.0		6in.	6	S-2				5.0
							Bottom of Test Pit at 6.5 feet.		
290.0	7.5								7.5
287.5	10.0								10.0
285.0	12.5								12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-16

Figure **A-24**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616322 Long: -122.411837 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 302 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
300.0	0.0		Topsoil (6-inch thick)	0.0
			BASALTIC ANDESITE, gray, fresh to slightly weathered, strong (R4), moderately spaced discontinuities. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
			Bottom of Test Pit at 2.0 feet.	
297.5	2.5			2.5
295.0	5.0			5.0
292.5	7.5			7.5
290.0	10.0			10.0
287.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HART CROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-17

Figure **A-25**
Sheet **1 of 1**

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Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616170 Long: -122.410459 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 310 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
	0.0		Topsoil (6-inch thick)	0.0
			BASALTIC ANDESITE, gray, fresh to slightly weathered, strong (R4), closely spaced discontinuities. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
307.5	2.5		Bottom of Test Pit at 2.0 feet.	2.5
305.0	5.0			5.0
302.5	7.5			7.5
300.0	10.0			10.0
297.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-18

Figure **A-26**
Sheet **1 of 1**

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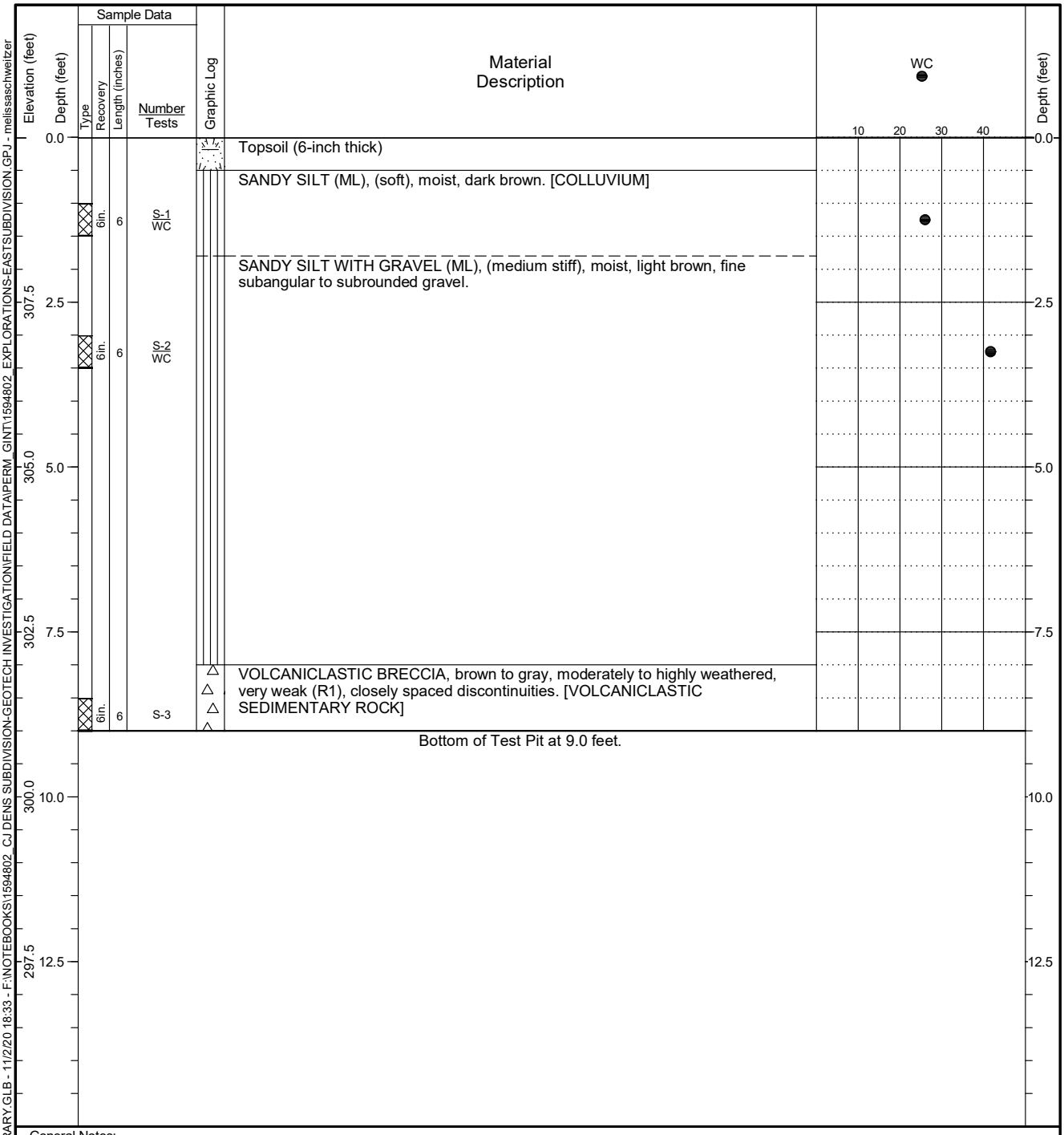
Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616855 Long: -122.410170 (WGS 84) Total Depth: 9 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 310 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-19**	Figure **A-27** Sheet **1 of 1**

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Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616546 Long: -122.410071 (WGS 84) Total Depth: 8 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 306 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	WC / Fines Content (%)	Depth (feet)
306.0	0.0						Topsoil (6-inch thick)		0.0
							SILTY SAND (SM), trace angular to subangular gravel, (loose), moist, brown. [RESIDUAL SOIL]		
303.5	2.5		6in.	6	S-1 GS, WC			24	2.5
301.0	5.0								5.0
298.5	7.5						VOLCANICLASTIC BRECCIA, brown to gray, moderately to highly weathered, very weak (R1), closely spaced discontinuities. [VOLCANICLASTIC SEDIMENTARY ROCK]		7.5
							Bottom of Test Pit at 8.0 feet.		
296.0	10.0								10.0
293.5	12.5								12.5
291.0	15.0								15.0

WC ● Fines Content (%) ✖ 10 20 30 40

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
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3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-20

Figure **A-28**
Sheet **1 of 1**

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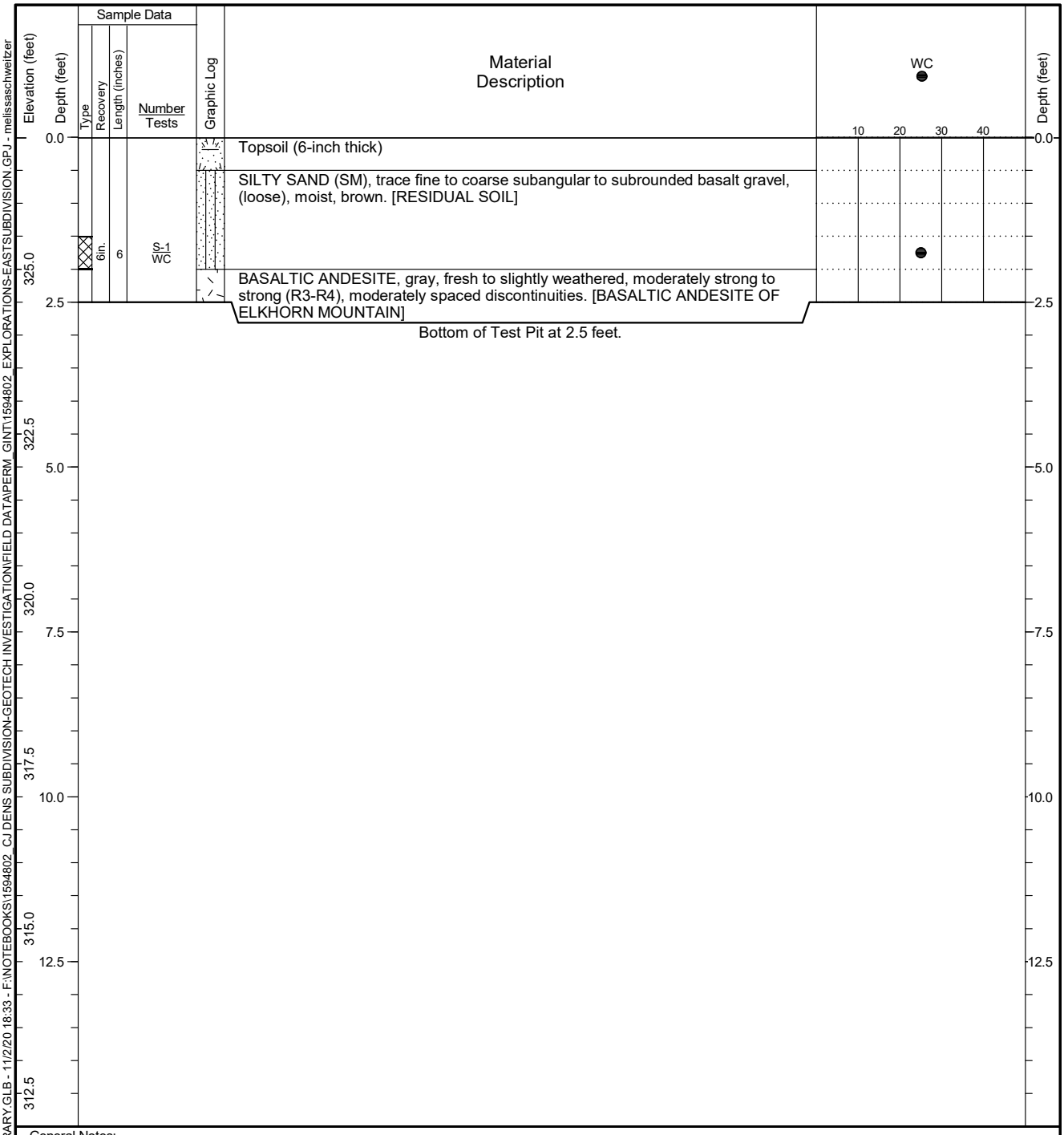
Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615457 Long: -122.410283 (WGS 84) Total Depth: 2.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 327 feet (NAVD 88)
Comments:



General Notes:
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2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
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4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-21

Figure **A-29**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614343 Long: -122.410129 (WGS 84) Total Depth: 2.6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 312 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
312.0	0.0		Topsoil (6-inch thick)	0.0
310.0	2.5		BASALTIC ANDESITE, gray, fresh to slightly weathered, strong (R4), closely spaced discontinuities, highly fractured and moderately weathered from 0.5 to 1.0 feet. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
			Bottom of Test Pit at 2.6 feet.	
307.5	5.0			5.0
305.0	7.5			7.5
302.5	10.0			10.0
300.0	12.5			12.5
297.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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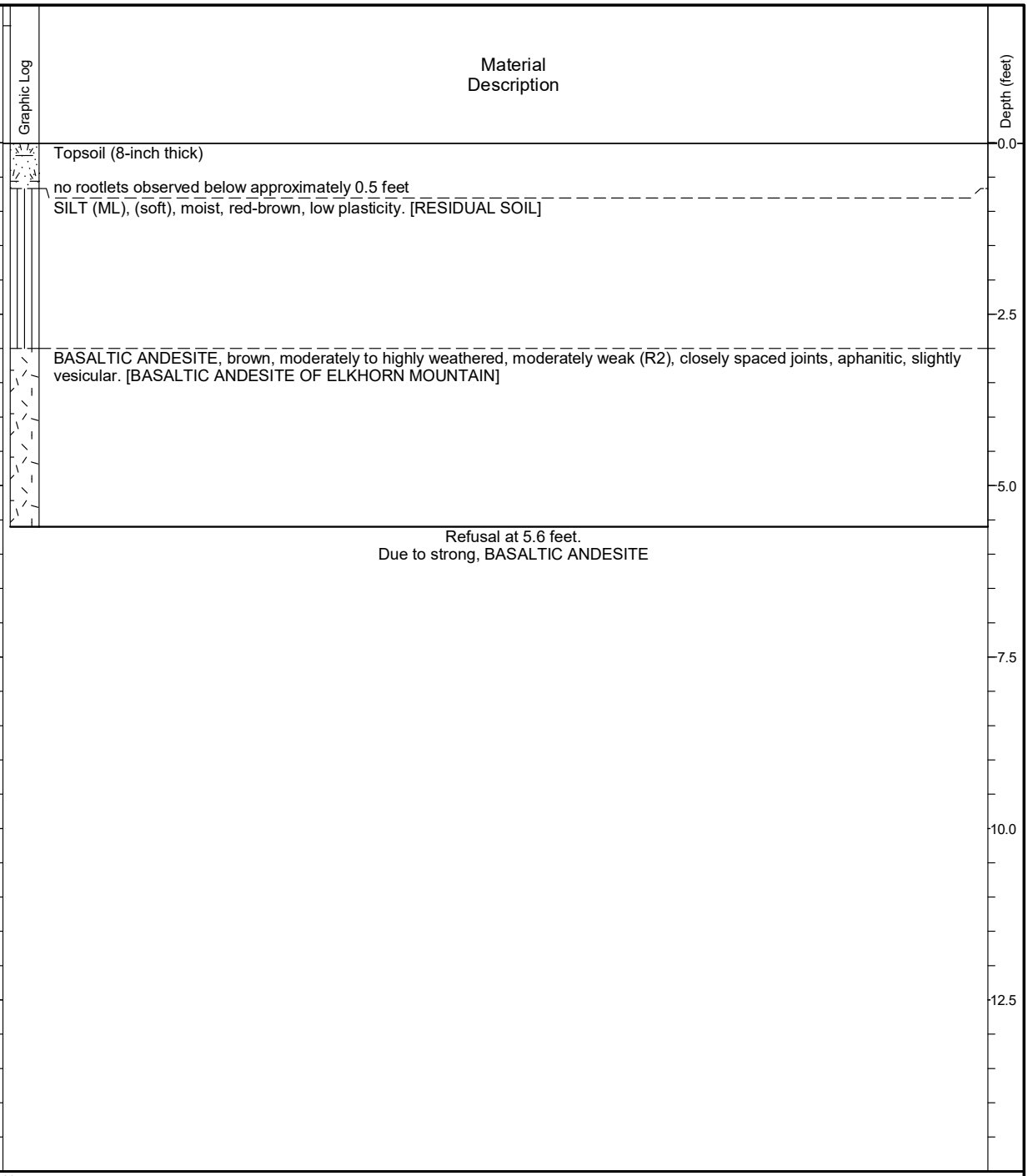
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-22

Figure **A-30**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614550 Long: -122.409480 (WGS 84) Total Depth: 5.6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 323.57 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-43**	Figure **A-31** Sheet **1 of 1**

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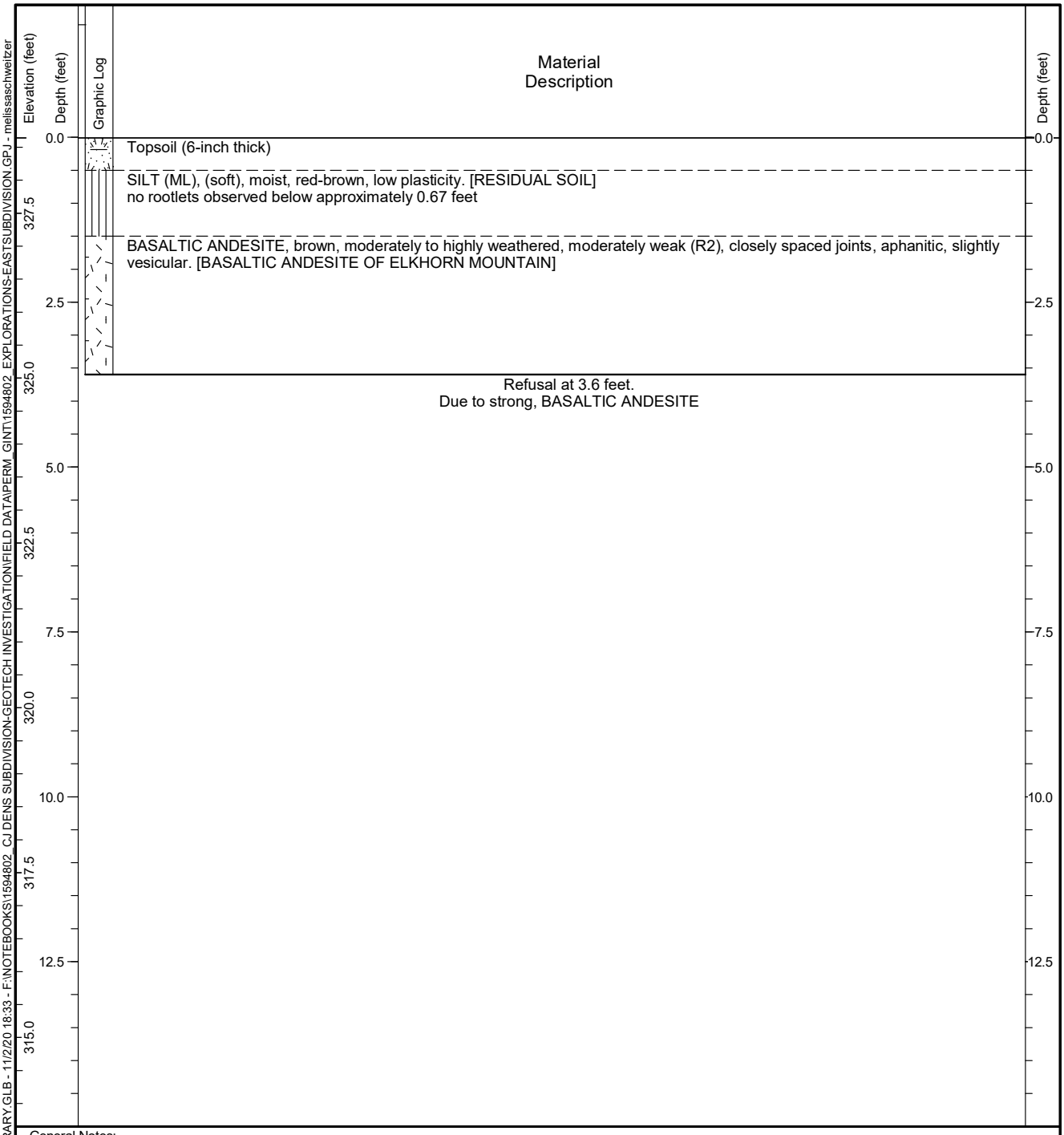
Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615000 Long: -122.409500 (WGS 84) Total Depth: 3.6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 328.65 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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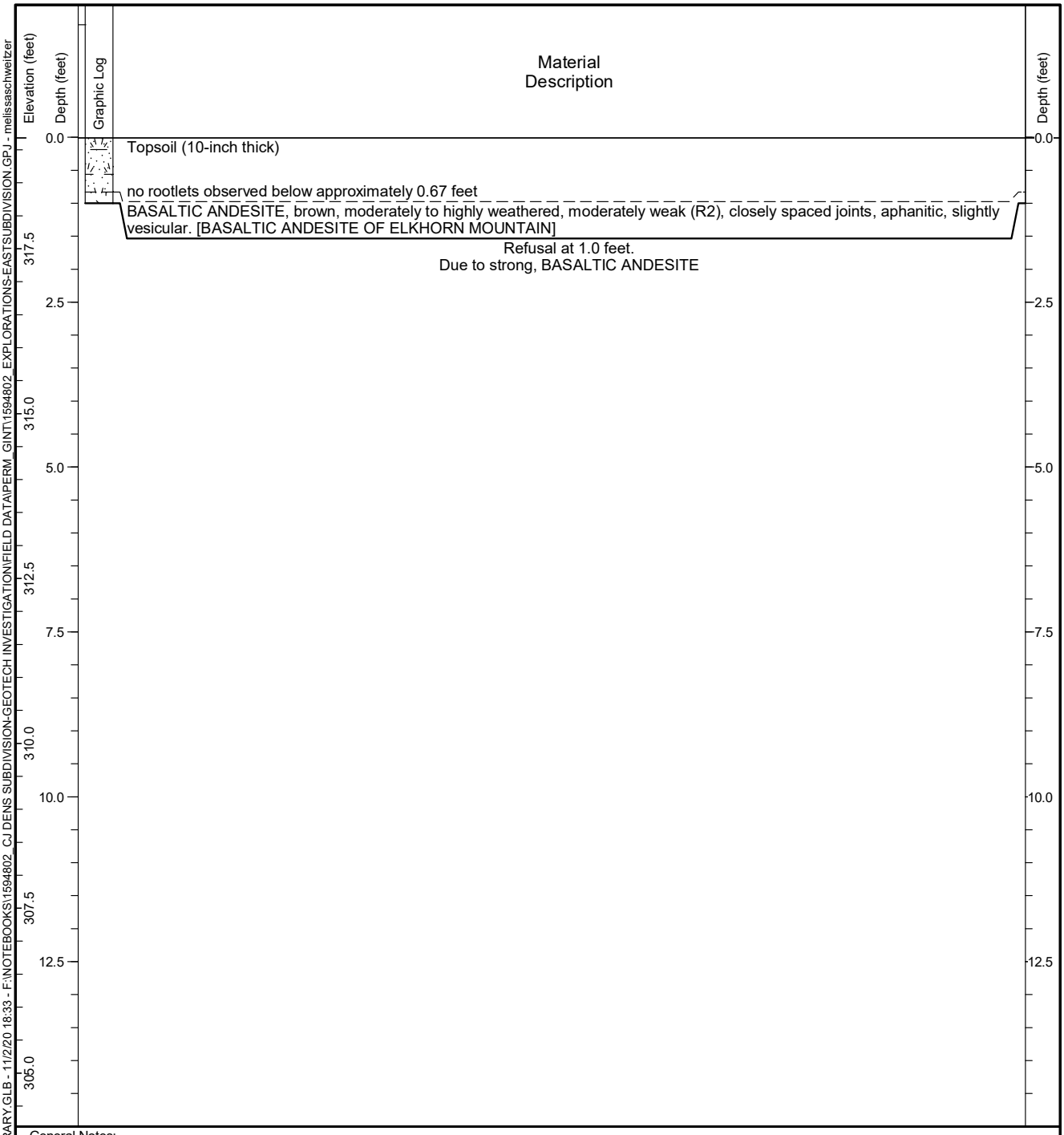
HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-44**	Figure **A-32** Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614460 Long: -122.409850 (WGS 84) Total Depth: 1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 319.19 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-45**	Figure **A-33** Sheet **1 of 1**

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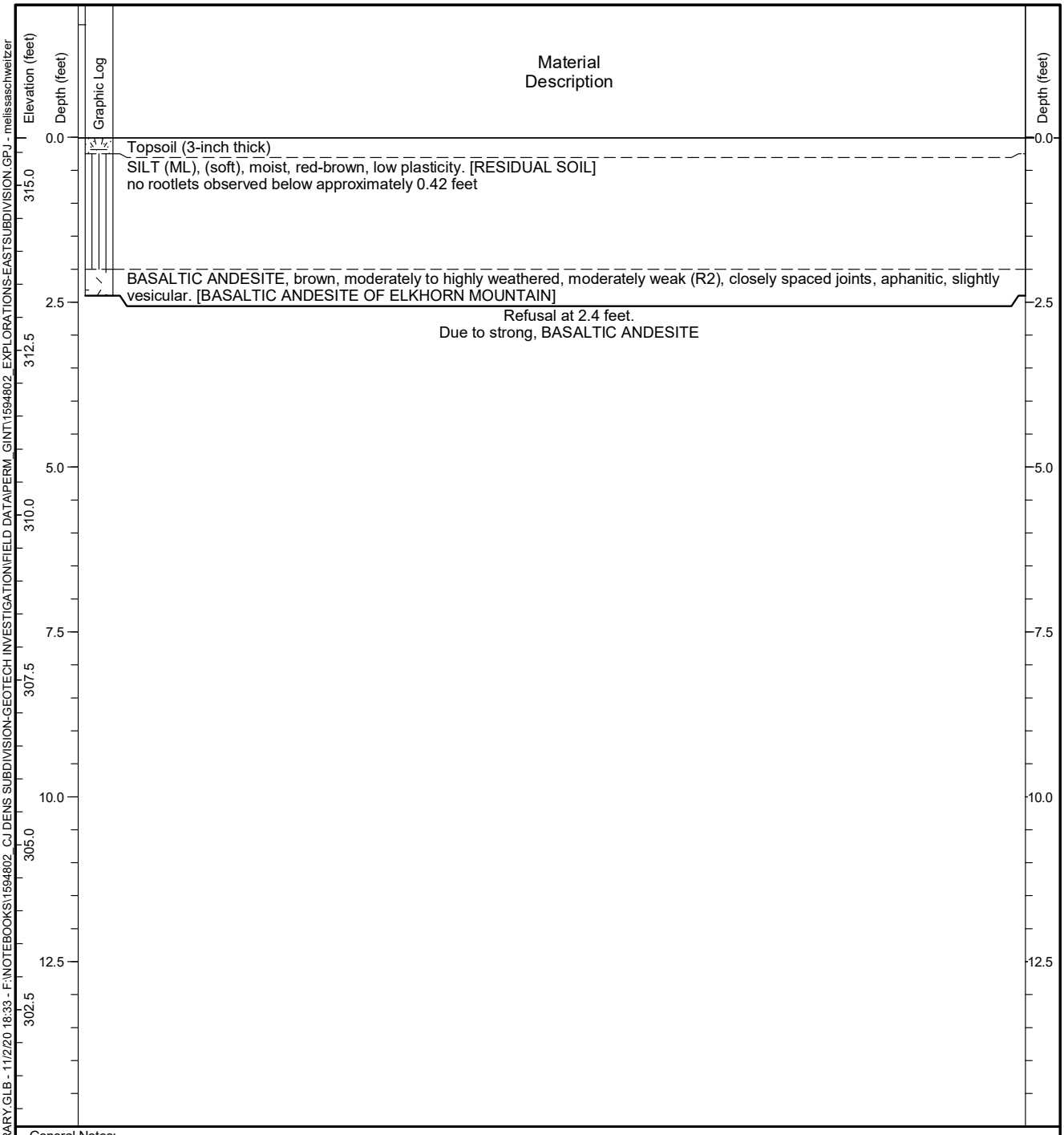
Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614400 Long: -122.410100 (WGS 84) Total Depth: 2.4 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 315.73 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-46

Figure **A-34**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614200 Long: -122.410500 (WGS 84) Total Depth: 3 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 310.06 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
	0.0		Topsoil (4-inch thick)	0.0
307.5	2.5		SILTY GRAVEL (GM), (loose), moist, red-brown, coarse angular gravel, low plasticity fines. [RESIDUAL SOIL] no rootlets observed below approximately 0.5 feet	2.5
			BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
305.0	5.0		Refusal at 3.0 feet. Due to strong, BASALTIC ANDESITE	5.0
302.5	7.5			7.5
300.0	10.0			10.0
297.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HART CROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-47

Figure **A-35**
Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:33 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614200 Long: -122.410900 (WGS 84) Total Depth: 6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 312.97 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
312.5	0.0		Topsoil (6-inch thick)	0.0
			SILT (ML), (soft), moist, red-brown, low plasticity. [RESIDUAL SOIL]	
310.0	2.5		no rootlets observed below approximately 2.5 feet	2.5
			BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
307.5	5.0		Refusal at 6.0 feet. Due to strong, BASALTIC ANDESITE	5.0
305.0	7.5			7.5
302.5	10.0			10.0
300.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

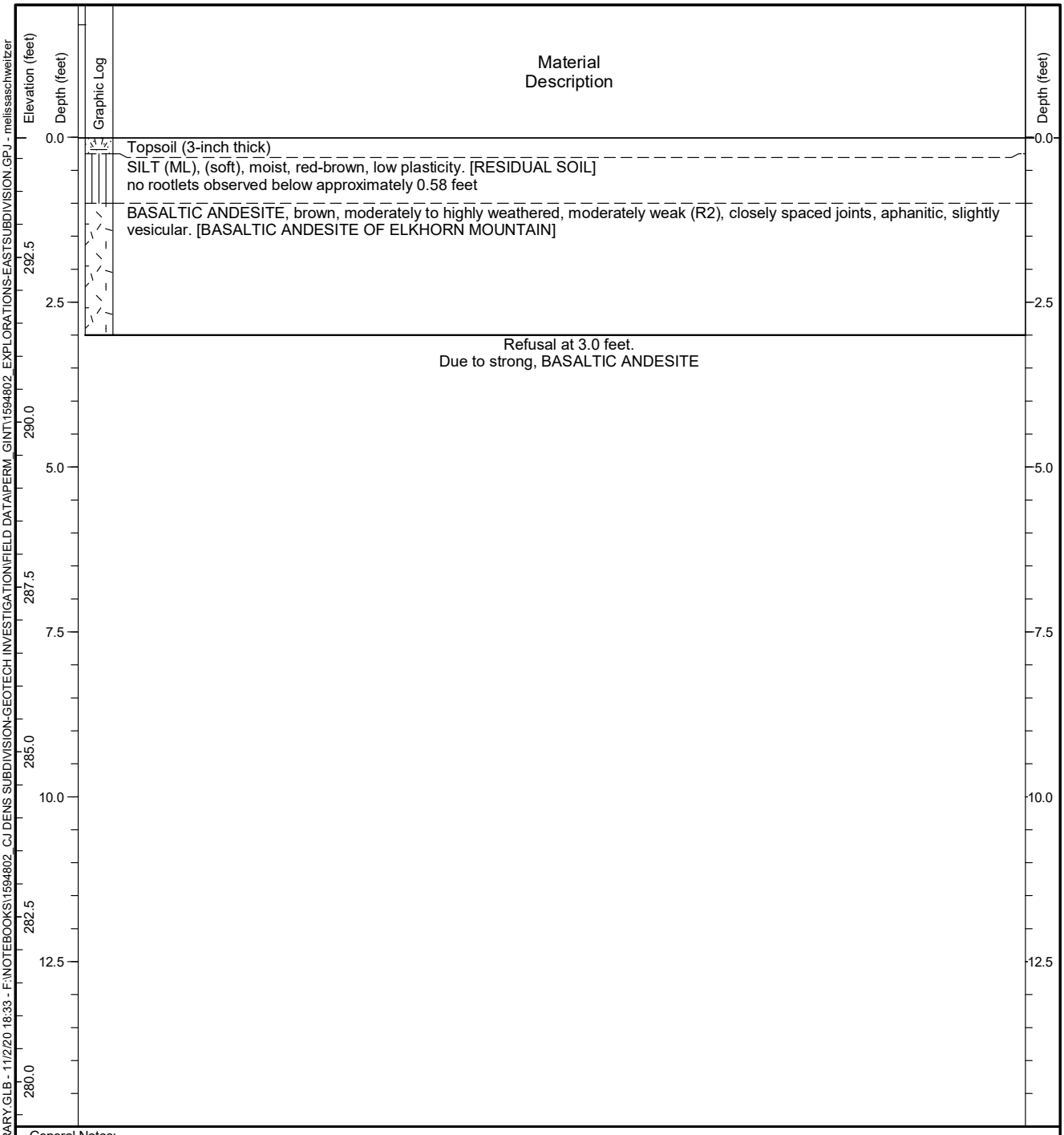
Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-48

Figure **A-36**
Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:33 - F:\NOTEBOOKS\15948002_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614200 Long: -122.411300 (WGS 84) Total Depth: 3 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 294.32 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-49**	Figure **A-37** Sheet **1 of 1**

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Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614300 Long: -122.411400 (WGS 84) Total Depth: 0.1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 303.33 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
302.5	0.0		BASALTIC ANDESITE, brown, slightly weathered, moderately strong (R3), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
			Refusal at 0.1 feet. Due to strong, BASALTIC ANDESITE	
300.0	2.5			2.5
297.5	5.0			5.0
295.0	7.5			7.5
292.5	10.0			10.0
290.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-50

Figure **A-38**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615300 Long: -122.409400 (WGS 84) Total Depth: 0.1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 333.90 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
333.9	0.0		BASALTIC ANDESITE, brown, slightly weathered, moderately strong (R3), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
			Refusal at 0.1 feet. Due to strong, BASALTIC ANDESITE	
332.5	2.5			2.5
330.0	5.0			5.0
327.5	7.5			7.5
325.0	10.0			10.0
322.5	12.5			12.5
320.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-51

Figure **A-39**
Sheet **1 of 1**

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Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615500 Long: -122.409300 (WGS 84) Total Depth: 6.5 feet Depth to Seepage: 6.4 feet
Ground Surface Elevation: 326.12 feet (NGVD 88)
Comments:

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-52**	Figure **A-40** Sheet **1 of 1**

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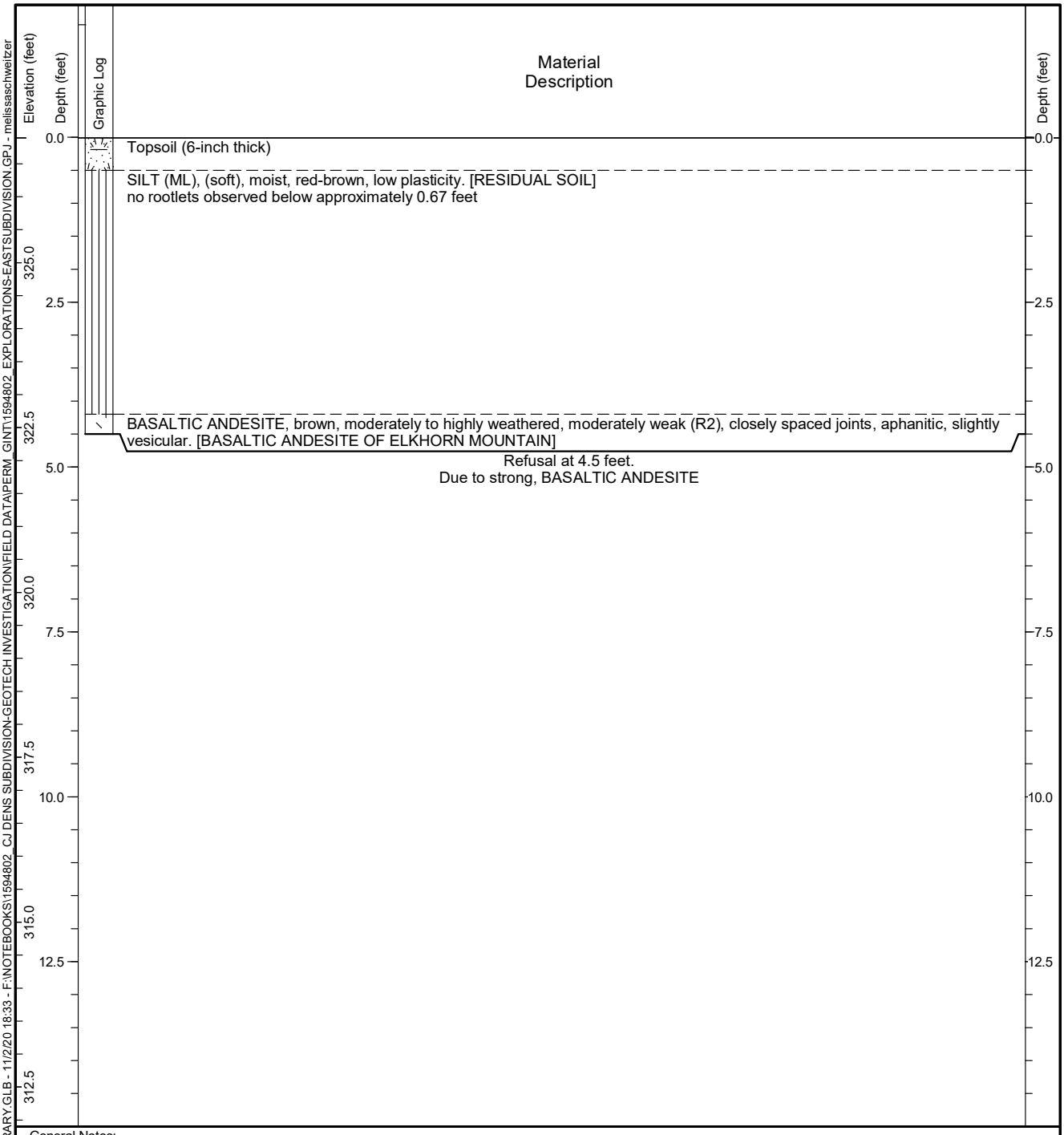
Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615400 Long: -122.409700 (WGS 84) Total Depth: 4.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 326.90 feet (NGVD 88)
Comments:

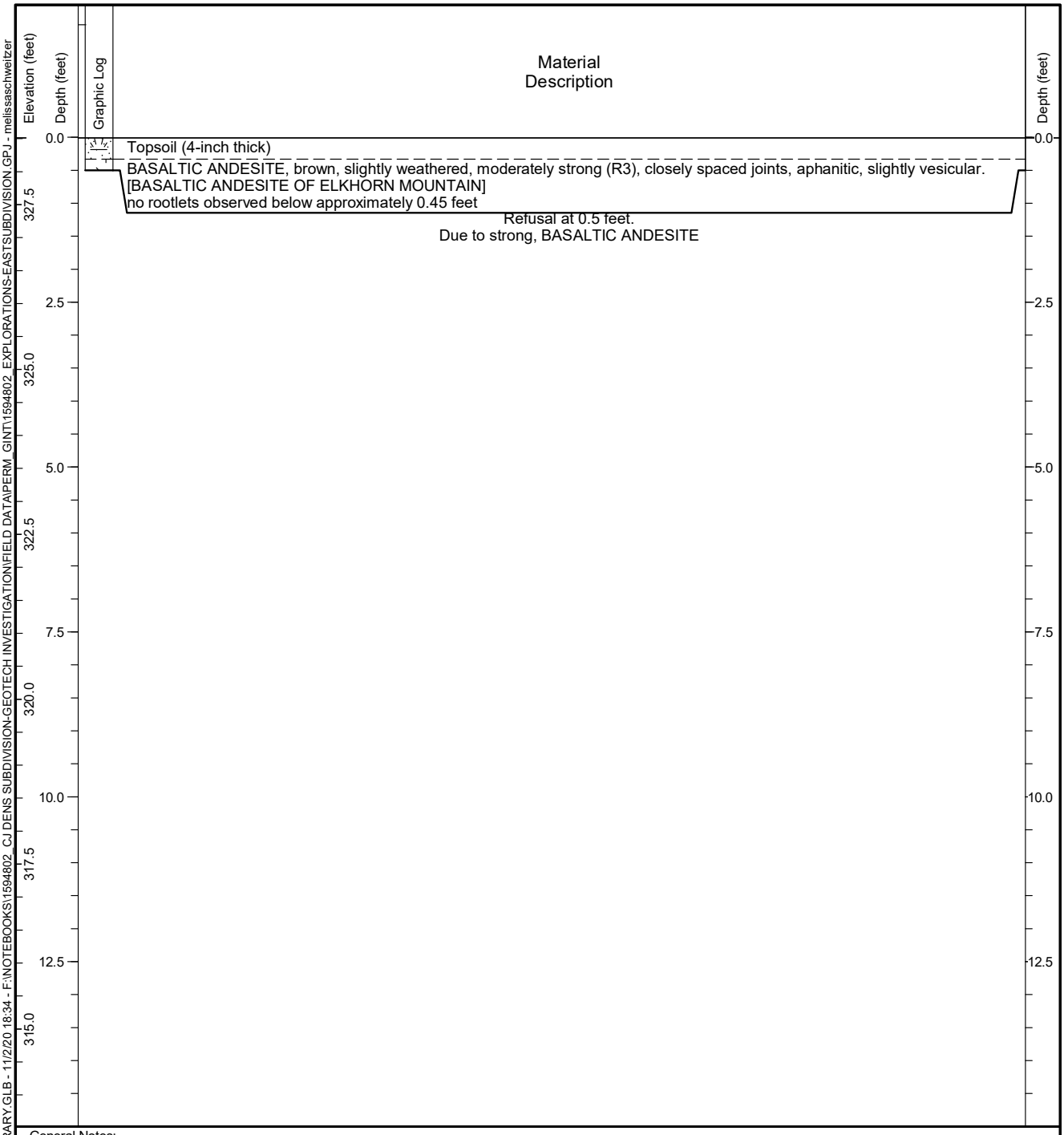


General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-53**	Figure **A-41** Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:33 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615500 Long: -122.410200 (WGS 84) Total Depth: 0.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 328.52 feet (NGVD 88)
Comments:

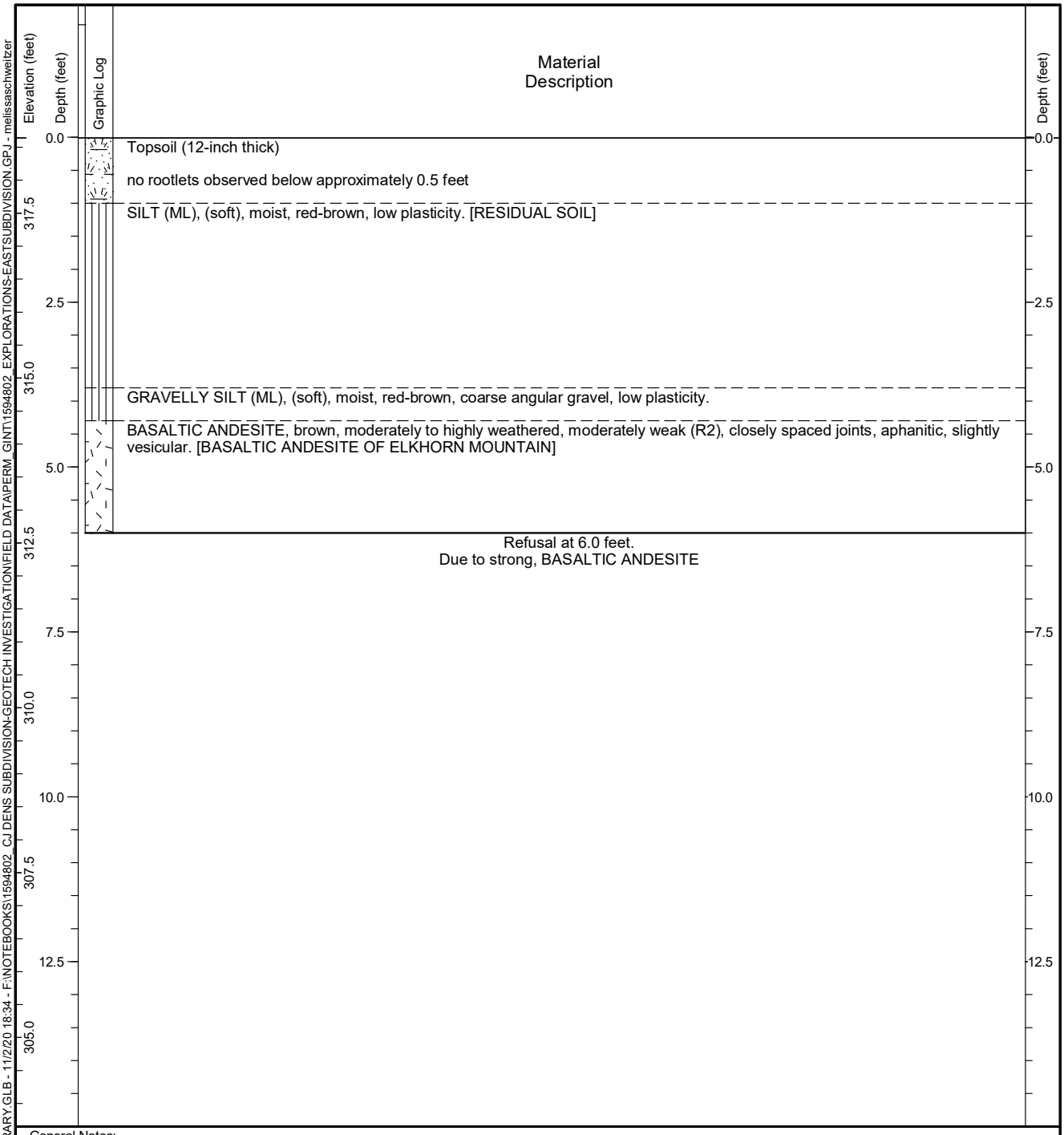


General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-54**	Figure **A-42** Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:34 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615400 Long: -122.410600 (WGS 84) Total Depth: 6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 318.65 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-55**	Figure **A-43** Sheet **1 of 1**

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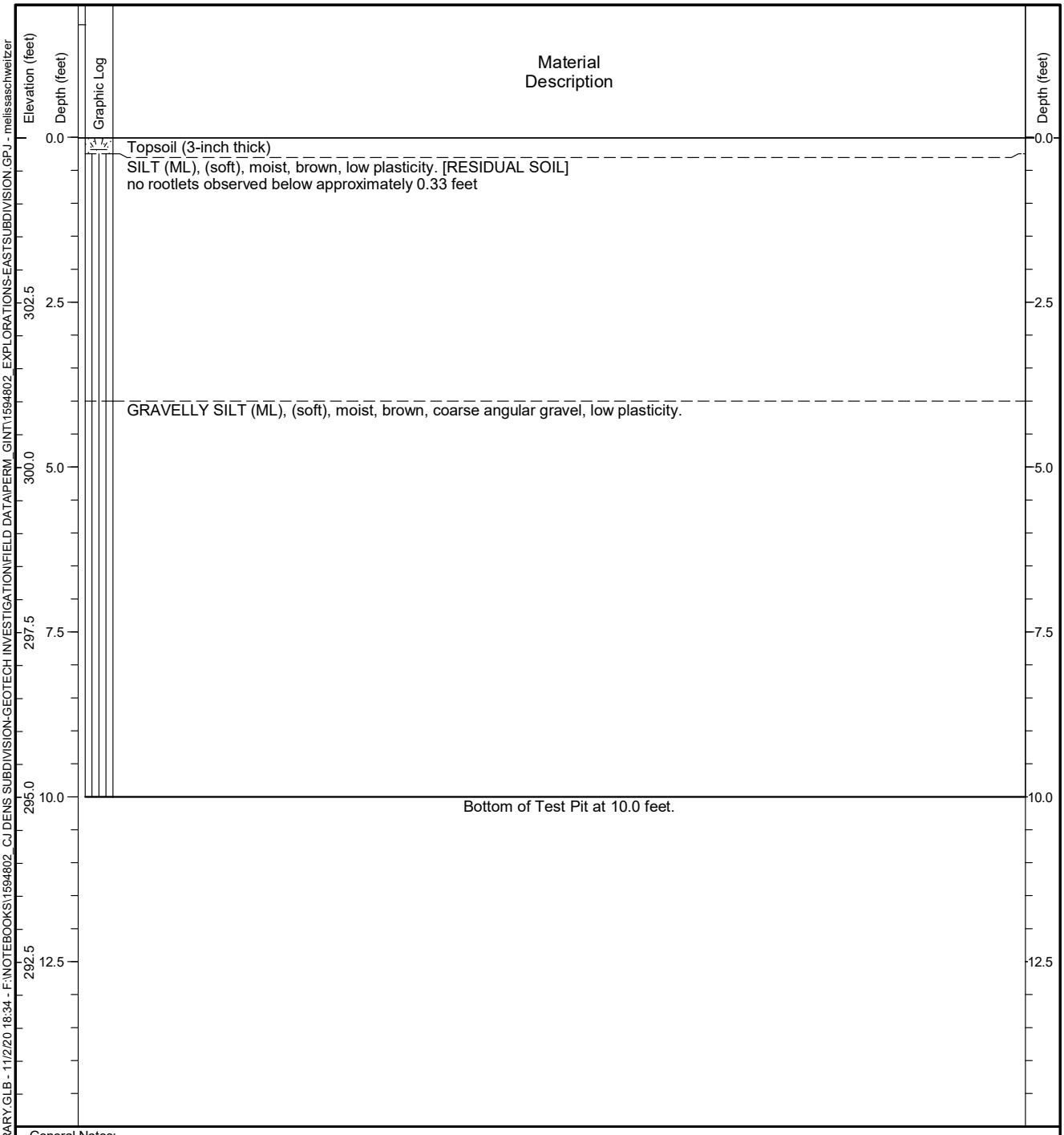
Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615400 Long: -122.411000 (WGS 84) Total Depth: 10 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 305.01 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-56**	Figure **A-44** Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:34 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615500 Long: -122.411400 (WGS 84) Total Depth: 3.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 307.45 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
307.5	0.0		Topsoil (6-inch thick)	0.0
			SILT (ML), (soft), moist, brown, low plasticity. [RESIDUAL SOIL]	
305.0	2.5		no rootlets observed below approximately 1.5 feet	2.5
			Refusal at 3.5 feet. Due to strong, BASALTIC ANDESITE	
302.5	5.0			5.0
300.0	7.5			7.5
297.5	10.0			10.0
295.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-57

Figure **A-45**
Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:34 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615500 Long: -122.411900 (WGS 84) Total Depth: 2.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 310.00 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
	0.0		Topsoil (6-inch thick)	0.0
			no rootlets observed below approximately 0.5 feet	
			BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
307.5	2.5		Refusal at 2.5 feet. Due to strong, BASALTIC ANDESITE	2.5
305.0	5.0			5.0
302.5	7.5			7.5
300.0	10.0			10.0
297.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-58

Figure **A-46**
Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:34 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615600 Long: -122.412400 (WGS 84) Total Depth: 0.25 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 308.91 feet (NGVD 88)
Comments:

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-59**	Figure **A-47** Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:34 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615500 Long: -122.412900 (WGS 84) Total Depth: 3.1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 297.15 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
295.0	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
			no rootlets observed below approximately 1.2 feet	
292.5	2.5			2.5
			Refusal at 3.1 feet. Due to strong, BASALTIC ANDESITE	
290.0	5.0			5.0
287.5	7.5			7.5
285.0	10.0			10.0
282.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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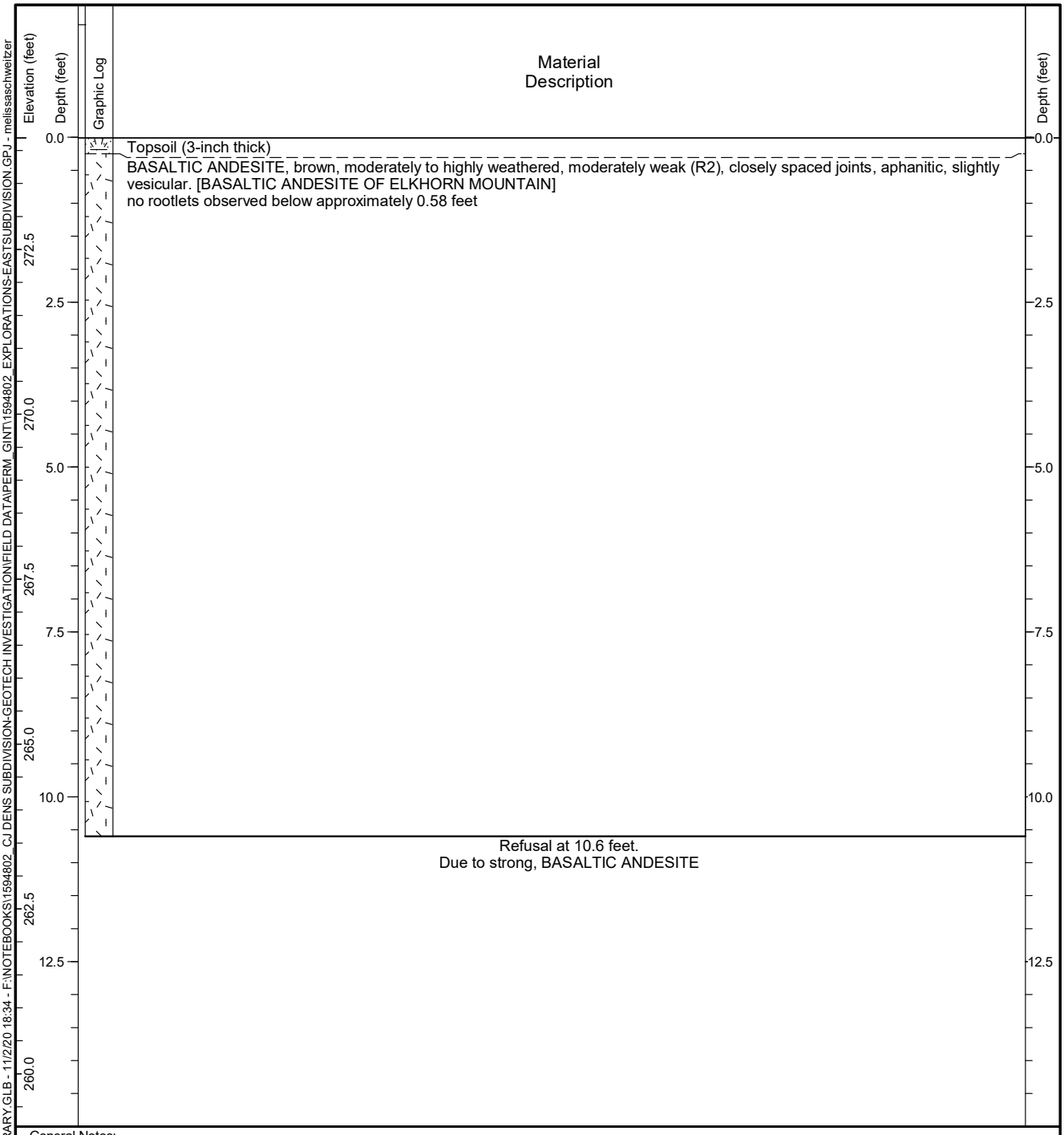
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-60

Figure **A-48**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615500 Long: -122.413400 (WGS 84) Total Depth: 10.6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 274.20 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-61**	Figure **A-49** Sheet **1 of 1**

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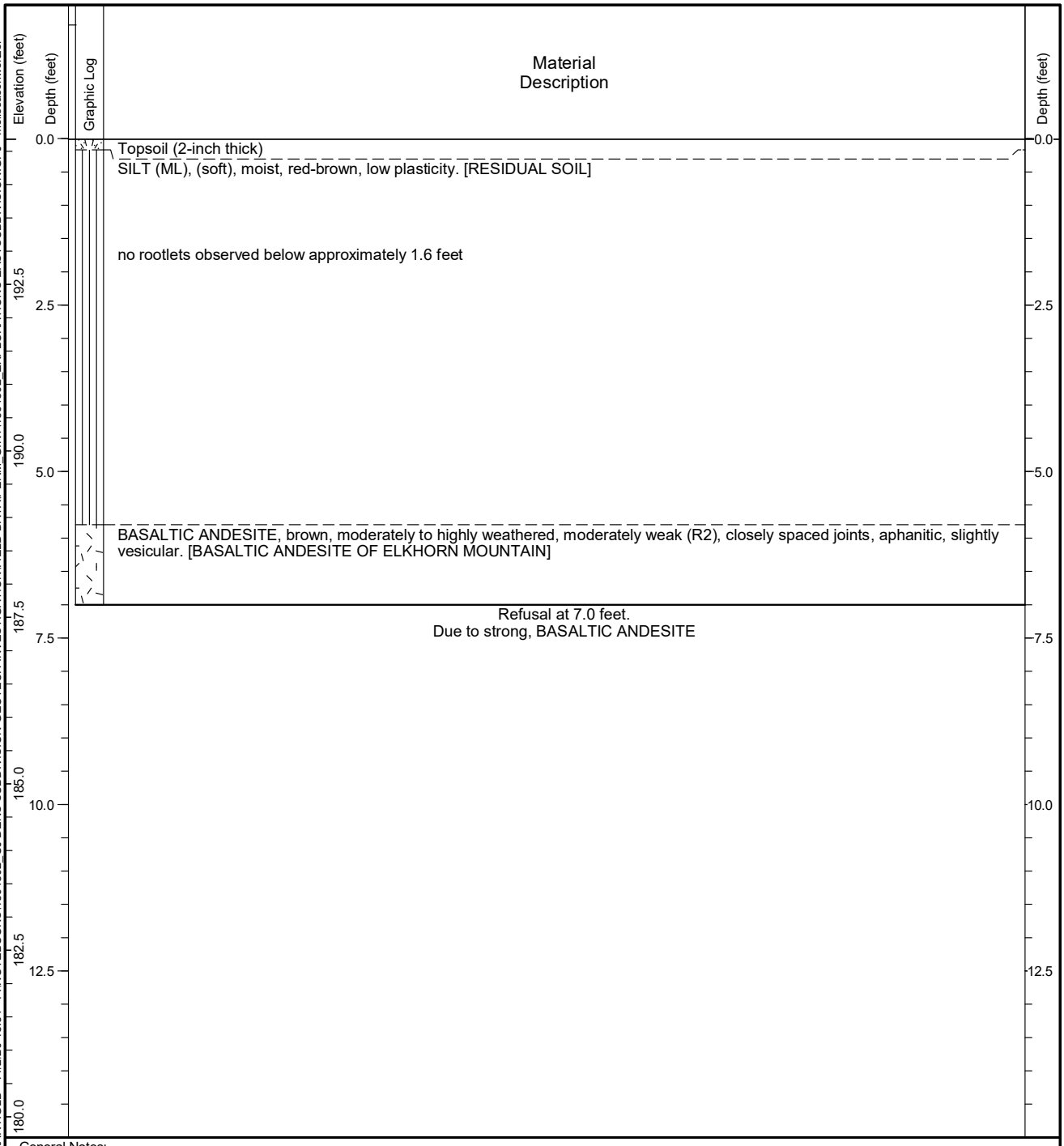
Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614200 Long: -122.414600 (WGS 84) Total Depth: 7 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 194.69 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-62

Figure **A-50**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615600 Long: -122.414300 (WGS 84) Total Depth: 0.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 279.38 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
277.5	0.0		Topsoil (6-inch thick) no rootlets observed below approximately 0.5 feet	0.0
			Refusal at 0.5 feet. Due to strong, BASALTIC ANDESITE	
275.0	2.5			2.5
272.5	5.0			5.0
270.0	7.5			7.5
267.5	10.0			10.0
265.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-63

Figure **A-51**
Sheet **1 of 1**

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Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615800 Long: -122.414400 (WGS 84) Total Depth: 2.75 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 288.09 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
	0.0		Topsoil (6-inch thick)	0.0
287.5			SILT (ML), (soft), moist, red-brown, low plasticity. [RESIDUAL SOIL] no rootlets observed below approximately 0.67 feet	
			BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
285.0	2.5		Refusal at 2.8 feet. Due to strong, BASALTIC ANDESITE	2.5
282.5	5.0			5.0
280.0	7.5			7.5
277.5	10.0			10.0
275.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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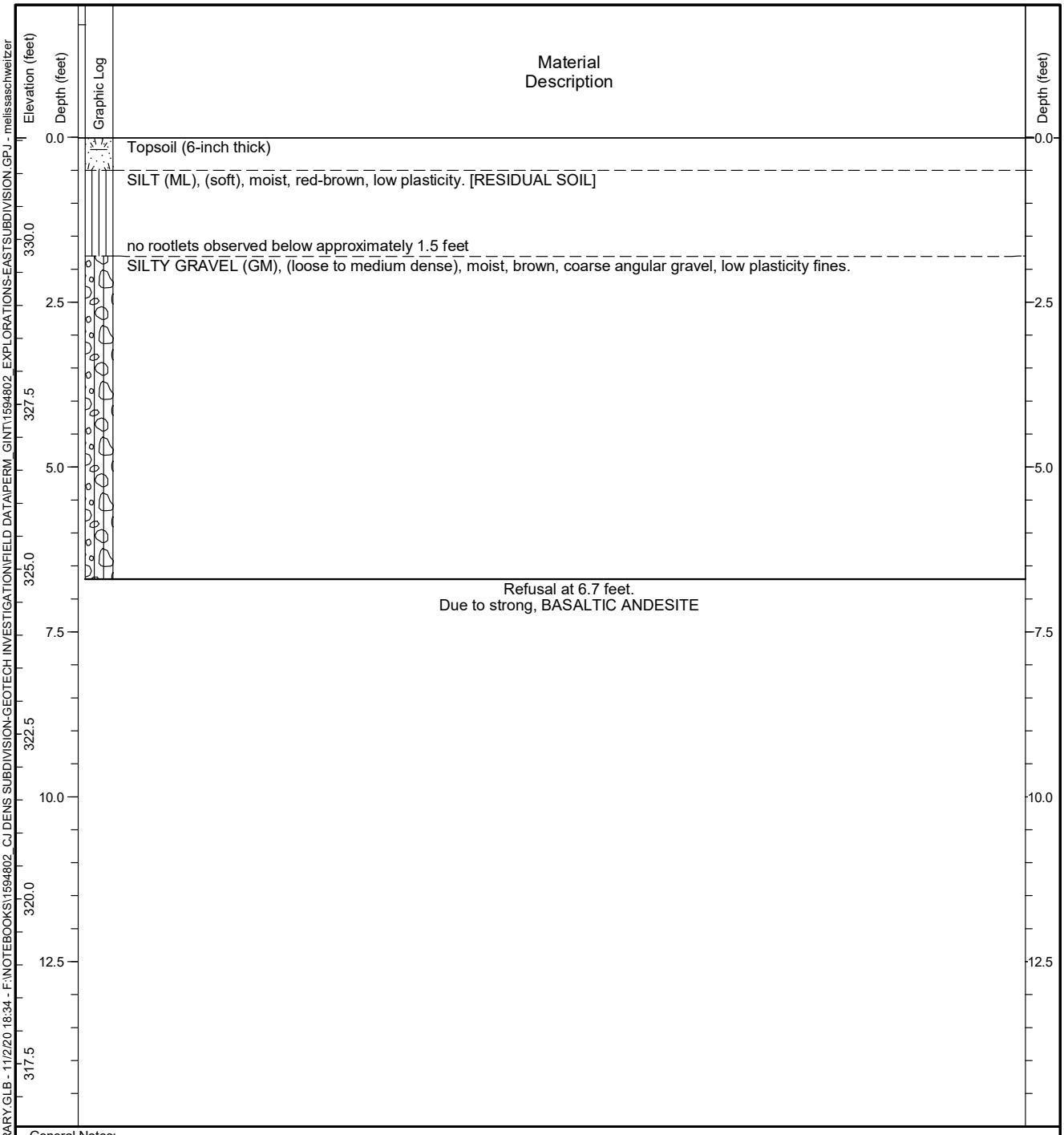
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-64

Figure **A-52**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614900 Long: -122.409800 (WGS 84) Total Depth: 6.7 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 331.55 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-65**	Figure **A-53** Sheet **1 of 1**

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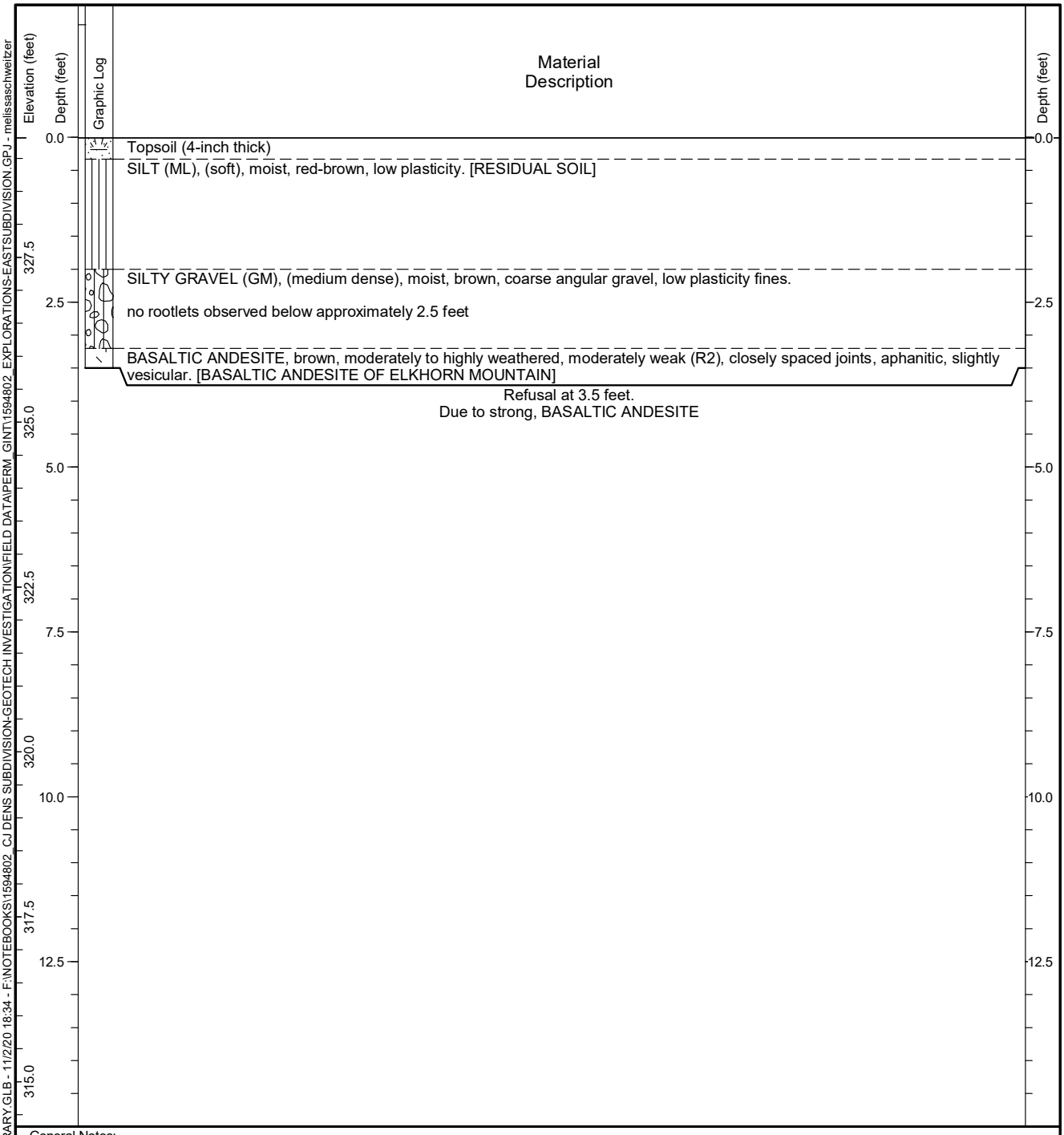
Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614900 Long: -122.410200 (WGS 84) Total Depth: 3.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 329.32 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-66**	Figure **A-54** Sheet **1 of 1**

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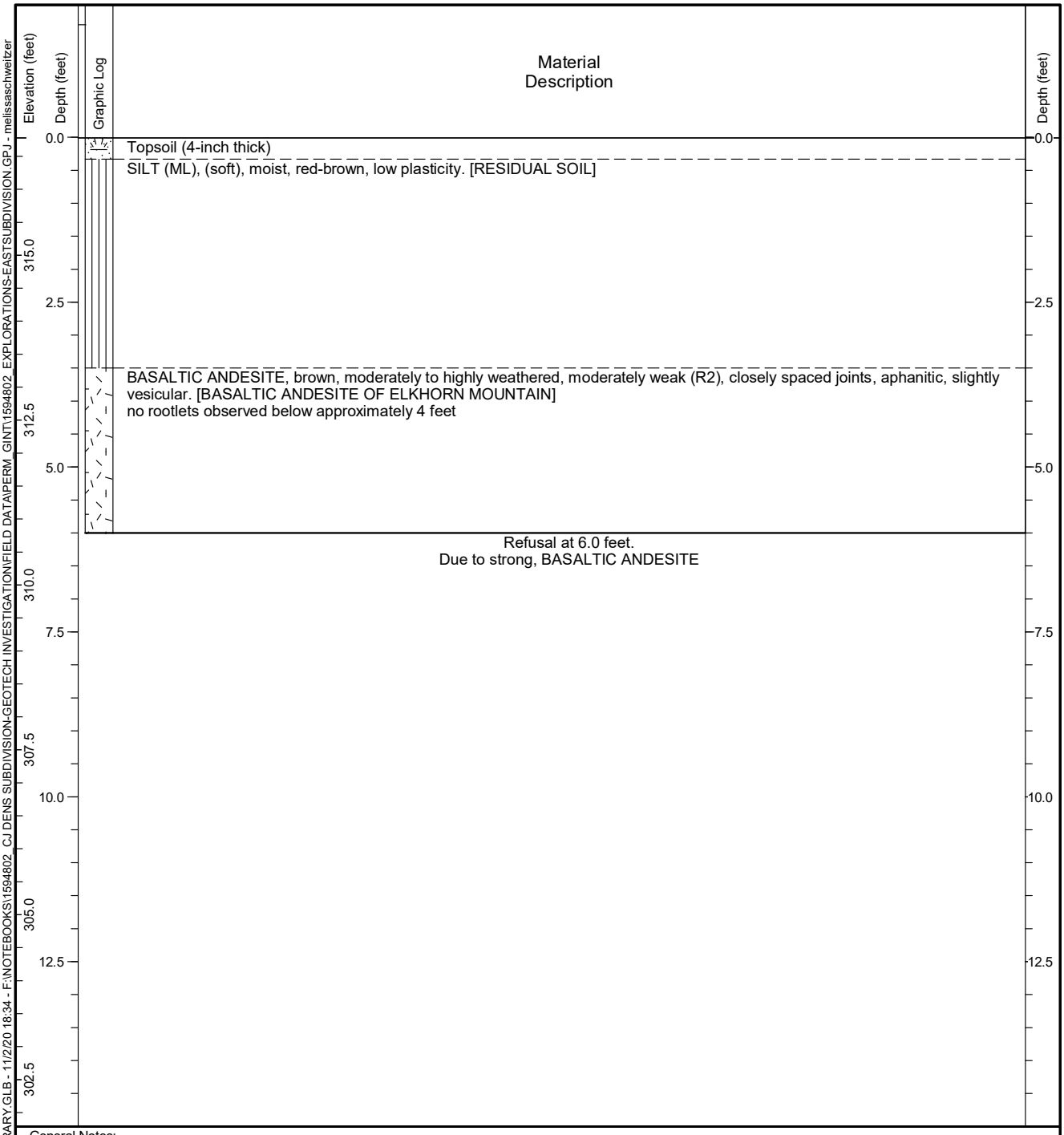
Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614900 Long: -122.410700 (WGS 84) Total Depth: 6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 316.79 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-67**	Figure **A-55** Sheet **1 of 1**

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Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614900 Long: -122.411000 (WGS 84) Total Depth: 5.1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 307.00 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
307.0	0.0		Topsoil (30-inch thick)	0.0
			no rootlets observed below approximately 1.08 feet	
305.0	2.5		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
302.5	5.0		Refusal at 5.1 feet. Due to strong, BASALTIC ANDESITE	5.0
300.0	7.5			7.5
297.5	10.0			10.0
295.0	12.5			12.5
292.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-68

Figure **A-56**
Sheet **1 of 1**

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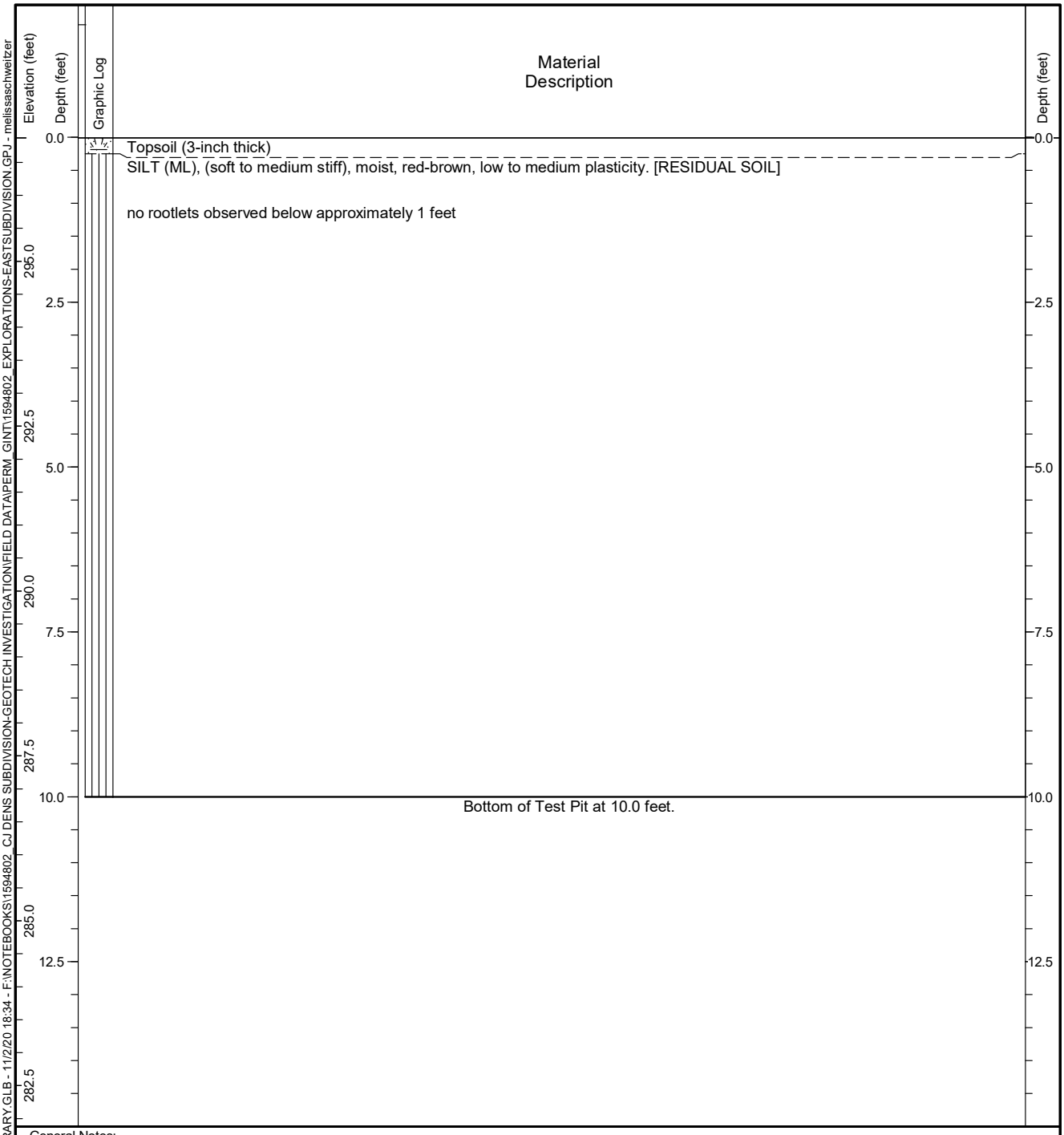
Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615000 Long: -122.411200 (WGS 84) Total Depth: 10 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 296.88 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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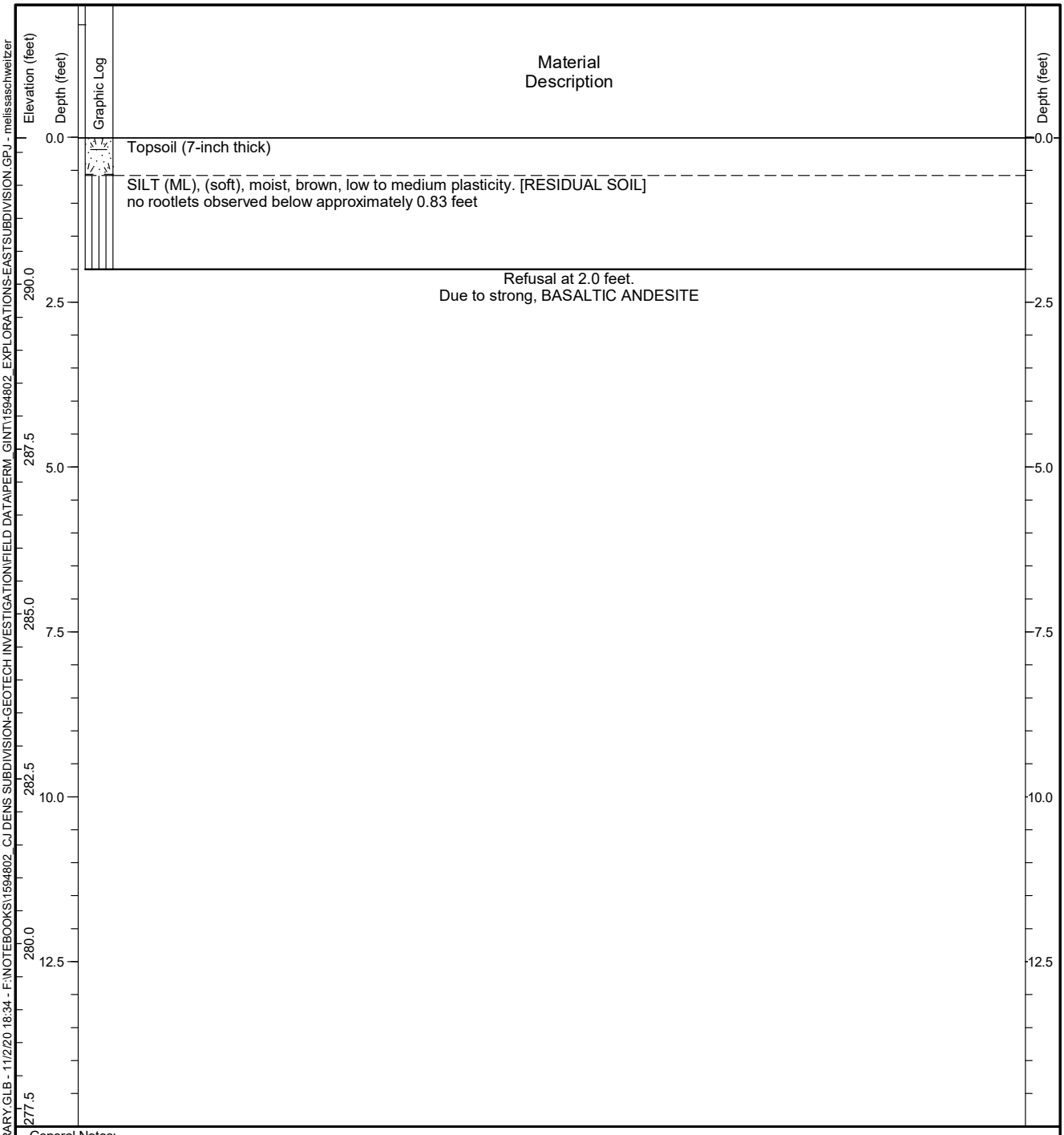
HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-69**	Figure **A-57** Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615000 Long: -122.411900 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 292.23 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-70**	Figure **A-58** Sheet **1 of 1**

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Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615200 Long: -122.412300 (WGS 84) Total Depth: 3.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 299.25 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
297.5	0.0		Topsoil (12-inch thick)	0.0
	2.5		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN] no rootlets observed below approximately 1.17 feet	2.5
295.0	5.0		Refusal at 3.5 feet. Due to strong, BASALTIC ANDESITE	5.0
292.5	7.5			7.5
290.0	10.0			10.0
287.5	12.5			12.5
285.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-71

Figure **A-59**
Sheet **1 of 1**

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Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615723 Long: -122.413005 (WGS 84) Total Depth: 3.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 283.30 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
282.5	0.0		Topsoil (6-inch thick)	0.0
			SILT (ML), (soft), moist, red-brown, low plasticity. [RESIDUAL SOIL]	
			no rootlets observed below approximately 1 feet	
280.0	2.5		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
			Refusal at 3.5 feet. Due to strong, BASALTIC ANDESITE	
277.5	5.0			5.0
275.0	7.5			7.5
272.5	10.0			10.0
270.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-72

Figure **A-60**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615400 Long: -122.412500 (WGS 84) Total Depth: 0 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 300.14 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
300.0	0.0		Refusal at 0.0 feet. Due to strong, BASALTIC ANDESITE	0.0
297.5	2.5			2.5
295.0	5.0			5.0
292.5	7.5			7.5
290.0	10.0			10.0
287.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-73

Figure **A-61**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616100 Long: -122.413900 (WGS 84) Total Depth: 0 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 309.08 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
307.5	0.0		Refusal at 0.0 feet. Due to strong, BASALTIC ANDESITE	0.0
305.0	2.5			2.5
302.5	5.0			5.0
300.0	7.5			7.5
297.5	10.0			10.0
295.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-74

Figure **A-62**
Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:34 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616200 Long: -122.413400 (WGS 84) Total Depth: 5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 311.84 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
310.0	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
	2.5		no rootlets observed below approximately 3.5 feet	2.5
307.5	5.0		Refusal at 5.0 feet. Due to strong, BASALTIC ANDESITE	5.0
305.0	7.5			7.5
302.5	10.0			10.0
300.0	12.5			12.5
297.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

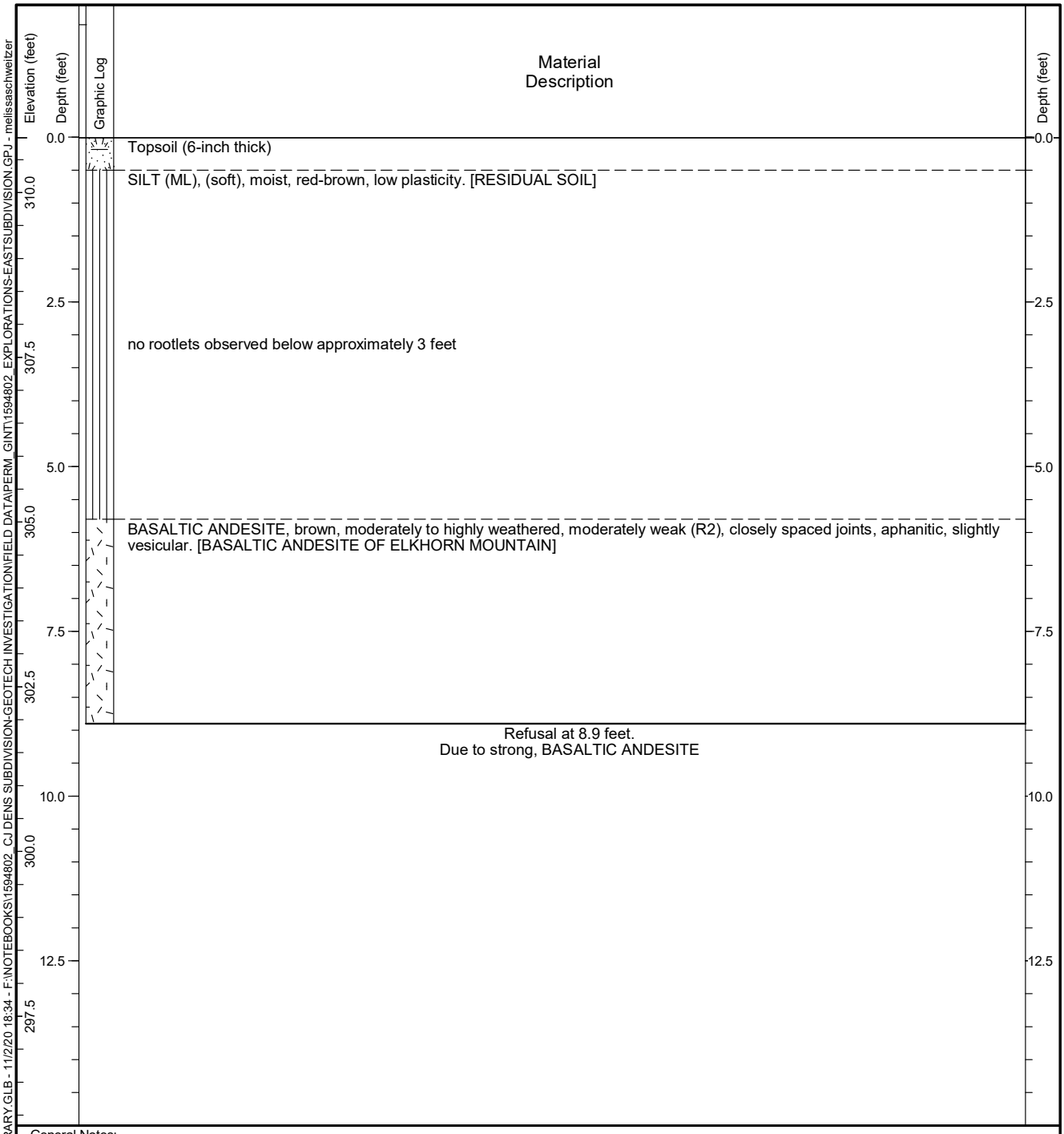
Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-75

Figure **A-63**
Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:34 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616100 Long: -122.413100 (WGS 84) Total Depth: 8.9 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 310.84 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-76**	Figure **A-64** Sheet **1 of 1**

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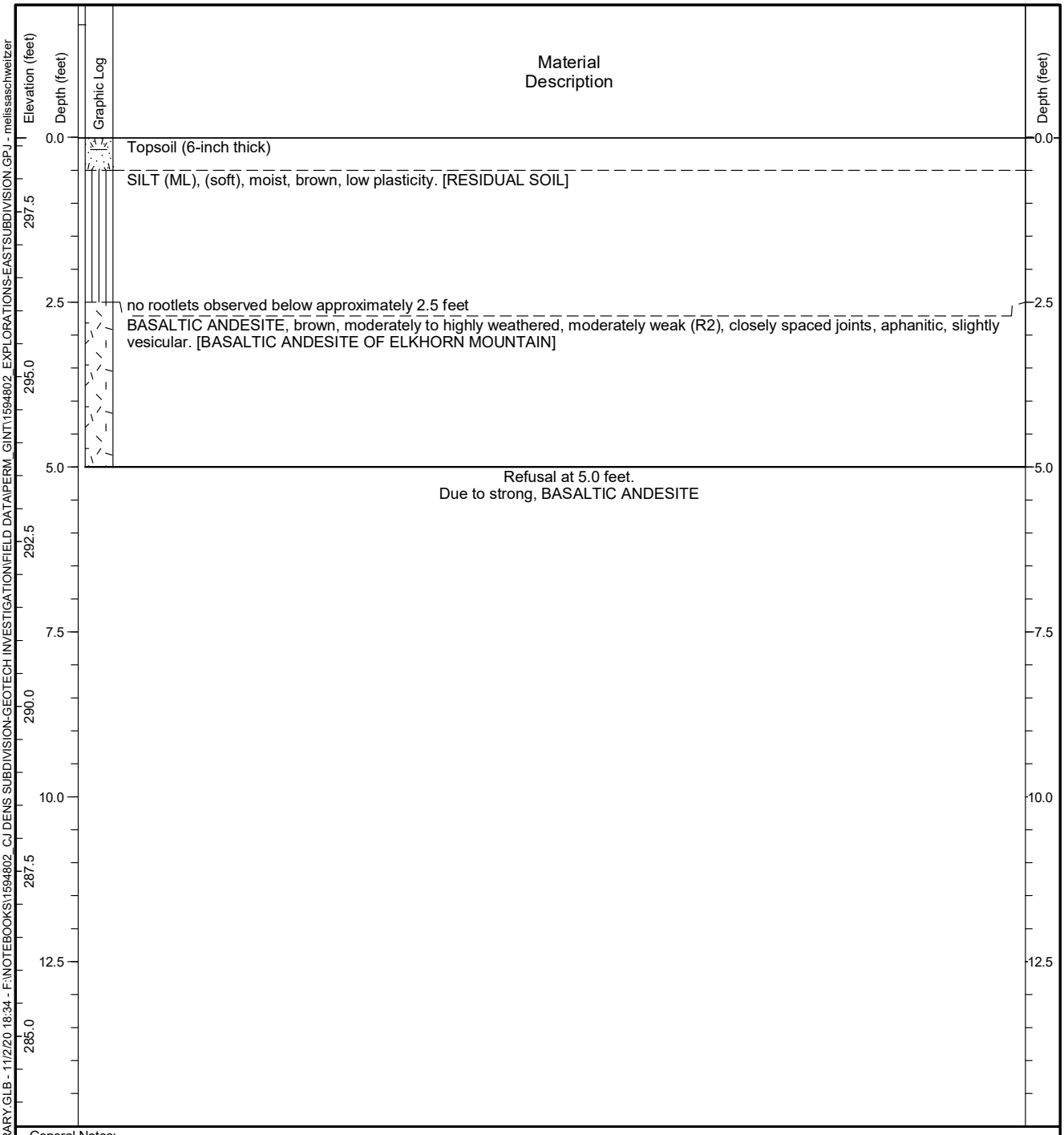
Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616000 Long: -122.412300 (WGS 84) Total Depth: 5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 298.63 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-77**	Figure **A-65** Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:34 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616100 Long: -122.411900 (WGS 84) Total Depth: 4 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 302.31 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
300.0	0.0		Topsoil (24-inch thick)	0.0
	2.5		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
			no rootlets observed below approximately 4 feet	
297.5	5.0		Refusal at 4.0 feet. Due to strong, BASALTIC ANDESITE	5.0
295.0	7.5			7.5
292.5	10.0			10.0
290.0	12.5			12.5
287.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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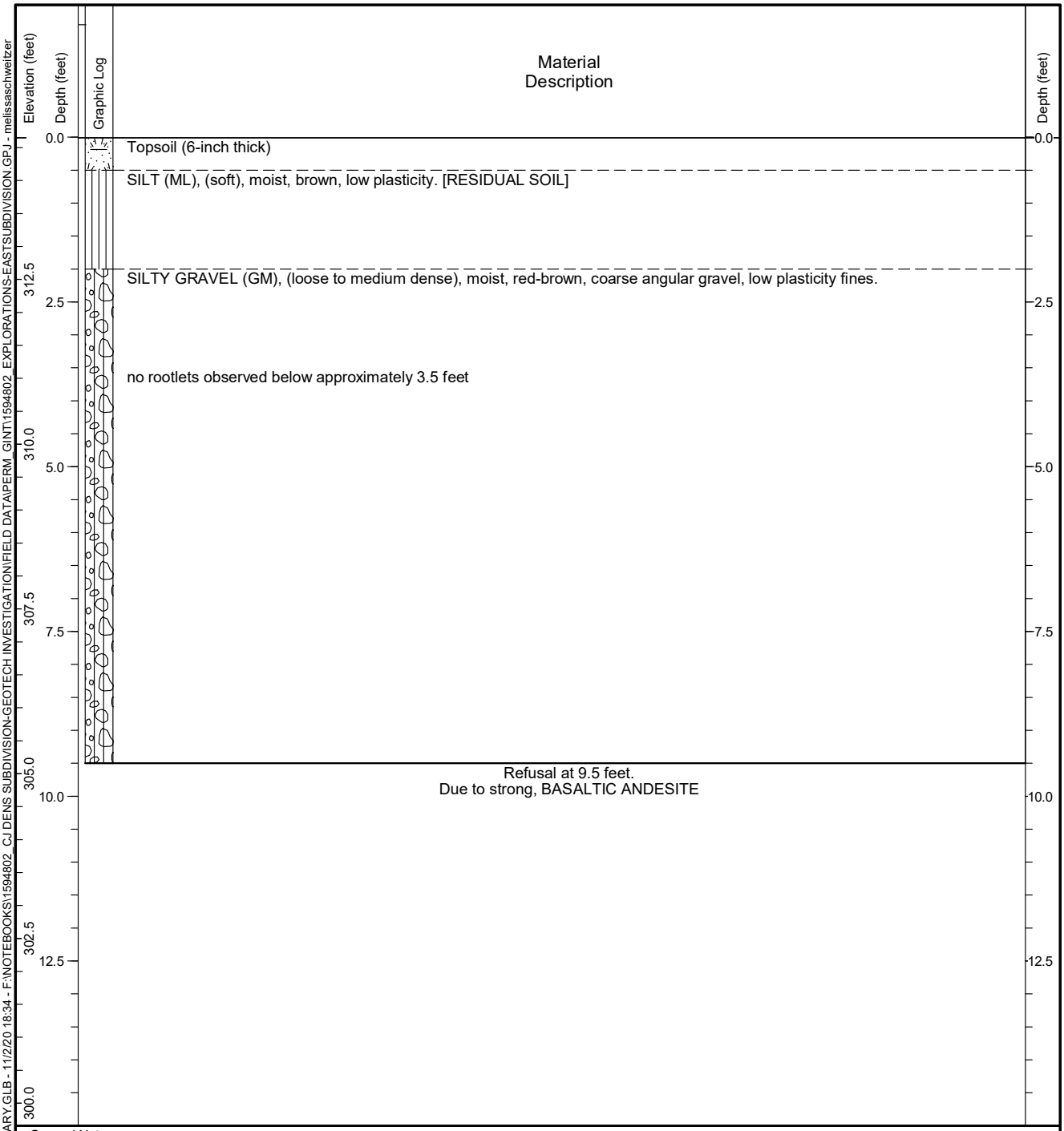
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-78

Figure **A-66**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616100 Long: -122.411400 (WGS 84) Total Depth: 9.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 314.66 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-79**	Figure **A-67** Sheet **1 of 1**

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Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616200 Long: -122.411000 (WGS 84) Total Depth: 1.4 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 305.96 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
305.0	0.0		Topsoil (3-inch thick) no rootlets observed below approximately 0.25 feet BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
			Refusal at 1.4 feet. Due to strong, BASALTIC ANDESITE	
302.5	2.5			2.5
300.0	5.0			5.0
297.5	7.5			7.5
295.0	10.0			10.0
292.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-80

Figure **A-68**
Sheet **1 of 1**

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Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616300 Long: -122.410600 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 304.20 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
304.2	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
302.5	2.5		Refusal at 2.0 feet. Due to strong, BASALTIC ANDESITE	2.5
300.0	5.0			5.0
297.5	7.5			7.5
295.0	10.0			10.0
292.5	12.5			12.5
290.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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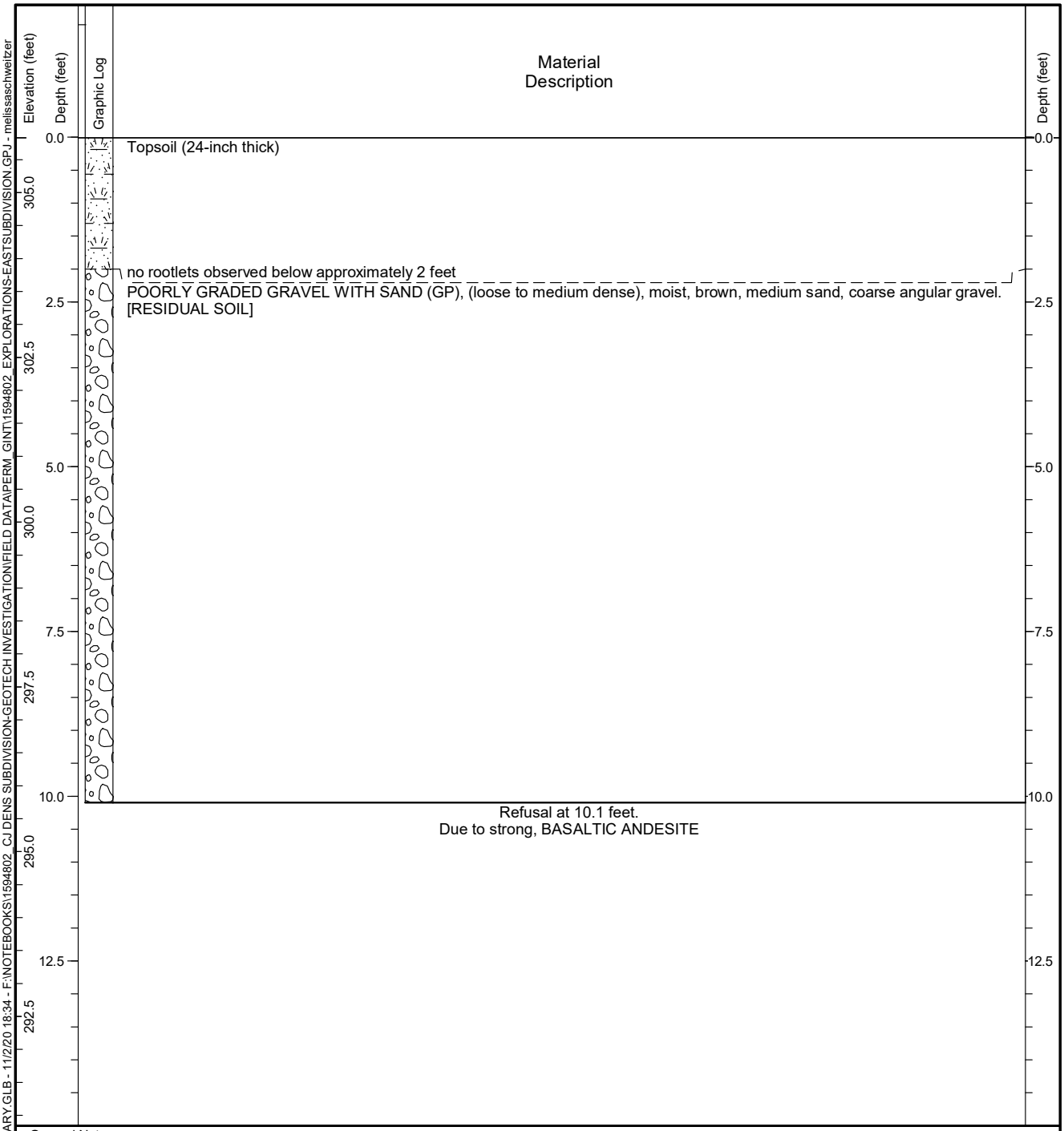
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-81

Figure **A-69**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616400 Long: -122.410200 (WGS 84) Total Depth: 10.1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 305.84 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-82**	Figure **A-70** Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616600 Long: -122.410000 (WGS 84) Total Depth: 11 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 305.54 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
305.0	0.0		Topsoil (6-inch thick)	0.0
			SILTY SAND (SM), (medium dense), moist, brown, medium to coarse sand. [RESIDUAL SOIL] no rootlets observed below approximately 0.67 feet	
302.5	2.5			2.5
300.0	5.0			5.0
297.5	7.5			7.5
295.0	10.0			10.0
			Bottom of Test Pit at 11.0 feet.	
292.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-83

Figure **A-71**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.617100 Long: -122.409300 (WGS 84) Total Depth: 10 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 302.15 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
302.5	0.0		Topsoil (12-inch thick)	0.0
			SILTY SAND (SM), (medium dense), moist, brown, medium to coarse sand. [RESIDUAL SOIL]	
300.0	2.5		no rootlets observed below approximately 3 feet	2.5
297.5	5.0			5.0
295.0	7.5			7.5
292.5	10.0		Bottom of Test Pit at 10.0 feet.	10.0
290.0	12.5			12.5
287.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-84

Figure **A-72**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.617400 Long: -122.409200 (WGS 84) Total Depth: 10 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 296.32 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
296.0	0.0		Topsoil (30-inch thick)	0.0
			no rootlets observed below approximately 1.2 feet	
295.0	2.5		SILTY SAND (SM), (medium dense), moist, brown, medium to coarse sand. [RESIDUAL SOIL]	2.5
292.5	5.0			5.0
290.0	7.5			7.5
287.5	10.0		Bottom of Test Pit at 10.0 feet.	10.0
285.0	12.5			12.5
282.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HART CROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-85

Figure **A-73**
Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:34 - F:\NOTEBOOKS\15948002_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616200 Long: -122.409900 (WGS 84) Total Depth: 3.1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 318.72 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
318.5	0.0		Topsoil (12-inch thick)	0.0
317.5			SILT (ML), (soft), moist, brown, low plasticity. [RESIDUAL SOIL]	
			no rootlets observed below approximately 2 feet	
316.2	2.5		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
			Refusal at 3.1 feet. Due to strong, BASALTIC ANDESITE	
315.0	5.0			5.0
312.5	7.5			7.5
310.0	10.0			10.0
307.5	12.5			12.5
305.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-86

Figure **A-74**
Sheet **1 of 1**

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Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616000 Long: -122.409700 (WGS 84) Total Depth: 5.8 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 325.10 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
325.0	0.0		Topsoil (12-inch thick)	0.0
			SILT WITH SAND (ML), (soft), moist, brown, fine to medium sand, low plasticity. [RESIDUAL SOIL]	
322.5	2.5		no rootlets observed below approximately 3.3 feet	2.5
320.0	5.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	5.0
			Refusal at 5.8 feet. Due to strong, BASALTIC ANDESITE	
317.5	7.5			7.5
315.0	10.0			10.0
312.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-87

Figure **A-75**
Sheet **1 of 1**

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Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616000 Long: -122.409200 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 318.65 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
	0.0		Topsoil (24-inch thick)	0.0
317.5			no rootlets observed below approximately 1.5 feet	
	2.5		Refusal at 2.0 feet. Due to strong, BASALTIC ANDESITE	2.5
315.0				
	5.0			5.0
312.5				
	7.5			7.5
310.0				
	10.0			10.0
307.5				
	12.5			12.5
305.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-88

Figure **A-76**
Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:34 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616000 Long: -122.411100 (WGS 84) Total Depth: 5.2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 309.66 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
309.66	0.0		Topsoil (48-inch thick)	0.0
307.5	2.5		no rootlets observed below approximately 4 feet BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
305.0	5.0		Refusal at 5.2 feet. Due to strong, BASALTIC ANDESITE	5.0
302.5	7.5			7.5
300.0	10.0			10.0
297.5	12.5			12.5
295.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-89

Figure **A-77**
Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:34 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615900 Long: -122.411500 (WGS 84) Total Depth: 0 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 315.01 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
315.0	0.0		Refusal at 0.0 feet. Due to strong, BASALTIC ANDESITE	0.0
312.5	2.5			2.5
310.0	5.0			5.0
307.5	7.5			7.5
305.0	10.0			10.0
302.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-90

Figure **A-78**
Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:34 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615900 Long: -122.411600 (WGS 84) Total Depth: 0 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 309.83 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
307.5	0.0		Refusal at 0.0 feet. Due to strong, BASALTIC ANDESITE	0.0
305.0	2.5			2.5
302.5	5.0			5.0
300.0	7.5			7.5
297.5	10.0			10.0
295.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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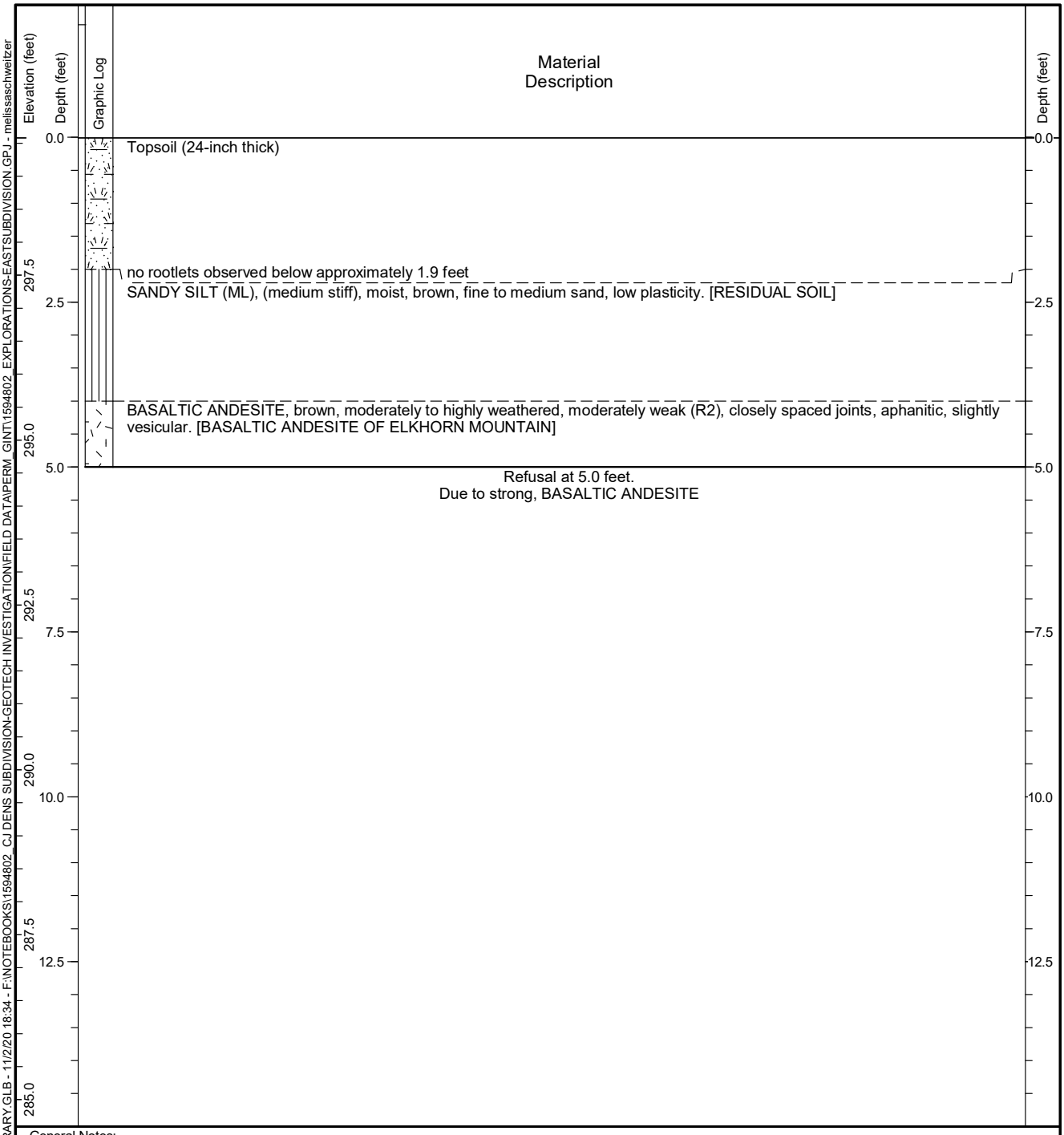
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-91

Figure **A-79**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616400 Long: -122.410700 (WGS 84) Total Depth: 5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 299.59 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-92**	Figure **A-80** Sheet **1 of 1**

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Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616500 Long: -122.410500 (WGS 84) Total Depth: 4.9 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 299.64 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
299.64	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
297.5	2.5		Organic rich soil observed within discontinuities from approximately 2 to 4 feet	2.5
295.0	5.0		Refusal at 4.9 feet. Due to strong, BASALTIC ANDESITE	5.0
292.5	7.5			7.5
290.0	10.0			10.0
287.5	12.5			12.5
285.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-93

Figure **A-81**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616400 Long: -122.412000 (WGS 84) Total Depth: 0 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 299.27 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
297.5	0.0		Refusal at 0.0 feet. Due to strong, BASALTIC ANDESITE	0.0
295.0	2.5			2.5
292.5	5.0			5.0
290.0	7.5			7.5
287.5	10.0			10.0
285.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-94

Figure **A-82**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616200 Long: -122.412600 (WGS 84) Total Depth: 2.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 317.41 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
315.0	0.0		Topsoil (7-inch thick)	0.0
			SILT WITH SAND (ML), (soft), moist, brown, fine to medium sand, low plasticity. [RESIDUAL SOIL]	
			no rootlets observed below approximately 0.92 feet	
312.5	2.5		Refusal at 2.5 feet. Due to strong, BASALTIC ANDESITE	2.5
310.0	5.0			5.0
307.5	7.5			7.5
305.0	10.0			10.0
302.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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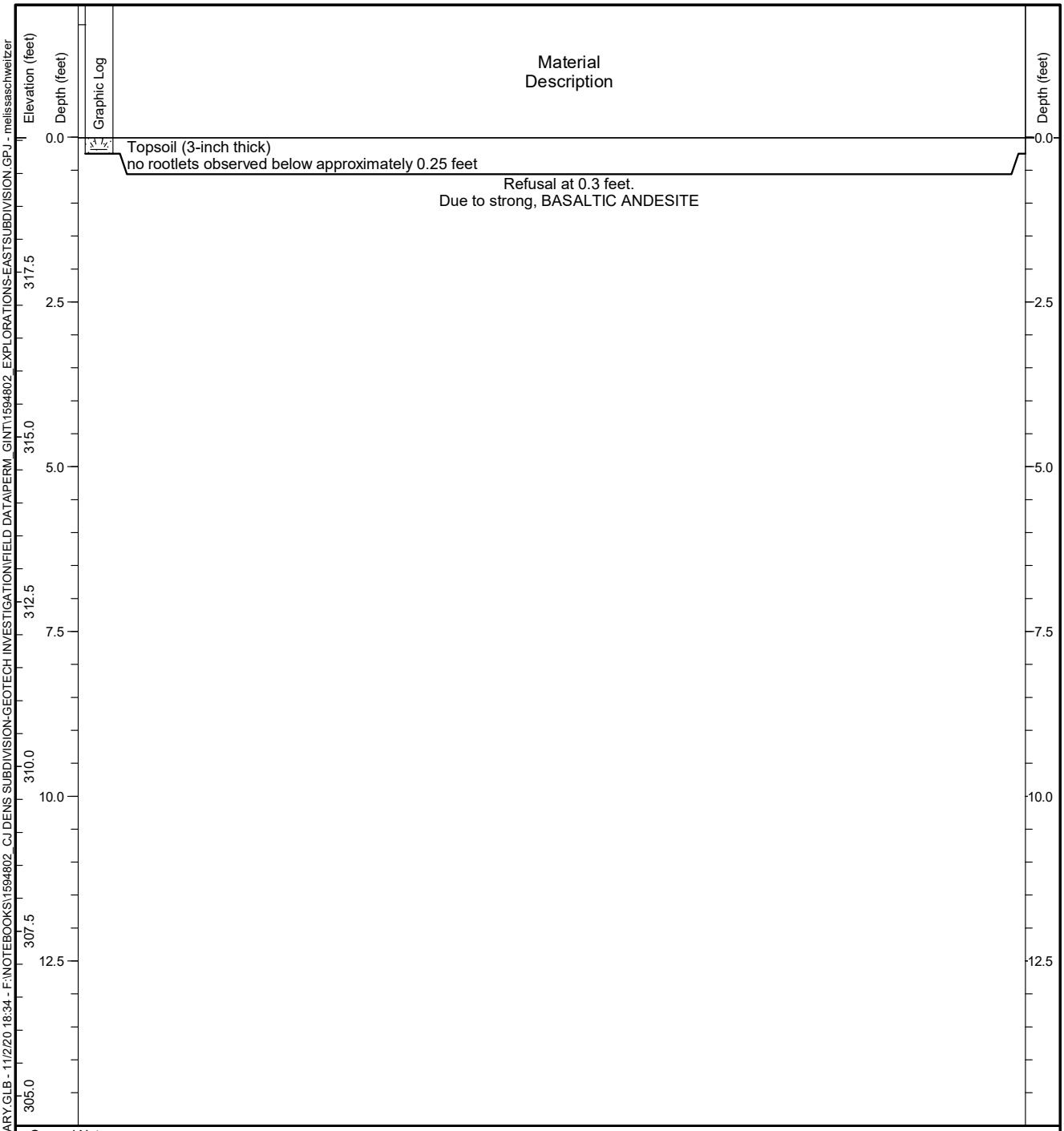
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-95

Figure **A-83**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616300 Long: -122.412700 (WGS 84) Total Depth: 0.25 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 319.55 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-96**	Figure **A-84** Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615900 Long: -122.414100 (WGS 84) Total Depth: 0.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 305.41 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
305.0	0.0		Topsoil (6-inch thick) no rootlets observed below approximately 0.5 feet	0.0
			Refusal at 0.5 feet. Due to strong, BASALTIC ANDESITE	
302.5	2.5			2.5
300.0	5.0			5.0
297.5	7.5			7.5
295.0	10.0			10.0
292.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-97

Figure **A-85**
Sheet **1 of 1**

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Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616000 Long: -122.414100 (WGS 84) Total Depth: 0.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 302.41 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
302.5	0.0		Topsoil (6-inch thick) no rootlets observed below approximately 0.5 feet	0.0
			Refusal at 0.5 feet. Due to strong, BASALTIC ANDESITE	
300.0	2.5			2.5
297.5	5.0			5.0
295.0	7.5			7.5
292.5	10.0			10.0
290.0	12.5			12.5
287.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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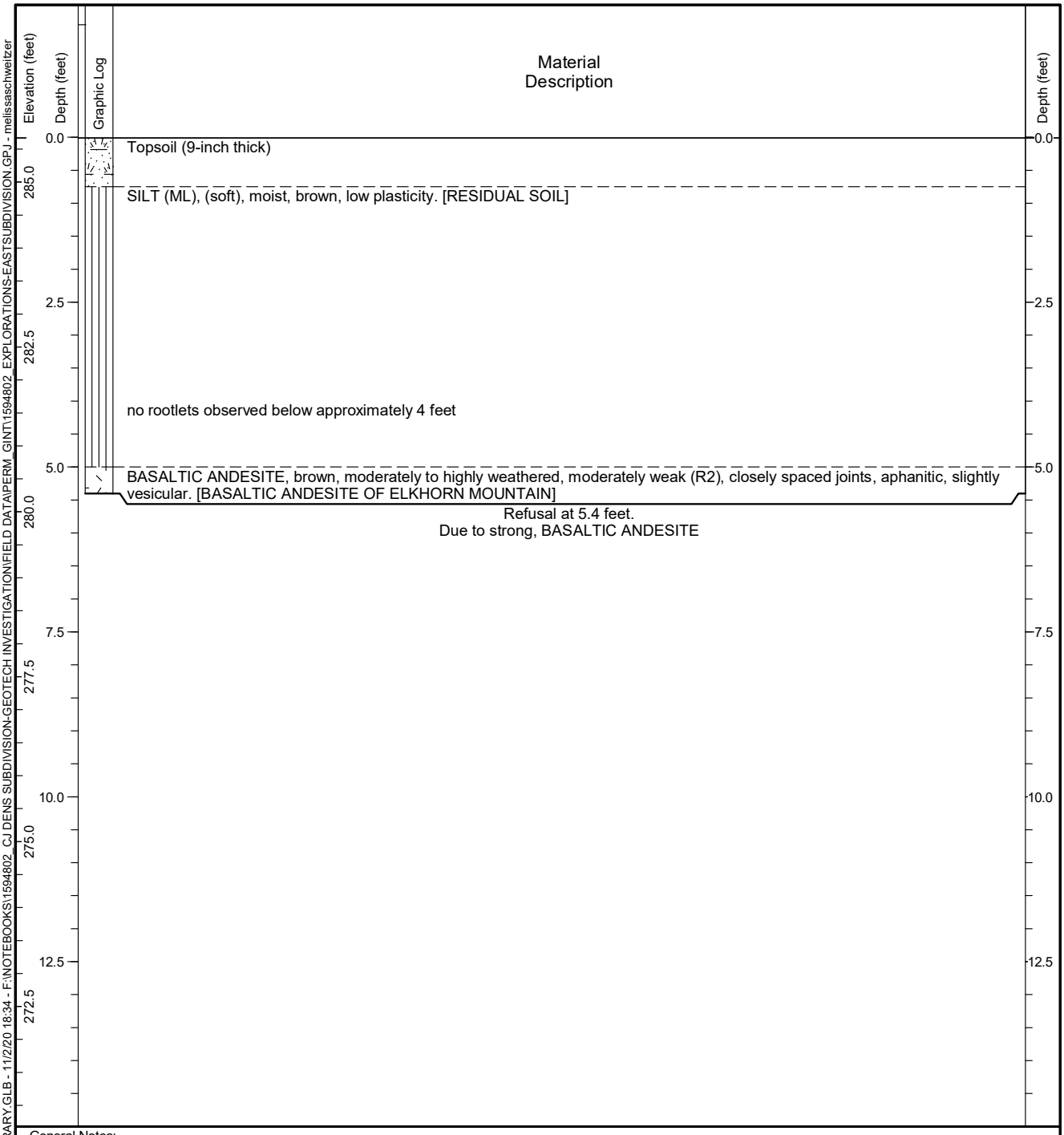
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-98

Figure **A-86**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616100 Long: -122.414700 (WGS 84) Total Depth: 5.4 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 285.68 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-99**	Figure **A-87** Sheet **1 of 1**

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Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615900 Long: -122.414700 (WGS 84) Total Depth: 2.25 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 286.04 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
286.0	0.0		Topsoil (8-inch thick)	0.0
			no rootlets observed below approximately 0.67 feet	
285.0			BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
	2.5		Refusal at 2.3 feet. Due to strong, BASALTIC ANDESITE	2.5
282.5				
	5.0			5.0
280.0				
	7.5			7.5
277.5				
	10.0			10.0
275.0				
	12.5			12.5
272.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-100

Figure **A-88**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615800 Long: -122.415200 (WGS 84) Total Depth: 1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 267.76 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
267.5	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
			Refusal at 1.0 feet. Due to strong, BASALTIC ANDESITE	
265.0	2.5			2.5
262.5	5.0			5.0
260.0	7.5			7.5
257.5	10.0			10.0
255.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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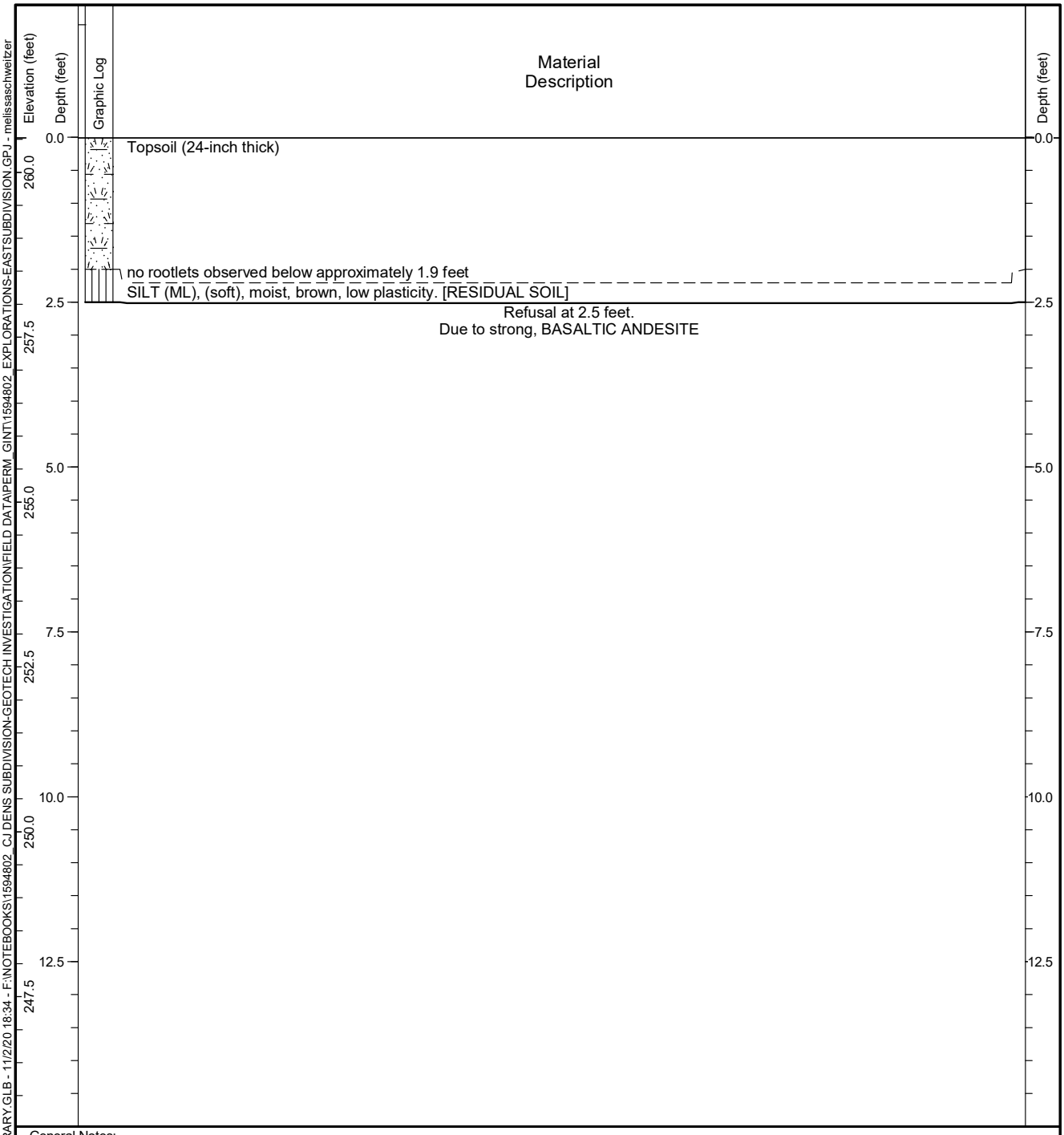
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-101

Figure **A-89**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615700 Long: -122.415400 (WGS 84) Total Depth: 2.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 260.53 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-102

Figure **A-90**
Sheet **1 of 1**

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Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615200 Long: -122.415200 (WGS 84) Total Depth: 4.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 261.19 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
260.0	0.0		Topsoil (24-inch thick)	0.0
			no rootlets observed below approximately 1.9 feet	
257.5	2.5		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
			Refusal at 4.5 feet. Due to strong, BASALTIC ANDESITE	
255.0	5.0			5.0
252.5	7.5			7.5
250.0	10.0			10.0
247.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-103

Figure **A-91**
Sheet **1 of 1**

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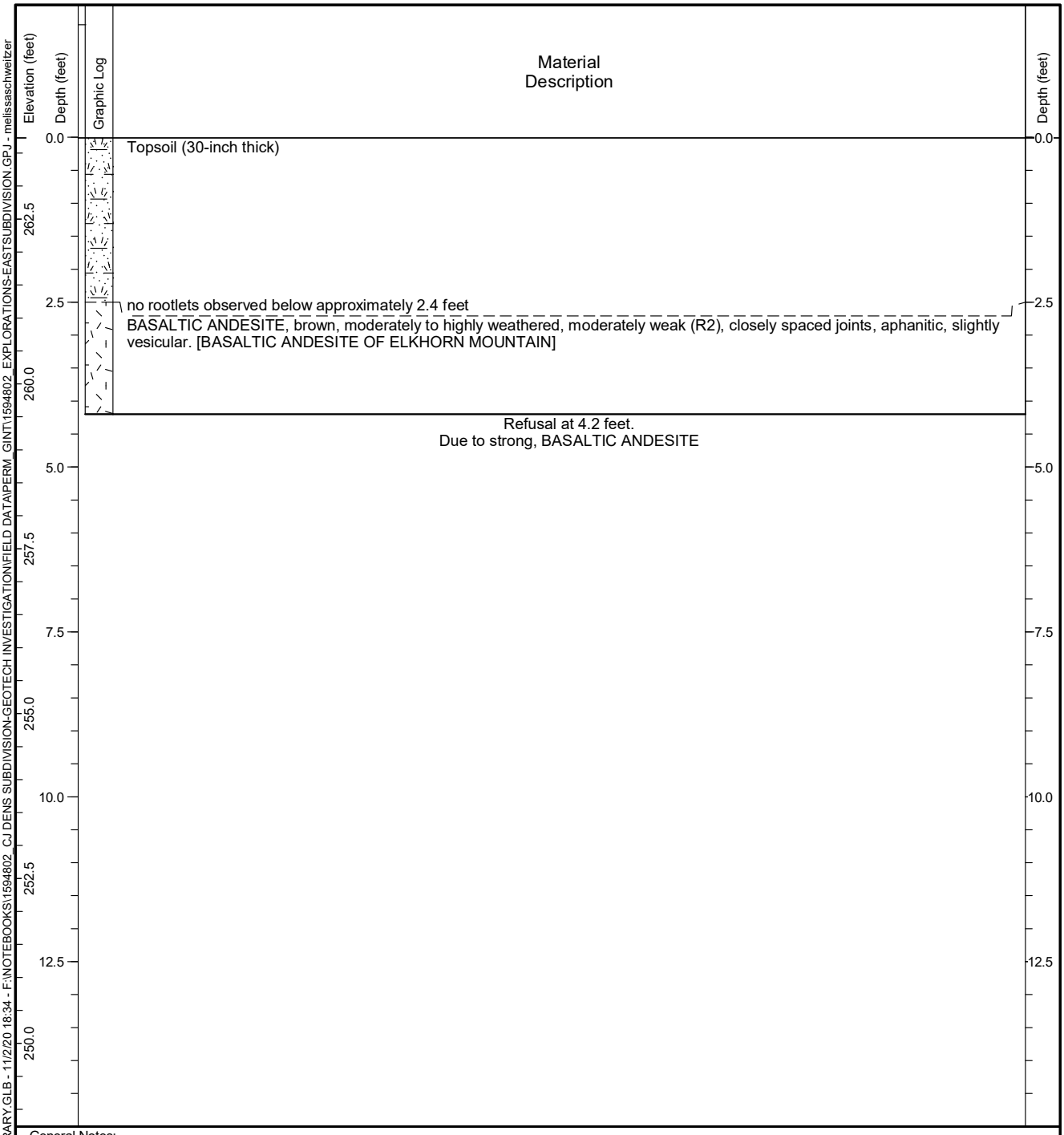
Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615100 Long: -122.414800 (WGS 84) Total Depth: 4.2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 263.74 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-104**	Figure **A-92** Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:34 - F:\NOTEBOOKS\15948O2_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615000 Long: -122.414600 (WGS 84) Total Depth: 3 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 264.12 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
262.5	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
	2.5		Refusal at 3.0 feet. Due to strong, BASALTIC ANDESITE	2.5
260.0	5.0			5.0
257.5	7.5			7.5
255.0	10.0			10.0
252.5	12.5			12.5
250.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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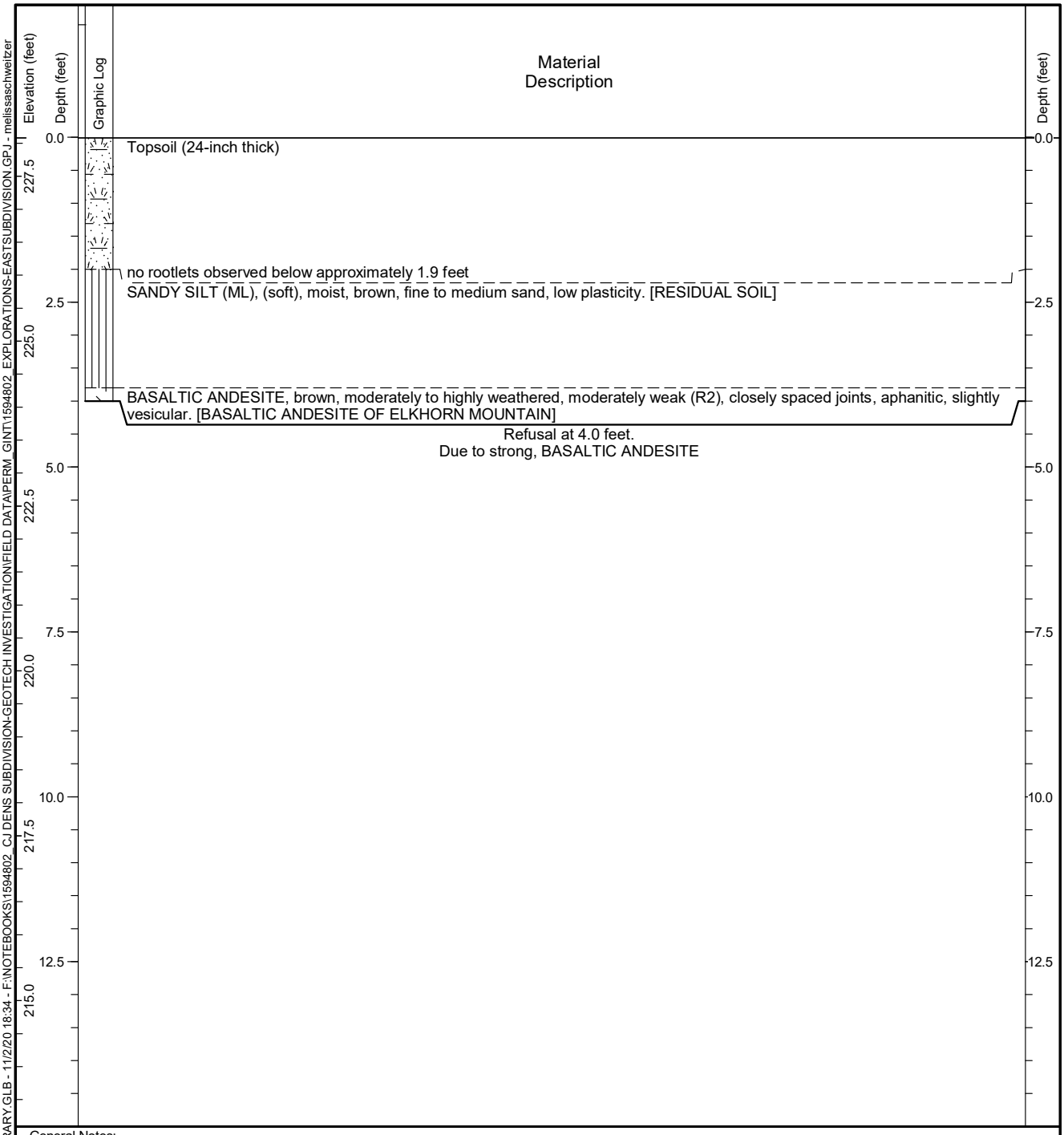
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-105

Figure **A-93**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614500 Long: -122.414100 (WGS 84) Total Depth: 4 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 228.09 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-106

Figure **A-94**
Sheet **1 of 1**

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Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614300 Long: -122.413800 (WGS 84) Total Depth: 6.6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 204.17 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
202.5	0.0		Topsoil (24-inch thick)	0.0
	2.5		SILT (ML), (soft), moist, brown, low plasticity. [COLLUVIUM] no rootlets observed below approximately 2.5 feet	2.5
200.0	5.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	5.0
197.5	7.5		Refusal at 6.6 feet. Due to strong, BASALTIC ANDESITE	7.5
195.0	10.0			10.0
192.5	12.5			12.5
190.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HART CROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-107

Figure **A-95**
Sheet **1 of 1**

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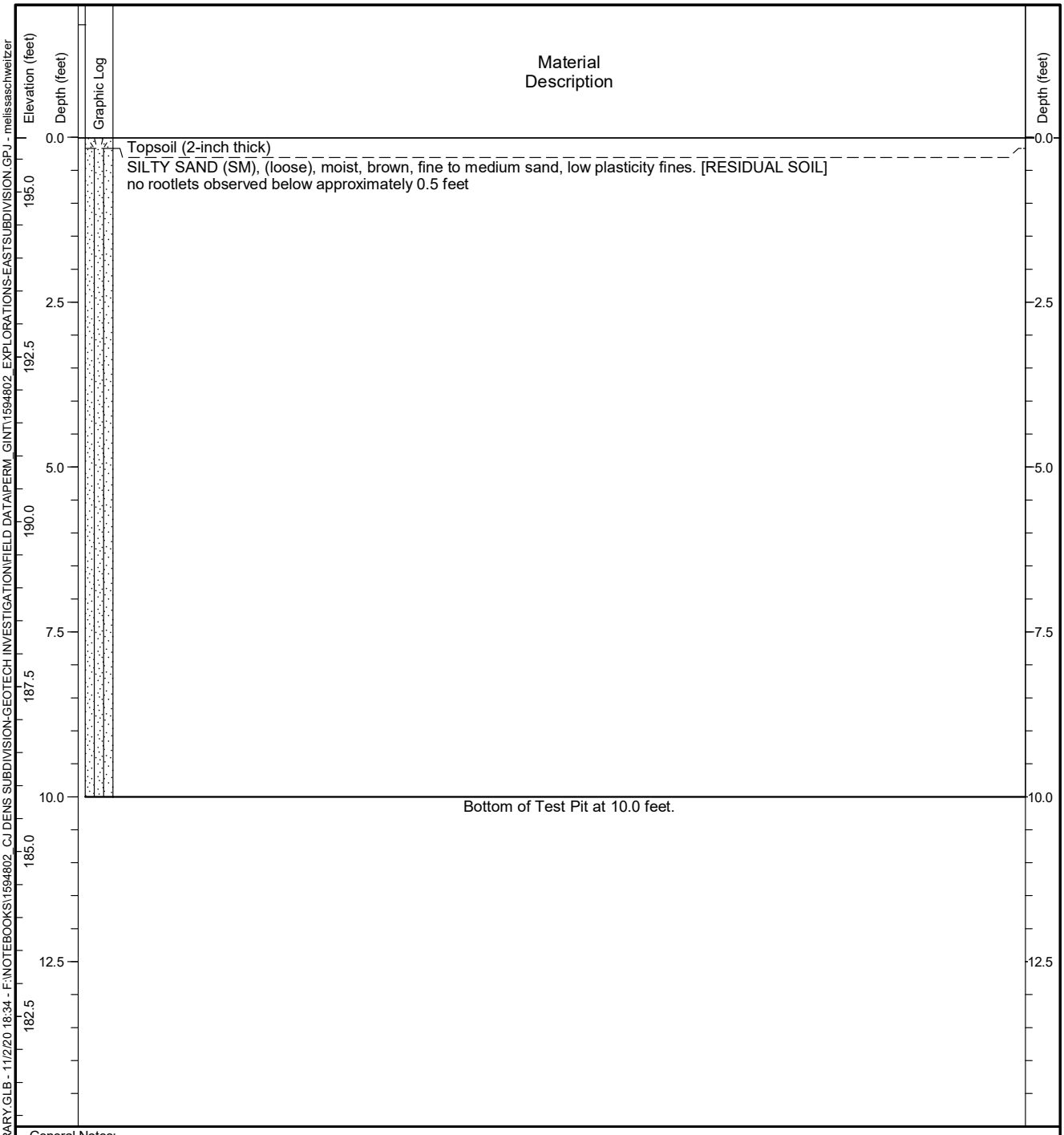
Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614100 Long: -122.413400 (WGS 84) Total Depth: 10 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 195.83 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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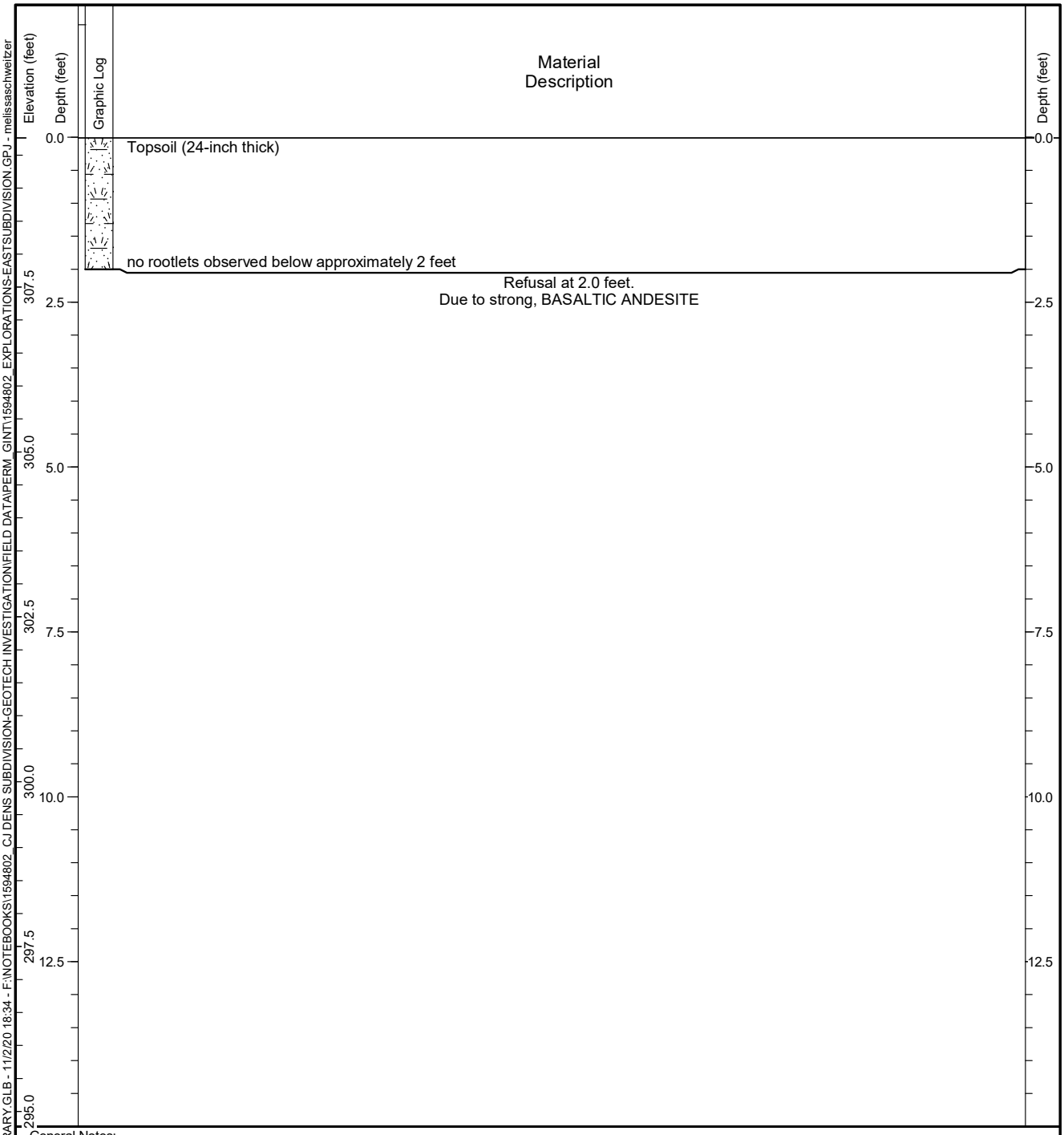
HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-108**	Figure **A-96** Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615400 Long: -122.411800 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 309.77 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-109**	Figure **A-97** Sheet **1 of 1**

HC TEST PIT - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:34 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615300 Long: -122.411600 (WGS 84) Total Depth: 2.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 304.37 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
302.5	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
			no rootlets observed below approximately 2.5 feet	
300.0	2.5		Refusal at 2.5 feet. Due to strong, BASALTIC ANDESITE	2.5
297.5	5.0			5.0
295.0	7.5			7.5
292.5	10.0			10.0
290.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-110

Figure **A-98**
Sheet **1 of 1**

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Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615200 Long: -122.409900 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 336.05 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
336.0	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
335.0	1.0		no rootlets observed below approximately 2 feet	1.0
			Refusal at 2.0 feet. Due to strong, BASALTIC ANDESITE	
332.5	2.5			2.5
330.0	5.0			5.0
327.5	7.5			7.5
325.0	10.0			10.0
322.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-111

Figure **A-99**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615200 Long: -122.410200 (WGS 84) Total Depth: 5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 332.01 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
330.0	0.0		Topsoil (12-inch thick)	0.0
			SANDY SILT (ML), (soft), moist, brown, fine to medium sand, low plasticity. [RESIDUAL SOIL] no rootlets observed below approximately 1.33 feet	
327.5	2.5			2.5
325.0	5.0		Bottom of Test Pit at 5.0 feet.	5.0
322.5	7.5			7.5
320.0	10.0			10.0
317.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-112

Figure **A-100**
Sheet **1 of 1**

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Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615200 Long: -122.410700 (WGS 84) Total Depth: 0.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 325.17 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
325.0	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN] no rootlets observed below approximately 0.5 feet	0.0
			Refusal at 0.5 feet. Due to strong, BASALTIC ANDESITE	
322.5	2.5			2.5
320.0	5.0			5.0
317.5	7.5			7.5
315.0	10.0			10.0
312.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-113

Figure **A-101**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615100 Long: -122.410700 (WGS 84) Total Depth: 0.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 323.50 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
323.5	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN] no rootlets observed below approximately 0.5 feet	0.0
			Refusal at 0.5 feet. Due to strong, BASALTIC ANDESITE	
322.5	2.5			2.5
320.0	5.0			5.0
317.5	7.5			7.5
315.0	10.0			10.0
312.5	12.5			12.5
310.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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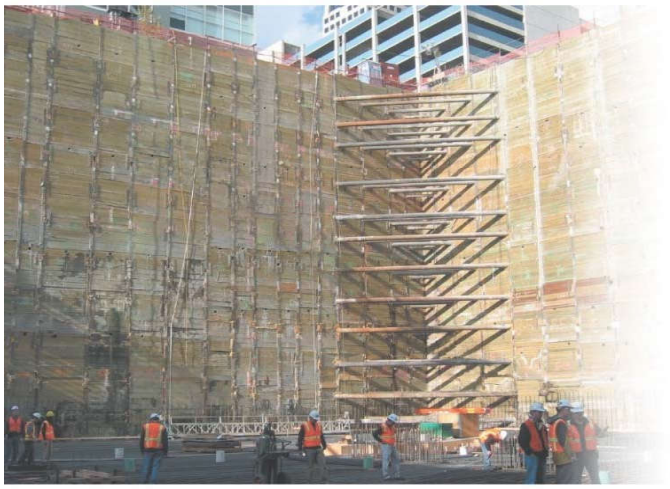
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-114

Figure **A-102**
Sheet **1 of 1**



Report of Geotechnical Engineering Services

CJ Dens Subdivision

Camas, Washington

Prepared for

CJ Dens Lacamas I, LLC

July 6, 2016
15948-02

HARTCROWSER

HARTCROWSER www.hartcrowser.com

Report of Geotechnical Engineering Services

CJ Dens Subdivision

Camas, Washington

Prepared for

CJ Dens Lacamas I, LLC

July 6, 2016
15948-02

Prepared by

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Report of Geotechnical Engineering Services

CJ Dens Subdivision

Camas, Washington

1.0 INTRODUCTION

Hart Crowser, Inc. is pleased to present this report to CJ Dens Lacamas I, LLC describing our geotechnical engineering services for the proposed CJ Dense Subdivision off of Leadbetter Road in Camas, Washington. Our work was performed in general accordance with our Contract Change Order dated May 27, 2016.

Hart Crowser has previously completed work at the site. In March 2013, Hart Crowser prepared an update to an existing Critical Areas Report (CAR) (dated 2005) and a Level One Hydrogeologic Assessment for the proposed subdivision. Several potential geologic hazards areas were identified during those studies. In December 2015, Hart Crowser completed an initial site-specific evaluation of two specific hazard areas (identified as A and C). Based on that initial review, it was our opinion that those geohazard areas did not present geologic hazards to the project that could not be reasonably mitigated. Details regarding these studies were provided in the reports listed below.

- Critical Areas Report – Update – Proposed Camas Subdivision – Leadbetter Road, Camas, Washington, HC Project Number 15948-01-01, dated march 19, 2013.
- Level One Hydrogeologic Assessment – Proposed Camas Subdivision – Leadbetter Road, Camas Washington, HC Project Number 15948-01-02, dated March 19, 2013
- Initial Site-Specific Evaluation of Geohazard Areas A and C – Camas Subdivision – Leadbetter Road, Camas, Washington, HC project number 15948-02, dated December 7, 2015.

2.0 PROJECT DESCRIPTION

Hart Crowser understands the overall proposed development will consist of an approximately 300-lot residential subdivision. However, the current work is limited to an initial phase of approximately 200 lots in the southern and eastern portions of the property. The remaining, northwestern portion of the site, is not included in this geotechnical study.

Conventional one- to three-story, single-family residences supported on shallow foundations will be constructed on each lot. We anticipate the buildings will be constructed with wood frames and will be relatively lightly loaded with strip loads up to 2.5 kips per lineal foot and column loads of 75 kips. Infrastructure, such as roadways and utilities, will also be constructed. We understand that mass cuts and fills of up to 20 feet will be required for site grading.

This report contains the results of our analysis and provides recommendations for design and construction of the subdivision. The first section of this report provides an overview of the project information discussed in the text. The main body of the report presents our geotechnical engineering findings and recommendations in detail. Figures are presented at the end of the text. The location of the site is shown on Figure 1, and the existing and proposed site layouts are shown on Figures 2 and 3, respectively. Supporting information is provided in the appendices. Appendix A contains site subsurface exploration logs, and Appendix B contains the results of laboratory testing completed for our analysis.

3.0 SCOPE OF SERVICES

The purpose of our work was to evaluate subsurface conditions at the project site and to provide geotechnical engineering services for design of project elements. Our complete scope of work was described in our Contract Change Order 2 and is summarized below.

- Conducted field explorations with Tapani Underground by excavating 22 test pits to bedrock, maintained a log of the soils and bedrock encountered in the test pits, and collected samples for laboratory testing.

- Conducted a limited program of laboratory testing on select soil and bedrock samples. The scope of testing included moisture content determinations, particle-size analyses, and Atterberg limits tests.

- Conducted engineering analysis to develop geotechnical design recommendations for earthwork, foundations, retaining walls, pavements, and seismic design criteria.

- Prepared this geotechnical report outlining our findings and recommendations, including information related to:
  - Subsurface soil, bedrock, and groundwater conditions;
  - Slope stability and slope stabilization measures;
  - Seismic hazards and design criteria;
  - Site preparation and grading;
  - Foundation design parameters;
  - Retaining wall design parameters; and
  - Pavement design (conventional asphalt and concrete).

- Provided project management and support services, including coordinating staff, conducting telephone consultations and email communications with you and the design team, etc.

4.0 SITE CONDITIONS

4.1 Geologic and Soil Mapping

The geology of the site is mapped in the *Geologic Map of the Vancouver Quadrangle, Oregon and Washington* (Phillips 1987). The geologic mapping of Phillips indicates that the site is predominantly underlain by Oligocene-age "Skamania Volcanics." The mapping of Evarts and O'Connor (2008) supersedes previous work and differentiates "Skamania Volcanics" into two distinct units at the site. Evarts and O'Connor have mapped the eastern hilltop and adjacent upper slopes as underlain by Oligocene "Volcaniclastic sedimentary rock" interbedded with basalt. The remainder of the site is mapped as underlain by Oligocene "Basaltic andesite of Elkhorn Mountain." Evarts and O'Connor (2008) explain that they consider the term "Skamania Volcanics" too broad and poorly defined to be useful; however, given the age they assign to these units and their description, these materials appear equivalent to the "Skamania Volcanics" of Phillips (1987). Our explorations of the site indicate that a majority of the site is underlain by residual and colluvial soils overlying volcanic breccia and basaltic andesite, which is consistent with the geologic mapping.

The near-surface soils at the site are mapped by the U.S. Department of Agriculture (USDA) as found on the Web Soil Survey (USDA 2006) website. The report generated by Web Soil Survey for the site indicates near surface soils in the vicinity of the project consist predominantly of Olympic Clay Loam (OlD) and Olympic Stony Clay Loam (OmE) and Vader Silt Loam (VaB/VaC). The Olympic soils are described as a mountain slope landform derived from residual soil and colluvium consisting of clay loam with varying percentages of gravel content. These soils are considered well drained, with a moderately high permeability ranging from approximately 0.2 to 0.6 inches per hour. The Vader soils are derived from residual soil and colluvium with a sedimentary rock parent material consisting of ashy silt loam over weathered bedrock. They are also considered well drained, with a moderately high to high permeability of approximately 0.6 to 2.0 inches per hour.

4.2 Surface Conditions

The proposed subdivision site is located on the upslope (northeast) side of Leadbetter Road in Camas, Washington. The site is within the NE Quarter of Section 34 and NW Quarter of Section 35, of Township 2 North and Range 3 East of the Willamette Meridian. The property is comprised of four irregularly shaped parcels (178236-000, 178172-000, 177906-000, and 177905-000) that total approximately 85 acres. The southeast corner of the site is approximately 500 feet northwest of the intersection of Leadbetter Road and NE Everett Street. The southern end of Lacamas Lake is located on the opposite (southwest) side of Leadbetter Road. A vicinity map of the project site is presented on Figure 1.

The site consists of two upland areas separated by a northeast to southwest-trending unnamed stream drainage. The site topography is highly variable, ranging from uniform to irregular and nearly level to very steeply sloping. Elevations range from approximately 175 feet along Leadbetter Road to approximately 360 feet along the northern property line. The overall existing site topography is shown on Figure 2.

The portion of the site northwest of the drainage comprises approximately 35 acres. This area is characterized by a series of small hilltops separated by short, moderately steep to gentle slopes. The northern site boundary rises gently to a broad upland plateau off site, while the southwest boundary slopes down moderately steeply to steeply to Leadbetter Road along Lacamas Lake. The internal slopes along the northwest side of the unnamed stream valley slope steeply down to the southeast and east. (This portion of the site in not included in the current study, as development of this area is not yet proposed.)

The approximately 50-acre portion of the site southeast of the drainage, which is included in this study, is dominated by an approximately 1,500-foot-long, broad-topped, west-trending ridge. This area was recently logged in the winter of 2015/2016 and is covered with light brush. The base of the ridge extends off site to the east and descends along steep, 60- to 80-foot-high side slopes down to Leadbetter Road along the southwest property boundary. The steep slopes descending into the unnamed stream canyon range from 40 to 80 feet high. Several short, steep internal slopes bound scattered rocky internal hilltops that rise above the ridge surface.

4.3 Subsurface Conditions

4.3.1 General

Soil conditions interpreted from geologic maps and our explorations, in conjunction with soil properties inferred from field observations and laboratory tests, formed the basis for the conclusions and recommendations in this report. Appendix A describes our field exploration procedures and presents field data and logs. Appendix B describes our laboratory soil testing procedures and results.

We completed explorations at the site by advancing nine test pits, designated TP-1A through TP-9A, to depths ranging from 4 to 14 feet below ground surface (bgs) on November 23, 2015, and an additional 22 test pits, designated TP-1 through TP-22, to depths ranging from approximately 2.5 to 12.5 feet bgs on May 27, 2016. Test pit locations are shown on Figures 2 and 3. The recent test pit logs are included in Appendix A1, while the prior test pit logs are included in Appendix A2.

The project area is typically mantled with residual soil and colluvium to depths ranging from approximately 1 to 12 feet bgs. Soils in the upland and hillslope areas of the site were typically in the range of 0.5 to 4 feet in thickness, while soils in drainages and at the bottom of slopes were thicker. Underlying the residual soil and colluvium is fresh to moderately weathered basaltic andesite and volaniclastic breccia to the maximum depths explored. Descriptions of these units are provided below.

4.3.2 Soil Conditions

4.3.2.1 Colluvium

Colluvium was encountered on or at the bottom of hillslopes at the site and is interpreted as slope wash deposits. The colluvium consisted of silty sand, sandy silt, silt with sand, elastic silt and lean clay with sand with varying percentages of fine, subrounded to subangular gravel. Colluvium up to 12 feet thick was encountered in test pit TP-8, but typically ranged from approximately 1 to 5 feet thick, and was thicker at the bottom of slopes. The colluvium was typically covered with approximately 6 to

12 inches of rooted topsoil. Based on the backhoe action and pocket penetrometer tests in the sidewalls of the excavations, we estimate the relatively density of the fine-grained colluvium to be soft to medium stiff and the coarse-grained colluvium to be loose to medium dense.

Moisture contents in the colluvium varied from approximately 25 to 42 percent based on 12 tests. Atterberg limit testing was conducted on two samples of fine-grained colluvium yielding liquid limits of 43 to 48 and plastic limits of 23 to 34 indicating silt to lean clay soil classifications.

4.3.2.2 Residual Soil

Residual soil consisting of silty sand, sandy silt, and lean clay with varying percentages of sand and fine gravel was encountered at the surface or underlying colluvium at the site. Residual soil is interpreted as completely weathered and decomposed in-place bedrock that has experienced minimal transport by water or other means. Residual soil was encountered at the ground surface in test pits TP-1, TP-2, TP-5, TP-20, and TP-21 and underlying the colluvium at depths ranging from 4 to 12 feet bgs in test pits TP-1a, TP-5a, TP-6a, TP-8, and TP-14. The residual soil extends to the maximum depth explored (13 feet bgs) in test pit TP-8. Based on the backhoe action during test pit excavation, we estimate the relative density of the fine-grained residual soil is soft to very stiff and the coarse-grained residual soil is loose to dense.

Moisture contents in the residual soil varied from 20 to 38 percent based on six tests. Atterberg limits testing was conducted on two samples of fine-grained residual soil yielding liquid limits of 46 to 49 and plastic limits of 26 to 31 indicating a silt soil classification.

4.3.2.3 Oligocene Basaltic Andesite of Elkhorn Mountain

Bedrock interpreted as Oligocene-age Basaltic Andesite of Elkhorn Mountain was observed in numerous outcrops across the site and was encountered near the surface and in test pits TP-3, TP-4, TP-11, TP-17, TP-18, and TP-22. Basaltic andesite was encountered at depths ranging from about 1.5 to 8 feet in test pits TP-1, TP-2, TP-5, TP-9 through TP-16, and TP-21. The basaltic andesite varied from fresh to moderately weathered, moderately weak to strong (R2-R4), with closely to moderately spaced fractures. The basalt was typically rippable with a toothed bucket to at least 1 foot below top of rock with moderate effort. Moisture contents in the basaltic andesite varied 9.0 to 9.4 percent based on two tests.

4.3.2.4 Oligocene Volcaniclastic Sedimentary Rock

Volcaniclastic breccia, interpreted as Oigocene-age Volcaniclastic Sedimentary Rock, was encountered at depths ranging from approximately 3 to 13 feet bgs in test pits TP-1a through TP-6a, TP-6, TP-7, TP-19, and TP-20. Volcaniclastic breccia was encountered in the northwest and southeast limits of our explorations and statigraphically underlies the basaltic andesite; no outcrops of volcaniclastic breccia were observed at the surface during our explorations. The breccia consists of angular, medium sand to coarse-gravel-sized fragments of igneous rocks in a weakly-cemented, fine-grained matrix. The breccia was typically moderately to highly weathered, thin-bedded, brown-gray to red-brown, and very weak to moderately weak (R1-R2), with closely spaced fractures. The breccia was typically rippable to at least 1 foot below top of rock with minimal effort.

4.3.2.5 Limitations

The subsurface information used for this study represents conditions at a discrete location at the project site. Actual conditions in other areas could vary. The nature and extent of any variations in subsurface conditions may not become evident until construction begins. If significant variations are observed at that time, we may need to modify our conclusions and recommendations accordingly to reflect actual site conditions.

4.3.3 Groundwater

Subsurface water seepage was encountered in test pit TP-1 at a depth of approximately 7.5 feet bgs. No other test pits encountered seepage during our explorations. Based on local well logs that are primarily screened in the basaltic andesite and volcaniclastic breccia, we anticipate regional groundwater levels to be approximately 50 to 100 feet bgs at the site. We anticipate shallowly infiltrating precipitation and surface run off can become perched within the upper soils at the site during the wetter months of the year, and may approach the ground surface during periods of heavy rain.

5.0 GEOLOGIC AND SEISMIC HAZARDS

5.1 Seismic Shaking

The site is in a seismically active area. In this section, we describe the seismic setting at the project site, identify the seismic basis of design, and discuss the seismic hazards at the site.

The seismicity of the region is controlled by the Cascadia Subduction Zone. Plate tectonics cause the oceanic Juan de Fuca Plate to subduct beneath the continental North American Plate. Three types of earthquakes are associated with subduction zones: intraslab, interface, and crustal earthquakes. Contributions from each of these sources to the total site seismic hazard was evaluated using the U.S. Geologic Survey (USGS) 2008 Interactive Deaggregations (USGS 2013).

Intraslab and Interface Sources. Subduction zones are characterized by the interaction of the oceanic Juan de Fuca plate and continental North American plates. As the oceanic plate subducts beneath the continental plate, the two plates lock together. As the plates move together, stresses similar to a spring build in the overlying continental plate. This stress acts to unlock the two plates. When the magnitude of the *spring* stresses becomes large enough to overcome the stresses locking the plates together, the plates will suddenly rupture causing an interface earthquake. Interface earthquakes (such as the 2011 magnitude M9.0 Tohoku earthquake in northern Japan) are some of the largest magnitude earthquakes on record.

Intraslab earthquakes originate from a deeper zone of seismicity that is associated with bending and breaking of the subducting Juan de Fuca plate. Intraslab earthquakes (such as the 2001 magnitude M7.0 Nisqually earthquake in west central Washington) occur at depths of 40 to 70 kilometers (km) and can produce earthquakes with magnitudes up to and greater than magnitude M7.0. Our review of the interactive deaggregations indicate interface and intraslab earthquakes contribute approximately 50 percent of the total seismic hazard to the site.

Crustal Sources. Shallow crustal faults are caused by cracking of the continental crust resulting from the stress that builds as the subduction zone plates remain locked together. Numerous crustal faults are mapped in the region and contribute approximately 17 percent of the total seismic hazard to the site. The remainder (approximately 32 percent) of the seismic hazard is "gridded" crustal faults, which represent general hazards, but not hazard associated with a specific fault.

We anticipate seismic design of new structures will be completed in accordance with the Washington State Building Code (Washington State Building Code Council 2013), which is based on the 2012 International Building Code (IBC) (ICC 2012). We evaluated potential seismic shaking at the site using data obtained from the U.S. Seismic Design Maps (USGS 2008). The expected peak bedrock acceleration having a 2 percent probability of exceedance in 50 years (2,475-year return period) is 0.380g. This value represents the peak acceleration on bedrock beneath the site and does not account for ground motion amplification due to site-specific effects. The peak ground acceleration (PGA) is determined by applying a Site Class factor to the peak bedrock acceleration. Refer to *Section 5.2 - Ground Motion Amplification (Site Class)* for a discussion of ground motion amplification.

5.2 Ground Motion Amplification (Site Class)

Thick sequences of unconsolidated, soft sediments typically amplify the shaking of long-period ground motions, such as those associated with subduction zone earthquakes; whereas, areas underlain by shallow soil profiles are not likely to amplify seismic waves.

The "Site Class" is a designation used by the 2012 IBC to quantify ground motion amplification. The classification is based on the stiffness in the upper 100 feet of soil and bedrock materials at a site. At the project site the upper 4 to 15 feet of soil is generally soft to medium stiff overlying shallow bedrock. This information leads us to classify the site as Site Class D.

5.3 Liquefaction

Based on the relatively deep phreatic groundwater elevation and shallow bedrock mantling the project site, a liquefaction hazard is likely not present.

5.4 Earthquake-Induced Landsliding

Based on the relatively thin soils overlying shallow bedrock at the site, in our opinion, the potential for earthquake-induced landsliding is low.

5.5 Ground Fault Rupture

Based on our review of the USGS Fault and Fold Database (Personius 2002) and mapping of Evarts and O'Connor (2008), several active crustal faults are mapped at and near the site. These include the Northeast/Southwest trending Lacamas Lake Fault, which is inferred beneath Lacamas Lake a few hundred feet from the site and the Northeast/Southwest-trending Prune Hill Thrust Fault, which intersects the Lacamas Lake Fault near the site. Additionally, two small unnamed faults, likely coincident with the Lacamas Lake Fault, are mapped within the project site near Leadbetter Road. No

faults were observed during our explorations. Although the age of movement is somewhat poorly constrained on the mapped faults in the area, we consider there to be a moderate risk of ground surface fault rupture at the site.

5.6 Geologically Hazardous Areas

Geologic Hazard Areas were addressed in our Critical Areas Update and Initial Site-Specific Evaluation of Geohazard Areas A and C for the site. As discussed, the majority of the site is mantled with thin layers of colluvium and residual bedrock overlying intact bedrock. In our opinion, the soils do not present a slope stability hazard to the proposed development, if designed in conformance with the recommendations in this report.

5.7 Severe Erosion Hazard

Review of the Clark County Maps Online viewer indicates that portions of the site, generally coincident with sloping areas, are mapped as a severe erosion hazard. A majority of the site was logged in winter 2015/2016 for development; however, few areas of exposed bare soil were noted and the ground surface is lightly vegetated with brambles and low brush. We consider the site in its current state to have a low to moderate erosion hazard around the perimeter and moderate erosion hazard in the interior. Erosion control measures should be implemented during earthwork construction, as recommended by the project civil engineer. With a properly implemented erosion control plan, the impact of erosion on the site during construction should be minimal and easily mitigated.

6.0 CONCLUSIONS

Based on our explorations, testing, and analyses, it is our opinion that the site is suitable for the proposed use, provided the recommendations in this report are included in design and construction. We offer the following general summary of our conclusions.

- The majority of the project site is underlain by shallow bedrock (less than 10 feet bgs). The bedrock will provide excellent support for shallow foundations. The bedrock generally results in a stable hillside, even though the slopes are moderately steep, although typical measures should be followed to prevent shallow landslides to affect site slopes.

- Grading plans indicate that required cuts are likely to encounter bedrock in areas. In general, the upper few feet of rock will likely be rippable with standard excavation equipment; however, the contractor should anticipate the use of a rock hammer or other methods where significant rock excavation is required or excavations extend more than a few feet into bedrock.

- Thick fills are proposed on some sloping portions of the site. Hillside construction techniques, including the installation of keys and benches, should be employed at the site.

- Due to the presence of a fine-grained soil matrix and hard bedrock, we recommend against the use of infiltration systems to dispose of stormwater.

- The native soils are mostly fine-grained with varying percentages of sand and fine gravel. The reuse of these materials as structural fill will be difficult, since the fine-grained soils will be moisture sensitive and susceptible to disturbance when wet.
- Shallow perched groundwater may result in the need for localized trench and excavation dewatering during earthwork activities, depending on the time of construction.
- We developed our conclusions and recommendations based on our current understanding of the project elements, subsurface explorations, local experience, and guidelines in various design references (as listed in the references section of this report and annotated below). The following sections of this report outline our recommendations for design and earthworks.

7.0 STRUCTURAL DESIGN RECOMMENDATIONS

7.1 Design Response Spectrum

We obtained design spectral acceleration parameters from the U.S. Seismic Design Maps (USGS 2008) for Latitude 45.61517 and Longitude -122.41132 with a 2,475-year return period. The parameters provided in Table 1 are appropriate for code-level seismic design.

Table 1 - Seismic Design Parameters

Parameter	Value (IBC)
Spectral Response Acceleration (Short Period), S_s	0.873 g
Spectral Response Acceleration (1-Second Period), S_1	0.371 g
Peak Ground Acceleration (0-second Period), PGA	0.380 g
Site Class	D
Site Coefficient, F_a	1.151
Site Coefficient, F_v	1.658
Spectral Response Acceleration (Short Period), S_{DS}	0.670 g
Spectral Response Acceleration (1-Second Period), S_{D1}	0.410 g

Note: PGA is the mapped MCE_G peak ground acceleration and should not be used to derive the design response spectrum in accordance with ASCE 7-10 (2011) section 11.4.5.

7.2 Foundation Support Recommendations

7.2.1 General

Based on the results of our investigation, it is our opinion the proposed structures can be supported on conventional spread footings bearing on native soil, bedrock, or new structural fill constructed in accordance with the recommendations in this report.

7.2.2 Dimensions and Design Parameters

We recommend a maximum allowable bearing pressure of 5,000 pounds per square foot (psf) for spread footings bearing directly on hard bedrock or a leveling course of aggregate base overlying hard bedrock. We recommend a maximum allowable bearing pressure of 2,500 psf for spread footings bearing directly on colluvium, residual bedrock soil, or new engineered fills. The allowable soil bearing pressures may be increased by up to one-third for short-duration loads, such as wind or seismic forces. The bearing values provided above represent net bearing pressures; the weight of the footings and overlying backfill can be ignored in calculating footing sizes. The recommended allowable bearing pressure applies to the total of dead plus long-term live loads and may be increased by one-third for short-term loads, such as wind or seismic forces.

Isolated spread footings should have a minimum width of 2 feet. Continuous strip footings should have a minimum width of 12 inches or as required by code. The bottoms of all footings should be at least 1 foot below the lowest adjacent finished grade and, in sloping areas, should be embedded such that there is a minimum of 10 feet of "horizontal cover" from the toe of the footing. For example, in areas with a 2 horizontal to 1 vertical (2H:1V) slope gradient, this will require 5 feet of footing embedment.

Lateral loads on footings can be resisted by passive earth pressures on the sides of footings and by friction on the bearing surface. We recommend that passive earth pressures be calculated using an equivalent fluid weight of 300 pounds per cubic foot (pcf). We recommend using a friction coefficient for footings cast directly against the materials shown in Table 2 below. The passive earth pressure and friction components may be combined, provided that the passive component does not exceed two-thirds of the total. The lateral resistance values do not include safety factors.

Table 2 – Footing Base Friction Coefficient

Footing Base Material	Friction Coefficient
Soil	0.3
Compacted Aggregate Base[a]	0.5
Hard Bedrock	0.6

Note a: Aggregate base must be a minimum 8 inches thick if overlying colluvium or residual bedrock.

Because the depth to bedrock varies across the site and grading activities may result in fill placement, it may not be possible to delineate prior to construction which footing excavations will expose intact bedrock and which footings will expose soil. Therefore, the designer can choose to conservatively use the soil design parameters outlined above for all footings and/or provide a footing "schedule" that identifies different foundation configurations, depending upon which materials are exposed in the excavations.

We estimate that total post-construction settlements should be less than 1 inch, with differential settlement of less than 1/2 inch between columns.

7.2.3 Foundation Subgrade Preparation

Foundation subgrades should be evaluated by Hart Crowser to confirm suitable bearing conditions. Observations should also confirm that loose material has been removed and the design bearing soil unit or bedrock are exposed.

The presence of cobbles, boulders or bedrock should be anticipated within the depths of footing excavations. Boulders, cobbles, or bedrock protruding into the depth of excavation should be overexcavated and backfilled with compacted crushed rock. In this regard, it may be advisable to overexcavate foundation excavations 3 to 6 inches and backfill with compacted crushed rock to form a leveling pad.

Water, along with any disturbed soil, should be removed from footing excavations before placement of reinforcing steel. If construction is undertaken during periods of rain, we recommend that imported granular material be placed over the base of footing excavations. The granular material reduces subgrade disturbance from standing water and from foot traffic during forming and tying of reinforcing steel. Typically, 3 to 6 inches of clean granular material that is lightly compacted until well keyed provides sufficient protection from disturbance.

7.3 Floor Slabs

Satisfactory subgrade support for building floor slabs can be obtained, provided the building pad is prepared as described previously. For loading up to 200 psf, we recommend a minimum 6-inch-thick layer of base rock be placed and compacted over the subgrade. The base rock should meet the criteria for aggregate base discussed in *Section 8.4 - Structural Fill and Backfill.*

We recommend that exterior slabs (e.g., patios, walkways, driveways, and interior garage slabs) be structurally independent from the building foundations. Expansion joints should be provided between floor slabs and foundations. This will allow minor movement of the slabs to occur as a result of vehicular loading, tree root growth, seasonal soil shifting, and other factors, while reducing the potential for slab cracking around the perimeter. Interior slabs may be tied to the building's foundation system.

Flooring manufacturers often require vapor barriers to protect flooring and flooring adhesives. Many flooring manufacturers will warrant their product only if a vapor barrier is installed according to their recommendations. Selection and design of an appropriate vapor barrier, if needed, should be based on discussions among members of the design team.

We recommend that Hart Crowser observe slab subgrade preparation before placement of aggregate base to determine if the subgrade has been adequately prepared and that the soil conditions are consistent with those observed during our explorations. We should also evaluate the compacted aggregate base to verify required compaction levels have been achieved.

7.4 Retaining Structures

We anticipate that various site and/or building retaining walls will be required throughout the project. If walls are greater than 8 feet tall, or are located on or within 20 feet of downward sloping areas with gradients steeper than 4H:1V, then our office should be contacted to complete a wall-specific stability evaluation. If walls are 8 feet or less in height and located in areas with gradients 4H:1V or flatter, then the design recommendations in the following sections can be used. (We have provided recommendations for both cantilevered, cast-in-place concrete walls and mechanically stabilized earth [MSE] walls.)

7.4.1 Cantilevered Wall Design Parameters

Cantilevered retaining walls supporting new engineered fill or native cuts should be designed to resist earth pressures as shown in Table 3. We anticipate the wall backslopes will vary between flat and up to 2H:1V. The values in Table 3 vary according to the indicated slope angle. Earth pressures for intermediate slope angles can be linearly interpolated.

Table 3 – Cantilevered Retaining Wall Earth Pressures

Wall Type/Loading Condition Static Forces	Slope Angle	Equivalent Fluid Pressure (pcf)
Unrestrained from Rotation (active condition)	Flat	33
	2H:1V	55
Restrained from Rotation (at rest condition)	Flat	56
	2H:1V	82
Dynamic (Seismic) Forces	**Slope Angle**	**Dynamic Surcharge Force (plf)**
Unrestrained from Rotation (active condition)	Flat	5 H^2
	2H:1V	23 H^2
Restrained from Rotation (at-rest condition)	Flat	8 H^2
	2H:1V	33 H^2

Notes: plf = Pounds per linear foot of wall • H = the height of wall in feet

For seismic loading on retaining structures, a superimposed seismic lateral force should be calculated based on the dynamic force surcharges shown in Table 3. The force is applied 0.6H from the base of the wall.

If cuts for retaining walls expose large zones of stable bedrock, then reduced earth pressures may be appropriate for design and some zones of rock may be able to be left structurally unsupported. However, the appropriateness of these options will need to be evaluated in the field when the rock exposures are visible.

7.4.2 MSE Wall Design Parameters

MSE retaining walls supporting new engineered fills or native cuts should be designed to using the soil and rock parameters shown in Table 4.

Table 4 – MSE Wall Design Parameters

Material	Unit Weight, γ (pcf)	Friction Angle, ϕ (degrees)	Cohesion, c (psf)
Reinforced Zone Fill	130	38	0
Retained Material (Soil)	120	32	0
Retained Material (Bedrock)	135	45	500
Foundation Material (Soil)	120	32	50
Foundation Material (Bedrock)	135	45	500

For seismic design of MSE walls, the appropriate seismic parameters are listed in Table 1. The designer may assume an allowable displacement of 3 inches during seismic shaking. Also, the vertical acceleration coefficient, k_V, may be assumed to be 0.

The "reinforced zone fill" shall include the entire zone with geogrid reinforcement and that material should meet the specifications provided in Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge, and Municipal Construction (WSS) WSS 9-03.14(4) – Gravel Borrow for Geosynthetic Retaining Wall, as discussed in *Section 8.4 – Structural Fill and Backfill* (WSDOT 2016).

Most MSE wall systems are proprietary and all materials for MSE walls should also meet the manufacturer's recommendations for their specific wall. If conflicts exist between the specifications, they should be resolved by the engineer of record for the wall before construction.

7.4.3 Surcharges

If surcharges (e.g., foundations, terraced walls, stored materials, traffic loads, etc.) are located within a horizontal distance from the back of a wall equal to twice the height of the wall, then additional pressures may need to be accounted for in the wall design. Our office should be contacted for appropriate wall surcharges based on the actual magnitude and configuration of the applied loads.

Where traffic loads are located within a horizontal distance from the top of the wall equal to one-half the wall height, the lateral earth pressure shall be increased by a surcharge load equal to 2 feet of soil (assuming a soil density of 125 pcf). For overturning and sliding analysis, this surcharge should only be applied behind the reinforced soil zone.

7.4.4 Foundations

The base of the excavation for the wall footings (or first row of MSE blocks) should extend a minimum of 18 inches below lowest adjacent grade. The excavation should be lined with a minimum 6-inch-thick layer of compacted, imported granular material. In addition, the toe of footings/first row of MSE blocks should be embedded such that a minimum of 10 feet of horizontal coverage is present between the face of the footing/block toe and any adjacent downward slope.

The wall footings should be designed in accordance with the guidelines provided in *Section 7.1 – Foundation Support Recommendations*.

All wall subgrades should be evaluated by a qualified geotechnical engineer or their representative to confirm suitable bearing conditions. Observations should also confirm that loose or soft material, organics, unsuitable fill, prior topsoil zones, and softened subgrades (if present) have been removed. Localized deepening of footing excavations may be required to penetrate deleterious materials.

7.4.5 Drainage, Waterproofing, and Backfill

The above design parameters have been provided assuming that back-of-wall drains will be installed to prevent buildup of hydrostatic pressures behind all walls. If a drainage system is not installed, then our office should be contacted for revised design forces.

A minimum 12-inch-wide zone of drain rock, extending from the base of the wall to within 6 inches of finished grade, should be placed against the back of all retaining walls. Alternatively, prefabricated drainage panels with a pocket of drain rock at the base of the wall may be used. Perforated collector pipes should be embedded at the base of the drain rock. The drain rock should meet the requirements provided in *Section 8.4 - Fill and Backfill* of this report. The perforated collector pipes should discharge at an appropriate location away from the base of the wall. The discharge pipe(s) should not be tied directly into stormwater drain systems, unless measures are taken to prevent backflow into the wall's drainage system.

We recommend that retaining walls that abut living space should be waterproofed to reduce the potential for efflorescence growth or water seepage through the wall. Additionally, care should be taken to assure that the drainage system and perforated collector pipes are located below any habitable areas or crawlspace subgrades. We recommend that waterproofing of all habitable living spaces be the responsibility of the architect/building designer.

The backfill for MSE walls should meet the requirements of and be compacted in conformance with the specifications provided in WSS 6-13 – Structural Earth Walls. The reinforcing geotextile should be installed in conformance with the specifications provided in WSS 2 12 – Construction Geotextile.

Settlements of up to 1 percent of the wall height commonly occur immediately adjacent to the wall, as the wall rotates and develops active lateral earth pressures. Consequently, we recommend that construction of improvements (such as pavements, sidewalks, or structures) adjacent to retaining walls be postponed at least 4 weeks after backfilling of the wall, unless survey data indicate that settlement is complete prior to that time.

8.0 EARTHWORK RECOMMENDATIONS

Based on available information, we estimate mass grading will be relatively substantial consisting of cuts and fills up to 20 feet tall/deep. Localized trench excavations that extend below the base of mass excavation will be required for installation of utilities and foundations. Hillside construction techniques should be employed at the project.

All earthwork should be conducted in accordance with the City of Camas Municipal Code and the WSS (WSDOT 2016) where applicable. Specific recommendations for earthwork are provided in the following sections.

8.1 Site and Subgrade Preparation

8.1.1 Stripping and Clearing

Initial site preparation and earthwork operations will include clearing and stripping of surficial organic materials. Based on our explorations, the anticipated depth of stripping is approximately 8 to 24 inches with an average of 12 inches. Actual stripping depths should be evaluated based on observations during the stripping operation. The prepared subgrade should be observed and approved by a representative of Hart Crowser. Generally, visible organic material (sod, humus, roots larger than 1/4-inch diameter, and/or other decaying plant material), debris, and other unsuitable materials should be removed from the subgrade areas.

Trees and their root balls should be grubbed out to the depth of the roots, which could exceed 3 feet bgs. Depending upon the methods used to remove the root balls, considerable disturbance and loosening of the subgrade could occur during site grubbing. We recommend that soil disturbed during grubbing operations be removed to expose firm, undisturbed subgrade. The resulting excavations should be backfilled with compacted structural fill, as described in *Section 8.4 - Structural Fill and Backfill* of this report.

8.1.2 Subgrade Preparation and Evaluation

Following completion of site stripping, clearing, and any mass excavation, and prior to the placement of any fill or aggregate base, the suitability of the subgrade should be evaluated by proofrolling with a fully loaded dump truck or similar heavy rubber-tired construction equipment to identify any remaining soft, loose, or unsuitable areas. The proofroll should be conducted prior to placing any fill. The proofrolling should be observed by Hart Crowser who will evaluate the suitability of the subgrade and identify areas of yielding that are indicative of soft or loose soil. If soft or loose zones are identified during evaluation, these areas should be excavated to the extent indicated by the engineer and replaced with compacted engineered fill in conformance with the specifications provided in WSS 2-03.3(3) – Excavation Below Subgrade, WSS 2-03.3(14)E – Unsuitable Foundation Excavation, and WSS 2-03.3(14)G – Backfilling. During wet weather conditions the subgrade should be evaluated per *Section 8.2 – Wet Soil/Wet Weather Construction*.

8.1.3 Bench Preparation for Fill on Slopes

Fill placed on slopes steeper than 5H:1V (20 percent gradient) will need to be constructed on a series of benches cut into the native slope. The benches shall be level or have an outward gradient of 0.5 percent or less, and have a maximum of height of approximately 5 feet. However, the lowest bench, also known as the keyway, shall be a minimum of 10 feet wide or one and one-half times the width of the compaction equipment, whichever is wider. The keyway shall slope back into the hillside at a 2 percent gradient.

A gravel subdrain should be constructed at the back of the keyway and any benches where seepage is observed in the field. The subdrain should consist of a minimum of a 2-foot-wide by 2-foot-tall "wedge" of drain rock placed at the back of the keyway. The drain rock should be completely wrapped with a geotextile drainage fabric. A perforated pipe should be installed at the base of the gravel to collect water seepage. The collector pipe should "daylight" at an appropriate location near the base of the slope. If seepage, or signs of seepage are present in the field, then a 1-foot-thick blanket drain may also be required along the base of the keyway.

Refer to Figure 7 for a schematic depiction of a keyway and benches.

8.2 Wet Soil/Wet Weather Construction

The site is mantled with soils containing a significant percentage of fine-grained soil that will be susceptible to moisture-related disturbance. Disturbance to subgrades containing these soils should be expected if site preparation and earthwork are conducted during periods of excessive wet weather and/or when the moisture content of the fine grained subgrade soil exceeds optimum. Wet soil construction practices may be necessary during extensive portions of the year, particularly during periods of wet weather. Wet soil construction practices include using equipment, such as smooth excavator buckets and tracked equipment, to limit subgrade disturbance.

During wet weather or when the exposed subgrade is wet or unsuitable for proofrolling, the prepared subgrade should be evaluated by observing excavation activity and probing with a steel foundation probe. Observations and probing should be performed by Hart Crowser.

During wet weather or when adequate moisture control is not possible, it may be necessary to install a granular working blanket to support construction equipment and to provide a firm base on which to place subsequent fill and pavement. Commonly, the working blanket consists of bank run gravel or pit run quarry rock (6-inch maximum size with no more than 5 percent by weight passing a No. 200 sieve).

Based on our experience, between 12 and 18 inches of imported granular material is generally required to provide stable staging and haul road areas. However, the actual thickness will depend on the contractor's means and methods, and accordingly, should be the contractor's responsibility. Additionally, a geotextile fabric should generally be placed as a barrier between the subgrade and imported granular material in areas of repeated construction traffic. The imported granular material and the geotextile fabric should meet the specifications in *Section 8.4 - Structural Fill and Backfill* of this report.

Portions of the site used as haul routes for heavy construction equipment may require a thicker working blanket to protect the fine-grained subgrade. If particularly soft/wet areas are encountered, a heavy grade, nonwoven geotextile fabric installed on the fine-grained subgrade may be helpful in preventing silt from contaminating and pumping into the granular working blanket. The geotextile should meet the specifications provided in WSS 9-33.2(1) Table 3 – Geotextile for Separation or Soil Stabilization.

8.3 Excavation, Shoring, and Dewatering

All excavations, shoring, and dewatering should be completed in accordance with the specifications provided in WSS 2-03 – Roadway Excavation and Embankment and WSS 2-09 – Structure Excavation, and the requirements of Washington Administrative Code (WAC) section 292-155.

The colluvium and residual bedrock soils within expected excavation depths typically range from soft to stiff. Vertical trench excavations into these materials will have a low to moderate tendency to run or slough. On average, the site colluvium and residual bedrock soils should be considered Soil Type C, as defined by Part N of the WAC 296-155. However, the deeper intact bedrock can be classified as "Stable Rock." The presence of cobbles and boulders may cause excavation sidewalls to cave or slough, resulting in greater than anticipated backfill quantities.

Because of the variables involved, actual slope angles required for stability in temporary cut areas can only be estimated before construction. We recommend that stability of the temporary slopes used for construction be the responsibility of the contractor, since the contractor is in control of the construction operation and is continuously at the site to observe the nature and condition of the subsurface. All temporary soil cuts associated with site excavations (greater than 4 feet in depth) should be adequately sloped back to prevent sloughing and collapse, in accordance with Department of Occupational Safety and Health (DOSH) Chapter 296-155 WAC Part N Excavation, Trenching and Shoring Occupational Safety and Health Administration (OSHA) guidelines.

Explorations completed at the site identified relatively shallow bedrock. Earthwork construction will require equipment capable of excavation in this hard material. In our experience, rippers equipped to a large bulldozer can be effective in breaking up hard bedrock to a few or several feet deep to facilitate excavation. However, it is acknowledged that ripping the bedrock may not be completely effective, particularly with increasing depths, and rock hammers or blasting may be necessary to completely remove bedrock encountered within cut areas.

The earthwork contractor should be responsible for providing equipment and following procedures as needed to safely excavate the site soils as described in this report.

If temporary sloping is not feasible, based on site spatial constraints, excavations could be supported by internally braced shoring systems, such as a trench box or other temporary shoring. There are a variety of options available. We recommend that the contractor be responsible for selecting the type of shoring system to apply.

We do not expect that the regional groundwater table will be encountered during construction. However, we encountered perched groundwater in one location at the site, and localized zones of perched water may be encountered during construction, particularly atop the site bedrock during the wet season. The contractor should be prepared to control perched water and water that may seep into trenches and through excavation faces.

8.4 Structural Fill and Backfill

Structural fill includes embankments, slab, and pavement support, such as aggregate base and other fill within the influence zone of structures adjacent to the improvement area. Fill should only be placed over a subgrade that has been prepared in accordance with *Section 8.1 - Site and Subgrade Preparation* of this report. A variety of soils may be used as structural fill, provided they are free of debris, clay balls, roots, organic matter, frozen soil, man-made contaminants, particles exceeding 4 inches in size, and other deleterious materials. Structural fill should meet the appropriate specification provided in WSS 9-03 – Aggregates.

Fill and backfill materials should be placed and compacted in lifts with maximum uncompacted thicknesses and relative densities as recommended in *Section 8.5 - Fill Placement and Compaction* of this report.

In areas where fill is to be placed on soft or fine-grained subgrade soils, then use of a subgrade geotextile per WSS 9-33.2(1) Table 3 – Geotextile for Separation or Soil Stabilization will be required.

8.4.1 On-Site Soils and Bedrock Spoils

In general, the overburden native materials in the project area consist of fine-grained materials. During periods of dry weather, the native soils may be used as fill, provided they are properly moisture conditioned and oversized materials (greater than 6 inches) are removed. During periods of wet weather, the fine-grained component of the native soil will likely make the use of the native soil as a structural fill infeasible. The earthwork contractor should plan accordingly.

Bedrock spoils from excavations may be used as structural fill, provided they are processed/crushed to remove oversized materials. Bedrock materials should generally be processed to a well-graded crushed material with nominal sizes between 1 and 6 inches, and/or meeting the gradations of the materials described in S*ection 8.4.2 - Imported Select Structural Fill.*

8.4.2 Imported Select Structural Fill

Imported granular material used as structural fill during periods of wet weather should be pit or quarry run rock, crushed rock, or crushed gravel and sand and should meet the specifications provided in WSS 9-03.9(1) – Ballast, WSS 9-03.14(1) – Gravel Borrow, or WSS-9 03.14(2) – Select Borrow. The imported granular material should also be angular, fairly well graded between coarse and fine material, have less than 5 percent by dry weight passing the U.S. Standard No. 200 Sieve, and have at least two mechanically fractured faces.

8.4.3 Aggregate Base

Imported granular material used as aggregate base (base rock) beneath pavements or the building should be clean, crushed rock or crushed gravel and sand that is fairly well graded between coarse and fine. The base aggregate should meet the specifications provided in WSS 9 03.9 – Aggregates for Ballast and Crushed Surfacing, depending upon application, with the exception that the aggregate have less than 5 percent by dry weight passing a U.S. Standard No. 200 Sieve and have at least two

mechanically fractured faces. The aggregate base should have a maximum particle size of 1.5 inches for use beneath pavements or footings and a maximum particle size of 0.75 or 1 inch for use beneath floor slabs, sidewalks, or patio slabs.

Refer to *Section 10.0 - Pavement Design and Considerations* for additional discussion regarding base materials for paved areas.

8.4.4 Trench Backfill

Trench backfill placed beneath, adjacent to, and for at least 12 inches above utility lines (i.e., the pipe zone) should meet the WSS requirements and consist of well-graded granular material with a maximum particle size of 3/4 inch and less than 10 percent by dry weight passing the U.S. Standard No. 200 Sieve. The trench backfill should meet the specifications provided in WSS 9 03.12(3) – Gravel Backfill for Pipe Zone Bedding.

Within pavement and slab subgrades the remainder of the trench backfill up to the subgrade elevation shall consist of granular material meeting the specifications provided in WSS 9 03.19 – Bank Run Gravel for Trench Backfill, or other material approved by the City of Camas.

Outside of structural improvement areas, trench backfill placed above the pipe zone may consist of general fill materials that are free of organics and materials over 6 inches in diameter and meet the specifications provided in WSS 9 03.14(3) – Common Borrow and WSS 9 03.15 – Native Material for Trench Backfill, as appropriate.

8.4.5 Drain Rock

Drain rock used for back-of-wall, footing, and keyway drains should meet the specifications provided in WSS 9 03.12(4) – Gravel Backfill for Drains. The drain rock should be wrapped in a geotextile fabric that meets the specifications provided in WSS 9 33.2 for drainage geotextiles. The geotextile should be installed in conformance with the specifications provided in WSS 2 12 – Construction Geosynthetic.

8.4.6 Retaining Wall Select Backfill

Granular wall backfill used as reinforced fill for MSE walls should consist of select granular material meeting the specifications of WSS 9 03.14(4) – Gravel Borrow for Geosynthetic Retaining Wall. The select granular material should also meet the gradations specified in WSS 9 03.14 (1) – Gravel Borrow or WSS 9 03.14 (2) – Select Borrow.

8.4.7 Stabilization Material

If imported granular material is used to create haul roads for construction traffic, we recommend that material consist of pit or quarry run rock, or crushed rock. The material should generally be sized between 2 and 6 inches, have less than 5 percent by dry weight passing the U.S. Standard No. 4 Sieve, and have at least two mechanically fractured faces. The material should be free of organic matter and other deleterious material. Material meeting the gradations of WSS 9-03.9(2) - Permeable Ballast, WSS 9-03.12(5) – Gravel Backfill for Drywells, or WSS 9-13.6 – Quarry Spalls is generally acceptable for use.

Stabilization material should be separated from the base of soft or fine-grained subgrades with a layer of subgrade geotextile that meets the specifications provided in WSDOT SS 9-33.2(1) Table 3 – Geotextile for Separation or Soil Stabilization. The geotextile should be installed in conformance with the specifications provided in WSS 2-12 – Construction Geosynthetic.

Stabilization material should be placed atop the geotextile in lifts between 12 and 18 inches thick and be compacted to a well-keyed condition with appropriate compaction equipment without using vibratory action. In trench excavations, a walk behind segmented pad roller or a pinwheel on an excavator typically can provide adequate compaction if carefully used.

8.5 Fill Placement and Compaction

Structural fill should be placed and compacted in accordance with WSS (2016) and the following guidelines.

In locations where fill is to be placed on slopes steeper than 5H:1V, benches should be cut in accordance with WSS 2-03.3(14) – Embankment Construction and *Section 8.1.3 - Bench Preparation for Fills on Slopes*. Fill slopes should be overbuilt by at least 12 inches and then trimmed back to the required slope to maintain a firm face.

- Place fill and backfill on a prepared subgrade that consists of firm, inorganic native soils or approved structural fill.
- Place fill or backfill in uniform horizontal lifts with a thickness appropriate for the material type and compaction equipment. Table 5 provides general guidance for uncompacted lift thicknesses.

Table 5 – Guidelines for Uncompacted Lift Thickness

Compaction Equipment	Guidelines for Uncompacted Lift Thickness (inches)		
	Fine-Grained Soil	Granular Soil and Crushed Rock (Maximum Size ≤ 1½ inch	Crushed Rock (Maximum Size > 1½ inch
Plate Compactors and Jumping Jacks	4 – 8	4 – 8	Not Recommended
Rubber-Tire Equipment	6 – 8	10 – 12	6 – 8
Light Roller	8 – 10	10 – 12	8 – 10
Heavy Roller	10 – 12	12 – 18	12 – 16
Hoe Pack Equipment	12 – 16	18 – 24	12 – 16

Note: The above table is based on our experience and is intended to serve as a guideline. The information provided in this table should not be included in the project specifications.

- Do not place fill and backfill until the required tests and evaluation of the underlying materials have been made and the appropriate approvals have been obtained.
- Limit the maximum particle size within the fill to two-thirds of the loose lift thickness.

- Control the moisture content of the fill to within 3 percent of the optimum moisture content based on laboratory Proctor tests. The optimum moisture content corresponds to the maximum attainable Proctor dry density.
- Perform a representative number of in-place density tests on structural fill in the field, to verify adequate compaction.
- Compact fill soils to the percentages of maximum dry density as shown in Table 6.

Table 6 – Fill Compaction Criteria

Fill Type	Percent of Maximum Dry Density Determined in Accordance with ASTM D 1557		
	0 – 2 Feet Below Subgrade	>2 Feet Below Subgrade	Pipe Bedding and Pipe Zone
Structural Fill	95	92	-----
Aggregate Base	95	95	-----
Trench Backfill	95	92	90
Nonstructural Trench Backfill	88	88	-----
Nonstructural Zones	88	88	-----

Note: Structural fill with more than 30 percent retained on the 3/4-inch sieve should be compacted to a well-keyed dense state within 3 percent of optimum moisture content. Compaction should be verified by Hart Crowser staff through performance testing, such as a proofroll.

8.6 Temporary Drainage

The contractor should be made responsible for temporary drainage of surface water as necessary to prevent standing water and/or erosion of the working surface during grading. During rough and finished grading of the roadway alignment the contractor should keep subgrades free of water.

9.0 DRAINAGE

As noted previously, the site lies on slopes up to 2H:1V, is mantled with a matrix of fine-grained soils, and is underlain by relatively shallow bedrock. These conditions will tend to perch, as opposed to infiltrate, stormwater; therefore, we recommend against the use of stormwater infiltration facilities at the site.

9.1 Surface Drainage

The finished ground surface around buildings should be sloped away from their foundations at a minimum 2 percent gradient for a distance of at least 5 feet. Downspouts or roof scuppers should discharge into a storm drain system that that carries the collected water to an appropriate stormwater system. Trapped planter areas should not be created adjacent to the building without providing means for positive drainage (i.e., swales or catch basins).

9.2 Subsurface Drainage

We recommend the installation of perimeter footing drains along the uphill sides of buildings and crawlspace areas at a minimum. Where retaining walls are incorporated into building foundation systems, the back-of-wall drain can serve as the footing drainage. Where used, the footing drains should consist of a filter fabric-wrapped, drain rock-filled trench that extends at least 12 inches below the lowest adjacent grade (i.e., crawlspace or slab subgrade elevation). A perforated pipe should be placed at the base to collect water that gathers in the drain rock. The drain rock and filter fabric should meet specifications outlined in *Section 8.4 - Structural Fill and Backfill* of this report. The discharge for the footing drain should not be tied directly into the stormwater drainage system, unless mechanisms are installed to prevent backflow.

10.0 PAVEMENT DESIGN AND CONSIDERATIONS

10.1 General

Our pavement design recommendations include options for flexible hot mixed asphaltic concrete (HMAC) pavement and Portland cement concrete (PCC). We were not provided specific traffic counts for the project, so we assumed some traffic loading criteria based on our experience with similar projects. If these and other assumptions in the following section are not valid, please contact our office so that updated recommendations can be developed.

10.2 Design Criteria

The pavement design criteria were based on guidelines found in the WSDOT Pavement Policy (WSDOT 2015) and American Association of State Highway and Transportation Officials (AASHTO*) Guide for Design of Pavement Structures* (AASHTO 1993), and our communications with the traffic engineer (Mackenzie). The following assumptions and criteria were used:

- Average daily traffic (ADT) ranging from approximately 500 to 1,500 vehicles per day with approximately 3 percent heavy truck traffic (e.g. buses, trash trucks, delivery trucks, etc.)
- No annual traffic growth due to lack of through streets
- Average resilient modulus of 6,000 pounds per square inch (psi) for *in situ* soil and fill subgrade
- A resilient modulus of 30,000 psi for aggregate base
- Initial and terminal serviceability indices of 4.5 and 2.0, respectively
- Reliability and standard deviation of 85 percent and 0.45, respectively for AC pavements and 95 percent and 0.35, respectively for PCC pavements
- PCC compressive strength of 4,000 psi and a modulus of rupture of 500 psi
- Structural coefficients of 0.45 and 0.12 for the HMAC and aggregate base layers, respectively

If these parameters and assumptions are incorrect, then we should be contacted to re-evaluate our recommendations.

Construction traffic should be limited to non-building, unpaved portions of the site or haul roads. Construction traffic should not be allowed on new pavements. If construction traffic is to be allowed on newly constructed road sections, an allowance for additional traffic will need to be made in the design pavement section.

10.3 Pavement Sections

The City standard pavement section for a typical residential street is 3 inches of HMAC over 9 to 12 inches of crushed surfacing (e.g., aggregate base). The results of our project-specific analyses for different ADT values indicates that somewhat different sections are feasible. Our recommended minimum pavement sections are summarized in Table 7.

Table 7 –Pavement Sections

Pavement Type/Location	Roadway Classification	Pavement Thickness (inches)	Aggregate Base Thickness (inches)
HMAC	Driveways	2.5	4.5
	ADT = 500	3.0	7.0
	ADT = 1000	3.0	9.0
	ADT = 1500	3.5	8.5
PCC	Driveways	3.5	4.0
	ADT = 500	4.0	6.0
	ADT = 1000	4.5	6.0
	ADT = 1500	5.0	6.0

We note that the aggregate base thicknesses are intended to support post-construction design traffic loads and should not be used to support construction traffic. Additional thickness of crushed surfacing may be necessary if excessive construction traffic is planned in the new pavement areas.

10.4 Pavement Materials

The HMAC should consist of a Level 2, 1/2-inch dense-graded, PG 64-22 material meeting the specifications of WSS 5-04 – Hot Mix Asphalt. The HMAC should be placed in lifts with minimum and maximum thickness of 1.5 and 3.5 inches, respectively, and be compacted in accordance with WSS 5-04.3(10) – Compaction to 91 percent of Rice Density of the mix, as determined in accordance with American Society for Testing and Materials (ASTM) D 2041.

The PCC should conform to the specifications provided in WSS 5-05 – Cement Concrete Pavement. The PCC should have a minimum modulus of rupture of 650 psi and a modulus of elasticity of approximately 3,500,000 psi. The PCC should be constructed with a maximum joint spacing of 12 feet. The slabs shall be interlocked at joints. However, if the designer wishes to utilize doweled joints then thinner PCC sections may be possible. We should be contacted for additional recommendations, if desired.

Imported granular material used as base aggregate (base rock) should meet the criteria specified in *Section 8.4 - Structural Fill and Backfill* of this report. The base aggregate should be compacted to not less than 95 percent of the maximum dry density as determined by ASTM D 1557.

11.0 CONSTRUCTION OBSERVATIONS

Satisfactory pavement and earthwork performance depends to a large degree on quality of construction. Sufficient monitoring of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. Subsurface conditions observed during construction should be compared with those encountered during subsurface explorations. Recognition of changed conditions often requires experience; therefore, Hart Crowser or their representative should visit the site with sufficient frequency to detect whether subsurface conditions change significantly from those anticipated.

We recommend that Hart Crowser be retained to monitor construction at the site to confirm that subsurface conditions are consistent with the site explorations and to confirm that the intent of project plans and specifications relating to earthwork and foundation construction are being met. In particular, we recommend that stripping and subgrade preparation, key and bench preparation, subsurface drainage system installation, placement and compaction of structural fill and backfill, aggregate bases, and asphalt pavements be observed and/or tested by Hart Crowser.

12.0 LIMITATIONS

We have prepared this report for the exclusive use of CJ Dens Lacamas I, LLC and their authorized agents for the proposed CJ Dens subdivision project in Camas, Washington, in accordance with our Agreement for Geotechnical Engineering Services and subsequent change orders. Our report is intended to provide our opinion of geotechnical parameters for design and construction of the proposed project based on exploration locations that are believed to be representative of site conditions. However, conditions can vary significantly between exploration locations and our conclusions should not be construed as a warranty or guarantee of subsurface conditions or future site performance.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty, express or implied, should be understood.

Any electronic form, facsimile, or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by Hart Crowser and will serve as the official document of record.

13.0 REFERENCES

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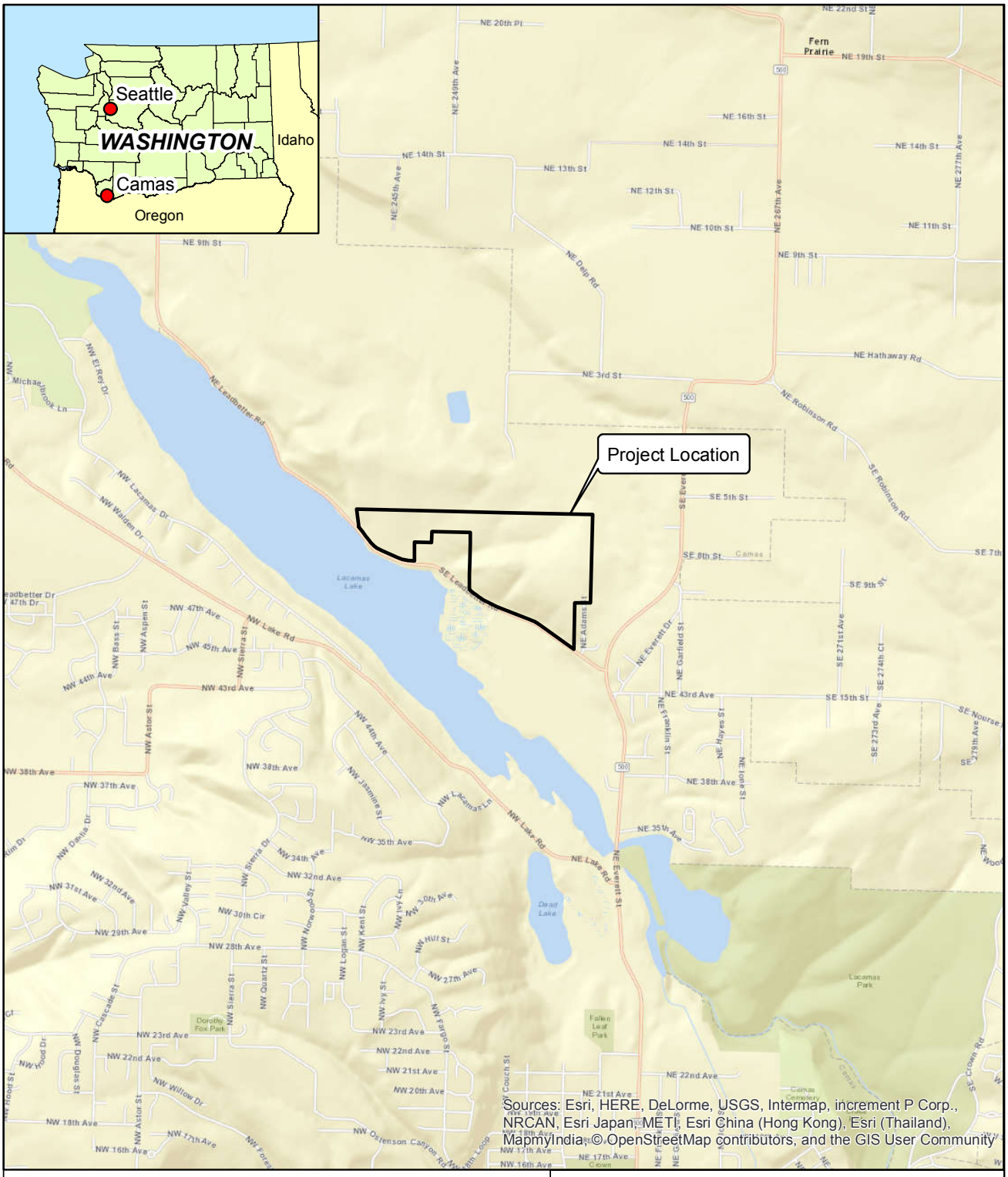

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CJ Dens Subdivision
Camas, Washington

Vicinity Map

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HARTCROWSER

Figure 1

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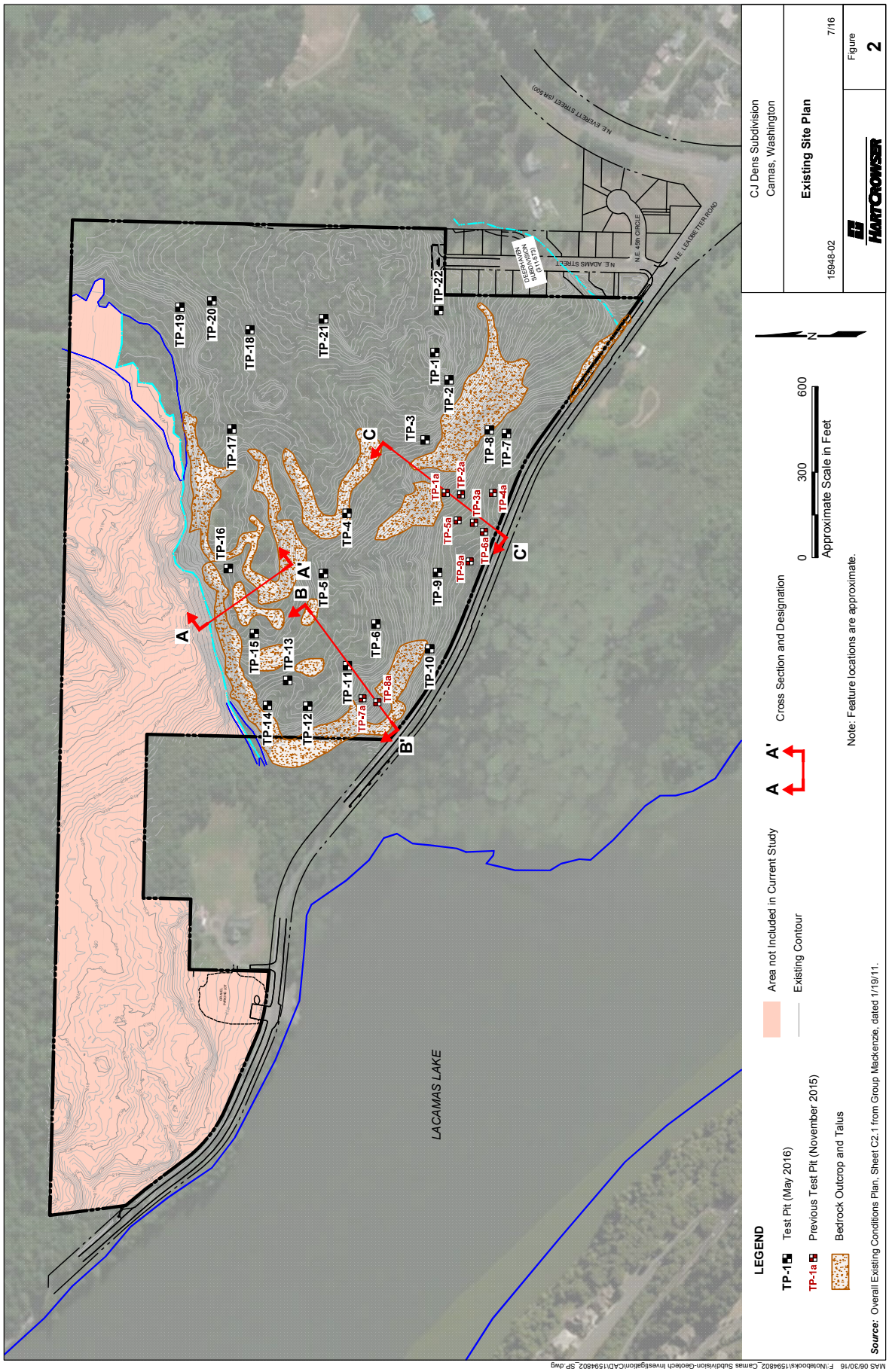
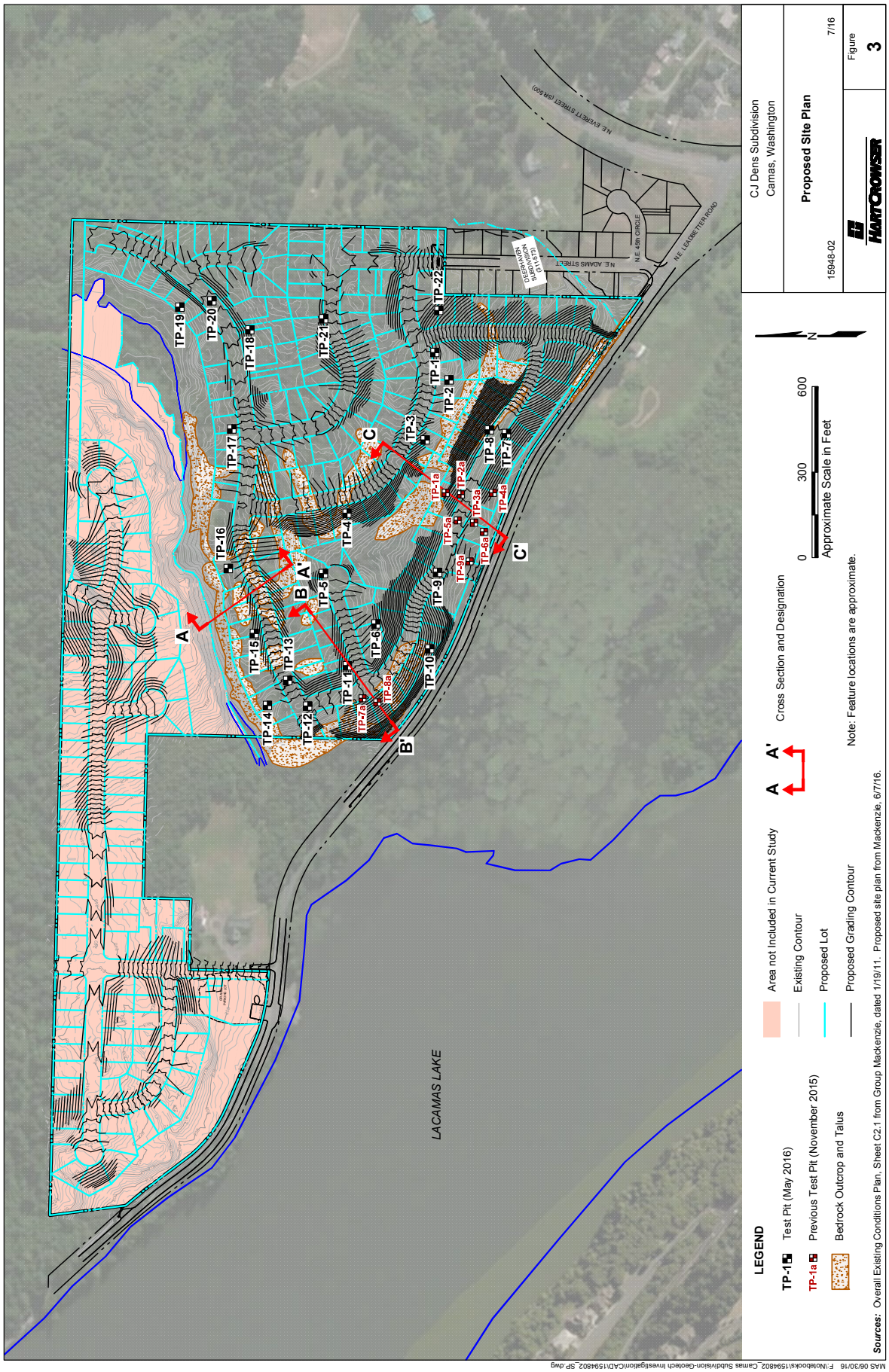
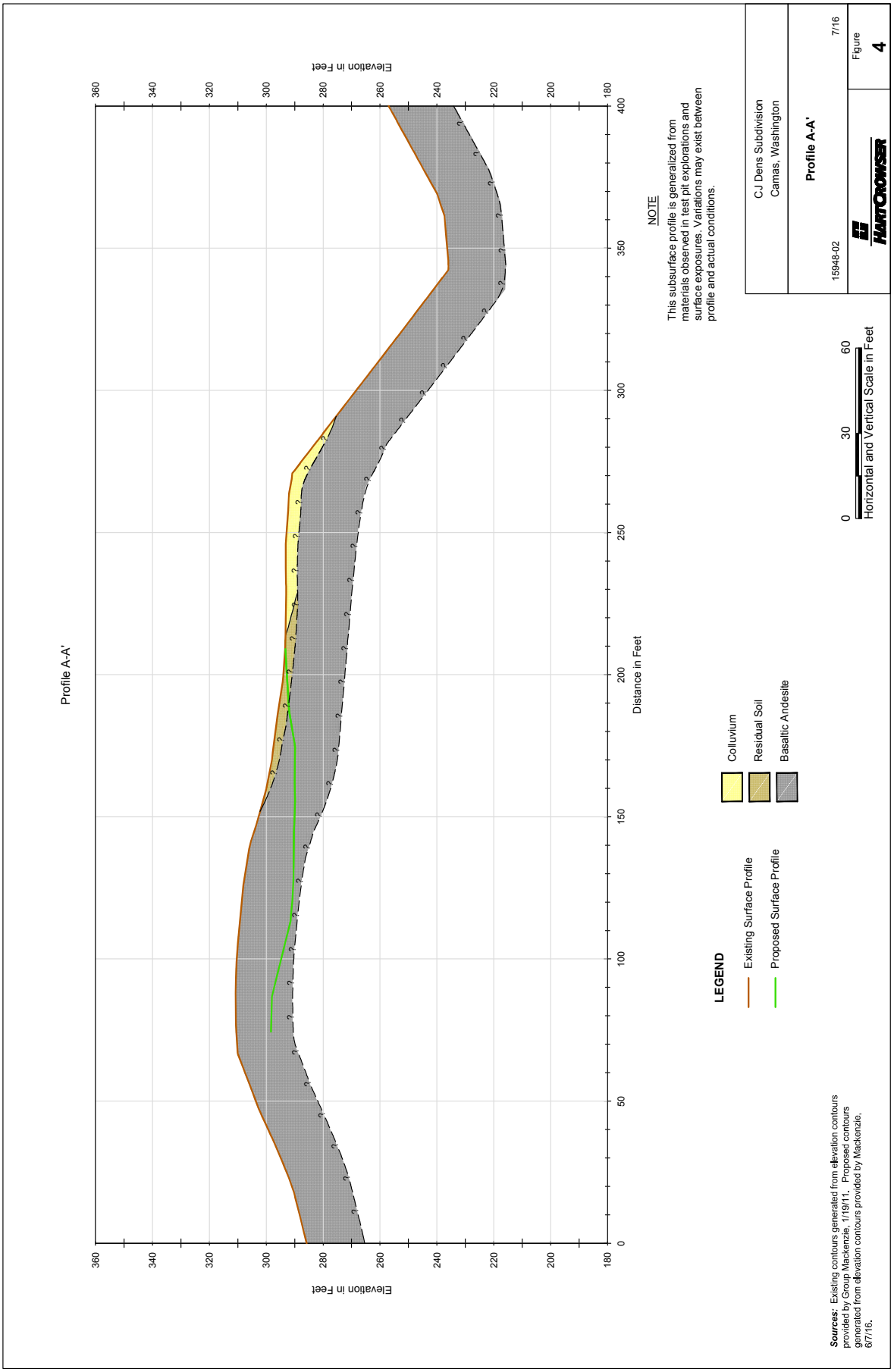
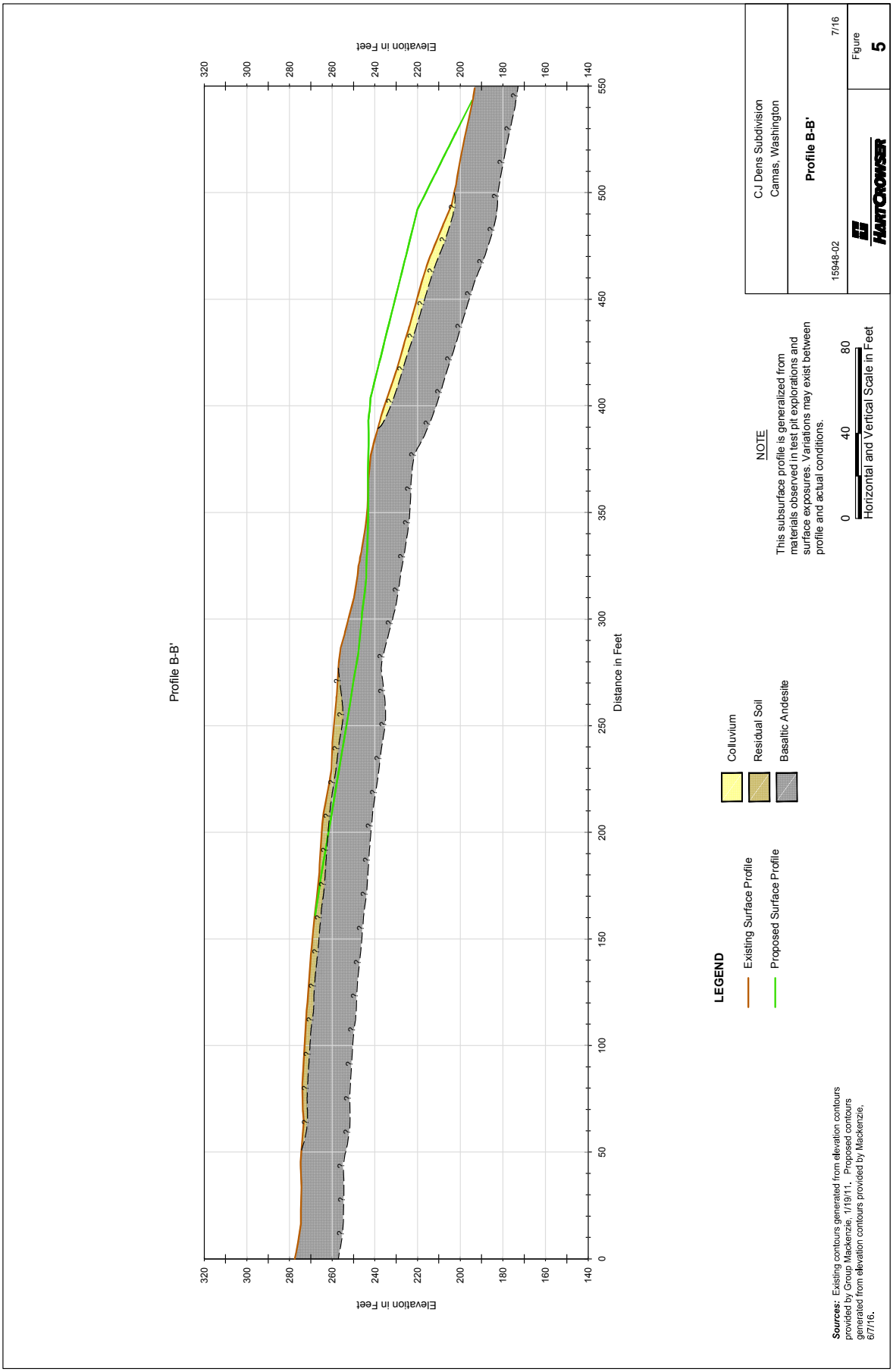
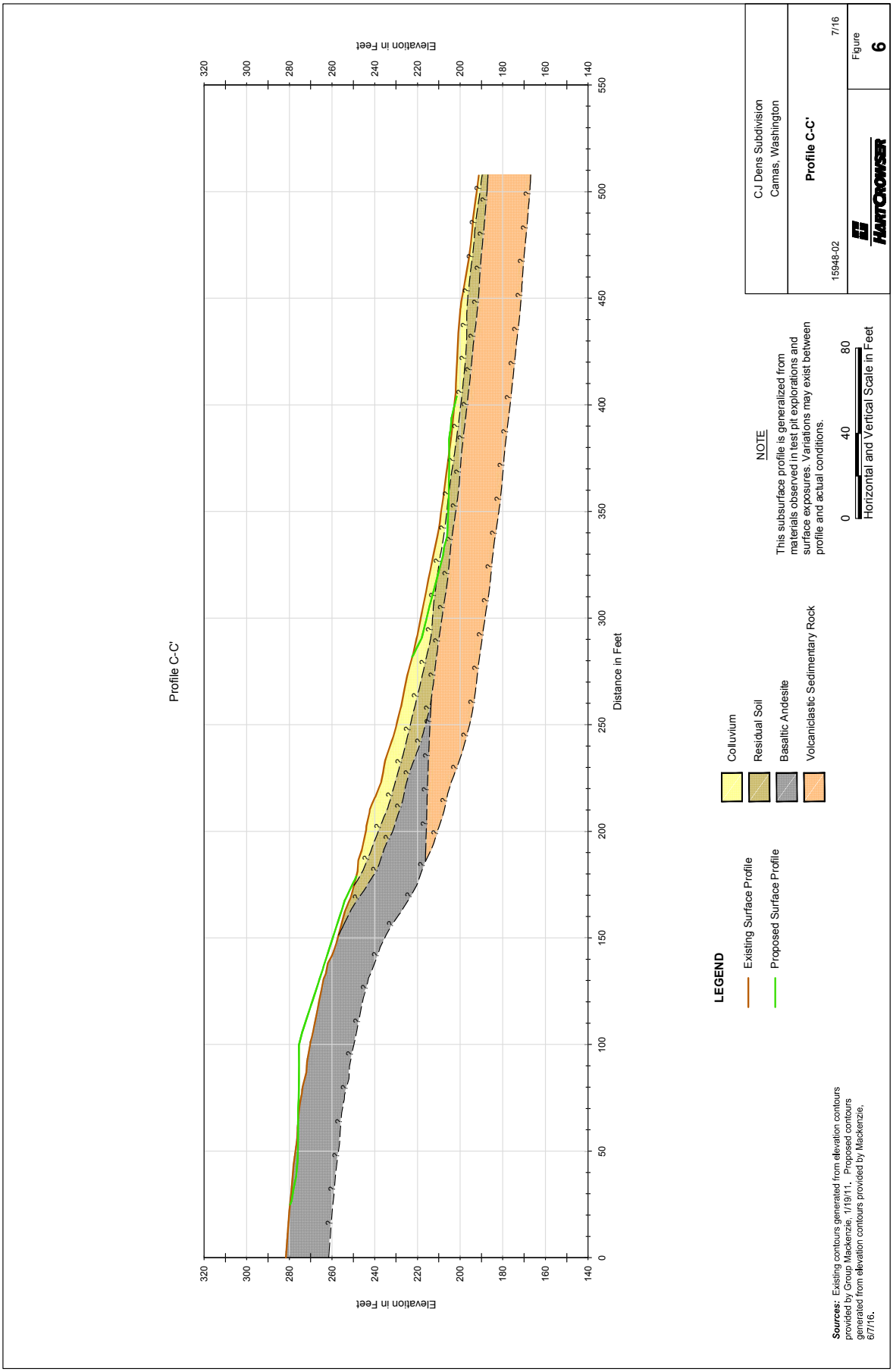
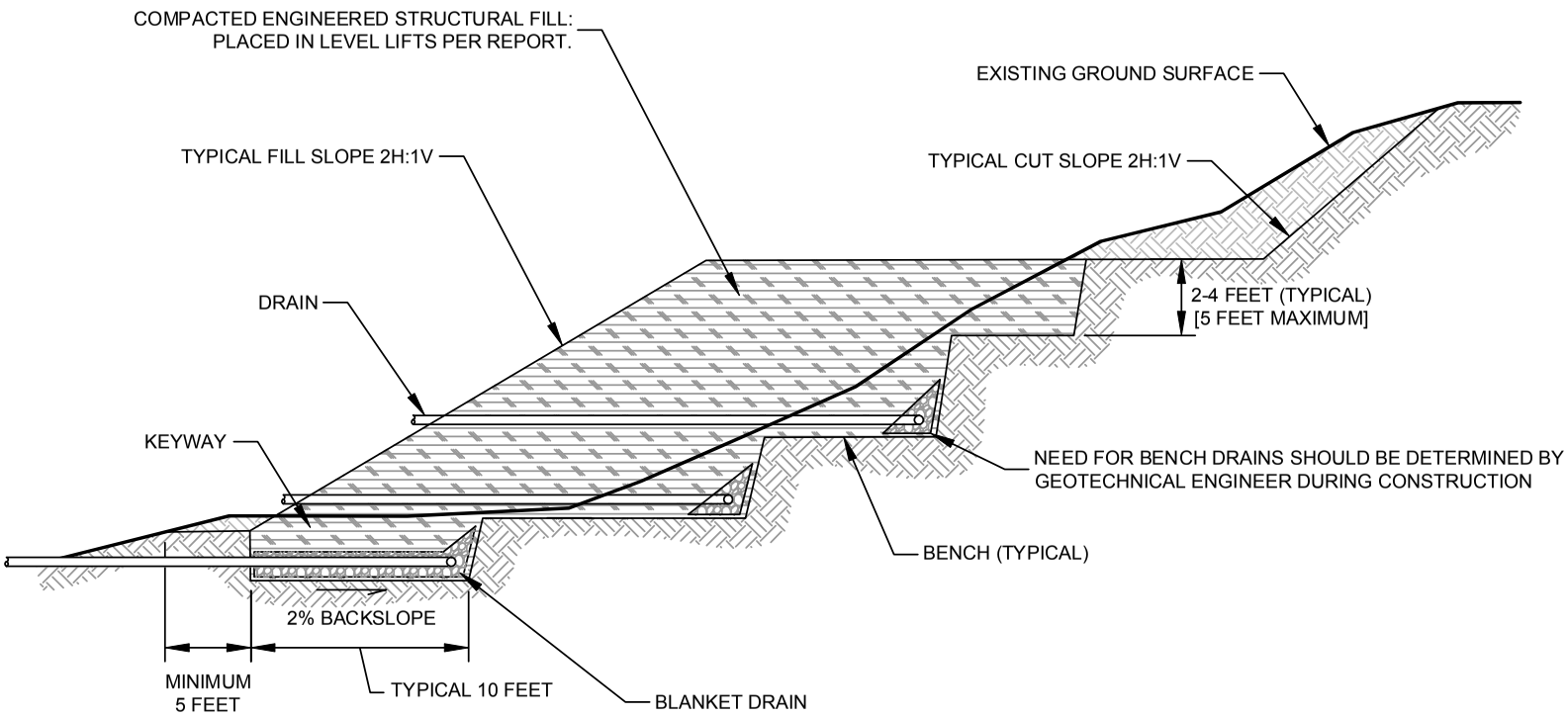

CJ Dens Subdivision
Camas, Washington
Existing Site Plan
15948-02
7/16
Figure
2
LEGEND
TP-1 Test Pit (May 2016)
TP-1a Previous Test Pit (November 2015)
Bedrock Outcrop and Talus
Area not Included in Current Study
Existing Contour
Cross Section and Designation
A A'
0 300 600
Approximate Scale in Feet
N
Note: Feature locations are approximate.
Source: Overall Existing Conditions Plan, Sheet C2.1 from Group Mackenzie, dated 1/19/11.
LACAMAS LAKE
N.E. ADAMS STREET
N.E. 4th CIRCLE
N.E. LEADBETTER ROAD
N.E. EVERETT STREET (SR-500)
MAS 06/30/16 F:\Notebooks\15948O2_Camas Subdivision-Geotech Investigation\CAD\15948O2_SP.dwg


LEGEND
TP-1 Test Pit (May 2016)
TP-1a Previous Test Pit (November 2015)
Bedrock Outcrop and Talus
Area not Included in Current Study
Existing Contour
Proposed Lot
Proposed Grading Contour
A A'
Cross Section and Designation
0 300 600
Approximate Scale in Feet
N
Note: Feature locations are approximate.
Sources: Overall Existing Conditions Plan. Sheet C2.1 from Group Mackenzie, dated 1/19/11. Proposed site plan from Mackenzie, 6/7/16.
LACAMAS LAKE
N.E. ADAMS STREET
N.E. 4th CIRCLE
N.E. LEADBETTER ROAD
N.E. EVERETT STREET (SR-500)
CJ Dens Subdivision
Camas, Washington
Proposed Site Plan
15948-02
7/16
Figure
3
F:\Notebooks\15948O2_Camas Subdivision-Geotech Investigation\CAD\15948O2_SP.dwg
MAS 06/30/16


Profile A-A'
Elevation in Feet
Distance in Feet
LEGEND
Existing Surface Profile
Proposed Surface Profile
Colluvium
Residual Soil
Basaltic Andesite
NOTE
This subsurface profile is generalized from materials observed in test pit explorations and surface exposures. Variations may exist between profile and actual conditions.
Horizontal and Vertical Scale in Feet
CJ Dens Subdivision
Camas, Washington
Profile A-A'
15948-02
7/16
Figure 4
Sources: Existing contours generated from elevation contours provided by Group Mackenzie, 1/19/11. Proposed contours generated from elevation contours provided by Mackenzie, 6/7/16.
File: F:\Notebooks\15948O2_Camas Subdivision-Geotech Investigation\CAD\15948O2_Profiles.dwg LayoutA Date: 06-30-2016 Author: melissaschweitzer

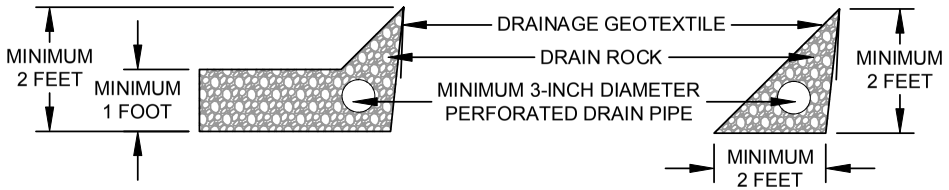

Profile B-B'
Elevation in Feet
320
300
280
260
240
220
200
180
160
140
0
50
100
150
200
250
300
350
400
450
500
550
Distance in Feet
LEGEND
Existing Surface Profile
Proposed Surface Profile
Colluvium
Residual Soil
Basaltic Andesite
NOTE
This subsurface profile is generalized from materials observed in test pit explorations and surface exposures. Variations may exist between profile and actual conditions.
0
40
80
Horizontal and Vertical Scale in Feet
Sources: Existing contours generated from elevation contours provided by Group Mackenzie, 1/19/11. Proposed contours generated from elevation contours provided by Mackenzie, 6/7/16.
CJ Dens Subdivision
Camas, Washington
Profile B-B'
15948-02
7/16
HartCrowser
Figure
5
File: F:\Notebooks\15948O2_Camas Subdivision-Geotech Investigation\CAD\15948O2_Profiles.dwg Layout:B Date: 06-30-2016 Author: melissaschweitzer


Profile C-C'
Elevation in Feet
Distance in Feet
320
300
280
260
240
220
200
180
160
140
0
50
100
150
200
250
300
350
400
450
500
550
LEGEND
Existing Surface Profile
Proposed Surface Profile
Colluvium
Residual Soil
Basaltic Andesite
Volcaniclastic Sedimentary Rock
NOTE
This subsurface profile is generalized from materials observed in test pit explorations and surface exposures. Variations may exist between profile and actual conditions.
0
40
80
Horizontal and Vertical Scale in Feet
Sources: Existing contours generated from elevation contours provided by Group Mackenzie, 1/19/11. Proposed contours generated from elevation contours provided by Mackenzie, 6/7/16.
CJ Dens Subdivision
Camas, Washington
Profile C-C'
15948-02
7/16
Figure
6
HartCrowser
File: F:\Notebooks\15948O2_Camas Subdivision-Geotech Investigation\CAD\15948O2_Profiles.dwg Layout:C Date: 06-30-2016 Author: melissaschweitzer



NOTES:
1. DRAWING IS NOT TO SCALE.
2. SLOPES AND PROFILES SHOWN ARE SCHEMATIC.
3. DRAWING REPRESENTS TYPICAL FILL AND CUT SLOPE SECTION, AND MAY NOT BE SITE-SPECIFIC.

TYPICAL DRAIN SECTION DETAIL



CJ Dens Subdivision
Camas, Washington

Typical Cut and Fill Slope Cross-Section

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Figure
7

APPENDIX A
Field Explorations

APPENDIX A

Field Explorations

This appendix documents the processes Hart Crowser used to determine the nature (and quality) of the soil and groundwater underlying the project site addressed by this report. The discussion includes information on the following subjects:

- Explorations and Their Locations,
- Test Pits, and
- Sampling Procedures.

Explorations and Their Locations

A member of our engineering staff observed subsurface explorations for this project that included test pits TP-1a through TP-9a completed November 23, 2015 and TP-1 through TP-22, completed May 27, 2016. The exploration logs in this appendix show our interpretation of the explorations, sampling, and testing data. The logs indicate the depths where the soils change. Note that soil changes may be gradual. In the field, we classified the samples taken from the explorations according to the methods presented on the *Key to Exploration Logs*. This key also provides a legend explaining the symbols and abbreviations used in the logs.

Figures 2 and 3 of the report show the locations of explorations. Exploration locations were estimated using GPS coordinate data.

Test Pits

Nine test pits, TP-1a through TP-9a, were excavated by a medium-sized, steel-track excavator subcontracted by CJ Dens Lacamas I, LLC. An additional 22 test pits, TP-1 through TP-22, were excavated with a Komatsu PC-200, steel-track excavator. The test pits were continuously observed by a geotechnical staff member from Hart Crowser and detailed field logs of the test pits were prepared. The logs are presented at the end of this appendix.

Sampling Procedures

Representative “grab” samples of the soil observed in the test pit explorations were obtained from the test pit walls by hand and/or the test pit base using the excavator bucket. All soil samples were placed into watertight bags and delivered to Hart Crowser's laboratory for further testing.

KEY TO EXPLORATION LOGS

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SOIL CLASSIFICATION CHART

MATERIAL TYPES	MAJOR DIVISIONS		GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	GW	WELL-GRADED GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES, >12% FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	SW	WELL-GRADED SAND
			SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	CL	LEAN CLAY
			ML	SILT
		ORGANIC	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	CH	FAT CLAY
			MH	ELASTIC SILT
		ORGANIC	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS			PT	PEAT

Note: Multiple symbols are used to indicate borderline or dual classifications

OTHER MATERIAL SYMBOLS

- Concrete
- Asphalt
- Topsoil

MOISTURE MODIFIERS

- Dry - Absence of moisture, dusty, dry to the touch
- Moist - Damp, but no visible water
- Wet - Visible free water or saturated, usually soil is obtained from below the water table

SEEPAGE MODIFIERS

- None -
- Slow - < 1 gpm
- Moderate - 1-3 gpm
- Heavy - > 3 gpm

CAVING MODIFIERS

- None -
- Minor - isolated
- Moderate - frequent
- Severe - general

MINOR CONSTITUENTS

- Trace - < 5% (silt/clay)
- Occasional - < 15% (sand/gravel)
- With - 5-15% (silt/clay) in sand or gravel
  15-30% (sand/gravel) in silt or clay

SAMPLE TYPES

- Dames & Moore
- Standard Penetration Test (SPT)
- Shelby Tube
- Bulk or Grab

LABORATORY/ FIELD TESTS

- ATT - Atterberg Limits
- CP - Laboratory Compaction Test
- CA - Chemical Analysis (Corrosivity)
- CN - Consolidation
- DD - Dry Density
- DS - Direct Shear
- HA - Hydrometer Analysis
- OC - Organic Content
- PP - Pocket Penetrometer (TSF)
- P200 - Percent Passing No. 200 Sieve
- SA - Sieve Analysis
- SW - Swell Test
- TV - Torvane Shear
- UC - Unconfined Compression

GROUNDWATER SYMBOLS

- Water Level (at time of drilling)
- Water Level (at end of drilling)
- Water Level (after drilling)

STRATIGRAPHIC CONTACT

- Distinct contact between soil strata or geologic units
- Gradual or approximate change between soil strata or geologic units

Notes:

Blowcount (N) is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted) per ASTM D-1586. See exploration log for hammer weight and drop.

When the Dames & Moore (D&M) sampler was driven with a 140-pound hammer (denoted on logs as D+M 140), the field blow counts (N-value) shown on the logs have been reduced by 50% to approximate SPT N-values.

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

Refer to the report text and exploration logs for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the exploration locations at the time the explorations were made. The logs are not warranted to be representative of the subsurface conditoins at other locations or times.

KEY TO EXPLORATION LOGS - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:48 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Figure A-1

Test Pit Log TP-1a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
ML		Organic Topsoil	0				
ML		(Soft), moist, brown to dark brown, sandy SILT, roots. (Colluvium/Disturbed Soil)		S-1			
MH		(Soft), moist, brown, ELASTIC SILT, some roots, disturbed texture.	5	S-2			
SM		(Loose), moist, brown, silty SAND with occasional gravel-sized clasts of subangular to subrounded volcaniclastic fragments, relict rock texture. (Residual Soil)	10				
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)		S-3			
		Bottom of Test Pit at 15.0 Feet. Started 11/23/15. Completed 11/23/15. Completed due to refusal.	15				

Test Pit Log TP-2a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
ML		Organic Topsoil, roots.	0				
SM		(Medium dense), moist, gray to brown, silty SAND with weathered gravel-sized subangular volcaniclastic fragments. (Colluvium/Disturbed Soil)		S-1			
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)	5	S-2			
		Bottom of Test Pit at 6.5 Feet. Started 11/23/15. Completed 11/23/15.	10				
			15				

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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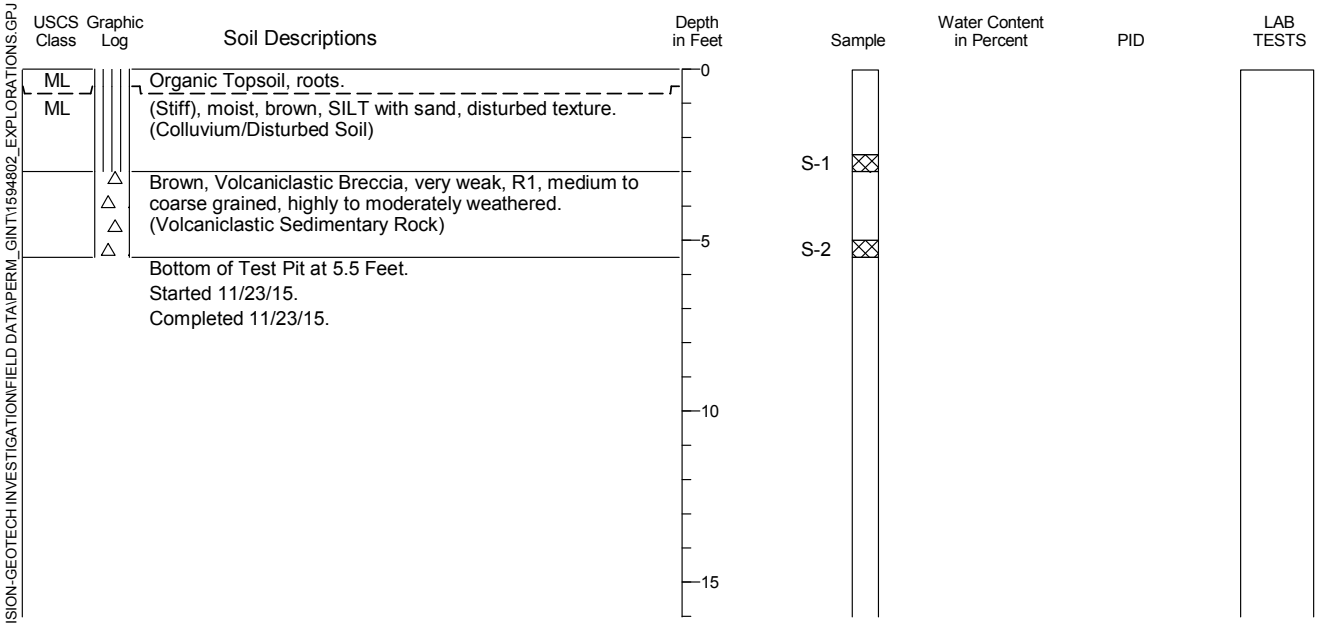
Figure A-3

Test Pit Log TP-3a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

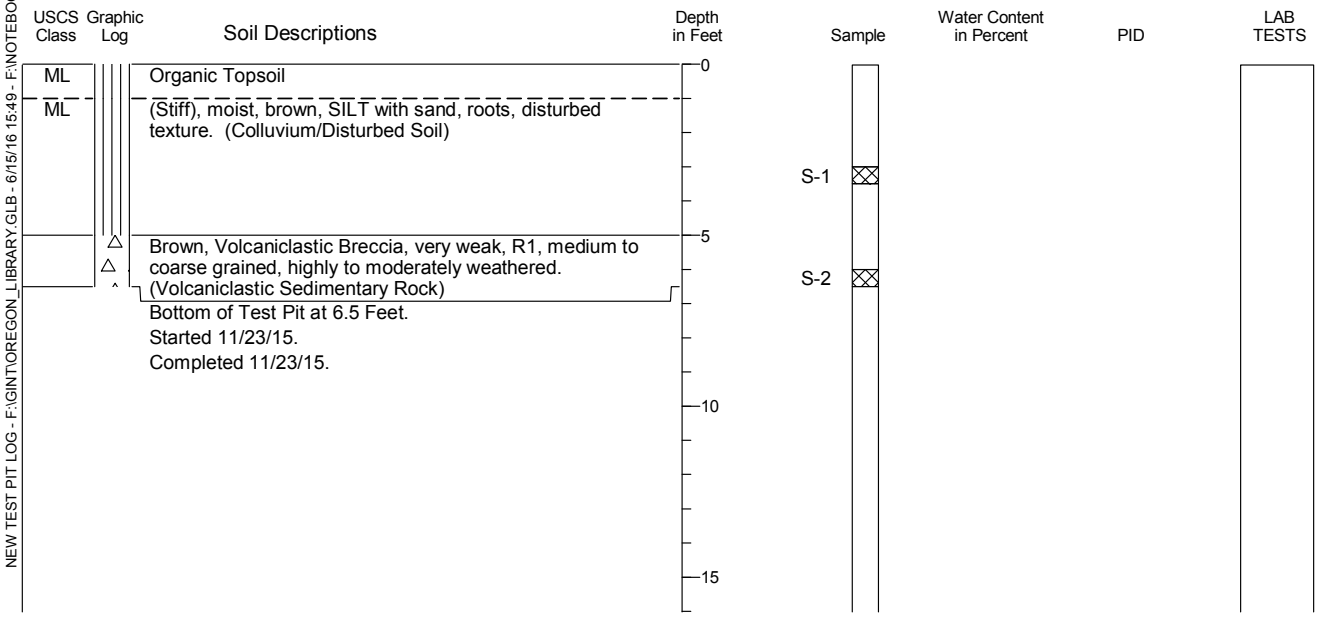
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-4a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-4

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Test Pit Log TP-5a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
ML		Organic Topsoil, roots, dark brown.	0				
SM		(Loose), moist, brown to dark brown, silty SAND, roots, weathered residual soil fragments in fine-grained matrix. (Colluvium/Disturbed Soil)					
CL		(Medium stiff), moist, brown, LEAN CLAY with sand.		S-1			
			5				
SM		(Loose), moist, brown, silty SAND with hard gravel-sized clasts of subangular to subrounded volcaniclastic fragments, relict rock texture. (Residual Soil)		S-2			
			10				
				S-3			
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)		S-4			
		Bottom of Test Pit at 13.5 Feet.	15				
		Started 11/23/15.					
		Completed 11/23/15.					
		Completed due to refusal.					

Test Pit Log TP-6a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM/ML		(Loose to medium stiff), dark brown, moist, silty SAND to sandy SILT, roots.	0				
ML		(Medium stiff), moist, brown, SILT with sand, small roots, disturbed texture. (Colluvium/Disturbed Soil)					
		Abundant roots and rootlets from 3.0 to 4.0 feet.		S-1			
SM		(Medium dense to dense), moist, light brown to brown, silty SAND, relict rock texture. (Residual Soil)	5				
				S-2			
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)		S-3			
		Bottom of Test Pit at 9.5 Feet.	10				
		Started 11/23/15.					
		Completed 11/23/15.					
		Completed due to refusal.	15				

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-5

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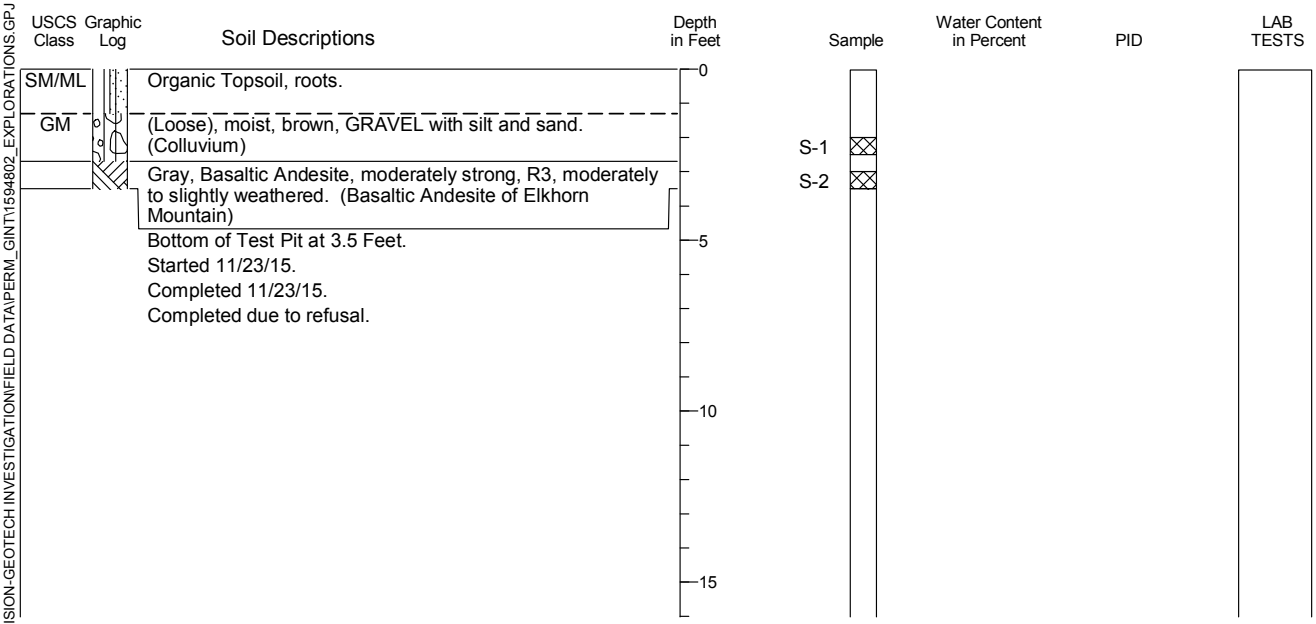
Test Pit Log TP-7a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

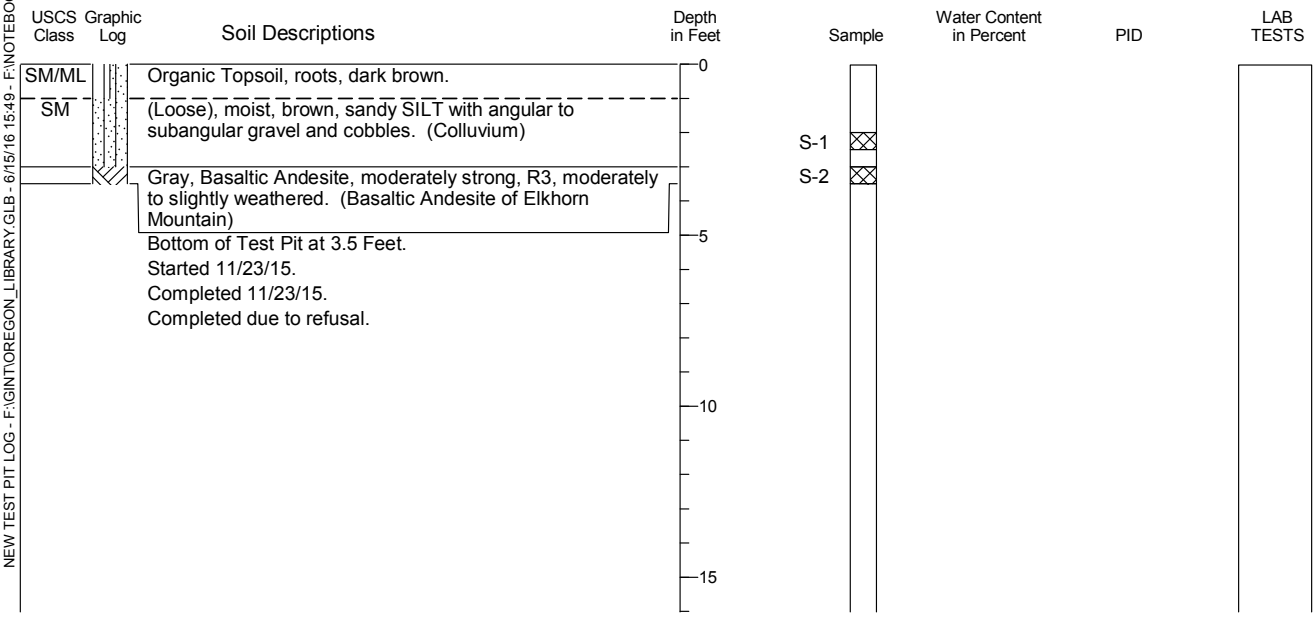
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-8a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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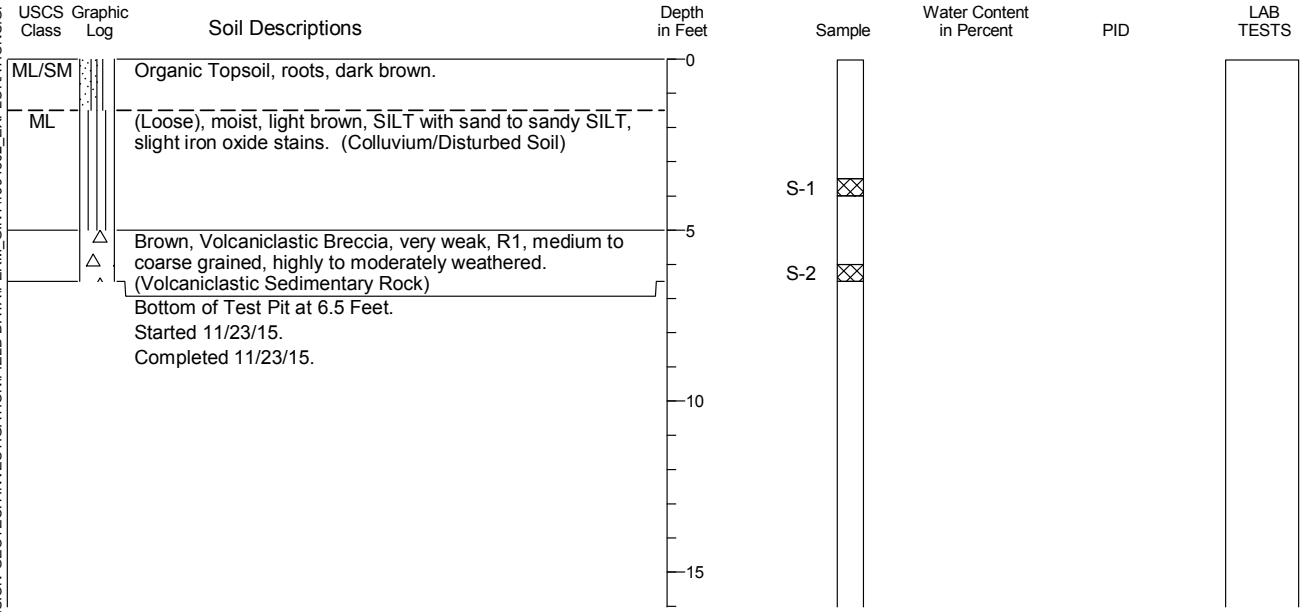
Figure A-6

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-9a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



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1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-7

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. ASTM D 2488 visual-manual identification methods were used as a guide. Major divisions are not necessarily an indicator of soil behavior, which is a function of fines content activity and loading rate.

Relative Density/Consistency

Soil density/consistency in borings is related primarily to the standard penetration resistance (N). Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

SAND or GRAVEL Relative Density	N (Blows/Foot)	SILT or CLAY Consistency	N (Blows/Foot)
Very loose	0 to 4	Very soft	0 to 2
Loose	4 to 10	Soft	2 to 4
Medium dense	10 to 30	Medium stiff	4 to 8
Dense	30 to 50	Stiff	8 to 15
Very dense	>50	Very stiff	15 to 30
		Hard	>30

Moisture

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

Soil Classification Chart

Major Divisions			Graph	USCS	Typical Descriptions
Coarse Grained Soils: More than 50% of Material Retained on No. 200 Sieve	Gravel and Gravelly Soils: More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravels (<5% fines)		GW	Well-Graded Gravel; Well-Graded Gravel with Sand
				GP	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Gravels (10% fines)		GW-GM	Well-Graded Gravel with Silt; Well-Graded Gravel with Silt and Sand
				GW-GC	Well-Graded Gravel with Clay; Well-Graded Gravel with Clay and Sand
				GP-GM	Poorly Graded Gravel with Silt; Poorly Graded Gravel with Silt and Sand
				GP-GC	Poorly Graded Gravel with Clay; Poorly Graded Gravel with Clay and Sand
		Gravels with Fines (>12% fines)		GM	Silty Gravel; Silty Gravel with Sand
				GC	Clayey Gravel; Clayey Gravel with Sand
	Sand and Sandy Soils: More than 50% of Coarse Fraction Passing No. 4 Sieve	Sands with few Fines (<5% fines)		SW	Well-Graded Sand; Well-Graded Sand with Gravel
				SP	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Sands (10% fines)		SW-SM	Well-Graded Sand with Silt Well-Graded Sand with Silt and Gravel
				SW-SC	Well-Graded Sand with Clay; Well-Graded Sand with Clay and Gravel
				SP-SM	Poorly Graded Sand with Silt; Poorly Graded Sand with Silt and Gravel
				SP-SC	Poorly Graded Sand with Clay; Poorly Graded Sand with Clay and Gravel
		Sands with Fines (>12% fines)		SM	Silty Sand; Silty Sand with Gravel
				SC	Clayey Sand; Clayey Sand with Gravel
Fine Grained Soils: More than 50% of Material Passing No. 200 Sieve	Silts			ML	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
				MH	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
	Clays			CL	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
				CH	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
	Organics			OL/OH	Organic Soil; Organic Soil with Sand or Gravel; Sandy or Gravelly Organic Soil
Highly Organic				PT	Peat - Decomposing Vegetation - Fibrous to Amorphous Texture

Minor Constituents

	Estimated Percentage
Trace	<5
Few	5 - 10
Little	15 - 25
Some	30 - 45

Soil Test Symbols

%F	Percent Passing No. 200 Sieve
AL	Atterberg Limits
	Water Content in Percent
	Liquid Limit
	Natural
	Plastic Limit
CA	Chemical Analysis
CAUC	Consolidated Anisotropic Undrained Compression
CAUE	Consolidated Anisotropic Undrained Extension
CBR	California Bearing Ratio
CIDC	Consolidated Drained Isotropic Triaxial Compression
CIUC	Consolidated Isotropic Undrained Compression
CK0DC	Consolidated Drained k0 Triaxial Compression
CK0DSS	Consolidated k0 Undrained Direct Simple Shear
CK0UC	Consolidated k0 Undrained Compression
CK0UE	Consolidated k0 Undrained Extension
CRSCN	Constant Rate of Strain Consolidation
DSS	Direct Simple Shear
DT	In Situ Density
GS	Grain Size Classification
HYD	Hydrometer
ILCN	Incremental Load Consolidation
K0CN	k0 Consolidation
kc	Constant Head Permeability
kf	Falling Head Permeability
MD	Moisture Density Relationship
OC	Organic Content
OT	Tests by Others
P	Pressuremeter
PID	Photoionization Detector Reading
PP	Pocket Penetrometer
SG	Specific Gravity
TRS	Torsional Ring Shear
TV	Torvane
UC	Unconfined Compression
UUC	Unconsolidated Undrained Triaxial Compression
VS	Vane Shear
WC	Water Content

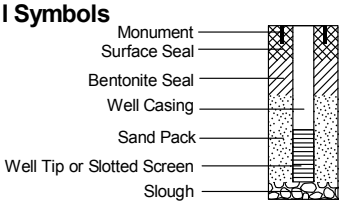
Groundwater Indicators

- Groundwater Level on Date or At Time of Drilling (ATD)
- Groundwater Seepage (Test Pits)

Sample Symbols

- 1.5" I.D. Split Spoon
- 3.0" I.D. Split Spoon
- Modified California Sampler
- Core Run
- Sonic Core
- Thin-walled Sampler
- Grab
- Cuttings

Well Symbols



KEY TO EXPLORATION LOGS (SOIL) - F:\GINT\HC_LIBRARY.GLB - 6/10/16 11:35 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-TPS.GPJ

HARTCROWSER

Project: Camas Subdivision
Location: Camas, Washington
Project No.: 15948-02

Key to Exploration Logs

Figure A-1
Sheet 1 of 1

Weathered State of Rock

Term	Description	Grade
Fresh	No visible signs of rock material weathering; perhaps slight discoloration in major discontinuity surfaces.	I
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering, and may be somwhat weaker externally than in its fresh condition	II
Moderately Weathered	Less than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as a continuous framework or as corestones.	III
Highly Weathered	More than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as discontinuous framework or as corestone.	IV
Completely Weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.	V
Residual Soil	All rock material is converted to soil. The mass structure and material fabric is destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI

Relative Rock Strength

Grade	Description	Field Identification	Uniaxial Compressive Strength
R0	Extremely Weak	Indented by thumbnail.	0.04 to 0.15 ksi
R1	Very Weak	Specimen crumbles under sharp blow with point of geological hammer, and can be cut with a pocket knife.	0.15 to 3.6 ksi
R2	Moderately Weak	Shallow cuts or scrapes can be made in a specimen with a pocket knife. Geological hammer point indents deeply with firm blow.	3.6 to 7.3 ksi
R3	Moderately Strong	Specimen cannot be scraped or cut with a pocket knife, shallow indentation can be made under firm blows from a hammer point.	7.3 to 15 ksi
R4	Strong	Specimen breaks with one firm blow from the hammer end of a geological hammer.	15 to 29 ksi
R5	Very Strong	Specimen requires many blows of a geological hammer to break intact sample.	Greater than 29 ksi

Discontinuities

Discontinuity Spacing		Discontinuity Condition	
Description	Spacing	Condition	Description
Very Widely Spaced	Greater than 10 feet	Excellent Condition	Very rough surfaces, no separation, hard discontinuity wall.
Widely Spaced	3 to 10 feet	Good Condition	Slightly rough surfaces, separation less than 0.05 inches, hard discontinuity wall.
Moderately Spaced	1 to 3 feet	Fair Condition	Slightly rough surface, separation greater than 0.05 inches, soft discontinuity wall.
Closely Spaced	2 to 12 inches	Poor Condition	Slickensided surfaces, or soft gouge less than 0.2 inches thick, or open discontinuities 0.05 to 0.2 inches.
Very Closely Spaced	Less than 2 inches	Very Poor Condition	Soft gouge greater than 0.2 inches, or open discontinuities greater than 0.2 inches.

Grain Size

Grain Size	Description	Criteria
Less than 0.04 inches	Fine grained	Few crystal boundaries/grains distinguishable in the field or with a hand lens.
0.04 to 0.2 inches	Medium grained	Most crystal boundaries/ grains distinguishable with the aid of a hand lens.
Greater than 0.2 inches	Coarse grained	Most crystal boundaries/ grains distinguishable with the naked eye.

Igneous Rock Textures

Texture	Grain Size
Pegmatitic	Very large; diameters greater than 0.8 in.
Phaneritic	Can be seen with the naked eye
Porphyritic	Grained of two widely different sizes
Aphanitic	Cannot be seen with the naked eye
Glassy	No grains present

Pyroclastic Rocks

Rock Name	Characteristics
Pyroclastic Breccia	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which angular pyroclasts predominate.
Agglomerate	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which rounded pyroclasts predominate.
Lapilli Tuff	Pyroclastic rock whose average pyroclast size is 0.08 to 2.5 inches.
Ash Tuff	Pyroclastic rock whose average pyroclast size is less than 0.08 inches.

Degree of Vesicularity

Designation	Percentage of Cavities (by volume) of Total Sample
Slightly Vesicular	5 to 10 Percent
Moderately Vesicular	10 to 25 Percent
Highly Vesicular	25 to 50 Percent
Scoriaceous	Greater than 50 Percent

Other Terms:

Core Recover (CR) = the ratio of core recovered to the core run length expressed as a percentage.

Rock Quality Designation (RQD) = the percentage of rock core recovered in intact pieces of 4 inches or more in length in the length of a core run. Does not include mechanical breaks caused by drilling.

Fracture Frequency (FF) = the number of natural fractures per foot in the length of core recovered.

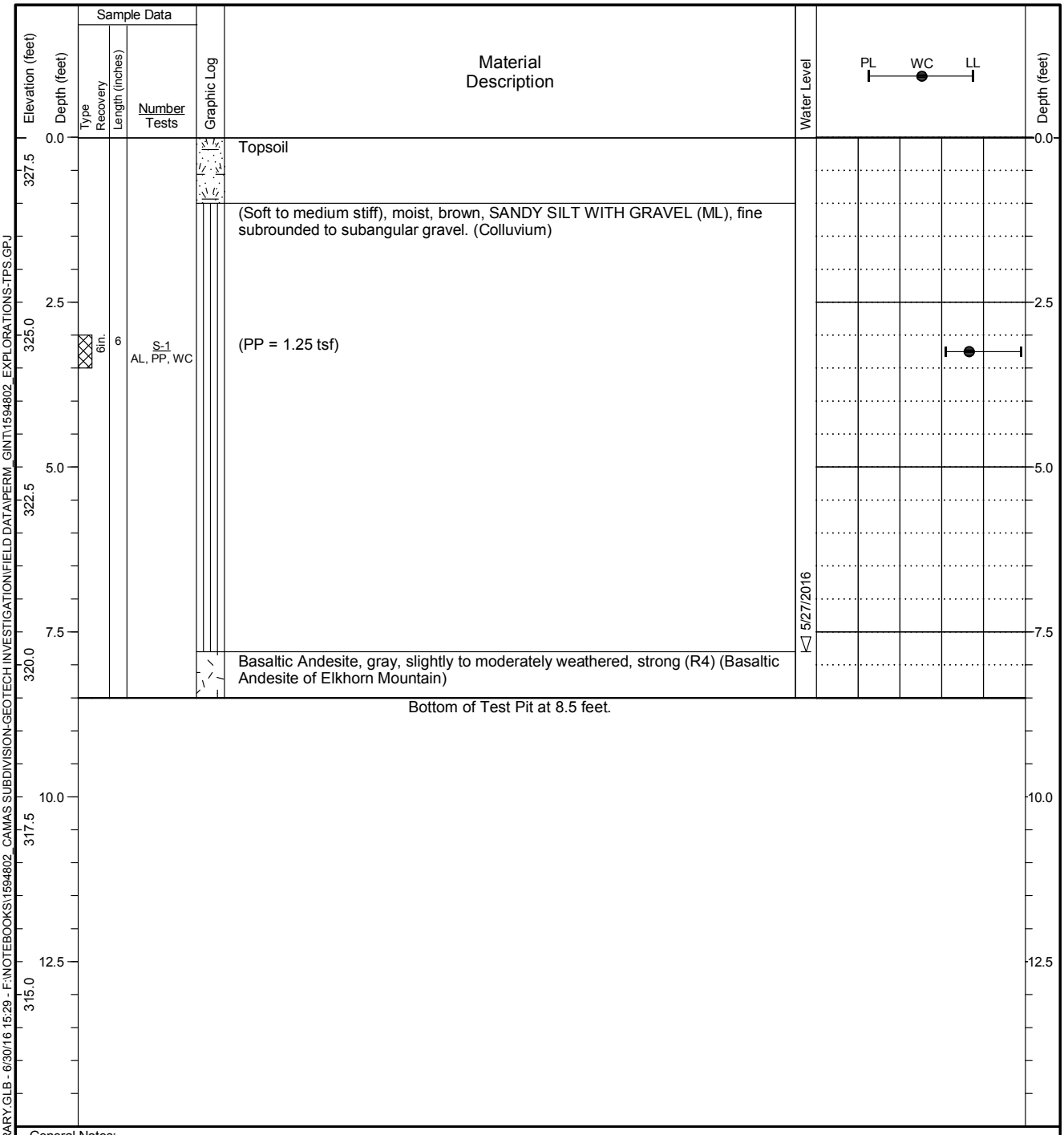
Reference:

Washington State Department of Transportation (WSDOT), 2014. *Geotechnical Design Manual*, Publication M 46-03.10, August, 2014.

KEY TO BEDROCK TERMS - WSDOT (2 OF 2) - F:\GINT\HC_LIBRARY.GLB - 6/10/16 11:36 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-TPS.GPJ

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,408.99 E: 1,151,478.00
Ground Surface Elevation: 328 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 8.5 feet Depth to Ground Water: 7.8 feet
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-1

Figure **A-3**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,359.15 E: 1,151,381.13
Ground Surface Elevation: 306 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2.8 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
305.0	0.0		(Soft), wet, brown, SANDY SILT (ML), with angular gravel. (Residual Soil)	0.0
	2.5		Basaltic Andesite, gray, slightly to moderately weathered, strong (R4) (Basaltic Andesite of Elkhorn Mountain)	2.5
			Bottom of Test Pit at 2.8 feet.	
302.5	5.0			5.0
300.0	7.5			7.5
297.5	10.0			10.0
295.0	12.5			12.5
292.5				

General Notes:
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3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-2

Figure **A-4**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,443.46 E: 1,151,168.38
Ground Surface Elevation: 280 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 3 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type Recovery	Sample Data: Length (inches)	Sample Data: Number Tests	Graphic Log	Material Description	WC	Depth (feet)
280.0	0.0					Topsoil		0.0
						Basaltic Andesite, gray, slightly to moderately weathered, strong (R4), closely spaced discontinuities, highly fractured from 0.5 to 1.0 feet (Basaltic Andesite of Elkhorn Mountain)		
277.5	2.5	6in.	6	S-1 WC			●	2.5
						Bottom of Test Pit at 3.0 feet.		
275.0	5.0							5.0
272.5	7.5							7.5
270.0	10.0							10.0
267.5	12.5							12.5

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-3

Figure **A-5**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,720.06 E: 1,150,909.13
Ground Surface Elevation: 282 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2.6 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
282.0	0.0		Topsoil	0.0
280.0	2.5		Basaltic Andesite, gray, slightly to moderately weathered, strong (R4), moderately spaced discontinuities, highly fractured from 0.5 to 1.0 feet (Basaltic Andesite of Elkhorn Mountain)	2.5
			Bottom of Test Pit at 2.6 feet.	
277.5	5.0			5.0
275.0	7.5			7.5
272.5	10.0			10.0
270.0	12.5			12.5
267.5				

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
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3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-4

Figure **A-6**
Sheet **1 of 1**

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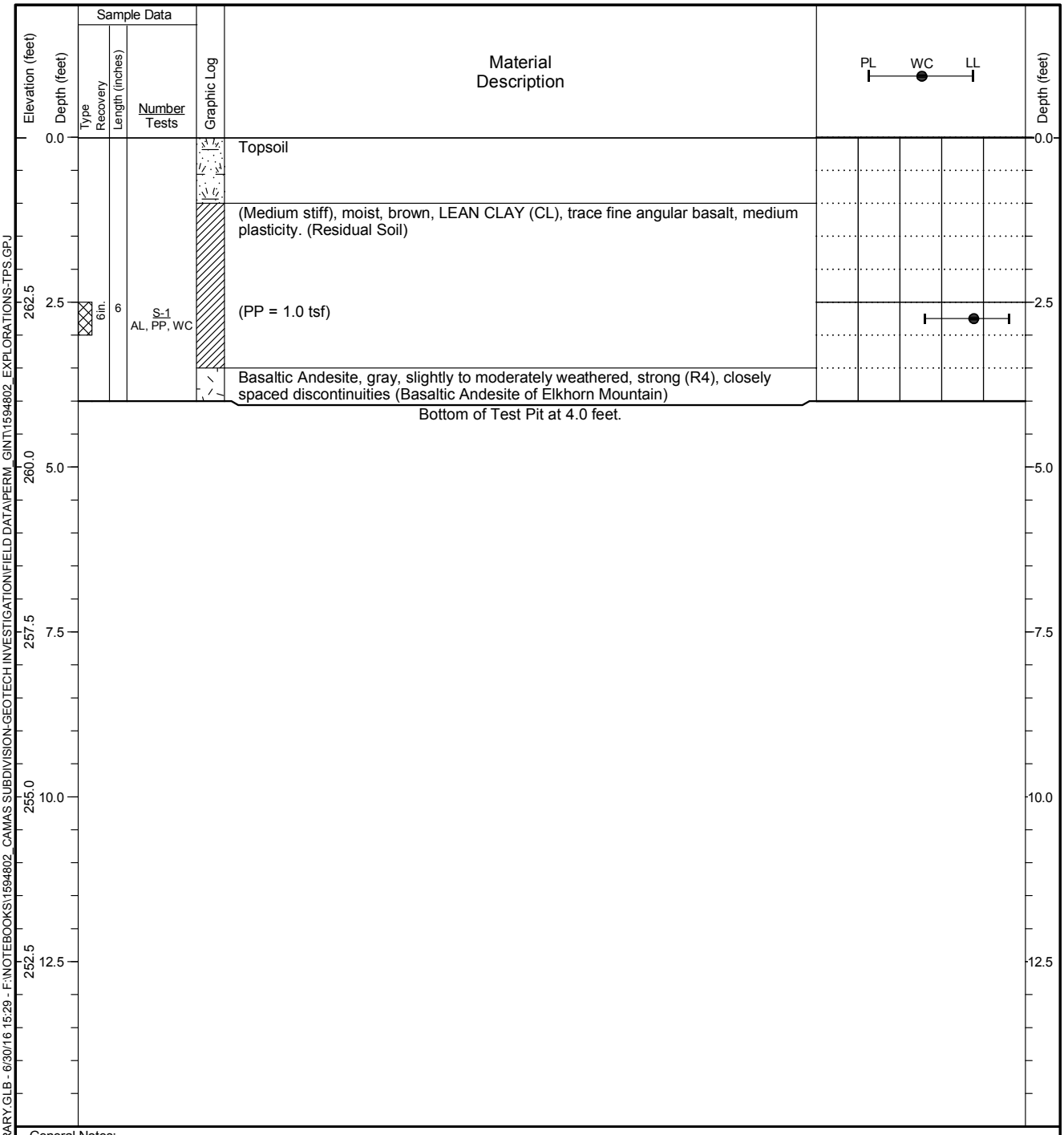
Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,803.30 E: 1,150,695.50
Ground Surface Elevation: 265 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 4 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-5

Figure **A-7**
Sheet **1 of 1**

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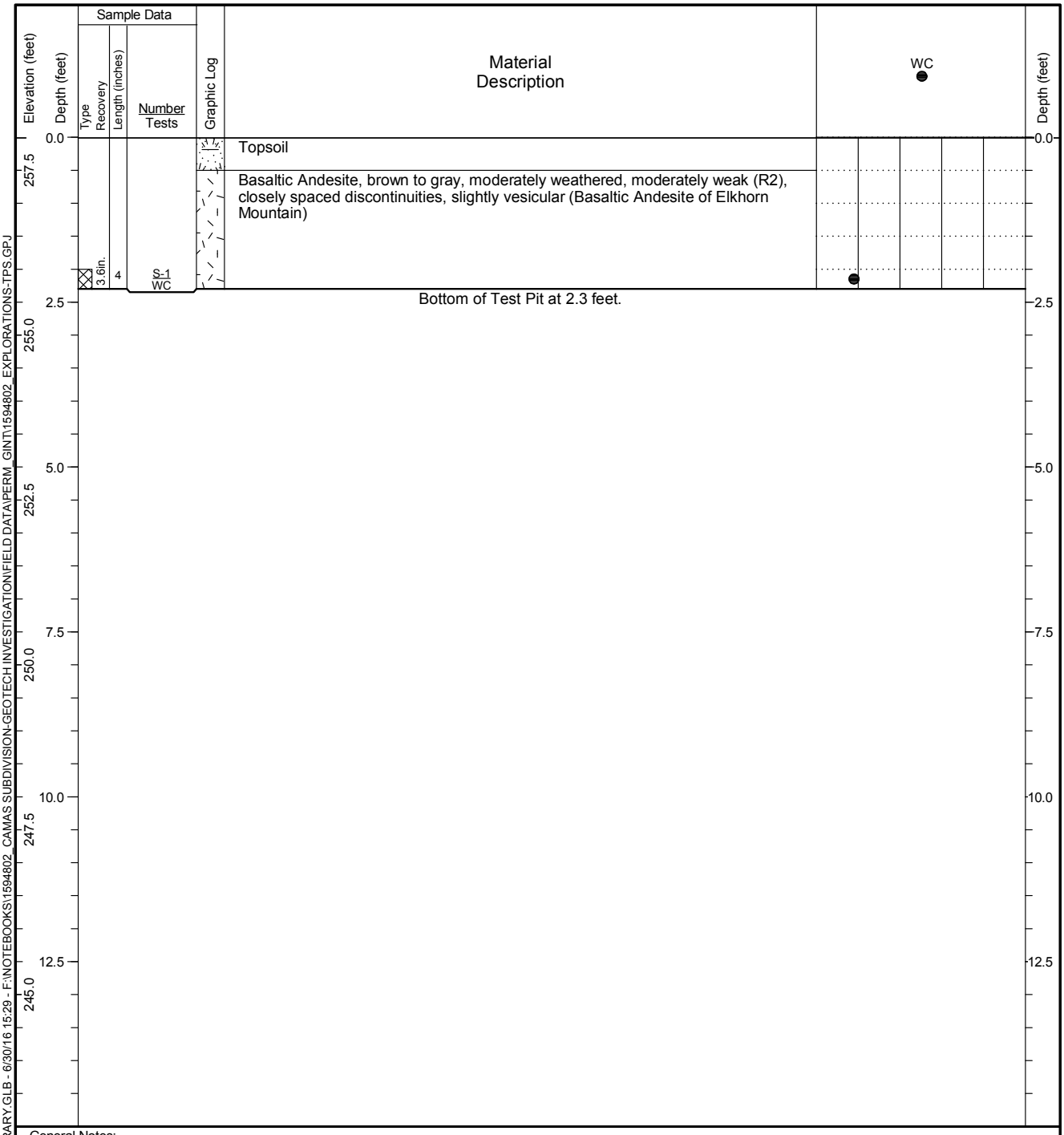
Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,617.58 E: 1,150,517.25
Ground Surface Elevation: 258 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2.3 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
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HARTCROWSER

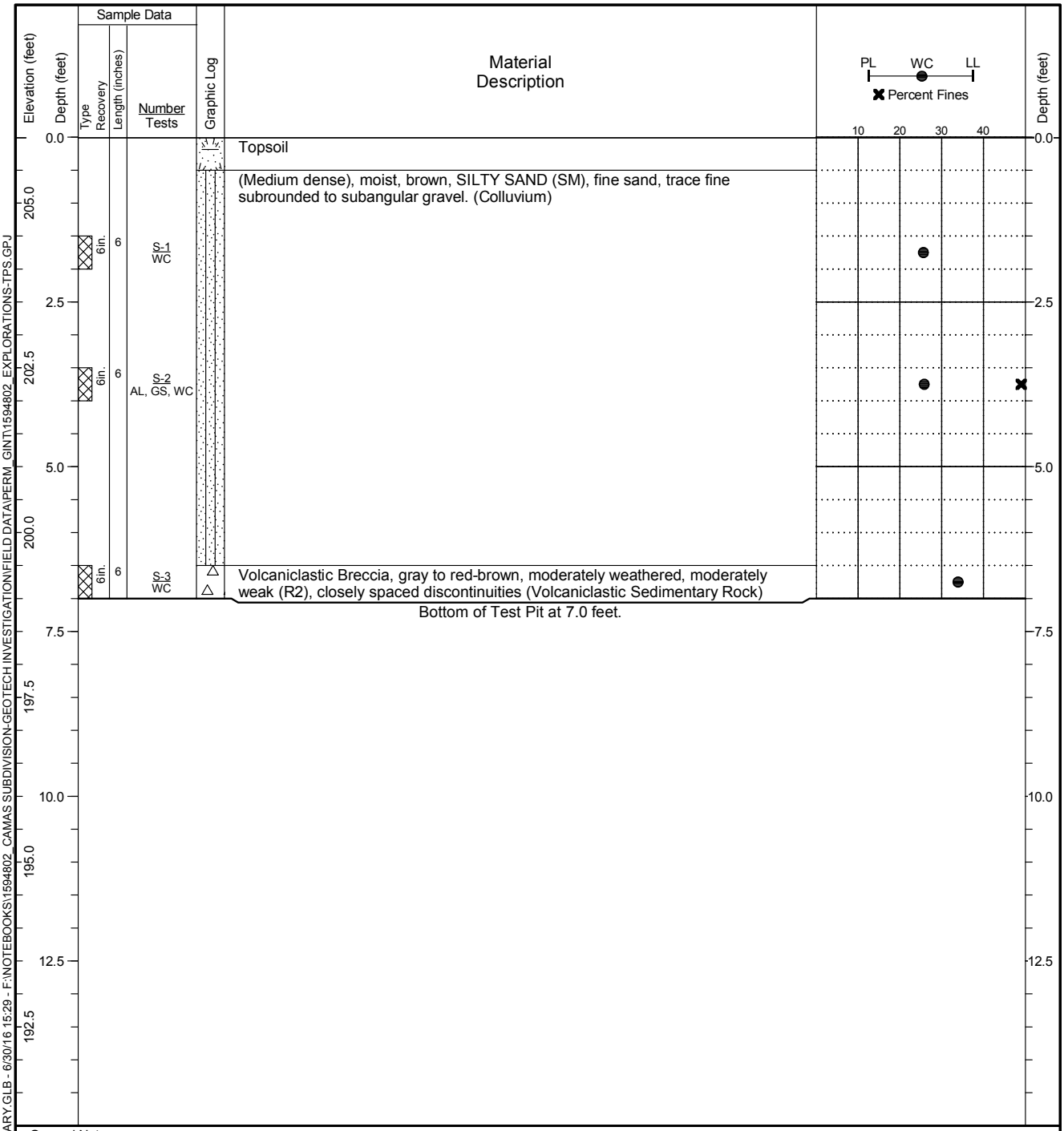
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-6

Figure **A-8**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,155.49 E: 1,151,190.88
Ground Surface Elevation: 206 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 7 feet Depth to Ground Water: Not Encountered
Comments:



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HARTCROWSER

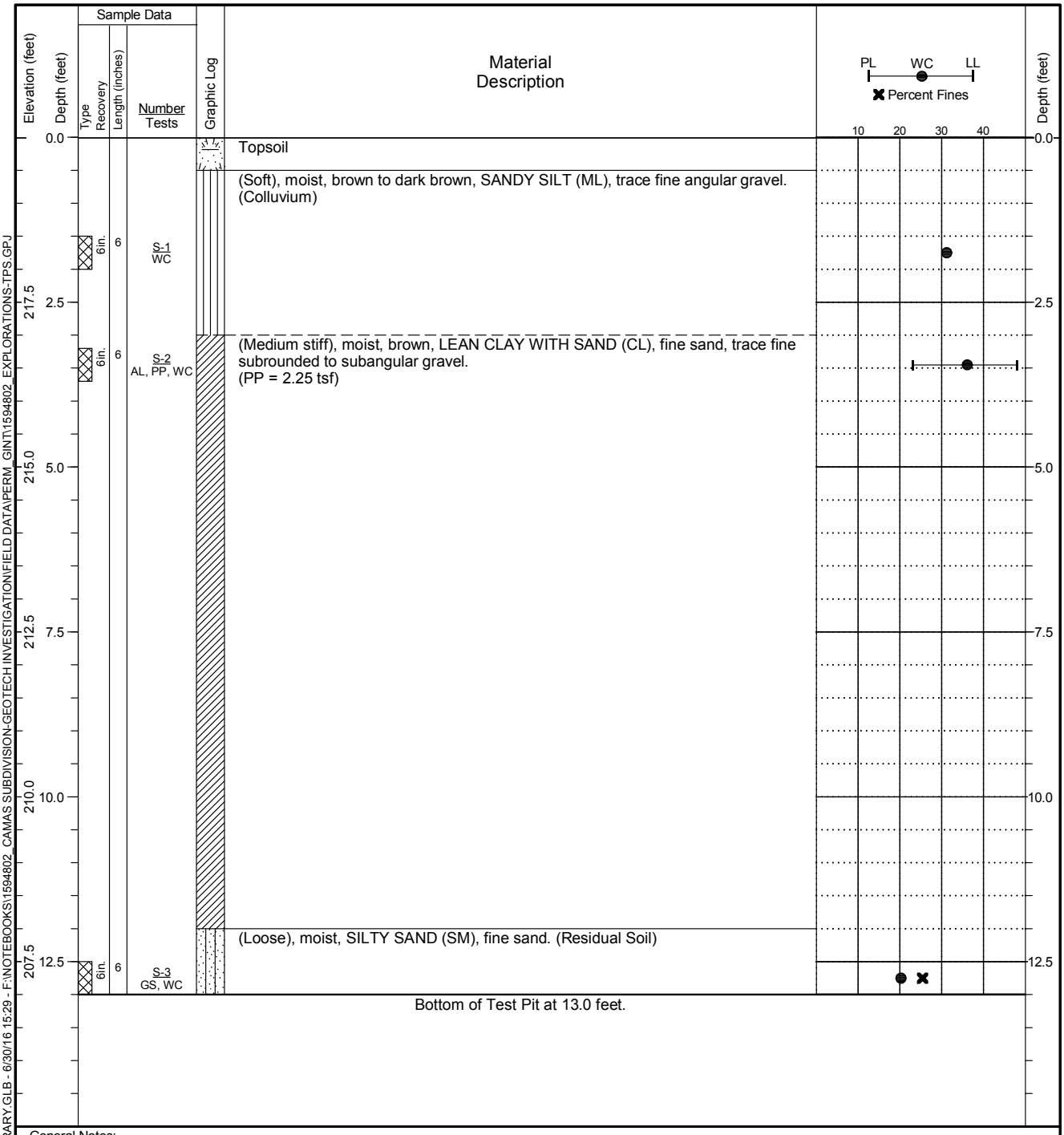
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-7

Figure **A-9**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,216.10 E: 1,151,204.00
Ground Surface Elevation: 220 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 13 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
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HARTCROWSER

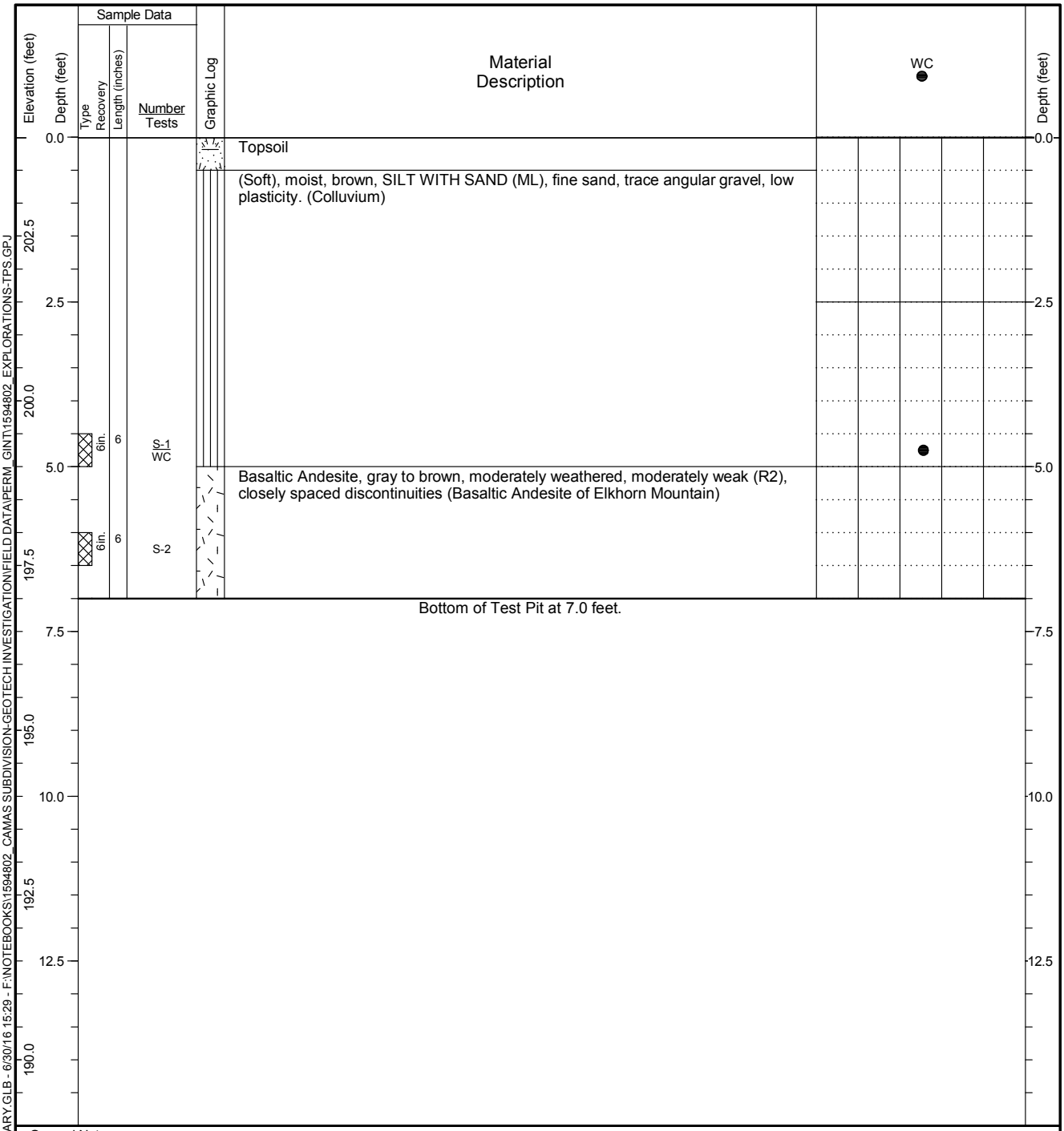
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-8

Figure **A-10**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,399.40 E: 1,150,699.63
Ground Surface Elevation: 204 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 7 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
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2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
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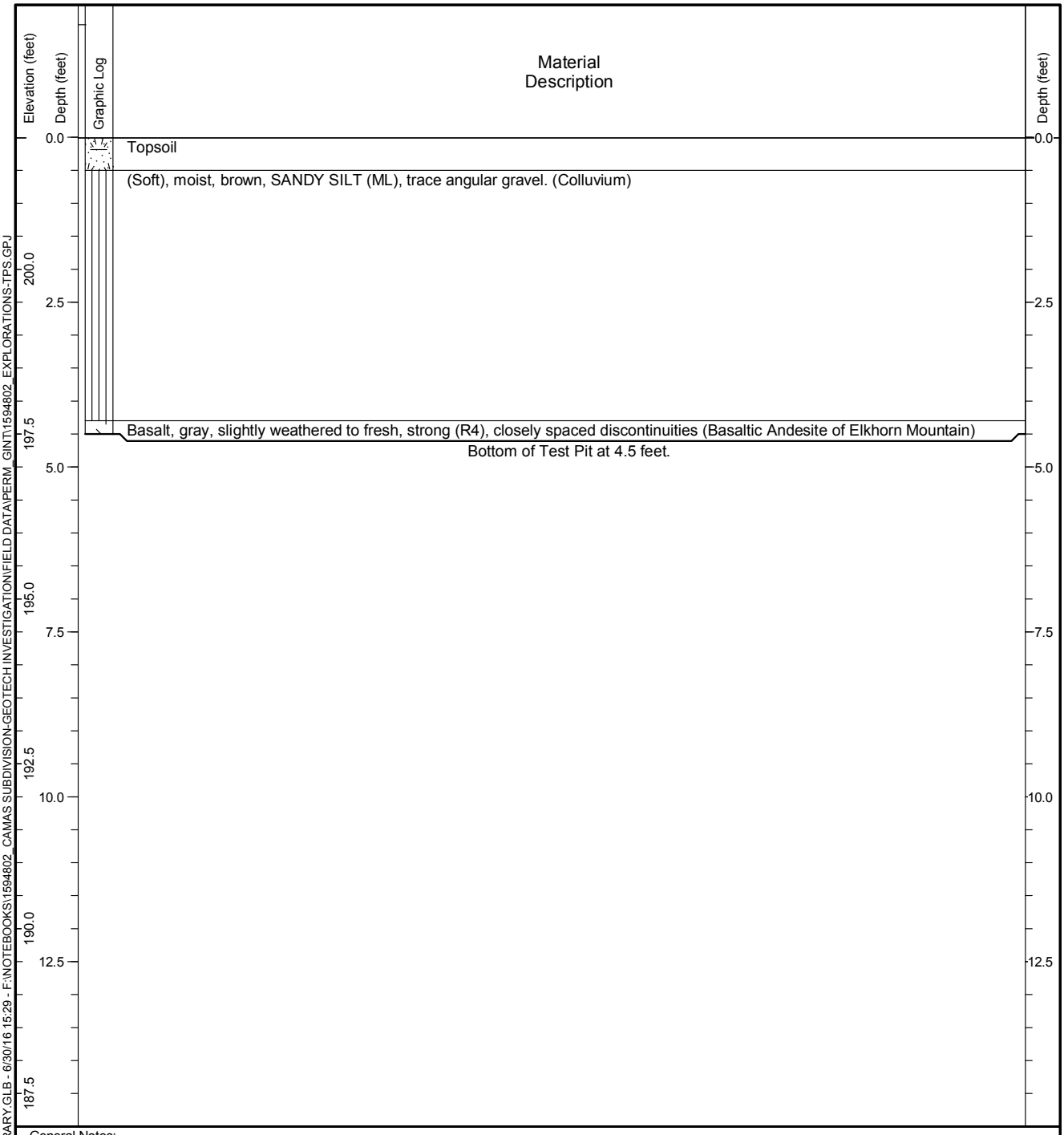
HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-9

Figure **A-11**
Sheet **1 of 1**

Date Started: 5/27/16	Date Completed: 5/27/16
Logged by: A. Jones	Checked by: A. Pyrch
Location: N: 108,427.13 E: 1,150,429.13	
Ground Surface Elevation: 202 feet	
Horizontal Datum: WA State Plane S, NAD 83, ft.	
Vertical Datum: NAVD88	
Excavation Contractor/Crew: Tapani, Inc.	
Excavation Method: Trackhoe	
Rig Model/Type: Komatsu PC-200	
Total Depth: 4.5 feet	Depth to Ground Water: Not Encountered
Comments:	



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER	Project: CJ Dens Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-10**	Figure **A-12** Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,718.59 E: 1,150,368.88
Ground Surface Elevation: 258 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
257.5	0.0		Topsoil	0.0
			Basaltic Andesite, gray, fresh to slightly weathered, strong (R4), closely spaced discontinuities (Basaltic Andesite of Elkhorn Mountain)	
			Bottom of Test Pit at 2.0 feet.	
255.0	2.5			2.5
252.5	5.0			5.0
250.0	7.5			7.5
247.5	10.0			10.0
245.0	12.5			12.5

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

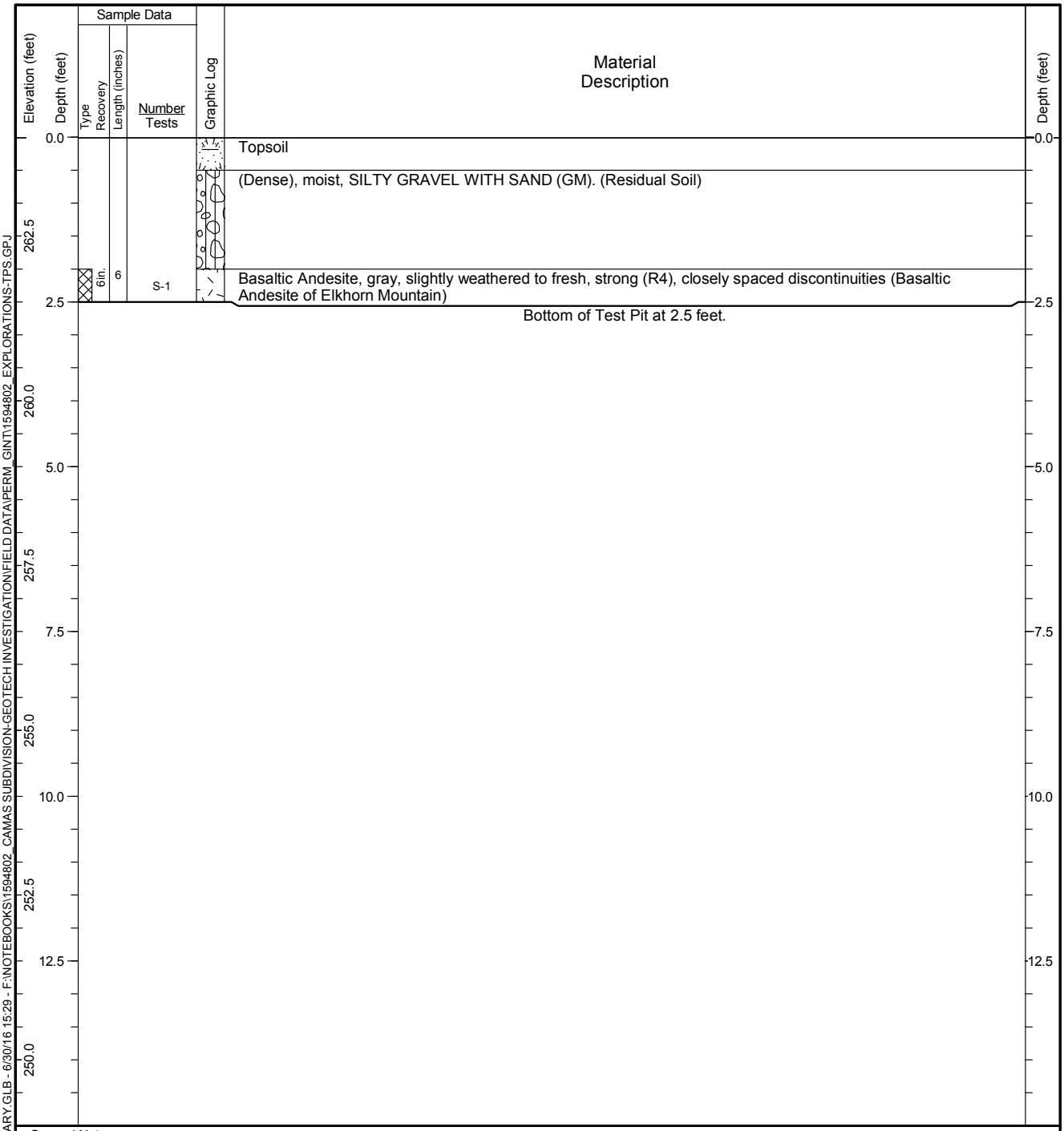
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-11

Figure **A-13**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,858.86 E: 1,150,225.88
Ground Surface Elevation: 264 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2.5 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-12

Figure **A-14**
Sheet **1 of 1**

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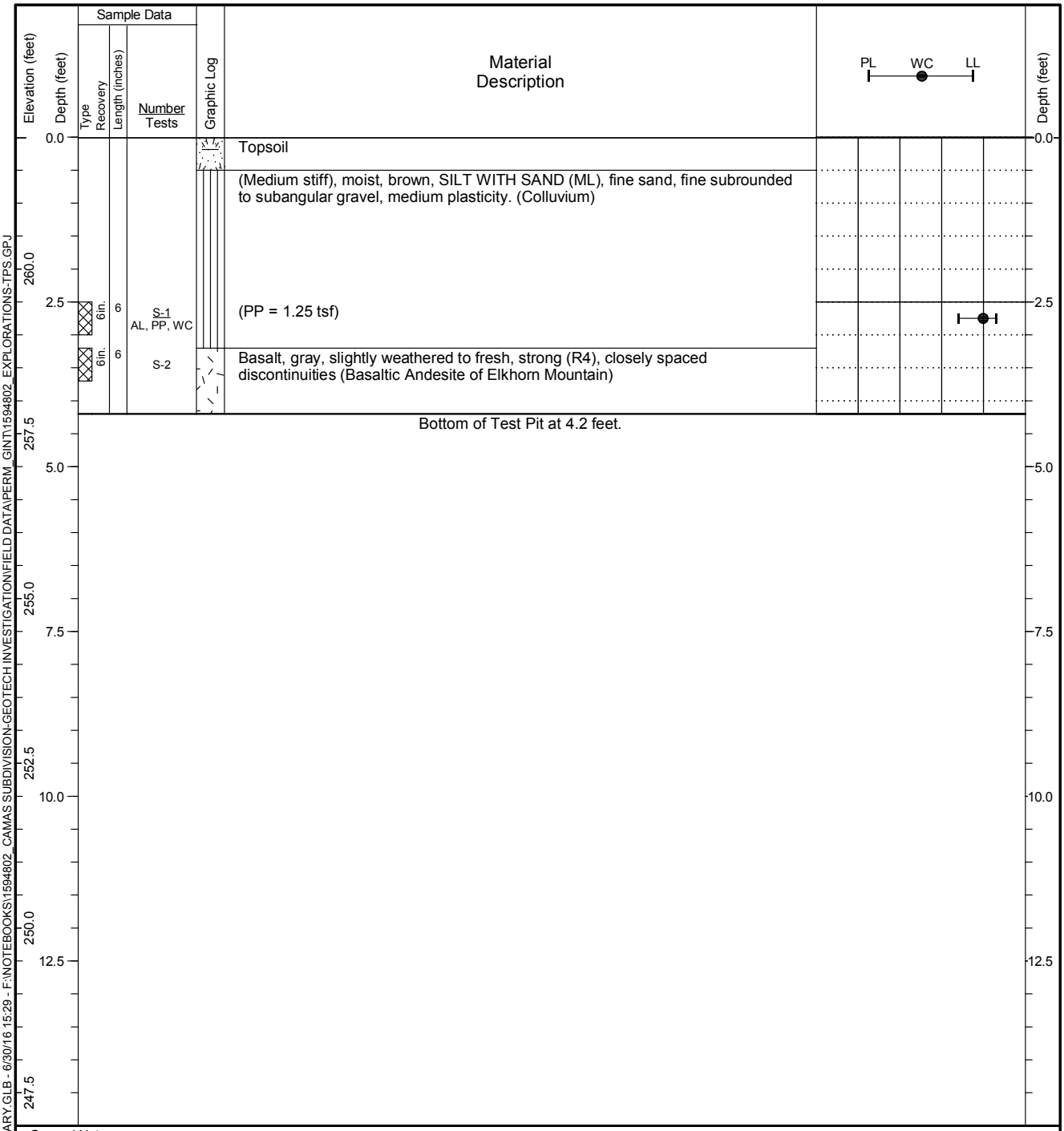
Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,929.59 E: 1,150,317.25
Ground Surface Elevation: 262 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 4.2 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

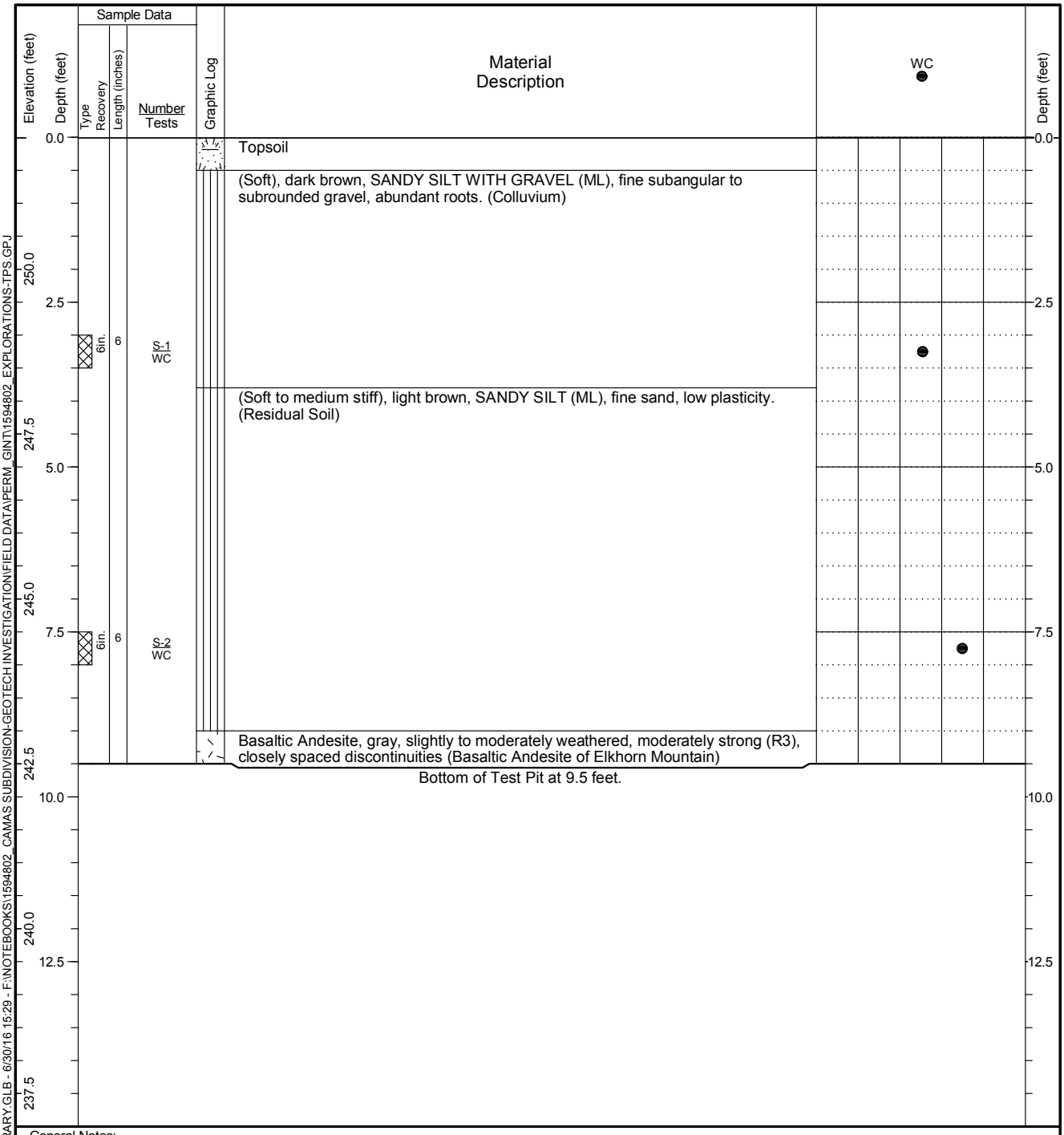
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-13

Figure **A-15**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 109,001.39 E: 1,150,228.63
Ground Surface Elevation: 252 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 9.5 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

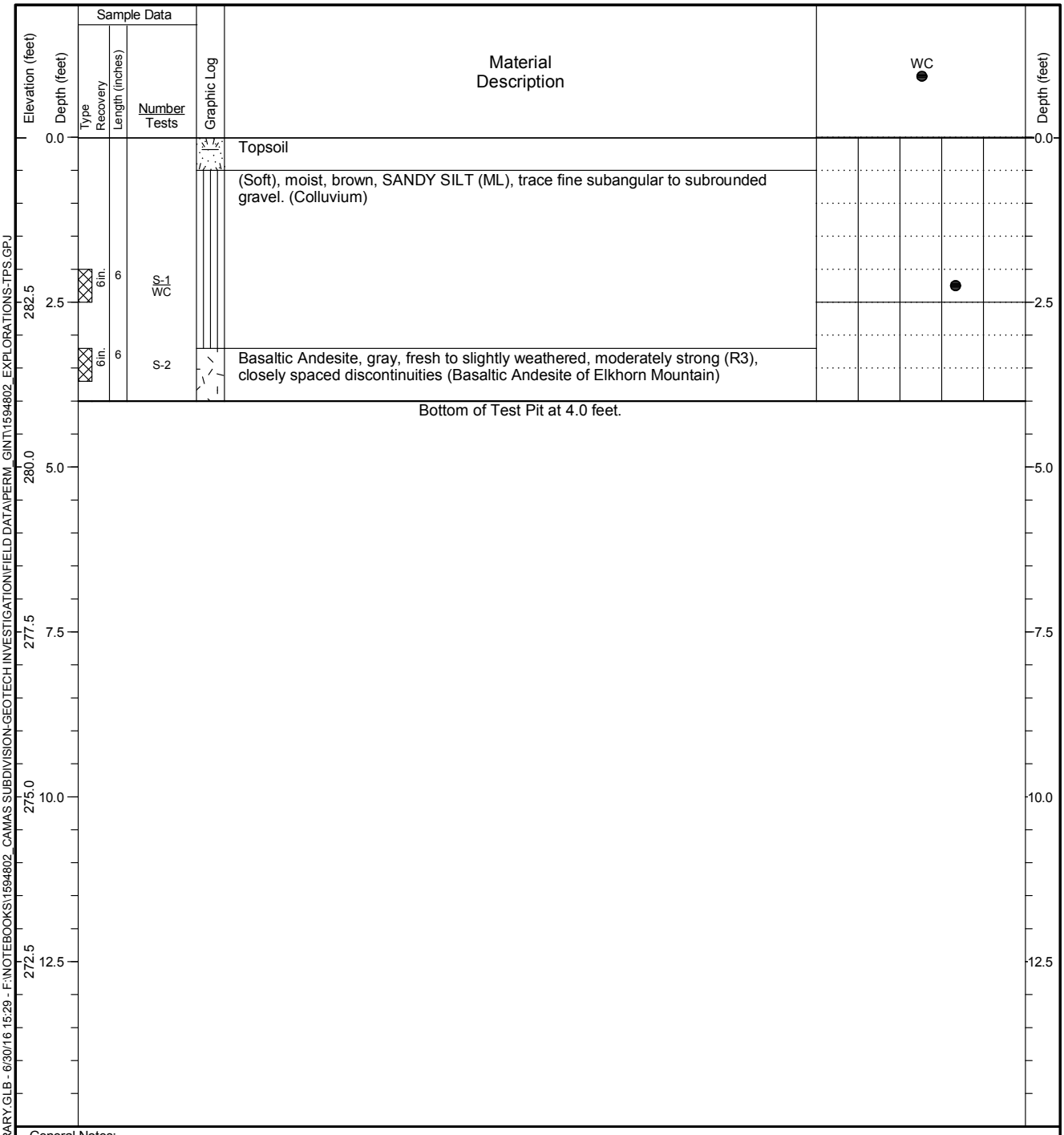
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-14

Figure **A-16**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 109,048.11 E: 1,150,482.88
Ground Surface Elevation: 285 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 4 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-15

Figure **A-17**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 109,139.92 E: 1,150,713.75
Ground Surface Elevation: 298 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 6.5 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type Recovery	Sample Data: Length (inches)	Sample Data: Number Tests	Graphic Log	Material Description	WC	Depth (feet)
297.5	0.0					Topsoil		0.0
		6in.	6	S-1 WC		(Loose), moist, brown, SILTY SAND WITH GRAVEL (SM), fine subrounded to subangular gravel. (Colluvium)		
295.0	2.5							2.5
						Basaltic Andesite, gray, slightly to moderately weathered, moderately strong (R3), closely spaced discontinuities (Basaltic Andesite of Elkhorn Mountain)		
292.5	5.0	6in.	6	S-2				5.0
						Bottom of Test Pit at 6.5 feet.		
290.0	7.5							7.5
287.5	10.0							10.0
285.0	12.5							12.5

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-16

Figure **A-18**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 109,127.21 E: 1,151,207.50
Ground Surface Elevation: 302 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description
302.0	0.0		Topsoil
			Basaltic Andesite, gray, fresh to slightly weathered, strong (R4), moderately spaced discontinuities (Basaltic Andesite of Elkhorn Mountain)
300.0	2.0		Bottom of Test Pit at 2.0 feet.
297.5	5.0		
295.0	7.5		
292.5	10.0		
290.0	12.5		
287.5			

Depth (feet): 0.0, 2.5, 5.0, 7.5, 10.0, 12.5

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-17

Figure **A-19**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 109,063.24 E: 1,151,558.63
Ground Surface Elevation: 310 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
	0.0		Topsoil	0.0
			Basaltic Andesite, gray, fresh to slightly weathered, strong (R4), closely spaced discontinuities (Basaltic Andesite of Elkhorn Mountain)	
307.5	2.5		Bottom of Test Pit at 2.0 feet.	2.5
305.0	5.0			5.0
302.5	7.5			7.5
300.0	10.0			10.0
297.5	12.5			12.5

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-18

Figure **A-20**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 109,311.19 E: 1,151,638.63
Ground Surface Elevation: 310 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 9 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	WC	Depth (feet)
	0.0						Topsoil		0.0
		6in.	6		S-1 WC		(Soft), moist, dark brown, SANDY SILT (ML). (Colluvium)		
307.5	2.5	6in.	6		S-2 WC		(Medium stiff), moist, light brown, SANDY SILT WITH GRAVEL (ML), fine subangular to subrounded gravel.		2.5
305.0	5.0								5.0
302.5	7.5	6in.	6		S-3		Volcaniclastic Breccia, brown to gray, moderately to highly weathered, very weak (R1), closely spaced discontinuities (Volcaniclastic Sedimentary Rock)		7.5
							Bottom of Test Pit at 9.0 feet.		
300.0	10.0								10.0
297.5	12.5								12.5

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-19

Figure **A-21**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 109,197.91 E: 1,151,661.25
Ground Surface Elevation: 306 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 8 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type / Recovery / Length (inches) / Number / Tests	Graphic Log	Material Description
305.0	0.0			Topsoil
		6in. / 6 / S-1 / GS, WC		(Loose), moist, brown, SILTY SAND (SM), trace angular to subangular gravel. (Residual Soil)
302.5	2.5			
300.0	5.0			
297.5	7.5			Volcaniclastic Breccia, brown to gray, moderately to highly weathered, very weak (R1), closely spaced discontinuities (Volcaniclastic Sedimentary Rock)
295.0	10.0			Bottom of Test Pit at 8.0 feet.
292.5	12.5			

WC ● Percent Fines ✖ (10, 20, 30, 40)

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

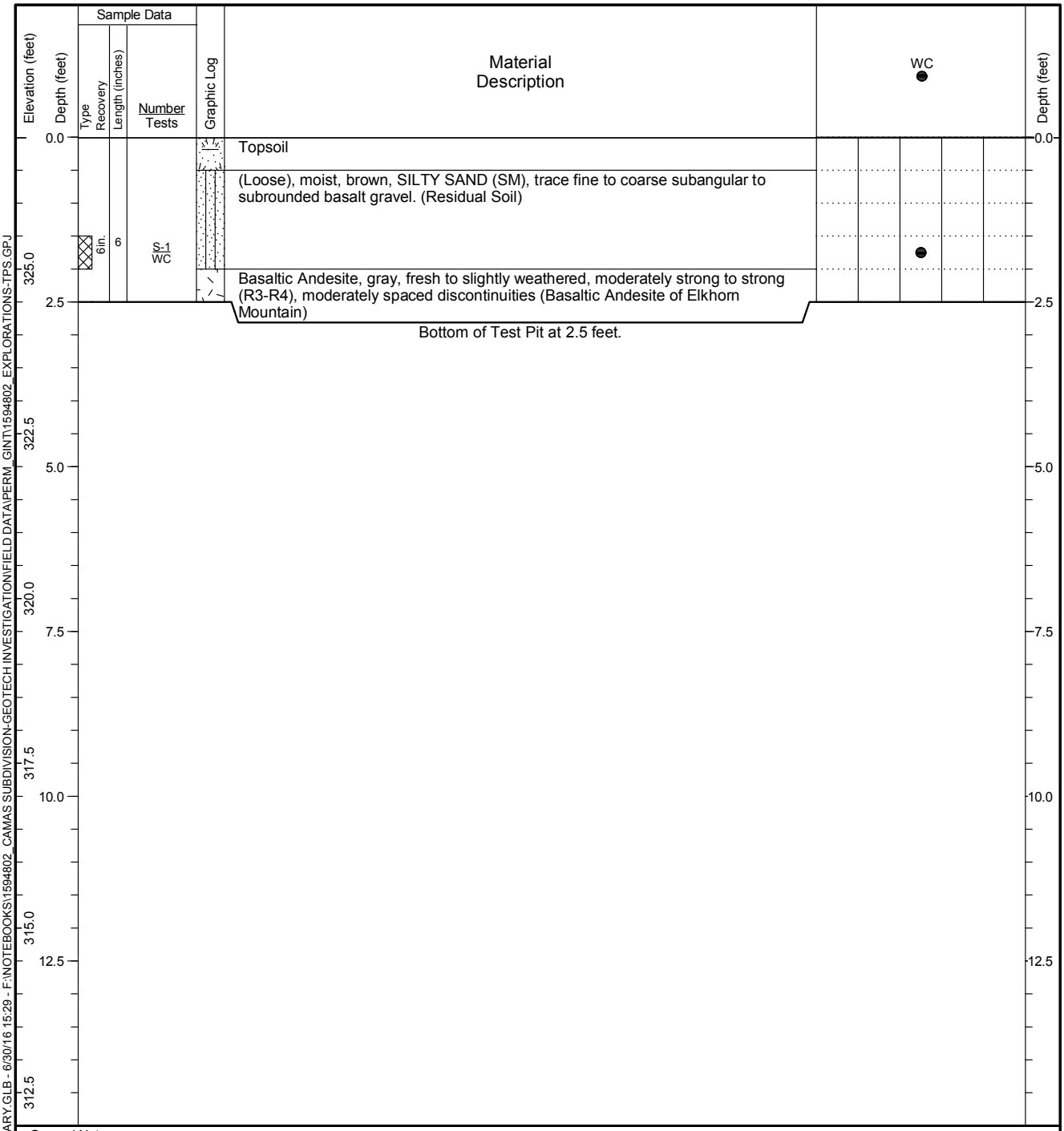
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-20

Figure **A-22**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,802.23 E: 1,151,597.38
Ground Surface Elevation: 327 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2.5 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-21

Figure **A-23**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,395.14 E: 1,151,627.00
Ground Surface Elevation: 312 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2.6 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
310.0	0.0		Topsoil	0.0
			Basaltic Andesite, gray, fresh to slightly weathered, strong (R4), closely spaced discontinuities, highly fractured and moderately weathered from 0.5 to 1.0 feet (Basaltic Andesite of Elkhorn Mountain)	
307.5	2.5		Bottom of Test Pit at 2.6 feet.	2.5
305.0	5.0			5.0
302.5	7.5			7.5
300.0	10.0			10.0
297.5	12.5			12.5

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-22

Figure **A-24**
Sheet **1 of 1**

APPENDIX B
Laboratory Testing

APPENDIX B

Laboratory Testing

A geotechnical laboratory testing program was performed for this study to evaluate the basic index and geotechnical engineering properties of the site soils. Testing was completed in Hart Crowser's soils laboratory. The tests performed and the procedures followed are outlined below.

Soil Classification

Soil samples were visually classified in our laboratory where the field classifications were verified in a relatively controlled laboratory environment. Classifications were made in general accordance with the Unified Soil Classification System (USCS) and ASTM Test Method D 2487.

Water Content Determinations

Water contents were determined for select samples recovered in the explorations in general accordance with ASTM Test Method D 2216. The test results are shown on the appropriate exploration log included in Appendix A and shown on Figure B-1 in this appendix.

Grain Size Analysis

Sieve analyses were conducted on select samples recovered in the explorations in general accordance with ASTM Test Method D 1140. The test results are shown on the appropriate exploration log included in Appendix A and on Figure B-2 in this appendix.

Atterberg Limits

Atterberg Limits (liquid limit, plastic limit and plasticity index) of select fine-grained soil samples were obtained in general accordance with ASTM Test Method D 4318-02. The test results are shown on Figure B-3 in this appendix.

Exploration	Depth	Class-ification	Water Content (%)	Dry Density (pcf)	Maximum Size (mm)	%<#200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index	Pocket Pen (tsf)	Torvane (tsf)
TP-1	3.0	ML	36.6				49	31	18	1.25	
TP-3	2.5		9.4								
TP-5	2.5	CL	37.7				46	26	20	1.0	
TP-6	2.0		9.0								
TP-7	1.5		25.6								
TP-7	3.5	SM	25.8		0.075	49					
TP-7	6.5		33.9								
TP-8	1.5		31.2								
TP-8	3.2	CL	36.1				48	23	25	2.25	
TP-8	12.5	SM	20.2		0.075	25					
TP-9	4.5		25.6								
TP-13	2.5	ML	39.9				43	34	9	1.25	
TP-14	3.0		25.4								
TP-14	7.5		34.9								
TP-15	2.0		33.3								
TP-16	2.0		25.4								
TP-19	1.0		26.0								
TP-19	3.0		41.7								
TP-20	2.5	SM	22.5		0.075	24					
TP-21	1.5		25.0								

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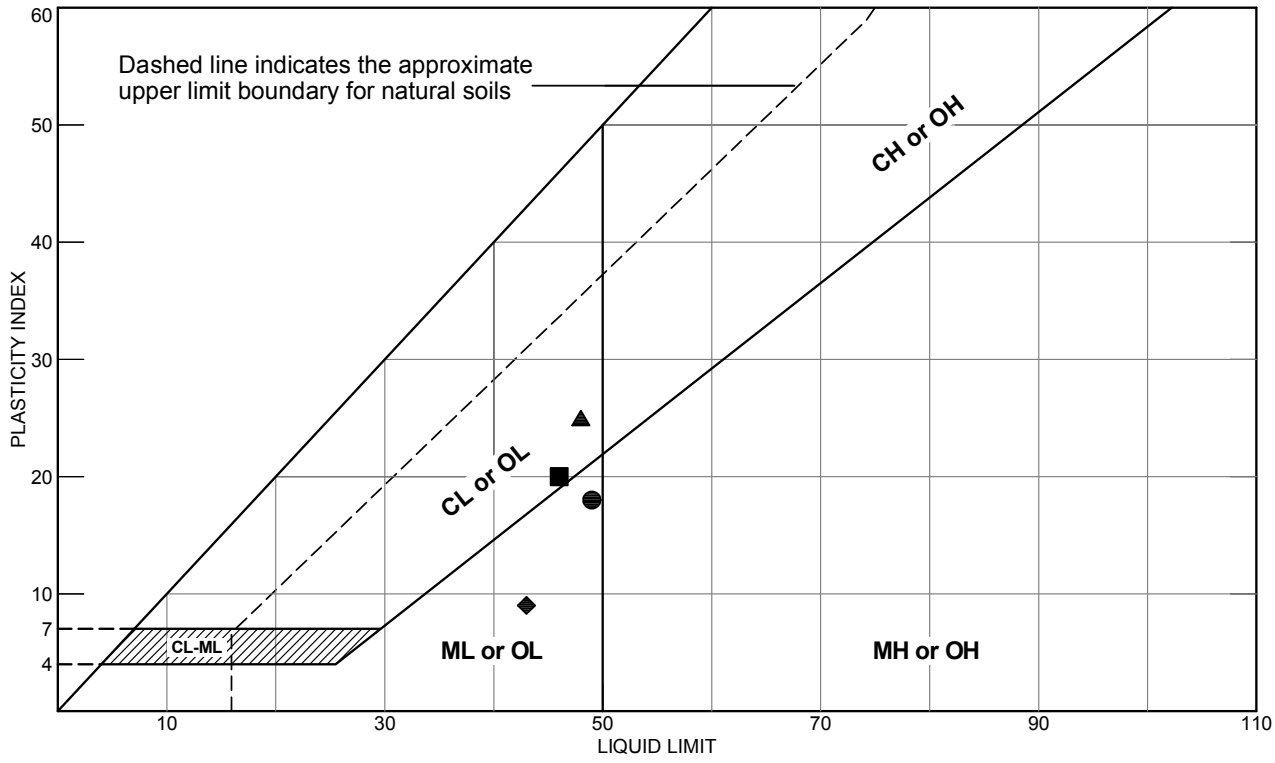
HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Summary of Laboratory Results

Figure **B-1**
Sheet **1 of 1**



Location and Description			LL	PL	PI	#200	MC%	USCS
● **Source:** TP-1 SILT WITH SAND	**Sample No.:** S-1	**Depth:** 3.0 to 3.5 feet	49	31	18	NT	37	ML
■ **Source:** TP-5 LEAN CLAY	**Sample No.:** S-1	**Depth:** 2.5 to 3.0 feet	46	26	20	NT	38	CL
▲ **Source:** TP-8 LEAN CLAY WITH SAND	**Sample No.:** S-2	**Depth:** 3.2 to 3.7 feet	48	23	25	NT	36	CL
◆ **Source:** TP-13 SILT WITH SAND	**Sample No.:** S-1	**Depth:** 2.5 to 3.0 feet	43	34	9	NT	40	ML

Remarks:

● ■ ▲ ◆

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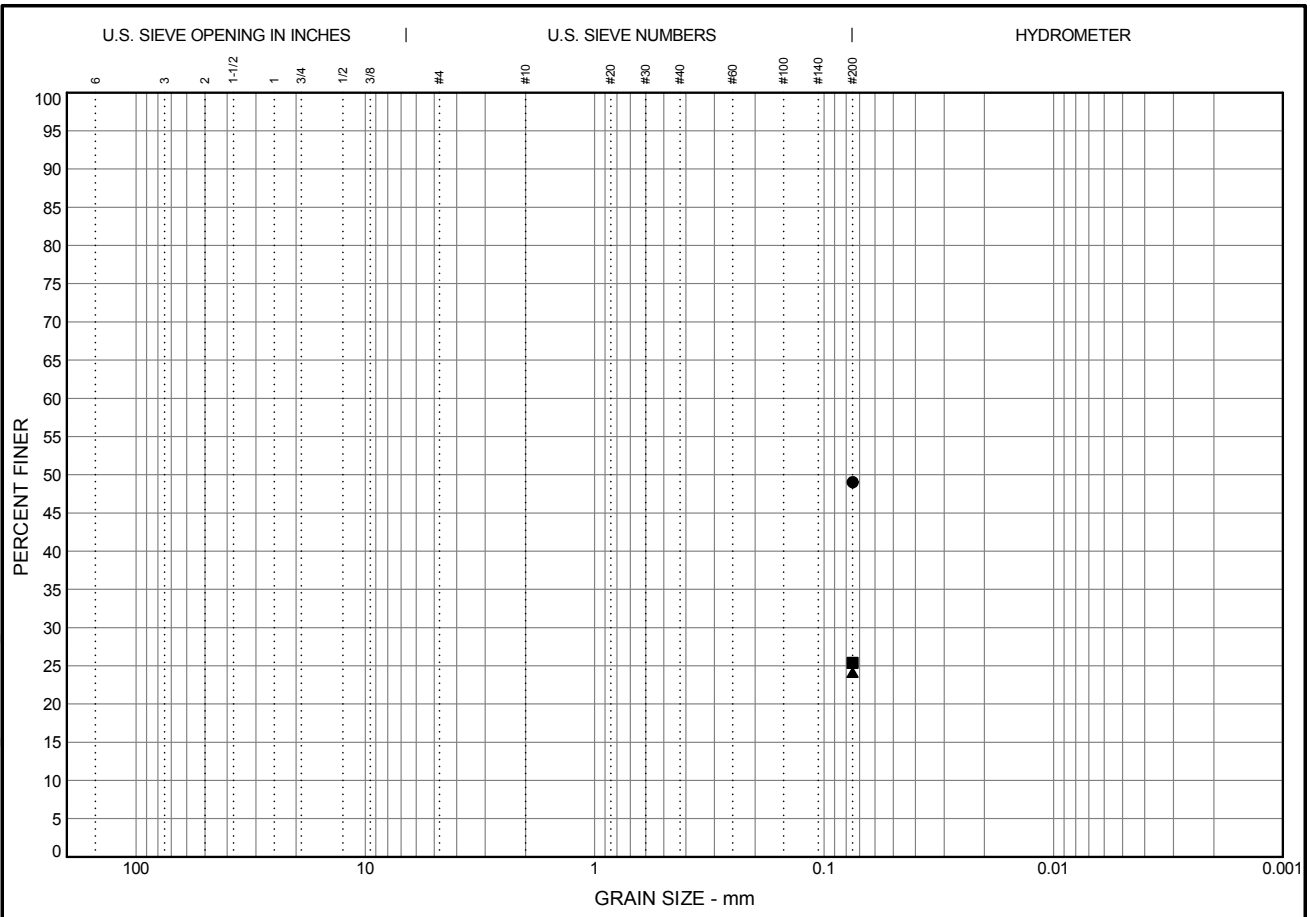
HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Liquid and Plastic Limits

Figure **B-2**
Sheet **1 of 1**



Location and Description	% Cobbles	% Gravel	% Sand	% Silt	% Clay	MC%	USCS
● **Source:** TP-7 **Sample No.:** S-2 **Depth:** 3.5 to 4.0 SILTY SAND				49.0		26	SM
■ **Source:** TP-8 **Sample No.:** S-3 **Depth:** 12.5 to 13.0 SILTY SAND				25.4		20	SM
▲ **Source:** TP-20 **Sample No.:** S-1 **Depth:** 2.5 to 3.0 SILTY SAND				24.1		23	SM

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●										
■										
▲										

Remarks:

● ■ ▲

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Partical Size Distribution

Figure **B-3**
Sheet **1 of 1**

HARTCROWSER www.hartcrowser.com

DANIEL J. TRISLER STATE OF WASHINGTON 38279 REGISTERED PROFESSIONAL ENGINEER

State of Washington Engineering Geologist 3074 Licensed Geologist

Rachel Pirot

MEMORANDUM

DATE: December 7, 2015

TO: CJ Dens Lacamas I, LLC
Attention: Mr. Carl Lawson

FROM: Daniel J. Trisler, PE
Rachel Pirot, LG, LEG

RE: **Initial Site-Specific Evaluation of Geohazard Areas A and C**
Camas Subdivision – Leadbetter Road
Camas, Washington
15948-02

CC: Mackenzie – Brian Hollenback, Todd Johnson
HFI Consultants – Tim Halme-

Introduction

Hart Crowser, Inc. is pleased to submit this memorandum to CJ Dens Lacamas I, LLC, summarizing our evaluation of Geohazard Areas A and C at the proposed subdivision development along Leadbetter Road in Camas, Washington. The proposed subdivision is an undeveloped property on the northeast side of Leadbetter Road, north of Leadbetter Lake, as described in our Critical Areas Report – Update (CAR Update) for the development, dated March 19, 2013.

Two specific geohazard areas were identified and described in the CAR Update that required further site specific-evaluation: Geohazard Areas A and C. The purpose of this evaluation was to gather additional information and provide recommendations to help you assess the general economic feasibility of developing these two areas. Our specific scope of work was detailed in our contract change agreement with you, dated October 14, 2015, and generally included a geologic reconnaissance of the two areas, test pit explorations, an evaluation of the hazards based on our field work, and preparation of this memorandum summarizing our evaluation and recommendations.

The location of the site is shown on Figure 1. The locations of Geohazard Areas A and C and our recent test pit explorations are shown on Figure 2.

300 West 15th Street
Vancouver, Washington 98660-2927
Tel 360.448.4189
Fax 503.620.6918

Site Conditions

We conducted a geotechnical reconnaissance and completed test pits at the two sites on November 23, 2015. Our updated findings from these investigations are described in detail below.

Surface Conditions

Site conditions in the general area of Geohazard Areas A and C consist of a northwest-trending slope abutting the north side of Leadbetter Road with flat slopes on the south side of the road leading to Lacamas Lake. The overall gradient of the northwest-trending slope is moderate, but with locally variable landforms and resulting gradients that are gentle to steep. Elevations range from approximately 190 feet above mean sea level (MSL) at Leadbetter Road to 320 feet MSL at the top of the northwest-trending slope, above both geohazard areas. Although gradients are variable, landforms are generally well-weathered and without abrupt transitions or other features indicative of accelerated erosional processes or earth movement. Prior to current logging activities, the area was forested with a dense mostly coniferous second-growth stand of timber and the ground surface well-vegetated with native understory plants. Conditions at each area specifically are described separately below.

Geohazard Area A

Geohazard Area A consists of an arcuate-shaped landform extending perpendicular to the predominant southwest-facing slope. The feature includes a steeper arcuate upper slope and convex lower toe slope that could be interpreted as the headscarp and toe, respectively, of a landslide.

During our reconnaissance, we observed these and associated features. We noted that the slope of the potential headscarp is only minimally steeper than adjacent slopes and the landform is not well-formed. No exposed soil or ground cracks were observed within it. Slopes in the body of the landform were gentle, approximately 25 to 30 percent. No developed stream channels, seeps or springs were observed within or adjacent to the feature. The area has irregular topography and several trees were observed to have experienced wind throw. The root balls of these trees were exposed and shallow bedrock was observed entangled with the roots. Relatively flat benches cut across the slopes in this area and are interpreted as old logging roads. At the toe of the slope, the cut for Leadbetter Road exposes volcanic rock that holds a vertical face and appears in-place.

The area is heavily vegetated with conifer to approximately 12 to 24 inches in diameter. The conifer trees are straight-trunked except immediately adjacent to Leadbetter Road, where they lean and exhibit bowed trunks. The bowed and leaning conifers continue along Leadbetter Road throughout the area and are not limited to Geohazard Area A.

Geohazard Area C

Geohazard Area C is a complex and irregular landform divided into a lower portion ("Older Debris Flow") and an upper portion ("Recent Debris Flow"). The upper portion is a narrow swale that extends to a distinct break in the southwest-facing slope at about elevation 270 feet MSL. The lower portion is a broader fan with very gentle slopes on both sides of Leadbetter Road.

During our reconnaissance we traversed up the upper portion and found it to consist of a saddle or swale in the otherwise continuous ridgetop. The saddle was slightly arcuate but landforms appeared mature and slopes were 25 to 35 percent. The upper portion of the saddle opened up to flat ground above, and no potential source area for past or future debris flows was observed. The ridgetop was weathered and rounded with gentle slopes and subdued features. The previously mapped geohazard area had a grade of approximately 25 percent in the upper slopes, which flattened to 10 to 20 percent downhill. The lower portion of the slopes were dominated by a wide, relatively flat bench with gentle undulating hummocks. No seeps or springs were observed, and no streams or erosive process at the toe of the slope of deposits were observed. No outcrops exposed bedrock geology directly within Geohazard Area C.

The lower portion of Geohazard Area C was thickly wooded with straight trunked conifers while the upper portion was characterized by a lack of mature conifers and was primarily forested with deciduous trees. Conifer trees where present were predominately straight throughout the area. Timber age and type were generally consistent between Geohazard Area C and other areas of the site.

Subsurface Conditions

Our understanding of the subsurface conditions is based on research and information collected from our field explorations completed for this project. Our explorations consisted of nine test pits and four potholes. (Potholes were test pits that encountered bedrock at very shallow depth, and for which formal test pit logs were not created.) The locations of the explorations are shown on Figure 2. Attachment A presents logs of the test pits. Samples of the soils were collected during the explorations for potential future laboratory testing, though no laboratory testing was conducted as part of this current scope of work.

Soil and Bedrock

Geohazard Area A

The bedrock geology at Geohazard Area A was interpreted to be Basaltic Andesite of Elkhorn Mountain, as discussed in our March 19, 2013 CAR Update. Test pits TP-7 and TP-8 and two additional potholes in this area exposed moderately strong bedrock at 2 to 4 feet below ground surface (bgs). In place jointing of the basaltic andesite was observed in the test pit walls. The overlying material encountered was colluvial gravel, cobbles, and silt. Two additional potholes adjacent to Geohazard Area A encountered a

thin (1 to 3 feet) veneer of colluvium over what appeared to be in-place basaltic andesite. We observed no definitive signs of past landsliding or slope movement within the materials exposed in the test pits and pot holes.

Geohazard Area C

Our test pits in Geohazard Area C encountered fine-grained silty soils over sandy residual soil which transitioned into Volcaniclastic Sedimentary bedrock. The surficial silty soil had a disturbed texture, although we observed no definitive signs of disturbance from landsliding (e.g., slickensides, etc.). In place bedding structures were observed in the residual soil and bedrock. Our test pits in this area encountered bedrock at between 3 and 13 feet bgs.

Groundwater

Groundwater and signs of groundwater (e.g., mottling, etc.) were not encountered in our test pits. Based on the previous Level 1 Hydrogeologic Assessment, dated March 19, 2013, depth to the regional groundwater level is expected to vary from approximately 50 to 100 feet bgs. However, we anticipate that locally perched groundwater will be encountered above the bedrock materials encountered at the site.

Conclusions

Based on our geotechnical reconnaissance and limited subsurface investigation it is our opinion that Geohazard Areas A and C do not present geologic hazards to the project that cannot be reasonably mitigated. We did not observe surface or subsurface signs of active landsliding and the potential for future landsliding in these areas appears low. It is our opinion, based on the observed surface and subsurface conditions, that future development of these areas is feasible with limited mitigation measures, which can be finalized during final design. Therefore, immediate logging of these areas is acceptable, as they can be included within the overall subdivision development.

Slopes across the site and within the previously mapped geohazard areas are gentle with weathered landforms and subdued topographic expression. No significant source areas or geomorphic processes, such as stream erosion or rapid downcutting, were observed that might cause slope movement in either area. Timber age and type are consistent across the site without significant differences within the geohazard areas. Bowed and tilted conifer trees were only observed adjacent the full length of Leadbetter Road, and therefore, suggest the cause of the bowing and tilting is related to the roadway, not slope movement from landsliding.

In Geohazard Area A, shallow bedrock was encountered in the test pits and previously mapped adjacent outcrops also indicate shallow bedrock depths. Bedrock was also exposed in the root balls of wind thrown trees. The hummocky features observed are likely due to wind throw of trees in shallow soils

and grading of old logging roads across the area. It is our opinion, based on the observed features and shallow bedrock encountered in our explorations, that the landform mapped as Geohazard Area A was not formed by a landslide, but the result of bedrock geologic conditions and normal weathering processes. In our opinion Geohazard Area A can henceforth be considered similarly with the rest of the development and specific mitigation for geohazards is not needed in this area. This area is suitable for future development, provided that the recommendations outlined below are followed.

In Geohazard Area C, the disturbed soil and fan morphology observed on site are likely the result of very old debris flows and/or colluvial processes. However, slopes in this area have been extensively modified by weathering since those processes were active. Landforms within the mapped Geohazard Area C exhibit very weathered and rounded topography with gentle slopes. Active driving processes for slope movement, such as streams or erosion at the toe of the deposit, were absent. No obvious source areas were observed for future debris flows. Additionally no discrete failure zone was identifiable in the test pits. Currently conditions to result in debris flows and landsliding appear to be low. This area is suitable for future development, provided that the recommendations outlined below are followed.

Based on our observations and evaluation, it is our opinion that the proposed development is feasible in both Geohazard Areas A and C. Development in these areas in accordance with the *Preliminary Recommendations* section of this memorandum should not adversely affect the stability of the site or neighboring properties. Final design should include additional evaluation and final recommendations related to these areas.

Preliminary Recommendations

As outlined in the CAR Update, general hillside development guidelines should be followed during the design and construction stages. Final geotechnical design recommendations will be developed at the time a full geotechnical investigation is completed. However, a summary of the anticipated general guidelines is provided below.

- Hillside grading methodologies shall be employed for earthwork in all sloping areas, including previously mapped Geohazard Areas A and C. This will likely include keys and benches, installation of sub drains where seepage is encountered, and installation of all material as a compacted structural fill. Limits on fill depths may also be necessary in some areas.
- A detailed erosion and sediment control plan will be required as part of the proposed development.
- In general, we anticipate that homes will be supported by conventional spread footings. However, homes near existing or new steep slopes may require the use of deepened footings, drilled piers, or larger slope setbacks.

- We recommend against the use of infiltration systems for disposal of stormwater from the site. Foundation subdrains may be required around homes to reduce the potential for water seepage in crawlspace areas.

Limitations

We have prepared this memorandum for the exclusive use of CJ Dens Lacamas I, LLC and their authorized agents for this specific site. The scope of our work was in general accordance with our agreement dated October 14, 2015, and is limited to providing the information requested. Our evaluation and conclusions are based on our interpretation of observed site conditions. However, conditions can vary along the slope, and our conclusions should not be construed as a warranty or guarantee of future site performance. This memorandum should not be construed as providing design and construction recommendations for the proposed subdivision. Additional and more detailed geotechnical investigation should be performed before final design-level recommendations may be developed.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this memorandum was prepared. No warranty, express or implied, should be understood. Any electronic form, facsimile, or hard copy of the original document (email, text, table and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by Hart Crowser and will serve as the official document of record.

Attachments:
Figure 1 – Vicinity Map
Figure 2 – Exploration Plan
Test Pit Logs

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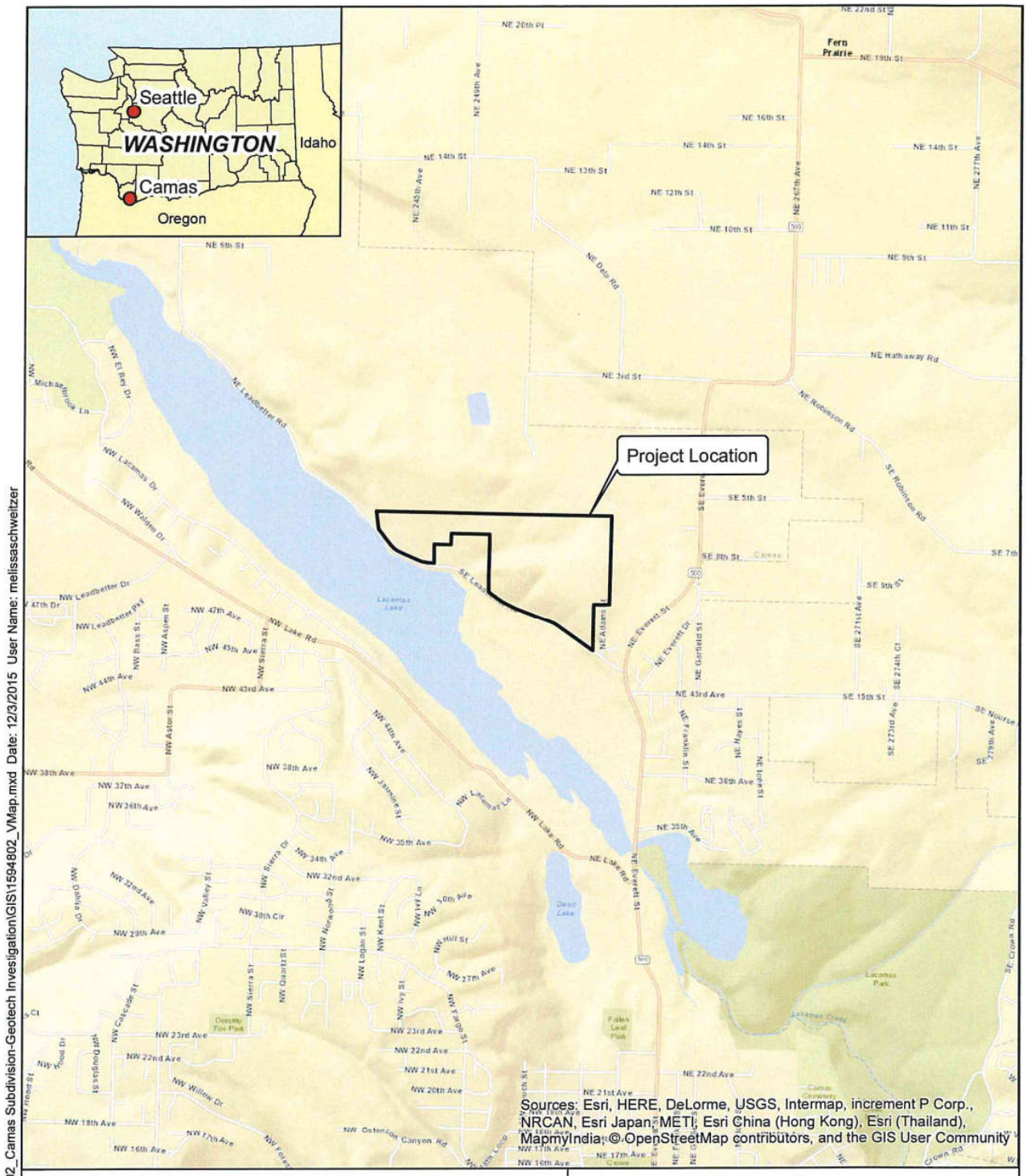
Seattle
WASHINGTON
Idaho
Camas
Oregon
Project Location
Fern Prairie
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
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Camas, Washington
Vicinity Map
15948-02
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200
400
Approximate Scale in Feet
N
LEGEND
TP-1 Test Pit
Pothole
Gechazard Area
A
TP-7
TP-8
C
TP-1
TP-2
TP-3
TP-4
TP-5
TP-6
TP-9
DEERHAVEN SUBDIVISION (311-573)
N.E. ADAMS STREET
N.E. LADDIE TER ROAD
N.E. 45th
Source: Overall Existing Conditions Plan, Sheet C2.1 from Group Mackenzie, dated 1/19/11.
Camas Subdivision
Camas, Washington
Exploration Plan
15948-02
12/15
HARTCROWSER
Figure
2

KEY TO EXPLORATION LOGS

HARTCROWSER

SOIL CLASSIFICATION CHART

MATERIAL TYPES	MAJOR DIVISIONS		GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	GW	WELL-GRADED GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES, >12% FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	SW	WELL-GRADED SAND
			SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	CL	LEAN CLAY
			ML	SILT
		ORGANIC	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	CH	FAT CLAY
			MH	ELASTIC SILT
		ORGANIC	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS			PT	PEAT

OTHER MATERIAL SYMBOLS

- Concrete
- Asphalt
- Topsoil

Note: Multiple symbols are used to indicate borderline or dual classifications

MOISTURE MODIFIERS

- Dry - Absence of moisture, dusty, dry to the touch
- Moist - Damp, but no visible water
- Wet - Visible free water or saturated, usually soil is obtained from below the water table

SEEPAGE MODIFIERS

- None -
- Slow - < 1 gpm
- Moderate - 1-3 gpm
- Heavy - > 3 gpm

CAVING MODIFIERS

- None -
- Minor - isolated
- Moderate - frequent
- Severe - general

MINOR CONSTITUENTS

- Trace - < 5% (silt/clay)
- Occasional - < 15% (sand/gravel)
- With - 5-15% (silt/clay) in sand or gravel
  15-30% (sand/gravel) in silt or clay

SAMPLE TYPES

- Dames & Moore
- Standard Penetration Test (SPT)
- Shelby Tube
- Bulk or Grab

LABORATORY/ FIELD TESTS

- ATT - Atterberg Limits
- CP - Laboratory Compaction Test
- CA - Chemical Analysis (Corrosivity)
- CN - Consolidation
- DD - Dry Density
- DS - Direct Shear
- HA - Hydrometer Analysis
- OC - Organic Content
- PP - Pocket Penetrometer (TSF)
- P200 - Percent Passing No. 200 Sieve
- SA - Sieve Analysis
- SW - Swell Test
- TV - Torvane Shear
- UC - Unconfined Compression

GROUNDWATER SYMBOLS

- Water Level (at time of drilling)
- Water Level (at end of drilling)
- Water Level (after drilling)

STRATIGRAPHIC CONTACT

- ——— Distinct contact between soil strata or geologic units
- – – – – Gradual or approximate change between soil strata or geologic units

Notes:

Blowcount (N) is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted) per ASTM D-1586. See exploration log for hammer weight and drop.

When the Dames & Moore (D&M) sampler was driven with a 140-pound hammer (denoted on logs as D+M 140), the field blow counts (N-value) shown on the logs have been reduced by 50% to approximate SPT N-values.

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

Refer to the report text and exploration logs for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the exploration locations at the time the explorations were made. The logs are not warranted to be representative of the subsurface conditoins at other locations or times.

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Figure A-1

KEY TO BEDROCK TERMS (1 of 2)
(WSDOT, 2014)

HARTCROWSER

8910 SW Gemini Drive
Beaverton, Oregon 97008

Weathered State of Rock

Term	Description	Grade
Fresh	No visible signs of rock material weathering; perhaps slight discoloration in major discontinuity surfaces.	I
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering, and may be somewhat weaker externally than in its fresh condition.	II
Moderately Weathered	Less than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as a continuous framework or as corestones.	III
Highly Weathered	More than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as discontinuous framework or as corestone.	IV
Completely Weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.	V
Residual Soil	All rock material is converted to soil. The mass structure and material fabric is destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI

Relative Rock Strength

Grade	Description	Field Identification	Uniaxial Compressive Strength
R0	Extremely Weak	Indented by thumbnail.	0.04 to 0.15 ksi
R1	Very Weak	Specimen crumbles under sharp blow with point of geological hammer, and can be cut with a pocket knife.	0.15 to 3.6 ksi
R2	Moderately Weak	Shallow cuts or scrapes can be made in a specimen with a pocket knife. Geological hammer point indents deeply with firm blow.	3.6 to 7.3 ksi
R3	Moderately Strong	Specimen cannot be scraped or cut with a pocket knife, shallow indentation can be made under firm blows from a hammer point.	7.3 to 15 ksi
R4	Strong	Specimen breaks with one firm blow from the hammer end of a geological hammer.	15 to 29 ksi
R5	Very Strong	Specimen requires many blows of a geological hammer to break intact sample.	Greater than 29 ksi

Discontinuities

Discontinuity Spacing		Discontinuity Condition	
Description	Spacing	Condition	Description
Very Widely Spaced	Greater than 10 feet.	Excellent Condition	Very rough surfaces, no separation, hard discontinuity wall.
Widely Spaced	3 to 10 feet.	Good Condition	Slightly rough surfaces, separation less than 0.05 inches, hard discontinuity wall.
Moderately Spaced	1 to 3 feet.	Fair Condition	Slightly rough surface, separation greater than 0.05 inches, soft discontinuity wall.
Closely Spaced	2 to 12 inches	Poor Condition	Slickensided surfaces, or soft gouge less than 0.2 inches thick, or open discontinuities 0.05 to 0.2 inches.
Very Closely Spaced	Less than 2 inches	Very Poor Condition	Soft gouge greater than 0.2 inches, or open discontinuities greater than 0.2 inches.

Figure A-2

KEY TO BEDROCK TERMS (2 of 2)
(WSDOT, 2014)

HARTCROWSER
8910 SW Gemini Drive
Beaverton, Oregon 97008

Grain Size

Grain Size	Description	Criteria
Less than 0.04 inches	Fine grained	Few crystal boundaries/ grains distinguishable in the field or with a hand lens.
0.04 to 0.2 inches	Medium grained	Most crystal boundaries/ grains distinguishable with the aid of a hand lens.
Greater than 0.2 inches	Coarse grained	Most crystal boundaries/ grains distinguishable with the naked eye.

Igneous Rock Textures

Texture	Grain Size
Pegmatitic	Very large; diameters greater than 0.8 in.
Phaneritic	Can be seen with the naked eye
Porphyritic	Grained of two widely different sizes
Aphanitic	Cannot be seen with the naked eye
Glassy	No grains present

Pyroclastic Rocks

Rock Name	Characteristics
Pyroclastic Breccia	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which *angular* pyroclasts predominate.
Agglomerate	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which *rounded* pyroclasts predominate.
Lapilli Tuff	Pyroclastic rock whose average pyroclast size is 0.08 to 2.5 inches.
Ash Tuff	Pyroclastic rock whose average pyroclast size is less than 0.08 inches.

Degree of Vesicularity

Designation	Percentage of Cavities (by volume) of Total Sample
Slightly Vesicular	5 to 10 Percent
Moderately Vesicular	10 to 25 Percent
Highly Vesicular	25 to 50 Percent
Scoriaceous	Greater than 50 Percent

OTHER TERMS:

Core Recover (CR) = the ratio of core recovered to the core run length expressed as a percentage.

Rock Quality Designation (RQD) = the percentage of rock core recovered in intact pieces of 4 inches or more in length in the length of a core run. Does not include mechanical breaks caused by drilling.

Fracture Frequency (FF) = the number of natural fractures per foot in the length of core recovered.

REFERENCE:

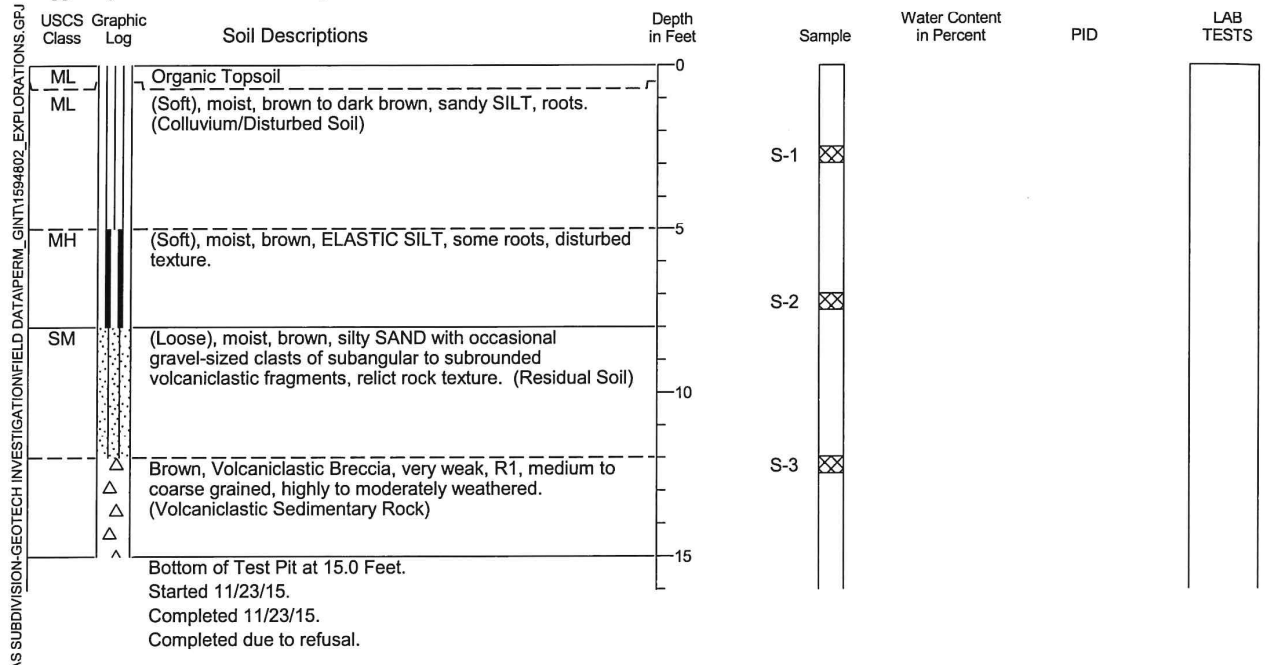
Washington State Department of Transportation (WSDOT), 2014. *Geotechnical Design Manual*, Publication M 46-03.02, August, 2014.

Figure A-2

Test Pit Log TP-1

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

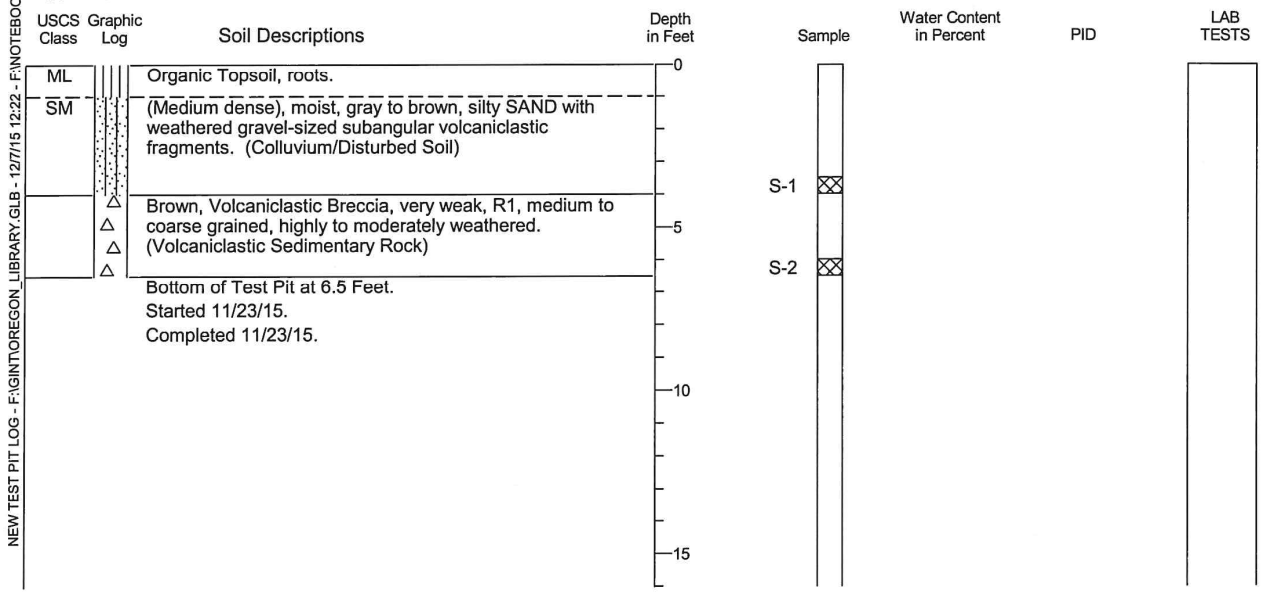
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-2

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



NEW TEST PIT LOG - F:\GINTOREGON_LIBRARY.GLB - 12/7/15 12:22 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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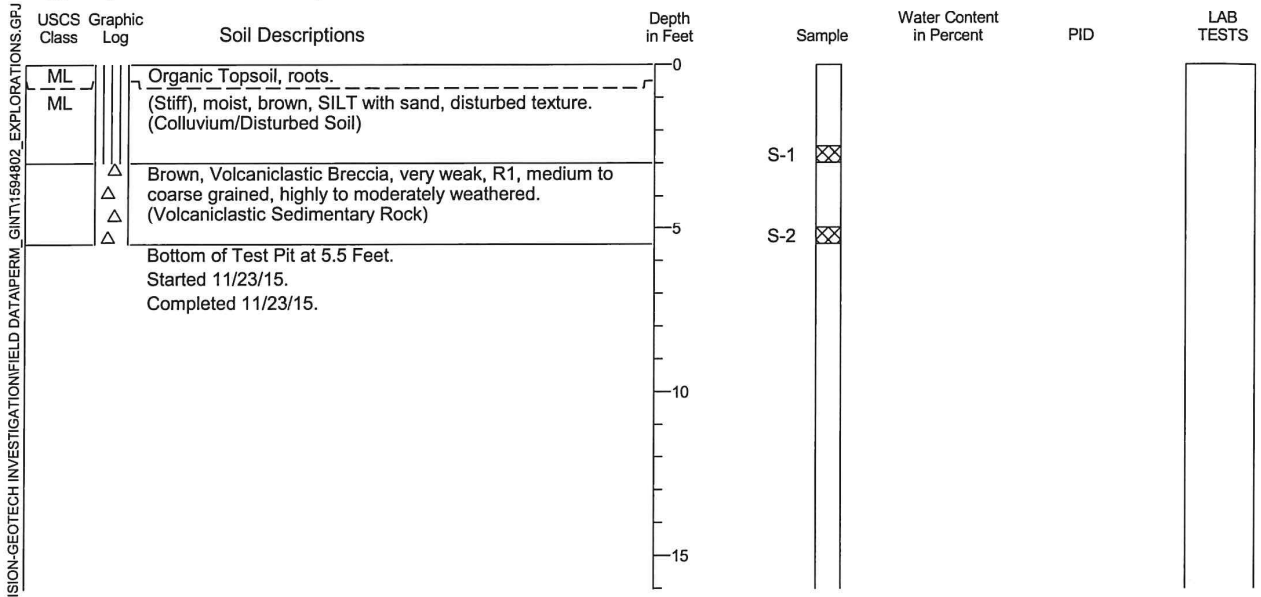
Figure A-3

Test Pit Log TP-3

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

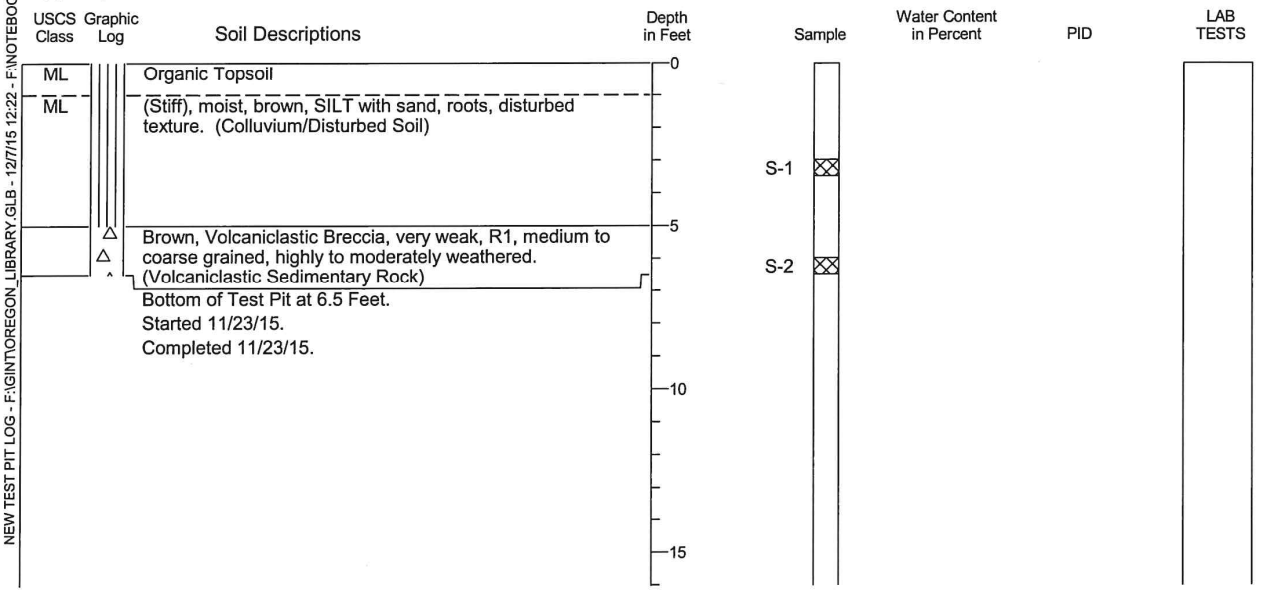
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-4

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-4

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 12/7/15 12:22 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-5

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
ML		Organic Topsoil, roots, dark brown.	0				
SM		(Loose), moist, brown to dark brown, silty SAND, roots, weathered residual soil fragments in fine-grained matrix. (Colluvium/Disturbed Soil)					
CL		(Medium stiff), moist, brown, LEAN CLAY with sand.		S-1			
			5				
SM		(Loose), moist, brown, silty SAND with hard gravel-sized clasts of subangular to subrounded volcaniclastic fragments, relict rock texture. (Residual Soil)		S-2			
			10	S-3			
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)		S-4			
			15				

Bottom of Test Pit at 13.5 Feet.
Started 11/23/15.
Completed 11/23/15.
Completed due to refusal.

Test Pit Log TP-6

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM/ML		(Loose to medium stiff), dark brown, moist, silty SAND to sandy SILT, roots.	0				
ML		(Medium stiff), moist, brown, SILT with sand, small roots, disturbed texture. (Colluvium/Disturbed Soil)					
		Abundant roots and rootlets from 3.0 to 4.0 feet.		S-1			
SM		(Medium dense to dense), moist, light brown to brown, silty SAND, relict rock texture. (Residual Soil)	5	S-2			
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)		S-3			
			10				
			15				

Bottom of Test Pit at 9.5 Feet.
Started 11/23/15.
Completed 11/23/15.
Completed due to refusal.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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15948-02 12/15

Figure A-5

NEW TEST PIT LOG - F:\GINTOREGON_LIBRARY.GLB - 12/7/15 12:22 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-7

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM/ML		Organic Topsoil, roots.	0				
GM		(Loose), moist, brown, GRAVEL with silt and sand. (Colluvium)		S-1			
		Gray, Basaltic Andesite, moderately strong, R3, moderately to slightly weathered. (Basaltic Andesite of Elkhorn Mountain)		S-2			
		Bottom of Test Pit at 3.5 Feet.	5				
		Started 11/23/15.					
		Completed 11/23/15.	10				
		Completed due to refusal.					
			15				

Test Pit Log TP-8

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM/ML		Organic Topsoil, roots, dark brown.	0				
SM		(Loose), moist, brown, sandy SILT with angular to subangular gravel and cobbles. (Colluvium)		S-1			
		Gray, Basaltic Andesite, moderately strong, R3, moderately to slightly weathered. (Basaltic Andesite of Elkhorn Mountain)		S-2			
		Bottom of Test Pit at 3.5 Feet.	5				
		Started 11/23/15.					
		Completed 11/23/15.	10				
		Completed due to refusal.					
			15				

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
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15948-02 12/15

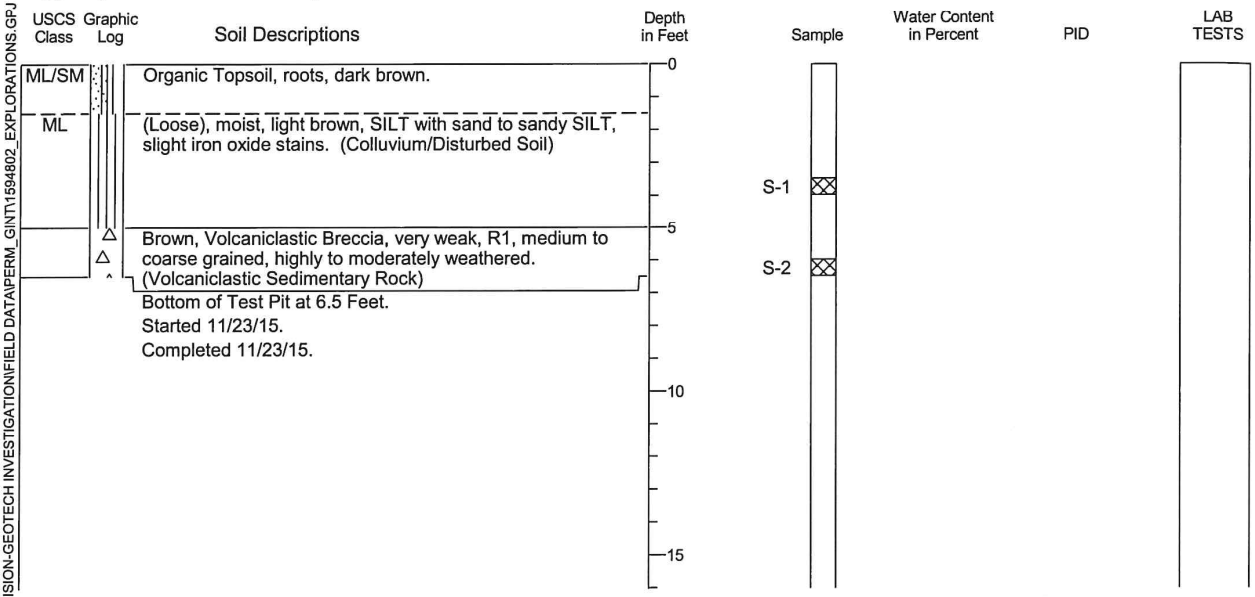
Figure A-6

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 12/7/15 12:22 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-9

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



NEW TEST PIT LOG - F:\GINTOREGON_LIBRARY.GLB - 12/7/15 12:22 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

1. Refer to Figure A-1 for explanation of descriptions and symbols.
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Figure A-7

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DANIEL J. TRISLER STATE OF WASHINGTON 38279 REGISTERED PROFESSIONAL ENGINEER

State of Washington Engineering Geologist 3074 Licensed Geologist

Rachel Pirot

MEMORANDUM

DATE: December 7, 2015

TO: CJ Dens Lacamas I, LLC
Attention: Mr. Carl Lawson

FROM: Daniel J. Trisler, PE
Rachel Pirot, LG, LEG

RE: **Initial Site-Specific Evaluation of Geohazard Areas A and C**
Camas Subdivision – Leadbetter Road
Camas, Washington
15948-02

CC: Mackenzie – Brian Hollenback, Todd Johnson
HFI Consultants – Tim Halme-

Introduction

Hart Crowser, Inc. is pleased to submit this memorandum to CJ Dens Lacamas I, LLC, summarizing our evaluation of Geohazard Areas A and C at the proposed subdivision development along Leadbetter Road in Camas, Washington. The proposed subdivision is an undeveloped property on the northeast side of Leadbetter Road, north of Leadbetter Lake, as described in our Critical Areas Report – Update (CAR Update) for the development, dated March 19, 2013.

Two specific geohazard areas were identified and described in the CAR Update that required further site specific-evaluation: Geohazard Areas A and C. The purpose of this evaluation was to gather additional information and provide recommendations to help you assess the general economic feasibility of developing these two areas. Our specific scope of work was detailed in our contract change agreement with you, dated October 14, 2015, and generally included a geologic reconnaissance of the two areas, test pit explorations, an evaluation of the hazards based on our field work, and preparation of this memorandum summarizing our evaluation and recommendations.

The location of the site is shown on Figure 1. The locations of Geohazard Areas A and C and our recent test pit explorations are shown on Figure 2.

300 West 15th Street
Vancouver, Washington 98660-2927
Tel 360.448.4189
Fax 503.620.6918

Site Conditions

We conducted a geotechnical reconnaissance and completed test pits at the two sites on November 23, 2015. Our updated findings from these investigations are described in detail below.

Surface Conditions

Site conditions in the general area of Geohazard Areas A and C consist of a northwest-trending slope abutting the north side of Leadbetter Road with flat slopes on the south side of the road leading to Lacamas Lake. The overall gradient of the northwest-trending slope is moderate, but with locally variable landforms and resulting gradients that are gentle to steep. Elevations range from approximately 190 feet above mean sea level (MSL) at Leadbetter Road to 320 feet MSL at the top of the northwest-trending slope, above both geohazard areas. Although gradients are variable, landforms are generally well-weathered and without abrupt transitions or other features indicative of accelerated erosional processes or earth movement. Prior to current logging activities, the area was forested with a dense mostly coniferous second-growth stand of timber and the ground surface well-vegetated with native understory plants. Conditions at each area specifically are described separately below.

Geohazard Area A

Geohazard Area A consists of an arcuate-shaped landform extending perpendicular to the predominant southwest-facing slope. The feature includes a steeper arcuate upper slope and convex lower toe slope that could be interpreted as the headscarp and toe, respectively, of a landslide.

During our reconnaissance, we observed these and associated features. We noted that the slope of the potential headscarp is only minimally steeper than adjacent slopes and the landform is not well-formed. No exposed soil or ground cracks were observed within it. Slopes in the body of the landform were gentle, approximately 25 to 30 percent. No developed stream channels, seeps or springs were observed within or adjacent to the feature. The area has irregular topography and several trees were observed to have experienced wind throw. The root balls of these trees were exposed and shallow bedrock was observed entangled with the roots. Relatively flat benches cut across the slopes in this area and are interpreted as old logging roads. At the toe of the slope, the cut for Leadbetter Road exposes volcanic rock that holds a vertical face and appears in-place.

The area is heavily vegetated with conifer to approximately 12 to 24 inches in diameter. The conifer trees are straight-trunked except immediately adjacent to Leadbetter Road, where they lean and exhibit bowed trunks. The bowed and leaning conifers continue along Leadbetter Road throughout the area and are not limited to Geohazard Area A.

Geohazard Area C

Geohazard Area C is a complex and irregular landform divided into a lower portion ("Older Debris Flow") and an upper portion ("Recent Debris Flow"). The upper portion is a narrow swale that extends to a distinct break in the southwest-facing slope at about elevation 270 feet MSL. The lower portion is a broader fan with very gentle slopes on both sides of Leadbetter Road.

During our reconnaissance we traversed up the upper portion and found it to consist of a saddle or swale in the otherwise continuous ridgetop. The saddle was slightly arcuate but landforms appeared mature and slopes were 25 to 35 percent. The upper portion of the saddle opened up to flat ground above, and no potential source area for past or future debris flows was observed. The ridgetop was weathered and rounded with gentle slopes and subdued features. The previously mapped geohazard area had a grade of approximately 25 percent in the upper slopes, which flattened to 10 to 20 percent downhill. The lower portion of the slopes were dominated by a wide, relatively flat bench with gentle undulating hummocks. No seeps or springs were observed, and no streams or erosive process at the toe of the slope of deposits were observed. No outcrops exposed bedrock geology directly within Geohazard Area C.

The lower portion of Geohazard Area C was thickly wooded with straight trunked conifers while the upper portion was characterized by a lack of mature conifers and was primarily forested with deciduous trees. Conifer trees where present were predominately straight throughout the area. Timber age and type were generally consistent between Geohazard Area C and other areas of the site.

Subsurface Conditions

Our understanding of the subsurface conditions is based on research and information collected from our field explorations completed for this project. Our explorations consisted of nine test pits and four potholes. (Potholes were test pits that encountered bedrock at very shallow depth, and for which formal test pit logs were not created.) The locations of the explorations are shown on Figure 2. Attachment A presents logs of the test pits. Samples of the soils were collected during the explorations for potential future laboratory testing, though no laboratory testing was conducted as part of this current scope of work.

Soil and Bedrock

Geohazard Area A

The bedrock geology at Geohazard Area A was interpreted to be Basaltic Andesite of Elkhorn Mountain, as discussed in our March 19, 2013 CAR Update. Test pits TP-7 and TP-8 and two additional potholes in this area exposed moderately strong bedrock at 2 to 4 feet below ground surface (bgs). In place jointing of the basaltic andesite was observed in the test pit walls. The overlying material encountered was colluvial gravel, cobbles, and silt. Two additional potholes adjacent to Geohazard Area A encountered a

thin (1 to 3 feet) veneer of colluvium over what appeared to be in-place basaltic andesite. We observed no definitive signs of past landsliding or slope movement within the materials exposed in the test pits and pot holes.

Geohazard Area C

Our test pits in Geohazard Area C encountered fine-grained silty soils over sandy residual soil which transitioned into Volcaniclastic Sedimentary bedrock. The surficial silty soil had a disturbed texture, although we observed no definitive signs of disturbance from landsliding (e.g., slickensides, etc.). In place bedding structures were observed in the residual soil and bedrock. Our test pits in this area encountered bedrock at between 3 and 13 feet bgs.

Groundwater

Groundwater and signs of groundwater (e.g., mottling, etc.) were not encountered in our test pits. Based on the previous Level 1 Hydrogeologic Assessment, dated March 19, 2013, depth to the regional groundwater level is expected to vary from approximately 50 to 100 feet bgs. However, we anticipate that locally perched groundwater will be encountered above the bedrock materials encountered at the site.

Conclusions

Based on our geotechnical reconnaissance and limited subsurface investigation it is our opinion that Geohazard Areas A and C do not present geologic hazards to the project that cannot be reasonably mitigated. We did not observe surface or subsurface signs of active landsliding and the potential for future landsliding in these areas appears low. It is our opinion, based on the observed surface and subsurface conditions, that future development of these areas is feasible with limited mitigation measures, which can be finalized during final design. Therefore, immediate logging of these areas is acceptable, as they can be included within the overall subdivision development.

Slopes across the site and within the previously mapped geohazard areas are gentle with weathered landforms and subdued topographic expression. No significant source areas or geomorphic processes, such as stream erosion or rapid downcutting, were observed that might cause slope movement in either area. Timber age and type are consistent across the site without significant differences within the geohazard areas. Bowed and tilted conifer trees were only observed adjacent the full length of Leadbetter Road, and therefore, suggest the cause of the bowing and tilting is related to the roadway, not slope movement from landsliding.

In Geohazard Area A, shallow bedrock was encountered in the test pits and previously mapped adjacent outcrops also indicate shallow bedrock depths. Bedrock was also exposed in the root balls of wind thrown trees. The hummocky features observed are likely due to wind throw of trees in shallow soils

and grading of old logging roads across the area. It is our opinion, based on the observed features and shallow bedrock encountered in our explorations, that the landform mapped as Geohazard Area A was not formed by a landslide, but the result of bedrock geologic conditions and normal weathering processes. In our opinion Geohazard Area A can henceforth be considered similarly with the rest of the development and specific mitigation for geohazards is not needed in this area. This area is suitable for future development, provided that the recommendations outlined below are followed.

In Geohazard Area C, the disturbed soil and fan morphology observed on site are likely the result of very old debris flows and/or colluvial processes. However, slopes in this area have been extensively modified by weathering since those processes were active. Landforms within the mapped Geohazard Area C exhibit very weathered and rounded topography with gentle slopes. Active driving processes for slope movement, such as streams or erosion at the toe of the deposit, were absent. No obvious source areas were observed for future debris flows. Additionally no discrete failure zone was identifiable in the test pits. Currently conditions to result in debris flows and landsliding appear to be low. This area is suitable for future development, provided that the recommendations outlined below are followed.

Based on our observations and evaluation, it is our opinion that the proposed development is feasible in both Geohazard Areas A and C. Development in these areas in accordance with the *Preliminary Recommendations* section of this memorandum should not adversely affect the stability of the site or neighboring properties. Final design should include additional evaluation and final recommendations related to these areas.

Preliminary Recommendations

As outlined in the CAR Update, general hillside development guidelines should be followed during the design and construction stages. Final geotechnical design recommendations will be developed at the time a full geotechnical investigation is completed. However, a summary of the anticipated general guidelines is provided below.

- Hillside grading methodologies shall be employed for earthwork in all sloping areas, including previously mapped Geohazard Areas A and C. This will likely include keys and benches, installation of sub drains where seepage is encountered, and installation of all material as a compacted structural fill. Limits on fill depths may also be necessary in some areas.
- A detailed erosion and sediment control plan will be required as part of the proposed development.
- In general, we anticipate that homes will be supported by conventional spread footings. However, homes near existing or new steep slopes may require the use of deepened footings, drilled piers, or larger slope setbacks.

- We recommend against the use of infiltration systems for disposal of stormwater from the site. Foundation subdrains may be required around homes to reduce the potential for water seepage in crawlspace areas.

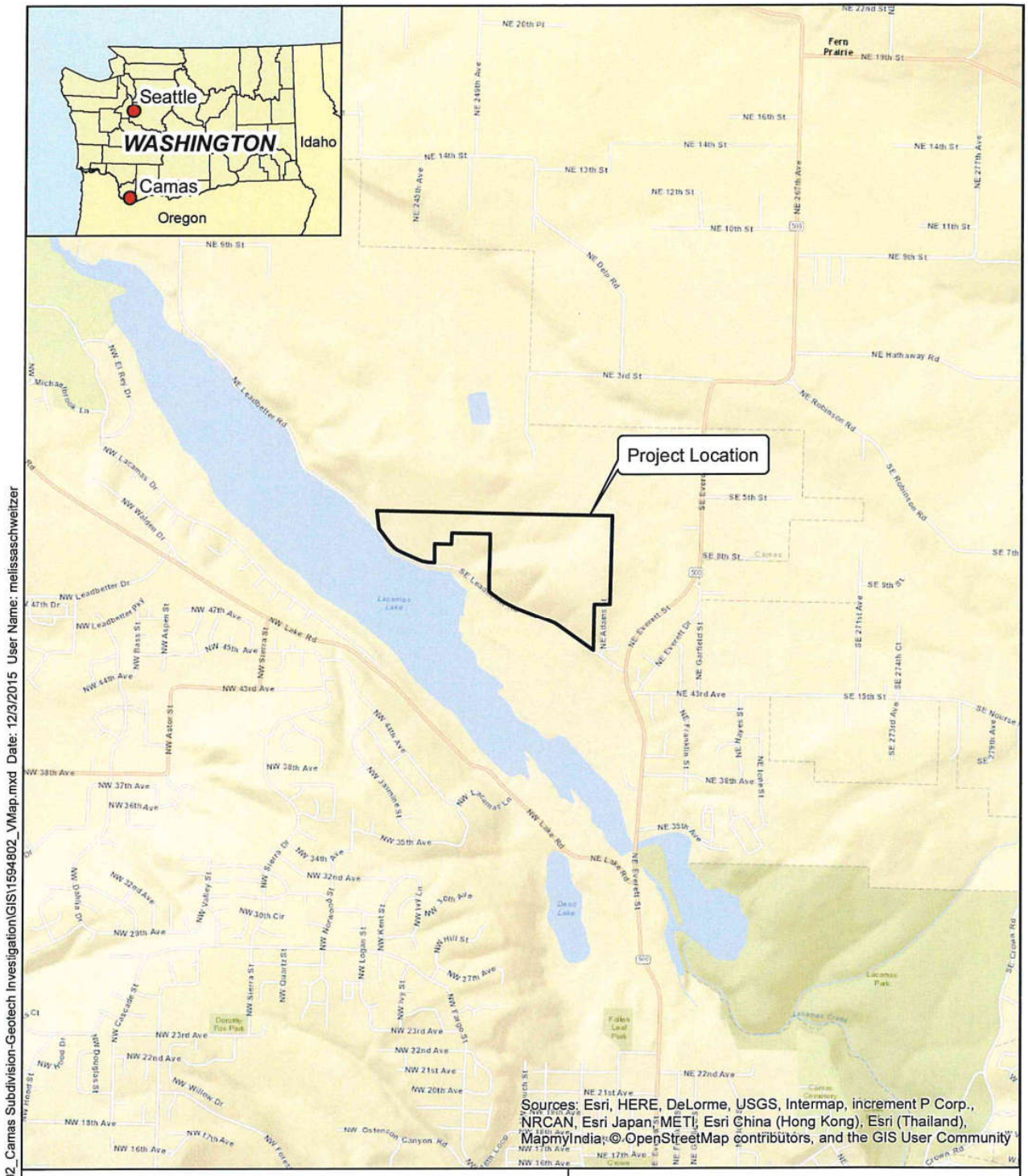
Limitations

We have prepared this memorandum for the exclusive use of CJ Dens Lacamas I, LLC and their authorized agents for this specific site. The scope of our work was in general accordance with our agreement dated October 14, 2015, and is limited to providing the information requested. Our evaluation and conclusions are based on our interpretation of observed site conditions. However, conditions can vary along the slope, and our conclusions should not be construed as a warranty or guarantee of future site performance. This memorandum should not be construed as providing design and construction recommendations for the proposed subdivision. Additional and more detailed geotechnical investigation should be performed before final design-level recommendations may be developed.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this memorandum was prepared. No warranty, express or implied, should be understood. Any electronic form, facsimile, or hard copy of the original document (email, text, table and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by Hart Crowser and will serve as the official document of record.

Attachments:
Figure 1 – Vicinity Map
Figure 2 – Exploration Plan
Test Pit Logs

F:\Notebooks\1594802_Camas Subdivision-Geotech Investigation\Deliverables\Memo-Geohazard Eval 12-07-15\Camas Subdivision Site-Specific Eval.docx



Document Path: F:\Notebooks\1594802_Camas Subdivision-Geotech Investigation\GIS\1594802_VMap.mxd Date: 12/3/2015 User Name: melissaschweitzer

Camas Subdivision
Camas, Washington

Vicinity Map

15948-02 12/15

HARTCROWSER

Figure
1

0
200
400
Approximate Scale in Feet
N
LEGEND
TP-1 Test Pit
Pothole
Gechazard Area
A
TP-7
TP-8
C
TP-1
TP-2
TP-3
TP-4
TP-5
TP-6
TP-9
DEERHAVEN SUBDIVISION (311-573)
N.E. ADAMS STREET
N.E. LADDIE LEE ROAD
N.E. 45th
Source: Overall Existing Conditions Plan, Sheet C2.1 from Group Mackenzie, dated 1/19/11.
Camas Subdivision
Camas, Washington
Exploration Plan
15948-02
12/15
HARTCROWSER
Figure
2

KEY TO EXPLORATION LOGS

HARTCROWSER

SOIL CLASSIFICATION CHART

MATERIAL TYPES	MAJOR DIVISIONS		GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	GW	WELL-GRADED GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES, >12% FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	SW	WELL-GRADED SAND
			SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	CL	LEAN CLAY
			ML	SILT
		ORGANIC	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	CH	FAT CLAY
			MH	ELASTIC SILT
		ORGANIC	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS			PT	PEAT

OTHER MATERIAL SYMBOLS

- Concrete
- Asphalt
- Topsoil

Note: Multiple symbols are used to indicate borderline or dual classifications

MOISTURE MODIFIERS

- Dry - Absence of moisture, dusty, dry to the touch
- Moist - Damp, but no visible water
- Wet - Visible free water or saturated, usually soil is obtained from below the water table

SEEPAGE MODIFIERS

- None -
- Slow - < 1 gpm
- Moderate - 1-3 gpm
- Heavy - > 3 gpm

CAVING MODIFIERS

- None -
- Minor - isolated
- Moderate - frequent
- Severe - general

MINOR CONSTITUENTS

- Trace - < 5% (silt/clay)
- Occasional - < 15% (sand/gravel)
- With - 5-15% (silt/clay) in sand or gravel
  15-30% (sand/gravel) in silt or clay

SAMPLE TYPES

- Dames & Moore
- Standard Penetration Test (SPT)
- Shelby Tube
- Bulk or Grab

LABORATORY/ FIELD TESTS

- ATT - Atterberg Limits
- CP - Laboratory Compaction Test
- CA - Chemical Analysis (Corrosivity)
- CN - Consolidation
- DD - Dry Density
- DS - Direct Shear
- HA - Hydrometer Analysis
- OC - Organic Content
- PP - Pocket Penetrometer (TSF)
- P200 - Percent Passing No. 200 Sieve
- SA - Sieve Analysis
- SW - Swell Test
- TV - Torvane Shear
- UC - Unconfined Compression

GROUNDWATER SYMBOLS

- Water Level (at time of drilling)
- Water Level (at end of drilling)
- Water Level (after drilling)

STRATIGRAPHIC CONTACT

- ——— Distinct contact between soil strata or geologic units
- – – – – Gradual or approximate change between soil strata or geologic units

Notes:

Blowcount (N) is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted) per ASTM D-1586. See exploration log for hammer weight and drop.

When the Dames & Moore (D&M) sampler was driven with a 140-pound hammer (denoted on logs as D+M 140), the field blow counts (N-value) shown on the logs have been reduced by 50% to approximate SPT N-values.

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

Refer to the report text and exploration logs for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the exploration locations at the time the explorations were made. The logs are not warranted to be representative of the subsurface conditoins at other locations or times.

KEY TO EXPLORATION LOGS - F:\GINT\OREGON_LIBRARY.GLB - 11/30/15 11:57 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Figure A-1

KEY TO BEDROCK TERMS (1 of 2)
(WSDOT, 2014)

HARTCROWSER
8910 SW Gemini Drive
Beaverton, Oregon 97008

Weathered State of Rock

Term	Description	Grade
Fresh	No visible signs of rock material weathering; perhaps slight discoloration in major discontinuity surfaces.	I
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering, and may be somewhat weaker externally than in its fresh condition.	II
Moderately Weathered	Less than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as a continuous framework or as corestones.	III
Highly Weathered	More than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as discontinuous framework or as corestone.	IV
Completely Weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.	V
Residual Soil	All rock material is converted to soil. The mass structure and material fabric is destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI

Relative Rock Strength

Grade	Description	Field Identification	Uniaxial Compressive Strength
R0	Extremely Weak	Indented by thumbnail.	0.04 to 0.15 ksi
R1	Very Weak	Specimen crumbles under sharp blow with point of geological hammer, and can be cut with a pocket knife.	0.15 to 3.6 ksi
R2	Moderately Weak	Shallow cuts or scrapes can be made in a specimen with a pocket knife. Geological hammer point indents deeply with firm blow.	3.6 to 7.3 ksi
R3	Moderately Strong	Specimen cannot be scraped or cut with a pocket knife, shallow indentation can be made under firm blows from a hammer point.	7.3 to 15 ksi
R4	Strong	Specimen breaks with one firm blow from the hammer end of a geological hammer.	15 to 29 ksi
R5	Very Strong	Specimen requires many blows of a geological hammer to break intact sample.	Greater than 29 ksi

Discontinuities

Discontinuity Spacing		Discontinuity Condition	
Description	Spacing	Condition	Description
Very Widely Spaced	Greater than 10 feet.	Excellent Condition	Very rough surfaces, no separation, hard discontinuity wall.
Widely Spaced	3 to 10 feet.	Good Condition	Slightly rough surfaces, separation less than 0.05 inches, hard discontinuity wall.
Moderately Spaced	1 to 3 feet.	Fair Condition	Slightly rough surface, separation greater than 0.05 inches, soft discontinuity wall.
Closely Spaced	2 to 12 inches	Poor Condition	Slickensided surfaces, or soft gouge less than 0.2 inches thick, or open discontinuities 0.05 to 0.2 inches.
Very Closely Spaced	Less than 2 inches	Very Poor Condition	Soft gouge greater than 0.2 inches, or open discontinuities greater than 0.2 inches.

Figure A-2

KEY TO BEDROCK TERMS (2 of 2)
(WSDOT, 2014)

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Grain Size

Grain Size	Description	Criteria
Less than 0.04 inches	Fine grained	Few crystal boundaries/ grains distinguishable in the field or with a hand lens.
0.04 to 0.2 inches	Medium grained	Most crystal boundaries/ grains distinguishable with the aid of a hand lens.
Greater than 0.2 inches	Coarse grained	Most crystal boundaries/ grains distinguishable with the naked eye.

Igneous Rock Textures

Texture	Grain Size
Pegmatitic	Very large; diameters greater than 0.8 in.
Phaneritic	Can be seen with the naked eye
Porphyritic	Grained of two widely different sizes
Aphanitic	Cannot be seen with the naked eye
Glassy	No grains present

Pyroclastic Rocks

Rock Name	Characteristics
Pyroclastic Breccia	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which *angular* pyroclasts predominate.
Agglomerate	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which *rounded* pyroclasts predominate.
Lapilli Tuff	Pyroclastic rock whose average pyroclast size is 0.08 to 2.5 inches.
Ash Tuff	Pyroclastic rock whose average pyroclast size is less than 0.08 inches.

Degree of Vesicularity

Designation	Percentage of Cavities (by volume) of Total Sample
Slightly Vesicular	5 to 10 Percent
Moderately Vesicular	10 to 25 Percent
Highly Vesicular	25 to 50 Percent
Scoriaceous	Greater than 50 Percent

OTHER TERMS:

Core Recover (CR) = the ratio of core recovered to the core run length expressed as a percentage.

Rock Quality Designation (RQD) = the percentage of rock core recovered in intact pieces of 4 inches or more in length in the length of a core run. Does not include mechanical breaks caused by drilling.

Fracture Frequency (FF) = the number of natural fractures per foot in the length of core recovered.

REFERENCE:

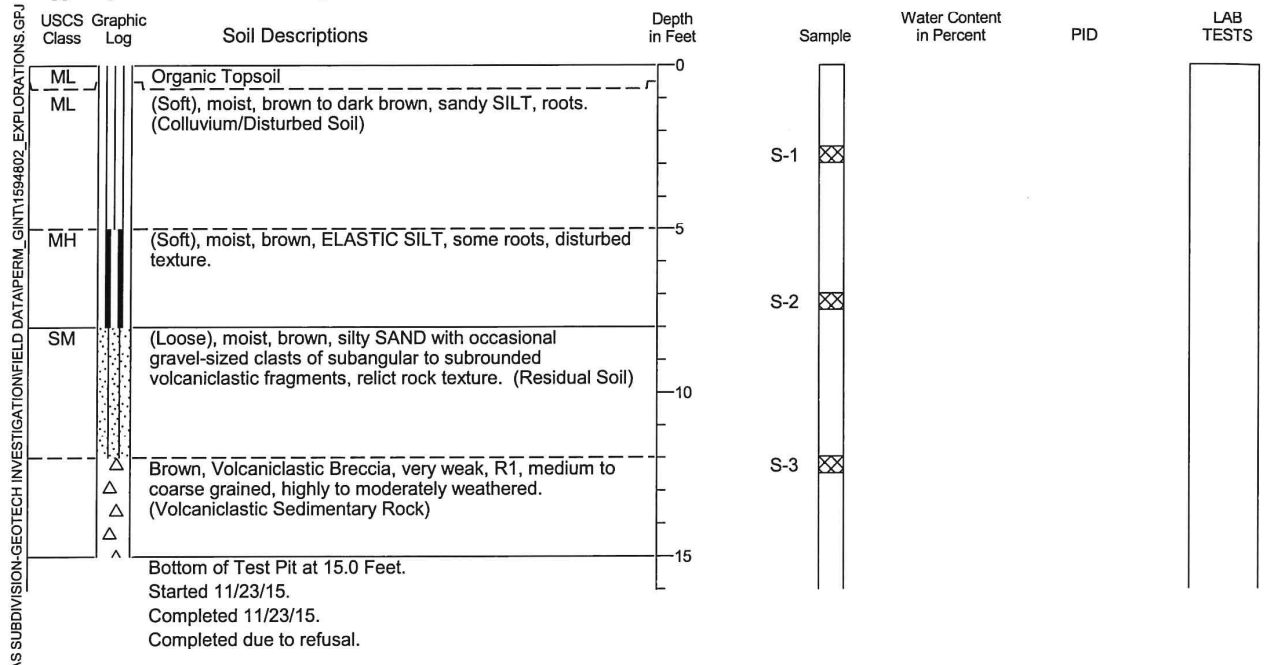
Washington State Department of Transportation (WSDOT), 2014. *Geotechnical Design Manual*, Publication M 46-03.02, August, 2014.

Figure A-2

Test Pit Log TP-1

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

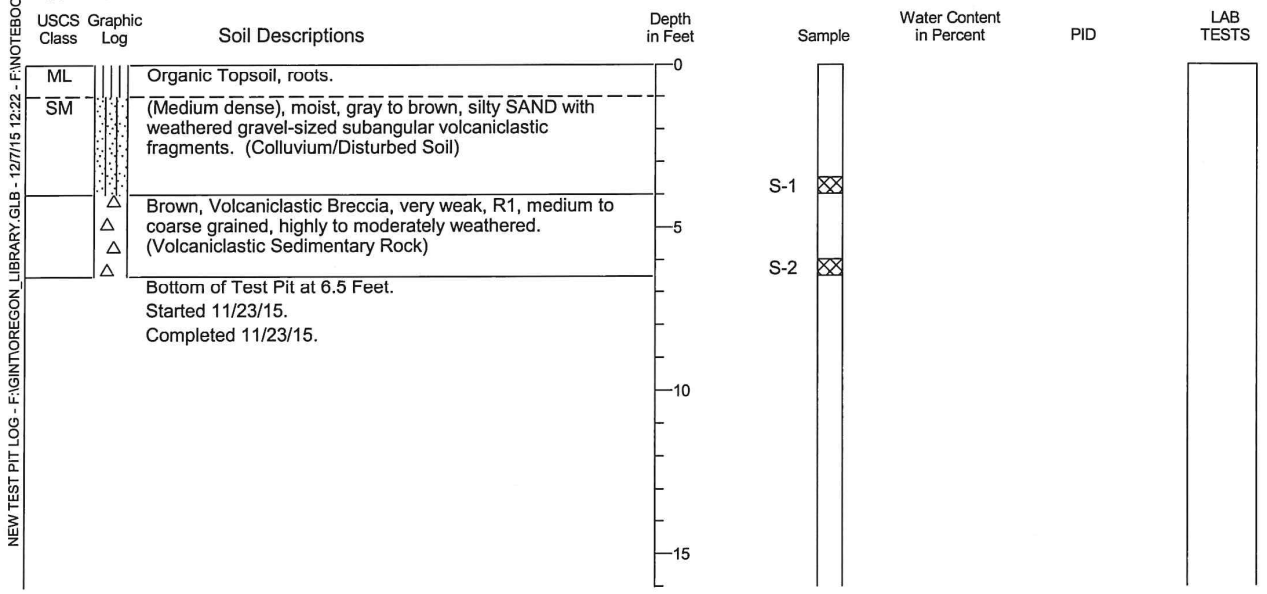
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-2

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



NEW TEST PIT LOG - F:\GINTOREGON_LIBRARY.GLB - 12/7/15 12:22 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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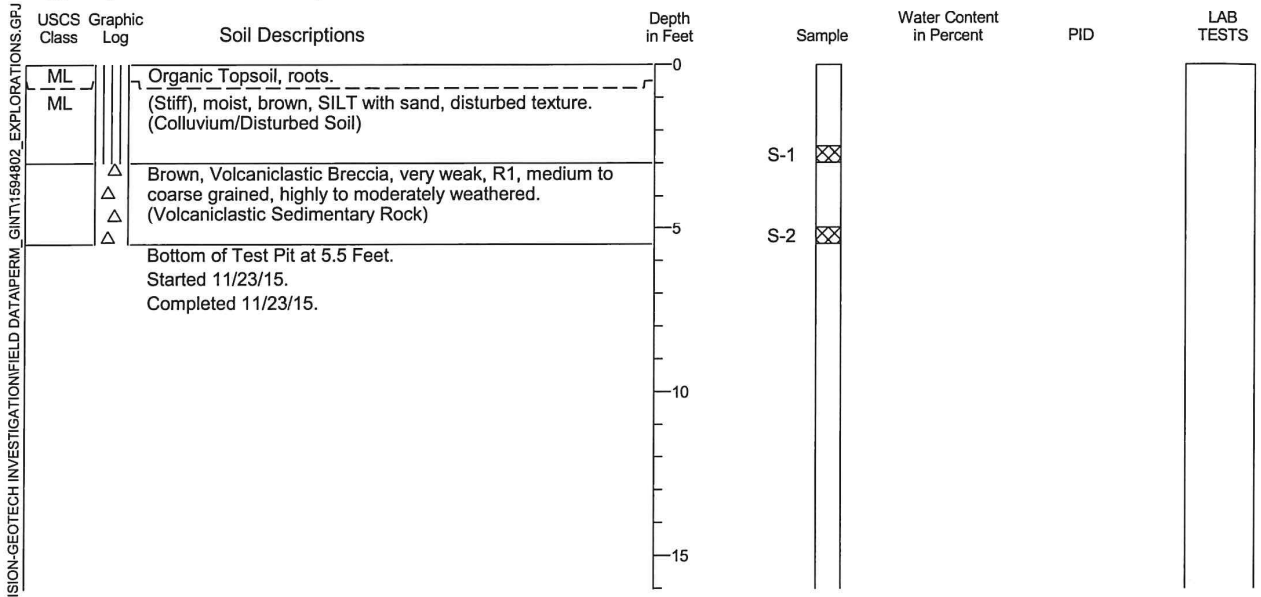
15948-02 12/15

Figure A-3

Test Pit Log TP-3

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

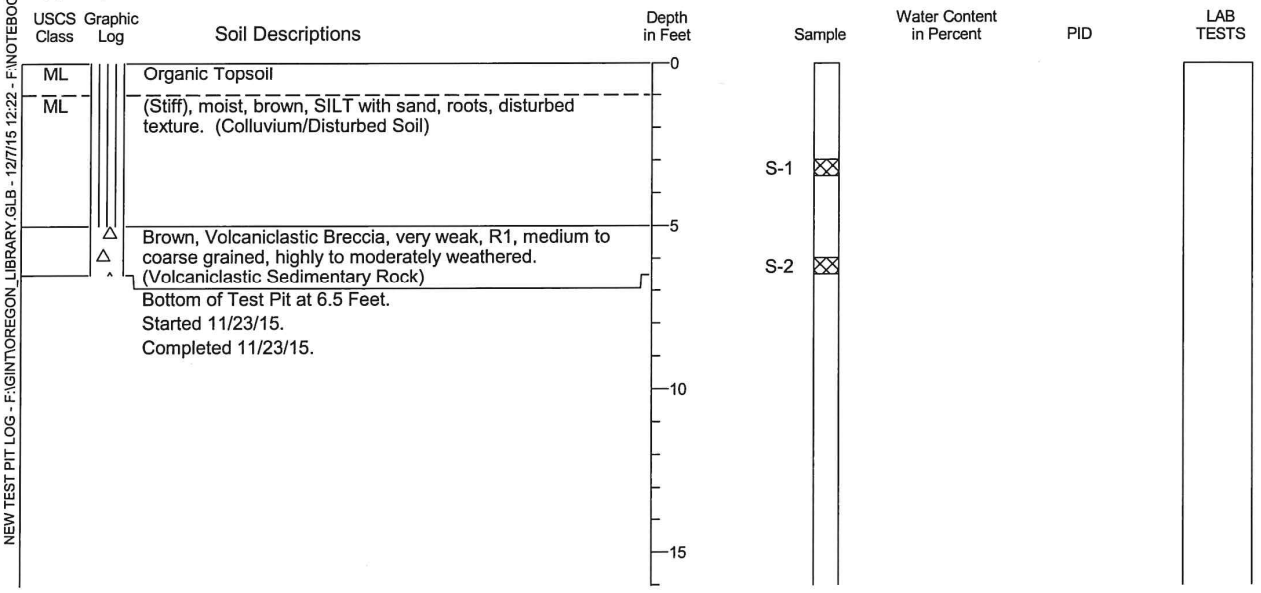
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-4

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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15948-02 12/15

Figure A-4

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 12/7/15 12:22 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-5

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
ML		Organic Topsoil, roots, dark brown.	0				
SM		(Loose), moist, brown to dark brown, silty SAND, roots, weathered residual soil fragments in fine-grained matrix. (Colluvium/Disturbed Soil)					
CL		(Medium stiff), moist, brown, LEAN CLAY with sand.		S-1			
			5				
SM		(Loose), moist, brown, silty SAND with hard gravel-sized clasts of subangular to subrounded volcaniclastic fragments, relict rock texture. (Residual Soil)		S-2			
			10	S-3			
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)		S-4			
			15				

Bottom of Test Pit at 13.5 Feet.
Started 11/23/15.
Completed 11/23/15.
Completed due to refusal.

Test Pit Log TP-6

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM/ML		(Loose to medium stiff), dark brown, moist, silty SAND to sandy SILT, roots.	0				
ML		(Medium stiff), moist, brown, SILT with sand, small roots, disturbed texture. (Colluvium/Disturbed Soil)					
		Abundant roots and rootlets from 3.0 to 4.0 feet.		S-1			
SM		(Medium dense to dense), moist, light brown to brown, silty SAND, relict rock texture. (Residual Soil)	5	S-2			
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)		S-3			
			10				
			15				

Bottom of Test Pit at 9.5 Feet.
Started 11/23/15.
Completed 11/23/15.
Completed due to refusal.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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15948-02 12/15

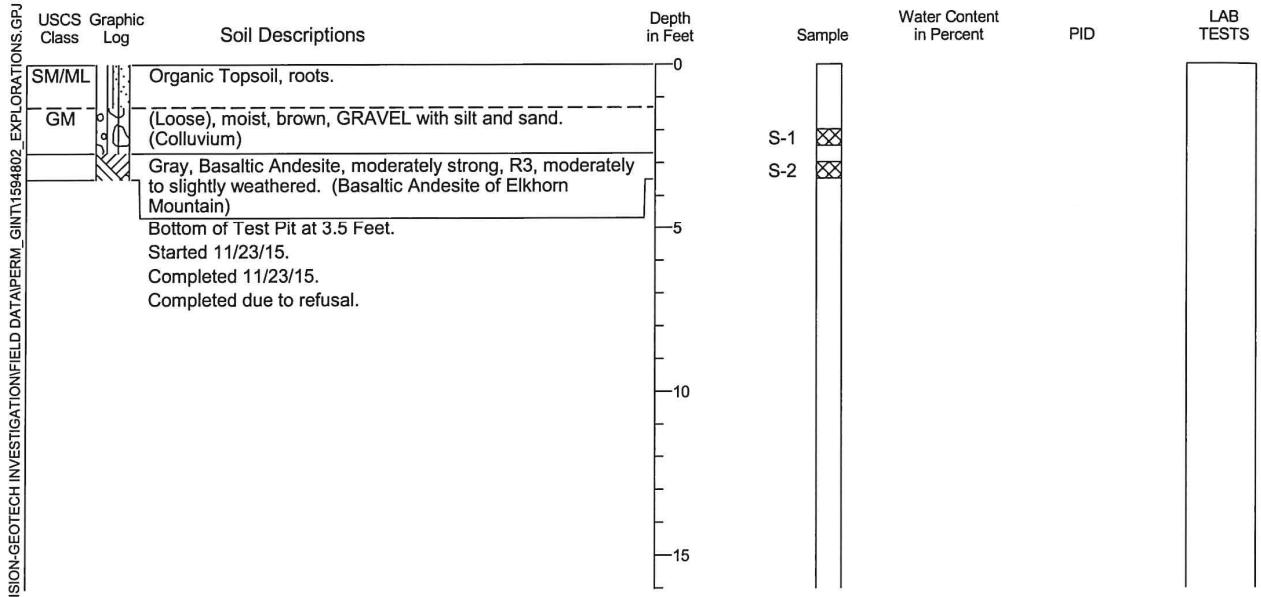
Figure A-5

NEW TEST PIT LOG - F:\GINTOREGON_LIBRARY.GLB - 12/7/15 12:22 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-7

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

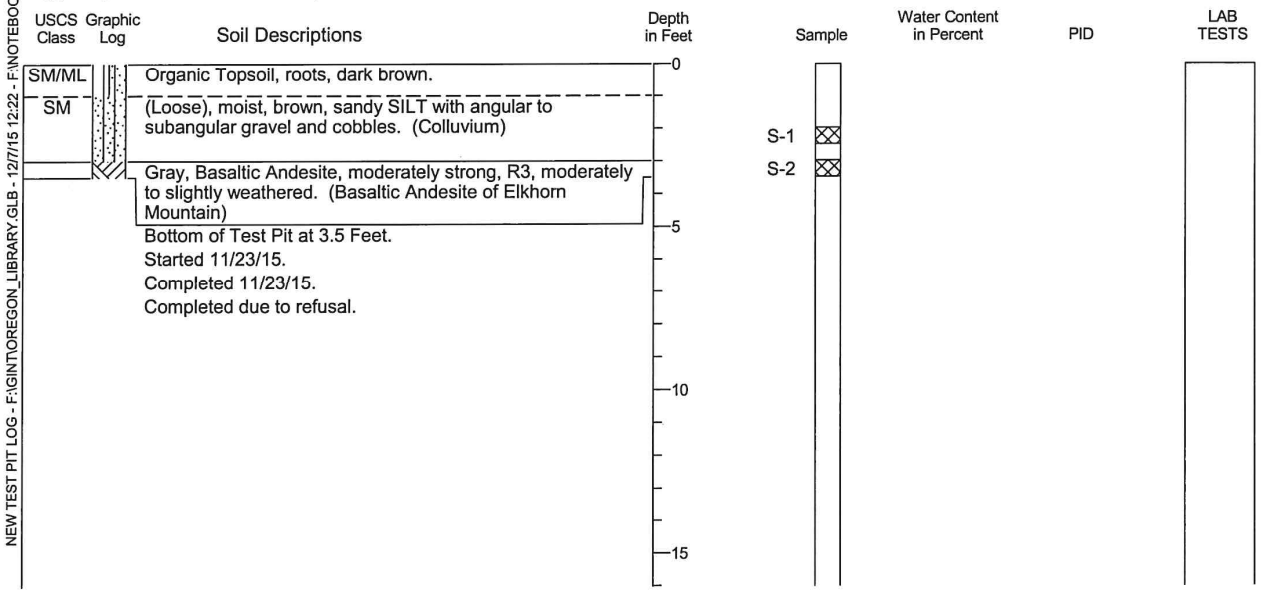
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-8

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 12/7/15 12:22 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

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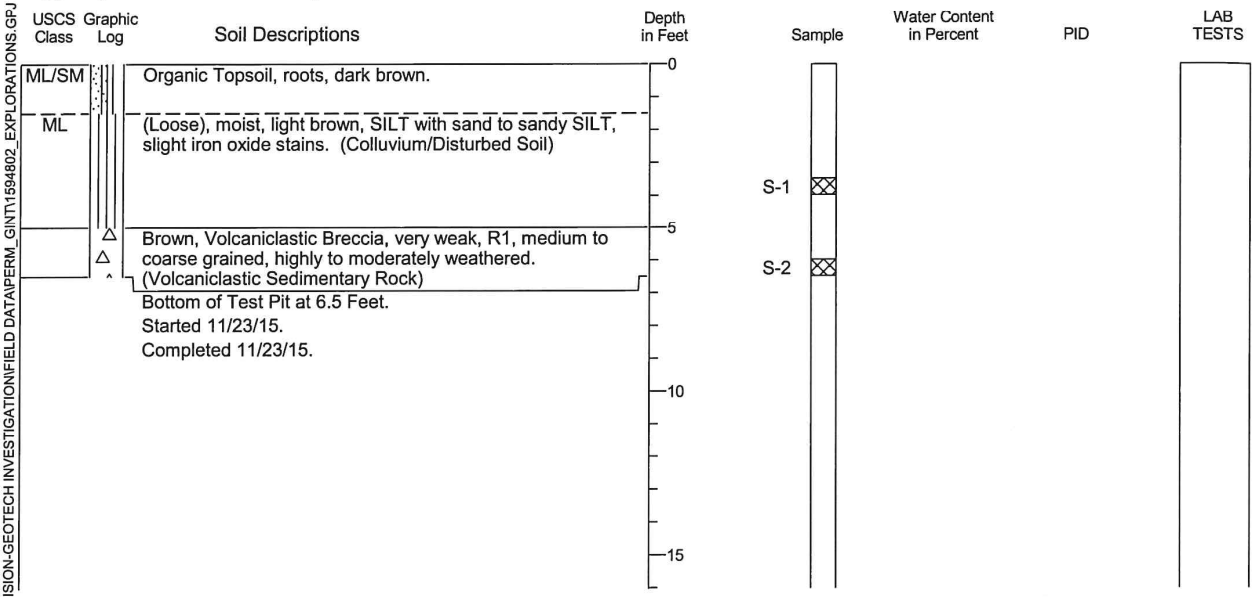
15948-02 12/15

Figure A-6

Test Pit Log TP-9

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



NEW TEST PIT LOG - F:\GINTOREGON_LIBRARY.GLB - 12/7/15 12:22 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

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15948-02 12/15

Figure A-7

2411 Southeast 8th Avenue ● Camas ● WA 98607
Phone: 360-567-1806 ● Fax: 360-253-8624
www.earth-engineers.com

March 9, 2021

City of Camas
Community Development Department
616 Northeast 4th Avenue
Camas, Washington 98607
Attention: Lauren Hollenbeck

Phone: 360-817-7253
E-mail: rmaul@cityofcamas.us

Subject: **Geotechnical Peer Review**
Proposed CJ Dens East Residential Subdivision
Southeast Leadbetter Road
Camas, Clark County, Washington
EEI Report No. 21-028-1

Dear Ms. Hollenbeck:

Per your request, **Earth Engineers, Inc. (EEI)** has completed a geotechnical review for the project referenced above. Our services for this project are being conducted in accordance with EEI Proposal No. 20-P038 dated February 6, 2020, which was authorized by Robert Maul on February 7, 2020.

PROJECT BACKGROUND INFORMATION

Our understanding of the project is based on the following information that you provided to us.

- **March 19, 2013 report by Hart Crowser titled "Critical Areas Report – Update, Proposed Camas Subdivision, Leadbetter Road, Camas, Washington, 15948-01 (Task 01)."**
- **December 7, 2015 report by Hart Crowser titled "Initial Site-Specific Evaluation of Geohazard Areas A and C, Camas Subdivision – Leadbetter Road, Camas, Washington, 15948-02."**
- **July 6, 2016 report by Hart Crowser titled "Report of Geotechnical Engineering Services, CJ Dens Subdivision, Camas, Washington."**

- **November 23, 2020 report by Hart Crowser titled "Geotechnical Report Addendum #1 – Supplemental Design Support, CJ Dens East Subdivision – Leadbetter Road, Camas, Washington."** This report clarifies that only the lots on the east side of the property are included now.

- **November 24, 2020 drawings by AKS titled "CJ Dens Subdivision, CJ Dens Lacamas II LLC, Camas, Washington."** The drawings are marked "preliminary not for construction."

Briefly, we understand that the current project consists of constructing a residential subdivision consisting of 152 single family residential lots on the 49.62 acre property. Hart Crowser has been retained by CJ Dens Lacamas I, LLC to act as the Geotechnical Engineer of Record for the project and has completed the relevant geotechnical reports, which have been submitted to the City of Camas and forwarded to us for review.

PURPOSE AND SCOPE OF SERVICES

The purpose of our geotechnical review was to assess the geotechnical report provided to us and provide our professional opinion on whether the report (1) meets the geotechnical engineering standard of care, and (2) meets Camas Municipal Code (CMC) Chapter 16.59.060—Critical Area Report Requirements for Geologically Hazardous Areas.

REVIEW COMMENTS

After reviewing the geotechnical reports and drawings referenced above, we offer the following comments:

1. The reports addressed in detail the following geologic hazards: erosion hazard, landslide hazard, and seismic hazard. Significant focus was put on landslide hazard, which was warranted in our opinion, given the slopes present on the property.

2. Hart Crowser performed in excess of 100 geotechnical subsurface explorations (test pits). In our opinion, Hart Crowser made an exceptional effort to thoroughly define the subsurface conditions across the site. The test pits generally encountered shallow bedrock, which generally mitigates the concern for slope instability hazard. In the limited areas where shallow bedrock was not encountered, either the slopes were gentle, or Hart Crowser recommended footings be deepened to establish a 10-foot minimum horizontal setback from the face of slopes.

With regard to general compliance with Camas Municipal Code (CMC) 16.59.060 and general geotechnical engineering standard of care, it is our professional opinion that the geotechnical reports provided to us do satisfy the intent of the code section and geotechnical standard of care.

As a condition of approval, we recommend that Hart Crowser be required to perform geotechnical construction inspection. Hart Crowser has been involved in this project for at least 8 years and has issued multiple reports addressing the geologic hazards and their mitigation. It will be important that Hart Crowser continue their involvement in the project through the completion of construction for continuity's sake.

The only other condition of approval that we recommend is to require that the project development follow the recommendations of Hart Crowser's July 6, 2016 and November 23, 2020 reports.

LIMITATIONS

This report has been prepared for the exclusive use of the City of Camas for the specific application to the proposed CJ Dens East Subdivision on Southeast Leadbetter Road in Camas, Washington. EEI does not authorize the use of the advice herein nor the reliance upon the report by third parties without prior written authorization by EEI.

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

We appreciate the opportunity to perform this geotechnical engineering evaluation. If you have any questions pertaining to this report, or if we may be of further service, please contact Troy Hull at 360-567-1806 (office) or 360-903-2784 (cell).

Sincerely,
Earth Engineers, Inc.

Troy Hull, P.E
Principal Geotechnical Engineer

Reviewed by:

Daniel Watkins, P.E.
Senior Geotechnical Engineer

CJ Dens Subdivision
Preliminary Tree Report

Date: May 2021

Prepared For:
Carl Lawson
CJ Dens Lacamas II, LLC
PO Box 2239
Kalama, Washington 98625

Prepared By: Bryce Hanson, Certified Arborist

Site Information:
715 SE Leadbetter Road
Camas, WA 98607
Parcel #'s 178236-000, 178172-000, 177906-000

AKS ENGINEERING & FORESTRY
9600 NE 126th Avenue, Suite 2520
Vancouver, WA 98682
(360) 882-0419

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General Site Notes 1
On-Site Tree Condition 1
Off-Site Trees 1
Tree Density Calculations 2
Designing for Tree Preservation 2
Windthrow Potential 5
Soils 5
Tree Protection Plan 5
Planting Plan 5
Hazard Assessment 5
Conclusion 6

Technical Appendices

Appendix A: Detailed Tree Inventory Table
Appendix B: Tree Preservation and Removal Plan
Appendix C: Tree Planting Plan

Tables

Table 1: Summary of Tree Units 2

Tree Report
CJ DENS SUBDIVISION
CAMAS, WASHINGTON

Location
The project site is located at 715 SE Leadbetter Road, (Parcel Serial No. 178236-000, 178172-000, 177906-000) in the City of Camas, Clark County, Washington.

General Site Notes
This Tree Plan consists of a written report with tree density calculations, Site Plan, Tree Protection Plan, and Landscape Plan.

This report is for the net developable area (43.90 net acres) of the proposed residential subdivision. The existing site consists of three parcels containing a stream-associated wetland area and numerous trees. The proposed development will result in 152 single-family residential lots with tracts set aside for wetland preservation, a stormwater facility and open space. Tree protection will be established at the beginning of development and be maintained through the entire length of the development. See Appendix A for additional information regarding the described trees in the detailed tree inventory table. The site consists of 408 trees over 6 inches in diameter. Only the trees existing near where the proposed development activities will occur have been inspected for this report, as the remainder are found in or immediately adjacent to the wetland area. Due to the planned site development and high potential for extensive root impacts, 113 on-site trees are proposed for removal. 295 on-site trees outside of the critical areas are planned for retention (72% of trees within the developable area are proposed for retention); however additional trees may need to be removed following construction activities for hazard abatement purposes.

On-Site Tree Condition
Based on the Detailed Tree Inventory Table (Appendix A), some on-site trees are recommended for removal. Preserved trees will require some pruning to remove dead branches and improve crown structure, and removal of competing vegetation to promote tree health. Site trees are primarily Douglas-fir, growing as a stand previously managed for timber production within the proposed Tract A. Other site trees exist along the boundaries of the site. Other species exist on-site and include Bigleaf Maple, Red Alder, and some Cherry. The health and structure of on-site trees range from poor to good based on conditions observed during the site visits on July 6- August 13, 2020. Tree removal was recommended based on location, root impact from development activities and higher likelihood of failure due to windthrow, as well as to enhance the health of trees selected for retention due to the high density of trees in the same location. Review of on-site trees was based on the site being fully developed and impacts to future site improvements.

Off-Site Trees
There are several off-site trees that are directly adjacent to the site. Most off-site trees should be minimally impacted based on the location of where development will happen. Some off-site trees appear along the site critical area within Tract S, along the eastern property boundary and the right-of-way along SE Leadbetter Road. Several trees along the city right-of-way are recommended for removal along a future pedestrian trail due to their poor condition, windthrow potential, and impacts created from construction of the trail. All remaining off-site trees will be protected with tree protection measures as further described in this report and on the Tree Preservation Plans (Appendix B).

Tree Density Calculations

The total site area is 49.62 acres, however the net area required to meet minimum tree density is 43.90 acres, which excludes the site critical area within Tract S. Per Chapter 18.13.051 of the City of Camas municipal code, the City requires 20 tree units per acre, or a total of 878 tree units (20*43.90 ac) for this site. Table 1 summarizes the tree units required, removed, retained, and proposed for the entire site. All trees, both retained and removed, are detailed on the Tree Preservation and Removal Plans found in Appendix B and in the Detailed Tree Inventory found in Appendix A. The proposed trees are detailed within the Tree Planting Plan in Appendix C.

	Net Site Area (Acres)	Tree Units Required	Tree Units Existing	Tree Units Removed	Tree Units Retained	Proposed Tree Units	Total Tree Units
Overall	43.90	878	1699	631	1068	397	1465

Table 1: Summary of Tree Units

Designing for Tree Preservation

Designing for tree preservation means that trees are considered an important project feature. The goal of tree preservation is to have trees remain safe assets to the site for years to come. Trees that are preserved must be carefully selected to make sure that they will survive the construction impacts, adapt to the new environment, and perform well in the new landscape. An assessment of suitability for preservation evaluates tree health, structure, age, and species factors. The consultant gathers information on the individual trees and makes recommendations as to which trees are suitable for preservation, and how much undisturbed space they will require. The consultant also provides specific guidelines regarding grading, drainage, trenching, protected areas, root pruning, etc.

Tree Characteristics and Their Suitability for Preservation:

Trees vary in their suitability for preservation both based on their inherent characteristics and their future response to construction impacts. Trees that are structurally unstable, in poor health, or are unlikely to survive construction impacts could be a dangerous liability to future neighborhoods. A good tree preservation plan will call for the pre-construction removal of trees likely to die or to become a tree with a higher than acceptable risk of failure after construction. The factors to be evaluated are:

Tree Health-Healthy, vigorous trees are more adaptable than non-vigorous trees to tolerate construction related stresses such as root removal, changes in grade, changes in soil moisture, and soil compaction. These healthy trees are also better able to adapt to the changed site conditions that occur after development.

Tree Structure-Trees with defects such as decayed wood, poor crown structure from past manual "topping" or natural broken tops, and co-dominant trunks with poor attachments are not suitable for preservation in areas where people or property could be injured or damaged. Such defects cannot be treated and may lead to failure.

Species-Although trees require protection to avoid injury, species vary widely in their ability to withstand damage and changes in their environment.

Tree Age-As a tree ages, its capacity to overcome injury, adapt to changes in its site environment, and to resist pests declines. For these reasons, mature and over-mature trees are less adaptable to tolerate construction impacts and remain assets than are young and semi-mature trees. Young vigorous trees are able to generate new tissue and adapt to a new environment better than old trees.

Tree Size/Height-Larger, taller trees are capable of hitting targets a greater distance away from the tree and cause greater damage. Taller trees also provide a larger wind "sail", catching more wind and being more prone to blowing down in a large storm. Coupling this "sail" effect with the structural weakening of root removal/disturbance can lead to a higher than acceptable windthrow risk.

Tree Location-The best candidates for preservation are single trees that developed as individual specimens, as they typically have uniform canopies and well tapered trunks. Trees that grow in groups do not function well as individuals. They often have tall, poorly shaped trunks, irregularly shaped crowns, and are prone to failure and decline when their neighbors are removed.

The arboricultural consultant weighs each of the above factors and makes recommendations as to which trees are likely to thrive and be a long-term asset to the new development, as well as recommendations to remove those trees that will likely have an unacceptable risk of failure and become a liability in the new development.

Guidelines for the Area Required to Preserve a Tree:
In order to preserve a tree, an area around that tree must be protected to ensure that the tree is not physically damaged and that the roots are protected. A method to calculate this area, utilizes the diameter at breast height (DBH), species, and age. The DBH is multiplied by a factor (the factor is based on the tree age and the species tolerance for disturbance) from 0.5 feet radius to 1.5 feet radius (from the trunk-often 1 foot radius per inch DBH is used for an average), and this area is called the "Optimal Tree Protection Zone". The general guidelines for preservation are that you do not want to disturb more than 1/3 of this area, but that with healthy vigorous trees, up to 50% of the area could be disturbed. In addition to these percentages, excavation should not take place within 10 feet of the base of a tree to avoid the loss of structural roots.

How to Preserve Trees During Construction:
The portion of the "Optimal Tree Protection Zone" that is being protected must be fenced off (with a "substantial" fence). Within this area, no soil disturbance, including stripping is permitted. The natural grade is to be maintained, and no storage or dumping of materials, parking, etc. will be allowed within this zone without the approval of the arboricultural consultant. This tree protection fence should remain in place through the construction of the dwellings.

Excavation Within the "Optimal Tree Protection Zone":
Where there is excavation proposed within an "Optimal Tree Protection Zone" (outside of the protected zone fenced off above), it will be important for the contractor to prune the roots along the excavation lines. These roots should be pruned in the following manner:

- Excavation in the top 24" of the soil in the critical root zone area should begin at the excavation line that is closest to the tree.
- The excavation should be done by hand/shovel or with a backhoe and a man with a shovel, pruning shears and a pruning saw.
- If done by hand all roots 1" or larger should be pruned at the excavation line.
- If done with a backhoe (most likely scenario) then the operator needs to start the cut at the excavation line and carefully "feel" for roots/resistance. When there is resistance, the man with the shovel hand digs around the roots and prunes the roots larger than 1" diameter.
- The backhoe is to remain off of the tree roots to be saved at all times.
- The work will be done under the supervision of the Project Consulting Arborist.

The above system works well and can be done quickly. The key is to avoid pulling on the roots larger than 1" diameter, potentially resulting in damage to roots between the excavation line and the tree.

How Trees Die:

Natural tree death is frequently a slow and complex process generally with a gradual decline involving a number of factors. Most trees die from one of three causes: (1) structural failure, (2) environmental degradation, or (3) pest infestation. Generally, trees die from a combination of factors. Trees weakened by changes in their environment (such as construction impacts) become more susceptible to infestation by disease and insects. Most individual trees survive for only a fraction of the potential lifespan of the species. Soil compaction, changes in grade, mechanical injury, changes in the environment around the tree, and changes in drainage may not kill the tree themselves, but they may weaken the tree to a point that death occurs by another cause. Prevention of stress and the maintenance of health are the key elements of tree longevity.

What is "Tree Topping" and How Does It Damage a Tree?

Tree Topping is a pruning technique to reduce the height by cutting the central leader. This method of pruning is very detrimental to trees and not considered a good practice. Trees are generally topped by unknowledgeable pruners in order to lower the height of the tree and minimize the chance of windthrow by reducing the tree's wind profile. The large stub of a topped tree has a difficult time forming callus over the wound. The terminal location of these cuts, as well as their large diameter, prevents the tree's chemically based natural defense system from doing its job. The stubs are highly vulnerable to both insect invasion and the spores of decay fungi. If decay is already present, topping will speed the spread of the disease. The tree reacts to the topping cut by producing multiple shoots below the cut. These shoots develop from buds near the surface of the topping cut. Unlike normal branches that develop in a socket of overlapping wood tissues, these new shoots are anchored only in the outermost layers of the bole. These new shoots grow quickly, and are prone to breaking, especially during windy conditions. For all of these reasons, trees that have been topped pose a danger to life and safety and are recommended for removal.

Development Impacts Affecting Preserved Trees:

Construction of the site improvements generally consists of cut and fills (grading), construction of retaining walls, trenching for the wet and dry utilities, coring of roads and placement of aggregate and pavement. During this work, adjacent soil areas outside of the grading can be compacted by heavy equipment driving over it. The grading and placement of utility trenches (and subsequent pipe bedding), and retaining walls can also affect the local water table.

Construction of the buildings and landscaping requires foundation placement, pruning of trees near the buildings under construction, and the installation of lawn irrigation systems. During this work, adjacent soil areas outside of the work area can be compacted by equipment driving over it.

Impacts during development may require the removal of additional trees shown to be preserved on the Tree Protection Plan (Appendix B).

Future Condition of Trees on the Site:

The characteristics of the individual tree are a guide to how well that tree will respond to site disturbance. Larger trees have correspondingly larger root zones. Older trees are less resilient to disturbance. Unhealthy trees are less resilient to disturbance than healthy trees.

Development of this site will result in a large area of disturbance. The disturbance to the on-site trees will occur during the site grading. The trees planned for retention are relatively healthy, but proper protection methods should be followed per this document to provide the greatest opportunity for survival following development.

Windthrow Potential

The trees on-site have been evaluated for windthrow based on factors including, but not limited to soil conditions, tree health, tree structure, prevailing wind direction, and past evidence of wind damage. Windthrow is defined as full tree failure in the form of trunk breakage or root ball overturning. It should be understood that proposed retained trees are still susceptible to partial tree failure from wind exposure. Refer to the tree inventory table in Appendix A for specific tree conditions at risk of single part failure and recommendations for risk reduction as well as a windthrow rating. A windthrow rating of A, B or C was assigned to each tree that was evaluated; with A being the least windthrow resistant, B being more windthrow resistant than A, and C being the most windthrow resistant. Since the edge of the stand has been changed to allow for development, trees along the new stand edge do not contain the same structural integrity and wind resistance as the existing trees did. The trees planned for retention have been selected because of their good taper, overall structure, health, and location to site impacts. Existing wind conditions of the site are relatively high with prevailing winds coming from the south and southwest. The windthrow potential of the site, post construction, should remain similar to the existing site conditions.

Soils

Soils on-site are comprised of Olympic Stony Clay Loam with slopes ranging from 3 to 30 percent and Vader Silt Loam with slopes ranging from 3 to 15 percent. These soils are described as very deep, well-drained soils per the USDA Natural Resources Conservation Service's Web Soil Survey. However, a geotechnical study performed on July 6, 2016, found that on-site conditions show the site is underlain with shallow bedrock. Trees growing in shallow soils generally exhibit shallow root growth and may be more susceptible to windthrow as a result. This is particularly true for Douglas-fir trees and is evidenced by the windthrown trees that have occurred following the timber harvest.

Tree Protection Plan

See the plans found in Appendix B.

Planting Plan

No trees are required for planting per the tree code on the site since the minimum 20 tree units per acre threshold has been satisfied. However, 336 street trees and 61 site trees are proposed to be planted to meet landscape requirements. If later determined necessary, Per Section 18.13.050 of Chapter 18 of the City of Camas Municipal Code, replacement trees shall optimize tree diversity by including a minimum of 60% native species and at least 50% evergreen. For this site, the required deciduous tree needs to be 2" or greater while a conifer tree needs to be a minimum of 5' tall. See Appendix C for the Tree Planting Plan.

Hazard Assessment

Hazard assessment of on-site trees was not performed for each tree during the initial arborist site assessment. However, general hazards may have been identified and reported in the Tree Inventory Table (Appendix A) as they were encountered during the site visit. Once development activities are complete, a hazard assessment is recommended on retained trees to review previously unseen defects or damages done to retained trees during land clearing and development activities. At that time, additional tree removal may be necessary for hazard abatement. If additional tree removal is necessary, an analysis will be submitted to the city to show that code will be met with any additional tree removal.

Conclusion

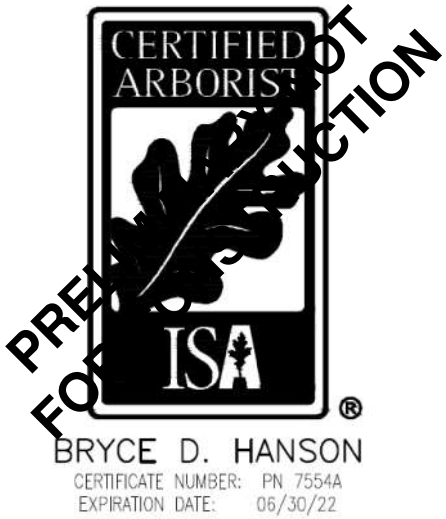
The development of the 43.90-acre site proposes to remove 113 on-site trees. Of the existing trees, 295 will be retained. 336 street trees and 61 site trees will be planted to meet landscape requirements. This tree report is only for the overall site development activities and tree protection measures outlined on the Tree Preservation Plan and for the protection of the existing trees from the overall proposed development. This does not include the construction of building foundations for each lot that may interfere with the proposed retained trees. This project reserves the right to remove additional trees, as deemed necessary/recommended by the Project Certified Arborist, for hazard abatement purposes. This cannot be evaluated until after construction as previously discussed and noted in the plans. The city will be notified of such removals and will be consulted with if a significant number of trees are recommended for removal post-construction.

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.



Appendix A: Detailed Tree Inventory Table

Detailed Tree Inventory for CJ Dens

AKS JOB NO. 5504 **Site Area = 43.90 acres**

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow	Reason for Removal	Tree Units Retained
11084	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, immediate risk to pump station, future trail	0
11085	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Unbalanced crown, broken branches, Poor live crown ratio	B		0
11086	34	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Unbalanced crown, broken branches, Poor live crown ratio	B		0
11087	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, some branch dieback	B		2
11088	11	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, Poor live crown ratio, broken branches	B		0
11089	13	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, Deformed bole	B		0
11090	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Codominant top with included bark, sparse canopy	B		0
11091	17	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, Unbalanced crown, some branch dieback	B		0
11092	8	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, Healthy	C		0
11093	12	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, Healthy	C		0
11094	20, 22	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, codominant base, deformed bole, lean, unbalanced crown	B		0
11096	12	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, dead	A		0
11097	10	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, Broken branches with decay, dead branches in crown	B		0
11098	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, dead	A		0
11099	13	Bigleaf Maple (*Acer macrophyllum*)	3	Bore holes, sluffing bark	B		3
11100	9	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11101	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Dead scaffold branches, sparse canopy	B		4
11102	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, broken top	A		0
11103	32	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, poor live crown ratio, branch dieback	B		0
11104	34	Douglas-fir (*Pseudotsuga menziesii*)	13	Some dead branches in crown	C		13
11105	28	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown, sweep	B		0
11106	12	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11107	22	Douglas-fir (*Pseudotsuga menziesii*)	7	Poor live crown ratio	B		7
11108	36	Douglas-fir (*Pseudotsuga menziesii*)	14	Healthy	C		14
11109	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown	B		6
11110	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown, dead branches in crown, crown cleaning recommended	B		6
11111	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, dead	A		0
11112	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11113	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown, poor live crown ratio	B		0
11114	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11115	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, suppressed, sparse canopy	B		0
11116	28	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11117	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11118	10	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11119	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Unbalanced crown	B		4
11120	21	Douglas-fir (*Pseudotsuga menziesii*)	7	Unbalanced crown	B		7
11121	8	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed	C		2
11122	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Sparse canopy, some branch dieback	B		4
11123	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy, some branch dieback	B		2
11124	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy, some branch dieback	B		2
11125	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Healthy	C		6
11127	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
11128	8	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, unbalanced crown	B		2
11129	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Dead branches in crown	C		5
11130	28	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11131	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown	B		6
11132	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Sparse canopy, some branch dieback	B		3
11133	22	Douglas-fir (*Pseudotsuga menziesii*)	7	Healthy	C		7
11134	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Healthy	C		4
11135	8,18	Douglas-fir (*Pseudotsuga menziesii*)	6	Codominant base	C		6
11137	18, 14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, codominant base, unbalanced crown	B		0
11139	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio	B		2
11140	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
11141	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, sparse canopy, some branch dieback	B		2
11142	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
11143	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, declining health	A		2
11144	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Healthy	C		3
11145	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, sparse canopy	B		2
11146	9	Douglas-fir (*Pseudotsuga menziesii*)	2	Deformed top	B		2
11147	8	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, sparse canopy, some branch dieback	B		2
11148	31	Douglas-fir (*Pseudotsuga menziesii*)	12	Healthy	C	Impacted by proposed path grading	0
11149	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11150	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Dead scaffold branches, crown cleaning recommended	B		2
11151	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11152	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11153	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11154	12	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11155	23	Douglas-fir (*Pseudotsuga menziesii*)	8	Poor live crown ratio	B		8
11156	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Unbalanced crown, epicormic sprouts	B		2
11157	24	Douglas-fir (*Pseudotsuga menziesii*)	8	Healthy	C		8
11158	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11159	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Several large conks up bole	A		0
11160	15	Bigleaf Maple (*Acer macrophyllum*)	4	Lean	B		4
11161	40	Douglas-fir (*Pseudotsuga menziesii*)	16	Some bore holes	C		16
11162	21	Douglas-fir (*Pseudotsuga menziesii*)	7	Healthy	C		7
11163	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, deformed top, some dead branches in crown	B		0
11164	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Lean, sweep	B		4
11165	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, numerous conks up bole, recommend removal of city owned tree	A		0
11166	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11167	7	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy	B		2
11168	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11169	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11170	28	Douglas-fir (*Pseudotsuga menziesii*)	10	Healthy	C		10
11171	12	Bigleaf Maple (*Acer macrophyllum*)	2	Cavity with decay in base	B		2
11172	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11173	42	Douglas-fir (*Pseudotsuga menziesii*)	17	Codominant top	B		17
11174	11	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, healthy	C		0
11175	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11176	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11177	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Healthy	C		3
11178	26	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, suppressed	B		0
11179	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11180	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11181	23	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11182	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11183	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, suppressed	B		0
11184	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, poor live crown ratio, unbalanced crown, dead branches in crown	B		0
11185	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, top lean, scars up bole	B		0
11186	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, dead branches in crown	C		0

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow	Reason for Removal	Tree Units Retained
11187	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11188	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11189	22	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11190	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11191	26	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11192	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11194	26	Douglas-fir (*Pseudotsuga menziesii*)	9	Large conks up bole, uneven canopy, poor live crown ratio	A		0
11195	8	Bigleaf Maple (*Acer macrophyllum*)	2	Lean	B		2
11196	36	Douglas-fir (*Pseudotsuga menziesii*)	14	Poor live crown ratio, bore holes	B		14
11197	24	Douglas-fir (*Pseudotsuga menziesii*)	8	Unbalanced crown	B		8
11198	22	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, lean, codominant top with included bark, deformed bole	B		0
11199	35	Douglas-fir (*Pseudotsuga menziesii*)	14	Unbalanced crown	B		14
11200	35	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown, Some branch dieback, bore holes	B		0
11201	22	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
11202	28	Douglas-fir (*Pseudotsuga menziesii*)	10	Poor live crown ratio, some dead branches in crown	B		10
11203	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, dead	A		0
11204	28	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11205	28	Douglas-fir (*Pseudotsuga menziesii*)	10	Poor live crown ratio, some dead branches in crown	B		10
11206	13	Bigleaf Maple (*Acer macrophyllum*)	3	Healthy	C		3
11207	8	Bigleaf Maple (*Acer macrophyllum*)	0	Dead	A		0
11208	36	Douglas-fir (*Pseudotsuga menziesii*)	14	Healthy	C		14
11209	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Healthy	C		3
11210	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11211	30	Douglas-fir (*Pseudotsuga menziesii*)	11	Poor live crown ratio	B		11
11212	20	Bigleaf Maple (*Acer macrophyllum*)	6	Deformed bole	B		6
11213	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown	B		6
11214	12	Bigleaf Maple (*Acer macrophyllum*)	2	Lean	B		2
11215	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Cavity with decay, some branch dieback	B		4
11216	41	Douglas-fir (*Pseudotsuga menziesii*)	17	Unbalanced crown	B		17
11217	28	Douglas-fir (*Pseudotsuga menziesii*)	10	Poor live crown ratio	B		10
11218	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Suppressed	C		5
11223	34	Douglas-fir (*Pseudotsuga menziesii*)	13	Healthy	C		13
11224	38	Douglas-fir (*Pseudotsuga menziesii*)	15	Healthy	C		15
11225	8	Douglas-fir (*Pseudotsuga menziesii*)	2	Sweep, codominant top	B		2
11226	6,7,10	Bigleaf Maple (*Acer macrophyllum*)	3	Dead codominant stems, scars, sparse canopy, branch dieback	B	Located within proposed road grading	0
11227	6	Bigleaf Maple (*Acer macrophyllum*)	2	Broken branches with decay, codominant top	B	Located within proposed road grading	0
11228	12	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C	Located within proposed road grading	0
11229	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Crooked bole, poor live crown ratio, branch dieback	B	Located within proposed road grading	0
11230	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy	B	Located within proposed road grading	0
11231	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Located within proposed road grading	0
11232	12	Bigleaf Maple (*Acer macrophyllum*)	2	Decaying foliage, sparse canopy	B	Located within proposed road grading	0
11233	9	Bigleaf Maple (*Acer macrophyllum*)	2	Lean (S)	B	Located within proposed road grading	0
11234	11	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C	Located within proposed road grading	0
11235	36	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C	Located within proposed road grading	0
11236	24	Douglas-fir (*Pseudotsuga menziesii*)	8	Healthy	C	Located within proposed road grading	0
11237	34	Douglas-fir (*Pseudotsuga menziesii*)	13	Poor live crown ratio, dead scaffold branches	B	Located within proposed road grading	0
11238	17	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C	Located within proposed road grading	0
11239	27	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, poor live crown ratio, unbalanced crown	B	Located within proposed road grading	0
11240	15	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, sparse canopy, unbalanced crown	B	Located within proposed road grading	0
11241	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C	Located within proposed road grading	0
11242	22	Douglas-fir (*Pseudotsuga menziesii*)	7	Healthy	C	Located within proposed road grading	0
11243	50	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, bore holes, broken branches	C	Located within proposed road grading	0
11244	36	Douglas-fir (*Pseudotsuga menziesii*)	14	Healthy	C	Located within proposed road grading	0
11245	7	Grand Fir (*Abies grandis*)	0	Off site, healthy	C	Located within proposed road grading	0
11246	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Road grading greatly impacts root zone	0
11247	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Road grading greatly impacts root zone	0
11248	37	Douglas-fir (*Pseudotsuga menziesii*)	15	Unbalanced crown	B	Road grading greatly impacts root zone	0
11249	12	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C	Road grading greatly impacts root zone	0
11250	18	Grand Fir (*Abies grandis*)	0	Dead	A	Dead, Road grading greatly impacts root zone	0
11251	28	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B	Road grading greatly impacts root zone	0
11252	30	Douglas-fir (*Pseudotsuga menziesii*)	11	Poor live crown ratio, some branch dieback	B	Road grading greatly impacts root zone	0
11253	7	Bigleaf Maple (*Acer macrophyllum*)	2	Sweep, lean (S)	B	Road grading greatly impacts root zone	0
11254	12	Bigleaf Maple (*Acer macrophyllum*)	2	Poor live crown ratio	B	Road grading greatly impacts root zone	0
11255	8,8	Bigleaf Maple (*Acer macrophyllum*)	2	Cavity with decay, top lean (S), codominant base	B		2
11256	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Sparse canopy	B		6
11257	22	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, conks up bole, branch die back, sparse canopy	A		0
11258	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio	B		4
11259	15	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, sparse canopy, branch dieback	B		0
11260	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11261	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11262	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11264	26	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11265	32	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11266	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11267	32	Douglas-fir (*Pseudotsuga menziesii*)	12	Healthy	C		12
11268	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11269	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11270	30	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11271	28	Douglas-fir (*Pseudotsuga menziesii*)	10	Healthy	C		10
11272	21	Douglas-fir (*Pseudotsuga menziesii*)	7	Broken scaffold branches	C		7
11273	9	Douglas-fir (*Pseudotsuga menziesii*)	2	Deformed bole, poor live crown ratio	B	Impacted by proposed path grading	0
11274	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11275	10	Bigleaf Maple (*Acer macrophyllum*)	0	Dead	A	Dead, Impacted by proposed path grading	0
11276	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed	C		2
11277	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11278	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, unbalanced crown	B		0
11279	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Broken branches, poor live crown ratio	B		6
11280	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Healthy	C		5
11282	23	Douglas-fir (*Pseudotsuga menziesii*)	8	Healthy	C		8
11283	25	Douglas-fir (*Pseudotsuga menziesii*)	9	Healthy	C		9
11284	23	Douglas-fir (*Pseudotsuga menziesii*)	8	Deformed bole	B		8
11285	25	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11286	23	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, healthy	C		0
11287	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Healthy	C	Impacted by proposed path grading	0
11288	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11289	8	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C	Impacted by proposed path grading	0
11290	30	Douglas-fir (*Pseudotsuga menziesii*)	11	Healthy	C		11
11291	25	Douglas-fir (*Pseudotsuga menziesii*)	9	Healthy	C		9
11292	8	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11293	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Healthy	C	Impacted by proposed path grading	0
11294	36	Douglas-fir (*Pseudotsuga menziesii*)	14	Broken top with weak leaders, significant decay	A	Poor Health, mpacted by proposed path grading	0
11295	25	Douglas-fir (*Pseudotsuga menziesii*)	9	Healthy	C	Impacted by proposed path grading	0
11296	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Healthy	C		3

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow	Reason for Removal	Tree Units Retained
11297	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Healthy	C		2
11298	7	Bigleaf Maple (*Acer macrophyllum*)	2	Sparse canopy	B		2
11300	6,12	Bigleaf Maple (*Acer macrophyllum*)	3	Dead scaffold branches, machete damage, crown cleaning recommended	B		3
11301	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Healthy	C		4
11302	14	Bigleaf Maple (*Acer macrophyllum*)	3	Dead scaffold branches, several cavities with decay	B		3
11303	6	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11304	7	Bigleaf Maple (*Acer macrophyllum*)	2	Dead scaffold branch	C		2
11305	8,10	Bigleaf Maple (*Acer macrophyllum*)	3	Dead scaffold branch	C		3
11306	6,6,6,6	Pacific Serviceberry (*Amelanchier alnifolia*)	2	Healthy	C		2
11307	7,9	Bigleaf Maple (*Acer macrophyllum*)	2	Several large cavities with decay	B		2
11308	8,10	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11309	7	Bigleaf Maple (*Acer macrophyllum*)	2	Deformed bole	B		2
11310	8	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11311	6	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11312	10	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11313	6,6	Bigleaf Maple (*Acer macrophyllum*)	2	Dead codominant stem	B		2
11314	8,8,9	Bigleaf Maple (*Acer macrophyllum*)	3	Codominant base with included bark, lean (S)	B		3
11315	6	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11316	7	Bigleaf Maple (*Acer macrophyllum*)	2	Lean (S)	B		2
11317	7	Bigleaf Maple (*Acer macrophyllum*)	2	Sparse canopy, dead scaffold branches	B		2
11318	6	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11319	8	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
11320	7,7,8	Sweet Cherry (*Prunus avium*)	3	Codominant base, lean (S), crooked bole	B		3
11321	7	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
12130	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Unbalanced crown, dead branches in crown	B		3
12132	14	Coniferous	3	Not Evaluated by an Arborist	-	Lot grading greatly impacts root zone	0
12133	8	Deciduous	2	Not Evaluated by an Arborist	-	Lot grading greatly impacts root zone	0
12134	9	Coniferous	2	Not Evaluated by an Arborist	-	Lot grading greatly impacts root zone	0
12136	12,12,6,7	Deciduous	2	Not Evaluated by an Arborist	-		2
12139	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Poor Health	A		0
12140	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Poor Health	A		0
12141	11	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Poor Health	A		0
12142	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Poor Health	A		0
12144	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12145	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12146	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12147	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12148	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12151	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12152	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12153	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12157	10	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12158	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12159	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12160	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12161	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12162	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12166	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12169	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12170	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12171	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12172	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12173	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12174	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12175	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12176	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12182	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12183	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12184	11	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12185	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12186	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12187	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12188	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12189	9	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12190	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12194	12	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12197	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor health	A	Poor Health, Lot grading greatly impacts root zone	0
12200	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12201	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12204	12,10	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12205	12	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12206	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12207	10	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12209	9	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12210	11	Bigleaf Maple (*Acer macrophyllum*)	0	Poor Health, located in Critical Area Tract S	A		0
12211	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12214	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12215	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12216	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12217	8	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12218	8,6,6	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12219	23	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12220	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Poor Health, located in Critical Area Tract S	A		0
12221	14	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12222	12,12	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12223	12	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12224	8	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12225	8	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12226	6	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12227	10,10,8,8	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12228	12	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12229	12,10,10	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12230	12,8	Red Alder (*Alnus rubra*)	0	Poor Health, located in Critical Area Tract S	A		0
12233	27,8,7,7	Bigleaf Maple (*Acer macrophyllum*)	11		C	Located within proposed road grading	0
12234	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, crooked bole	C		0
12235	7	Red Alder (*Alnus rubra*)	2	Dead top, in decline	A	Poor tree health	0
12236	7	Red Alder (*Alnus rubra*)	2	Dead top, in decline	A	Poor tree health	0
12237	6,6,6	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, evaluated behind fence, dead branches in canopy	B		0
12238	10	Douglas-fir (*Pseudotsuga menziesii*)	2		C		2
12239	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed	B		2
12240	7,7,7,7	Bigleaf Maple (*Acer macrophyllum*)	3		C		3
12241	7,7,7,7,7	Bigleaf Maple (*Acer macrophyllum*)	4		C		4
12242	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed	B		2

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow	Reason for Removal	Tree Units Retained
12243	8	Red Alder (*Alnus rubra*)	0	Off site, evaluated behind fence	C		0
12244	8,8,8,8,7	Bigleaf Maple (*Acer macrophyllum*)	5		C	Located within proposed road grading	0
12245	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated from property line, unbalanced crown	B		0
12246	6	Beaked Hazelnut (Corylus cornuta)	2	Clustered shrub, stem lean, broken top	A	Poor health, Parking grading impacts root zone	0
12247	6	Red Alder (*Alnus rubra*)	0	Snag	A	Dead, Parking and lot grading impacts root zone	0
12248	10	Red Alder (*Alnus rubra*)	0	Off site, Snag	A		0
12249	12	Bigleaf Maple (*Acer macrophyllum*)	2	Crooked bole, dead branches, unbalanced crown	B	Lot grading greatly impacts root zone	0
12250	10,9	Bigleaf Maple (*Acer macrophyllum*)	3	Unbalanced crown	B	Lot grading greatly impacts root zone	0
12252	9	Bigleaf Maple (*Acer macrophyllum*)	2		C	Lot grading greatly impacts root zone	0
12253	14	Bigleaf Maple (*Acer macrophyllum*)	0	Snag	A	Dead, Lot grading greatly impacts root zone	0
12254	14	Bigleaf Maple (*Acer macrophyllum*)	0	Snag	A	Dead, Lot grading greatly impacts root zone	0
12255	18	Bigleaf Maple (*Acer macrophyllum*)	5	Crooked bole, dead branches, dead foliage, epicormic sprouts	B		5
12256	6	Bigleaf Maple (*Acer macrophyllum*)	2	Lean, unbalanced crown	B		2
12257	7	Bigleaf Maple (*Acer macrophyllum*)	0	Snag	A	Dead, Lot grading greatly impacts root zone	0
12258	8	Bigleaf Maple (*Acer macrophyllum*)	2	Sparse canopy, crooked bole	B	Lot grading greatly impacts root zone	0
12260	12,11,10,10,9,9,9	Bigleaf Maple (*Acer macrophyllum*)	2	Dead top, in decline, sparse canopy	A		2
12261	11	Bigleaf Maple (*Acer macrophyllum*)	2	crooked bole, sparse canopy, dead scaffold branches	B	Lot grading greatly impacts root zone	0
12262	9,8	Bigleaf Maple (*Acer macrophyllum*)	2	Dead top, in decline, sparse canopy	A	Poor health, Lot grading greatly impacts root zone	0
12263	9	Bigleaf Maple (*Acer macrophyllum*)	0	Snag	A	Dead, Lot grading greatly impacts root zone	0
12264	6	Bigleaf Maple (*Acer macrophyllum*)	0	Snag	A	Dead, Lot grading greatly impacts root zone	0
12265	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, Snag	A		0
12266	36	Douglas-fir (*Pseudotsuga menziesii*)	14		C		14
12267	11,10,10,8,7,6,6,6	Bigleaf Maple (*Acer macrophyllum*)	2	Dead tops, epicormic sprouts, dead limbs	A	Poor health, Lot grading greatly impacts root zone	0
12268	9	Bigleaf Maple (*Acer macrophyllum*)	2	Dead branches, lopsided canopy	B	Lot grading greatly impacts root zone	0
12270	6	Bigleaf Maple (*Acer macrophyllum*)	2	Broken top, sparse canopy, many epicormic sprouts	A	Poor health, Lot grading greatly impacts root zone	0
12271	20,20	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, evaluated behind fence	C		0
12272	38	Douglas-fir (*Pseudotsuga menziesii*)	15	Evaluated behind fence	C	Lot grading greatly impacts root zone	0
12273	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed, in decline	A	Poor healt, Lot grading greatly impacts root zone	0
12274	12	Bigleaf Maple (*Acer macrophyllum*)	2	Dead top	A	Poor healt, Lot grading greatly impacts root zone	0
12275	6	Bigleaf Maple (*Acer macrophyllum*)	2	Lean, sparse canopy, dead top	A	Poor healt, Lot grading greatly impacts root zone	0
12276	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Evaluated behind fence, Codominant top, dead branches in canopy	B	Lot grading greatly impacts root zone	0
12277	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Suppressed	B	Lot grading greatly impacts root zone	0
12278	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Evaluated behind fence, dead	A	Dead, Lot grading greatly impacts root zone	0
12279	26	Douglas-fir (*Pseudotsuga menziesii*)	9	Evaluated behind fence	C	Lot grading greatly impacts root zone	0
12280	9	Douglas-fir (*Pseudotsuga menziesii*)	2	Evaluated behind fence, Codominant top, epicormic sprouts, dead branches in canopy	B	Lot grading greatly impacts root zone	0
12282	30	Douglas-fir (*Pseudotsuga menziesii*)	11	Evaluated behind fence, Butt sweep, crooked top	B	Lot grading greatly impacts root zone	0
12283	19	Douglas-fir (*Pseudotsuga menziesii*)	6		C	Located within proposed road grading	0
12284	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Seepage, sparse canopy, epicormic sprouts	B	Lot grading greatly impacts root zone	0
12285	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Seepage, sparse canopy, epicormic sprouts	B	Lot grading greatly impacts root zone	0
12286	20	Douglas-fir (*Pseudotsuga menziesii*)	6		C	Lot grading greatly impacts root zone	0
12287	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12288	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12289	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Unbalanced crown, dead branches in canopy	B		2
12290	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence	C		0
12291	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12292	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12293	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12294	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, dead branches in canopy	C		0
12295	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12296	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12297	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12298	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12299	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Snag	A	Dead, Lot grading greatly impacts root zone	0
12300	20	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, unbalanced crown	B		0
12301	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Very sparse canopy, dead top, in decline	A	Poor health, Lot grading greatly impacts root zone	0
12302	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12303	18	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, evaluated behind fence, pruned branches, dead scaffold branches	B		0
12305	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12306	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12307	10	Bigleaf Maple (*Acer macrophyllum*)	2		C	Lot grading greatly impacts root zone	0
12308	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12309	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, sparse canopy	B		2
12310	18	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence	C		0
12311	12	Douglas-fir (*Pseudotsuga menziesii*)	2		C	Lot grading greatly impacts root zone	0
12312	24	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, scar with seepage, lopsided canopy	B		0
12313	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12314	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12315	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12316	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
12318	12	Bigleaf Maple (*Acer macrophyllum*)	0	Off site, evaluated behind fence	C		0
12319	9	Bigleaf Maple (*Acer macrophyllum*)	2	Lean, dead branches in canopy	B	Lot grading greatly impacts root zone	0
12320	13	Bigleaf Maple (*Acer macrophyllum*)	3	Codominant with included bark, dead branches in canopy	B	Lot grading greatly impacts root zone	0
12321	11	Bigleaf Maple (*Acer macrophyllum*)	2	Unbalanced crown, dead scaffold branches	B	Lot grading greatly impacts root zone	0
12322	7	Bigleaf Maple (*Acer macrophyllum*)	2	Many dead branches, sparse canopy, butt sweep, in decline	A	Poor health, Lot grading greatly impacts root zone	0
12323	8	Bigleaf Maple (*Acer macrophyllum*)	2	Broken codominant stem with decay	B	Lot grading greatly impacts root zone	0
12324	10	Bigleaf Maple (*Acer macrophyllum*)	2	Unbalanced crown	B	Lot grading greatly impacts root zone	0
12325	12	Bigleaf Maple (*Acer macrophyllum*)	2		C	Lot grading greatly impacts root zone	0
12326	7	Cherry (*Prunus sp.*)	2	Lean	B	Lot grading greatly impacts root zone	0
12327	11	Cherry (*Prunus sp.*)	2	Exposed buttress roots, dead branches in crown	B	Lot grading greatly impacts root zone	0
12328	19	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, dead top, very sparse canopy, in decline	A		0
12329	19	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, dead	A		0
12330	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated behind fence, dead	A		0
12331	56	Bigleaf Maple (*Acer macrophyllum*)	24	Weakly attached scaffold branches, codominant stem pruned leaving cavity	B	Lot grading greatly impacts root zone	0
12332	34	Douglas-fir (*Pseudotsuga menziesii*)	0	Off site, evaluated from property line	C		0
12334	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Unbalanced crown	B	Lot grading greatly impacts root zone	0
12335	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Codominant top with included bark	B	Lot grading greatly impacts root zone	0
12336	6	Cherry (*Prunus sp.*)	2	Sweep, lean	B	Lot grading greatly impacts root zone	0
12337	8	Cherry (*Prunus sp.*)	2		C	Lot grading greatly impacts root zone	0
12338	14	Bigleaf Maple (*Acer macrophyllum*)	3	Unbalanced crown	B	Lot grading greatly impacts root zone	0
12435	18	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12436	10	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12437	10	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12438	10	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12439	10	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12440	18	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12441	14	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12442	10,10	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
12443	10,22	Deciduous	0	Off site, Not evaluated by an Arborist	-		0
50000	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50001	6	Douglas-fir (*Pseudotsuga menziesii*)	2	Sweep	C		2
50002	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50003	6	Bigleaf Maple (*Acer macrophyllum*)	2	Healthy	C		2
50004	12,8,13,10,11	Bigleaf Maple (*Acer macrophyllum*)	8	Dead scaffold branches, stem lean, some dead branches in crown	B	Lot grading greatly impacts root zone	0

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow	Reason for Removal	Tree Units Retained
50005	8,8,15	Bigleaf Maple (*Acer macrophyllum*)	6	Stem lean, dead scaffold branches, dead codominant stems, unbalanced crown	B	Lot grading greatly impacts root zone	0
50006	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50007	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50008	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50009	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50010	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Very sparse canopy, dead branches in crown, in decline	A	Dead, Lot grading greatly impacts root zone	0
50011	19	Douglas-fir (*Pseudotsuga menziesii*)	6	Exposed buttress roots, some dead branches in crown	C	Lot grading greatly impacts root zone	0
50012	12	Bigleaf Maple (*Acer macrophyllum*)	2		C	Lot grading greatly impacts root zone	0
50013	12	Oregon Ash (*Fraxinus latifolia*)	2	Crooked bole, codominant top, some broken branches	B	Lot grading greatly impacts root zone	0
50015	15	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead, significant lean, uprooted	A	Dead, Lot grading greatly impacts root zone	0
50016	17	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50017	8,10	Bigleaf Maple (*Acer macrophyllum*)	3	Sluffing bark, codominant base, lean, dead top	A	Poor health, Lot grading greatly impacts root zone	0
50018	17	Bigleaf Maple (*Acer macrophyllum*)	5	Other tree leaning on this tree	B	Lot grading greatly impacts root zone	0
50019	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50020	12	Douglas-fir (*Pseudotsuga menziesii*)	2		C		2
50021	19	Douglas-fir (*Pseudotsuga menziesii*)	6		C		6
50022	16	Douglas-fir (*Pseudotsuga menziesii*)	4		C		4
50023	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, impacts from lot grading	0
50024	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50025	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Some dead branches, poor live crown ratio	B	Lot grading greatly impacts root zone	0
50026	11	Bigleaf Maple (*Acer macrophyllum*)	2	Crooked bole	B		2
50027	6,10	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50028	14	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50029	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50030	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead, uprooted	A	Dead, Lot grading greatly impacts root zone	0
50031	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, sparse canopy, unbalanced crown, epicormic sprouts	B	Lot grading greatly impacts root zone	0
50032	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, sparse canopy, unbalanced crown, epicormic sprouts	B	Lot grading greatly impacts root zone	0
50033	15	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50034	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, unbalanced crown	B		2
50035	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B	Lot grading greatly impacts root zone	0
50036	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Dead branches in crown, Crown cleaning recommended	C	Lot grading greatly impacts root zone	0
50037	8	Red Alder (*Alnus rubra*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50038	8,10	Red Alder (*Alnus rubra*)	2	Dead tops, codominant base, in decline	A	Poor health, Lot grading greatly impacts root zone	0
50039	10	Bigleaf Maple (*Acer macrophyllum*)	2	Dead codominant stems, crooked	B	Lot grading greatly impacts root zone	0
50040	6,8	Bigleaf Maple (*Acer macrophyllum*)	2	Broken top, dead codominant stems	A	Poor health, Lot grading greatly impacts root zone	0
50041	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio	B	Lot grading greatly impacts root zone	0
50042	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, sparse canopy	B	Lot grading greatly impacts root zone	0
50043	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Some dead branches in crown, Crown cleaning recommended	C	Lot grading greatly impacts root zone	0
50044	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown, sparse canopy, poor live crown ratio	B	Lot grading greatly impacts root zone	0
50045	6,6,7,12,12	Bigleaf Maple (*Acer macrophyllum*)	6	Dead codominant stems, unbalanced crown	B		6
50046	6,6,7,12,12	Bigleaf Maple (*Acer macrophyllum*)	6	Dead codominant stems, cavities	B	Lot grading greatly impacts root zone	0
50047	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50048	8	Douglas-fir (*Pseudotsuga menziesii*)	0	Snag	A		0
50049	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Sparse canopy, sap seepage	B	Lot grading greatly impacts root zone	0
50050	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50051	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Significant lean, sweep, dead branches, sparse canopy	A		2
50052	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy, poor live crown ratio, dead branches in crown	B		2
50053	19	Douglas-fir (*Pseudotsuga menziesii*)	6	Crown cleaning recommended	C	Lot grading greatly impacts root zone	0
50054	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Sparse canopy, poor live crown ratio, dead branches in crown	B		3
50055	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown, poor live crown ratio	B		6
50056	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Very poor live crown ratio, sparse canopy	A		2
50057	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Sparse canopy, poor live crown ratio	B		2
50058	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Sparse canopy, poor live crown ratio	B		4
50059	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Sparse canopy, poor live crown ratio	B		5
50060	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50061	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50062	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Unbalanced crown, poor live crown ratio	B	Lot grading greatly impacts root zone	0
50063	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Sweep, very sparse canopy, very poor live crown ratio	A	Poor health, Lot grading greatly impacts root zone	0
50064	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50065	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50066	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50067	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50068	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50069	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50070	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, Sparse canopy	B	Lot grading greatly impacts root zone	0
50071	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, Sparse canopy, unbalanced crown	B	Lot grading greatly impacts root zone	0
50072	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown	B	Lot grading greatly impacts root zone	0
50073	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50074	20	Douglas-fir (*Pseudotsuga menziesii*)	6		C		6
50075	18	Douglas-fir (*Pseudotsuga menziesii*)	5		C		5
50076	17	Douglas-fir (*Pseudotsuga menziesii*)	5		C		5
50077	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Very poor live crown ratio, sparse canopy	B		0
50078	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Very poor live crown ratio, sparse canopy	B		4
50079	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Poor live crown ratio	B		6
50080	12	Bigleaf Maple (*Acer macrophyllum*)	0	Snag	A		0
50081	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, unbalanced crown	B		4
50082	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B		3
50083	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Very poor live crown ratio, sparse canopy	B		3
50084	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Very poor live crown ratio, sparse canopy	B		3
50085	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Very poor live crown ratio, sparse canopy	B		3
50086	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, sparse canopy	B		4
50087	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B		3
50088	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B		3
50089	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50090	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, sparse canopy	B		5
50091	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, very sparse canopy	A	Poor health, Lot grading greatly impacts root zone	0
50092	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, very sparse canopy	A	Poor health, Lot grading greatly impacts root zone	0
50093	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, very sparse canopy	A		3
50095	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio	B		5
50096	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, dead branches in crown	B		4
50098	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50099	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio	B		5
50100	10	Bigleaf Maple (*Acer macrophyllum*)	2	Dead scaffold branches, unbalanced crown	B		2
50101	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown, dead lower branches	B		5
50102	6	Bigleaf Maple (*Acer macrophyllum*)	2	dead branches in crown, Crown cleaning recommended	C		2
50103	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio	B		5
50104	22	Douglas-fir (*Pseudotsuga menziesii*)	7	Unbalanced crown	B		7
50105	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Unbalanced crown, dead branches in crown	B		3
50106	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Dead lower branches	C		6
50107	7	Bigleaf Maple (*Acer macrophyllum*)	2	Crooked bole, dead scaffold branches, sluffing bark	B		2
50108	14	Douglas-fir (*Pseudotsuga menziesii*)	3	dead branches in crown, Crown cleaning recommended	C		3
50109	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown, codominant top	B		6
50110	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Unbalanced crown, dead branches in crown	B		4

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow	Reason for Removal	Tree Units Retained
50111	17	Douglas-fir (*Pseudotsuga menziesii*)	5	dead branches in crown, Crown cleaning recommended	C		5
50112	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50113	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown, dead branches in crown	B		5
50114	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, sparse canopy	B		2
50115	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B		3
50116	8	Red Alder (*Alnus rubra*)	2	Epicormic sprouts, dead branches in crown, dead top	B		2
50117	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Sap seepage, dead lower branches	C		5
50118	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio	B	Lot grading greatly impacts root zone	0
50119	6,6,6,7	Bigleaf Maple (*Acer macrophyllum*)	3	Unbalanced crown, dead scaffold branches, dead codominant stems at base	B		3
50120	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio	B		2
50121	9	Bigleaf Maple (*Acer macrophyllum*)	2		C	Lot grading greatly impacts root zone	0
50122	6	Bigleaf Maple (*Acer macrophyllum*)	2	Sparse canopy, lean	B	Lot grading greatly impacts root zone	0
50123	6,6,8,8	Bigleaf Maple (*Acer macrophyllum*)	3	Lean	B	Lot grading greatly impacts root zone	0
50124	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio	B		2
50125	10	Bigleaf Maple (*Acer macrophyllum*)	2	Lean, unbalanced crown	B		2
50126	7,8	Bigleaf Maple (*Acer macrophyllum*)	2	In decline, lean, unbalanced crown, dead codominant stems	A	Poor health, Lot grading greatly impacts root zone	0
50127	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50128	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, dead branches in crown	B	Lot grading greatly impacts root zone	0
50129	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Unbalanced crown	B	Lot grading greatly impacts root zone	0
50130	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Very sparse canopy, poor live crown ratio	A	Poor health, Lot grading greatly impacts root zone	0
50131	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Dead lower branches	C	Lot grading greatly impacts root zone	0
50132	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio	B	Lot grading greatly impacts root zone	0
50133	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio	B		4
50134	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Unbalanced crown	B		4
50136	9	Cherry (*Prunus sp.*)	2	Dead top, epicormic sprouts, in decline	A		2
50137	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio	B		4
50138	19	Douglas-fir (*Pseudotsuga menziesii*)	6		C		6
50139	15	Douglas-fir (*Pseudotsuga menziesii*)	4		C		4
50140	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Unbalanced crown, poor live crown ratio	B		2
50141	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Dead lower branches, some dead branches in crown, Crown cleaning recommended	C		5
50142	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Unbalanced crown, poor live crown ratio	B		3
50143	6	Bigleaf Maple (*Acer macrophyllum*)	2	Dead top, in decline	A		2
50144	17	Douglas-fir (*Pseudotsuga menziesii*)	5		C		5
50145	8,10	Bigleaf Maple (*Acer macrophyllum*)	3	Codominant base	B		3
50146	10	Bigleaf Maple (*Acer macrophyllum*)	2	Crooked bole, sparse canopy	B	Lot grading greatly impacts root zone	0
50147	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Branch dieback, Sparse canopy, poor live crown ratio, unbalanced crown	A		2
50148	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Dead branches in crown, Crown cleaning recommended	C		5
50149	17,18	Bigleaf Maple (*Acer macrophyllum*)	9	Cavities, dead codominant stem	B	Lot grading greatly impacts root zone	0
50150	19	Douglas-fir (*Pseudotsuga menziesii*)	6	Poor live crown ratio, branch dieback	B	Lot grading greatly impacts root zone	0
50151	12	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, branch dieback	B	Lot grading greatly impacts root zone	0
50152	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Dead branches in crown	B	Lot grading greatly impacts root zone	0
50153	6,8	Bigleaf Maple (*Acer macrophyllum*)	2	Dead codominant stems at base, sparse canopy	B	Lot grading greatly impacts root zone	0
50154	10	Douglas-fir (*Pseudotsuga menziesii*)	2	In significant decline	A		2
50155	6	Bigleaf Maple (*Acer macrophyllum*)	2	Significant lean, broken codominant stems, in decline	A		2
50156	10	Bigleaf Maple (*Acer macrophyllum*)	2	Cavity, crooked bole, poor live crown ratio	B		2
50157	6,9	Bigleaf Maple (*Acer macrophyllum*)	2		C		2
50158	7	Bigleaf Maple (*Acer macrophyllum*)	2	Lean, codominant top	B		2
50159	7,10	Bigleaf Maple (*Acer macrophyllum*)	2	Dead top, in decline	A		2
50160	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50161	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Unbalanced crown	B		4
50162	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Unbalanced crown, poor live crown ratio	B		4
50163	8	Bigleaf Maple (*Acer macrophyllum*)	2	Dead branches in crown, sparse canopy	B		2
50164	18	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50165	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Unbalanced crown, dead branches in crown	B		6
50166	13	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio	B		3
50167	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Poor live crown ratio, epicormic sprouts, dead branches	B		2
50168	23	Douglas-fir (*Pseudotsuga menziesii*)	8	Crooked bole, unbalanced crown	B		8
50169	12,13	Douglas-fir (*Pseudotsuga menziesii*)	5	Codominant base with included bark, sparse canopy	B	Lot grading greatly impacts root zone	0
50170	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Unbalanced crown	B		5
50171	10	Cherry (*Prunus sp.*)	2	Sparse canopy, many dead branches, in decline	A		2
50172	10	Cherry (*Prunus sp.*)	0	Dead	A		0
50173	9	Cherry (*Prunus sp.*)	2	Sparse canopy, many dead branches, in decline	A		2
50174	10	Bigleaf Maple (*Acer macrophyllum*)	2	Dead branches in crown, codominant base	B		2
50175	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Sweep, poor live crown ratio	B		4
50176	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, sparse canopy, epicormic sprouts	B		5
50178	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, dead branches in crown	B		4
50179	10	Bigleaf Maple (*Acer macrophyllum*)	2	Dead top	B		2
50180	6,9,9	Bigleaf Maple (*Acer macrophyllum*)	3	Branch dieback, sparse canopy	B		3
50181	6,6,7	Bigleaf Maple (*Acer macrophyllum*)	2	Branch dieback, sparse canopy, dead codominant stem	B		2
50183	7,7,9,10,10	Bigleaf Maple (*Acer macrophyllum*)	6	Clustered base, some branch dieback, dead scaffold branches	B		6
50184	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio	B		4
50185	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, sparse canopy	B		5
50186	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, sparse canopy	B		4
50187	8	Bigleaf Maple (*Acer macrophyllum*)	2	Sweep	B		2
50188	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50190	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50191	6,6,6,7,10,10	Bigleaf Maple (*Acer macrophyllum*)	6	Dead scaffold branches, cavities in base	B		6
50192	16	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50193	13	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50194	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50195	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, sparse canopy, dead branches in crown	B		5
50196	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A	Dead, Lot grading greatly impacts root zone	0
50197	17	Douglas-fir (*Pseudotsuga menziesii*)	5	Poor live crown ratio, sparse canopy, dead branches in crown	B	Lot grading greatly impacts root zone	5
50198	10,10	Bigleaf Maple (*Acer macrophyllum*)	2	Significant lean	A		2
50199	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Tree leaning on	B		2
50200	10	Douglas-fir (*Pseudotsuga menziesii*)	2	Lean	B		2
50201	6	Douglas-fir (*Pseudotsuga menziesii*)	2		C		2
50202	11	Douglas-fir (*Pseudotsuga menziesii*)	2	Very poor live crown ratio, very sparse canopy, in decline	A	Poor health, Lot grading greatly impacts root zone	0
50203	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Very poor live crown ratio, very sparse canopy, in decline	A	Poor health, Lot grading greatly impacts root zone	0
50204	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Very poor live crown ratio, very sparse canopy, in decline	A		4
50205	10	Douglas-fir (*Pseudotsuga menziesii*)	0	Snag	A		0
50206	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50207	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Poor live crown ratio	B		6
50208	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50209	17	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50210	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50211	12	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50212	15	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50213	6	Bigleaf Maple (*Acer macrophyllum*)	2	Lean	B		2
50214	6,6,6,10,10,10	Bigleaf Maple (*Acer macrophyllum*)	6	Dead branches, dead codominant stems	B		6
50215	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio	B		4
50216	14	Douglas-fir (*Pseudotsuga menziesii*)	3	Poor live crown ratio, sparse canopy	B		3
50217	6	Douglas-fir (*Pseudotsuga menziesii*)	0	Snag	A		0

AKS Reference #	Total DBH (In)	Tree Species Common Name (*Scientific name*)	Tree Units Initial	Condition/Comments	Windthrow	Reason for Removal	Tree Units Retained
50218	7	Douglas-fir (*Pseudotsuga menziesii*)	0	Snag	A		0
50219	15	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, sparse canopy	B	Lot grading greatly impacts root zone	0
50220	16	Douglas-fir (*Pseudotsuga menziesii*)	4	Poor live crown ratio, sparse canopy	B	Lot grading greatly impacts root zone	0
50221	9	Douglas-fir (*Pseudotsuga menziesii*)	0	Dead	A		0
50222	14	Coniferous	3	Not Evaluated by an Arborist	-		3
50223	7	Deciduous	2	Not Evaluated by an Arborist	-		2
50500	8	Douglas-fir (*Pseudotsuga menziesii*)	2		C	Located within proposed road grading	0
50501	29	Bigleaf Maple (*Acer macrophyllum*)	11		C	Construction activities impact root zone	0
50502	17	Red Alder (*Alnus rubra*)	0	Snag	A	Dead, Lot grading greatly impacts root zone	0
50503	18	Bigleaf Maple (*Acer macrophyllum*)	0	Large hollow in base with significant decay, located in Critical Area Tract S	A		0
50504	13	Red Alder (*Alnus rubra*)	0	Snag, located in Critical Area Tract S	A		0
50505	17	Bigleaf Maple (*Acer macrophyllum*)	0	Sweep, deformed bole, located in Critical Area Tract S	B		0
50506	12,11,10,6,6,6	Bigleaf Maple (*Acer macrophyllum*)	7	Cavity with decay in base, dead limbs	B	Lot grading greatly impacts root zone	0
50507	13,13,10,6	Bigleaf Maple (*Acer macrophyllum*)	7	Dead scaffold branches, broken Codominant stems	B	Lot grading greatly impacts root zone	0
50508	20	Douglas-fir (*Pseudotsuga menziesii*)	6	Poor live crown ratio	B	Lot grading greatly impacts root zone	0
50509	13	Red Alder (*Alnus rubra*)	0	Dead top, poor live crown ratio, in decline, , located in Critical Area Tract S	A		0
50510	12	Bigleaf Maple (*Acer macrophyllum*)	0	Located in Critical Area Tract S	C		0
50511	14	Red Alder (*Alnus rubra*)	0	Dead branches, , located in Critical Area Tract S	C		0
50512	15,6,6	Bigleaf Maple (*Acer macrophyllum*)	0	Located in Critical Area Tract S	C		0

NOTE: Onsite trees existed during the site visits performed on 07/06/2020 - 8/13/2020.

Total # of On Site Existing Trees= 408
Total On Site Existing Tree Units = 1699.0
Total # of On Site Trees Retained= 295
Total # of Tree Units Retained= 1068.0
Minimum Tree Units Required per City Code = 878
(43.90 acres * 20 trees/acre)
Minimum # Trees to replant= 0

Total # of Existing Trees Removed= 113
Total Existing Tree Units Removed= 631.0

Windthrow Rating:
A=Least windthrow resistant
B=Moderate windthrow resistant
C=Most windthrow resistant

Tree Root Protection Zone: The tree root protection zone for each tree is a circle with a radius equal to 1 foot per 1 inch DBH.

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.
At the completion of construction, all trees must once again be reviewed to evaluate their hazard rating. Land clearing and removal of adjacent trees can expose previously unseen defects and otherwise healthy trees can be damaged during construction. Additional tree removal may be recommended by the project arborist.

Appendix B: Tree Preservation and Removal Plan

PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN (SOUTH)
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON
PRELIMINARY NOT FOR CONSTRUCTION
P5.0
AKS ENGINEERING & FORESTRY, LLC
9600 NE 126TH AVE, STE 2520
VANCOUVER, WA 98682
360.882.0419
WWW.AKS-ENG.COM
ENGINEERING • SURVEYING • NATURAL RESOURCES
FORESTRY • PLANNING • LANDSCAPE ARCHITECTURE
TREE PLAN
GROSS AREA: 46.87 AC
SITE AREA EXCLUDING TRACT 'A': 43.90 AC
TOTAL TREE UNITS REQUIRED (43.90 X 20): 878
CALIPER INCHES REMOVED: 1,357 (1,000)
PROPOSED SITE TREES/TREE UNITS: 357 (357)
NOTE: SEE LANDSCAPING PLAN (PA.0) FOR PROPOSED TREE PLANTING PLAN
KEYED NOTE:
1. TREE REMOVAL ALONG PEDESTRIAN TRAIL TO BE DETERMINED AT TIME OF TRAIL CONSTRUCTION. TRAIL TO BE CONSTRUCTED TO LIMIT IMPACTS TO TREES. HOWEVER, SOME IMPACTS MAY BE NECESSARY AND REQUIRE TREE REMOVAL.
SCALE: 1"=50 FEET
SEE SHEET P5.1
SEE SHEET P5.2
SEE ABOVE
SEE BELOW
N ADAMS ST
N 45TH CIR
N 46TH AVENUE
NE LEADBETTER RD
LACAMAS LAKE
TRACT A INTERNAL AREA
EXISTING TREE UNITS RETAINED EXCEEDS THE TOTAL TREE UNITS REQUIRED BY THE TREE CODE. ADDITIONAL TREE REMOVAL MAY BE RECOMMENDED DURING DESIGN AND/OR CONSTRUCTION. IF ADDITIONAL TREE REMOVAL IS TO OCCUR, COMPLIANCE WITH TREE RETENTION REQUIREMENTS WILL BE MAINTAINED.
GENERAL NOTES:
1. A CERTIFIED ARBORIST SHALL BE PRESENT DURING EXCAVATION ACTIVITIES WITHIN TREE PROTECTION ZONE OF PRESERVED TREES. SEE TREE PROTECTION NOTES ON SHEET P5.1 FOR MORE INFORMATION.
2. A CERTIFIED ARBORIST SHALL BE PRESENT DURING ALL TREE REMOVAL ACTIVITIES BEHIND THE TREE PROTECTION FENCE.
3. SEE SHEET P5.1 FOR TREE PROTECTION NOTES.
4. SEE SHEET P5.3–P5.5 FOR DETAILED INVENTORY TABLE.
5. TREE PROTECTION MEASURES SHALL BE INSTITUTED PRIOR TO ANY DEVELOPMENT ACTIVITIES, INCLUDING, BUT NOT LIMITED TO, CLEARING, GRADING, EXCAVATION OR DEMOLITION WORK, AND REMAIN IN PLACE UNTIL FINAL LANDSCAPING IS INSTALLED. WHERE PHASED CONSTRUCTION OCCURS, LANDSCAPING AND IRRIGATION INSTALLATION, SEE TREE PROTECTION DETAIL ON THIS SHEET.
6. TREE PROTECTION FENCING SHALL BE FLUSH WITH THE INITIAL UNDISTURBED GRADE.
7. NO CONSTRUCTION ACTIVITY SHALL OCCUR WITHIN THE TREE PROTECTION ZONE, INCLUDING, BUT NOT LIMITED TO, DUMPING OR STORAGE OF MATERIALS SUCH AS BUILDING SUPPLIES, SOIL, WASTE ITEMS OR PARKED VEHICLES OR EQUIPMENT.
8. NO EXCAVATION, TRENCHING, GRADING, ROOT PRUNING OR OTHER ACTIVITIES SHALL OCCUR WITHIN THE TREE PROTECTION ZONE UNLESS DIRECTED BY AN ARBORIST PRESENT ON-SITE AND APPROVED BY THE CITY.
9. NOT ALL TREES WERE SURVEYED AND/OR INSPECTED WITHIN THE CRITICAL AREAS, ONLY TREES ADJACENT TO THE PROPOSED DEVELOPMENT ACTIVITIES WERE INSPECTED AND INCLUDED WITHIN THE TREE SURVEY.
10. FOLLOWING CLEARING AND GRADING ACTIVITIES, A CERTIFIED ARBORIST SHALL INSPECT EXPOSED ROOTS OF TREES LOCATED ADJACENT TO CONSTRUCTION ACTIVITIES. THE CITY SHALL OCCUR PRIOR TO ANY ADDITIONAL TREE REMOVALS FOR HAZARD ABATEMENT.
LEGEND
EXISTING GROUND CONTOUR (2 FT)
EXISTING GROUND CONTOUR (10 FT)
FINISHED GRADE CONTOUR (2 FT)
FINISHED GRADE CONTOUR (10 FT)
EXISTING CONIFEROUS TREE
EXISTING DECIDUOUS TREE
TREE REMOVAL
TREE PROTECTION/CONSTRUCTION FENCE (TREE PROTECTION AREA)
OPTIMAL TREE PROTECTION ZONE (1-FT RADIUS PER 1-IN OF DBH)
PLASTIC MESH TREE PROTECTION FENCE
NOT TO SCALE
HIGHLY VISIBLE FLAGGING ATTACHED TO TOPS OF ANCHOR POSTS
4'-0" MIN
USE AT MIN 10' TO SECURE FENCE BOTTOM
ANCHOR POSTS SHOULD BE MINIMUM 2" STEEL U CHANNEL OR 2"x2" TIMBER, 6' IN LENGTH
ANCHOR POSTS MUST BE INSTALLED AT LEAST 2' AND LESS THAN 1/3 THE TOTAL HEIGHT OF POST
TREE PROTECTION NOTES:
1. BLAZE ORANGE OR BLUE PLASTIC MESH FENCE FOR TREE PROTECTION DEVICE, ONLY.
2. BOUNDARIES OF PROTECTION AREA SHALL BE STAKED AND FLAGGED BY THE ARBORIST PRIOR TO CONSTRUCTION ACTIVITIES. FLAGGING SHALL BE HIGHLY VISIBLE.
3. AVOID DAMAGE TO CRITICAL ROOT ZONE. DO NOT DAMAGE OR SEVER LARGE ROOTS WHEN INSTALLING POSTS.
4. TREE PROTECTION TO BE INSTALLED PRIOR TO CONSTRUCTION AND REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETED.
5. TREE PROTECTION FENCE SHALL BE INSTALLED AT THE DRIPLINE OF TREES, WHERE POSSIBLE.
AKS DRAWING FILE: 5604 P5.0 TREE PLAN.DWG | LAYOUT: P5.0

PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN (WEST)

CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

P5.1

JOB NUMBER:	5564
DATE:	5/7/2021
DESIGNED BY:	CJS
DRAWN BY:	BRC
CHECKED BY:	BDH

AKS ENGINEERING & FORESTRY, LLC
9600 NE 126TH AVE, STE 2520
VANCOUVER, WA 98682
360.882.0419
WWW.AKS-ENG.COM

ENGINEERING • SURVEYING • NATURAL RESOURCES
FORESTRY • PLANNING • LANDSCAPE ARCHITECTURE

TREE PROTECTION NOTES

A. PLANS MATERIALS NEAR TREES – NO PERSON MAY CONDUCT ANY ACTIVITY WITHIN THE PROTECTED AREA OF ANY TREE DESIGNATED TO REMAIN, INCLUDING, BUT NOT LIMITED TO, PARKING EQUIPMENT, PLACING SOLVENTS, STORING BUILDING MATERIALS AND SOIL DEPOSITION, WITHOUT FIRST OBTAINING A TREE PERMIT. (J.F.)

B. ATTACHMENTS TO TREES – DURING CONSTRUCTION, NO PERSON SHALL ATTACH ANY OBJECT TO ANY TREE DESIGNATED FOR PROTECTION. (J.G.)

C. PROTECTIVE BARRIER – BEFORE DEVELOPMENT, LAND CLEARING, FILLING OR ANY LAND ALTERATION FOR WHICH A TREE PERMIT IS REQUIRED, THE APPLICANT SHALL ERECT AND MAINTAIN READILY VISIBLE, PROTECTIVE TREE FENCING ALONG THE OUTER EDGE AND COMPLETELY SURROUNDING THE PROTECTED AREA OF ALL DESIGNATED TREES OR GROUP OF TREES. FENCES SHALL BE CONSTRUCTED FOR THE DETAIL ON THIS SHEET.

C.A. PROTECTIVE BARRIER – ANY DAMAGE CAUSED BY THE CONTRACTOR, INCLUDING, BUT NOT LIMITED TO, WORKER, EQUIPMENT, OR MATERIAL DAMAGE, MUST BE REPORTED TO THE OWNER OR THE OWNER'S REPRESENTATIVE. SUCH TREES SHALL INCLUDE THOSE THAT ARE OVER MATURE, DISEASED, OR SHOWING SIGNS OF DECAY OR OTHER HAZARDOUS TREES–REPORTING – ANY PERSON ENGAGED IN TRIMMING OR PRUNING WHO BECOMES AWARE OF A TREE OF DOUBTFUL STRENGTH, THAT COULD BE DANGEROUS TO PERSONS AND PROPERTY, SHALL REPORT SUCH TREE IMMEDIATELY TO THE OWNER OR THE OWNERS REPRESENTATIVE. (J.H.)

C.B. MAY BE REQUIRED TO COVER WITH MULCH TO A DEPTH OF AT LEAST SIX (6) INCHES AND MAINTAIN MOISTURE DURING CONSTRUCTION. (J.I.)

C.C. CRITICAL ROOT ZONE OF A TREE IN ORDER TO PROTECT ROOTS FROM DAMAGE CAUSED BY HEAVY EQUIPMENT. (J.J.)

C.D. DAMAGING ACTIVITIES WITHIN THE BARRIERS. (J.K.)

C.E. MAY BE REQUIRED TO MINIMIZE ROOT DAMAGE BY EXCAVATING A TWO (2) FOOT DEEP TRENCH, CLEANLY CUTTING ROOTS AT THE EDGE OF THE CRITICAL ROOT ZONE OF TREES TO BE RETAINED. ROOTS ONE (1) INCH DIAMETER OR GREATER SHALL BE CLEANLY CUT WITH A SAW OR PRUNERS. (J.L.)

C.F. TREES IN ORDER TO AVOID DAMAGE FROM MACHINERY OR BUILDING ACTIVITY MAY BE REQUIRED TO MAINTAIN TREES THROUGHOUT THE CONSTRUCTION PERIOD BY PRUNING. TREES SHALL BE PRUNED PRIOR TO THE START OF CONSTRUCTION. (J.M.)

C.G. SHALL MAINTAIN THE PROTECTIVE BARRIERS IN PLACE UNTIL THE PROJECT ARBORIST AUTHORIZES THEIR REMOVAL OR A FINAL CERTIFICATE OF OCCUPANCY IS ISSUED BY THE BUILDING DEPARTMENT. TREES SHALL BE ACCOMPLISHED WITH LIGHT MACHINERY OR HAND WORK. (J.N.)

D. GRADE

D.A. SHALL ENSURE THAT ANY LANDSCAPING DONE IN THE PROTECTED ZONE SHALL NOT REQUIRE EXCAVATION, GRADE CHANGE, OR COMPACTION OF SOILS WITHIN THE BARRIERS. THE GRADE SHALL NOT BE ELEVATED OR REDUCED WITHIN THE CRITICAL ROOT ZONE OF TREES TO BE RETAINED, UNLESS APPROVED BY THE PROJECT ARBORIST. THE PROJECT ARBORIST MAY REQUIRE SPECIFIC CONSTRUCTION METHODS OR ADDITIONAL PROTECTIVE MEASURES IN ORDER TO ALLOW GRADE CHANGES WITHIN THE CRITICAL ROOT ZONE OF TREES TO BE RETAINED. (J.O.)

D.B. PERMANENTLY STABILIZED TO PREVENT SUFFOCATION OF THE ROOTS. (J.O.)

D.C. ROOT ZONE OF ANY TREE TO BE RETAINED WITHOUT THE AUTHORIZATION OF THE PROJECT ARBORIST. THE PROJECT ARBORIST MAY REQUIRE SPECIFIC CONSTRUCTION METHODS OR ADDITIONAL PROTECTIVE MEASURES IN ORDER TO ALLOW GRADE CHANGES WITHIN THE CRITICAL ROOT ZONE OF TREES TO BE RETAINED, OR DISREGARD THE RECOMMENDATIONS OF THE ARBORIST DISCLOSURE STATEMENT. (J.O.)

D.D. SLOPE OR ERODE INTO THE TREES CRITICAL ROOT ZONE, IT SHALL BE ENSURE THE TREE'S SURVIVAL. (J.O.)

D.E. TRENCHES, UNLESS APPROVED BY THE PROJECT ARBITRATOR. TRENCHES SHALL BE LOCATED OUTSIDE OF THE CRITICAL ROOT ZONE OF TREES TO BE RETAINED, THE PROJECT ARBORIST DETERMINES THAT THE ROOTS OR TREE CANOPY WILL NOT BE SIGNIFICANTLY REDUCE THE CHANCES OF THE TREE'S SURVIVAL. (J.O.)

E. DIRECTIONAL FELLING OF TREES SHALL BE USED TO AVOID DAMAGE TO TREES DESIGNATED FOR RETENTION. (J.P.)

F. ADDITIONAL REQUIREMENTS – THE PROJECT ARBORIST MAY REQUIRE ADDITIONAL TREE PROTECTION MEASURES WHICH ARE CONSISTENT WITH ACCEPTED URBAN FORESTRY PRACTICES. (J.Q.)

G. ENCROACHMENT INTO THE ROOT PROTECTION ZONE IS ALLOWED WITH PROJECT ARBORIST APPROVAL AS DESCRIBED IN THE FOLLOWING NOTES.

G.A. TREE PROTECTION ZONE. NO GRADE CHANGES SHALL BE ALLOWED IN THE CRITICAL ROOT ZONE AREA SHOULD BEGIN AT THE EXCAVATION LINE THAT IS CLOSEST TO THE TREE.

G.B. THE EXCAVATION SHOULD BE DONE BY HAND/SHOVEL OR WITH A BACKHOE AND A FLAT BLADE OPERATED PERPENDICULAR TO THE TREE.

G.C. ALL ROOTS 1 INCH OR LARGER SHALL BE LEFT UNCUT, IF POSSIBLE. ALL ROOTS 1 INCH OR LARGER SHOULD BE PRUNED AT THE EXCAVATION LINE.

G.D. ROOTS SHALL BE CUT CLEANLY WITH PRUNING SHEARS OR A PRUNING SAW. ALL ROOTS SHALL BE CAREFULLY "TIDIED" FOR ROOT/RESISTANCE. WHEN THERE IS RESISTANCE, THE MAN WITH THE SHOVEL HAND TOOLS SHALL BE USED TO CAREFULLY EXPOSE THE ROOT AND CUT IT CLEANLY WITH THE SHOVEL. THE BACKHOE IS TO REMAIN OFF OF THE TREE ROOTS TO BE PRESERVED AT ALL TIMES.

G.E. ROOTS SHALL BE CUT CLEANLY WITH PRUNING SHEARS OR A PRUNING SAW.

G.F. ALL ROOTS SHALL BE EXPOSED DURING ANY WORK WITHIN THE TREE ROOT PROTECTION ZONE.

G.G. THE CITY PLANNER MUST BE CONTACTED 24 HOURS PRIOR TO WORKING WITHIN THE CITY'S PLANNER MUST BE CONTACTED AT ALL AREAS BOUND AND PROTECTING THE OPTIMAL TREE PROTECTION ZONE.

H. TREE PROTECTION ZONE IS DEFINED AS ALL AREAS BOUND AND PROTECTING THE OPTIMAL TREE PROTECTION ZONE.

I. TIMELINE FOR CLEARING, GRADING, AND INSTALLATION OF TREE PROTECTION MEASURES: ALL TREE PROTECTION MEASURES SHALL BE INSTALLED PRIOR TO ANY GRADING ACTIVITIES. PROTECTION MEASURES WILL BE DONE DURING CLEARING AND ANY GRADING WILL FOLLOW.

J. PRUNING/TREE REMOVAL NOTES: THE WORK TO BE COMPLETED UNDER THIS PROJECT SHALL BE PERFORMED AS FOLLOWS:

J.A. THE CONTRACTOR SHALL PROVIDE ADEQUATE CREW OF MEN, EQUIPMENT AND MATERIALS TO SAFELY AND EFFICIENTLY COMPLETE THE ASSIGNED WORK. EACH CREW SHALL HAVE AT LEAST ONE MEMBER WHO IS FULLY TRAINED IN THE WORK TO BE DONE AND WHO SHALL BE RESPONSIBLE FOR THE CREW'S ACTIVITIES AND WHO SHALL RECEIVE INSTRUCTION FROM THE OWNER OR THE OWNER'S REPRESENTATIVE BEFORE BEGINNING WORK. (J.R.)

J.B. WHENEVER A TREE, WHICH IS NOT SCHEDULED TO BE REMOVED, MUST BE TRIMMED OR PRUNED, THE CONTRACTOR SHALL ENSURE THAT SUCH TRIMMING AND PRUNING IS DONE IN ACCORDANCE WITH THE LATEST EDITION OF ANSI A300 STANDARD PRACTICES FOR TREE, SHRUB AND OTHER WOODY PLANT MAINTENANCE.

J.C. THE CONTRACTOR SHALL BE REQUIRED TO CUT TREES TO A HEIGHT OF APPROXIMATELY 12". THE STUMPS AND ROOTS SHALL BE GROUND DOWN A MINIMUM OF 12" BELOW THE SURROUNDING GRADE.

J.D. THE CONTRACTOR SHALL PERFORM ALL WORK IN ACCORDANCE WITH THE LATEST EDITION OF ANSI Z133.1 AND APPLICABLE SECTIONS OF THE WISHA SAFETY STANDARDS. ALL WORK SHALL BE PERFORMED IN STRICT COMPLIANCE WITH ALL FEDERAL, STATE AND LOCAL SAFETY ORDINANCES GOVERNING REMOVING TREES AND CUTTING BRUSH–SAFETY REQUIREMENTS" WITH SPECIAL EMPHASIS GIVEN TO THE REQUIREMENTS THAT ONLY EDUCATED LUMBERJACKS BE ALLOWED TO FELL TREES AND THAT ALL DANGEROUS LIMBS AND SNAGS BE REMOVED.

J.E. THE CONTRACTOR SHALL MAKE ALL THE NECESSARY ARRANGEMENTS WITH ANY UTILITY THAT MUST BE PROTECTED OR RELOCATED IN ORDER TO ACCOMPLISH THE WORK. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE PROTECTION OF THE OPERATING CONDITION OF ALL ACTIVE UTILITIES WITHIN THE AREA OF CONSTRUCTION, AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO EXISTING UTILITIES.

J.F. ANY MATERIAL RESULTING FROM THE TRIMMING OR REMOVAL OF ANY TREES SHALL BE REMOVED FROM THE SITE WITHIN 24 HOURS.

J.G. HAZARDOUS TREES–REPORTING – ANY PERSON ENGAGED IN TRIMMING OR PRUNING WHO BECOMES AWARE OF A TREE OF DOUBTFUL STRENGTH, THAT COULD BE DANGEROUS TO PERSONS AND PROPERTY, SHALL REPORT SUCH TREE IMMEDIATELY TO THE OWNER OR THE OWNERS REPRESENTATIVE. SUCH TREES SHALL INCLUDE THOSE THAT ARE OVER MATURE, DISEASED, OR SHOWING SIGNS OF DECAY OR OTHER HAZARDOUS CONDITIONS.

J.H. DAMAGES–ANY DAMAGE CAUSED BY THE CONTRACTOR, INCLUDING, BUT NOT LIMITED TO, WORKER, EQUIPMENT, OR MATERIAL DAMAGE, MUST BE REPORTED TO THE OWNER OR THE OWNER'S REPRESENTATIVE. SUCH TREES SHALL INCLUDE THOSE THAT ARE OVER MATURE, DISEASED, OR SHOWING SIGNS OF DECAY OR OTHER HAZARDOUS CONDITIONS.

J.I. ANY BRUSH CLEARING REQUIRED WITHIN THE TREE PROTECTION ZONE SHALL BE ACCOMPLISHED WITH HAND OPERATED EQUIPMENT.

J.J. ANY EXCAVATION REQUIRED WITHIN THE TREE PROTECTION ZONE SHALL BE DONE TO AVOID FELLING AND BREAKING OF ROOTS TO REMAIN. ALL DOWNED BRUSH AND TREES SHALL BE REMOVED FROM THE TREE PROTECTION ZONE BY LIFTING THE MATERIAL OUT, NOT BY SKIDDING IT ACROSS THE GROUND.

J.K. ANY EXCAVATION SHALL OCCUR BY LIFTING THE MATERIAL OUT, NOT BY SKIDDING IT ACROSS THE GROUND.

J.L. ALL EQUIPMENT AND MATERIALS MUST PASS OVER THE ROOT AREA OF TREES TO BE RETAINED A ROADBED OF 6 INCHES OF MULCH OR GRAVEL SHALL BE CREATED TO PROTECT THE SOIL. THE ROADBED MATERIAL SHALL BE REPLENISHED AS NECESSARY TO MAINTAIN A 6 INCH DEPTH.

J.M. PRUNING – TREES SHALL BE PRUNED PRIOR TO THE START OF CONSTRUCTION. TREES SHALL BE CROWN CLEANED TO REMOVE THE DEADWOOD 1 INCHES IN DIAMETER AND LARGER. LIVE BRANCHES THAT OVERHANG THE CONSTRUCTION ZONE MAY BE RAISED BY REMOVING BOTTOM BRANCHES AS NECESSARY UP TO 14 FEET ABOVE GRADE. ALL PRUNING SHALL BE DONE IN ACCORDANCE WITH ANSI A300 STANDARDS. REMOVE ANY LIMBS OF DOUBTFUL STRENGTH THAT COULD BE DANGEROUS TO PERSONS AND PROPERTY.

ARBORIST DISCLOSURE STATEMENT

ARBORISTS ARE TREE SPECIALISTS WHO USE THEIR EDUCATION, KNOWLEDGE, TRAINING, AND EXPERIENCE TO EXAMINE TREES, RECOMMEND MEASURES TO ENHANCE THE BEAUTY OF TREES, AND ATTEMPT TO REDUCE THE RISK OF LIVING NEAR TREES. THE CLIENT AND ARBORIST 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. RARELY CAN AN ARBORIST GUARANTEE THAT A TREE WILL SURVIVE OR THAT IT WILL NOT FAIL UNDER ALL CIRCUMSTANCES OR FOR A SPECIFIED PERIOD OF TIME. LIKEWISE, REMOVAL OF TREES CAN BE MANAGED, BUT THEY CANNOT BE CONTROLLED. TO LIVE NEAR TREES IS TO ACCEPT SOME RISK. THE ARBORIST MAY RECOMMEND MEASURES TO MINIMIZE RISK ASSOCIATED WITH TREES IS TO ELIMINATE ALL TREES.

AT THE COMPLETION OF CONSTRUCTION, ALL TREES MUST ONCE AGAIN BE REVIEWED TO EVALUATE THEIR HAZARD RATING. LAND CLEARING AND REMOVAL OF ADJACENT TREES OFTEN EXPOSES TREES TO NEW STRESSES. DEFECTS AND DYSFUNCTIONS HEALTHY TREES CAN BE DAMAGED DURING CONSTRUCTION.

TREE INFORMATION GATHERED UNDER THE SUPERVISION OF BRYCE HANSON, CERTIFIED ARBORIST, WITH AKS ENGINEERING AND FORESTRY, LLC.

TREES SHOWN TO BE SAVED WILL BE EVALUATED BY THE PROJECT ARBORIST PRIOR TO, DURING, AND AFTER CONSTRUCTION. TREES ADVERSELY AFFECTED BY CONSTRUCTION AND/OR DETERMINED TO BE A SAFETY HAZARD WILL BE REMOVED.

GENERAL NOTES:

1. A CERTIFIED ARBORIST SHALL BE PRESENT DURING EXCAVATION ACTIVITIES WITHIN THE CRITICAL ROOT ZONE OF PROTECTED TREES. SEE TREE PROTECTION NOTES ON THIS SHEET FOR MORE INFORMATION.
2. A CERTIFIED ARBORIST SHALL BE PRESENT DURING ALL TREE REMOVAL ACTIVITIES BEHIND THE TREE PROTECTION FENCE.
3. SEE SHEET THIS SHEET FOR TREE PROTECTION NOTES.
4. SEE SHEET P1.5–P1.6 FOR DETAILED INVENTORY TABLE.
5. SEE SHEET P2.0 FOR GRADING AND EROSION CONTROL PLAN.
6. TREE PROTECTION FENCING SHALL BE FLUSH WITH THE INITIAL UNDISTURBED GRADE.
7. NO CONSTRUCTION ACTIVITY SHALL OCCUR WITHIN THE TREE PROTECTION ZONE, INCLUDING, BUT NOT LIMITED TO, DUMPING OR STORAGE OF MATERIALS SUCH AS BUILDING SUPPLIES, SOILS, WASTE ITEMS OR PAINTS, EQUIPMENT OR EQUIPMENT CLEANING.
8. NO EXCAVATION, TRENCHING, GRADING, ROOT PRUNING OR OTHER ACTIVITIES SHALL OCCUR WITHIN THE TREE PROTECTION ZONE UNLESS APPROVED BY THE PROJECT ARBORIST PRESENT ON-SITE AND APPROVED BY THE CITY.
9. NOT ALL TREES WERE SURVEYED AND/OR INSPECTED WITHIN THE CRITICAL AREAS. ONLY TREES ADJACENT TO THE PROPOSED DEVELOPMENT ACTIVITIES WERE INSPECTED AND INCLUDED WITHIN THE TREE SURVEY.
10. FOLLOWING CLEARING AND GRADING ACTIVITIES, A CERTIFIED ARBORIST SHALL INSPECT ALL TREES WITHIN 50 FEET OF DISTURBANCE. ALL TREES SHALL BE INSPECTED IN COORDINATION WITH THE CITY SHALL OCCUR PRIOR TO ANY ADDITIONAL TREE REMOVALS FOR HAZARD ABATEMENT.
11. EXISTING TREE UNITS RETAINED EXCEEDS THE TOTAL TREE UNITS REQUIRED BY 15%. THEREFORE, NO ADDITIONAL TREES MAY BE RECOMMENDED DURING DESIGN AND/OR CONSTRUCTION. IF ADDITIONAL TREE REMOVAL IS TO OCCUR, COMPLIANCE WITH TREE RETENTION REQUIREMENTS WILL BE MAINTAINED.

KEYED NOTE: (#)

1. TREE REMOVAL IN THIS AREA TO BE DETERMINED AT TIME OF TRIAL CONSTRUCTION. TRIAL TO BE CONSTRUCTED TO LIMIT IMPACTS TO TREES. HOWEVER SOME IMPACTS MAY BE NECESSARY AND REQUIRE TREE REMOVAL.

LEGEND

EXISTING GROUND CONTOUR (2 FT)	
EXISTING GROUND CONTOUR (10 FT)	150
FINISHED GRADE CONTOUR (2 FT)	
FINISHED GRADE CONTOUR (10 FT)	150
EXISTING CONIFEROUS TREE	
EXISTING DECIDUOUS TREE	
TREE REMOVAL	
TREE PROTECTION/CONSTRUCTION FENCE (TREE PROTECTION AREA)	
OPTIMAL TREE PROTECTION ZONE (1-FT RADIUS PER 1-IN OF DBH)	

BRYCE D. HANSON
OREGON
2009
EXPIRES: 06/30/22

AKS DRAWING FILE: 5564 P&O TREE PLANS.DWG | LAYOUT: P5.1

PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN (NORTH)
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON
PRELIMINARY NOT FOR CONSTRUCTION
P5.2
AKS ENGINEERING & FORESTRY, LLC
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VANCOUVER, WA 98682
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GENERAL NOTES:
1. EXISTING AMORPHOTS SHALL BE PRESENT DURING EXCAVATION ACTIVITIES WITHIN TREE PROTECTION ZONE OF PRESERVED TREES. SEE TREE PROTECTION FENCE DETAIL ON SHEET P5.1 FOR MORE INFORMATION.
2. A CERTIFIED ARBORIST SHALL BE PRESENT DURING ALL TREE REMOVAL ACTIVITIES BEHIND THE TREE PROTECTION FENCE.
3. SEE SHEET P5.1 FOR TREE PROTECTION NOTES.
4. SEE SHEET P5.3–P5.5 FOR DETAILED INVENTORY TABLE.
5. TREE PROTECTION MEASURES SHALL BE INSTITUTED PRIOR TO ANY DEVELOPMENT ACTIVITIES, INCLUDING, BUT NOT LIMITED TO, CLEARING, GRADING, EXCAVATION OR DEMOLITION WORK, AND SHALL BE REMOVED ONLY AFTER COMPLETION OF ALL CONSTRUCTION ACTIVITY, INCLUDING LANDSCAPING AND IRRIGATION INSTALLATION. SEE TREE PROTECTION DETAIL ON SHEET P5.1.
6. TREE PROTECTION FENCING SHALL BE FLUSH WITH THE INITIAL UNDISTURBED GRADE.
7. NO CONSTRUCTION ACTIVITY SHALL OCCUR WITHIN THE TREE PROTECTION ZONE, INCLUDING, BUT NOT LIMITED TO, DUMPING OR STORAGE OF MATERIALS SUCH AS BUILDING SUPPLIES, SOIL, WASTE ITEMS OR PARKED VEHICLES OR EQUIPMENT.
8. NO EXCAVATION, TRENCHING, GRADING, ROOT PRUNING OR OTHER ACTIVITIES SHALL OCCUR WITHIN THE TREE PROTECTION ZONE UNLESS DIRECTED BY AN ARBORIST PRESENT ON SITE AND APPROVED BY THE CITY.
9. NOT ALL TREES WERE SURVEYED AND/OR INSPECTED WITHIN THE CRITICAL AREAS. ONLY TREES ADJACENT TO THE PROPOSED DEVELOPMENT AND/OR ROADS WERE SURVEYED AND/OR INSPECTED WITHIN THE CRITICAL AREAS.
10. FOLLOWING CLEARING AND GRUBBING ACTIVITIES, A CERTIFIED ARBORIST SHALL INSPECT RETAINED TREES FOR POTENTIALLY HAZARDOUS TREE CONDITIONS. COORDINATION WITH THE CITY SHALL OCCUR PRIOR TO ANY ADDITIONAL TREE REMOVALS FOR HAZARD ABATEMENT.
11. EXISTING TREE UNITS RETAINED EXCEEDS THE TOTAL TREE UNITS REQUIRED BY THE TREE CODE. ADDITIONAL TREE REMOVAL MAY BE RECOMMENDED DURING DESIGN AND/OR CONSTRUCTION. IF ADDITIONAL TREE REMOVAL IS TO OCCUR, COMPLIANCE WITH TREE RETENTION REQUIREMENTS WILL BE MAINTAINED.
LEGEND
EXISTING GROUND CONTOUR (2 FT)
EXISTING GROUND CONTOUR (10 FT)
FINISHED GRADE CONTOUR (2 FT)
FINISHED GRADE CONTOUR (10 FT)
EXISTING CONIFEROUS TREE
EXISTING DECIDUOUS TREE
TREE REMOVAL
TREE PROTECTION/CONSTRUCTION FENCE (TREE PROTECTION AREA)
OPTIMAL TREE PROTECTION ZONE (1-FT RADIUS PER 1-IN OF DBH)
EXISTING TREE UNITS RETAINED EXCEEDS THE TOTAL TREE UNITS REQUIRED BY THE TREE CODE. ADDITIONAL TREE REMOVAL MAY BE RECOMMENDED DURING DESIGN AND/OR CONSTRUCTION. IF ADDITIONAL TREE REMOVAL IS TO OCCUR, COMPLIANCE WITH TREE RETENTION REQUIREMENTS WILL BE MAINTAINED.
SEE SHEET P5.0
SEE SHEET P5.1
SCALE: 1"=50' FEET
JOB NUMBER: 9564
DATE: 5/7/2021
DESIGNED BY: CJS
DRAWN BY: BRK
CHECKED BY: BDH
BRYCE D. HANSON
OREGON JULY 13, 2010
EXPIRES: 6/30/2021
AKS DRAWING FILE: 9564 P&O TREE PLAN.DWG | LAYOUT: P5.2

Appendix C: Tree Planting Plan

PRELIMINARY LANDSCAPE AND LIGHTING PLAN (SOUTH)
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON
P9.0
PRELIMINARY NOT FOR CONSTRUCTION
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SCALE: 1" = 50 FEET
SEE SHEET P9.2
SEE SHEET P9.1
SEE ABOVE
SEE BELOW
N ADAMS ST
N 45TH CIR
N 46TH AVE
NE LEADBETTER RD
SE LEADBETTER RD
N FIR DR
LACAMAS LAKE
GENERAL NOTES
1. REFER TO SHEET P9.2 FOR PRELIMINARY PLANT SCHEDULE AND LANDSCAPE NOTES.
2. ROBUST PLANTING IS PROVIDED THROUGHOUT THE DEVELOPMENT BY PROVIDING PLANTINGS IN OPEN SPACE TRACTS, ALONG ROADWAYS, AND WITHIN THE STORMWATER FACILITY. IN ADDITION, A MINIMUM OF 15 PERCENT OF THE SITE WILL BE PLANTED WITH A MIX OF TREES, SHRUBS AND GROUNDCOVER. A NATIVE SHRUB SEED MIX TO KEEP AS MUCH OF THE UNDERSTORY PLANTS IN AREAS DISTURBED BY CONSTRUCTION.

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PRELIMINARY LANDSCAPE AND LIGHTING PLAN (WEST)

CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	9564
DATE:	5/7/2021
DESIGNED BY:	TEB
DRAWN BY:	TEB
CHECKED BY:	AMF

P9.1

GENERAL NOTES

1. REFER TO SHEET P9.2 FOR PRELIMINARY PLANT SCHEDULE AND LANDSCAPE NOTES.
2. ROBUST PLANTING IS PROVIDED THROUGHOUT THE DEVELOPMENT BY PROVIDING PLANTINGS IN OPEN SPACE TRACTS ABOVE CODE REQUIREMENTS. SPECIFICALLY, ADDITIONAL PLANTINGS IN TRACTS A AND B WILL PROVIDE A DENSE MIX OF SHRUBS AND TREES AND WILL BE SIMILAR TO THE UNDERSTORY PLANTS IN AREAS DISTURBED BY CONSTRUCTION.

PRELIMINARY LANDSCAPE AND LIGHTING PLAN (NORTH)

CJ DENS SUBDIVISION

CJ DENS LACAMAS II LLC

CAMAS, WASHINGTON

P9.2

JOB NUMBER: 9564
DATE: 5/7/2021
DESIGNED BY: EB
DRAWN BY: AM
CHECKED BY: AM

PRELIMINARY NOT FOR CONSTRUCTION

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PRELIMINARY PLANT SCHEDULE

STREET TREES	QTY.	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER	SPACING
	166	ACER TRUNCATUM X PLATANOIDES 'WARRENRED'	PACIFIC SUNSET MAPLE	2" CAL. B&B	AS SHOWN
	50	CARPINUS BETULUS	EUROPEAN HORNBEAM	2" CAL. B&B	AS SHOWN
	41	PYRUS CALLERYANA 'ARISTOCRAT'	ARISTOCRAT FLOWERING PEAR	2" CAL. B&B	AS SHOWN
	79	TILIA CORDATA 'GREENSPIRE'	GREENSPIRE LITTLELEAF LINDEN	2" CAL. B&B	AS SHOWN
OPEN SPACE TREES	QTY.	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER	SPACING
	4	ACER CIRCINATUM	VINE MAPLE	6' HT. B&B	AS SHOWN
	28	ACER MACROPHYLLUM	BIG LEAF MAPLE	1 GAL. CONT. TRACTS A&B	AS SHOWN
	30	ACER RUBRUM 'BOWHALL'	BOWHALL MAPLE	2" CAL. B&B	AS SHOWN
	45	RHAMNUS PURSHIANA	CASCARA	1 GAL. CONT. TRACTS A&B	AS SHOWN
	13	RHAMNUS PURSHIANA	CASCARA	2" CAL. B&B	AS SHOWN
	22	THUJA PLICATA	WESTERN RED CEDAR	1 GAL. CONT. TRACTS A&B	AS SHOWN
	5	THUJA PLICATA	WESTERN RED CEDAR	6' HT. B&B	AS SHOWN
BUFFER SHRUBS	QTY.	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER	SPACING
	125	MAHONIA AQUIFOLIUM	OREGON GRAPE	2 GAL CONT.	48" o.c.
	92	VACCINIUM OVATUM	EVERGREEN HUCKLEBERRY	2 GAL CONT.	48" o.c.
GROUND COVER	±QTY.	DESCRIPTION			
	8,120 SF	LAWN – SEED			

PRELIMINARY LANDSCAPE NOTES

1. LANDSCAPE PLAN IS PRELIMINARY AND INTENDED TO SHOW DESIGN INTENT ONLY. REVISIONS OR SUBSTITUTIONS AS REQUIRED TO FULFILL CITY CONDITIONS, TYPICAL AND SIZES MAY BE NECESSARY PRIOR TO FINAL APPROVAL BASED ON PLANT AVAILABILITY, SITE CONDITIONS, UTILITY CONFLICTS, ETC. ALL REVISIONS SHALL COMPLY WITH CITY CODE AND/OR DESIGN STANDARDS. STREET TREES WILL BE UPDATED TO AVOID FUTURE DRIVEWAY DROPS.
2. ALL PLANTS AND PLANTINGS SHALL CONFORM TO CITY OF CAMAS DESIGN STANDARDS AND TO AMERICAN NURSERY STANDARDS ANSI Z60.1. PLANT IN ACCORDANCE WITH ACCEPTED BEST-PRACTICE METHODS AND STANDARDS SUCH AS THOSE ADOPTED BY THE WASHINGTON ASSOCIATION OF LANDSCAPE PROFESSIONALS (WALP).
3. CENTER TREES IN PLANTER STRIPS AND LANDSCAPE PLANTING BEDS WHERE POSSIBLE. KEEP OTHER TREE TRUNKS 3' O.C. MINIMUM FROM CURBS, SIDEWALKS, AND OTHER PAVING OR EDGINGS IN PLANTING ISLANDS. KEEP SHRUBS AND GROUNDCOVER A MINIMUM OF 24" O.C. FROM PAVING AND 3' O.C. FROM CURBS. ADJUST PLANTING LOCATIONS AS NECESSARY ON SITE TO AVOID CONFLICT WITH UTILITIES, HYDRANTS, LIGHT POLES, METERS, ETC.
4. HATCHED AREAS ARE MEANT TO CONVEY GENERAL PLANT LOCATION, PLANT COVERAGE, SPACING, AND LAYOUT SHALL BE CONSISTENT WITH THE SPACING LISTED IN THE PLANT LEGEND FOR FULL COVERAGE.
5. MULCH: APPLY 3" DEEP WELL-AGED MEDIUM GRIND OR SHREDDED DARK HEMLOCK BARK MULCH UNDER AND AROUND ALL TREES AND SHRUBS IN PLANTER STRIP AREAS NOT INCLUDED AS STORMWATER FACILITIES. ALL PLANTING AREAS SHALL BE MULCHED TO A MINIMUM DEPTH OF 3". MULCH SHALL BE USED AROUND THE TREE TO PROTECT THE TRUNK FROM MOWER DAMAGE. CARE SHALL BE TAKEN TO AVOID COVERING FOLIAGE OR ROOT CROWNS OF PLANTS. PLANTS SHALL BE PLANTED AT A DEPTH TO ACCOMMODATE BARK MULCH APPLICATION.
6. IRRIGATION FOR NEW PLANT ESTABLISHMENT AND SERVICE IS RECOMMENDED AND SHALL BE PROVIDED BY AN AUTOMATIC UNDERGROUND SYSTEM.
7. UNDISTURBED AREAS WITHIN TRACTS A AND B NOT SHOWING LANDSCAPE ARE TO BE LEFT NATURAL.
8. DISTURBED AREAS WITHIN THE TRACTS A AND B WILL BE SEEDED WITH A NATIVE SHRUB SEED MIX. ALL DISTURBED AREAS NOT PROPOSED TO HAVE LANDSCAPE WILL BE REPLANTED WITH A NATIVE SEED MIX.
9. REFER TO SHEET P5.0 FOR PRELIMINARY TREE PLAN.
10. SEED MIX WITHIN OPEN SPACE AREAS SHALL INCLUDE WOODY PLANT MATERIAL (SHRUB SEED).
11. ONE GALLON TREES ARE BEING PLACED IN OPEN SPACE TRACTS DUE TO SHALLOW BEDROCK. STEEP SLOPES, AND FUTURE SURVIVABILITY.

GENERAL NOTES

1. REFER TO THIS SHEET FOR PRELIMINARY PLANT SCHEDULE AND LANDSCAPE NOTES.
2. ROBUST PLANTING IS PROVIDED THROUGHOUT THE DEVELOPMENT BY PROVIDING PLANTINGS IN OPEN SPACES, STORMWATER FACILITIES, AND ALONG ROADWAYS. STORMWATER FACILITIES ALONE HAVE A TOTAL OF 1,400 PLANTS AND 8 MILL PROVIDE 93 NEW TREES AND A NATIVE SHRUB SEED MIX TO HELP RE-ESTABLISH UNDERSTORY PLANTS IN AREAS DISTURBED BY CONSTRUCTION.

AKS DRAWING FILE: 9564 P9.0 LANDSCAPE LIGHTING P9.2

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PRELIMINARY TRACT I PARK PLANTING PLAN
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	9564
DATE:	5/7/2021
DESIGNED BY:	EB
DRAWN BY:	EB
CHECKED BY:	AM

P9.3

GENERAL NOTES

1. REFER TO SHEET P4.2 FOR PRELIMINARY PLANT SCHEDULE AND LANDSCAPE NOTES.
2. ROBUST PLANTING IS PROVIDED THROUGHOUT THE DEVELOPMENT BY PROVIDING PLANTINGS IN OPEN SPACE TRACTS ABOVE CODE REQUIREMENTS. SPECIFICALLY, ADDITIONAL PLANTINGS IN TRACTS A AND B WILL PROVIDE 30 NEW TREES AND A NATIVE SHRUB SEED MIX TO HELP RE-ESTABLISH UNDERSTORY PLANTS IN AREAS DISTURBED BY CONSTRUCTION.

PLANT SCHEDULE - TRACT I PARK

	SITE TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER	SPACING
		3	RHAMNUS PURSHIANA	CASCARA	2" CAL B&B	AS SHOWN
		4	THUJA PLICATA	WESTERN RED CEDAR	6' HT. B&B	AS SHOWN
	BUFFER SHRUBS	QTY	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER	SPACING
⊙		6	MAHONIA AQUIFOLIUM	OREGON GRAPE	2 GAL CONT.	48" o.c.

AKS DRAWING FILE: 9564 P9.0 LANDSCAPE PLANS | LAYOUT: P9.3

CJ Dens Subdivision (PA20-09)

Preliminary Stormwater Technical Information Report (TIR)

Date: November 2020

Submitted To:
City of Camas
Community Development Department
616 NE 4th Avenue
Camas, WA 98607

Applicant:
CJ Dens Lacamas II LLC
Contact: Carl Lawson
PO Box 2239
Kalama, WA 98625
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Prepared By:
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9600 NE 126th Avenue, Suite 2520
Vancouver, WA 98682

AKS Job Number: 5504

AKS ENGINEERING & FORESTRY

www.aks-eng.com

Certificate of the Engineer

CJ Dens Subdivision
Camas, Washington
Preliminary Technical Information Report

This Preliminary Technical Information Report and the data contained herein were prepared by the undersigned, whose seal, as a Professional Engineer licensed to practice as such, is affixed below. All information required by Camas Municipal Code (CMC) Chapter 14.02 is included in the proposed stormwater plan and the proposed facilities are feasible.

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Appendix H: Maintenance & Operations

References

Camas Stormwater Design Standards Manual, November 2016, Resolution #1193 – "CSDSM"

2019 Stormwater Management Manual for Western Washington, (Ecology Publication No. 19-10-021, July 2019), Errata released January 22, 2020 – "SWMMWW"

Preliminary Stormwater Technical Information Report (TIR)

CJ DENS SUBDIVISION
CAMAS, WASHINGTON

Section A – Project Overview

This report analyzes the effects the proposed development will have on the existing stormwater conveyance system; documents the criteria, methodology, and informational sources used to design the proposed stormwater system; and presents the results from the preliminary hydraulic analysis.

Section A.1 – Site Location

The CJ Dens Subdivision project site is located on three parcels of land, totaling approximately 49.62 acres. The CJ Dens Subdivision is located within portions of Sections 34 & 35 of Township 2 North, Range 3 East, Willamette Meridian, Clark County, Washington (Parcel Serial No.'s 178172-000, 178236-000, 177906-000). All parcels are zoned Residential – 7.5 (R7.5) with an Airport Overlay. The site is accessed from SE Leadbetter Road along the southern portion of the project site.

Section A.2 –Site topography and Critical Areas

The existing site is vacant land and is mostly cleared previously forested land, with slopes ranging from 3 to 80 percent. Steep slopes will be protected from development and are buffered out within preservation tracts. The site also contains some exposed rock outcroppings throughout. The site generally slopes to the south towards SE Leadbetter Road and Lacamas Lake. A portion of the site slopes to the north towards an on-site wetland and unnamed non-fish bearing stream.

There is one delineated wetland (Wetland A) located on-site and adjacent to the site along the northern boundary of the site. The wetland is to be protected by wetland and aquatic system buffers. Any discharge to the wetland shall maintain the hydrologic conditions, hydrophytic vegetation, and substrate characteristics necessary to support existing and designated uses. There are two unnamed non-fish bearing tributary streams on-site. The first stream is a perennial Type Np stream that originates in the offsite portion of the wetland to the north and runs southwesterly through the site and an offsite parcel to a culvert located under SE Leadbetter Road and into Lacamas Lake. The second stream is a seasonal Type Ns stream that flows through the southeast corner of the site and into the ditch along SE Leadbetter Road before flowing into a culvert cross drain to Lacamas Lake.

Section A.3 –Existing onsite Stormwater System

Currently stormwater infiltrates or sheet flows to the south and is collected either in an unnamed non-fish bearing tributary stream that flows to Lacamas Lake or is collected within the ditch of SE Leadbetter Rd and conveyed to the lake by culvert cross drains under the roadbed. No other stormwater systems exist on the subject site.

Section A.4 –Site Parameters That Influence Stormwater Design

The CJ Dens project site consists of varied slopes across the entire site. These slopes contribute to challenges associated with site stormwater collection and conveyance design. The site also contains shallow bedrock throughout the site which will influence conveyance design.

Section A.5 –Adjacent Property Drainage

Properties from the north of the site contribute to the drainage area to Wetland A and the associated non-fish bearing perennial stream. This off-site area only flows through the project site and will be contained within the critical areas and associated perennial stream. All critical areas will be protected by

a critical areas buffer. The Deer Haven Subdivision to the southeast of the project site also contains a non-fish bearing seasonal stream that flows through the site. The flow from this stream is directed to the ditch on the north side of SE Leadbetter Road. The CJ Dens project will share the outfall discharge location to Lacamas Lake at a culvert crossing SE Leadbetter Road.

Section A.6 –Adjacent Site Areas

The proposed site is bounded by the Deer Haven Subdivision to the southeast, SE Leadbetter Road & Lacamas lake to the south, vacant parcels to the north zoned R-7.5 and Business Park, vacant parcels to the east and west zoned R-7.5 and Community Commercial.

Section A.7 –General Project Stormwater Description

Proposed site improvements include sidewalks, public streets, open spaces, and 152 single-family residences. The majority of site stormwater will be collected via catch basins or dispersed and routed to conveyance piping and discharged into Lacamas Lake. The portion of the site that will discharge to Lacamas Lake will meet the exemption requirements for being Flow-Control-Exempt, as outlined in Volume I, Chapter 3.4.7 of the 2019 Stormwater Management Manual for Western Washington (SWMMWW). A small portion of the site will be collected via catch basins or collected and routed to conveyance piping and discharge to an on-site detention pond located within Tract R. Discharge from the Tract R detention pond will be released to the Wetland A after being detained at or below pre-developed release rates. Rear yards of lots that are adjacent to Wetland A will also discharge rear lot area runoff into Wetland A. All pollution-generating surfaces on-site will be treated by mechanical filter catch basins located within the street. See the development plans, Appendix C, and the Stormwater Basin Plans, Appendix D, for location and size of each basin.

Section B –Minimum Requirements

Section B.1 – Determination of Applicable Minimum Requirements

Proposed land disturbances shall include grading and excavation of unsuitable soils for the construction of sidewalks, utilities, streets, and 152 residential lots. Due to the amount of proposed hard surfaces (greater than 5,000 square feet), the project is required to meet Minimum Requirements 1 through 9 per Figures 1.1 & 1.2 of the City of Camas Stormwater Design Manual (CSDSM) (see Appendix B).

The tables in this section provide information pertaining to each stormwater basin within the project area. See the Stormwater Basin Plans for basin locations (Appendix D).

Table B-1: Proposed Hard Surface and Landscaping

Basin	Existing Hard Surfaces (acres)	New Hard Surfaces (acres)	Replaced Hard Surfaces (acres)	Native Vegetation Replaced w/ Landscaping (acres)	Total Land Disturbed (acres)
1.1S	0.000	1.229	0.000	0.777	2.006
1.2S	0.000	0.000	0.000	1.214	1.214
2S	0.000	19.937	0.000	20.323	40.259
3S	0.000	0.000	0.000	0.559	0.599

Note: Areas listed are in acres. Assumes 700-square-foot driveway and 3,400-square-foot roof area per lot.

Tables B-2 and B-3 show the mitigated site basins, differentiated between pollution- and non-pollution-generating surfaces. It is important to note that any non-pollution-generating areas directly mixing or

having the opportunity to mix with stormwater runoff from pollution-generating surface areas are classified as pollution-generating. Therefore, any stormwater collected from a private lot is not collected from a lateral is considered pollution-generating.

Table B-2: Pollution-Generating Surfaces

Basin	Hard Surfaces (acres)	Pervious Surfaces (acres)	Total Surface Area (acres)
1.1S	1.261	0.746	2.007
1.2S	0.000	0.000	0.000
2S	8.878	1.819	10.697
3S	0.000	0.000	0.000

Note: Areas listed are in acres. Assume 700-square-foot driveway and 3,400-square-foot roof area per lot.

Table B-3: Non-Pollution-Generating Surfaces

Basin	Hard Surfaces (acres)	Pervious Surfaces (acres)	Total Surface Area (acres)
1.1S	0.000	0.000	0.000
1.2S	0.000	1.214	1.214
2S	11.059	18.503	29.562
3S	0.000	0.559	0.559

Note: Areas listed are in acres. Assume 700-square-foot driveway and 3,400-square-foot roof area per lot.

Each developed basin's effective hard surfaces and their applicability for meeting Minimum Requirements 6 through 8 are summarized in Table B-4 below.

Table B-4: Effective Hard Surfaces

Basin	Hard Surface Area (acres)	MR #6 Required (Y/N)	MR #7 Required (Y/N)	MR #8 Required (Y/N)
1.1S	1.261	Y	Y	Y
1.2S	0.000	Y	Y	Y
2S	19.937	Y	N	N
3S	0.000	Y	Y	N

Note: Areas listed are in acres. Assume 700-square-foot driveway and 3,400-square-foot roof area per lot.

Section C –Soils Evaluation

Section C.1 – Soil Suitability for Low Impact Development BMPs

The CJ Dens project is not suitable for stormwater infiltration for flow control, runoff treatment, or LID measures due to the majority of the site being underlain by shallow bedrock. The project geotechnical report, dated July 2016 and within Appendix G, recommends against the use of infiltration systems for stormwater disposal due to the presence of a fine-grained soil matrix and hard bedrock.

Section C.2 –Water Table Information

Per the project geotechnical report, subsurface seepage was only encountered in a single test pit during site exploration. Some perched groundwater may be present on-site during the wetter months and periods of heavy rain. It is anticipated that no stormwater facilities will be affected by ground water presence.

Section C.3 –Soil Parameters
Soil parameters were not used for design of the site stormwater due to the existence of shallow bedrock. It is anticipated that all site runoff will be collected and conveyed to Lacamas Lake.

Section C.4 –Infiltration Rate Testing
As recommended in the project geotechnical report, the site is not suitable for infiltration to control stormwater. Infiltration is not recommended due to the presence of a fine-grained soil matrix and hard bedrock.

Section C.5 – Complex Soil Conditions
A preliminary geotechnical report has been prepared and is attached to this report, see Appendix G. Existing soil conditions are summarized, and recommendations are presented in relation to site stormwater design considerations.

Section D –Source Control

Volume IV of the Stormwater Management Manual for Western Washington (SWMMWW) contains the following applicable source control best management practices (BMPs) for residential development. The source control BMPs and applicable notes to control stormwater runoff impacted by these activities will be included in the Erosion Control Plans and Details and in the Stormwater Pollution Prevention Plan (SWPPP).

- S407: Dust Control at Disturbed Land Areas and Unpaved Roadways and Parking Lots
- S411: BMPs for Landscaping and Lawn/Vegetation Management

Section E –Onsite Stormwater Management BMPs

Figure I-3.3 of the SWMMWW was used to determine that LIDs are infeasible as infiltration on-site is not recommended because of the presence of a fine-grained soil matrix and hard bedrock (see the geotechnical report in Appendix G). Therefore, site runoff from pollution-generating impervious surfaces will be collected and treated by water quality structures and conveyed to Lacamas Lake. Mechanical filter catch basin structures are proposed to meet water quality requirements for all on-site areas. Water quantity requirements for this site is exempt due to the site's discharge to Lamas Lake, a rule defined large water body. All disturbed areas will meet post-construction soil quality and quantity requirements per BMP T5.13. A portion of the site will flow north into a detention pond to protect the hydraulic function of Wetland A.

Section F –Runoff Treatment Analysis and Design

Surface water from pollution-generating surfaces will be treated with mechanical filter catch basins within the street right-of-way for treatment based on Volume III, Chapter 1.2 of the SWMMWW as well as Chapter 5 of the CSDSM. Any basin that mixes non-pollution-generating runoff with pollution-generating runoff, the combined runoff is considered to be pollution-generating. A majority of lots will be served by a stormwater lateral to maintain separation from pollution-generating surfaces, see Development Plans in Appendix C for which lots are required to have a service lateral installed. Service laterals will collect lot roof area and lot landscaped area that will not mix with any other stormwater.

Due to the location of the CJ Dens site, above the dam at the south end of Round Lake, mechanical filter treatment catch basins will be required to meet phosphorus treatment per Chapter 5 of the CSDSM.

Section G –Flow Control Analysis and Design

The CJ Dens site is comprised of three main basins. See the Basin Plans in Appendix D for the locations of these basins.

Basins 1.1S & 1.2S will be required to meet flow control standards due to the discharge of this basin being to a Category III wetland at the northern extent of the site. The project proposes to use a detention pond, with a flow control manhole, to meet the site flow control requirements. All roof, driveway and incidental landscape runoff within Basin 1.1S is proposed to flow through the site detention pond within Tract R. Basin 1.2S will consist of dispersed flow from rear yard runoff of all lots directly adjacent to Wetland A and the associated stream. Analysis for Basin 1.1S and the site detention pond is summarized by the Western Washington Hydraulic Model (WWHM2012) program output within Appendix F.

Based on Volume 1, Chapter 3.4.7 of the SWMMWW, flow control is not required for the largest basin, Basin 2S, of the project site due to this project being able to directly discharge to a flow control-exempt surface water, Lacamas Lake. Basin 2S will discharge treated stormwater from the on-site conveyance system directly into Lacamas Lake at the location of an existing culvert that currently flows under SE Leadbetter Road.

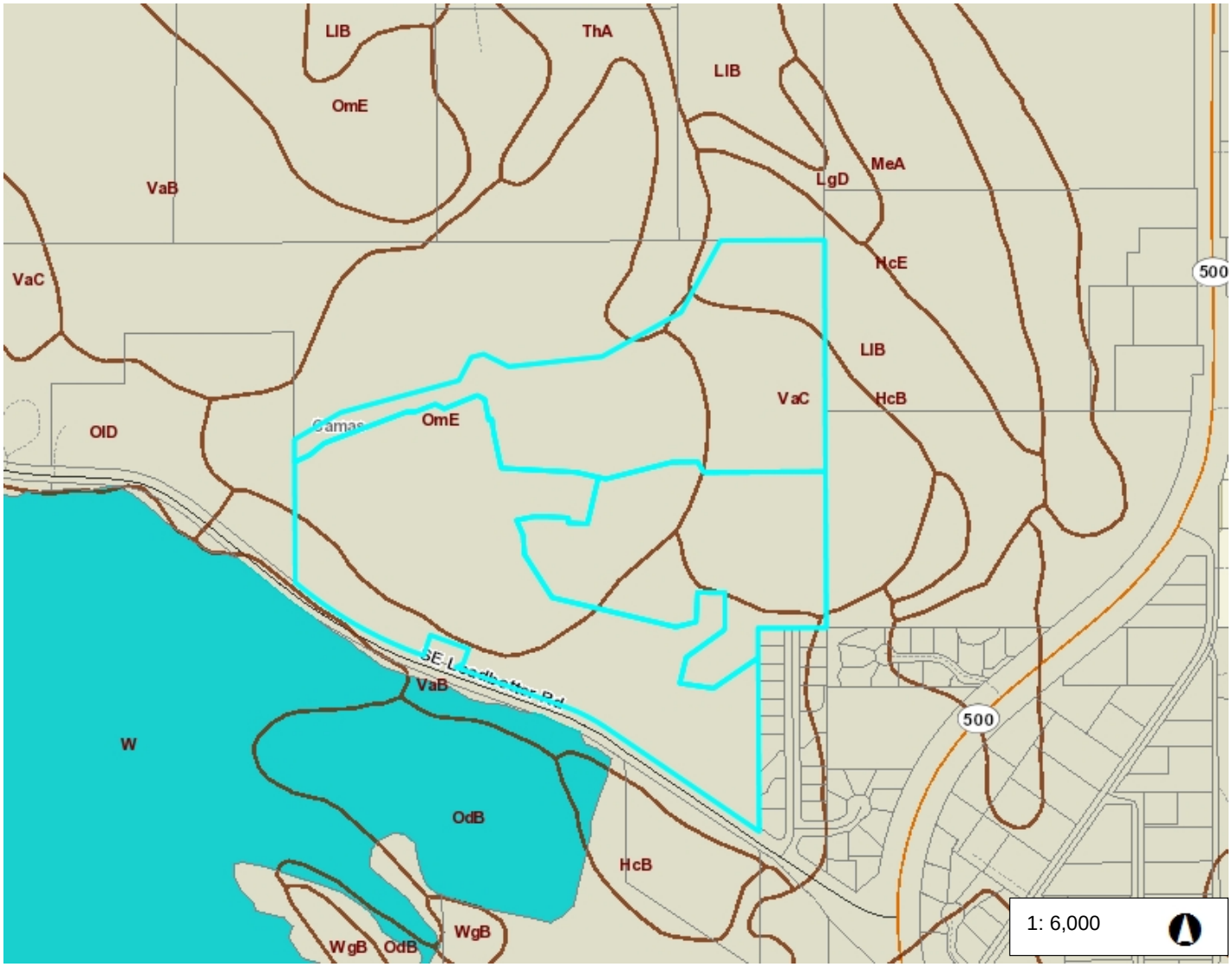
Basin 3S is described as only rear yard runoff that is unable to be collected along the eastern property boundary from lots 92-103 and is a total of 0.56 acres. This area is only 20 percent of the total area that currently flows to the east and will be dispersed at the property line to limit any concentrated erosion concerns. The remainder of the pre-developed basin area, Pre-developed Basin 3S, will flow to the manmade conveyance system within Basin 2S, which is flow control exempt.

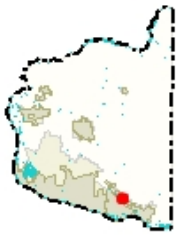
Section H –Wetland Protection

The site contains a category III wetland associated with the natural drainage on site. The wetland is to be protected by wetland and aquatic system buffers. Water quality of the wetland should not be degraded as treated discharge from the proposed site stormwater facility in Tract R will discharge from a flow control structure to match pre-developed flow rates. Discharge from the site will also be dispersed from landscaped areas through the wetland buffer into the wetland and associated perennial stream. No impacts to wetlands are proposed with this development. Hydrophytic vegetation will be maintained or enhanced within the wetland, see the project wetland mitigation plan for more information on site enhancements.

Appendix A: Map Submittals

CJ DENS SUBDIVISION SOILS MAP





Legend

- Taxlots
- Soil Type
- All Roads
  - Interstate
  - State Route
  - Arterial
  - Forest Arterial
  - Minor Collector
  - Forest Collector
  - Private or Other
- Cities Boundaries
- Urban Growth Boundaries

Notes:

1,000.0 0 500.00 1,000.0 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - http://gis.clark.wa.gov

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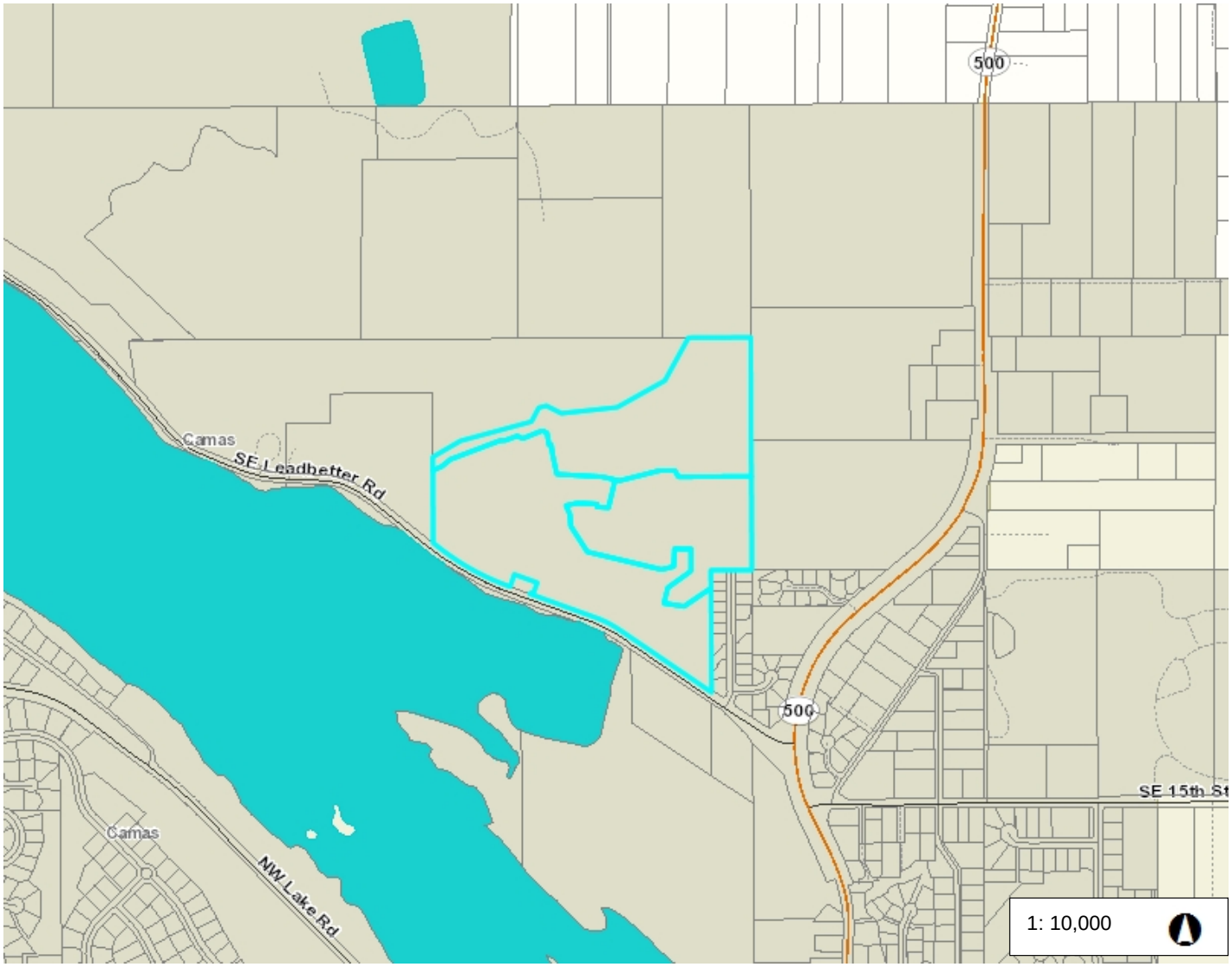
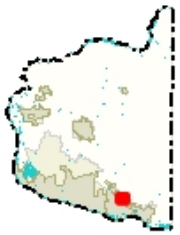
CJ DENS SUBDIVISION





Legend

- Taxlots
- Cities Boundaries
- Urban Growth Boundaries

Notes:

1: 10,000

1,666.7 0 833.33 1,666.7 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
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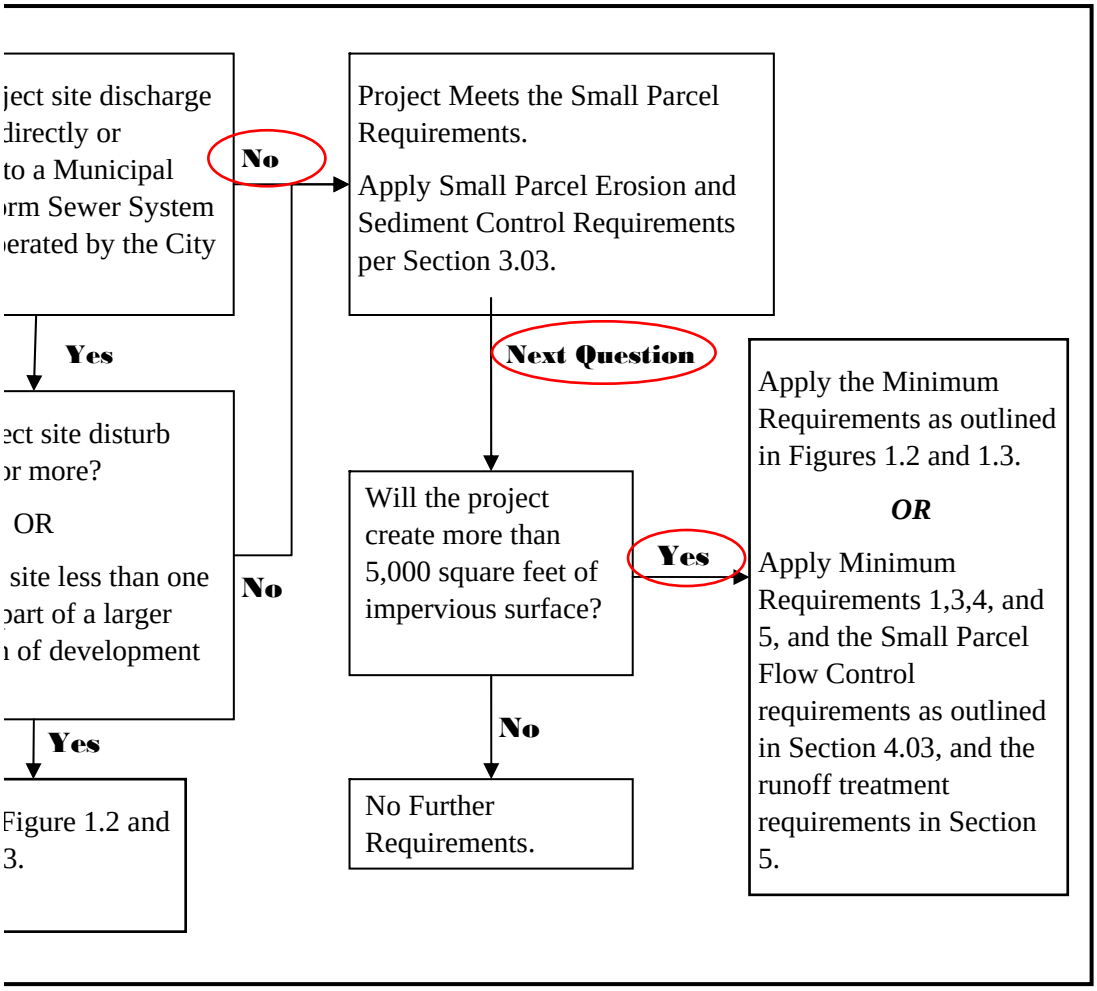
Appendix B: New Development Flow Chart

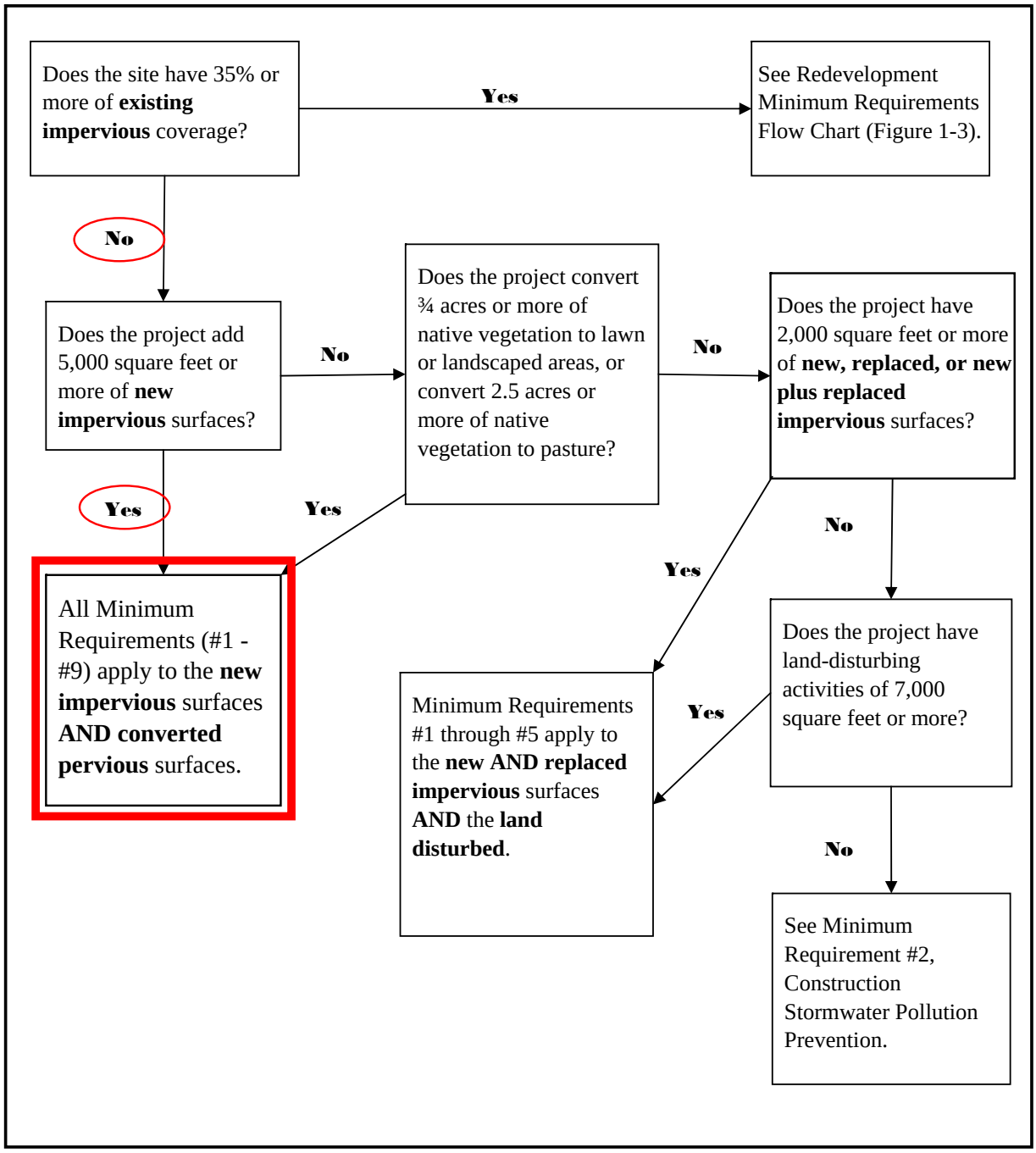
1: General Requirements

ow Chart for Determining Stormwater Requirements

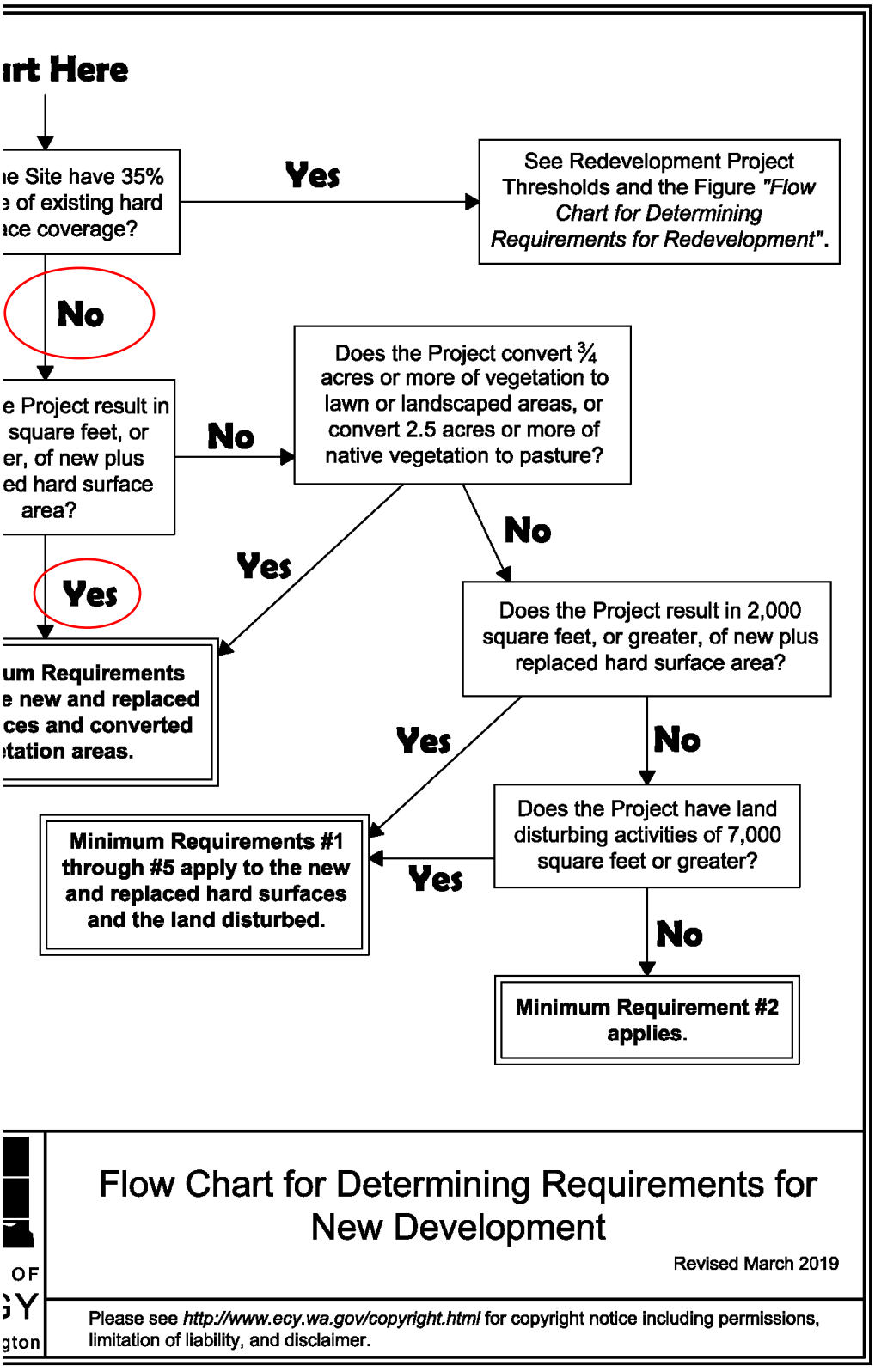


Chapter 1: General Requirements
Continued

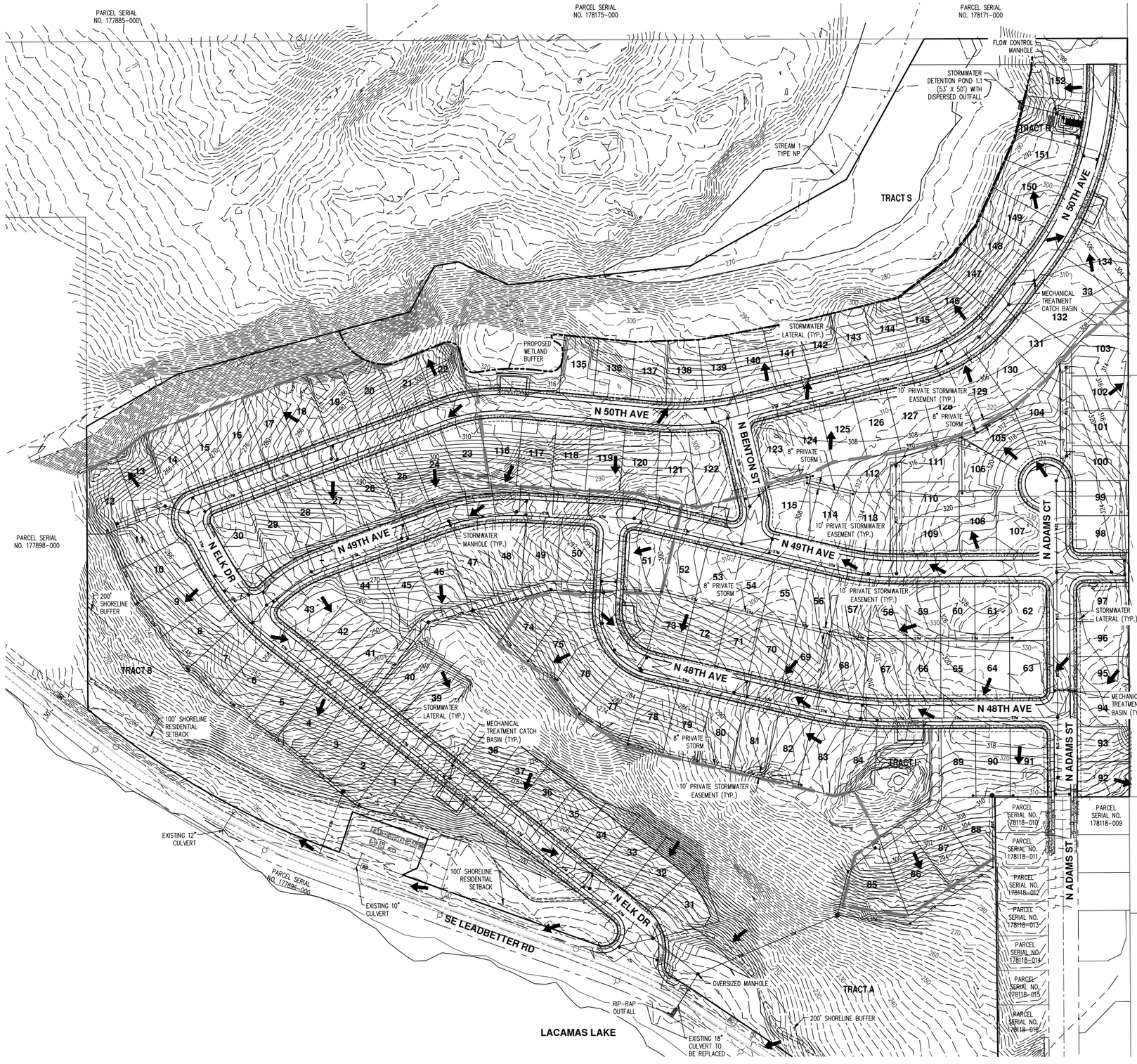
Figure 1.2: New Development Minimum Requirements Flow Chart



-3.1: Flow Chart for Determining Requirements for New Development



Appendix C: Development Plans



LEGEND

- EXISTING GROUND CONTOUR (2 FT)
- EXISTING GROUND CONTOUR (10 FT) — 350
- FINISHED GRADE CONTOUR (2 FT)
- FINISHED GRADE CONTOUR (10 FT) — 350
- PHASE BOUNDARY
- STORMWATER FLOW ARROWS
- STORM FACILITY ACCESS

GENERAL NOTES

1. CONTOUR INTERVAL IS 2 FOOT.
2. TREES ARE NOT SHOWN.
3. STORMWATER DETENTION POND 1.1 ON TRACT R TO BE OWNED AND MAINTAINED BY THE HOA.
4. ACCORDING TO CLARK COUNTY GIS, THE SITE IS NOT WITHIN OR ADJACENT TO A 100-YEAR FLOODPLAIN.
5. THERE ARE NO KNOWN EXISTING ON-SITE STORMWATER FACILITIES.
6. NATIVE VEGETATION WITHIN TRACT A, TRACT B, TRACT S, AND THE CRITICAL AREAS WILL BE RETAINED AS MUCH AS POSSIBLE AND ENHANCED, AS NEEDED, PER THE WETLAND MITIGATION PLAN.
7. SOME OFF-SITE FLOW OCCURS FROM ADJACENT PARCELS. ANALYSIS OF OFF-SITE FLOW WAS NOT DONE AT THIS TIME AND WILL BE INCLUDED WITH THE FINAL STORMWATER PLAN.
8. REAR YARD RUNOFF FOR LOTS 12-22 AND 135-152 WILL BE COLLECTED AND DISPERSED INTO THE ADJACENT WETLAND BUFFER. ROOFS WILL DRAIN TO A STORMWATER LATERAL.
9. REAR YARD RUNOFF FOR LOTS 92-103 WILL BE COLLECTED AND DISPERSED INTO THE NEIGHBORING PROPERTY. ROOFS WILL DRAIN TO A STORMWATER LATERAL.

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PRELIMINARY STORMWATER PLAN

CJ DENS SUBDIVISION

CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

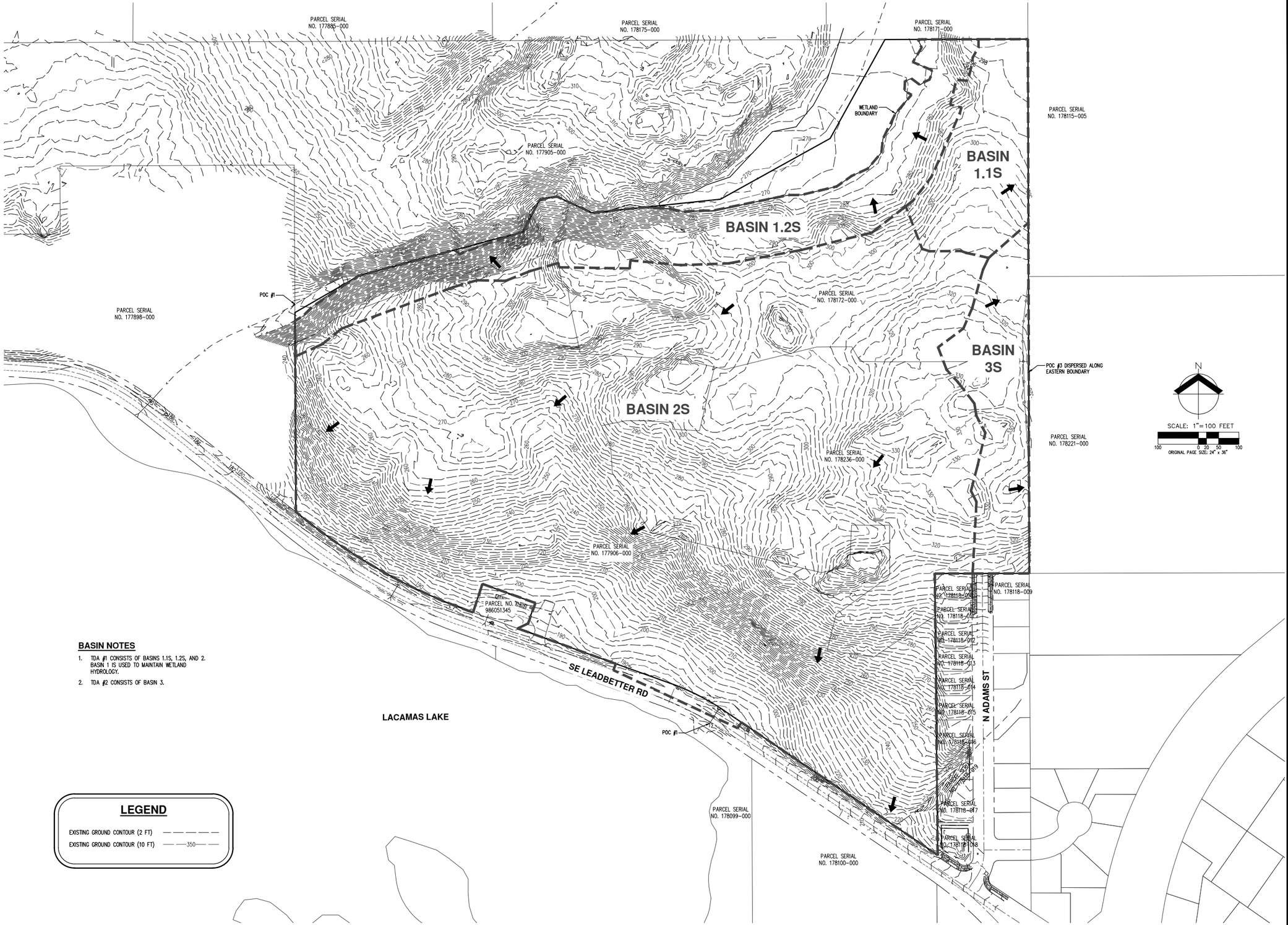
PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

P7.0

AKS DRAWING FILE: 5504 P7.0 STNDWC | LAYOUT: P7.0

Appendix D: Stormwater Basin Plans



BASIN NOTES

1. TDA #1 CONSISTS OF BASINS 1.1S, 1.2S, AND 2. BASIN 1 IS USED TO MAINTAIN WETLAND HYDROLOGY.
2. TDA #2 CONSISTS OF BASIN 3.

LEGEND

EXISTING GROUND CONTOUR (2 FT)

EXISTING GROUND CONTOUR (10 FT) 350

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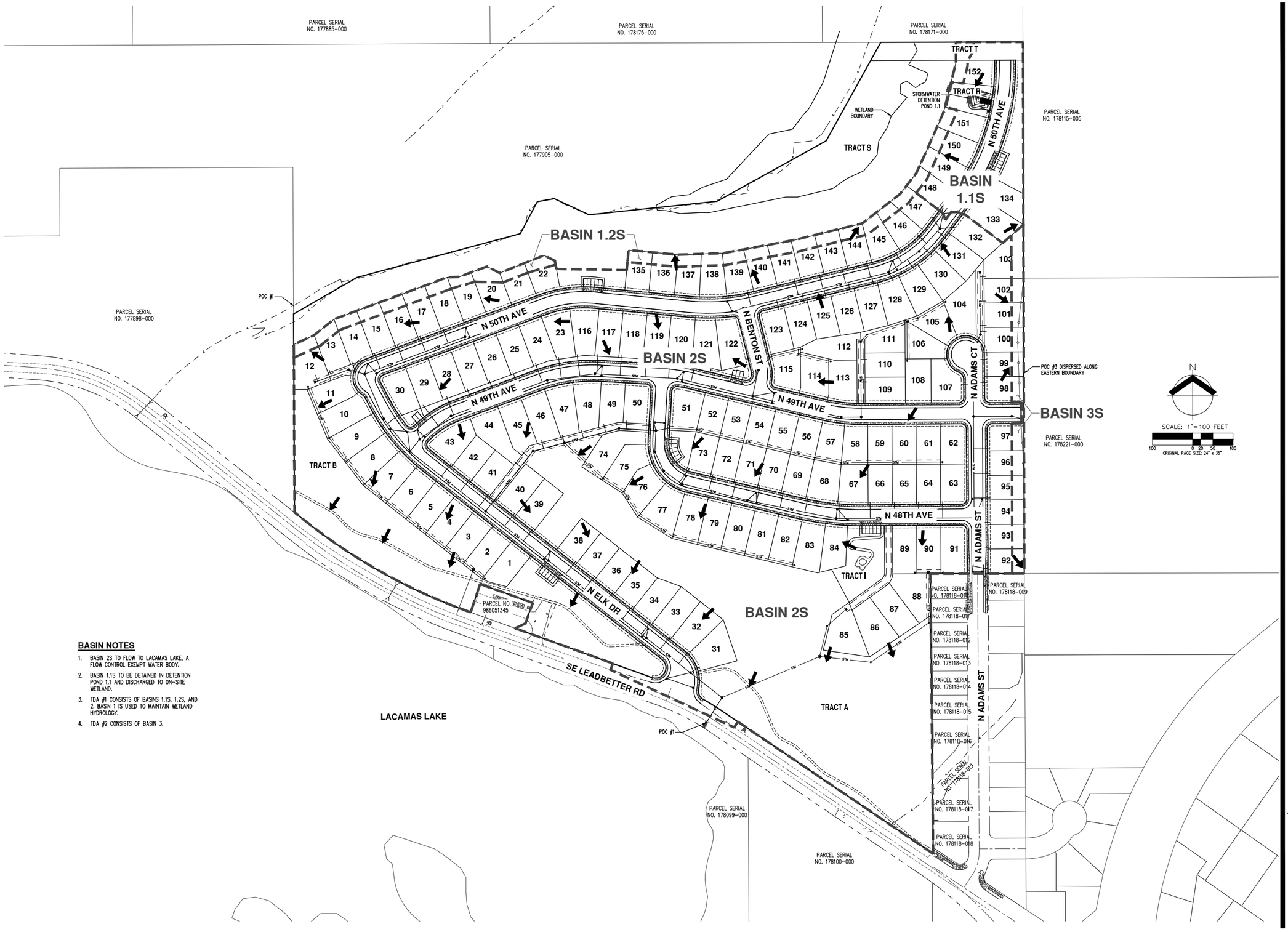
PRE-DEVELOPED BASIN MAP
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

FIG. 1

AKS DRAWING FILE: 5504 PRELIMBASINMAP.DWG | LAYOUT: PREDEVELOPED



N

SCALE: 1"=100 FEET

100 0 20 50 100

ORIGINAL PAGE SIZE: 24" x 36"

BASIN NOTES

1. BASIN 2S TO FLOW TO LACAMAS LAKE, A FLOW CONTROL EXEMPT WATER BODY.
2. BASIN 1.1S TO BE DETAINED IN DETENTION POND 1.1 AND DISCHARGED TO ON-SITE WETLAND.
3. TDA #1 CONSISTS OF BASINS 1.1S, 1.2S, AND 2. BASIN 1 IS USED TO MAINTAIN WETLAND HYDROLOGY.
4. TDA #2 CONSISTS OF BASIN 3.

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POST-DEVELOPED BASIN MAP
CJ DENS SUBDIVISION
CJ DENS LACAMAS II LLC
CAMAS, WASHINGTON

PRELIMINARY NOT FOR CONSTRUCTION

JOB NUMBER:	5504
DATE:	11/24/2020
DESIGNED BY:	CJS
DRAWN BY:	NAL
CHECKED BY:	JMM

FIG. 2

AKS DRAWING FILE: 5504 PRELIMBASINMAP.DWG | LAYOUT: POSTDEVELOPED

Appendix E: BMP Details

V-11 Miscellaneous LID BMPs

V-11.1 Introduction to Miscellaneous LID BMPs

BMPs in this chapter have been grouped because they have the following in common:

- They employ Low Impact Development (LID) Principles
- They cannot be used to meet I-3.4.6 MR6: Runoff Treatment
- They cannot, by themselves, be used to meet the Flow Control Performance Standard or the LID Performance Standard.
    - Some of the BMPs in this chapter do allow for some amount of Flow Control credit. See the guidance for each individual BMP for details.
- The design methods for each BMP in this chapter are unique. They do not have strong enough design similarities to other BMPs in this volume to place them in the other BMP categories identified in this volume.

BMP T5.13: Post-Construction Soil Quality and Depth

Purpose and Definition

Naturally occurring (undisturbed) soil and vegetation provide important stormwater functions including: water infiltration; nutrient, sediment, and pollutant adsorption; sediment and pollutant biofiltration; water interflow storage and transmission; and pollutant decomposition. These functions are largely lost when development strips away native soil and vegetation and replaces it with minimal topsoil and sod. Not only are these important stormwater functions lost, but such landscapes themselves become pollution generating pervious surfaces due to increased use of pesticides, fertilizers and other landscaping and household/industrial chemicals, the concentration of pet wastes, and pollutants that accompany roadside litter.

Establishing soil quality and depth regains greater stormwater functions in the post development landscape, provides increased treatment of pollutants and sediments that result from development and habitation, and minimizes the need for some landscaping chemicals, thus reducing pollution through prevention.

Applications and Limitations

Establishing a minimum soil quality and depth is not the same as preservation of naturally occurring soil and vegetation. However, establishing a minimum soil quality and depth will provide improved on-site management of stormwater flow and water quality.

Soil organic matter can be attained through numerous materials such as compost, composted woody material, biosolids, and forest product residuals. It is important that the materials used to

meet this BMP be appropriate and beneficial to the plant cover to be established. Likewise, it is important that imported topsoils improve soil conditions and do not have an excessive percent of clay fines.

This BMP can be considered infeasible on till soil slopes greater than 33 percent.

Design Guidelines

Soil Retention

Retain, in an undisturbed state, the duff layer and native topsoil to the maximum extent practicable. In any areas requiring grading, remove and stockpile the duff layer and topsoil on site in a designated, controlled area, not adjacent to public resources and critical areas, to be reapplied to other portions of the site where feasible.

Soil Quality

All areas subject to clearing and grading that have not been covered by impervious surface, incorporated into a drainage facility or engineered as structural fill or slope shall, at project completion, demonstrate the following:

1. A topsoil layer with a minimum organic matter content of 10% dry weight in planting beds, and 5% organic matter content in turf areas, and a pH from 6.0 to 8.0 or matching the pH of the undisturbed soil. The topsoil layer shall have a minimum depth of eight inches except where tree roots limit the depth of incorporation of amendments needed to meet the criteria. Subsoils below the topsoil layer should be scarified at least 4 inches with some incorporation of the upper material to avoid stratified layers, where feasible.
2. Mulch planting beds with 2 inches of organic material.
3. Use compost and other materials that meet the following organic content requirements:

    a. The organic content for “pre-approved” amendment rates can be met only using compost meeting the compost specification for BMP T7.30: Bioretention, with the exception that the compost may have up to 35% biosolids or manure.

    The compost must also have an organic matter content of 40% to 65%, and a carbon to nitrogen ratio below 25:1.

    The carbon to nitrogen ratio may be as high as 35:1 for plantings composed entirely of plants native to the Puget Sound Lowlands region.

    b. Calculated amendment rates may be met through use of composted material meeting (a.) above; or other organic materials amended to meet the carbon to nitrogen ratio requirements, and not exceeding the contaminant limits identified in Table 220-B, Testing Parameters, in WAC 173-350-220.

The resulting soil should be conducive to the type of vegetation to be established.

Implementation Options

The soil quality design guidelines listed above can be met by using one of the methods listed below:

1. Leave undisturbed native vegetation and soil, and protect from compaction during construction.
2. Amend existing site topsoil or subsoil either at default "pre-approved" rates, or at custom calculated rates based on tests of the soil and amendment.
3. Stockpile existing topsoil during grading, and replace it prior to planting. Stockpiled topsoil must also be amended if needed to meet the organic matter or depth requirements, either at a default "pre-approved" rate or at a custom calculated rate.
4. Import topsoil mix of sufficient organic content and depth to meet the requirements.

More than one method may be used on different portions of the same site. Soil that already meets the depth and organic matter quality standards, and is not compacted, does not need to be amended.

Planning/Permitting/Inspection/Verification Guidelines & Procedures

Local governments are encouraged to adopt guidelines and procedures similar to those recommended in *Building Soil: Guidelines and Resources for Implementing Soil Quality and Depth BMP T5.13 in WDOE Stormwater Management Manual for Western Washington* (Stenn et al., 2016).

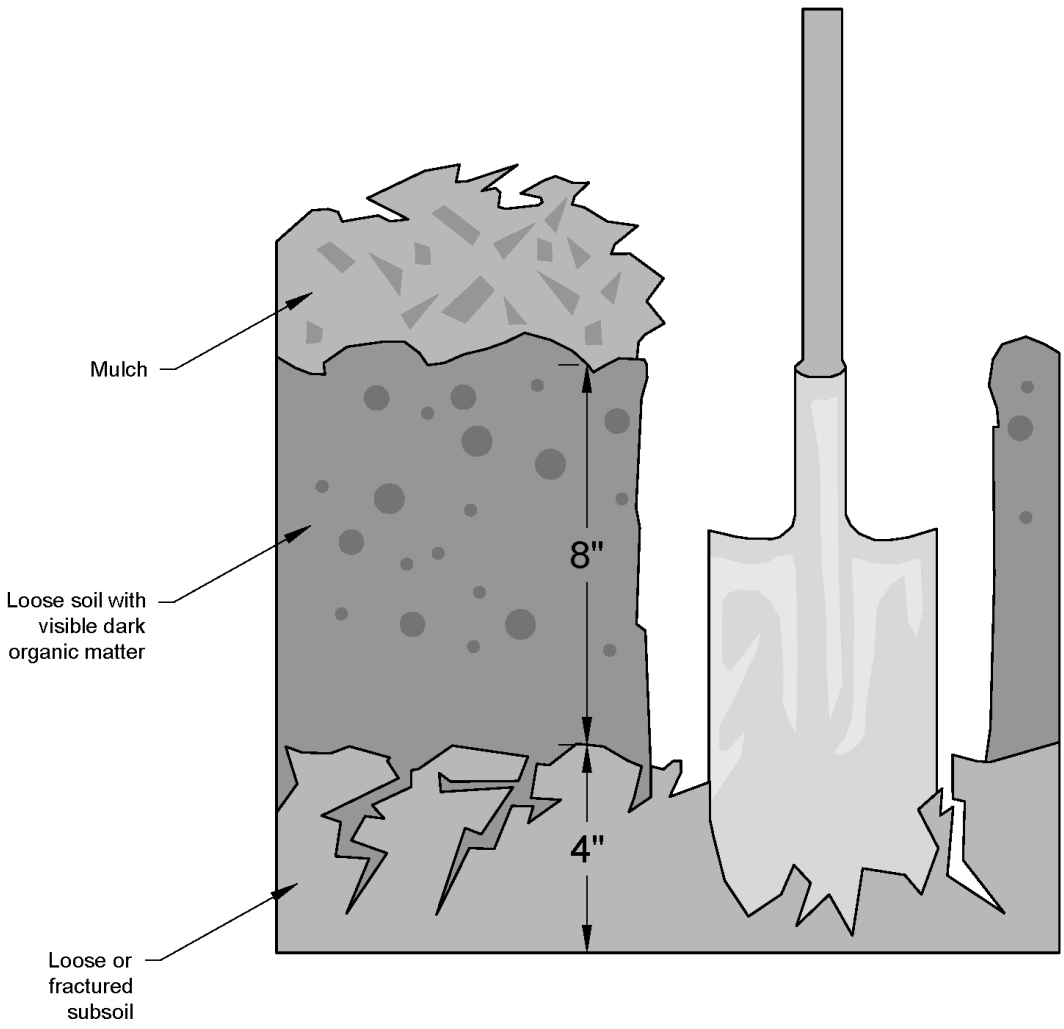
Maintenance

- Establish soil quality and depth toward the end of construction and once established, protect from compaction, such as from large machinery use, and from erosion.
- Plant vegetation and mulch the amended soil area after installation.
- Leave plant debris or its equivalent on the soil surface to replenish organic matter.
- Reduce and adjust, where possible, the use of irrigation, fertilizers, herbicides and pesticides, rather than continuing to implement formerly established practices.

Runoff Model Representation

All areas meeting the soil quality and depth design criteria may be entered into approved runoff models as "Pasture" rather than "Lawn/Landscaping".

Figure V-11.1: Planting Bed Cross-Section



Reprinted from *Guidelines and Resources For Implementing Soil Quality and Depth BMP T5.13 in WDOE Stormwater Management Manual for Western Washington*, 2010, Washington Organic Recycling Council

NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Planting Bed Cross-Section

Revised June 2016

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V-2 Site Design BMPs

V-2.1 Introduction to Site Design BMPs

Site Design BMPs are general practices for site design to minimize the impacts of development on stormwater runoff. They are provided here as an encouragement to project designers. The extent to which these BMPs must be followed depends upon the site development codes, rules, and standards adopted by the local government.

BMP T5.40: Preserving Native Vegetation

Purpose and Definition

Preserving native vegetation on-site to the maximum extent practicable will minimize the impacts of development on stormwater runoff. Preferably 65 percent or more of the development site should be protected for the purposes of retaining or enhancing existing forest cover and preserving wetlands and stream corridors. Maintain tree canopy on the project site to the greatest extent feasible and in accordance with the requirements of the local jurisdiction.

Applications and Limitations

New development often takes place on tracts of forested land. In fact, building sites are often selected because of the presence of mature trees. However, unless sufficient care is taken and planning done, in the interval between buying the property and completing construction much of this resource is likely to be destroyed. The property owner is ultimately responsible for protecting as many trees as possible, with their understory and groundcover. This responsibility is usually exercised by agents, the planners, designers and contractors. It takes 20 to 30 years for newly planted trees to provide the benefits for which trees are so highly valued.

Forest and native growth areas allow rainwater to naturally percolate into the soil, recharging ground water for summer stream flows and reducing surface water runoff that creates erosion and flooding. Conifers can hold up to about 50 percent of all rain that falls during a storm. Twenty to 30 percent of this rain may never reach the ground but evaporates or is taken up by the tree. Forested and native growth areas also may be effective as stormwater buffers around smaller developments.

Preservation of 65 percent or more of the site in native vegetation will allow the use of full dispersion techniques presented in BMP T5.30: Full Dispersion. Sites that can fully disperse per BMP T5.30: Full Dispersion have met the requirements of I-3.4.5 MR5: On-Site Stormwater Management, I-3.4.6 MR6: Runoff Treatment, and I-3.4.7 MR7: Flow Control.

Design Guidelines

- The preserved area should be situated to minimize the clearing of existing forest cover, to maximize the preservation of wetlands, and to buffer stream corridors.
- The preserved area should be placed in a separate tract or protected through recorded

easements for individual lots.

- If feasible, the preserved area should be located downslope from the building sites, since flow control and runoff treatment are enhanced by flow dispersion through duff, undisturbed soils, and native vegetation.
- The preserved area should be shown on all property maps and should be clearly marked during clearing and construction on the site.

Maintenance

Vegetation and trees should not be removed from the natural growth retention area, except for approved timber harvest activities and the removal of dangerous and diseased trees.

BMP T5.41: Better Site Design

Purpose and Definition

Fundamental hydrological and stormwater management concepts can be applied at the site design phase that are:

- more integrated with natural topography,
- reinforcing the hydrologic cycle,
- more aesthetically pleasing, and
- often less expensive to build.

A few site planning principles help to:

- locate development on the least sensitive areas of a site;
- accommodate residential land use; and
- mitigate the impact on stormwater quality.

Design Guidelines

- **Define Development Envelope and Protected Areas** - The first step in site planning is to define the development envelope. This is done by identifying protected areas, setbacks, easements and other site features, and by consulting applicable local standards and requirements. Site features to be protected may include important existing trees, steep slopes, erosive soils, riparian areas, or wetlands.

  By keeping the development envelope compact, environmental impacts can be minimized, construction costs can be reduced, and many of the site's most attractive landscape features can be retained. In some cases, economics or other factors may not allow avoidance of all sensitive areas. In these cases, care can be taken to mitigate the impacts of development through site work and other landscape treatments.

- **Minimize Directly Connected Impervious Areas** - Impervious areas directly connected to

the drainage system are the greatest contributors to urban nonpoint source pollution. Any impervious surface that drains into a catch basin or other conveyance structure is a “directly connected impervious surface.” As stormwater runoff flows across parking lots, roadways, and other paved areas, the oil, sediment, metals, and other pollutants are collected and concentrated. If this runoff is collected by a drainage structure and carried directly along impervious gutters or in sealed underground pipes, it has no opportunity for filtering by plant material or infiltration into the soil. It also increases in velocity and amount, causing increased peak-flows in the winter and decreased base-flows in the summer.

A basic site design principle for stormwater management is to minimize these directly connected impervious areas. This can be done by limiting overall impervious land coverage or by infiltrating and/or dispersing runoff within these impervious areas.

- **Maximize Permeability** - Within the development envelope, many opportunities are available to maximize the permeability of new construction. These include minimizing impervious areas, paving with permeable materials, clustering buildings, and reducing the land coverage of buildings by smaller footprints. All of these strategies make more land available for infiltration and dispersion through natural vegetation.

  Clustered driveways, small visitor parking bays and other strategies can also minimize the impact of transportation-related surfaces while still providing adequate access.

  Once site coverage is minimized through clustering and careful planning, pavement surfaces can be selected for permeability. A patio of brick-on-sand, for example, is more permeable than a large concrete slab. Engineered soil/landscape systems are permeable ground covers suitable for a wide variety of uses. Permeable/porous pavements can be used in place of traditional concrete or asphalt pavements in many low traffic applications.

  Maximizing permeability at every possible opportunity requires the integration of many small strategies. These strategies will be reflected at all levels of a project, from site planning to materials selection. In addition to the environmental and aesthetic benefits, a high-permeability site plan may allow the reduction or elimination of expensive underground conveyance systems, Flow Control BMPs, and/or Runoff Treatment BMPs, yielding significant savings in development costs.

- **Build Narrower Streets** - More than any other single element, street design has a powerful impact on stormwater quantity and quality. In residential development, streets and other transportation-related structures typically can comprise between 60 and 70 percent of the total impervious area, and, unlike rooftops, streets are almost always directly connected to the drainage system.

  The combination of large, directly connected impervious areas, together with the pollutants generated by automobiles, makes the street network a principal contributor to stormwater pollution in residential areas.

  Street design is usually mandated by local municipal standards. These standards have been developed to facilitate efficient automobile traffic, maximize parking, and allow for emergency vehicle access. Most require large impervious land coverage. In recent years, new street standards have been gaining acceptance that meet the access requirements of local residential streets while reducing impervious land coverage. These standards generally create a

new class of street that is narrower than the current local street standard, called an “access” street. An access street is intended only to provide access to a limited number of residences.

Because street design is the greatest factor in a residential development’s impact on stormwater quality, it is important that designers, municipalities and developers employ street standards that reduce impervious land coverage.

- **Maximize Choices for Mobility** - Given the costs of automobile use, both in land area consumed and pollutants generated, maximizing choices for mobility is a basic principle for environmentally responsible site design. By designing residential developments to promote alternatives to automobile use, a primary source of stormwater pollution can be mitigated.

  Bicycle lanes and paths, secure bicycle parking at community centers and shops, direct, safe pedestrian connections, and transit facilities are all site-planning elements that maximize choices for mobility.

- **Use Drainage as a Design Element** - Unlike conveyance drainage systems that hide water beneath the surface and work independently of surface topography, a drainage system for stormwater infiltration or dispersion can work with natural land forms and land uses to become a major design element of a site plan.

  By applying stormwater management techniques early in the site plan development, the drainage system can suggest pathway alignments, optimum locations for parks and play areas, and potential building sites. In this way, the drainage system helps to generate urban form, giving the development an integral, more aesthetically pleasing relationship to the natural features of the site. Not only does the integrated site plan complement the land, it can also save on development costs by minimizing earthwork and expensive drainage features.

V-12 Detention BMPs

V-12.1 Introduction to Detention BMPs

This section presents guidance for design and analysis of detention BMPs. These BMPs provide Flow Control by providing temporary storage of the increased surface water runoff that results from development. See I-3.4.7 MR7: Flow Control for details on the performance requirements for Flow Control.

The concept of detention is to collect runoff from a developed area and, using a control structure, release it at a slower rate than it enters the collection system (see V-12.2 Control Structure Design). The reduced release rate requires temporary storage of the excess runoff in a pond, tank, or vault, with release occurring over a few hours or days. The volume of temporary storage needed is dependent on:

1. The size of the drainage area.
2. The extent of disturbance of the natural vegetation, topography, and soils and creation of effective impervious surfaces (surfaces that drain to a stormwater collection system).
3. How rapidly the water is allowed to leave the detention pond; i.e., the target release rates.

If runoff from surfaces that require Flow Control is not separated from runoff from other existing surfaces (whether on-site or off-site), refer to the guidance in III-2.4 Flow Bypass and Additional Area Inflow for additional guidance when sizing the detention BMPs.

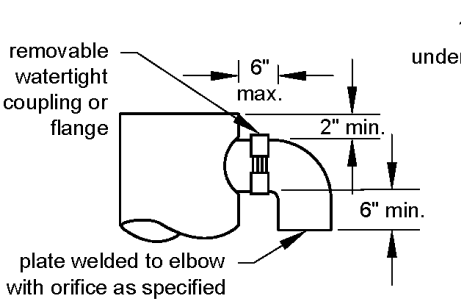
V-12.2 Control Structure Design

Control structures are catch basins or manholes with a restrictor device for controlling outflow from a detention BMP to meet the desired performance standard. Riser type restrictor devices (“tees” or “FROP Ts”) also provide some incidental oil and water separation to temporarily detain oil or other floatable pollutants in runoff due to accidental spill or illegal dumping.

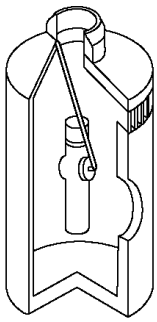
The restrictor device usually consists of two or more orifices and/or a weir section sized to meet performance requirements.

Standard control structure details are shown in Figure V-12.1: Flow Restrictor (TEE), Figure V-12.2: Flow Restrictor (Baffle), and Figure V-12.3: Flow Restrictor (Weir).

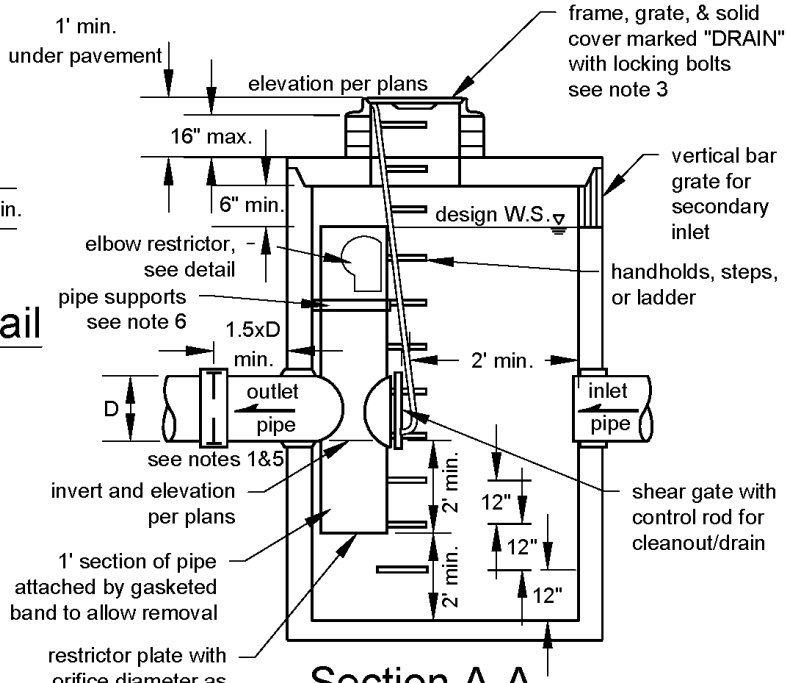
Figure V-12.1: Flow Restrictor (TEE)



Elbow Restrictor Detail



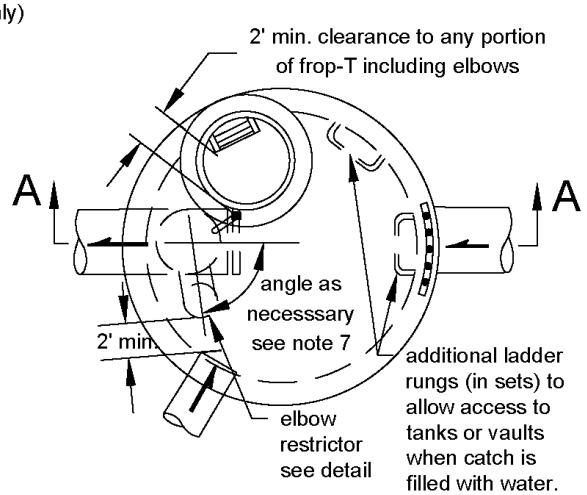
Isometric



Section A-A

Notes:

1. Use a minimum of a 54" diameter type 2 catch basin.
2. Outlet Capacity: 100-yr developed peak flow.
3. Metal Parts: Corrosion resistant. Non-Galvanized parts preferred. Galvanized pipe parts to have asphalt treatment 1.
4. Frame and ladder or steps offset so:
   A. Cleanout gate is visible from top.
   B. Climb-down space is clear of riser and cleanout gate.
   C. Frame is clear of curb.
5. If metal outlet pipe connects to cement concrete pipe: outlet pipe to have smooth O.D. equal to concrete pipe I.D. less ¼".
6. Provide at least one 3" x 0.90 inches support bracket anchored to concrete wall. (maximum 3'-0" vertical spacing)
7. Locate elbow restrictor(s) as necessary to provide minimum clearance as shown.
8. Locate additional ladder rungs in structures used as access to tanks or vaults to allow access when catch basin is filled with water.



Plan View

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Flow Restrictor (TEE)

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Figure V-12.2: Flow Restrictor (Baffle)

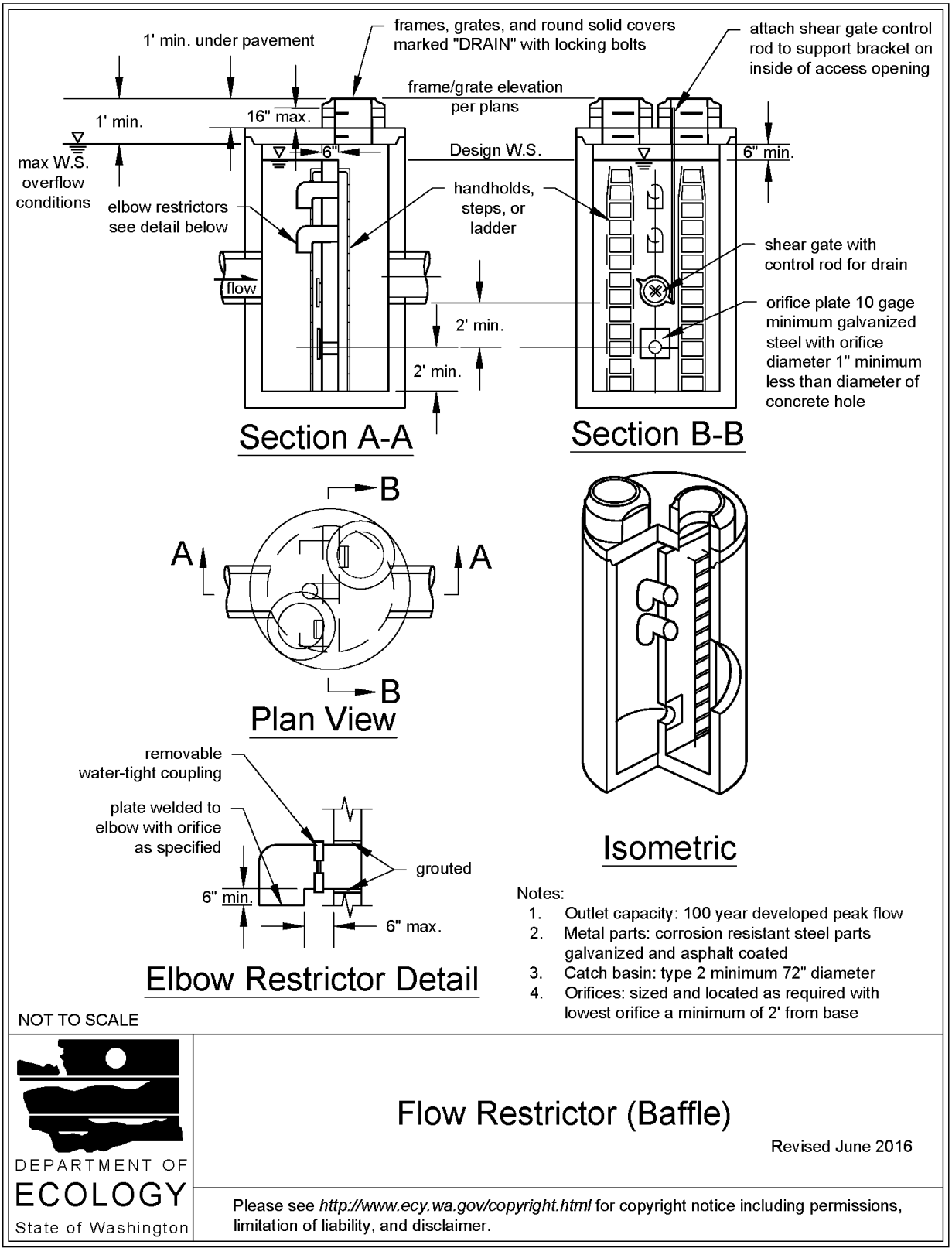
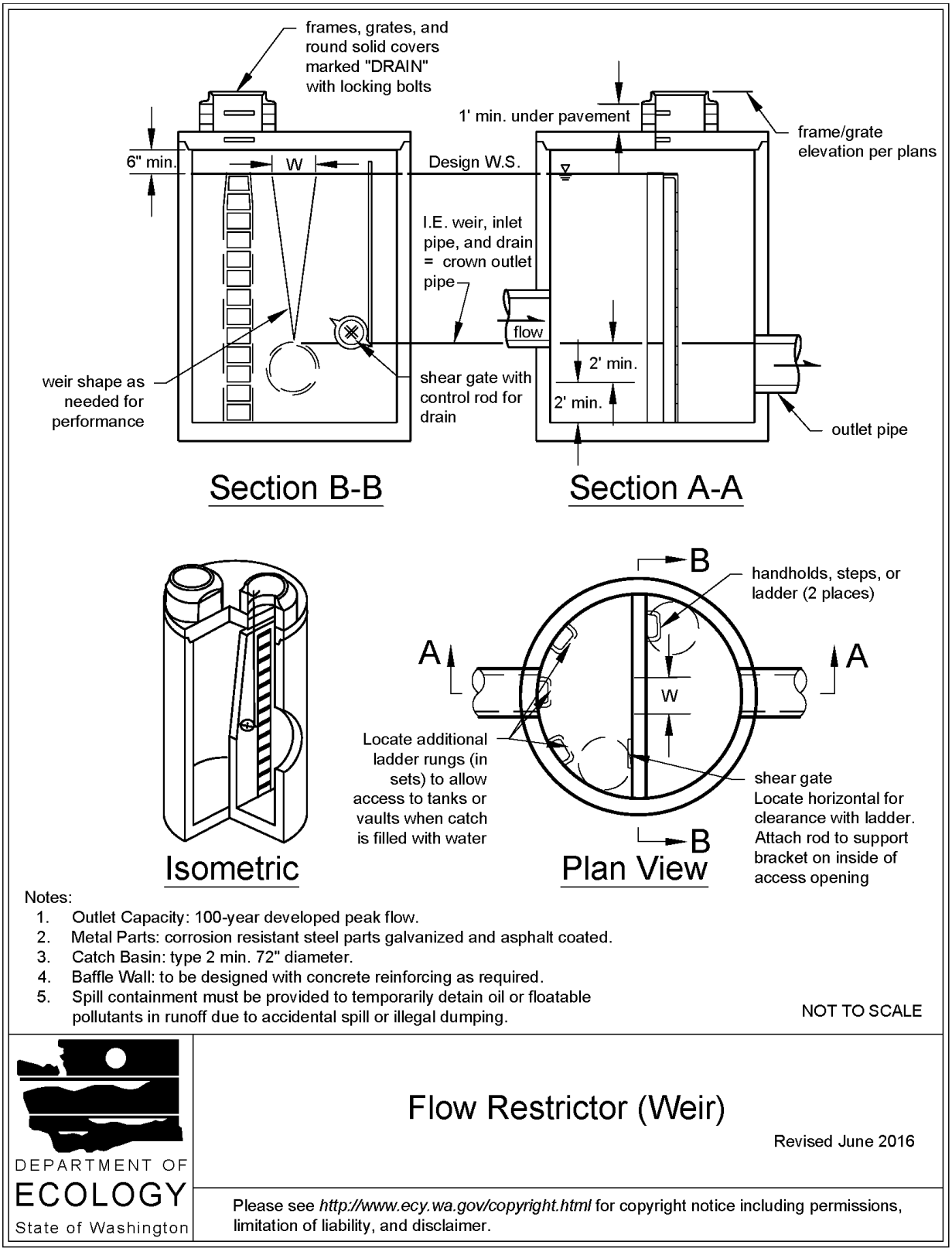


Figure V-12.3: Flow Restrictor (Weir)



Notes:

1. Outlet Capacity: 100-year developed peak flow.
2. Metal Parts: corrosion resistant steel parts galvanized and asphalt coated.
3. Catch Basin: type 2 min. 72" diameter.
4. Baffle Wall: to be designed with concrete reinforcing as required.
5. Spill containment must be provided to temporarily detain oil or floatable pollutants in runoff due to accidental spill or illegal dumping.

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Flow Restrictor (Weir)

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Design Criteria

Multiple Orifice Restrictor

In most cases, control structures need only two orifices: one at the bottom and one near the top of the riser, although additional orifices may best utilize the detention storage volume. Several orifices may be located at the same elevation if necessary to meet performance requirements.

1. The minimum orifice diameter is 0.5 inches.

   In some instances, a 0.5 inch bottom orifice will be too large to meet target release rates, even with minimal head. In these cases, the live storage depth need not be reduced to less than 3 feet in an attempt to meet the performance standards. Also, under such circumstances, flow-throttling devices may be a feasible option. These devices will throttle flows while maintaining a plug-resistant opening.

2. Orifices may be constructed on a tee section as shown in Figure V-12.1: Flow Restrictor (TEE) or on a baffle as shown in Figure V-12.2: Flow Restrictor (Baffle).

3. In some cases, performance requirements may require the top orifice/elbow to be located too high on the riser to be physically constructed (e.g., a 13-inch diameter orifice positioned 0.5 feet from the top of the riser). In these cases, a notch weir in the riser pipe may be used to meet performance requirements (see Figure V-12.5: Rectangular, Sharp Crested Weir).

4. Consider the backwater effect of water surface elevations in the downstream conveyance system. High tailwater elevations may affect performance of the restrictor system and reduce live storage volumes.

Riser and Weir Restrictor

1. Properly designed weirs may be used as flow restrictors (see Figure V-12.3: Flow Restrictor (Weir), Figure V-12.5: Rectangular, Sharp Crested Weir, Figure V-12.6: V-Notch, Sharp-Crested Weir, and Figure V-12.7: Sutro Weir). However, they must be designed to provide for primary overflow of the developed 100-year peak flow discharging to the detention BMP.

2. The combined orifice and riser (or weir) overflow may be used to meet performance requirements; however, the design must still provide for primary overflow of the developed 100 year peak flow assuming all orifices are plugged. Figure V-12.8: Riser Inflow Curves can be used to calculate the head in feet above a riser of given diameter and flow.

Access

1. Provide an access road to the control structure for inspection and maintenance. Design and construct the access road as specified in BMP D.1: Detention Ponds.

2. Manhole and catch basin lids for control structures must be locking, and rim elevations must match proposed finish grade.

3. Manholes and catch basins must meet the OSHA confined space requirements, which include

clearly marking entrances to confined space areas. This may be accomplished by hanging a removable sign in the access riser, just under the access lid.

Information Plate

It is recommended that a brass or stainless steel plate be permanently attached inside each control structure with the following information engraved on the plate:

- Name and file number of the project
- Name and organization of (1) project proponent, (2) engineer, and (3) contractor
- Date constructed
- Name and date of manual used for design
- Outflow performance criteria
- Release mechanism size, type, and invert elevation
- List of stage, discharge, and volume at one foot increments
- Elevation of overflow
- Recommended frequency of maintenance.

Maintenance

Control structures have a history of maintenance-related problems and it is imperative to establish a good maintenance program for them to function properly. Typically, sediment builds up inside the structure, which blocks or restricts flow to the inlet. To prevent this problem, routinely clean out control structures at least twice per year. Conduct regular inspections of control structures to detect the need for non-routine cleanout, especially if construction or land-disturbing activities occur in the contributing drainage area.

Appendix V-A: BMP Maintenance Tables provides maintenance recommendations for control structures.

Methods of Analysis

This section presents the methods and equations for design of control structure restrictor devices. Included are details for the design of orifices, rectangular sharp crested weirs, v notch weirs, sutro weirs, and overflow risers.

Orifices

Flow through orifice plates in the standard tee section or turned down elbow may be approximated by the general equation:

$$Q = CA\sqrt{2gh}$$

where

Q = flow (cfs)

C = coefficient of discharge (0.62 for plate orifice)

A = area of orifice (ft^2)

h = hydraulic head (ft)

g = gravity (32.2 ft/sec^2)

Figure V-12.4: Simple Orifice illustrates this simplified application of the orifice equation.

The diameter of the orifice is calculated from the flow. The orifice equation is often useful when expressed as the orifice diameter in inches:

$$d = \sqrt{\frac{36.88Q}{\sqrt{h}}}$$

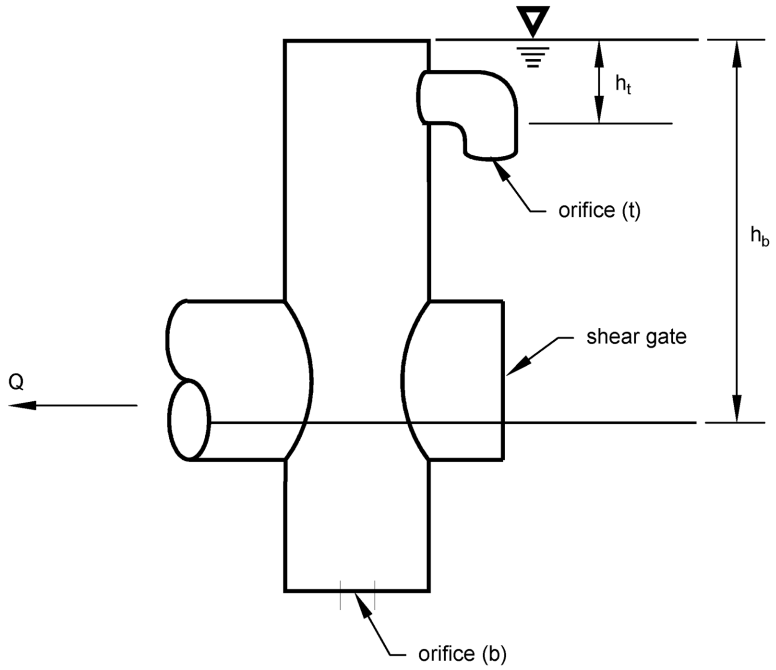
where

d = orifice diameter (inches)

Q = flow (cfs)

h = hydraulic head (ft)

Figure V-12.4: Simple Orifice



$$Q = CA_b\sqrt{2gh_b} + CA_t\sqrt{2gh_t}$$
$$= C\sqrt{2g}(A_b\sqrt{h_b} + A_t\sqrt{h_t})$$

h_b = distance from hydraulic grade line at the 2 – year flow of the outflow pipe to the overflow elevation

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Simple Orifice

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Rectangular Sharp Crested Weir

The rectangular sharp crested weir design shown in Figure V-12.5: Rectangular, Sharp Crested Weir may be analyzed using standard weir equations for the fully contracted condition.

$$Q=C(L - 0.2H)H^{3/2}$$

where

Q = flow (cfs)

C = 3.27 + 0.40 H/P (ft)

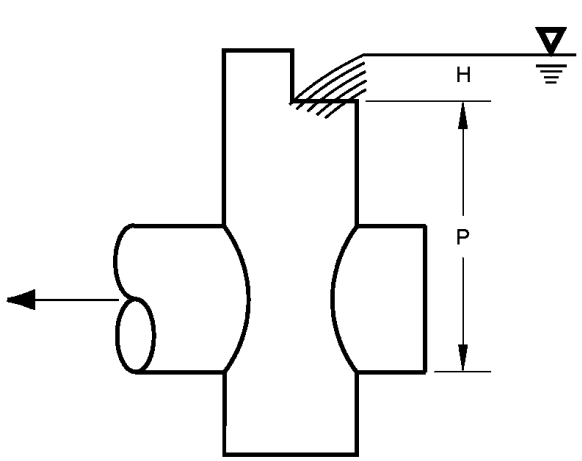
H, P are as shown in Figure V-12.5: Rectangular, Sharp Crested Weir

L = length (ft) of the portion of the riser circumference as necessary not to exceed 50 percent of the circumference

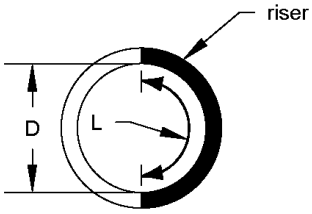
D = inside riser diameter (ft)

Note that this equation accounts for side contractions by subtracting 0.1H from L for each side of the notch weir.

Figure V-12.5: Rectangular, Sharp Crested Weir



Section



Plan

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Rectangular, Sharp-Crested Weir

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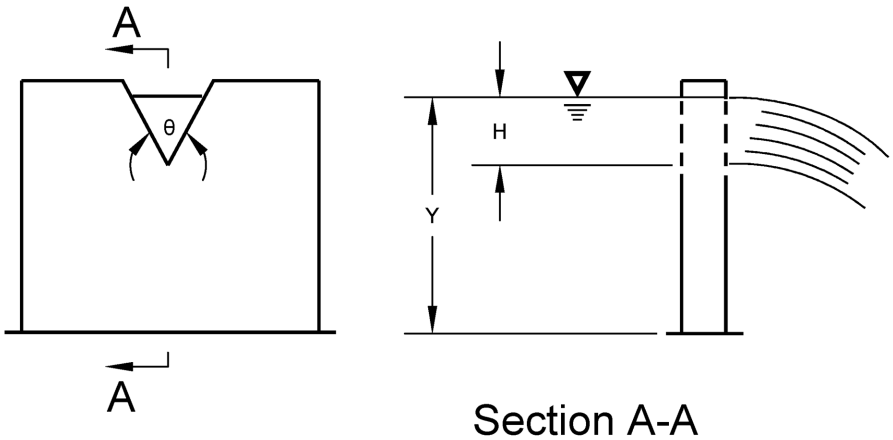
V-Notch Sharp - Crested Weir

V-notch weirs as shown in Figure V-12.6: V-Notch, Sharp-Crested Weir may be analyzed using standard equations for the fully contracted condition.

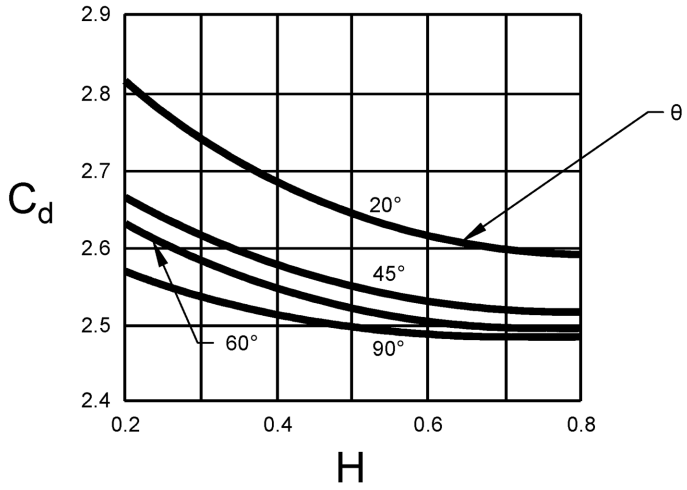
Figure V-12.6: V-Notch, Sharp-Crested Weir



Section A-A

$$Q = C_d(\text{Tan}\frac{\theta}{2})H^{\frac{5}{2}} \text{ in cfs}$$

Where values of C_d may be taken from the following chart :



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V-Notch, Sharp Crested Weir

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Proportional or Sutro Weir

Sutro weirs are designed so that the discharge is proportional to the total head. This design may be useful in some cases to meet performance requirements.

The sutro weir consists of a rectangular section joined to a curved portion that provides proportionality for all heads above the line A-B (see Figure V-12.7: Sutro Weir). The weir may be symmetrical or non-symmetrical.

For this type of weir, the curved portion is defined by the following equation (calculated in radians):

$$\frac{x}{b} = 1 - \frac{2}{\pi} Tan^{-1} \sqrt{\frac{Z}{a}}$$

where a, b, x and Z are as shown in Figure V-12.7: Sutro Weir.

The head discharge relationship is:

$$Q = (C_d)(b)(\sqrt{2ga})(h_1 - \frac{a}{3})$$

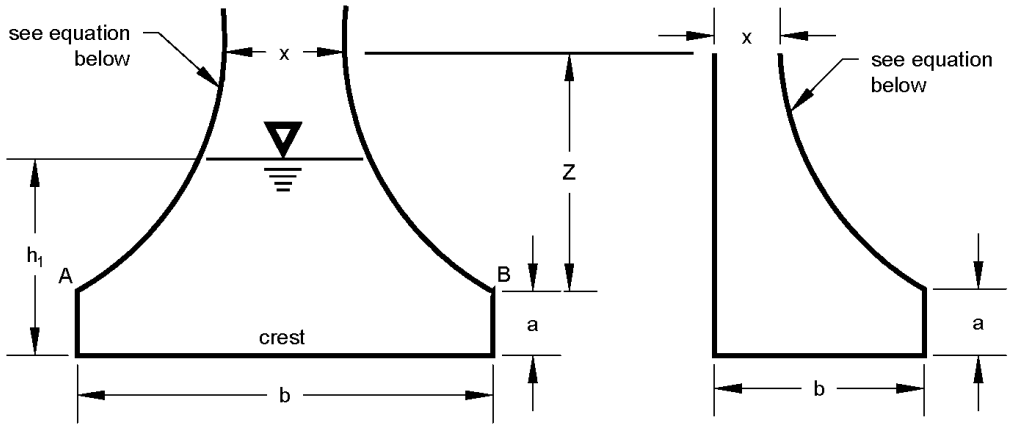
Values of C_d for both symmetrical and non symmetrical sutro weirs are summarized in Table V-12.1: Values of Cd for Sutro Weirs.

Note: When b > 1.50 or a > 0.30, use C_d=0.6.

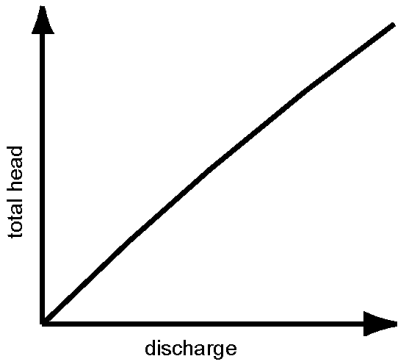
Table V-12.1: Values of C_d for Sutro Weirs

C_d Values, Symmetrical						C_d Values, Non-Symmetrical					
b (ft)						b (ft)					
a (ft)	0.50	0.75	1.00	1.25	1.50	a (ft)	0.50	0.75	1.00	1.25	1.50
0.02	0.608	0.613	0.617	0.6185	0.619	0.02	0.614	0.619	0.623	0.6245	0.625
0.05	0.606	0.611	0.615	0.617	0.6175	0.05	0.612	0.617	0.621	0.623	0.6235
0.10	0.603	0.608	0.612	0.6135	0.614	0.10	0.609	0.614	0.618	0.6195	0.620
0.15	0.601	0.6055	0.610	0.6115	0.612	0.15	0.607	0.6115	0.616	0.6175	0.618
0.20	0.599	0.604	0.608	0.6095	0.610	0.20	0.605	0.610	0.614	0.6155	0.616
0.25	0.598	0.6025	0.6065	0.608	0.6085	0.25	0.604	0.6085	0.6125	0.614	0.6145
0.30	0.597	0.602	0.606	0.6075	0.608	0.30	0.603	0.608	0.612	0.6135	0.614

Figure V-12.7: Sutro Weir



Symmetrical Non-symmetrical



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Sutro Weir

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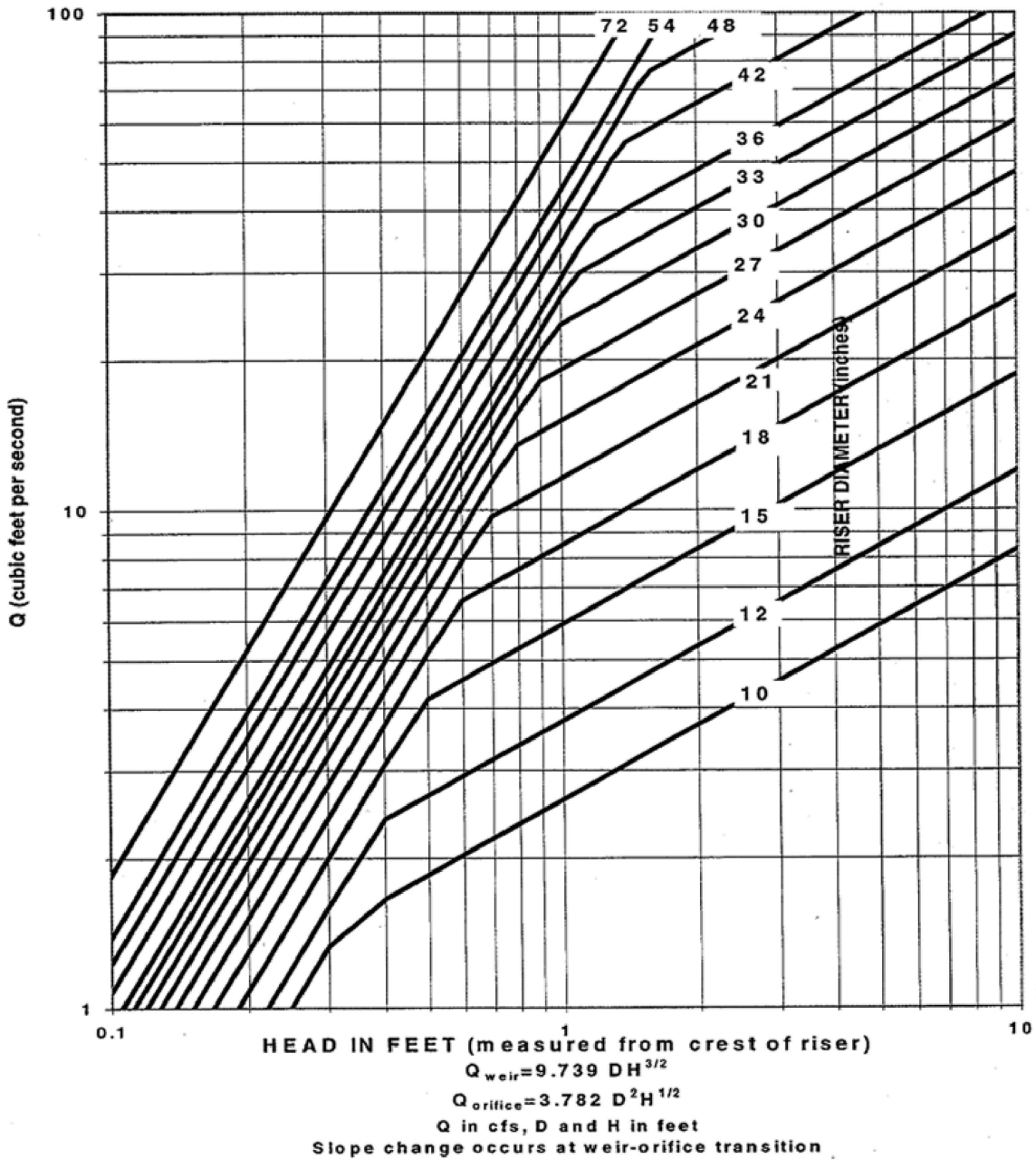
Riser Overflow

The nomograph in Figure V-12.8: Riser Inflow Curves can be used to determine the head (in feet) above a riser of given diameter and for a given flow (usually the 100 year peak flow for developed conditions).

Figure V-12.8: Riser Inflow Curves



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Riser Inflow Curves

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Appendix F: WWHM Analysis

WWHM2012

PROJECT REPORT

General Model Information

Project Name: 5504WWHM_Basin1
Site Name: CJ Dens
Site Address:
City: Camas
Report Date: 11/24/2020
Gage: Lacamas
Data Start: 1948/10/01
Data End: 2008/09/30
Timestep: 15 Minute
Precip Scale: 1.300
Version Date: 2018/10/10
Version: 4.2.16

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

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Landuse Basin Data

Predeveloped Land Use

Basin_1 Pre

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SG4, Forest, Steep	2.5
Pervious Total	2.5
Impervious Land Use	acre
Impervious Total	0
Basin Total	2.5

Element Flows To:

Surface	Interflow	Groundwater

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Mitigated Land Use

Basin_1.1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
SG4, Field, Flat	0.747
Pervious Total	0.747

Impervious Land Use	acre
ROADS FLAT	0.332
ROOF TOPS FLAT	0.546
DRIVEWAYS FLAT	0.112
SIDEWALKS FLAT	0.094
POND	0.176
Impervious Total	1.26
Basin Total	2.007

Element Flows To:

Surface	Interflow	Groundwater
Pond_1.1	Pond_1.1	

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Routing Elements
Predeveloped Routing

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Mitigated Routing

Pond_1.1

Bottom Length: 40.00 ft.
Bottom Width: 40.00 ft.
Depth: 4 ft.
Volume at riser head: 0.1689 acre-feet.
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 3 ft.
Riser Diameter: 24 in.
Notch Type: Rectangular
Notch Width: 0.750 ft.
Notch Height: 1.000 ft.
Orifice 1 Diameter: 1 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

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Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.036	0.000	0.000	0.000
0.0444	0.037	0.001	0.005	0.000
0.0889	0.037	0.003	0.008	0.000
0.1333	0.038	0.005	0.009	0.000
0.1778	0.038	0.006	0.011	0.000
0.2222	0.039	0.008	0.012	0.000
0.2667	0.039	0.010	0.014	0.000
0.3111	0.040	0.012	0.015	0.000
0.3556	0.040	0.013	0.016	0.000
0.4000	0.041	0.015	0.017	0.000
0.4444	0.041	0.017	0.018	0.000
0.4889	0.042	0.019	0.019	0.000
0.5333	0.042	0.021	0.019	0.000
0.5778	0.043	0.023	0.020	0.000
0.6222	0.043	0.025	0.021	0.000
0.6667	0.044	0.027	0.022	0.000
0.7111	0.045	0.029	0.022	0.000
0.7556	0.045	0.031	0.023	0.000
0.8000	0.046	0.033	0.024	0.000
0.8444	0.046	0.035	0.024	0.000
0.8889	0.047	0.037	0.025	0.000
0.9333	0.047	0.039	0.026	0.000
0.9778	0.048	0.041	0.026	0.000
1.0222	0.048	0.043	0.027	0.000
1.0667	0.049	0.045	0.028	0.000
1.1111	0.050	0.048	0.028	0.000
1.1556	0.050	0.050	0.029	0.000
1.2000	0.051	0.052	0.029	0.000
1.2444	0.051	0.054	0.030	0.000
1.2889	0.052	0.057	0.030	0.000
1.3333	0.052	0.059	0.031	0.000
1.3778	0.053	0.061	0.031	0.000

1.4222	0.054	0.064	0.032	0.000
1.4667	0.054	0.066	0.032	0.000
1.5111	0.055	0.069	0.033	0.000
1.5556	0.055	0.071	0.033	0.000
1.6000	0.056	0.074	0.034	0.000
1.6444	0.057	0.076	0.034	0.000
1.6889	0.057	0.079	0.035	0.000
1.7333	0.058	0.081	0.035	0.000
1.7778	0.058	0.084	0.036	0.000
1.8222	0.059	0.086	0.036	0.000
1.8667	0.060	0.089	0.037	0.000
1.9111	0.060	0.092	0.037	0.000
1.9556	0.061	0.095	0.037	0.000
2.0000	0.062	0.097	0.038	0.000
2.0444	0.062	0.100	0.062	0.000
2.0889	0.063	0.103	0.105	0.000
2.1333	0.064	0.106	0.161	0.000
2.1778	0.064	0.109	0.227	0.000
2.2222	0.065	0.111	0.302	0.000
2.2667	0.066	0.114	0.384	0.000
2.3111	0.066	0.117	0.474	0.000
2.3556	0.067	0.120	0.571	0.000
2.4000	0.067	0.123	0.673	0.000
2.4444	0.068	0.126	0.782	0.000
2.4889	0.069	0.129	0.896	0.000
2.5333	0.070	0.132	1.015	0.000
2.5778	0.070	0.136	1.140	0.000
2.6222	0.071	0.139	1.269	0.000
2.6667	0.072	0.142	1.403	0.000
2.7111	0.072	0.145	1.542	0.000
2.7556	0.073	0.148	1.685	0.000
2.8000	0.074	0.152	1.832	0.000
2.8444	0.074	0.155	1.983	0.000
2.8889	0.075	0.158	2.139	0.000
2.9333	0.076	0.162	2.298	0.000
2.9778	0.076	0.165	2.461	0.000
3.0222	0.077	0.168	2.615	0.000
3.0667	0.078	0.172	2.910	0.000
3.1111	0.079	0.175	3.330	0.000
3.1556	0.079	0.179	3.843	0.000
3.2000	0.080	0.183	4.432	0.000
3.2444	0.081	0.186	5.084	0.000
3.2889	0.081	0.190	5.786	0.000
3.3333	0.082	0.193	6.526	0.000
3.3778	0.083	0.197	7.292	0.000
3.4222	0.084	0.201	8.073	0.000
3.4667	0.084	0.205	8.855	0.000
3.5111	0.085	0.208	9.626	0.000
3.5556	0.086	0.212	10.37	0.000
3.6000	0.087	0.216	11.08	0.000
3.6444	0.087	0.220	11.75	0.000
3.6889	0.088	0.224	12.37	0.000
3.7333	0.089	0.228	12.92	0.000
3.7778	0.090	0.232	13.41	0.000
3.8222	0.090	0.236	13.84	0.000
3.8667	0.091	0.240	14.20	0.000
3.9111	0.092	0.244	14.51	0.000
3.9556	0.093	0.248	14.77	0.000

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4.0000	0.094	0.252	15.01	0.000
4.0444	0.094	0.256	15.42	0.000

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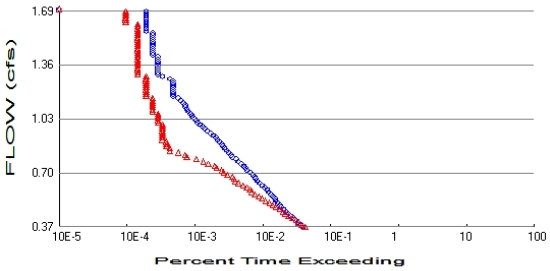
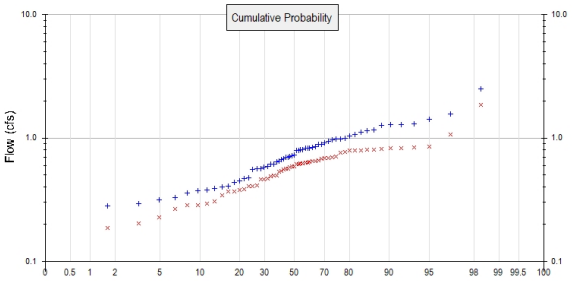
Analysis Results

POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 2.5
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.747
Total Impervious Area: 1.26

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.748861
5 year	1.142264
10 year	1.353216
25 year	1.566356
50 year	1.692389
100 year	1.795696

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.554412
5 year	0.785927
10 year	0.920457
25 year	1.070554
50 year	1.169541
100 year	1.258948

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.565	0.463
1950	0.698	0.562
1951	0.984	0.577
1952	0.616	0.686
1953	0.790	0.618
1954	1.283	0.766
1955	0.610	0.466
1956	1.121	0.823
1957	1.033	0.686
1958	0.808	0.760

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1959	0.471	0.285
1960	0.439	0.368
1961	0.994	0.707
1962	0.707	0.626
1963	0.790	0.627
1964	0.729	0.584
1965	0.653	0.535
1966	0.886	0.695
1967	0.820	0.408
1968	0.942	0.656
1969	0.973	0.824
1970	2.488	1.857
1971	0.403	0.383
1972	0.642	0.489
1973	0.675	0.651
1974	0.980	0.836
1975	0.567	0.498
1976	0.886	0.639
1977	0.029	0.227
1978	1.303	0.854
1979	0.827	0.679
1980	0.476	0.413
1981	1.148	0.794
1982	0.802	0.610
1983	1.417	0.817
1984	0.452	0.379
1985	0.314	0.541
1986	0.392	0.459
1987	0.698	0.498
1988	0.376	0.368
1989	0.408	0.185
1990	0.330	0.291
1991	0.831	0.305
1992	0.837	0.284
1993	1.061	0.795
1994	0.712	0.613
1995	0.577	0.651
1996	1.269	1.068
1997	1.568	0.798
1998	1.285	0.790
1999	0.853	0.558
2000	0.556	0.204
2001	0.294	0.127
2002	1.160	0.808
2003	0.908	0.628
2004	0.281	0.264
2005	0.358	0.407
2006	0.671	0.590
2007	0.377	0.564
2008	0.590	0.344

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Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	2.4881	1.8569
2	1.5681	1.0678
3	1.4167	0.8535
4	1.3027	0.8362

5	1.2848	0.8241
6	1.2831	0.8227
7	1.2693	0.8167
8	1.1599	0.8076
9	1.1477	0.7985
10	1.1206	0.7952
11	1.0608	0.7942
12	1.0335	0.7897
13	0.9936	0.7658
14	0.9838	0.7597
15	0.9797	0.7072
16	0.9727	0.6952
17	0.9415	0.6863
18	0.9081	0.6862
19	0.8858	0.6786
20	0.8858	0.6557
21	0.8527	0.6514
22	0.8373	0.6509
23	0.8306	0.6391
24	0.8269	0.6282
25	0.8204	0.6274
26	0.8078	0.6259
27	0.8022	0.6176
28	0.7900	0.6129
29	0.7899	0.6105
30	0.7288	0.5905
31	0.7124	0.5839
32	0.7071	0.5772
33	0.6981	0.5638
34	0.6976	0.5616
35	0.6751	0.5582
36	0.6711	0.5407
37	0.6526	0.5349
38	0.6417	0.4981
39	0.6155	0.4977
40	0.6102	0.4885
41	0.5898	0.4656
42	0.5767	0.4634
43	0.5671	0.4589
44	0.5654	0.4125
45	0.5557	0.4084
46	0.4755	0.4067
47	0.4706	0.3834
48	0.4516	0.3787
49	0.4393	0.3682
50	0.4084	0.3680
51	0.4026	0.3439
52	0.3916	0.3046
53	0.3767	0.2912
54	0.3759	0.2851
55	0.3576	0.2843
56	0.3297	0.2640
57	0.3143	0.2274
58	0.2936	0.2039
59	0.2814	0.1851
60	0.0289	0.1271

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Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.3744	815	874	107	Fail
0.3877	751	791	105	Fail
0.4011	688	714	103	Fail
0.4144	631	647	102	Fail
0.4277	585	574	98	Pass
0.4410	542	505	93	Pass
0.4543	499	456	91	Pass
0.4676	466	414	88	Pass
0.4809	427	375	87	Pass
0.4942	391	327	83	Pass
0.5076	372	293	78	Pass
0.5209	354	264	74	Pass
0.5342	330	232	70	Pass
0.5475	313	204	65	Pass
0.5608	293	183	62	Pass
0.5741	274	159	58	Pass
0.5874	258	144	55	Pass
0.6007	244	136	55	Pass
0.6141	222	123	55	Pass
0.6274	205	108	52	Pass
0.6407	190	92	48	Pass
0.6540	176	82	46	Pass
0.6673	165	79	47	Pass
0.6806	158	75	47	Pass
0.6939	151	63	41	Pass
0.7072	136	56	41	Pass
0.7206	122	52	42	Pass
0.7339	116	44	37	Pass
0.7472	110	41	37	Pass
0.7605	101	33	32	Pass
0.7738	92	28	30	Pass
0.7871	85	22	25	Pass
0.8004	75	16	21	Pass
0.8138	71	15	21	Pass
0.8271	66	12	18	Pass
0.8404	62	9	14	Pass
0.8537	57	9	15	Pass
0.8670	55	8	14	Pass
0.8803	52	8	15	Pass
0.8936	48	8	16	Pass
0.9069	45	7	15	Pass
0.9203	43	7	16	Pass
0.9336	39	7	17	Pass
0.9469	36	7	19	Pass
0.9602	32	7	21	Pass
0.9735	29	7	24	Pass
0.9868	27	7	25	Pass
1.0001	25	7	28	Pass
1.0134	23	6	26	Pass
1.0268	22	6	27	Pass
1.0401	20	6	30	Pass
1.0534	19	6	31	Pass
1.0667	18	6	33	Pass

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1.0800	17	5	29	Pass
1.0933	16	5	31	Pass
1.1066	15	5	33	Pass
1.1199	15	5	33	Pass
1.1333	14	5	35	Pass
1.1466	13	5	38	Pass
1.1599	12	5	41	Pass
1.1732	10	4	40	Pass
1.1865	10	4	40	Pass
1.1998	10	4	40	Pass
1.2131	10	4	40	Pass
1.2264	10	4	40	Pass
1.2398	10	4	40	Pass
1.2531	10	4	40	Pass
1.2664	10	4	40	Pass
1.2797	9	4	44	Pass
1.2930	7	4	57	Pass
1.3063	6	3	50	Pass
1.3196	6	3	50	Pass
1.3329	6	3	50	Pass
1.3463	6	3	50	Pass
1.3596	6	3	50	Pass
1.3729	6	3	50	Pass
1.3862	6	3	50	Pass
1.3995	6	3	50	Pass
1.4128	6	3	50	Pass
1.4261	5	3	60	Pass
1.4394	5	3	60	Pass
1.4528	5	3	60	Pass
1.4661	5	3	60	Pass
1.4794	5	3	60	Pass
1.4927	5	3	60	Pass
1.5060	5	3	60	Pass
1.5193	5	3	60	Pass
1.5326	5	3	60	Pass
1.5459	5	3	60	Pass
1.5593	5	3	60	Pass
1.5726	4	3	75	Pass
1.5859	4	3	75	Pass
1.5992	4	3	75	Pass
1.6125	4	3	75	Pass
1.6258	4	2	50	Pass
1.6391	4	2	50	Pass
1.6525	4	2	50	Pass
1.6658	4	2	50	Pass
1.6791	4	2	50	Pass
1.6924	4	2	50	Pass

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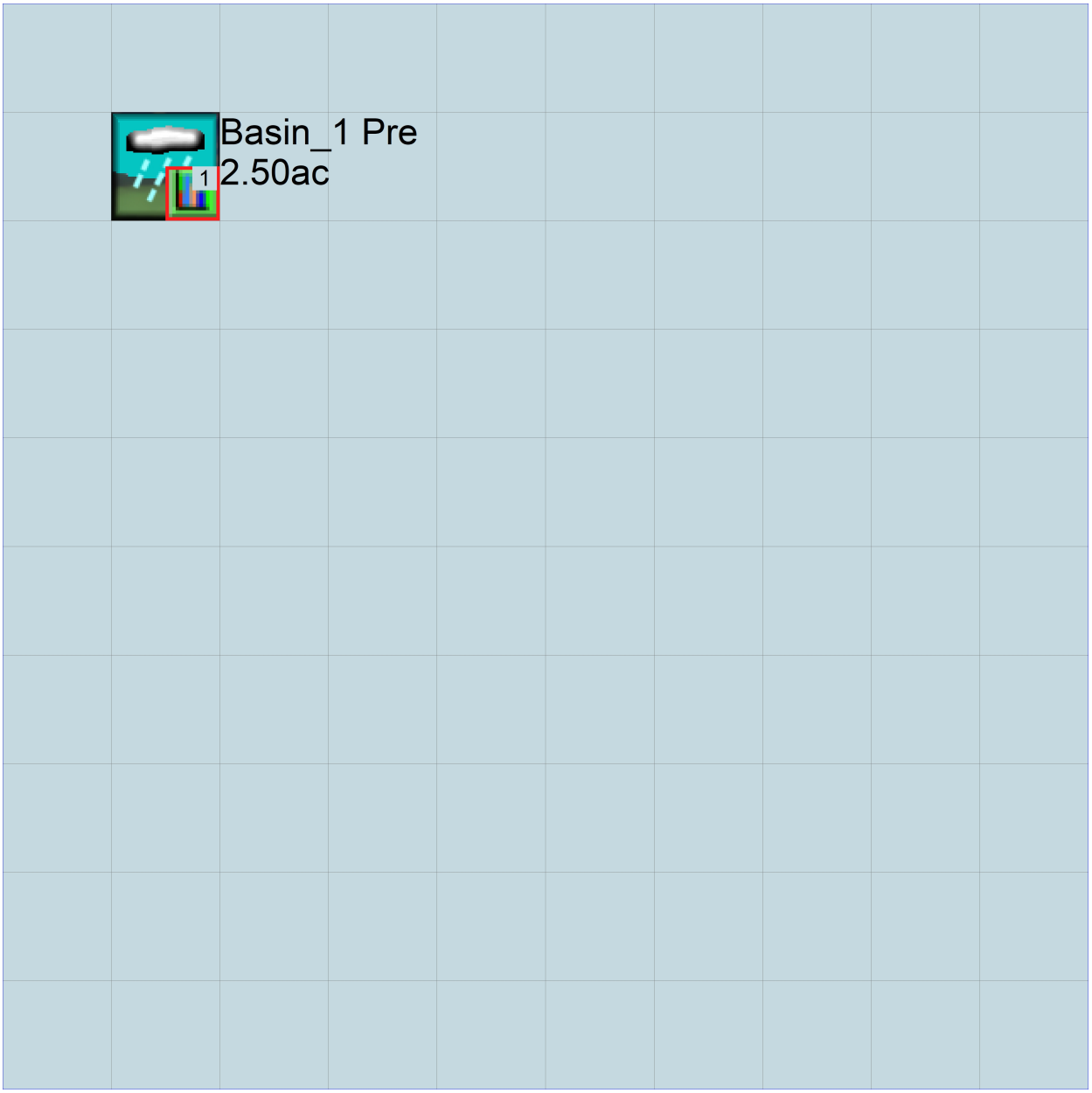
The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

Appendix

Predeveloped Schematic



Mitigated Schematic

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Appendix G: Geotechnical Reports

HARTCROWSER www.hartcrowser.com

DANIEL J. TRISLER STATE OF WASHINGTON 38279 REGISTERED PROFESSIONAL ENGINEER

State of Washington Engineering Geologist 3074 Licensed Geologist

Rachel Pirot

MEMORANDUM

DATE: December 7, 2015

TO: CJ Dens Lacamas I, LLC
Attention: Mr. Carl Lawson

FROM: Daniel J. Trisler, PE
Rachel Pirot, LG, LEG

RE: **Initial Site-Specific Evaluation of Geohazard Areas A and C**
Camas Subdivision – Leadbetter Road
Camas, Washington
15948-02

CC: Mackenzie – Brian Hollenback, Todd Johnson
HFI Consultants – Tim Halme-

Introduction

Hart Crowser, Inc. is pleased to submit this memorandum to CJ Dens Lacamas I, LLC, summarizing our evaluation of Geohazard Areas A and C at the proposed subdivision development along Leadbetter Road in Camas, Washington. The proposed subdivision is an undeveloped property on the northeast side of Leadbetter Road, north of Leadbetter Lake, as described in our Critical Areas Report – Update (CAR Update) for the development, dated March 19, 2013.

Two specific geohazard areas were identified and described in the CAR Update that required further site specific-evaluation: Geohazard Areas A and C. The purpose of this evaluation was to gather additional information and provide recommendations to help you assess the general economic feasibility of developing these two areas. Our specific scope of work was detailed in our contract change agreement with you, dated October 14, 2015, and generally included a geologic reconnaissance of the two areas, test pit explorations, an evaluation of the hazards based on our field work, and preparation of this memorandum summarizing our evaluation and recommendations.

The location of the site is shown on Figure 1. The locations of Geohazard Areas A and C and our recent test pit explorations are shown on Figure 2.

300 West 15th Street
Vancouver, Washington 98660-2927
Tel 360.448.4189
Fax 503.620.6918

Site Conditions

We conducted a geotechnical reconnaissance and completed test pits at the two sites on November 23, 2015. Our updated findings from these investigations are described in detail below.

Surface Conditions

Site conditions in the general area of Geohazard Areas A and C consist of a northwest-trending slope abutting the north side of Leadbetter Road with flat slopes on the south side of the road leading to Lacamas Lake. The overall gradient of the northwest-trending slope is moderate, but with locally variable landforms and resulting gradients that are gentle to steep. Elevations range from approximately 190 feet above mean sea level (MSL) at Leadbetter Road to 320 feet MSL at the top of the northwest-trending slope, above both geohazard areas. Although gradients are variable, landforms are generally well-weathered and without abrupt transitions or other features indicative of accelerated erosional processes or earth movement. Prior to current logging activities, the area was forested with a dense mostly coniferous second-growth stand of timber and the ground surface well-vegetated with native understory plants. Conditions at each area specifically are described separately below.

Geohazard Area A

Geohazard Area A consists of an arcuate-shaped landform extending perpendicular to the predominant southwest-facing slope. The feature includes a steeper arcuate upper slope and convex lower toe slope that could be interpreted as the headscarp and toe, respectively, of a landslide.

During our reconnaissance, we observed these and associated features. We noted that the slope of the potential headscarp is only minimally steeper than adjacent slopes and the landform is not well-formed. No exposed soil or ground cracks were observed within it. Slopes in the body of the landform were gentle, approximately 25 to 30 percent. No developed stream channels, seeps or springs were observed within or adjacent to the feature. The area has irregular topography and several trees were observed to have experienced wind throw. The root balls of these trees were exposed and shallow bedrock was observed entangled with the roots. Relatively flat benches cut across the slopes in this area and are interpreted as old logging roads. At the toe of the slope, the cut for Leadbetter Road exposes volcanic rock that holds a vertical face and appears in-place.

The area is heavily vegetated with conifer to approximately 12 to 24 inches in diameter. The conifer trees are straight-trunked except immediately adjacent to Leadbetter Road, where they lean and exhibit bowed trunks. The bowed and leaning conifers continue along Leadbetter Road throughout the area and are not limited to Geohazard Area A.

Geohazard Area C

Geohazard Area C is a complex and irregular landform divided into a lower portion ("Older Debris Flow") and an upper portion ("Recent Debris Flow"). The upper portion is a narrow swale that extends to a distinct break in the southwest-facing slope at about elevation 270 feet MSL. The lower portion is a broader fan with very gentle slopes on both sides of Leadbetter Road.

During our reconnaissance we traversed up the upper portion and found it to consist of a saddle or swale in the otherwise continuous ridgetop. The saddle was slightly arcuate but landforms appeared mature and slopes were 25 to 35 percent. The upper portion of the saddle opened up to flat ground above, and no potential source area for past or future debris flows was observed. The ridgetop was weathered and rounded with gentle slopes and subdued features. The previously mapped geohazard area had a grade of approximately 25 percent in the upper slopes, which flattened to 10 to 20 percent downhill. The lower portion of the slopes were dominated by a wide, relatively flat bench with gentle undulating hummocks. No seeps or springs were observed, and no streams or erosive process at the toe of the slope of deposits were observed. No outcrops exposed bedrock geology directly within Geohazard Area C.

The lower portion of Geohazard Area C was thickly wooded with straight trunked conifers while the upper portion was characterized by a lack of mature conifers and was primarily forested with deciduous trees. Conifer trees where present were predominately straight throughout the area. Timber age and type were generally consistent between Geohazard Area C and other areas of the site.

Subsurface Conditions

Our understanding of the subsurface conditions is based on research and information collected from our field explorations completed for this project. Our explorations consisted of nine test pits and four potholes. (Potholes were test pits that encountered bedrock at very shallow depth, and for which formal test pit logs were not created.) The locations of the explorations are shown on Figure 2. Attachment A presents logs of the test pits. Samples of the soils were collected during the explorations for potential future laboratory testing, though no laboratory testing was conducted as part of this current scope of work.

Soil and Bedrock

Geohazard Area A

The bedrock geology at Geohazard Area A was interpreted to be Basaltic Andesite of Elkhorn Mountain, as discussed in our March 19, 2013 CAR Update. Test pits TP-7 and TP-8 and two additional potholes in this area exposed moderately strong bedrock at 2 to 4 feet below ground surface (bgs). In place jointing of the basaltic andesite was observed in the test pit walls. The overlying material encountered was colluvial gravel, cobbles, and silt. Two additional potholes adjacent to Geohazard Area A encountered a

thin (1 to 3 feet) veneer of colluvium over what appeared to be in-place basaltic andesite. We observed no definitive signs of past landsliding or slope movement within the materials exposed in the test pits and pot holes.

Geohazard Area C

Our test pits in Geohazard Area C encountered fine-grained silty soils over sandy residual soil which transitioned into Volcaniclastic Sedimentary bedrock. The surficial silty soil had a disturbed texture, although we observed no definitive signs of disturbance from landsliding (e.g., slickensides, etc.). In place bedding structures were observed in the residual soil and bedrock. Our test pits in this area encountered bedrock at between 3 and 13 feet bgs.

Groundwater

Groundwater and signs of groundwater (e.g., mottling, etc.) were not encountered in our test pits. Based on the previous Level 1 Hydrogeologic Assessment, dated March 19, 2013, depth to the regional groundwater level is expected to vary from approximately 50 to 100 feet bgs. However, we anticipate that locally perched groundwater will be encountered above the bedrock materials encountered at the site.

Conclusions

Based on our geotechnical reconnaissance and limited subsurface investigation it is our opinion that Geohazard Areas A and C do not present geologic hazards to the project that cannot be reasonably mitigated. We did not observe surface or subsurface signs of active landsliding and the potential for future landsliding in these areas appears low. It is our opinion, based on the observed surface and subsurface conditions, that future development of these areas is feasible with limited mitigation measures, which can be finalized during final design. Therefore, immediate logging of these areas is acceptable, as they can be included within the overall subdivision development.

Slopes across the site and within the previously mapped geohazard areas are gentle with weathered landforms and subdued topographic expression. No significant source areas or geomorphic processes, such as stream erosion or rapid downcutting, were observed that might cause slope movement in either area. Timber age and type are consistent across the site without significant differences within the geohazard areas. Bowed and tilted conifer trees were only observed adjacent the full length of Leadbetter Road, and therefore, suggest the cause of the bowing and tilting is related to the roadway, not slope movement from landsliding.

In Geohazard Area A, shallow bedrock was encountered in the test pits and previously mapped adjacent outcrops also indicate shallow bedrock depths. Bedrock was also exposed in the root balls of wind thrown trees. The hummocky features observed are likely due to wind throw of trees in shallow soils

and grading of old logging roads across the area. It is our opinion, based on the observed features and shallow bedrock encountered in our explorations, that the landform mapped as Geohazard Area A was not formed by a landslide, but the result of bedrock geologic conditions and normal weathering processes. In our opinion Geohazard Area A can henceforth be considered similarly with the rest of the development and specific mitigation for geohazards is not needed in this area. This area is suitable for future development, provided that the recommendations outlined below are followed.

In Geohazard Area C, the disturbed soil and fan morphology observed on site are likely the result of very old debris flows and/or colluvial processes. However, slopes in this area have been extensively modified by weathering since those processes were active. Landforms within the mapped Geohazard Area C exhibit very weathered and rounded topography with gentle slopes. Active driving processes for slope movement, such as streams or erosion at the toe of the deposit, were absent. No obvious source areas were observed for future debris flows. Additionally no discrete failure zone was identifiable in the test pits. Currently conditions to result in debris flows and landsliding appear to be low. This area is suitable for future development, provided that the recommendations outlined below are followed.

Based on our observations and evaluation, it is our opinion that the proposed development is feasible in both Geohazard Areas A and C. Development in these areas in accordance with the *Preliminary Recommendations* section of this memorandum should not adversely affect the stability of the site or neighboring properties. Final design should include additional evaluation and final recommendations related to these areas.

Preliminary Recommendations

As outlined in the CAR Update, general hillside development guidelines should be followed during the design and construction stages. Final geotechnical design recommendations will be developed at the time a full geotechnical investigation is completed. However, a summary of the anticipated general guidelines is provided below.

- Hillside grading methodologies shall be employed for earthwork in all sloping areas, including previously mapped Geohazard Areas A and C. This will likely include keys and benches, installation of sub drains where seepage is encountered, and installation of all material as a compacted structural fill. Limits on fill depths may also be necessary in some areas.
- A detailed erosion and sediment control plan will be required as part of the proposed development.
- In general, we anticipate that homes will be supported by conventional spread footings. However, homes near existing or new steep slopes may require the use of deepened footings, drilled piers, or larger slope setbacks.

- We recommend against the use of infiltration systems for disposal of stormwater from the site. Foundation subdrains may be required around homes to reduce the potential for water seepage in crawlspace areas.

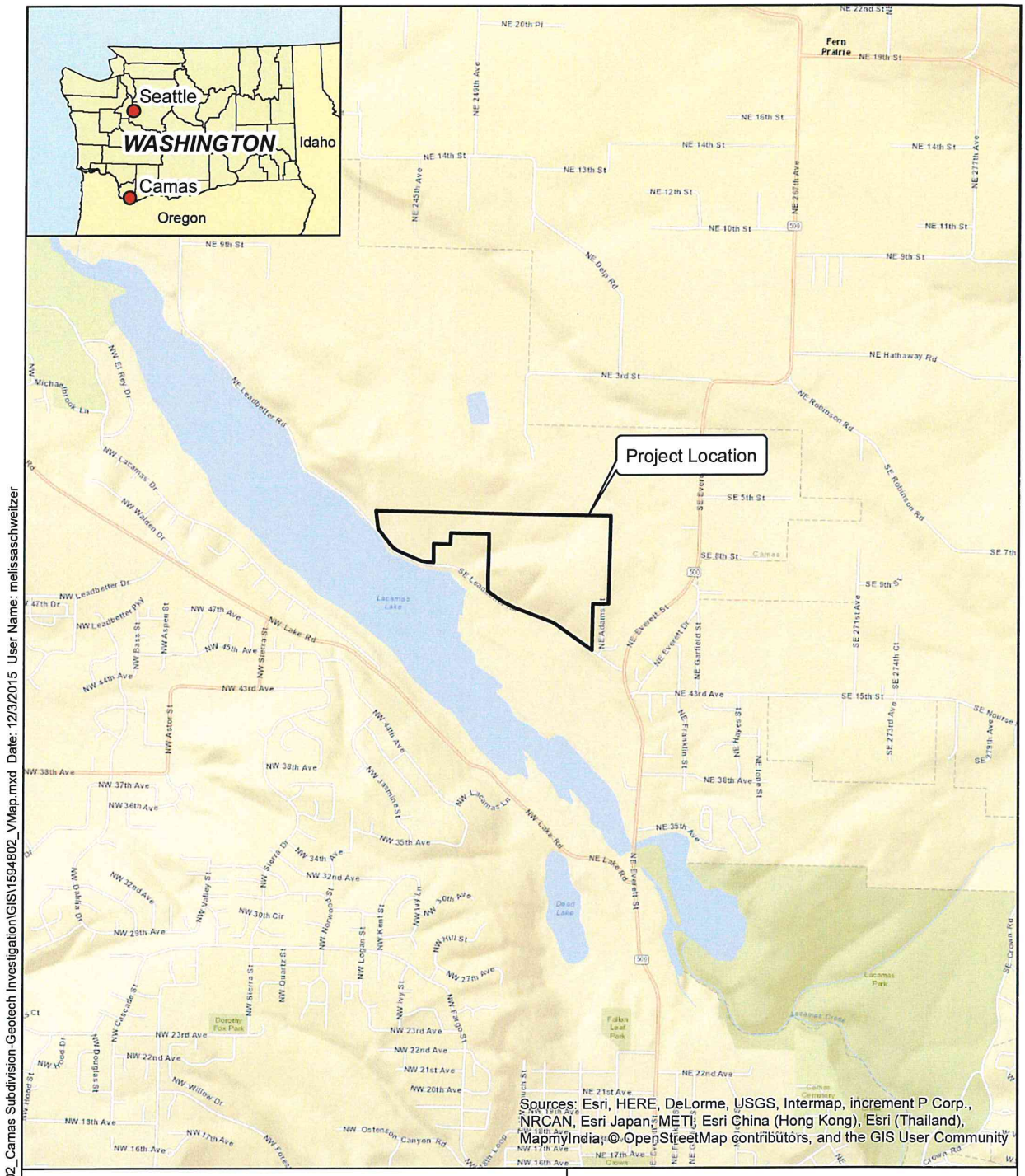
Limitations

We have prepared this memorandum for the exclusive use of CJ Dens Lacamas I, LLC and their authorized agents for this specific site. The scope of our work was in general accordance with our agreement dated October 14, 2015, and is limited to providing the information requested. Our evaluation and conclusions are based on our interpretation of observed site conditions. However, conditions can vary along the slope, and our conclusions should not be construed as a warranty or guarantee of future site performance. This memorandum should not be construed as providing design and construction recommendations for the proposed subdivision. Additional and more detailed geotechnical investigation should be performed before final design-level recommendations may be developed.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this memorandum was prepared. No warranty, express or implied, should be understood. Any electronic form, facsimile, or hard copy of the original document (email, text, table and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by Hart Crowser and will serve as the official document of record.

Attachments:
Figure 1 – Vicinity Map
Figure 2 – Exploration Plan
Test Pit Logs

F:\Notebooks\1594802_Camas Subdivision-Geotech Investigation\Deliverables\Memo-Geohazard Eval 12-07-15\Camas Subdivision Site-Specific Eval.docx


Seattle
WASHINGTON
Idaho
Camas
Oregon
Project Location
Fern Prairie
Camas
Lacamas Lake
Dead Lake
Lacamas Park
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
0 1,000 2,000 4,000
Feet
N
Camas Subdivision
Camas, Washington
Vicinity Map
15948-02
12/15
HARTCROWSER
Figure
1
Document Path: F:\Notebooks\1594802_Camas Subdivision-Geotech Investigation\GIS\1594802_VMap.mxd Date: 12/3/2015 User Name: melissaschweitzer

0
200
400
Approximate Scale in Feet
N
LEGEND
TP-1 Test Pit
Pothole
Geohazard Area
A
TP-7
TP-8
C
TP-1
TP-2
TP-3
TP-4
TP-5
TP-6
TP-9
N.E. LEADBETTER ROAD
DEERHAVEN SUBDIVISION (311-573)
N.E. ADAMS STREET
N.E. 45th
Source: Overall Existing Conditions Plan, Sheet C2.1 from Group Mackenzie, dated 1/19/11.
Camas Subdivision
Camas, Washington
Exploration Plan
15948-02
12/15
HARTCROWSER
Figure
2

KEY TO EXPLORATION LOGS

HARTCROWSER

SOIL CLASSIFICATION CHART

MATERIAL TYPES	MAJOR DIVISIONS		GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	GW	WELL-GRADED GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES, >12% FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	SW	WELL-GRADED SAND
			SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	CL	LEAN CLAY
			ML	SILT
		ORGANIC	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	CH	FAT CLAY
			MH	ELASTIC SILT
		ORGANIC	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS			PT	PEAT

Note: Multiple symbols are used to indicate borderline or dual classifications

OTHER MATERIAL SYMBOLS

- Concrete
- Asphalt
- Topsoil

MOISTURE MODIFIERS

- Dry - Absence of moisture, dusty, dry to the touch
- Moist - Damp, but no visible water
- Wet - Visible free water or saturated, usually soil is obtained from below the water table

SEEPAGE MODIFIERS

- None -
- Slow - < 1 gpm
- Moderate - 1-3 gpm
- Heavy - > 3 gpm

CAVING MODIFIERS

- None -
- Minor - isolated
- Moderate - frequent
- Severe - general

MINOR CONSTITUENTS

- Trace - < 5% (silt/clay)
- Occasional - < 15% (sand/gravel)
- With - 5-15% (silt/clay) in sand or gravel
  15-30% (sand/gravel) in silt or clay

SAMPLE TYPES

- Dames & Moore
- Standard Penetration Test (SPT)
- Shelby Tube
- Bulk or Grab

LABORATORY/ FIELD TESTS

- ATT - Atterberg Limits
- CP - Laboratory Compaction Test
- CA - Chemical Analysis (Corrosivity)
- CN - Consolidation
- DD - Dry Density
- DS - Direct Shear
- HA - Hydrometer Analysis
- OC - Organic Content
- PP - Pocket Penetrometer (TSF)
- P200 - Percent Passing No. 200 Sieve
- SA - Sieve Analysis
- SW - Swell Test
- TV - Torvane Shear
- UC - Unconfined Compression

GROUNDWATER SYMBOLS

- Water Level (at time of drilling)
- Water Level (at end of drilling)
- Water Level (after drilling)

STRATIGRAPHIC CONTACT

- ——— Distinct contact between soil strata or geologic units
- – – – – Gradual or approximate change between soil strata or geologic units

Notes:

Blowcount (N) is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted) per ASTM D-1586. See exploration log for hammer weight and drop.

When the Dames & Moore (D&M) sampler was driven with a 140-pound hammer (denoted on logs as D+M 140), the field blow counts (N-value) shown on the logs have been reduced by 50% to approximate SPT N-values.

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

Refer to the report text and exploration logs for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the exploration locations at the time the explorations were made. The logs are not warranted to be representative of the subsurface conditoins at other locations or times.

KEY TO EXPLORATION LOGS - F:\GINT\OREGON_LIBRARY.GLB - 11/30/15 11:57 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Figure A-1

KEY TO BEDROCK TERMS (1 of 2)
(WSDOT, 2014)

HARTCROWSER
8910 SW Gemini Drive
Beaverton, Oregon 97008

Weathered State of Rock

Term	Description	Grade
Fresh	No visible signs of rock material weathering; perhaps slight discoloration in major discontinuity surfaces.	I
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering, and may be somewhat weaker externally than in its fresh condition.	II
Moderately Weathered	Less than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as a continuous framework or as corestones.	III
Highly Weathered	More than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as discontinuous framework or as corestone.	IV
Completely Weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.	V
Residual Soil	All rock material is converted to soil. The mass structure and material fabric is destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI

Relative Rock Strength

Grade	Description	Field Identification	Uniaxial Compressive Strength
R0	Extremely Weak	Indented by thumbnail.	0.04 to 0.15 ksi
R1	Very Weak	Specimen crumbles under sharp blow with point of geological hammer, and can be cut with a pocket knife.	0.15 to 3.6 ksi
R2	Moderately Weak	Shallow cuts or scrapes can be made in a specimen with a pocket knife. Geological hammer point indents deeply with firm blow.	3.6 to 7.3 ksi
R3	Moderately Strong	Specimen cannot be scraped or cut with a pocket knife, shallow indentation can be made under firm blows from a hammer point.	7.3 to 15 ksi
R4	Strong	Specimen breaks with one firm blow from the hammer end of a geological hammer.	15 to 29 ksi
R5	Very Strong	Specimen requires many blows of a geological hammer to break intact sample.	Greater than 29 ksi

Discontinuities

Discontinuity Spacing		Discontinuity Condition	
Description	Spacing	Condition	Description
Very Widely Spaced	Greater than 10 feet.	Excellent Condition	Very rough surfaces, no separation, hard discontinuity wall.
Widely Spaced	3 to 10 feet.	Good Condition	Slightly rough surfaces, separation less than 0.05 inches, hard discontinuity wall.
Moderately Spaced	1 to 3 feet.	Fair Condition	Slightly rough surface, separation greater than 0.05 inches, soft discontinuity wall.
Closely Spaced	2 to 12 inches	Poor Condition	Slickensided surfaces, or soft gouge less than 0.2 inches thick, or open discontinuities 0.05 to 0.2 inches.
Very Closely Spaced	Less than 2 inches	Very Poor Condition	Soft gouge greater than 0.2 inches, or open discontinuities greater than 0.2 inches.

Figure A-2

KEY TO BEDROCK TERMS (2 of 2)
(WSDOT, 2014)

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Grain Size

Grain Size	Description	Criteria
Less than 0.04 inches	Fine grained	Few crystal boundaries/ grains distinguishable in the field or with a hand lens.
0.04 to 0.2 inches	Medium grained	Most crystal boundaries/ grains distinguishable with the aid of a hand lens.
Greater than 0.2 inches	Coarse grained	Most crystal boundaries/ grains distinguishable with the naked eye.

Igneous Rock Textures

Texture	Grain Size
Pegmatitic	Very large; diameters greater than 0.8 in.
Phaneritic	Can be seen with the naked eye
Porphyritic	Grained of two widely different sizes
Aphanitic	Cannot be seen with the naked eye
Glassy	No grains present

Pyroclastic Rocks

Rock Name	Characteristics
Pyroclastic Breccia	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which *angular* pyroclasts predominate.
Agglomerate	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which *rounded* pyroclasts predominate.
Lapilli Tuff	Pyroclastic rock whose average pyroclast size is 0.08 to 2.5 inches.
Ash Tuff	Pyroclastic rock whose average pyroclast size is less than 0.08 inches.

Degree of Vesicularity

Designation	Percentage of Cavities (by volume) of Total Sample
Slightly Vesicular	5 to 10 Percent
Moderately Vesicular	10 to 25 Percent
Highly Vesicular	25 to 50 Percent
Scoriaceous	Greater than 50 Percent

OTHER TERMS:

Core Recover (CR) = the ratio of core recovered to the core run length expressed as a percentage.

Rock Quality Designation (RQD) = the percentage of rock core recovered in intact pieces of 4 inches or more in length in the length of a core run. Does not include mechanical breaks caused by drilling.

Fracture Frequency (FF) = the number of natural fractures per foot in the length of core recovered.

REFERENCE:

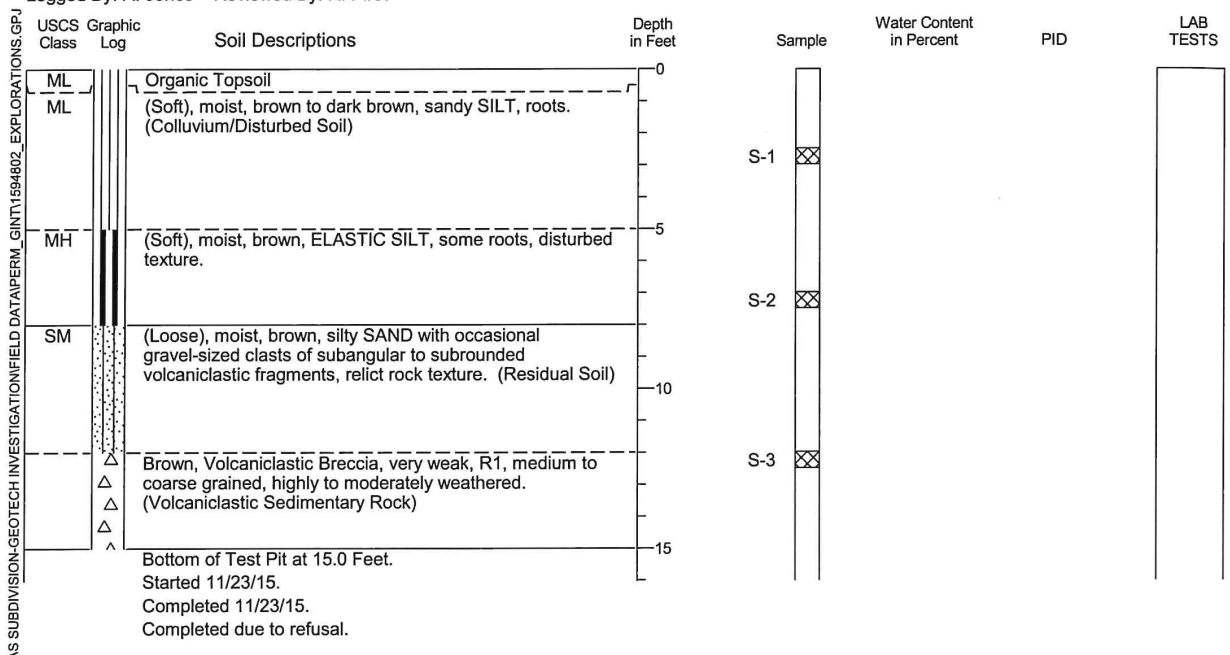
Washington State Department of Transportation (WSDOT), 2014. *Geotechnical Design Manual*, Publication M 46-03.02, August, 2014.

Figure A-2

Test Pit Log TP-1

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

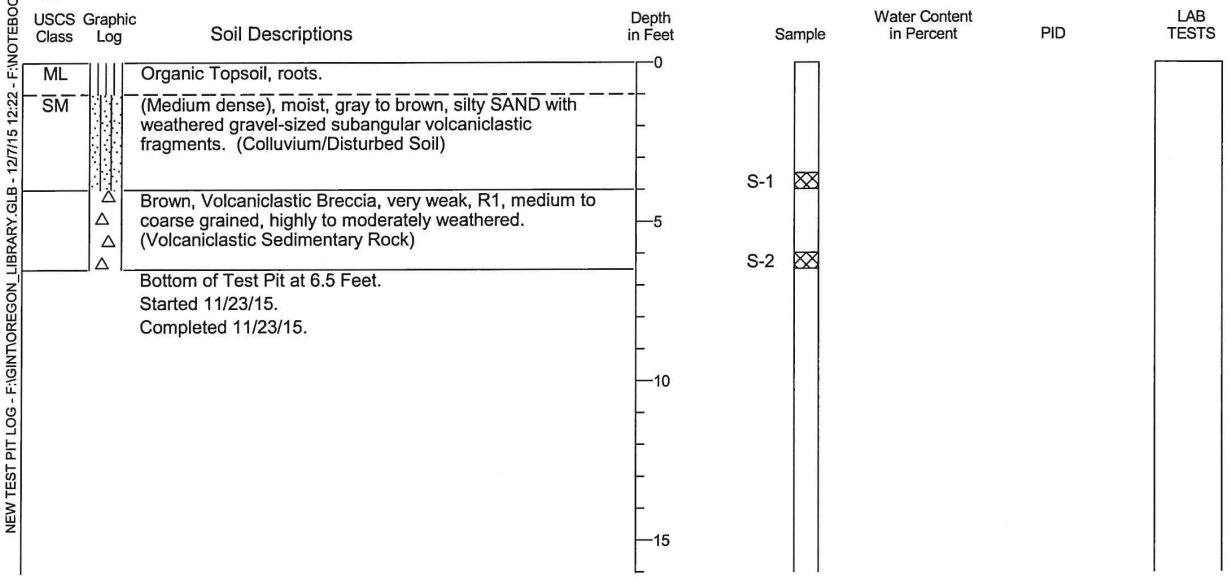
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-2

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

15948-02 12/15

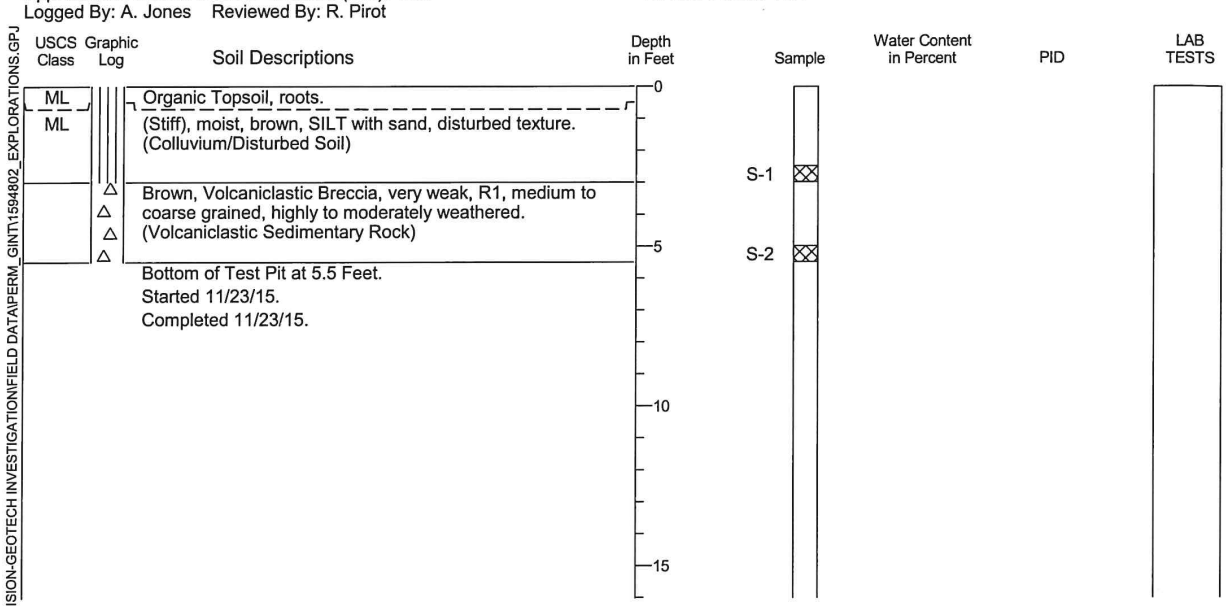
Figure A-3

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 12/7/15 12:22 - F:\NOTEBOOKS\15948002_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\15948002_EXPLORATIONS.GPJ

Test Pit Log TP-3

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

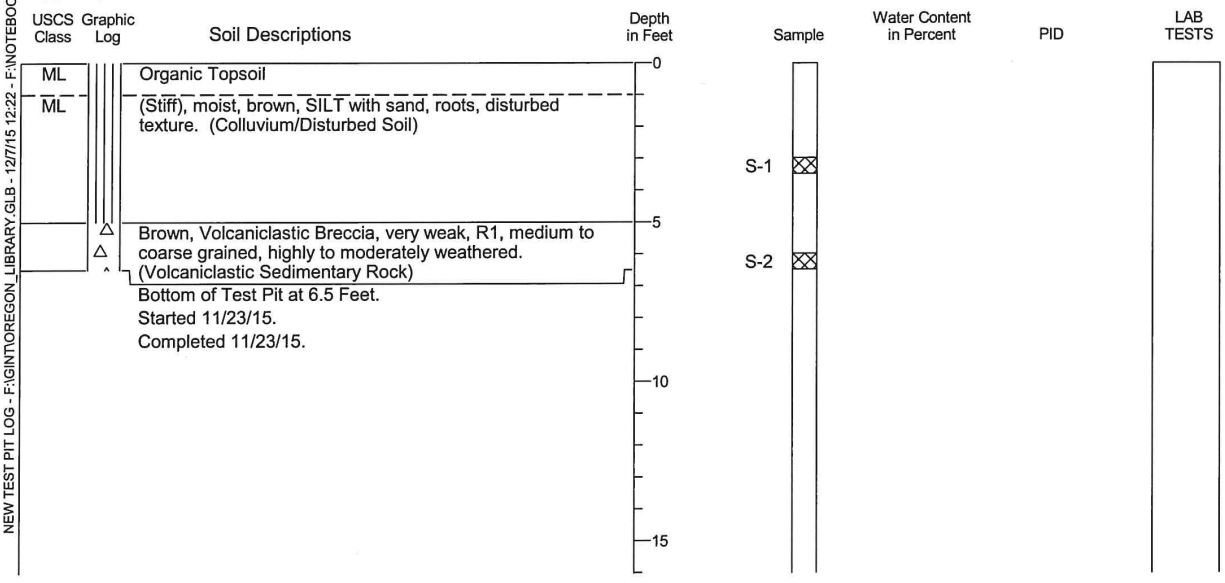
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-4

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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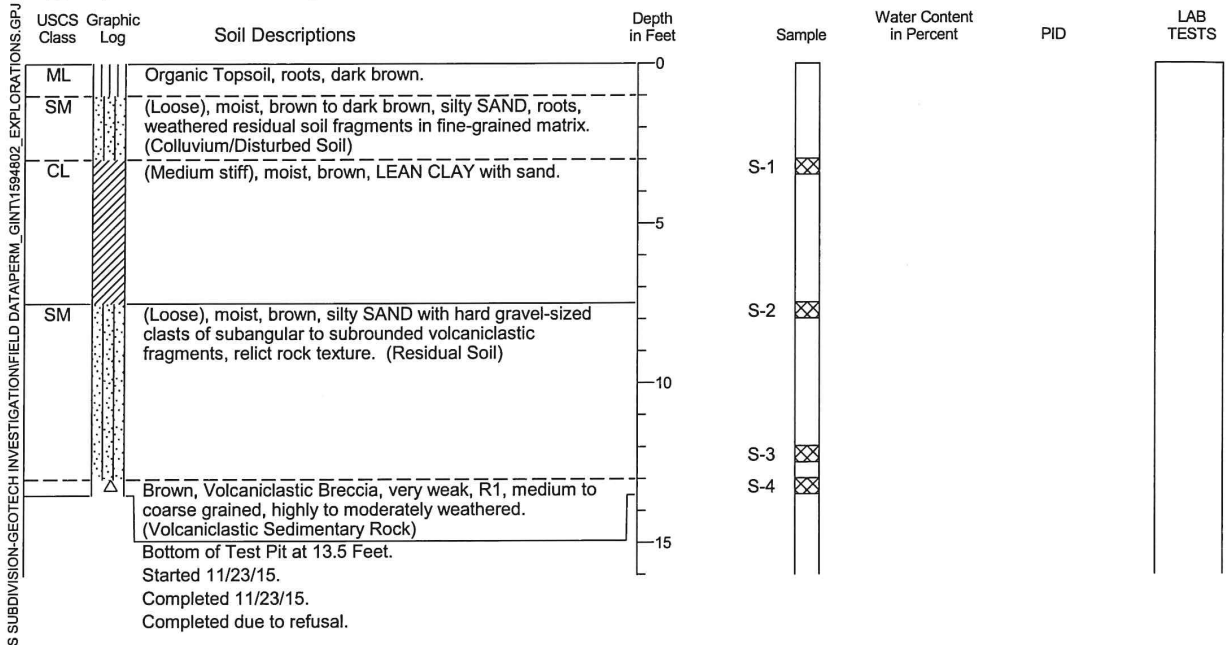
Figure A-4

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 12/7/15 12:22 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-5

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

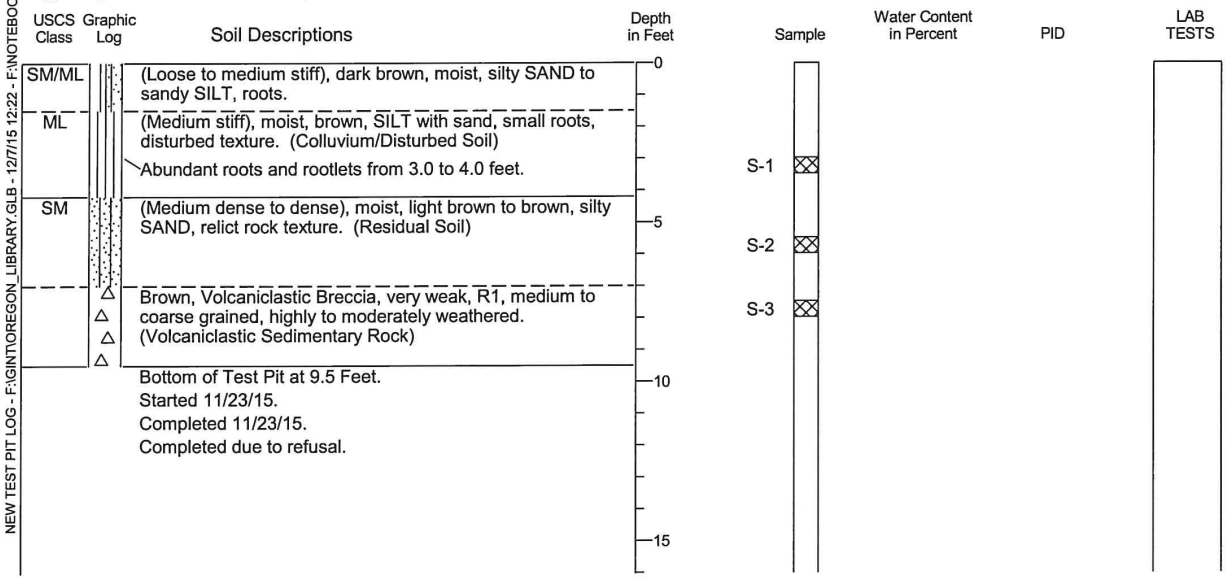
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-6

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 12/7/15 12:22 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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15948-02 12/15

Figure A-5

Test Pit Log TP-7

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM/ML		Organic Topsoil, roots.	0				
GM		(Loose), moist, brown, GRAVEL with silt and sand. (Colluvium)		S-1			
		Gray, Basaltic Andesite, moderately strong, R3, moderately to slightly weathered. (Basaltic Andesite of Elkhorn Mountain)		S-2			
		Bottom of Test Pit at 3.5 Feet.	5				
		Started 11/23/15.					
		Completed 11/23/15.					
		Completed due to refusal.	10				
			15				

Test Pit Log TP-8

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM/ML		Organic Topsoil, roots, dark brown.	0				
SM		(Loose), moist, brown, sandy SILT with angular to subangular gravel and cobbles. (Colluvium)		S-1			
		Gray, Basaltic Andesite, moderately strong, R3, moderately to slightly weathered. (Basaltic Andesite of Elkhorn Mountain)		S-2			
		Bottom of Test Pit at 3.5 Feet.	5				
		Started 11/23/15.					
		Completed 11/23/15.					
		Completed due to refusal.	10				
			15				

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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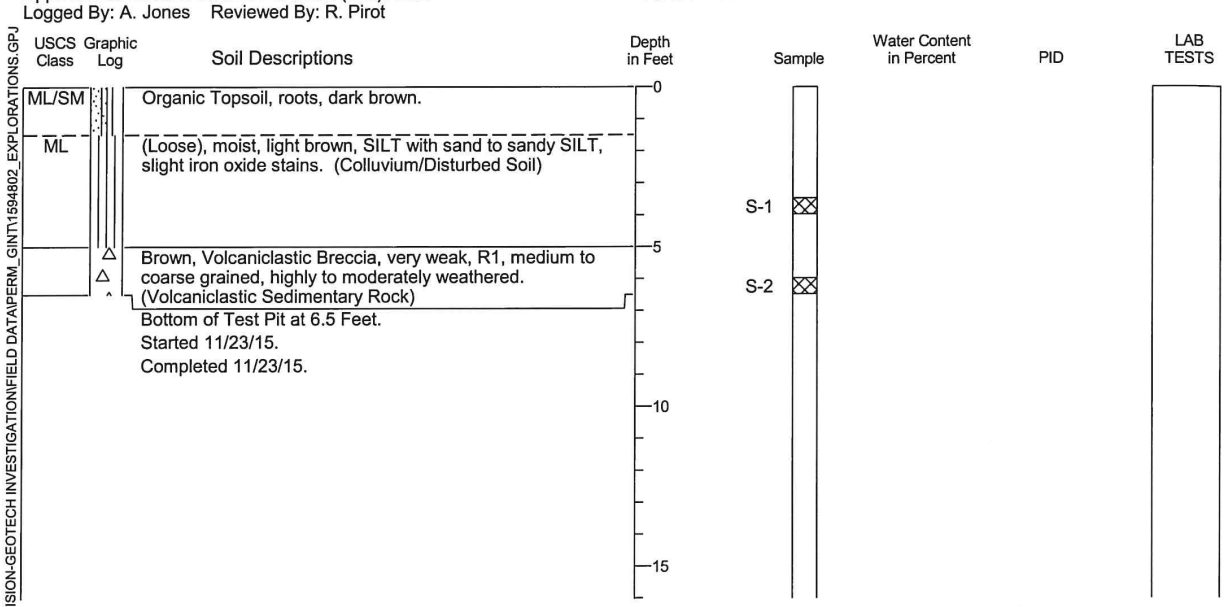
Figure A-6

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 12/7/15 12:22 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-9

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 12/7/15 12:22 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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15948-02 *12/15*

Figure A-7

Report of Geotechnical Engineering Services

CJ Dens Subdivision

Camas, Washington

Prepared for

CJ Dens Lacamas I, LLC

July 6, 2016
15948-02

HARTCROWSER

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Report of Geotechnical Engineering Services

CJ Dens Subdivision

Camas, Washington

Prepared for
CJ Dens Lacamas I, LLC

July 6, 2016
15948-02

Prepared by
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APPENDIX A

Field Explorations
A1 – Current Test Pits (5/16)
A2 – Prior Test Pits (11/15)

APPENDIX B

Laboratory Testing

Report of Geotechnical Engineering Services

CJ Dens Subdivision

Camas, Washington

1.0 INTRODUCTION

Hart Crowser, Inc. is pleased to present this report to CJ Dens Lacamas I, LLC describing our geotechnical engineering services for the proposed CJ Dense Subdivision off of Leadbetter Road in Camas, Washington. Our work was performed in general accordance with our Contract Change Order dated May 27, 2016.

Hart Crowser has previously completed work at the site. In March 2013, Hart Crowser prepared an update to an existing Critical Areas Report (CAR) (dated 2005) and a Level One Hydrogeologic Assessment for the proposed subdivision. Several potential geologic hazards areas were identified during those studies. In December 2015, Hart Crowser completed an initial site-specific evaluation of two specific hazard areas (identified as A and C). Based on that initial review, it was our opinion that those geohazard areas did not present geologic hazards to the project that could not be reasonably mitigated. Details regarding these studies were provided in the reports listed below.

- Critical Areas Report – Update – Proposed Camas Subdivision – Leadbetter Road, Camas, Washington, HC Project Number 15948-01-01, dated march 19, 2013.
- Level One Hydrogeologic Assessment – Proposed Camas Subdivision – Leadbetter Road, Camas Washington, HC Project Number 15948-01-02, dated March 19, 2013
- Initial Site-Specific Evaluation of Geohazard Areas A and C – Camas Subdivision – Leadbetter Road, Camas, Washington, HC project number 15948-02, dated December 7, 2015.

2.0 PROJECT DESCRIPTION

Hart Crowser understands the overall proposed development will consist of an approximately 300-lot residential subdivision. However, the current work is limited to an initial phase of approximately 200 lots in the southern and eastern portions of the property. The remaining, northwestern portion of the site, is not included in this geotechnical study.

Conventional one- to three-story, single-family residences supported on shallow foundations will be constructed on each lot. We anticipate the buildings will be constructed with wood frames and will be relatively lightly loaded with strip loads up to 2.5 kips per lineal foot and column loads of 75 kips. Infrastructure, such as roadways and utilities, will also be constructed. We understand that mass cuts and fills of up to 20 feet will be required for site grading.

This report contains the results of our analysis and provides recommendations for design and construction of the subdivision. The first section of this report provides an overview of the project information discussed in the text. The main body of the report presents our geotechnical engineering findings and recommendations in detail. Figures are presented at the end of the text. The location of the site is shown on Figure 1, and the existing and proposed site layouts are shown on Figures 2 and 3, respectively. Supporting information is provided in the appendices. Appendix A contains site subsurface exploration logs, and Appendix B contains the results of laboratory testing completed for our analysis.

3.0 SCOPE OF SERVICES

The purpose of our work was to evaluate subsurface conditions at the project site and to provide geotechnical engineering services for design of project elements. Our complete scope of work was described in our Contract Change Order 2 and is summarized below.

- Conducted field explorations with Tapani Underground by excavating 22 test pits to bedrock, maintained a log of the soils and bedrock encountered in the test pits, and collected samples for laboratory testing.

- Conducted a limited program of laboratory testing on select soil and bedrock samples. The scope of testing included moisture content determinations, particle-size analyses, and Atterberg limits tests.

- Conducted engineering analysis to develop geotechnical design recommendations for earthwork, foundations, retaining walls, pavements, and seismic design criteria.

- Prepared this geotechnical report outlining our findings and recommendations, including information related to:
  - Subsurface soil, bedrock, and groundwater conditions;
  - Slope stability and slope stabilization measures;
  - Seismic hazards and design criteria;
  - Site preparation and grading;
  - Foundation design parameters;
  - Retaining wall design parameters; and
  - Pavement design (conventional asphalt and concrete).

- Provided project management and support services, including coordinating staff, conducting telephone consultations and email communications with you and the design team, etc.

4.0 SITE CONDITIONS

4.1 Geologic and Soil Mapping

The geology of the site is mapped in the *Geologic Map of the Vancouver Quadrangle, Oregon and Washington* (Phillips 1987). The geologic mapping of Phillips indicates that the site is predominantly underlain by Oligocene-age "Skamania Volcanics." The mapping of Evarts and O'Connor (2008) supersedes previous work and differentiates "Skamania Volcanics" into two distinct units at the site. Evarts and O'Connor have mapped the eastern hilltop and adjacent upper slopes as underlain by Oligocene "Volcaniclastic sedimentary rock" interbedded with basalt. The remainder of the site is mapped as underlain by Oligocene "Basaltic andesite of Elkhorn Mountain." Evarts and O'Connor (2008) explain that they consider the term "Skamania Volcanics" too broad and poorly defined to be useful; however, given the age they assign to these units and their description, these materials appear equivalent to the "Skamania Volcanics" of Phillips (1987). Our explorations of the site indicate that a majority of the site is underlain by residual and colluvial soils overlying volcanic breccia and basaltic andesite, which is consistent with the geologic mapping.

The near-surface soils at the site are mapped by the U.S. Department of Agriculture (USDA) as found on the Web Soil Survey (USDA 2006) website. The report generated by Web Soil Survey for the site indicates near surface soils in the vicinity of the project consist predominantly of Olympic Clay Loam (OlD) and Olympic Stony Clay Loam (OmE) and Vader Silt Loam (VaB/VaC). The Olympic soils are described as a mountain slope landform derived from residual soil and colluvium consisting of clay loam with varying percentages of gravel content. These soils are considered well drained, with a moderately high permeability ranging from approximately 0.2 to 0.6 inches per hour. The Vader soils are derived from residual soil and colluvium with a sedimentary rock parent material consisting of ashy silt loam over weathered bedrock. They are also considered well drained, with a moderately high to high permeability of approximately 0.6 to 2.0 inches per hour.

4.2 Surface Conditions

The proposed subdivision site is located on the upslope (northeast) side of Leadbetter Road in Camas, Washington. The site is within the NE Quarter of Section 34 and NW Quarter of Section 35, of Township 2 North and Range 3 East of the Willamette Meridian. The property is comprised of four irregularly shaped parcels (178236-000, 178172-000, 177906-000, and 177905-000) that total approximately 85 acres. The southeast corner of the site is approximately 500 feet northwest of the intersection of Leadbetter Road and NE Everett Street. The southern end of Lacamas Lake is located on the opposite (southwest) side of Leadbetter Road. A vicinity map of the project site is presented on Figure 1.

The site consists of two upland areas separated by a northeast to southwest-trending unnamed stream drainage. The site topography is highly variable, ranging from uniform to irregular and nearly level to very steeply sloping. Elevations range from approximately 175 feet along Leadbetter Road to approximately 360 feet along the northern property line. The overall existing site topography is shown on Figure 2.

The portion of the site northwest of the drainage comprises approximately 35 acres. This area is characterized by a series of small hilltops separated by short, moderately steep to gentle slopes. The northern site boundary rises gently to a broad upland plateau off site, while the southwest boundary slopes down moderately steeply to steeply to Leadbetter Road along Lacamas Lake. The internal slopes along the northwest side of the unnamed stream valley slope steeply down to the southeast and east. (This portion of the site in not included in the current study, as development of this area is not yet proposed.)

The approximately 50-acre portion of the site southeast of the drainage, which is included in this study, is dominated by an approximately 1,500-foot-long, broad-topped, west-trending ridge. This area was recently logged in the winter of 2015/2016 and is covered with light brush. The base of the ridge extends off site to the east and descends along steep, 60- to 80-foot-high side slopes down to Leadbetter Road along the southwest property boundary. The steep slopes descending into the unnamed stream canyon range from 40 to 80 feet high. Several short, steep internal slopes bound scattered rocky internal hilltops that rise above the ridge surface.

4.3 Subsurface Conditions

4.3.1 General

Soil conditions interpreted from geologic maps and our explorations, in conjunction with soil properties inferred from field observations and laboratory tests, formed the basis for the conclusions and recommendations in this report. Appendix A describes our field exploration procedures and presents field data and logs. Appendix B describes our laboratory soil testing procedures and results.

We completed explorations at the site by advancing nine test pits, designated TP-1A through TP-9A, to depths ranging from 4 to 14 feet below ground surface (bgs) on November 23, 2015, and an additional 22 test pits, designated TP-1 through TP-22, to depths ranging from approximately 2.5 to 12.5 feet bgs on May 27, 2016. Test pit locations are shown on Figures 2 and 3. The recent test pit logs are included in Appendix A1, while the prior test pit logs are included in Appendix A2.

The project area is typically mantled with residual soil and colluvium to depths ranging from approximately 1 to 12 feet bgs. Soils in the upland and hillslope areas of the site were typically in the range of 0.5 to 4 feet in thickness, while soils in drainages and at the bottom of slopes were thicker. Underlying the residual soil and colluvium is fresh to moderately weathered basaltic andesite and volaniclastic breccia to the maximum depths explored. Descriptions of these units are provided below.

4.3.2 Soil Conditions

4.3.2.1 Colluvium

Colluvium was encountered on or at the bottom of hillslopes at the site and is interpreted as slope wash deposits. The colluvium consisted of silty sand, sandy silt, silt with sand, elastic silt and lean clay with sand with varying percentages of fine, subrounded to subangular gravel. Colluvium up to 12 feet thick was encountered in test pit TP-8, but typically ranged from approximately 1 to 5 feet thick, and was thicker at the bottom of slopes. The colluvium was typically covered with approximately 6 to

12 inches of rooted topsoil. Based on the backhoe action and pocket penetrometer tests in the sidewalls of the excavations, we estimate the relatively density of the fine-grained colluvium to be soft to medium stiff and the coarse-grained colluvium to be loose to medium dense.

Moisture contents in the colluvium varied from approximately 25 to 42 percent based on 12 tests. Atterberg limit testing was conducted on two samples of fine-grained colluvium yielding liquid limits of 43 to 48 and plastic limits of 23 to 34 indicating silt to lean clay soil classifications.

4.3.2.2 Residual Soil

Residual soil consisting of silty sand, sandy silt, and lean clay with varying percentages of sand and fine gravel was encountered at the surface or underlying colluvium at the site. Residual soil is interpreted as completely weathered and decomposed in-place bedrock that has experienced minimal transport by water or other means. Residual soil was encountered at the ground surface in test pits TP-1, TP-2, TP-5, TP-20, and TP-21 and underlying the colluvium at depths ranging from 4 to 12 feet bgs in test pits TP-1a, TP-5a, TP-6a, TP-8, and TP-14. The residual soil extends to the maximum depth explored (13 feet bgs) in test pit TP-8. Based on the backhoe action during test pit excavation, we estimate the relative density of the fine-grained residual soil is soft to very stiff and the coarse-grained residual soil is loose to dense.

Moisture contents in the residual soil varied from 20 to 38 percent based on six tests. Atterberg limits testing was conducted on two samples of fine-grained residual soil yielding liquid limits of 46 to 49 and plastic limits of 26 to 31 indicating a silt soil classification.

4.3.2.3 Oligocene Basaltic Andesite of Elkhorn Mountain

Bedrock interpreted as Oligocene-age Basaltic Andesite of Elkhorn Mountain was observed in numerous outcrops across the site and was encountered near the surface and in test pits TP-3, TP-4, TP-11, TP-17, TP-18, and TP-22. Basaltic andesite was encountered at depths ranging from about 1.5 to 8 feet in test pits TP-1, TP-2, TP-5, TP-9 through TP-16, and TP-21. The basaltic andesite varied from fresh to moderately weathered, moderately weak to strong (R2-R4), with closely to moderately spaced fractures. The basalt was typically rippable with a toothed bucket to at least 1 foot below top of rock with moderate effort. Moisture contents in the basaltic andesite varied 9.0 to 9.4 percent based on two tests.

4.3.2.4 Oligocene Volcaniclastic Sedimentary Rock

Volcaniclastic breccia, interpreted as Oigocene-age Volcaniclastic Sedimentary Rock, was encountered at depths ranging from approximately 3 to 13 feet bgs in test pits TP-1a through TP-6a, TP-6, TP-7, TP-19, and TP-20. Volcaniclastic breccia was encountered in the northwest and southeast limits of our explorations and statigraphically underlies the basaltic andesite; no outcrops of volcaniclastic breccia were observed at the surface during our explorations. The breccia consists of angular, medium sand to coarse-gravel-sized fragments of igneous rocks in a weakly-cemented, fine-grained matrix. The breccia was typically moderately to highly weathered, thin-bedded, brown-gray to red-brown, and very weak to moderately weak (R1-R2), with closely spaced fractures. The breccia was typically rippable to at least 1 foot below top of rock with minimal effort.

4.3.2.5 Limitations

The subsurface information used for this study represents conditions at a discrete location at the project site. Actual conditions in other areas could vary. The nature and extent of any variations in subsurface conditions may not become evident until construction begins. If significant variations are observed at that time, we may need to modify our conclusions and recommendations accordingly to reflect actual site conditions.

4.3.3 Groundwater

Subsurface water seepage was encountered in test pit TP-1 at a depth of approximately 7.5 feet bgs. No other test pits encountered seepage during our explorations. Based on local well logs that are primarily screened in the basaltic andesite and volcaniclastic breccia, we anticipate regional groundwater levels to be approximately 50 to 100 feet bgs at the site. We anticipate shallowly infiltrating precipitation and surface run off can become perched within the upper soils at the site during the wetter months of the year, and may approach the ground surface during periods of heavy rain.

5.0 GEOLOGIC AND SEISMIC HAZARDS

5.1 Seismic Shaking

The site is in a seismically active area. In this section, we describe the seismic setting at the project site, identify the seismic basis of design, and discuss the seismic hazards at the site.

The seismicity of the region is controlled by the Cascadia Subduction Zone. Plate tectonics cause the oceanic Juan de Fuca Plate to subduct beneath the continental North American Plate. Three types of earthquakes are associated with subduction zones: intraslab, interface, and crustal earthquakes. Contributions from each of these sources to the total site seismic hazard was evaluated using the U.S. Geologic Survey (USGS) 2008 Interactive Deaggregations (USGS 2013).

Intraslab and Interface Sources. Subduction zones are characterized by the interaction of the oceanic Juan de Fuca plate and continental North American plates. As the oceanic plate subducts beneath the continental plate, the two plates lock together. As the plates move together, stresses similar to a spring build in the overlying continental plate. This stress acts to unlock the two plates. When the magnitude of the *spring* stresses becomes large enough to overcome the stresses locking the plates together, the plates will suddenly rupture causing an interface earthquake. Interface earthquakes (such as the 2011 magnitude M9.0 Tohoku earthquake in northern Japan) are some of the largest magnitude earthquakes on record.

Intraslab earthquakes originate from a deeper zone of seismicity that is associated with bending and breaking of the subducting Juan de Fuca plate. Intraslab earthquakes (such as the 2001 magnitude M7.0 Nisqually earthquake in west central Washington) occur at depths of 40 to 70 kilometers (km) and can produce earthquakes with magnitudes up to and greater than magnitude M7.0. Our review of the interactive deaggregations indicate interface and intraslab earthquakes contribute approximately 50 percent of the total seismic hazard to the site.

Crustal Sources. Shallow crustal faults are caused by cracking of the continental crust resulting from the stress that builds as the subduction zone plates remain locked together. Numerous crustal faults are mapped in the region and contribute approximately 17 percent of the total seismic hazard to the site. The remainder (approximately 32 percent) of the seismic hazard is "gridded" crustal faults, which represent general hazards, but not hazard associated with a specific fault.

We anticipate seismic design of new structures will be completed in accordance with the Washington State Building Code (Washington State Building Code Council 2013), which is based on the 2012 International Building Code (IBC) (ICC 2012). We evaluated potential seismic shaking at the site using data obtained from the U.S. Seismic Design Maps (USGS 2008). The expected peak bedrock acceleration having a 2 percent probability of exceedance in 50 years (2,475-year return period) is 0.380g. This value represents the peak acceleration on bedrock beneath the site and does not account for ground motion amplification due to site-specific effects. The peak ground acceleration (PGA) is determined by applying a Site Class factor to the peak bedrock acceleration. Refer to *Section 5.2 - Ground Motion Amplification (Site Class)* for a discussion of ground motion amplification.

5.2 Ground Motion Amplification (Site Class)

Thick sequences of unconsolidated, soft sediments typically amplify the shaking of long-period ground motions, such as those associated with subduction zone earthquakes; whereas, areas underlain by shallow soil profiles are not likely to amplify seismic waves.

The "Site Class" is a designation used by the 2012 IBC to quantify ground motion amplification. The classification is based on the stiffness in the upper 100 feet of soil and bedrock materials at a site. At the project site the upper 4 to 15 feet of soil is generally soft to medium stiff overlying shallow bedrock. This information leads us to classify the site as Site Class D.

5.3 Liquefaction

Based on the relatively deep phreatic groundwater elevation and shallow bedrock mantling the project site, a liquefaction hazard is likely not present.

5.4 Earthquake-Induced Landsliding

Based on the relatively thin soils overlying shallow bedrock at the site, in our opinion, the potential for earthquake-induced landsliding is low.

5.5 Ground Fault Rupture

Based on our review of the USGS Fault and Fold Database (Personius 2002) and mapping of Evarts and O'Connor (2008), several active crustal faults are mapped at and near the site. These include the Northeast/Southwest trending Lacamas Lake Fault, which is inferred beneath Lacamas Lake a few hundred feet from the site and the Northeast/Southwest-trending Prune Hill Thrust Fault, which intersects the Lacamas Lake Fault near the site. Additionally, two small unnamed faults, likely coincident with the Lacamas Lake Fault, are mapped within the project site near Leadbetter Road. No

faults were observed during our explorations. Although the age of movement is somewhat poorly constrained on the mapped faults in the area, we consider there to be a moderate risk of ground surface fault rupture at the site.

5.6 Geologically Hazardous Areas

Geologic Hazard Areas were addressed in our Critical Areas Update and Initial Site-Specific Evaluation of Geohazard Areas A and C for the site. As discussed, the majority of the site is mantled with thin layers of colluvium and residual bedrock overlying intact bedrock. In our opinion, the soils do not present a slope stability hazard to the proposed development, if designed in conformance with the recommendations in this report.

5.7 Severe Erosion Hazard

Review of the Clark County Maps Online viewer indicates that portions of the site, generally coincident with sloping areas, are mapped as a severe erosion hazard. A majority of the site was logged in winter 2015/2016 for development; however, few areas of exposed bare soil were noted and the ground surface is lightly vegetated with brambles and low brush. We consider the site in its current state to have a low to moderate erosion hazard around the perimeter and moderate erosion hazard in the interior. Erosion control measures should be implemented during earthwork construction, as recommended by the project civil engineer. With a properly implemented erosion control plan, the impact of erosion on the site during construction should be minimal and easily mitigated.

6.0 CONCLUSIONS

Based on our explorations, testing, and analyses, it is our opinion that the site is suitable for the proposed use, provided the recommendations in this report are included in design and construction. We offer the following general summary of our conclusions.

- The majority of the project site is underlain by shallow bedrock (less than 10 feet bgs). The bedrock will provide excellent support for shallow foundations. The bedrock generally results in a stable hillside, even though the slopes are moderately steep, although typical measures should be followed to prevent shallow landslides to affect site slopes.

- Grading plans indicate that required cuts are likely to encounter bedrock in areas. In general, the upper few feet of rock will likely be rippable with standard excavation equipment; however, the contractor should anticipate the use of a rock hammer or other methods where significant rock excavation is required or excavations extend more than a few feet into bedrock.

- Thick fills are proposed on some sloping portions of the site. Hillside construction techniques, including the installation of keys and benches, should be employed at the site.

- Due to the presence of a fine-grained soil matrix and hard bedrock, we recommend against the use of infiltration systems to dispose of stormwater.

- The native soils are mostly fine-grained with varying percentages of sand and fine gravel. The reuse of these materials as structural fill will be difficult, since the fine-grained soils will be moisture sensitive and susceptible to disturbance when wet.
- Shallow perched groundwater may result in the need for localized trench and excavation dewatering during earthwork activities, depending on the time of construction.
- We developed our conclusions and recommendations based on our current understanding of the project elements, subsurface explorations, local experience, and guidelines in various design references (as listed in the references section of this report and annotated below). The following sections of this report outline our recommendations for design and earthworks.

7.0 STRUCTURAL DESIGN RECOMMENDATIONS

7.1 Design Response Spectrum

We obtained design spectral acceleration parameters from the U.S. Seismic Design Maps (USGS 2008) for Latitude 45.61517 and Longitude -122.41132 with a 2,475-year return period. The parameters provided in Table 1 are appropriate for code-level seismic design.

Table 1 - Seismic Design Parameters

Parameter	Value (IBC)
Spectral Response Acceleration (Short Period), S_s	0.873 g
Spectral Response Acceleration (1-Second Period), S_1	0.371 g
Peak Ground Acceleration (0-second Period), PGA	0.380 g
Site Class	D
Site Coefficient, F_a	1.151
Site Coefficient, F_v	1.658
Spectral Response Acceleration (Short Period), S_{DS}	0.670 g
Spectral Response Acceleration (1-Second Period), S_{D1}	0.410 g

Note: PGA is the mapped MCE_G peak ground acceleration and should not be used to derive the design response spectrum in accordance with ASCE 7-10 (2011) section 11.4.5.

7.2 Foundation Support Recommendations

7.2.1 General

Based on the results of our investigation, it is our opinion the proposed structures can be supported on conventional spread footings bearing on native soil, bedrock, or new structural fill constructed in accordance with the recommendations in this report.

7.2.2 Dimensions and Design Parameters

We recommend a maximum allowable bearing pressure of 5,000 pounds per square foot (psf) for spread footings bearing directly on hard bedrock or a leveling course of aggregate base overlying hard bedrock. We recommend a maximum allowable bearing pressure of 2,500 psf for spread footings bearing directly on colluvium, residual bedrock soil, or new engineered fills. The allowable soil bearing pressures may be increased by up to one-third for short-duration loads, such as wind or seismic forces. The bearing values provided above represent net bearing pressures; the weight of the footings and overlying backfill can be ignored in calculating footing sizes. The recommended allowable bearing pressure applies to the total of dead plus long-term live loads and may be increased by one-third for short-term loads, such as wind or seismic forces.

Isolated spread footings should have a minimum width of 2 feet. Continuous strip footings should have a minimum width of 12 inches or as required by code. The bottoms of all footings should be at least 1 foot below the lowest adjacent finished grade and, in sloping areas, should be embedded such that there is a minimum of 10 feet of "horizontal cover" from the toe of the footing. For example, in areas with a 2 horizontal to 1 vertical (2H:1V) slope gradient, this will require 5 feet of footing embedment.

Lateral loads on footings can be resisted by passive earth pressures on the sides of footings and by friction on the bearing surface. We recommend that passive earth pressures be calculated using an equivalent fluid weight of 300 pounds per cubic foot (pcf). We recommend using a friction coefficient for footings cast directly against the materials shown in Table 2 below. The passive earth pressure and friction components may be combined, provided that the passive component does not exceed two-thirds of the total. The lateral resistance values do not include safety factors.

Table 2 – Footing Base Friction Coefficient

Footing Base Material	Friction Coefficient
Soil	0.3
Compacted Aggregate Base[a]	0.5
Hard Bedrock	0.6

Note a: Aggregate base must be a minimum 8 inches thick if overlying colluvium or residual bedrock.

Because the depth to bedrock varies across the site and grading activities may result in fill placement, it may not be possible to delineate prior to construction which footing excavations will expose intact bedrock and which footings will expose soil. Therefore, the designer can choose to conservatively use the soil design parameters outlined above for all footings and/or provide a footing "schedule" that identifies different foundation configurations, depending upon which materials are exposed in the excavations.

We estimate that total post-construction settlements should be less than 1 inch, with differential settlement of less than 1/2 inch between columns.

7.2.3 Foundation Subgrade Preparation

Foundation subgrades should be evaluated by Hart Crowser to confirm suitable bearing conditions. Observations should also confirm that loose material has been removed and the design bearing soil unit or bedrock are exposed.

The presence of cobbles, boulders or bedrock should be anticipated within the depths of footing excavations. Boulders, cobbles, or bedrock protruding into the depth of excavation should be overexcavated and backfilled with compacted crushed rock. In this regard, it may be advisable to overexcavate foundation excavations 3 to 6 inches and backfill with compacted crushed rock to form a leveling pad.

Water, along with any disturbed soil, should be removed from footing excavations before placement of reinforcing steel. If construction is undertaken during periods of rain, we recommend that imported granular material be placed over the base of footing excavations. The granular material reduces subgrade disturbance from standing water and from foot traffic during forming and tying of reinforcing steel. Typically, 3 to 6 inches of clean granular material that is lightly compacted until well keyed provides sufficient protection from disturbance.

7.3 Floor Slabs

Satisfactory subgrade support for building floor slabs can be obtained, provided the building pad is prepared as described previously. For loading up to 200 psf, we recommend a minimum 6-inch-thick layer of base rock be placed and compacted over the subgrade. The base rock should meet the criteria for aggregate base discussed in *Section 8.4 - Structural Fill and Backfill.*

We recommend that exterior slabs (e.g., patios, walkways, driveways, and interior garage slabs) be structurally independent from the building foundations. Expansion joints should be provided between floor slabs and foundations. This will allow minor movement of the slabs to occur as a result of vehicular loading, tree root growth, seasonal soil shifting, and other factors, while reducing the potential for slab cracking around the perimeter. Interior slabs may be tied to the building's foundation system.

Flooring manufacturers often require vapor barriers to protect flooring and flooring adhesives. Many flooring manufacturers will warrant their product only if a vapor barrier is installed according to their recommendations. Selection and design of an appropriate vapor barrier, if needed, should be based on discussions among members of the design team.

We recommend that Hart Crowser observe slab subgrade preparation before placement of aggregate base to determine if the subgrade has been adequately prepared and that the soil conditions are consistent with those observed during our explorations. We should also evaluate the compacted aggregate base to verify required compaction levels have been achieved.

7.4 Retaining Structures

We anticipate that various site and/or building retaining walls will be required throughout the project. If walls are greater than 8 feet tall, or are located on or within 20 feet of downward sloping areas with gradients steeper than 4H:1V, then our office should be contacted to complete a wall-specific stability evaluation. If walls are 8 feet or less in height and located in areas with gradients 4H:1V or flatter, then the design recommendations in the following sections can be used. (We have provided recommendations for both cantilevered, cast-in-place concrete walls and mechanically stabilized earth [MSE] walls.)

7.4.1 Cantilevered Wall Design Parameters

Cantilevered retaining walls supporting new engineered fill or native cuts should be designed to resist earth pressures as shown in Table 3. We anticipate the wall backslopes will vary between flat and up to 2H:1V. The values in Table 3 vary according to the indicated slope angle. Earth pressures for intermediate slope angles can be linearly interpolated.

Table 3 – Cantilevered Retaining Wall Earth Pressures

Wall Type/Loading Condition Static Forces	Slope Angle	Equivalent Fluid Pressure (pcf)
Unrestrained from Rotation (active condition)	Flat	33
	2H:1V	55
Restrained from Rotation (at rest condition)	Flat	56
	2H:1V	82
Dynamic (Seismic) Forces	**Slope Angle**	**Dynamic Surcharge Force (plf)**
Unrestrained from Rotation (active condition)	Flat	5 H^2
	2H:1V	23 H^2
Restrained from Rotation (at-rest condition)	Flat	8 H^2
	2H:1V	33 H^2

Notes: plf = Pounds per linear foot of wall • H = the height of wall in feet

For seismic loading on retaining structures, a superimposed seismic lateral force should be calculated based on the dynamic force surcharges shown in Table 3. The force is applied 0.6H from the base of the wall.

If cuts for retaining walls expose large zones of stable bedrock, then reduced earth pressures may be appropriate for design and some zones of rock may be able to be left structurally unsupported. However, the appropriateness of these options will need to be evaluated in the field when the rock exposures are visible.

7.4.2 MSE Wall Design Parameters

MSE retaining walls supporting new engineered fills or native cuts should be designed to using the soil and rock parameters shown in Table 4.

Table 4 – MSE Wall Design Parameters

Material	Unit Weight, γ (pcf)	Friction Angle, ϕ (degrees)	Cohesion, c (psf)
Reinforced Zone Fill	130	38	0
Retained Material (Soil)	120	32	0
Retained Material (Bedrock)	135	45	500
Foundation Material (Soil)	120	32	50
Foundation Material (Bedrock)	135	45	500

For seismic design of MSE walls, the appropriate seismic parameters are listed in Table 1. The designer may assume an allowable displacement of 3 inches during seismic shaking. Also, the vertical acceleration coefficient, k_v, may be assumed to be 0.

The "reinforced zone fill" shall include the entire zone with geogrid reinforcement and that material should meet the specifications provided in Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge, and Municipal Construction (WSS) WSS 9-03.14(4) – Gravel Borrow for Geosynthetic Retaining Wall, as discussed in *Section 8.4 – Structural Fill and Backfill* (WSDOT 2016).

Most MSE wall systems are proprietary and all materials for MSE walls should also meet the manufacturer's recommendations for their specific wall. If conflicts exist between the specifications, they should be resolved by the engineer of record for the wall before construction.

7.4.3 Surcharges

If surcharges (e.g., foundations, terraced walls, stored materials, traffic loads, etc.) are located within a horizontal distance from the back of a wall equal to twice the height of the wall, then additional pressures may need to be accounted for in the wall design. Our office should be contacted for appropriate wall surcharges based on the actual magnitude and configuration of the applied loads.

Where traffic loads are located within a horizontal distance from the top of the wall equal to one-half the wall height, the lateral earth pressure shall be increased by a surcharge load equal to 2 feet of soil (assuming a soil density of 125 pcf). For overturning and sliding analysis, this surcharge should only be applied behind the reinforced soil zone.

7.4.4 Foundations

The base of the excavation for the wall footings (or first row of MSE blocks) should extend a minimum of 18 inches below lowest adjacent grade. The excavation should be lined with a minimum 6-inch-thick layer of compacted, imported granular material. In addition, the toe of footings/first row of MSE blocks should be embedded such that a minimum of 10 feet of horizontal coverage is present between the face of the footing/block toe and any adjacent downward slope.

The wall footings should be designed in accordance with the guidelines provided in *Section 7.1 – Foundation Support Recommendations*.

All wall subgrades should be evaluated by a qualified geotechnical engineer or their representative to confirm suitable bearing conditions. Observations should also confirm that loose or soft material, organics, unsuitable fill, prior topsoil zones, and softened subgrades (if present) have been removed. Localized deepening of footing excavations may be required to penetrate deleterious materials.

7.4.5 Drainage, Waterproofing, and Backfill

The above design parameters have been provided assuming that back-of-wall drains will be installed to prevent buildup of hydrostatic pressures behind all walls. If a drainage system is not installed, then our office should be contacted for revised design forces.

A minimum 12-inch-wide zone of drain rock, extending from the base of the wall to within 6 inches of finished grade, should be placed against the back of all retaining walls. Alternatively, prefabricated drainage panels with a pocket of drain rock at the base of the wall may be used. Perforated collector pipes should be embedded at the base of the drain rock. The drain rock should meet the requirements provided in *Section 8.4 - Fill and Backfill* of this report. The perforated collector pipes should discharge at an appropriate location away from the base of the wall. The discharge pipe(s) should not be tied directly into stormwater drain systems, unless measures are taken to prevent backflow into the wall's drainage system.

We recommend that retaining walls that abut living space should be waterproofed to reduce the potential for efflorescence growth or water seepage through the wall. Additionally, care should be taken to assure that the drainage system and perforated collector pipes are located below any habitable areas or crawlspace subgrades. We recommend that waterproofing of all habitable living spaces be the responsibility of the architect/building designer.

The backfill for MSE walls should meet the requirements of and be compacted in conformance with the specifications provided in WSS 6-13 – Structural Earth Walls. The reinforcing geotextile should be installed in conformance with the specifications provided in WSS 2 12 – Construction Geotextile.

Settlements of up to 1 percent of the wall height commonly occur immediately adjacent to the wall, as the wall rotates and develops active lateral earth pressures. Consequently, we recommend that construction of improvements (such as pavements, sidewalks, or structures) adjacent to retaining walls be postponed at least 4 weeks after backfilling of the wall, unless survey data indicate that settlement is complete prior to that time.

8.0 EARTHWORK RECOMMENDATIONS

Based on available information, we estimate mass grading will be relatively substantial consisting of cuts and fills up to 20 feet tall/deep. Localized trench excavations that extend below the base of mass excavation will be required for installation of utilities and foundations. Hillside construction techniques should be employed at the project.

All earthwork should be conducted in accordance with the City of Camas Municipal Code and the WSS (WSDOT 2016) where applicable. Specific recommendations for earthwork are provided in the following sections.

8.1 Site and Subgrade Preparation

8.1.1 Stripping and Clearing

Initial site preparation and earthwork operations will include clearing and stripping of surficial organic materials. Based on our explorations, the anticipated depth of stripping is approximately 8 to 24 inches with an average of 12 inches. Actual stripping depths should be evaluated based on observations during the stripping operation. The prepared subgrade should be observed and approved by a representative of Hart Crowser. Generally, visible organic material (sod, humus, roots larger than 1/4-inch diameter, and/or other decaying plant material), debris, and other unsuitable materials should be removed from the subgrade areas.

Trees and their root balls should be grubbed out to the depth of the roots, which could exceed 3 feet bgs. Depending upon the methods used to remove the root balls, considerable disturbance and loosening of the subgrade could occur during site grubbing. We recommend that soil disturbed during grubbing operations be removed to expose firm, undisturbed subgrade. The resulting excavations should be backfilled with compacted structural fill, as described in *Section 8.4 - Structural Fill and Backfill* of this report.

8.1.2 Subgrade Preparation and Evaluation

Following completion of site stripping, clearing, and any mass excavation, and prior to the placement of any fill or aggregate base, the suitability of the subgrade should be evaluated by proofrolling with a fully loaded dump truck or similar heavy rubber-tired construction equipment to identify any remaining soft, loose, or unsuitable areas. The proofroll should be conducted prior to placing any fill. The proofrolling should be observed by Hart Crowser who will evaluate the suitability of the subgrade and identify areas of yielding that are indicative of soft or loose soil. If soft or loose zones are identified during evaluation, these areas should be excavated to the extent indicated by the engineer and replaced with compacted engineered fill in conformance with the specifications provided in WSS 2-03.3(3) – Excavation Below Subgrade, WSS 2-03.3(14)E – Unsuitable Foundation Excavation, and WSS 2-03.3(14)G – Backfilling. During wet weather conditions the subgrade should be evaluated per *Section 8.2 – Wet Soil/Wet Weather Construction*.

8.1.3 Bench Preparation for Fill on Slopes

Fill placed on slopes steeper than 5H:1V (20 percent gradient) will need to be constructed on a series of benches cut into the native slope. The benches shall be level or have an outward gradient of 0.5 percent or less, and have a maximum of height of approximately 5 feet. However, the lowest bench, also known as the keyway, shall be a minimum of 10 feet wide or one and one-half times the width of the compaction equipment, whichever is wider. The keyway shall slope back into the hillside at a 2 percent gradient.

A gravel subdrain should be constructed at the back of the keyway and any benches where seepage is observed in the field. The subdrain should consist of a minimum of a 2-foot-wide by 2-foot-tall "wedge" of drain rock placed at the back of the keyway. The drain rock should be completely wrapped with a geotextile drainage fabric. A perforated pipe should be installed at the base of the gravel to collect water seepage. The collector pipe should "daylight" at an appropriate location near the base of the slope. If seepage, or signs of seepage are present in the field, then a 1-foot-thick blanket drain may also be required along the base of the keyway.

Refer to Figure 7 for a schematic depiction of a keyway and benches.

8.2 Wet Soil/Wet Weather Construction

The site is mantled with soils containing a significant percentage of fine-grained soil that will be susceptible to moisture-related disturbance. Disturbance to subgrades containing these soils should be expected if site preparation and earthwork are conducted during periods of excessive wet weather and/or when the moisture content of the fine grained subgrade soil exceeds optimum. Wet soil construction practices may be necessary during extensive portions of the year, particularly during periods of wet weather. Wet soil construction practices include using equipment, such as smooth excavator buckets and tracked equipment, to limit subgrade disturbance.

During wet weather or when the exposed subgrade is wet or unsuitable for proofrolling, the prepared subgrade should be evaluated by observing excavation activity and probing with a steel foundation probe. Observations and probing should be performed by Hart Crowser.

During wet weather or when adequate moisture control is not possible, it may be necessary to install a granular working blanket to support construction equipment and to provide a firm base on which to place subsequent fill and pavement. Commonly, the working blanket consists of bank run gravel or pit run quarry rock (6-inch maximum size with no more than 5 percent by weight passing a No. 200 sieve).

Based on our experience, between 12 and 18 inches of imported granular material is generally required to provide stable staging and haul road areas. However, the actual thickness will depend on the contractor's means and methods, and accordingly, should be the contractor's responsibility. Additionally, a geotextile fabric should generally be placed as a barrier between the subgrade and imported granular material in areas of repeated construction traffic. The imported granular material and the geotextile fabric should meet the specifications in *Section 8.4 - Structural Fill and Backfill* of this report.

Portions of the site used as haul routes for heavy construction equipment may require a thicker working blanket to protect the fine-grained subgrade. If particularly soft/wet areas are encountered, a heavy grade, nonwoven geotextile fabric installed on the fine-grained subgrade may be helpful in preventing silt from contaminating and pumping into the granular working blanket. The geotextile should meet the specifications provided in WSS 9-33.2(1) Table 3 – Geotextile for Separation or Soil Stabilization.

8.3 Excavation, Shoring, and Dewatering

All excavations, shoring, and dewatering should be completed in accordance with the specifications provided in WSS 2-03 – Roadway Excavation and Embankment and WSS 2-09 – Structure Excavation, and the requirements of Washington Administrative Code (WAC) section 292-155.

The colluvium and residual bedrock soils within expected excavation depths typically range from soft to stiff. Vertical trench excavations into these materials will have a low to moderate tendency to run or slough. On average, the site colluvium and residual bedrock soils should be considered Soil Type C, as defined by Part N of the WAC 296-155. However, the deeper intact bedrock can be classified as "Stable Rock." The presence of cobbles and boulders may cause excavation sidewalls to cave or slough, resulting in greater than anticipated backfill quantities.

Because of the variables involved, actual slope angles required for stability in temporary cut areas can only be estimated before construction. We recommend that stability of the temporary slopes used for construction be the responsibility of the contractor, since the contractor is in control of the construction operation and is continuously at the site to observe the nature and condition of the subsurface. All temporary soil cuts associated with site excavations (greater than 4 feet in depth) should be adequately sloped back to prevent sloughing and collapse, in accordance with Department of Occupational Safety and Health (DOSH) Chapter 296-155 WAC Part N Excavation, Trenching and Shoring Occupational Safety and Health Administration (OSHA) guidelines.

Explorations completed at the site identified relatively shallow bedrock. Earthwork construction will require equipment capable of excavation in this hard material. In our experience, rippers equipped to a large bulldozer can be effective in breaking up hard bedrock to a few or several feet deep to facilitate excavation. However, it is acknowledged that ripping the bedrock may not be completely effective, particularly with increasing depths, and rock hammers or blasting may be necessary to completely remove bedrock encountered within cut areas.

The earthwork contractor should be responsible for providing equipment and following procedures as needed to safely excavate the site soils as described in this report.

If temporary sloping is not feasible, based on site spatial constraints, excavations could be supported by internally braced shoring systems, such as a trench box or other temporary shoring. There are a variety of options available. We recommend that the contractor be responsible for selecting the type of shoring system to apply.

We do not expect that the regional groundwater table will be encountered during construction. However, we encountered perched groundwater in one location at the site, and localized zones of perched water may be encountered during construction, particularly atop the site bedrock during the wet season. The contractor should be prepared to control perched water and water that may seep into trenches and through excavation faces.

8.4 Structural Fill and Backfill

Structural fill includes embankments, slab, and pavement support, such as aggregate base and other fill within the influence zone of structures adjacent to the improvement area. Fill should only be placed over a subgrade that has been prepared in accordance with *Section 8.1 - Site and Subgrade Preparation* of this report. A variety of soils may be used as structural fill, provided they are free of debris, clay balls, roots, organic matter, frozen soil, man-made contaminants, particles exceeding 4 inches in size, and other deleterious materials. Structural fill should meet the appropriate specification provided in WSS 9-03 – Aggregates.

Fill and backfill materials should be placed and compacted in lifts with maximum uncompacted thicknesses and relative densities as recommended in *Section 8.5 - Fill Placement and Compaction* of this report.

In areas where fill is to be placed on soft or fine-grained subgrade soils, then use of a subgrade geotextile per WSS 9-33.2(1) Table 3 – Geotextile for Separation or Soil Stabilization will be required.

8.4.1 On-Site Soils and Bedrock Spoils

In general, the overburden native materials in the project area consist of fine-grained materials. During periods of dry weather, the native soils may be used as fill, provided they are properly moisture conditioned and oversized materials (greater than 6 inches) are removed. During periods of wet weather, the fine-grained component of the native soil will likely make the use of the native soil as a structural fill infeasible. The earthwork contractor should plan accordingly.

Bedrock spoils from excavations may be used as structural fill, provided they are processed/crushed to remove oversized materials. Bedrock materials should generally be processed to a well-graded crushed material with nominal sizes between 1 and 6 inches, and/or meeting the gradations of the materials described in S*ection 8.4.2 - Imported Select Structural Fill.*

8.4.2 Imported Select Structural Fill

Imported granular material used as structural fill during periods of wet weather should be pit or quarry run rock, crushed rock, or crushed gravel and sand and should meet the specifications provided in WSS 9-03.9(1) – Ballast, WSS 9-03.14(1) – Gravel Borrow, or WSS-9 03.14(2) – Select Borrow. The imported granular material should also be angular, fairly well graded between coarse and fine material, have less than 5 percent by dry weight passing the U.S. Standard No. 200 Sieve, and have at least two mechanically fractured faces.

8.4.3 Aggregate Base

Imported granular material used as aggregate base (base rock) beneath pavements or the building should be clean, crushed rock or crushed gravel and sand that is fairly well graded between coarse and fine. The base aggregate should meet the specifications provided in WSS 9 03.9 – Aggregates for Ballast and Crushed Surfacing, depending upon application, with the exception that the aggregate have less than 5 percent by dry weight passing a U.S. Standard No. 200 Sieve and have at least two

mechanically fractured faces. The aggregate base should have a maximum particle size of 1.5 inches for use beneath pavements or footings and a maximum particle size of 0.75 or 1 inch for use beneath floor slabs, sidewalks, or patio slabs.

Refer to *Section 10.0 - Pavement Design and Considerations* for additional discussion regarding base materials for paved areas.

8.4.4 Trench Backfill

Trench backfill placed beneath, adjacent to, and for at least 12 inches above utility lines (i.e., the pipe zone) should meet the WSS requirements and consist of well-graded granular material with a maximum particle size of 3/4 inch and less than 10 percent by dry weight passing the U.S. Standard No. 200 Sieve. The trench backfill should meet the specifications provided in WSS 9 03.12(3) – Gravel Backfill for Pipe Zone Bedding.

Within pavement and slab subgrades the remainder of the trench backfill up to the subgrade elevation shall consist of granular material meeting the specifications provided in WSS 9 03.19 – Bank Run Gravel for Trench Backfill, or other material approved by the City of Camas.

Outside of structural improvement areas, trench backfill placed above the pipe zone may consist of general fill materials that are free of organics and materials over 6 inches in diameter and meet the specifications provided in WSS 9 03.14(3) – Common Borrow and WSS 9 03.15 – Native Material for Trench Backfill, as appropriate.

8.4.5 Drain Rock

Drain rock used for back-of-wall, footing, and keyway drains should meet the specifications provided in WSS 9 03.12(4) – Gravel Backfill for Drains. The drain rock should be wrapped in a geotextile fabric that meets the specifications provided in WSS 9 33.2 for drainage geotextiles. The geotextile should be installed in conformance with the specifications provided in WSS 2 12 – Construction Geosynthetic.

8.4.6 Retaining Wall Select Backfill

Granular wall backfill used as reinforced fill for MSE walls should consist of select granular material meeting the specifications of WSS 9 03.14(4) – Gravel Borrow for Geosynthetic Retaining Wall. The select granular material should also meet the gradations specified in WSS 9 03.14 (1) – Gravel Borrow or WSS 9 03.14 (2) – Select Borrow.

8.4.7 Stabilization Material

If imported granular material is used to create haul roads for construction traffic, we recommend that material consist of pit or quarry run rock, or crushed rock. The material should generally be sized between 2 and 6 inches, have less than 5 percent by dry weight passing the U.S. Standard No. 4 Sieve, and have at least two mechanically fractured faces. The material should be free of organic matter and other deleterious material. Material meeting the gradations of WSS 9-03.9(2) - Permeable Ballast, WSS 9-03.12(5) – Gravel Backfill for Drywells, or WSS 9-13.6 – Quarry Spalls is generally acceptable for use.

Stabilization material should be separated from the base of soft or fine-grained subgrades with a layer of subgrade geotextile that meets the specifications provided in WSDOT SS 9-33.2(1) Table 3 – Geotextile for Separation or Soil Stabilization. The geotextile should be installed in conformance with the specifications provided in WSS 2-12 – Construction Geosynthetic.

Stabilization material should be placed atop the geotextile in lifts between 12 and 18 inches thick and be compacted to a well-keyed condition with appropriate compaction equipment without using vibratory action. In trench excavations, a walk behind segmented pad roller or a pinwheel on an excavator typically can provide adequate compaction if carefully used.

8.5 Fill Placement and Compaction

Structural fill should be placed and compacted in accordance with WSS (2016) and the following guidelines.

In locations where fill is to be placed on slopes steeper than 5H:1V, benches should be cut in accordance with WSS 2-03.3(14) – Embankment Construction and *Section 8.1.3 - Bench Preparation for Fills on Slopes*. Fill slopes should be overbuilt by at least 12 inches and then trimmed back to the required slope to maintain a firm face.

- Place fill and backfill on a prepared subgrade that consists of firm, inorganic native soils or approved structural fill.
- Place fill or backfill in uniform horizontal lifts with a thickness appropriate for the material type and compaction equipment. Table 5 provides general guidance for uncompacted lift thicknesses.

Table 5 – Guidelines for Uncompacted Lift Thickness

Compaction Equipment	Guidelines for Uncompacted Lift Thickness (inches)		
	Fine-Grained Soil	Granular Soil and Crushed Rock (Maximum Size ≤ 1½ inch	Crushed Rock (Maximum Size > 1½ inch
Plate Compactors and Jumping Jacks	4 – 8	4 – 8	Not Recommended
Rubber-Tire Equipment	6 – 8	10 – 12	6 – 8
Light Roller	8 – 10	10 – 12	8 – 10
Heavy Roller	10 – 12	12 – 18	12 – 16
Hoe Pack Equipment	12 – 16	18 – 24	12 – 16

Note: The above table is based on our experience and is intended to serve as a guideline. The information provided in this table should not be included in the project specifications.

- Do not place fill and backfill until the required tests and evaluation of the underlying materials have been made and the appropriate approvals have been obtained.
- Limit the maximum particle size within the fill to two-thirds of the loose lift thickness.

- Control the moisture content of the fill to within 3 percent of the optimum moisture content based on laboratory Proctor tests. The optimum moisture content corresponds to the maximum attainable Proctor dry density.
- Perform a representative number of in-place density tests on structural fill in the field, to verify adequate compaction.
- Compact fill soils to the percentages of maximum dry density as shown in Table 6.

Table 6 – Fill Compaction Criteria

Fill Type	Percent of Maximum Dry Density Determined in Accordance with ASTM D 1557		
	0 – 2 Feet Below Subgrade	>2 Feet Below Subgrade	Pipe Bedding and Pipe Zone
Structural Fill	95	92	-----
Aggregate Base	95	95	-----
Trench Backfill	95	92	90
Nonstructural Trench Backfill	88	88	-----
Nonstructural Zones	88	88	-----

Note: Structural fill with more than 30 percent retained on the 3/4-inch sieve should be compacted to a well-keyed dense state within 3 percent of optimum moisture content. Compaction should be verified by Hart Crowser staff through performance testing, such as a proofroll.

8.6 Temporary Drainage

The contractor should be made responsible for temporary drainage of surface water as necessary to prevent standing water and/or erosion of the working surface during grading. During rough and finished grading of the roadway alignment the contractor should keep subgrades free of water.

9.0 DRAINAGE

As noted previously, the site lies on slopes up to 2H:1V, is mantled with a matrix of fine-grained soils, and is underlain by relatively shallow bedrock. These conditions will tend to perch, as opposed to infiltrate, stormwater; therefore, we recommend against the use of stormwater infiltration facilities at the site.

9.1 Surface Drainage

The finished ground surface around buildings should be sloped away from their foundations at a minimum 2 percent gradient for a distance of at least 5 feet. Downspouts or roof scuppers should discharge into a storm drain system that that carries the collected water to an appropriate stormwater system. Trapped planter areas should not be created adjacent to the building without providing means for positive drainage (i.e., swales or catch basins).

9.2 Subsurface Drainage

We recommend the installation of perimeter footing drains along the uphill sides of buildings and crawlspace areas at a minimum. Where retaining walls are incorporated into building foundation systems, the back-of-wall drain can serve as the footing drainage. Where used, the footing drains should consist of a filter fabric-wrapped, drain rock-filled trench that extends at least 12 inches below the lowest adjacent grade (i.e., crawlspace or slab subgrade elevation). A perforated pipe should be placed at the base to collect water that gathers in the drain rock. The drain rock and filter fabric should meet specifications outlined in *Section 8.4 - Structural Fill and Backfill* of this report. The discharge for the footing drain should not be tied directly into the stormwater drainage system, unless mechanisms are installed to prevent backflow.

10.0 PAVEMENT DESIGN AND CONSIDERATIONS

10.1 General

Our pavement design recommendations include options for flexible hot mixed asphaltic concrete (HMAC) pavement and Portland cement concrete (PCC). We were not provided specific traffic counts for the project, so we assumed some traffic loading criteria based on our experience with similar projects. If these and other assumptions in the following section are not valid, please contact our office so that updated recommendations can be developed.

10.2 Design Criteria

The pavement design criteria were based on guidelines found in the WSDOT Pavement Policy (WSDOT 2015) and American Association of State Highway and Transportation Officials (AASHTO*) Guide for Design of Pavement Structures* (AASHTO 1993), and our communications with the traffic engineer (Mackenzie). The following assumptions and criteria were used:

- Average daily traffic (ADT) ranging from approximately 500 to 1,500 vehicles per day with approximately 3 percent heavy truck traffic (e.g. buses, trash trucks, delivery trucks, etc.)
- No annual traffic growth due to lack of through streets
- Average resilient modulus of 6,000 pounds per square inch (psi) for *in situ* soil and fill subgrade
- A resilient modulus of 30,000 psi for aggregate base
- Initial and terminal serviceability indices of 4.5 and 2.0, respectively
- Reliability and standard deviation of 85 percent and 0.45, respectively for AC pavements and 95 percent and 0.35, respectively for PCC pavements
- PCC compressive strength of 4,000 psi and a modulus of rupture of 500 psi
- Structural coefficients of 0.45 and 0.12 for the HMAC and aggregate base layers, respectively

If these parameters and assumptions are incorrect, then we should be contacted to re-evaluate our recommendations.

Construction traffic should be limited to non-building, unpaved portions of the site or haul roads. Construction traffic should not be allowed on new pavements. If construction traffic is to be allowed on newly constructed road sections, an allowance for additional traffic will need to be made in the design pavement section.

10.3 Pavement Sections

The City standard pavement section for a typical residential street is 3 inches of HMAC over 9 to 12 inches of crushed surfacing (e.g., aggregate base). The results of our project-specific analyses for different ADT values indicates that somewhat different sections are feasible. Our recommended minimum pavement sections are summarized in Table 7.

Table 7 –Pavement Sections

Pavement Type/Location	Roadway Classification	Pavement Thickness (inches)	Aggregate Base Thickness (inches)
HMAC	Driveways	2.5	4.5
	ADT = 500	3.0	7.0
	ADT = 1000	3.0	9.0
	ADT = 1500	3.5	8.5
PCC	Driveways	3.5	4.0
	ADT = 500	4.0	6.0
	ADT = 1000	4.5	6.0
	ADT = 1500	5.0	6.0

We note that the aggregate base thicknesses are intended to support post-construction design traffic loads and should not be used to support construction traffic. Additional thickness of crushed surfacing may be necessary if excessive construction traffic is planned in the new pavement areas.

10.4 Pavement Materials

The HMAC should consist of a Level 2, 1/2-inch dense-graded, PG 64-22 material meeting the specifications of WSS 5-04 – Hot Mix Asphalt. The HMAC should be placed in lifts with minimum and maximum thickness of 1.5 and 3.5 inches, respectively, and be compacted in accordance with WSS 5-04.3(10) – Compaction to 91 percent of Rice Density of the mix, as determined in accordance with American Society for Testing and Materials (ASTM) D 2041.

The PCC should conform to the specifications provided in WSS 5-05 – Cement Concrete Pavement. The PCC should have a minimum modulus of rupture of 650 psi and a modulus of elasticity of approximately 3,500,000 psi. The PCC should be constructed with a maximum joint spacing of 12 feet. The slabs shall be interlocked at joints. However, if the designer wishes to utilize doweled joints then thinner PCC sections may be possible. We should be contacted for additional recommendations, if desired.

Imported granular material used as base aggregate (base rock) should meet the criteria specified in *Section 8.4 - Structural Fill and Backfill* of this report. The base aggregate should be compacted to not less than 95 percent of the maximum dry density as determined by ASTM D 1557.

11.0 CONSTRUCTION OBSERVATIONS

Satisfactory pavement and earthwork performance depends to a large degree on quality of construction. Sufficient monitoring of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. Subsurface conditions observed during construction should be compared with those encountered during subsurface explorations. Recognition of changed conditions often requires experience; therefore, Hart Crowser or their representative should visit the site with sufficient frequency to detect whether subsurface conditions change significantly from those anticipated.

We recommend that Hart Crowser be retained to monitor construction at the site to confirm that subsurface conditions are consistent with the site explorations and to confirm that the intent of project plans and specifications relating to earthwork and foundation construction are being met. In particular, we recommend that stripping and subgrade preparation, key and bench preparation, subsurface drainage system installation, placement and compaction of structural fill and backfill, aggregate bases, and asphalt pavements be observed and/or tested by Hart Crowser.

12.0 LIMITATIONS

We have prepared this report for the exclusive use of CJ Dens Lacamas I, LLC and their authorized agents for the proposed CJ Dens subdivision project in Camas, Washington, in accordance with our Agreement for Geotechnical Engineering Services and subsequent change orders. Our report is intended to provide our opinion of geotechnical parameters for design and construction of the proposed project based on exploration locations that are believed to be representative of site conditions. However, conditions can vary significantly between exploration locations and our conclusions should not be construed as a warranty or guarantee of subsurface conditions or future site performance.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty, express or implied, should be understood.

Any electronic form, facsimile, or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by Hart Crowser and will serve as the official document of record.

13.0 REFERENCES

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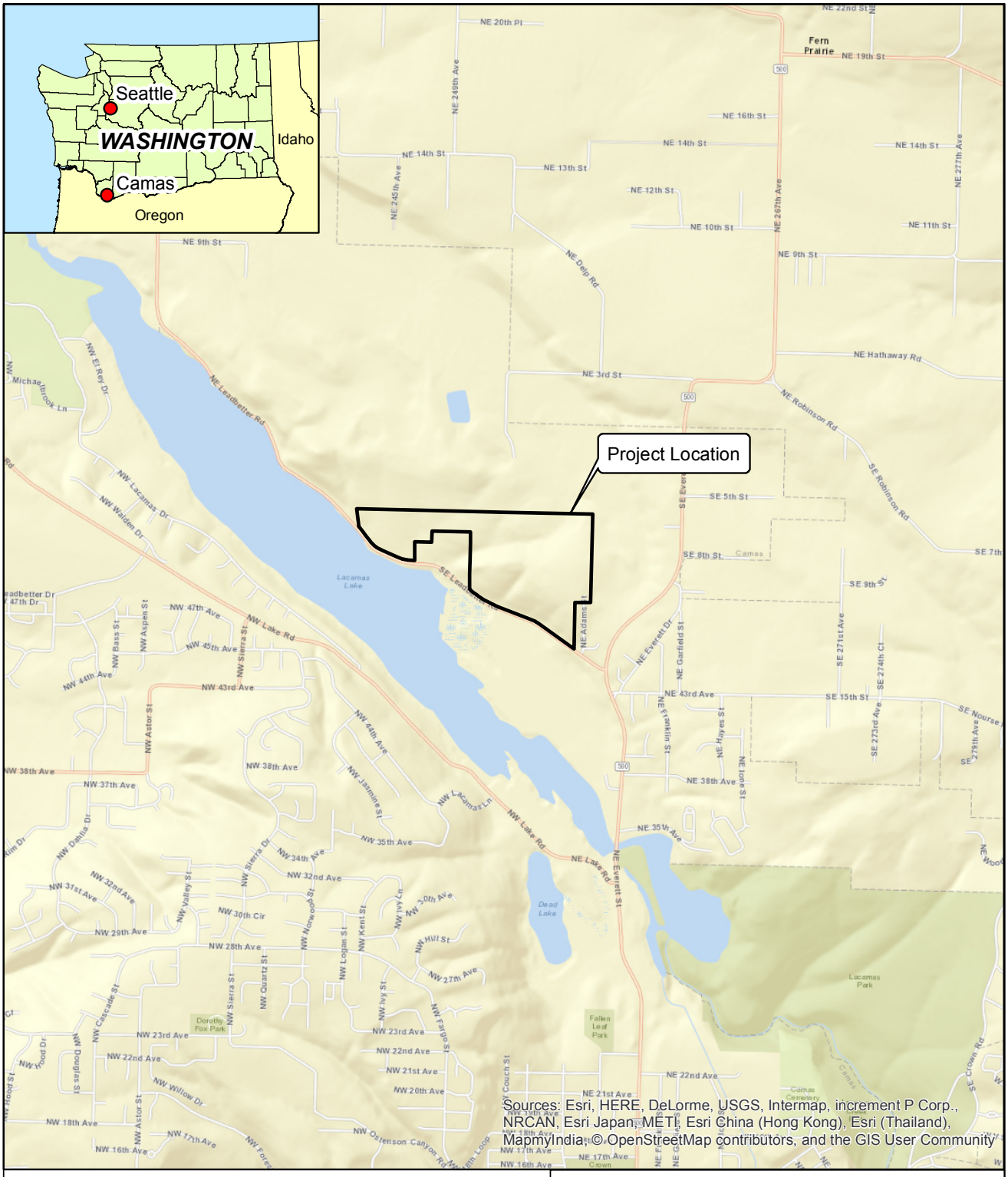

CJ Dens Subdivision
Camas, Washington

Vicinity Map

15948-02 7/16

HARTCROWSER

Figure
1

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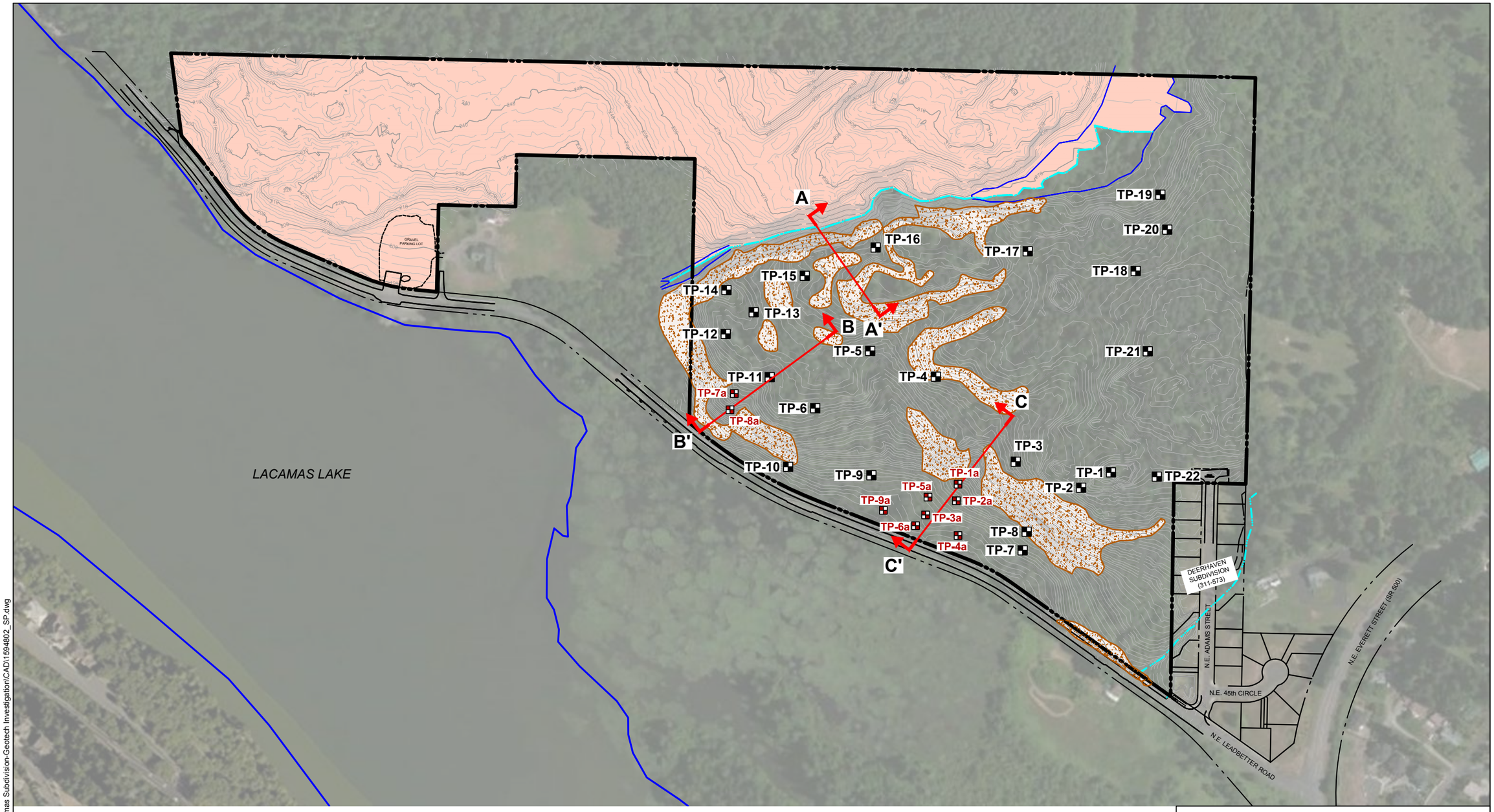

LEGEND

- TP-1 Test Pit (May 2016)
- TP-1a Previous Test Pit (November 2015)
- Bedrock Outcrop and Talus
- Area not Included in Current Study
- Existing Contour
- A A' Cross Section and Designation

0 300 600
Approximate Scale in Feet

N

Note: Feature locations are approximate.

Source: Overall Existing Conditions Plan, Sheet C2.1 from Group Mackenzie, dated 1/19/11.

CJ Dens Subdivision
Camas, Washington

Existing Site Plan

15948-02 7/16

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Figure **2**

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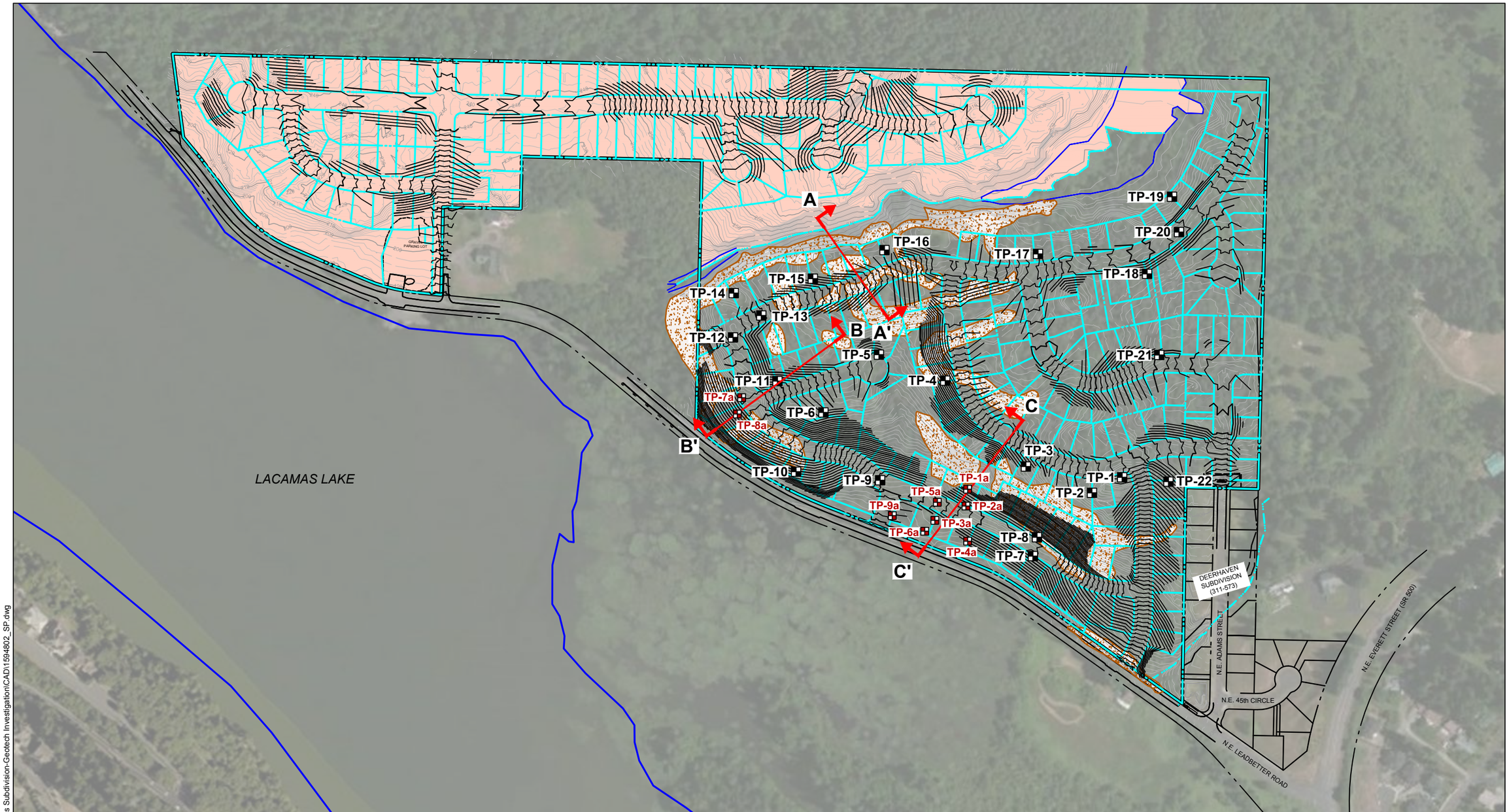

LEGEND

- **TP-1** Test Pit (May 2016)
- **TP-1a** Previous Test Pit (November 2015)
- Bedrock Outcrop and Talus
- Area not Included in Current Study
- Existing Contour
- Proposed Lot
- Proposed Grading Contour
- A A' Cross Section and Designation

0 300 600
Approximate Scale in Feet

N

Note: Feature locations are approximate.

Sources: Overall Existing Conditions Plan, Sheet C2.1 from Group Mackenzie, dated 1/19/11. Proposed site plan from Mackenzie, 6/7/16.

CJ Dens Subdivision
Camas, Washington

Proposed SIte Plan

15948-02 7/16

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Figure **3**

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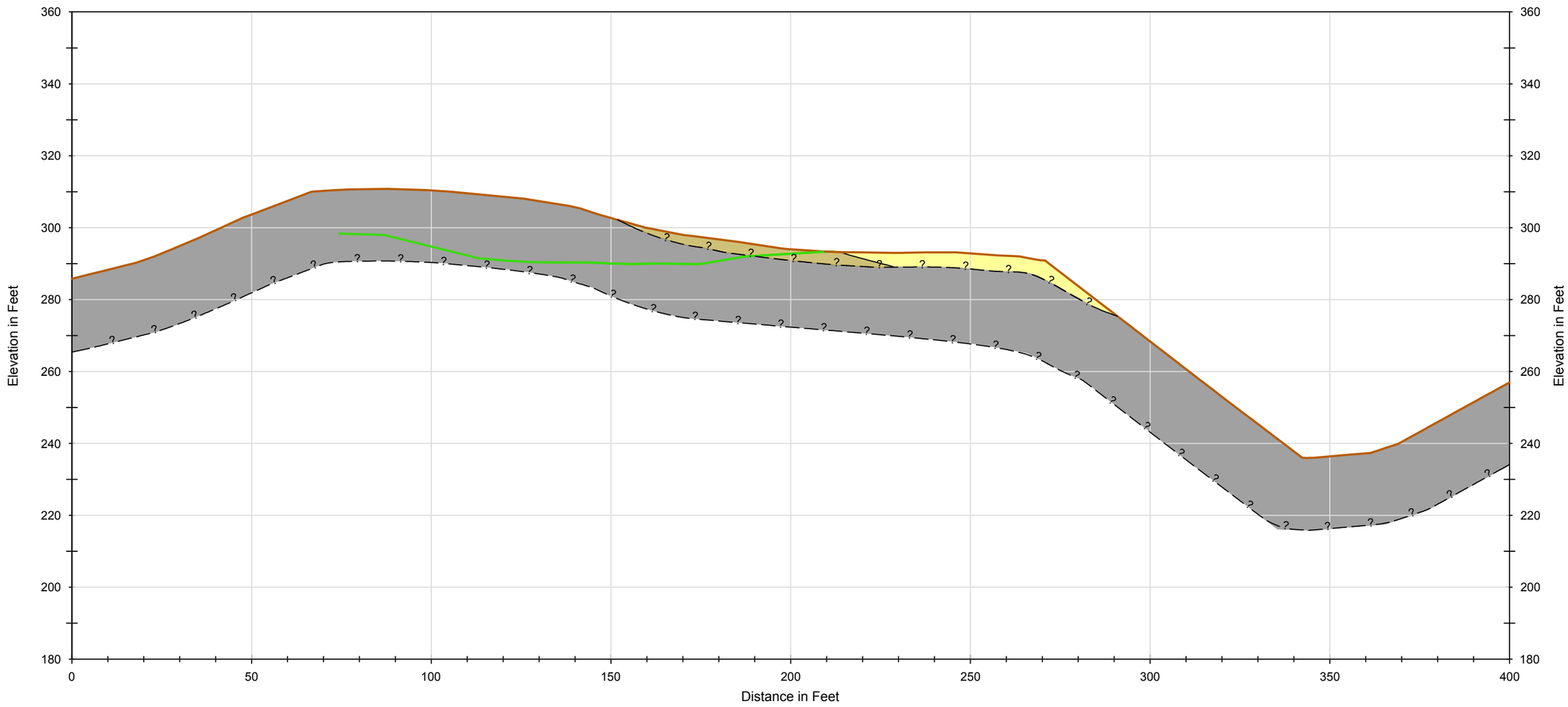
Profile A-A'



NOTE

This subsurface profile is generalized from materials observed in test pit explorations and surface exposures. Variations may exist between profile and actual conditions.

LEGEND

- Existing Surface Profile
- Proposed Surface Profile
- Colluvium
- Residual Soil
- Basaltic Andesite

Sources: Existing contours generated from elevation contours provided by Group Mackenzie, 1/19/11. Proposed contours generated from elevation contours provided by Mackenzie, 6/7/16.

0 30 60
Horizontal and Vertical Scale in Feet

CJ Dens Subdivision
Camas, Washington

Profile A-A'

15948-02 7/16

HARTCROWSER

Figure **4**

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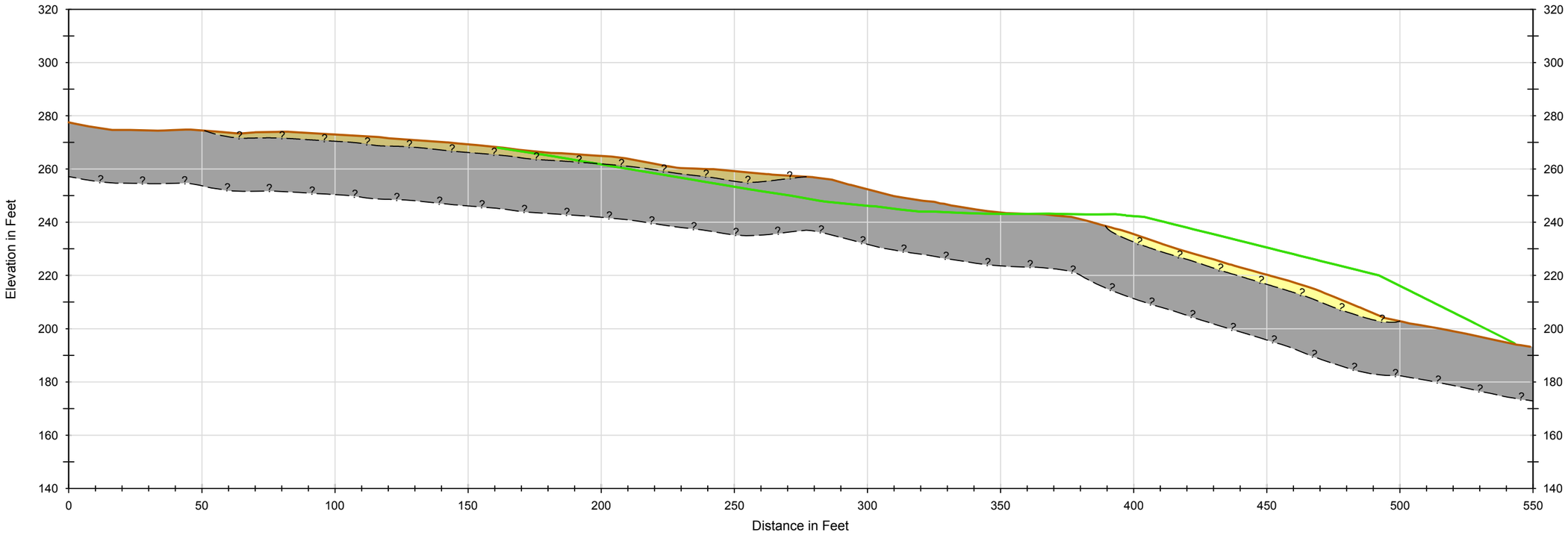
Profile B-B'



LEGEND

- Existing Surface Profile
- Proposed Surface Profile
- Colluvium
- Residual Soil
- Basaltic Andesite

NOTE

This subsurface profile is generalized from materials observed in test pit explorations and surface exposures. Variations may exist between profile and actual conditions.

0 40 80
Horizontal and Vertical Scale in Feet

Sources: Existing contours generated from elevation contours provided by Group Mackenzie, 1/19/11. Proposed contours generated from elevation contours provided by Mackenzie, 6/7/16.

CJ Dens Subdivision
Camas, Washington

Profile B-B'

15948-02 7/16

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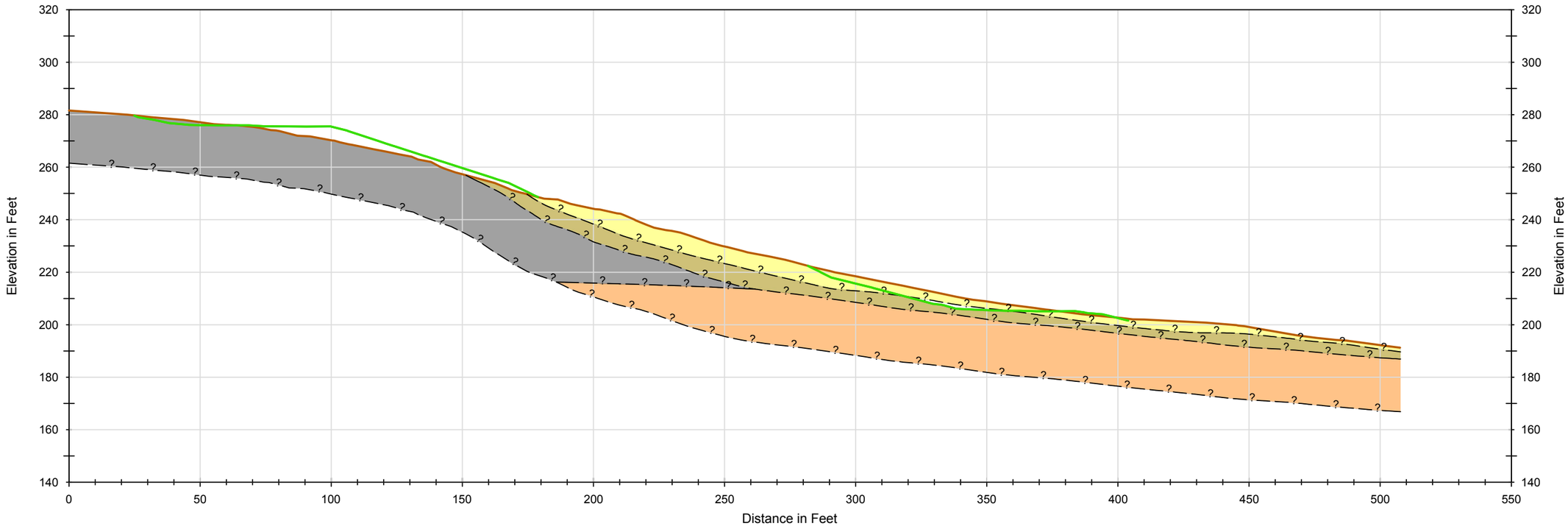
Figure **5**

File: F:\Notebooks\1594802_Camas Subdivision-Geotech Investigation\CAD\1594802_Profiles.dwg Layout:B Date: 06-30-2016 Author: melissaschweitzer

Profile C-C'



LEGEND

- Existing Surface Profile
- Proposed Surface Profile
- Colluvium
- Residual Soil
- Basaltic Andesite
- Volcaniclastic Sedimentary Rock

NOTE

This subsurface profile is generalized from materials observed in test pit explorations and surface exposures. Variations may exist between profile and actual conditions.

0 40 80
Horizontal and Vertical Scale in Feet

Sources: Existing contours generated from elevation contours provided by Group Mackenzie, 1/19/11. Proposed contours generated from elevation contours provided by Mackenzie, 6/7/16.

CJ Dens Subdivision
Camas, Washington

Profile C-C'

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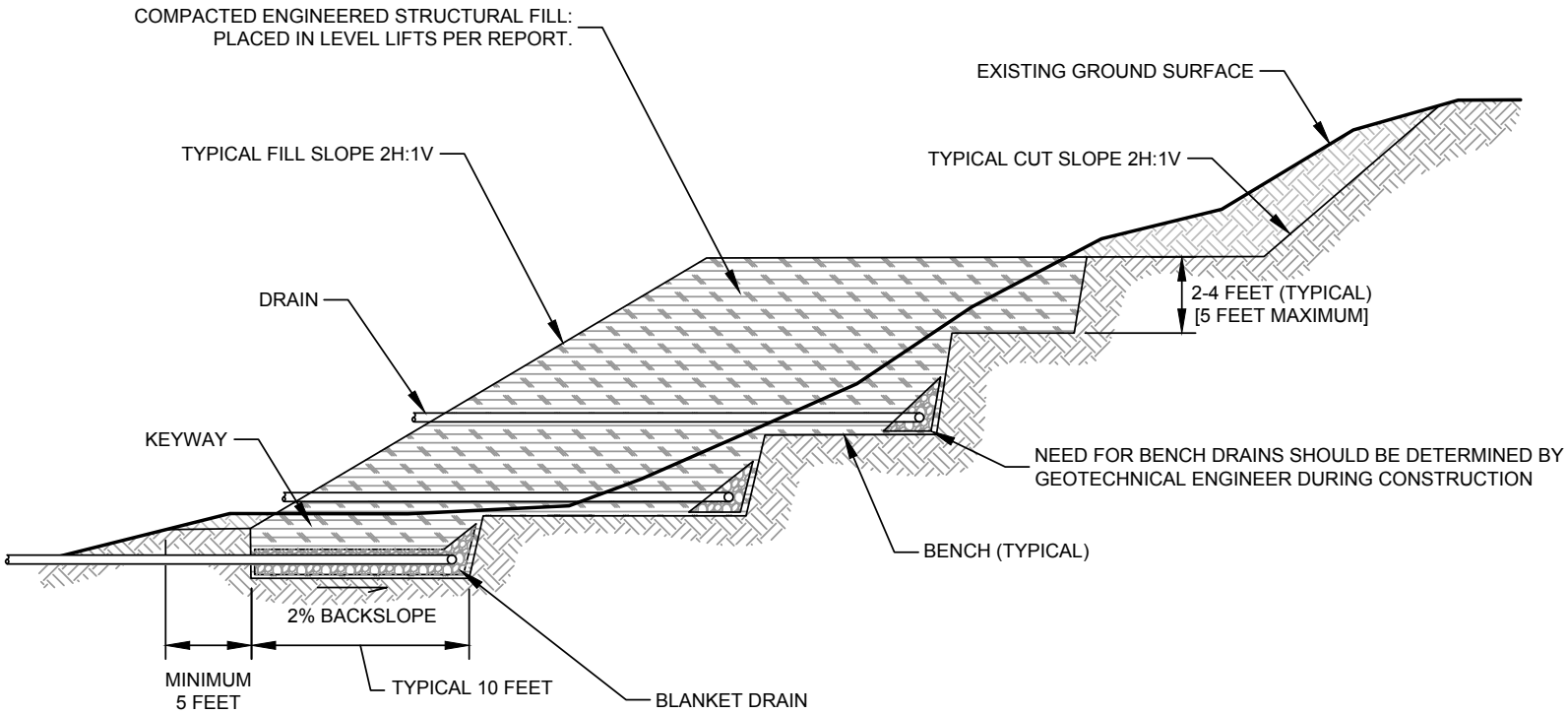
Figure
6

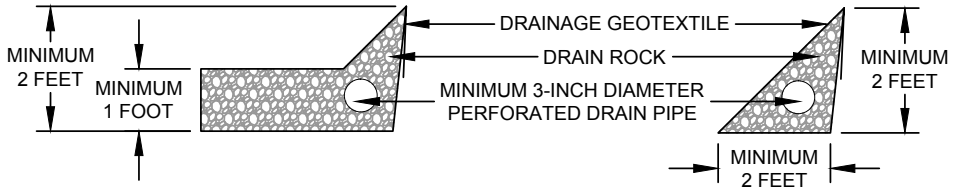
File: F:\Notebooks\1594802_Camas Subdivision-Geotech Investigation\CAD\1594802_Profiles.dwg Layout:C Date: 06-30-2016 Author: melissaschweitzer

File: F:\Notebooks\1594802_Camas Subdivision-Geotech Investigation\CAD\1594802_TypicalCutFillSlope.dwg Layout:Horizontal Date: 07-06-2016 Author: melissaschweitzer



NOTES:
1. DRAWING IS NOT TO SCALE.
2. SLOPES AND PROFILES SHOWN ARE SCHEMATIC.
3. DRAWING REPRESENTS TYPICAL FILL AND CUT SLOPE SECTION, AND MAY NOT BE SITE-SPECIFIC.

TYPICAL DRAIN SECTION DETAIL



CJ Dens Subdivision
Camas, Washington

Typical Cut and Fill Slope Cross-Section

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Figure
7

APPENDIX A
Field Explorations

APPENDIX A

Field Explorations

This appendix documents the processes Hart Crowser used to determine the nature (and quality) of the soil and groundwater underlying the project site addressed by this report. The discussion includes information on the following subjects:

- Explorations and Their Locations,
- Test Pits, and
- Sampling Procedures.

Explorations and Their Locations

A member of our engineering staff observed subsurface explorations for this project that included test pits TP-1a through TP-9a completed November 23, 2015 and TP-1 through TP-22, completed May 27, 2016. The exploration logs in this appendix show our interpretation of the explorations, sampling, and testing data. The logs indicate the depths where the soils change. Note that soil changes may be gradual. In the field, we classified the samples taken from the explorations according to the methods presented on the *Key to Exploration Logs*. This key also provides a legend explaining the symbols and abbreviations used in the logs.

Figures 2 and 3 of the report show the locations of explorations. Exploration locations were estimated using GPS coordinate data.

Test Pits

Nine test pits, TP-1a through TP-9a, were excavated by a medium-sized, steel-track excavator subcontracted by CJ Dens Lacamas I, LLC. An additional 22 test pits, TP-1 through TP-22, were excavated with a Komatsu PC-200, steel-track excavator. The test pits were continuously observed by a geotechnical staff member from Hart Crowser and detailed field logs of the test pits were prepared. The logs are presented at the end of this appendix.

Sampling Procedures

Representative “grab” samples of the soil observed in the test pit explorations were obtained from the test pit walls by hand and/or the test pit base using the excavator bucket. All soil samples were placed into watertight bags and delivered to Hart Crowser's laboratory for further testing.

KEY TO EXPLORATION LOGS

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SOIL CLASSIFICATION CHART

MATERIAL TYPES	MAJOR DIVISIONS		GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	GW	WELL-GRADED GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES, >12% FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	SW	WELL-GRADED SAND
			SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	CL	LEAN CLAY
			ML	SILT
		ORGANIC	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	CH	FAT CLAY
			MH	ELASTIC SILT
		ORGANIC	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS			PT	PEAT

Note: Multiple symbols are used to indicate borderline or dual classifications

OTHER MATERIAL SYMBOLS

- Concrete
- Asphalt
- Topsoil

MOISTURE MODIFIERS

- Dry - Absence of moisture, dusty, dry to the touch
- Moist - Damp, but no visible water
- Wet - Visible free water or saturated, usually soil is obtained from below the water table

SEEPAGE MODIFIERS

- None -
- Slow - < 1 gpm
- Moderate - 1-3 gpm
- Heavy - > 3 gpm

CAVING MODIFIERS

- None -
- Minor - isolated
- Moderate - frequent
- Severe - general

MINOR CONSTITUENTS

- Trace - < 5% (silt/clay)
- Occasional - < 15% (sand/gravel)
- With - 5-15% (silt/clay) in sand or gravel
  15-30% (sand/gravel) in silt or clay

SAMPLE TYPES

- Dames & Moore
- Standard Penetration Test (SPT)
- Shelby Tube
- Bulk or Grab

LABORATORY/ FIELD TESTS

- ATT - Atterberg Limits
- CP - Laboratory Compaction Test
- CA - Chemical Analysis (Corrosivity)
- CN - Consolidation
- DD - Dry Density
- DS - Direct Shear
- HA - Hydrometer Analysis
- OC - Organic Content
- PP - Pocket Penetrometer (TSF)
- P200 - Percent Passing No. 200 Sieve
- SA - Sieve Analysis
- SW - Swell Test
- TV - Torvane Shear
- UC - Unconfined Compression

GROUNDWATER SYMBOLS

- Water Level (at time of drilling)
- Water Level (at end of drilling)
- Water Level (after drilling)

STRATIGRAPHIC CONTACT

- ——— Distinct contact between soil strata or geologic units
- – – – Gradual or approximate change between soil strata or geologic units

Notes:

Blowcount (N) is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted) per ASTM D-1586. See exploration log for hammer weight and drop.

When the Dames & Moore (D&M) sampler was driven with a 140-pound hammer (denoted on logs as D+M 140), the field blow counts (N-value) shown on the logs have been reduced by 50% to approximate SPT N-values.

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

Refer to the report text and exploration logs for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the exploration locations at the time the explorations were made. The logs are not warranted to be representative of the subsurface conditoins at other locations or times.

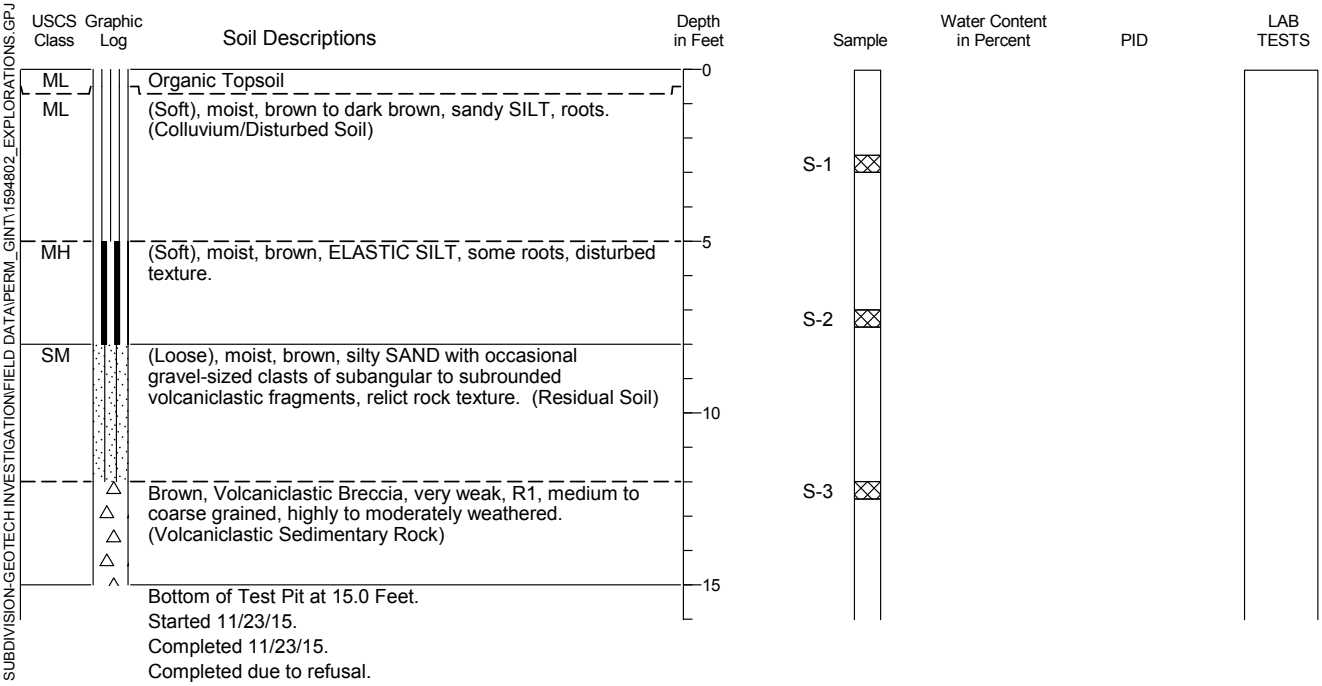
KEY TO EXPLORATION LOGS - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:48 - F:\NOTEBOOKS\11594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT11594802_EXPLORATIONS.GPJ

Figure A-1

Test Pit Log TP-1a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

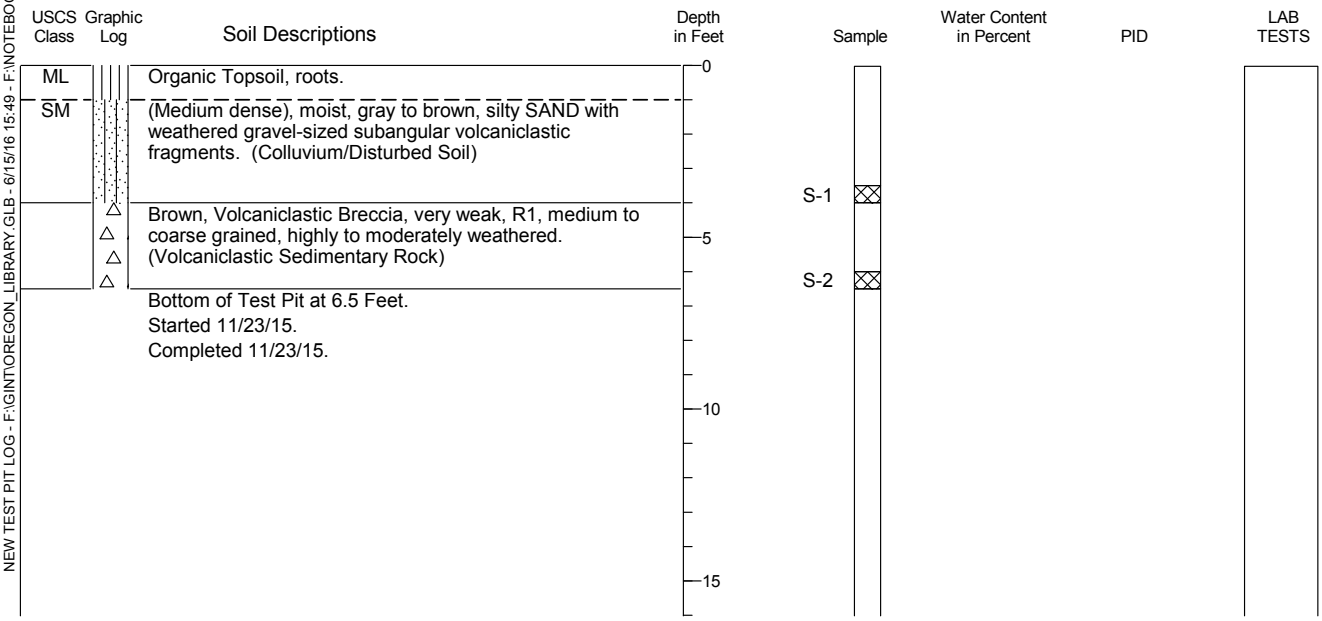
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-2a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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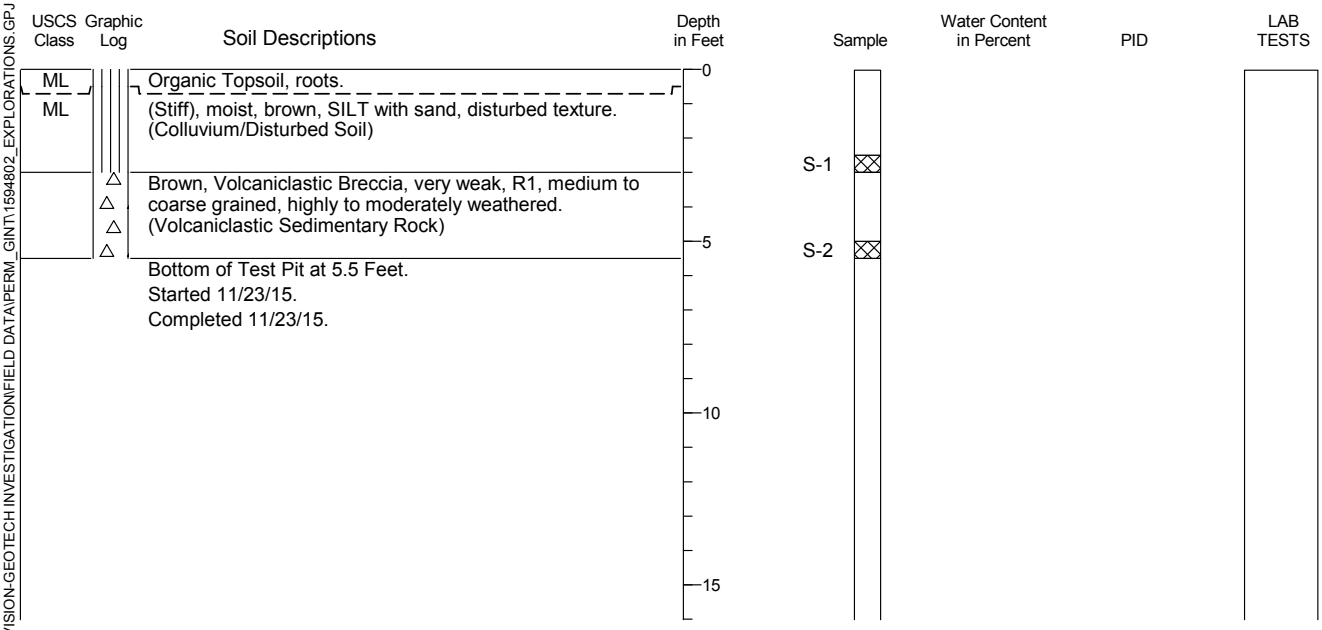
Figure A-3

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-3a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

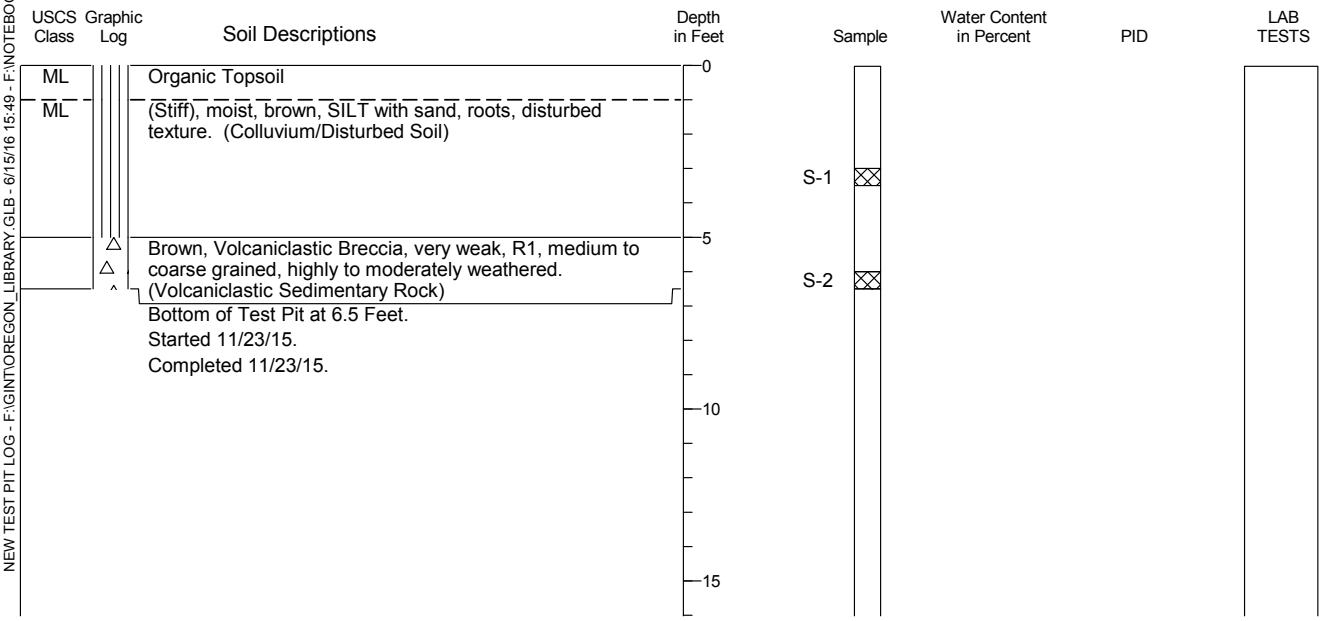
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-4a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-4

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH IN\VESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-5a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
ML		Organic Topsoil, roots, dark brown.	0				
SM		(Loose), moist, brown to dark brown, silty SAND, roots, weathered residual soil fragments in fine-grained matrix. (Colluvium/Disturbed Soil)					
CL		(Medium stiff), moist, brown, LEAN CLAY with sand.		S-1			
			5				
SM		(Loose), moist, brown, silty SAND with hard gravel-sized clasts of subangular to subrounded volcaniclastic fragments, relict rock texture. (Residual Soil)		S-2			
			10				
				S-3			
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)		S-4			
		Bottom of Test Pit at 13.5 Feet.	15				
		Started 11/23/15.					
		Completed 11/23/15.					
		Completed due to refusal.					

Test Pit Log TP-6a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM/ML		(Loose to medium stiff), dark brown, moist, silty SAND to sandy SILT, roots.	0				
ML		(Medium stiff), moist, brown, SILT with sand, small roots, disturbed texture. (Colluvium/Disturbed Soil)					
		Abundant roots and rootlets from 3.0 to 4.0 feet.		S-1			
SM		(Medium dense to dense), moist, light brown to brown, silty SAND, relict rock texture. (Residual Soil)	5				
				S-2			
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)		S-3			
		Bottom of Test Pit at 9.5 Feet.	10				
		Started 11/23/15.					
		Completed 11/23/15.					
		Completed due to refusal.					
			15				

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-5

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-7a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM/ML		Organic Topsoil, roots.	0				
GM		(Loose), moist, brown, GRAVEL with silt and sand. (Colluvium)		S-1			
		Gray, Basaltic Andesite, moderately strong, R3, moderately to slightly weathered. (Basaltic Andesite of Elkhorn Mountain)		S-2			
		Bottom of Test Pit at 3.5 Feet.	5				
		Started 11/23/15.					
		Completed 11/23/15.					
		Completed due to refusal.	10				
			15				

Test Pit Log TP-8a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM/ML		Organic Topsoil, roots, dark brown.	0				
SM		(Loose), moist, brown, sandy SILT with angular to subangular gravel and cobbles. (Colluvium)		S-1			
		Gray, Basaltic Andesite, moderately strong, R3, moderately to slightly weathered. (Basaltic Andesite of Elkhorn Mountain)		S-2			
		Bottom of Test Pit at 3.5 Feet.	5				
		Started 11/23/15.					
		Completed 11/23/15.					
		Completed due to refusal.	10				
			15				

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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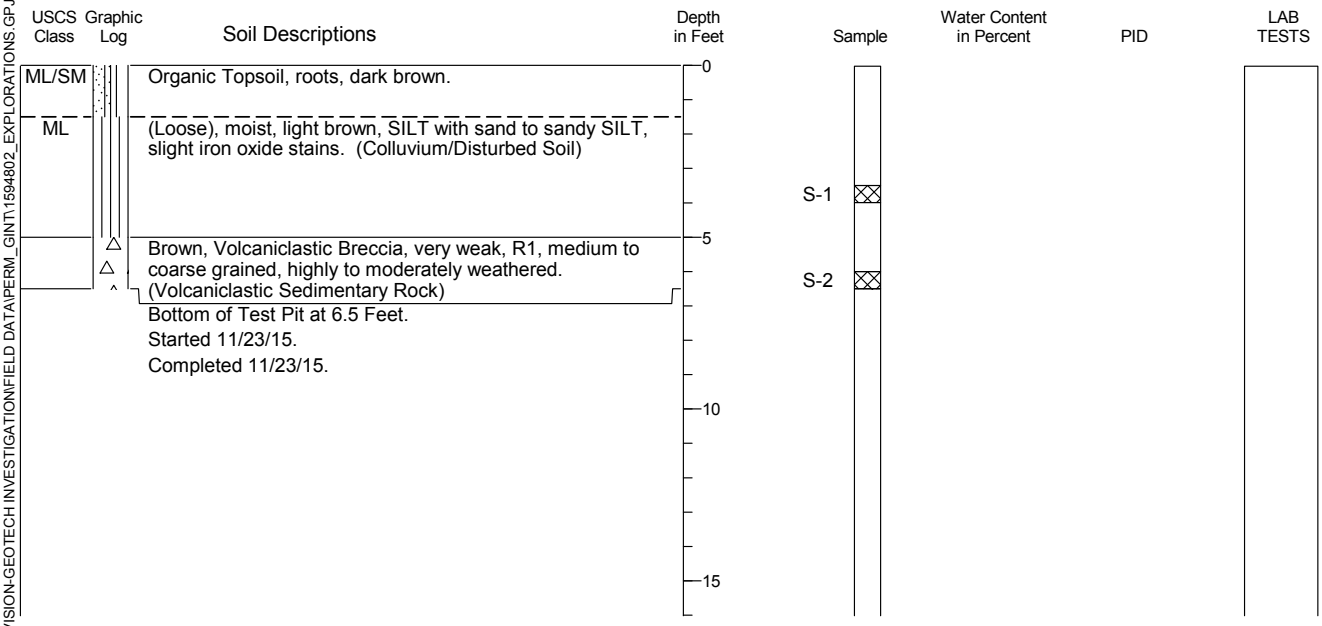
Figure A-6

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH IN\VESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-9a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH IN\VESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-7

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. ASTM D 2488 visual-manual identification methods were used as a guide. Major divisions are not necessarily an indicator of soil behavior, which is a function of fines content activity and loading rate.

Relative Density/Consistency

Soil density/consistency in borings is related primarily to the standard penetration resistance (N). Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

SAND or GRAVEL Relative Density	N (Blows/Foot)	SILT or CLAY Consistency	N (Blows/Foot)
Very loose	0 to 4	Very soft	0 to 2
Loose	4 to 10	Soft	2 to 4
Medium dense	10 to 30	Medium stiff	4 to 8
Dense	30 to 50	Stiff	8 to 15
Very dense	>50	Very stiff	15 to 30
		Hard	>30

Moisture

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

Soil Classification Chart

Major Divisions			Symbols Graph	Symbols USCS	Typical Descriptions
Coarse Grained Soils: More than 50% of Material Retained on No. 200 Sieve	Gravel and Gravelly Soils: More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravels (<5% fines)		GW	Well-Graded Gravel; Well-Graded Gravel with Sand
				GP	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Gravels (10% fines)		GW-GM	Well-Graded Gravel with Silt; Well-Graded Gravel with Silt and Sand
				GW-GC	Well-Graded Gravel with Clay; Well-Graded Gravel with Clay and Sand
				GP-GM	Poorly Graded Gravel with Silt; Poorly Graded Gravel with Silt and Sand
				GP-GC	Poorly Graded Gravel with Clay; Poorly Graded Gravel with Clay and Sand
		Gravels with Fines (>12% fines)		GM	Silty Gravel; Silty Gravel with Sand
				GC	Clayey Gravel; Clayey Gravel with Sand
	Sand and Sandy Soils: More than 50% of Coarse Fraction Passing No. 4 Sieve	Sands with few Fines (<5% fines)		SW	Well-Graded Sand; Well-Graded Sand with Gravel
				SP	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Sands (10% fines)		SW-SM	Well-Graded Sand with Silt Well-Graded Sand with Silt and Gravel
				SW-SC	Well-Graded Sand with Clay; Well-Graded Sand with Clay and Gravel
				SP-SM	Poorly Graded Sand with Silt; Poorly Graded Sand with Silt and Gravel
				SP-SC	Poorly Graded Sand with Clay; Poorly Graded Sand with Clay and Gravel
		Sands with Fines (>12% fines)		SM	Silty Sand; Silty Sand with Gravel
				SC	Clayey Sand; Clayey Sand with Gravel
Fine Grained Soils: More than 50% of Material Passing No. 200 Sieve	Silts			ML	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
				MH	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
	Clays			CL	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
				CH	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
	Organics			OL/OH	Organic Soil; Organic Soil with Sand or Gravel; Sandy or Gravelly Organic Soil
Highly Organic				PT	Peat - Decomposing Vegetation - Fibrous to Amorphous Texture

Minor Constituents

	Estimated Percentage
Trace	<5
Few	5 - 10
Little	15 - 25
Some	30 - 45

Soil Test Symbols

%F	Percent Passing No. 200 Sieve
AL	Atterberg Limits
	Water Content in Percent
	Liquid Limit
	Natural
	Plastic Limit
CA	Chemical Analysis
CAUC	Consolidated Anisotropic Undrained Compression
CAUE	Consolidated Anisotropic Undrained Extension
CBR	California Bearing Ratio
CIDC	Consolidated Drained Isotropic Triaxial Compression
CIUC	Consolidated Isotropic Undrained Compression
CK0DC	Consolidated Drained k0 Triaxial Compression
CK0DSS	Consolidated k0 Undrained Direct Simple Shear
CK0UC	Consolidated k0 Undrained Compression
CK0UE	Consolidated k0 Undrained Extension
CRSCN	Constant Rate of Strain Consolidation
DSS	Direct Simple Shear
DT	In Situ Density
GS	Grain Size Classification
HYD	Hydrometer
ILCN	Incremental Load Consolidation
K0CN	k0 Consolidation
kc	Constant Head Permeability
kf	Falling Head Permeability
MD	Moisture Density Relationship
OC	Organic Content
OT	Tests by Others
P	Pressuremeter
PID	Photoionization Detector Reading
PP	Pocket Penetrometer
SG	Specific Gravity
TRS	Torsional Ring Shear
TV	Torvane
UC	Unconfined Compression
UUC	Unconsolidated Undrained Triaxial Compression
VS	Vane Shear
WC	Water Content

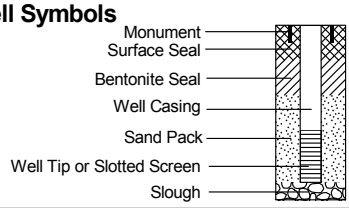
Groundwater Indicators

- Groundwater Level on Date or At Time of Drilling (ATD)
- Groundwater Seepage (Test Pits)

Sample Symbols

- 1.5" I.D. Split Spoon
- 3.0" I.D. Split Spoon
- Modified California Sampler
- Core Run
- Sonic Core
- Thin-walled Sampler
- Grab
- Cuttings

Well Symbols



HARTCROWSER

Project: Camas Subdivision
Location: Camas, Washington
Project No.: 15948-02

Key to Exploration Logs

Figure **A-1**
Sheet **1 of 1**

KEY TO EXPLORATION LOGS (SOIL) - F:\GINT\HC_LIBRARY.GLB - 6/10/16 11:35 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-TPS.GPJ

Weathered State of Rock

Term	Description	Grade
Fresh	No visible signs of rock material weathering; perhaps slight discoloration in major discontinuity surfaces.	I
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering, and may be somwhat weaker externally than in its fresh condition	II
Moderately Weathered	Less than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as a continuous framework or as corestones.	III
Highly Weathered	More than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as discontinuous framework or as corestone.	IV
Completely Weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.	V
Residual Soil	All rock material is converted to soil. The mass structure and material fabric is destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI

Relative Rock Strength

Grade	Description	Field Identification	Uniaxial Compressive Strength
R0	Extremely Weak	Indented by thumbnail.	0.04 to 0.15 ksi
R1	Very Weak	Specimen crumbles under sharp blow with point of geological hammer, and can be cut with a pocket knife.	0.15 to 3.6 ksi
R2	Moderately Weak	Shallow cuts or scrapes can be made in a specimen with a pocket knife. Geological hammer point indents deeply with firm blow.	3.6 to 7.3 ksi
R3	Moderately Strong	Specimen cannot be scraped or cut with a pocket knife, shallow indentation can be made under firm blows from a hammer point.	7.3 to 15 ksi
R4	Strong	Specimen breaks with one firm blow from the hammer end of a geological hammer.	15 to 29 ksi
R5	Very Strong	Specimen requires many blows of a geological hammer to break intact sample.	Greater than 29 ksi

Discontinuities

Discontinuity Spacing		Discontinuity Condition	
Description	**Spacing**	**Condition**	**Description**
Very Widely Spaced	Greater than 10 feet	Excellent Condition	Very rough surfaces, no separation, hard discontinuity wall.
Widely Spaced	3 to 10 feet	Good Condition	Slightly rough surfaces, separation less than 0.05 inches, hard discontinuity wall.
Moderately Spaced	1 to 3 feet	Fair Condition	Slightly rough surface, separation greater than 0.05 inches, soft discontinuity wall.
Closely Spaced	2 to 12 inches	Poor Condition	Slickensided surfaces, or soft gouge less than 0.2 inches thick, or open discontinuities 0.05 to 0.2 inches.
Very Closely Spaced	Less than 2 inches	Very Poor Condition	Soft gouge greater than 0.2 inches, or open discontinuities greater than 0.2 inches.

KEY TO BEDROCK TERMS - WSDOT (1 OF 2) - F:\GINT\HC_LIBRARY.GLB - 6/10/16 11:36 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-TPS.GPJ

HARTCROWSER

Project: Camas Subdivision
Location: Camas, Washington
Project No.: 15948-02

Key to WSDOT Bedrock Terms

Figure **A-2**
Sheet **1 of 2**

Grain Size

Grain Size	Description	Criteria
Less than 0.04 inches	Fine grained	Few crystal boundaries/grains distinguishable in the field or with a hand lens.
0.04 to 0.2 inches	Medium grained	Most crystal boundaries/ grains distinguishable with the aid of a hand lens.
Greater than 0.2 inches	Coarse grained	Most crystal boundaries/ grains distinguishable with the naked eye.

Igneous Rock Textures

Texture	Grain Size
Pegmatitic	Very large; diameters greater than 0.8 in.
Phaneritic	Can be seen with the naked eye
Porphyritic	Grained of two widely different sizes
Aphanitic	Cannot be seen with the naked eye
Glassy	No grains present

Pyroclastic Rocks

Rock Name	Characteristics
Pyroclastic Breccia	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which angular pyroclasts predominate.
Agglomerate	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which rounded pyroclasts predominate.
Lapilli Tuff	Pyroclastic rock whose average pyroclast size is 0.08 to 2.5 inches.
Ash Tuff	Pyroclastic rock whose average pyroclast size is less than 0.08 inches.

Degree of Vesicularity

Designation	Percentage of Cavities (by volume) of Total Sample
Slightly Vesicular	5 to 10 Percent
Moderately Vesicular	10 to 25 Percent
Highly Vesicular	25 to 50 Percent
Scoriaceous	Greater than 50 Percent

Other Terms:

Core Recover (CR) = the ratio of core recovered to the core run length expressed as a percentage.

Rock Quality Designation (RQD) = the percentage of rock core recovered in intact pieces of 4 inches or more in length in the length of a core run. Does not include mechanical breaks caused by drilling.

Fracture Frequency (FF) = the number of natural fractures per foot in the length of core recovered.

Reference:

Washington State Department of Transportation (WSDOT), 2014. *Geotechnical Design Manual*, Publication M 46-03.10, August, 2014.

HARTCROWSER

Project: Camas Subdivision
Location: Camas, Washington
Project No.: 15948-02

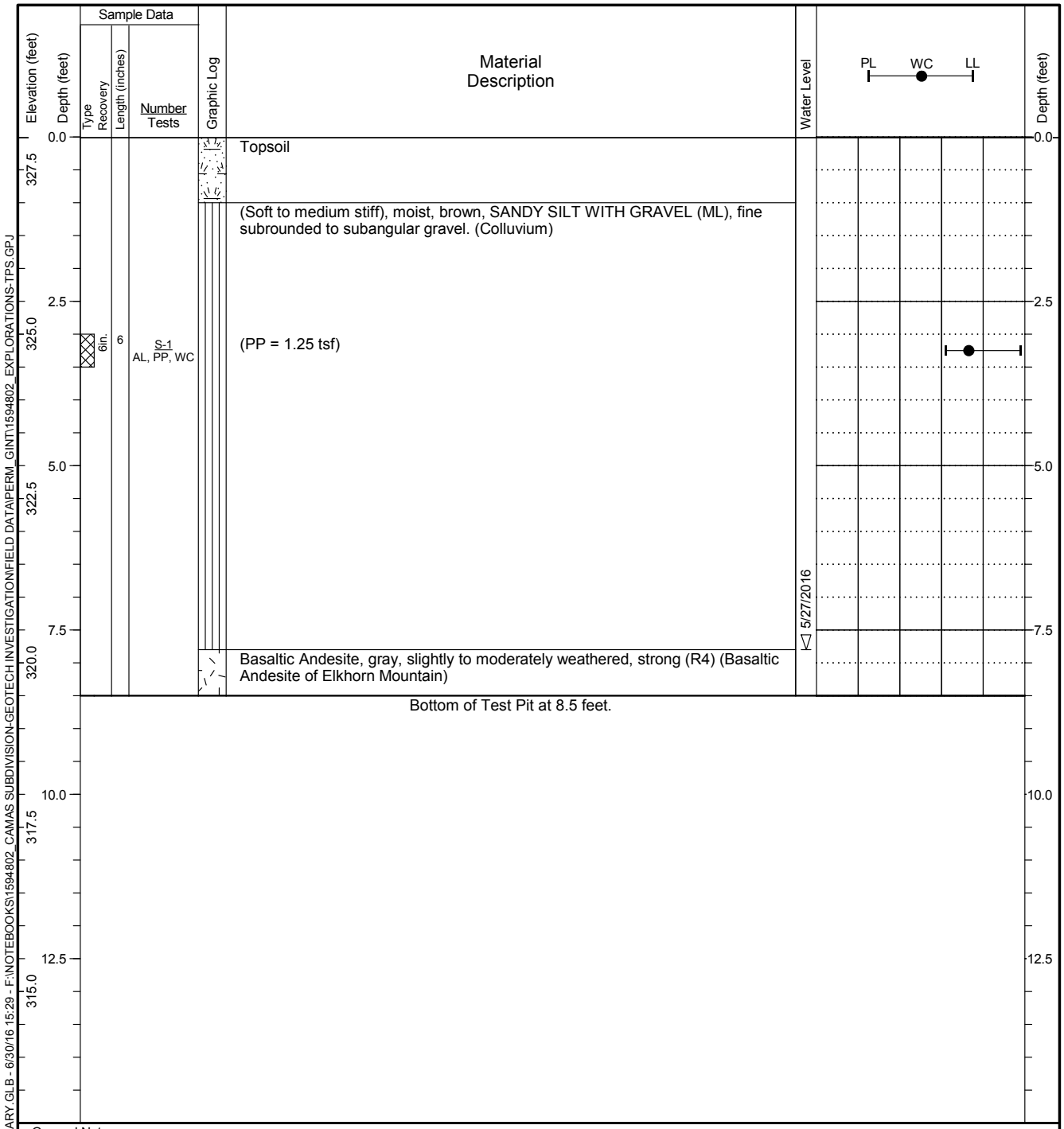
Key to WSDOT Bedrock Terms

Figure **A-2**
Sheet **2 of 2**

KEY TO BEDROCK TERMS - WSDOT (2 OF 2) - F:\GINT\HC_LIBRARY.GLB - 6/10/16 11:36 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-TPS.GPJ

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,408.99 E: 1,151,478.00
Ground Surface Elevation: 328 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 8.5 feet Depth to Ground Water: 7.8 feet
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-1

Figure **A-3**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,359.15 E: 1,151,381.13
Ground Surface Elevation: 306 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2.8 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
305.0	0.0		(Soft), wet, brown, SANDY SILT (ML), with angular gravel. (Residual Soil)	0.0
302.5	2.5		Basaltic Andesite, gray, slightly to moderately weathered, strong (R4) (Basaltic Andesite of Elkhorn Mountain)	2.5
			Bottom of Test Pit at 2.8 feet.	
300.0	5.0			5.0
297.5	7.5			7.5
295.0	10.0			10.0
292.5	12.5			12.5

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-2

Figure **A-4**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,443.46 E: 1,151,168.38
Ground Surface Elevation: 280 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 3 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type Recovery	Sample Data: Length (inches)	Sample Data: Number Tests	Graphic Log	Material Description	WC	Depth (feet)
277.5	0.0					Topsoil		0.0
						Basaltic Andesite, gray, slightly to moderately weathered, strong (R4), closely spaced discontinuities, highly fractured from 0.5 to 1.0 feet (Basaltic Andesite of Elkhorn Mountain)		
	2.5	6in.	6	S-1 WC			●	2.5
						Bottom of Test Pit at 3.0 feet.		
275.0	5.0							5.0
272.5	7.5							7.5
270.0	10.0							10.0
267.5	12.5							12.5

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-3

Figure **A-5**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,720.06 E: 1,150,909.13
Ground Surface Elevation: 282 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2.6 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
282.0	0.0		Topsoil	0.0
280.0	2.5		Basaltic Andesite, gray, slightly to moderately weathered, strong (R4), moderately spaced discontinuities, highly fractured from 0.5 to 1.0 feet (Basaltic Andesite of Elkhorn Mountain)	2.5
			Bottom of Test Pit at 2.6 feet.	
277.5	5.0			5.0
275.0	7.5			7.5
272.5	10.0			10.0
270.0	12.5			12.5
267.5				

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

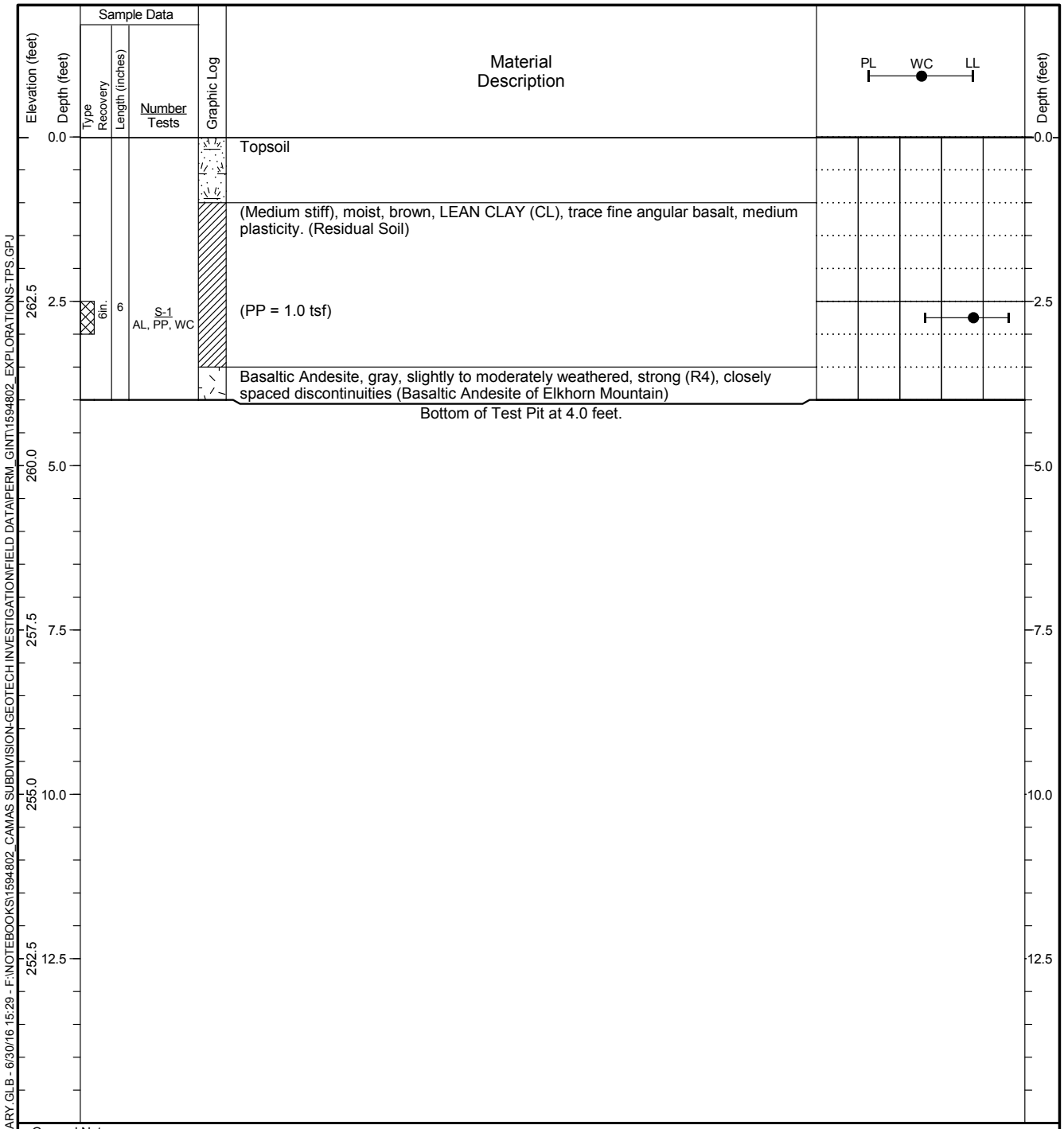
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-4

Figure **A-6**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,803.30 E: 1,150,695.50
Ground Surface Elevation: 265 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 4 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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Project: CJ Dens Subdivision
Location: Camas, Washington
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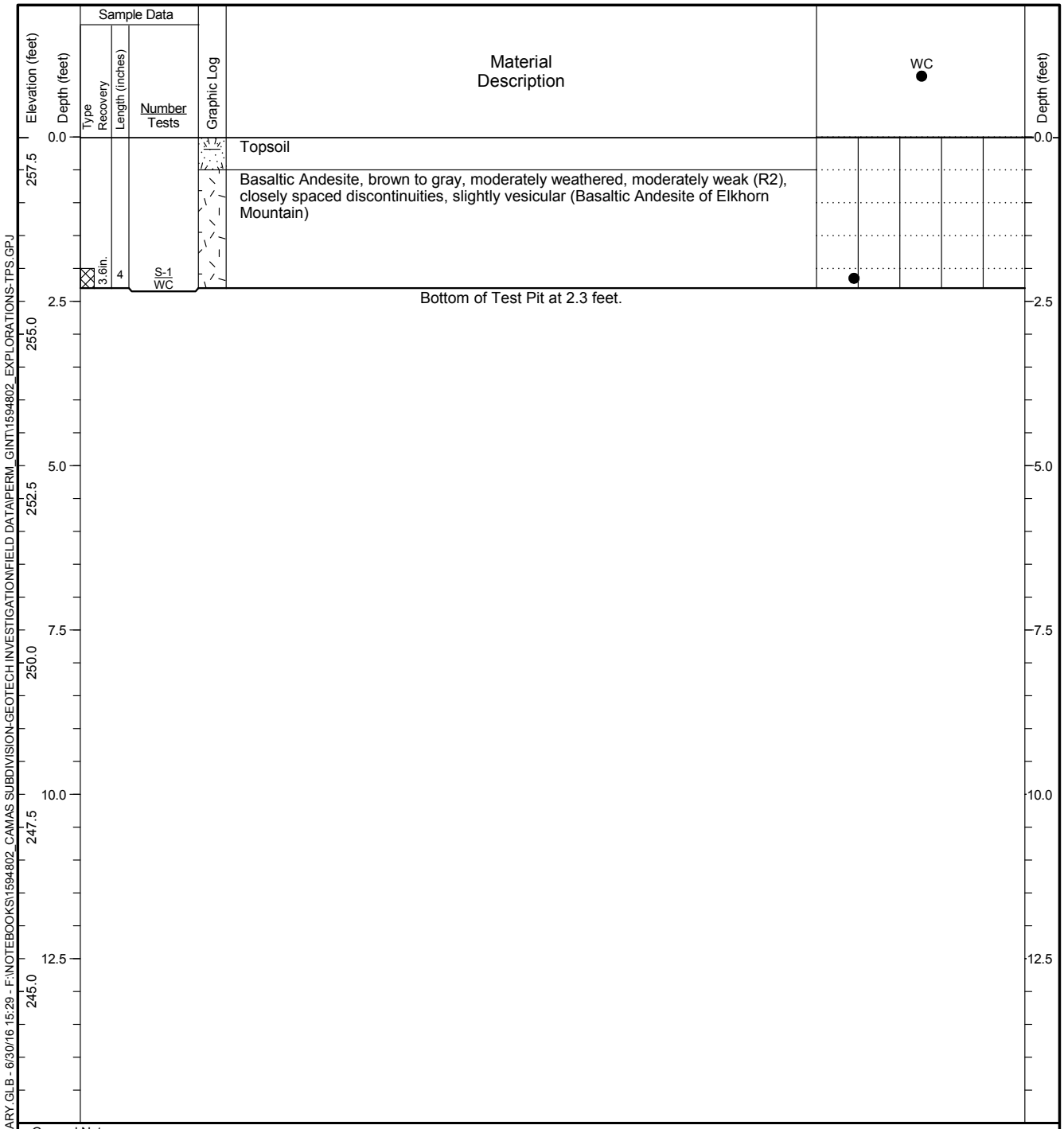
Test Pit Log
TP-5

Figure **A-7**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,617.58 E: 1,150,517.25
Ground Surface Elevation: 258 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2.3 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

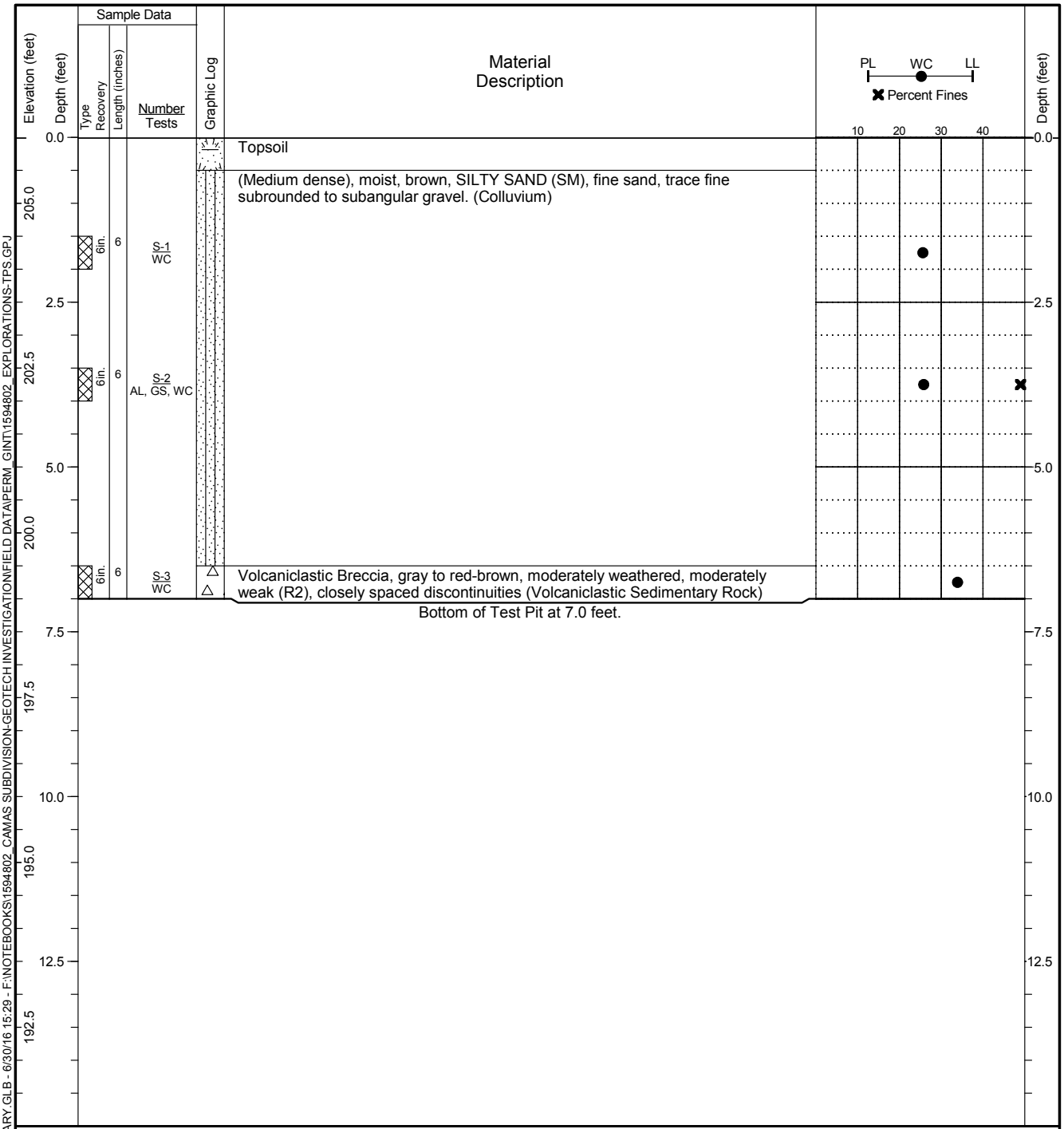
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-6

Figure **A-8**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,155.49 E: 1,151,190.88
Ground Surface Elevation: 206 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 7 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

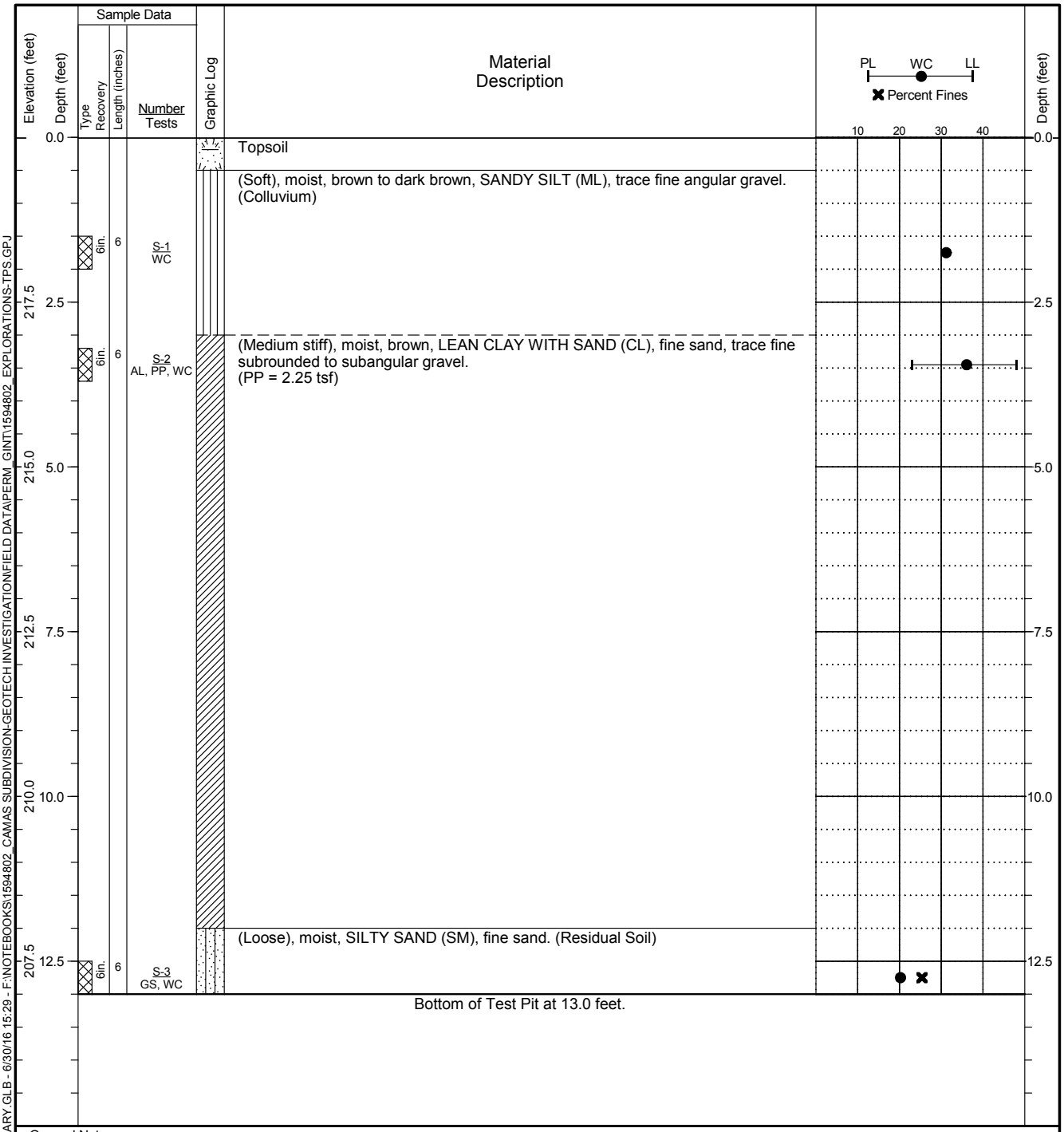
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-7

Figure **A-9**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,216.10 E: 1,151,204.00
Ground Surface Elevation: 220 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 13 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
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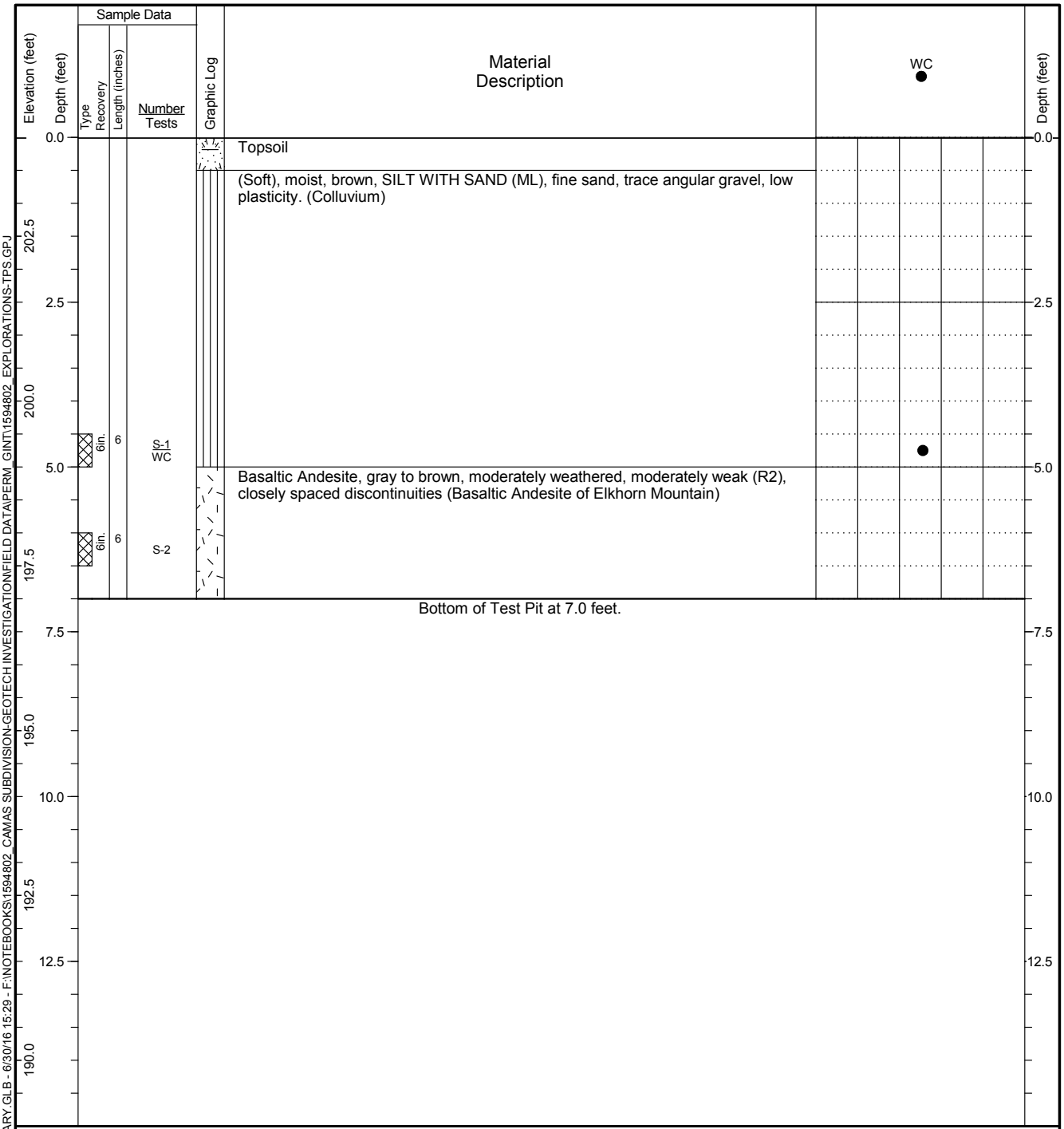
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-8

Figure **A-10**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,399.40 E: 1,150,699.63
Ground Surface Elevation: 204 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 7 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
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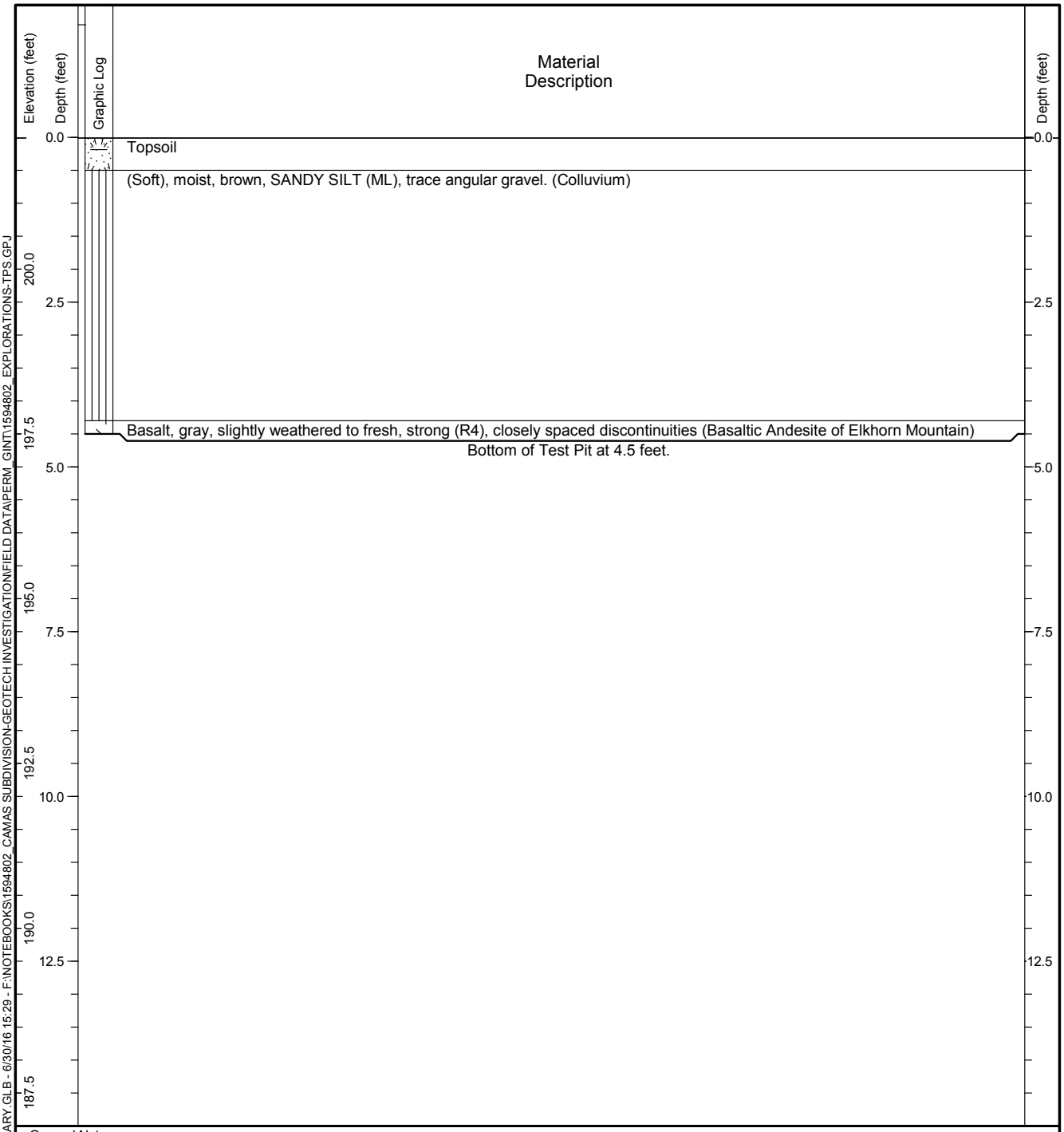
Test Pit Log
TP-9

Figure **A-11**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,427.13 E: 1,150,429.13
Ground Surface Elevation: 202 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 4.5 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-10

Figure **A-12**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,718.59 E: 1,150,368.88
Ground Surface Elevation: 258 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
257.5	0.0		Topsoil	0.0
			Basaltic Andesite, gray, fresh to slightly weathered, strong (R4), closely spaced discontinuities (Basaltic Andesite of Elkhorn Mountain)	
			Bottom of Test Pit at 2.0 feet.	
255.0	2.5			2.5
252.5	5.0			5.0
250.0	7.5			7.5
247.5	10.0			10.0
245.0	12.5			12.5

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
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Project No.: 15948-02

Test Pit Log
TP-11

Figure **A-13**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,858.86 E: 1,150,225.88
Ground Surface Elevation: 264 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2.5 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type Recovery	Sample Data: Length (inches)	Sample Data: Number Tests	Graphic Log	Material Description	Depth (feet)
264	0.0					Topsoil	0.0
						(Dense), moist, SILTY GRAVEL WITH SAND (GM). (Residual Soil)	
262.5		6in.	6	S-1		Basaltic Andesite, gray, slightly weathered to fresh, strong (R4), closely spaced discontinuities (Basaltic Andesite of Elkhorn Mountain)	
	2.5					Bottom of Test Pit at 2.5 feet.	2.5
260.0	5.0						5.0
257.5	7.5						7.5
255.0	10.0						10.0
252.5	12.5						12.5
250.0							

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

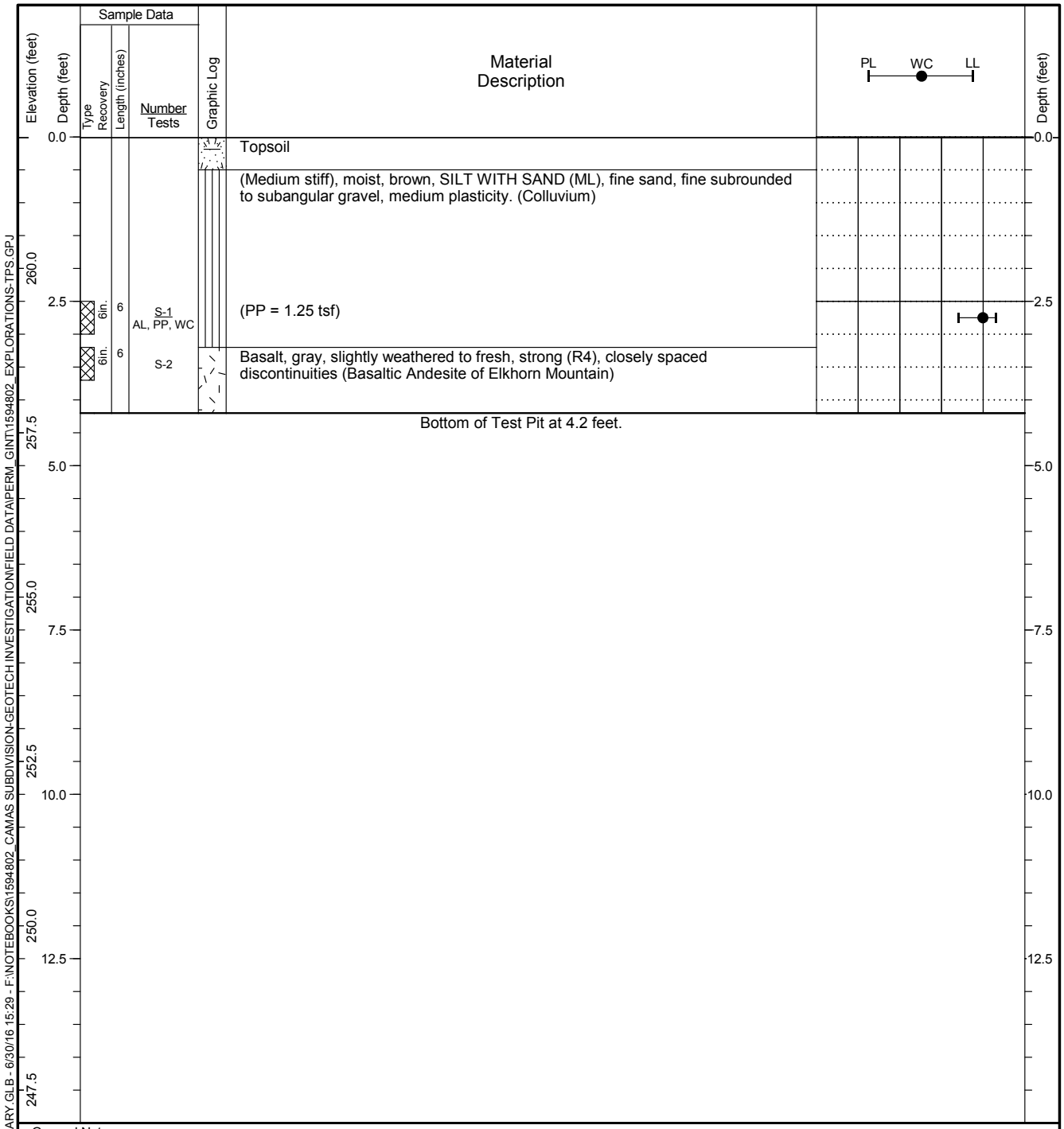
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-12

Figure **A-14**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,929.59 E: 1,150,317.25
Ground Surface Elevation: 262 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 4.2 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

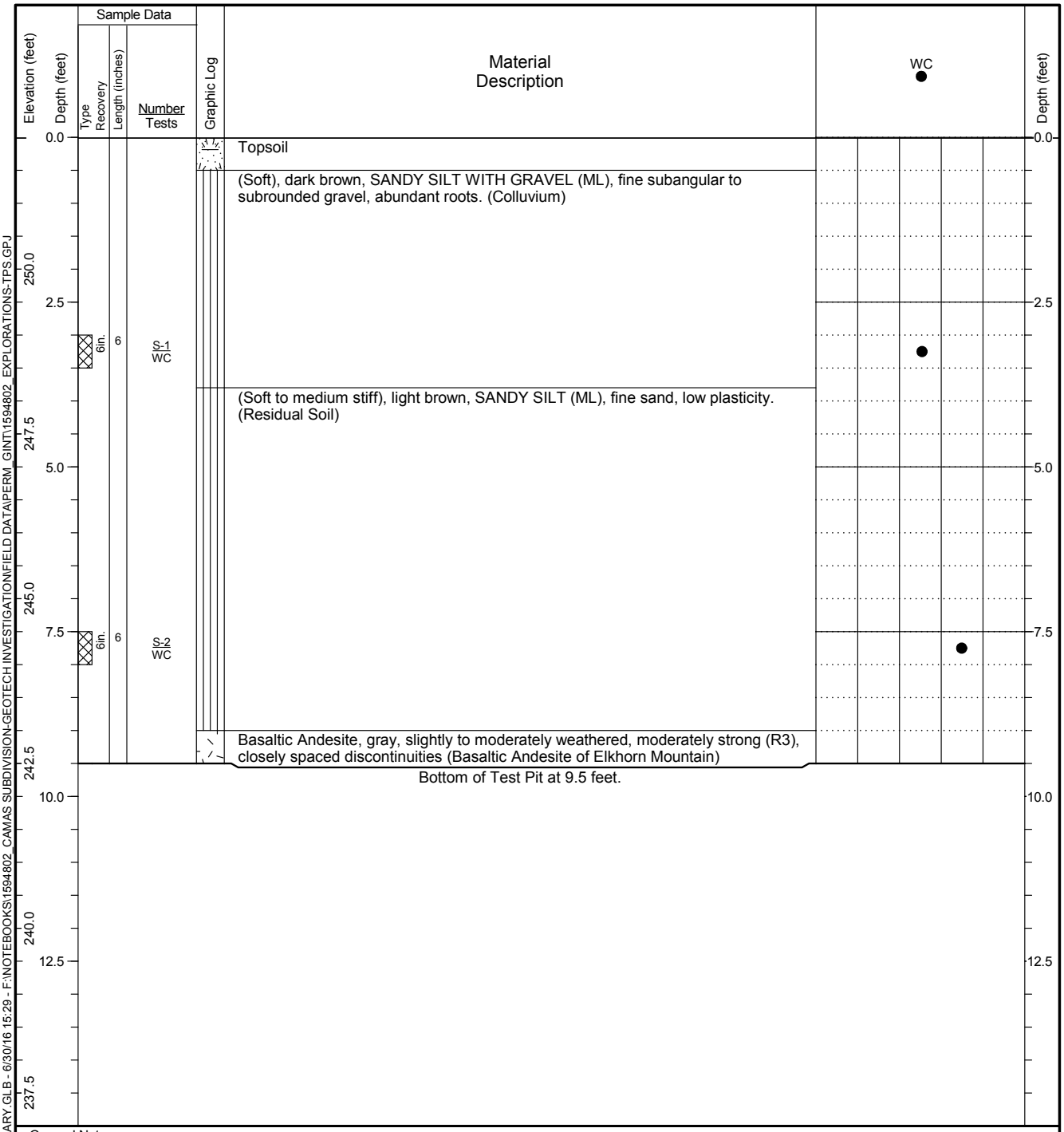
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-13

Figure **A-15**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 109,001.39 E: 1,150,228.63
Ground Surface Elevation: 252 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 9.5 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
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4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

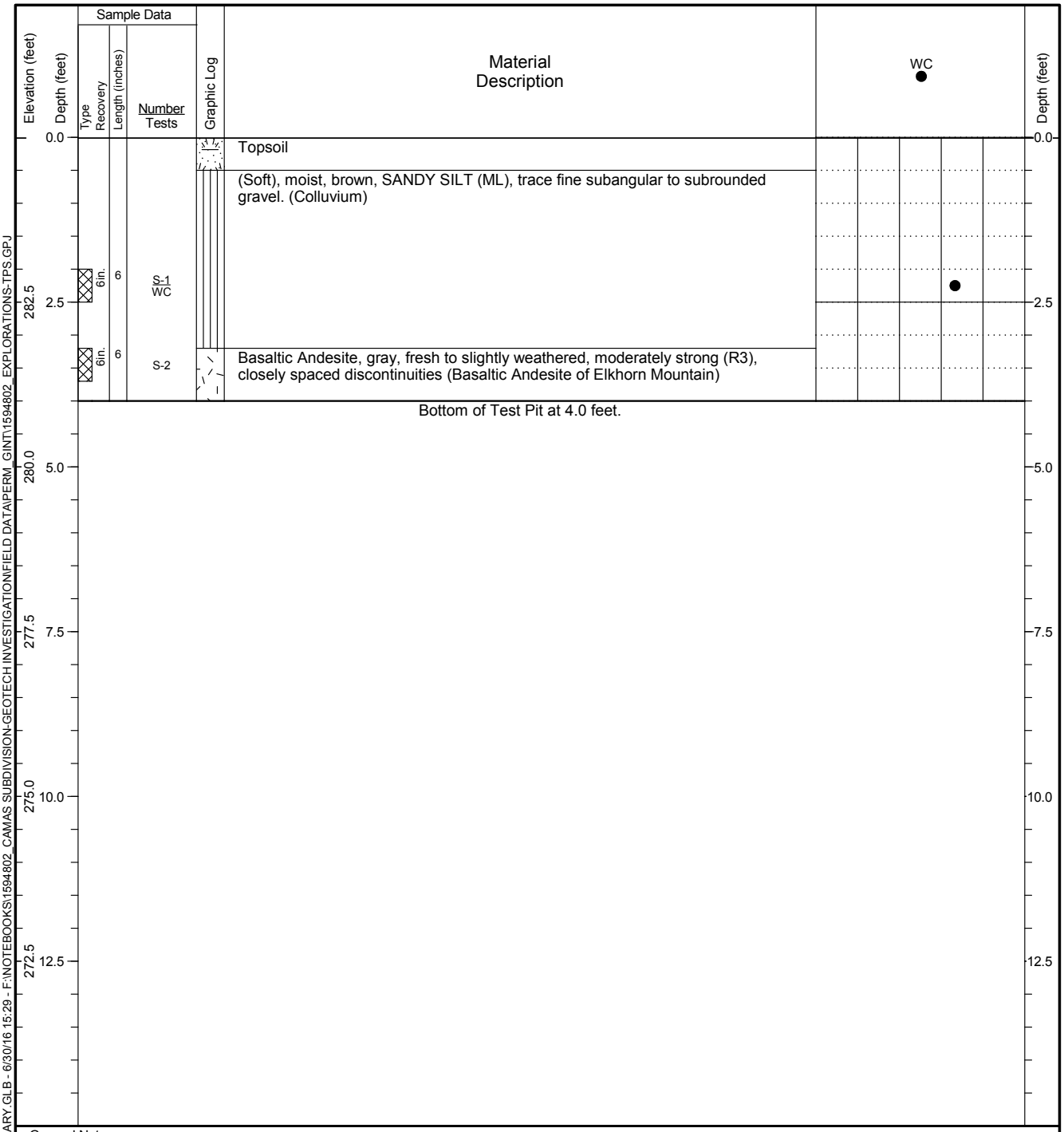
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-14

Figure **A-16**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 109,048.11 E: 1,150,482.88
Ground Surface Elevation: 285 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 4 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

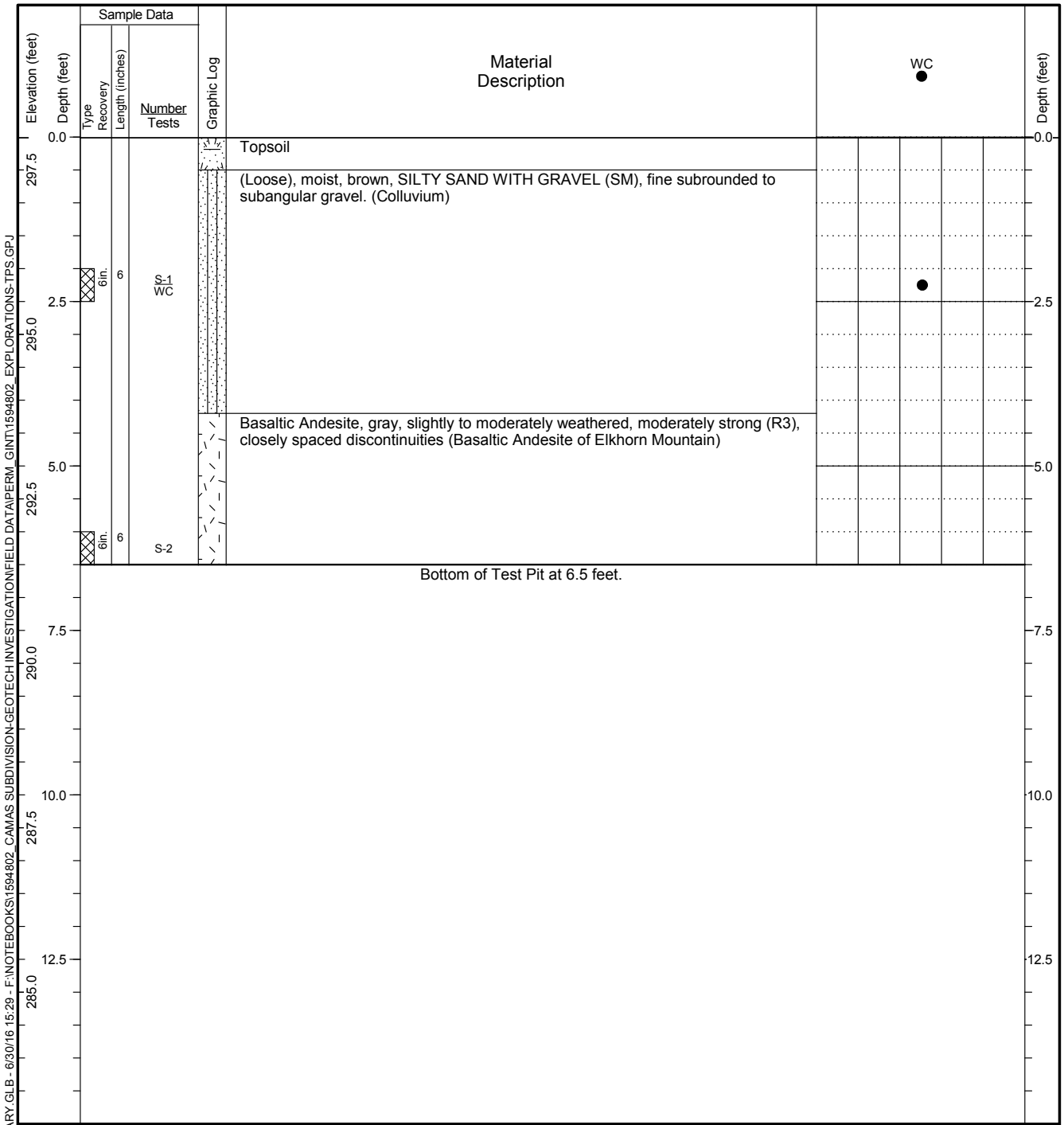
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-15

Figure **A-17**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 109,139.92 E: 1,150,713.75
Ground Surface Elevation: 298 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 6.5 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-16

Figure **A-18**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 109,127.21 E: 1,151,207.50
Ground Surface Elevation: 302 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
302.0	0.0		Topsoil	0.0
300.0	2.0		Basaltic Andesite, gray, fresh to slightly weathered, strong (R4), moderately spaced discontinuities (Basaltic Andesite of Elkhorn Mountain)	
			Bottom of Test Pit at 2.0 feet.	
297.5	5.0			5.0
295.0	7.5			7.5
292.5	10.0			10.0
290.0	12.5			12.5
287.5				

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-17

Figure **A-19**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 109,063.24 E: 1,151,558.63
Ground Surface Elevation: 310 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
	0.0		Topsoil	0.0
			Basaltic Andesite, gray, fresh to slightly weathered, strong (R4), closely spaced discontinuities (Basaltic Andesite of Elkhorn Mountain)	
			Bottom of Test Pit at 2.0 feet.	
307.5	2.5			2.5
305.0	5.0			5.0
302.5	7.5			7.5
300.0	10.0			10.0
297.5	12.5			12.5

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-18

Figure **A-20**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 109,311.19 E: 1,151,638.63
Ground Surface Elevation: 310 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 9 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type Recovery	Sample Data: Length (inches)	Sample Data: Number Tests	Graphic Log	Material Description	WC	Depth (feet)
	0.0					Topsoil		0.0
		6in.	6	S-1 WC		(Soft), moist, dark brown, SANDY SILT (ML). (Colluvium)	●	
307.5	2.5	6in.	6	S-2 WC		(Medium stiff), moist, light brown, SANDY SILT WITH GRAVEL (ML), fine subangular to subrounded gravel.	●	2.5
305.0	5.0							5.0
302.5	7.5	6in.	6	S-3		Volcaniclastic Breccia, brown to gray, moderately to highly weathered, very weak (R1), closely spaced discontinuities (Volcaniclastic Sedimentary Rock)		7.5
						Bottom of Test Pit at 9.0 feet.		
300.0	10.0							10.0
297.5	12.5							12.5

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-19

Figure **A-21**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 109,197.91 E: 1,151,661.25
Ground Surface Elevation: 306 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 8 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type Recovery	Sample Data: Length (inches)	Sample Data: Number Tests	Graphic Log	Material Description
305.0	0.0					Topsoil
		6in.	6	S-1 GS, WC		(Loose), moist, brown, SILTY SAND (SM), trace angular to subangular gravel. (Residual Soil)
302.5	2.5					
300.0	5.0					
297.5	7.5					Volcaniclastic Breccia, brown to gray, moderately to highly weathered, very weak (R1), closely spaced discontinuities (Volcaniclastic Sedimentary Rock)
295.0	10.0					Bottom of Test Pit at 8.0 feet.
292.5	12.5					

WC ● Percent Fines ✖ (10, 20, 30, 40)

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between soil strata or geologic units. Dashed stratum lines indicate gradual or approximate change between soil strata or geologic units.
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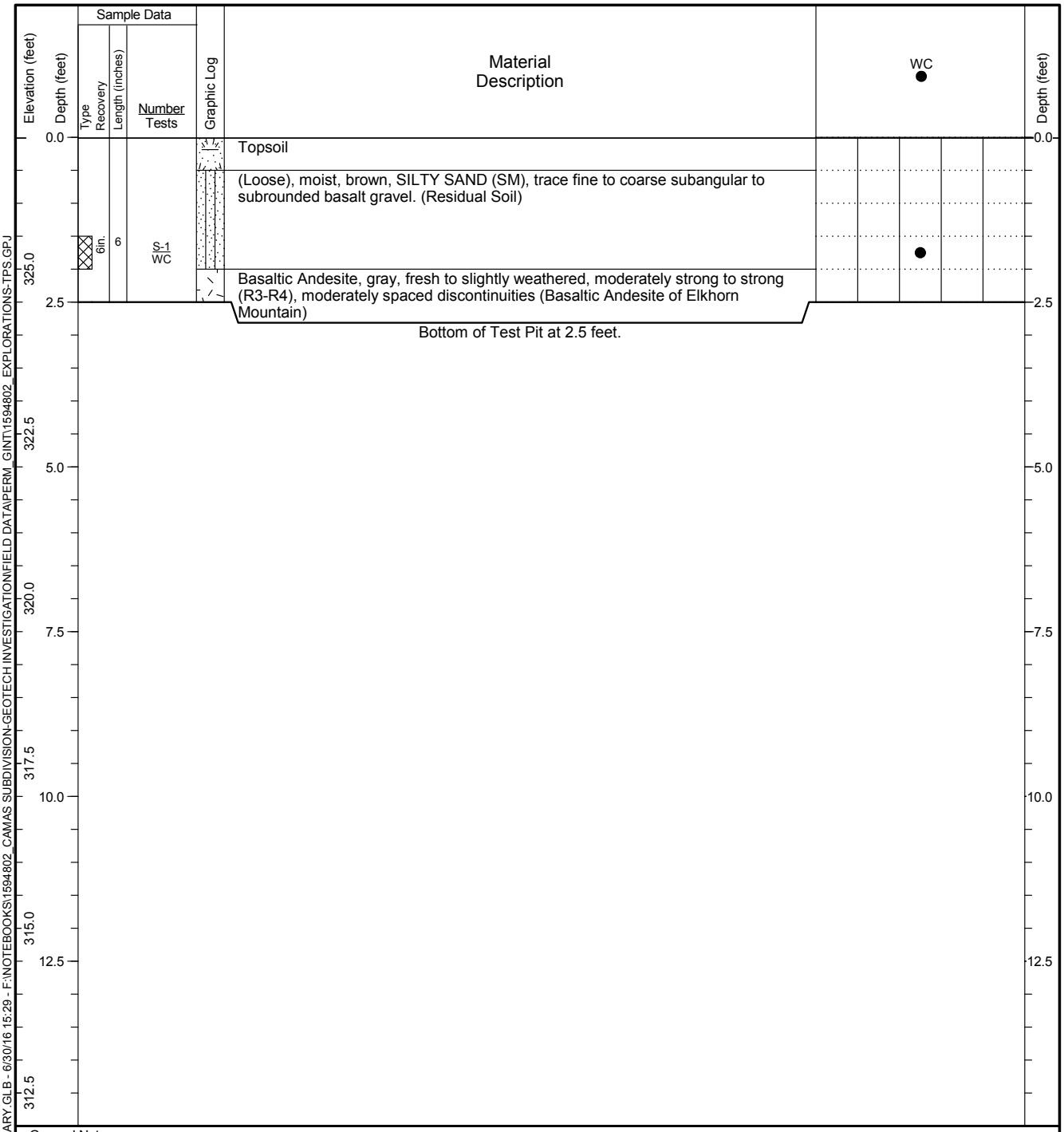
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-20

Figure **A-22**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,802.23 E: 1,151,597.38
Ground Surface Elevation: 327 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2.5 feet Depth to Ground Water: Not Encountered
Comments:



General Notes:
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4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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HARTCROWSER

Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-21

Figure **A-23**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16
Logged by: A. Jones Checked by: A. Pyrch
Location: N: 108,395.14 E: 1,151,627.00
Ground Surface Elevation: 312 feet
Horizontal Datum: WA State Plane S, NAD 83, ft.
Vertical Datum: NAVD88

Excavation Contractor/Crew: Tapani, Inc.
Excavation Method: Trackhoe
Rig Model/Type: Komatsu PC-200
Total Depth: 2.6 feet Depth to Ground Water: Not Encountered
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
312.0	0.0		Topsoil	0.0
310.0	2.5		Basaltic Andesite, gray, fresh to slightly weathered, strong (R4), closely spaced discontinuities, highly fractured and moderately weathered from 0.5 to 1.0 feet (Basaltic Andesite of Elkhorn Mountain)	2.5
			Bottom of Test Pit at 2.6 feet.	
307.5	5.0			5.0
305.0	7.5			7.5
302.5	10.0			10.0
300.0	12.5			12.5
297.5				

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
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Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-22

Figure **A-24**
Sheet **1 of 1**

APPENDIX B
Laboratory Testing

APPENDIX B

Laboratory Testing

A geotechnical laboratory testing program was performed for this study to evaluate the basic index and geotechnical engineering properties of the site soils. Testing was completed in Hart Crowser's soils laboratory. The tests performed and the procedures followed are outlined below.

Soil Classification

Soil samples were visually classified in our laboratory where the field classifications were verified in a relatively controlled laboratory environment. Classifications were made in general accordance with the Unified Soil Classification System (USCS) and ASTM Test Method D 2487.

Water Content Determinations

Water contents were determined for select samples recovered in the explorations in general accordance with ASTM Test Method D 2216. The test results are shown on the appropriate exploration log included in Appendix A and shown on Figure B-1 in this appendix.

Grain Size Analysis

Sieve analyses were conducted on select samples recovered in the explorations in general accordance with ASTM Test Method D 1140. The test results are shown on the appropriate exploration log included in Appendix A and on Figure B-2 in this appendix.

Atterberg Limits

Atterberg Limits (liquid limit, plastic limit and plasticity index) of select fine-grained soil samples were obtained in general accordance with ASTM Test Method D 4318-02. The test results are shown on Figure B-3 in this appendix.

Exploration	Depth	Class-ification	Water Content (%)	Dry Density (pcf)	Maximum Size (mm)	%<#200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index	Pocket Pen (tsf)	Torvane (tsf)
TP-1	3.0	ML	36.6				49	31	18	1.25	
TP-3	2.5		9.4								
TP-5	2.5	CL	37.7				46	26	20	1.0	
TP-6	2.0		9.0								
TP-7	1.5		25.6								
TP-7	3.5	SM	25.8		0.075	49					
TP-7	6.5		33.9								
TP-8	1.5		31.2								
TP-8	3.2	CL	36.1				48	23	25	2.25	
TP-8	12.5	SM	20.2		0.075	25					
TP-9	4.5		25.6								
TP-13	2.5	ML	39.9				43	34	9	1.25	
TP-14	3.0		25.4								
TP-14	7.5		34.9								
TP-15	2.0		33.3								
TP-16	2.0		25.4								
TP-19	1.0		26.0								
TP-19	3.0		41.7								
TP-20	2.5	SM	22.5		0.075	24					
TP-21	1.5		25.0								

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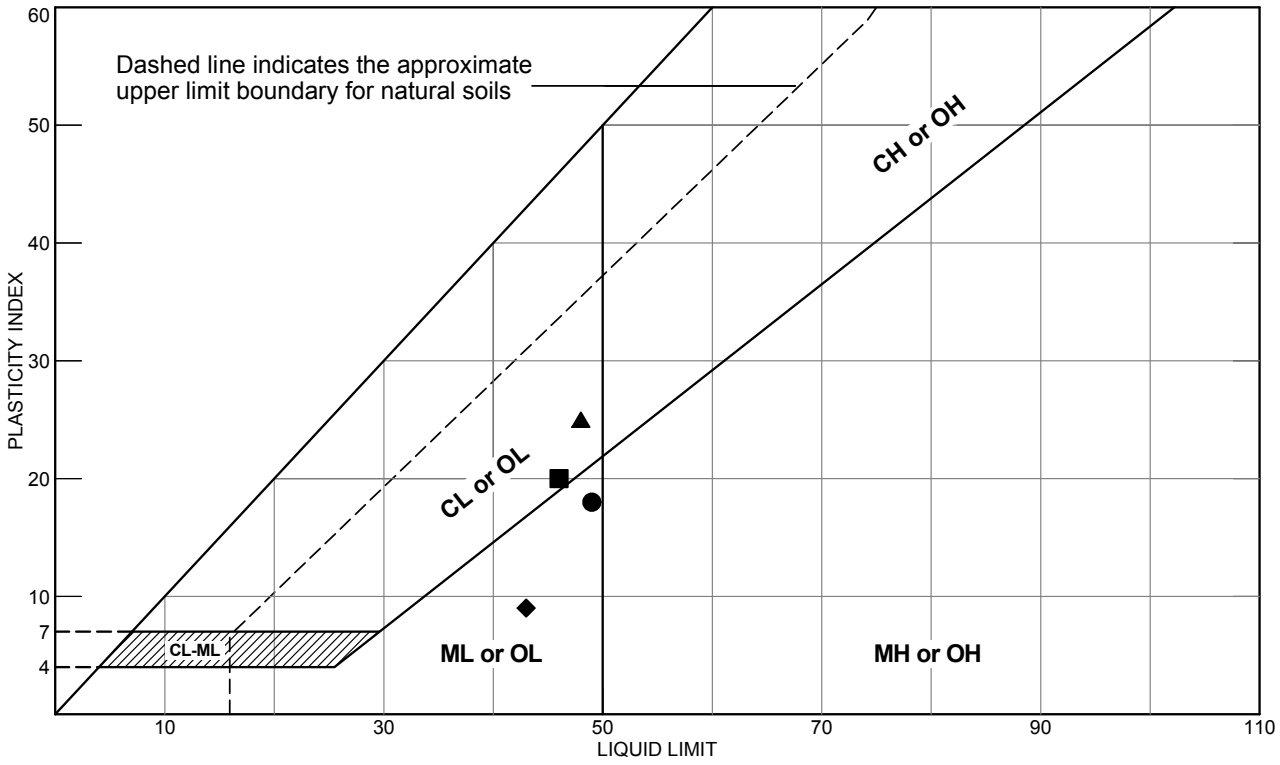
Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Summary of Laboratory Results

Figure **B-1**
Sheet **1 of 1**



Location and Description			LL	PL	PI	-#200	MC%	USCS
● **Source:** TP-1 SILT WITH SAND	**Sample No.:** S-1	**Depth:** 3.0 to 3.5 feet	49	31	18	NT	37	ML
■ **Source:** TP-5 LEAN CLAY	**Sample No.:** S-1	**Depth:** 2.5 to 3.0 feet	46	26	20	NT	38	CL
▲ **Source:** TP-8 LEAN CLAY WITH SAND	**Sample No.:** S-2	**Depth:** 3.2 to 3.7 feet	48	23	25	NT	36	CL
◆ **Source:** TP-13 SILT WITH SAND	**Sample No.:** S-1	**Depth:** 2.5 to 3.0 feet	43	34	9	NT	40	ML

Remarks:

●
■
▲
◆

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Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Liquid and Plastic Limits

Figure **B-2**
Sheet **1 of 1**

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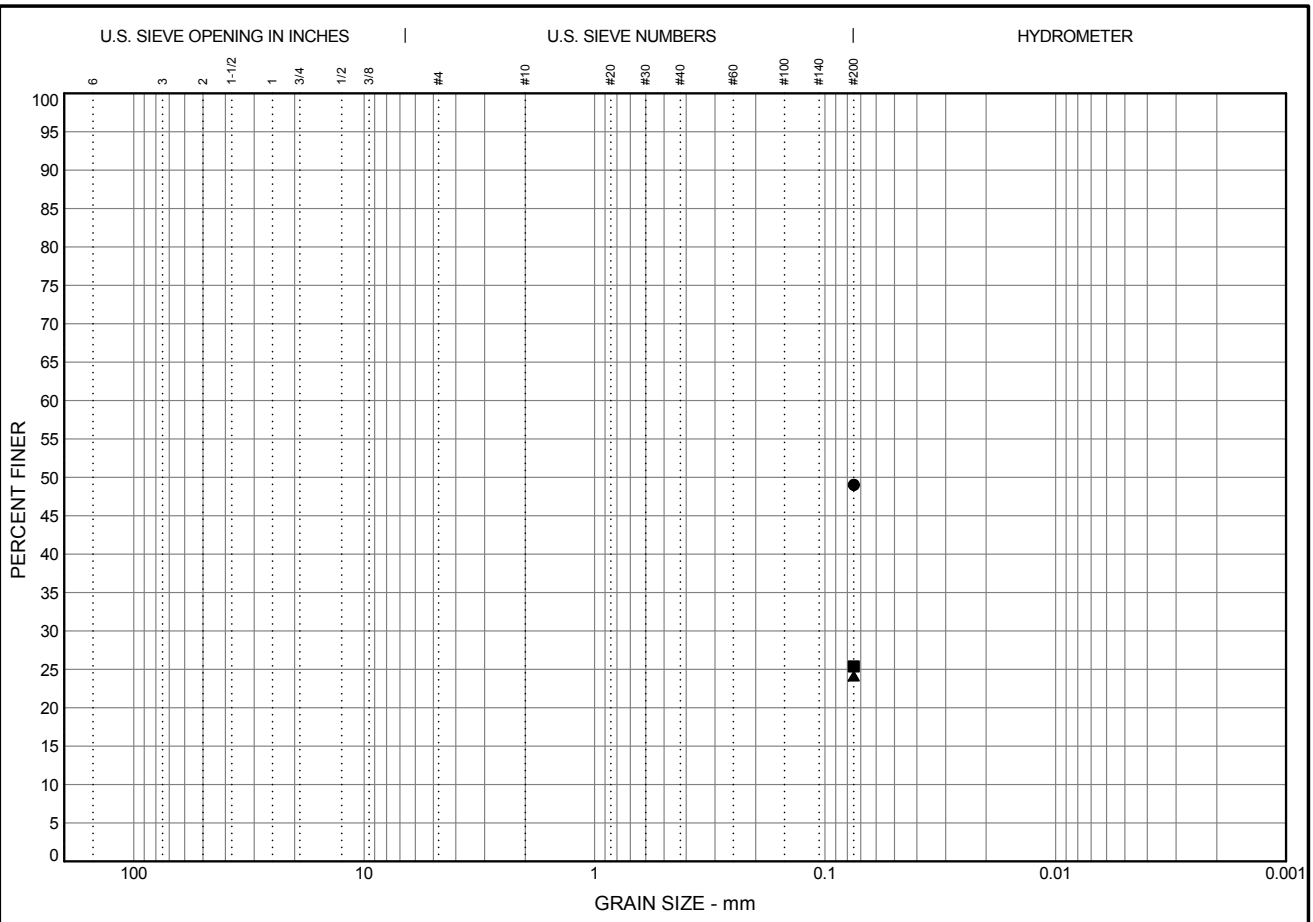

Location and Description	% Cobbles	% Gravel	% Sand	% Silt	% Clay	MC%	USCS
● **Source:** TP-7 **Sample No.:** S-2 **Depth:** 3.5 to 4.0 SILTY SAND				49.0		26	SM
■ **Source:** TP-8 **Sample No.:** S-3 **Depth:** 12.5 to 13.0 SILTY SAND				25.4		20	SM
▲ **Source:** TP-20 **Sample No.:** S-1 **Depth:** 2.5 to 3.0 SILTY SAND				24.1		23	SM

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●										
■										
▲										

Remarks:

● ■ ▲

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Project: CJ Dens Subdivision
Location: Camas, Washington
Project No.: 15948-02

Partical Size Distribution

Figure **B-3**
Sheet **1 of 1**

HARTCROWSER
A division of Haley & Aldrich

MEMORANDUM

DATE: November 23, 2020

TO: CJ Dens Lacamas I, LLC
Attention: Mr. Carl Lawson

FROM: Daniel J. Trisler, PE
Russell Rosenberg, GIT

RE: **Geotechnical Report Addendum #1 - Supplemental Design Support**
CJ Dens East Subdivision – Leadbetter Road
Camas, Washington
15948-02

CC: AKS Engineering & Forestry – John Meier, PE

Hart Crowser, a division of Haley & Aldrich, Inc., is pleased to submit this addendum to CJ Dens Lacamas I, LLC (CJ Dens) summarizing our updated geotechnical findings and recommendations, as applicable, for the CJ Dens East Subdivision in Camas, Washington. This memorandum and all attachments supersede or should be considered supplemental to our geotechnical report titled "Report of Geotechnical Engineering Services, CJ Dens Subdivision, Camas, Washington," dated July 6, 2016 (Geotechnical Report).

Our specific scope of work for the addendum was detailed in our contract change agreement with you, dated August 24, 2020, and generally included reviewing the updated development (grading) plans, reviewing our past reports, reviewing supplemental test pit explorations completed in November 2017, conducting limited geotechnical analysis to evaluate rock slope stability, and preparing this addendum summarizing our findings and any updated recommendations.

Amended or updated sections from the Geotechnical Report are shown with the relevant section numbers. The header titles for new sections are numbered and underlined.

We updated figures from the Geotechnical Report and added a new figure showing the depth to rock across the site. These updated figures are attached. We have also updated Attachment A-1 providing logs of explorations completed in 2015 and Attachment A-2 providing logs of explorations completed on the site since 2016. Attachment A-2 includes new explorations (TP-43 to TP-114) not included in the Geotechnical Report. All supplemental explorations in Attachment A-2 were completed using the procedures outline in Appendix A of the Geotechnical Report for TP-1 to TP-22.

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We note that this update does not address the portion of the original development that was designated Phase II and was generally located in the northern and western portions of the site. The area was addressed in a geotechnical report titled "Report of Geotechnical Engineering Services, CJ Dens Subdivision (Phase II), Camas, Washington," dated July 31, 2017.

2.0 Project Description

We understand that since the Geotechnical Report was prepared, the northwest portion of the original property, or the former "Phase II" area of the project has been sold and is no longer part of the project, as shown on Figure 1. Therefore, we understand the currently proposed development to consist of approximately 200 lots on the remaining eastern portion of original property.

As stated in our original report, we understand that conventional one- to three-story, single-family residences supported on shallow foundations will be constructed on each lot. We anticipate the buildings will be constructed with wood frames and will be relatively lightly loaded with strip loads up to 2.5 kips per lineal foot and column loads of 75 kips.

Infrastructure, such as roadways and utilities, will also be constructed. We understand that mass cuts and fills of up to approximately 20 feet deep will be required for site grading. Finished cut and fill slopes up to approximately 40 feet tall will be created by this mass earthwork. Figure 3 shows preliminary mass grading for the development.

4.1 Geologic and Soils Mapping

In additional to the geologic and soils mapping described in *Section 4.1* of the Geotechnical Report, we further reviewed the available geologic mapping (Evarts and O'Connor 2008) for orientation measurements of the basaltic andesite and/or volcaniclastic rocks. No orientation data were available within the project area; however, rock attitude measurements in the basaltic andesite closer to the Washougal River indicate a generally 15- to 30-degree dip to the southeast within the basaltic andesite to the southeast of the site.

4.3 Subsurface Conditions

The following material completely replaces *Section 4.3* of the Geotechnical Report.

4.3.1 General

Soil and rock conditions interpreted from geologic maps and our explorations, in conjunction with soil and rock properties inferred from field observations and laboratory tests, formed the basis for the conclusions and recommendations in this report. Test pit locations relative to the existing and proposed site plans are shown on Figures 2 and 3, and the depth to bedrock encountered in each test pit is shown

on Figure 4. Appendix A describes our field exploration procedures and presents field data and logs. Appendix B (not replicated herein) describes our laboratory soil testing procedures and results.

We completed exploration of the site by observing the advancement of 102 test pits to depths ranging from approximately zero feet bgs (refusal on strong bedrock at the surface) to 15 feet bgs. Nine test pits, designated TP-1a through TP-9a were completed on November 23, 2015, 22 test pits, designated TP-1 through TP-22, were completed on May 27, 2016, and 71 tests pits, designated TP-43 to TP-114 were completed between October 26 and 30, 2017. Additional test pit and hand auger explorations were completed within the former Phase II area of the project in 2016 and 2017; however, we do not discuss them further or include logs of these explorations in this memorandum.

The project area is typically mantled with colluvium and residual soil overlying moderately weathered to fresh basaltic andesite and slightly weathered to highly weathered volcaniclastic breccia to the maximum depths explored. Soil thickness (or depth to bedrock in feet bgs) ranged from approximately 0 to 13 feet. The average soil thickness for the site was approximately 2.6 feet. Most of the site consists of upland and mild hillslope areas, which typically had thin soil thicknesses of approximately 0 to 4 feet, with occasional areas of up to approximately 6 feet of soil and up to approximately 7.8 feet of soil at TP-1. Soil thickness within drainages and on, or at the base, of taller slopes was greater and typically ranged from approximately 4 to 9 feet and was up to 13 feet. The most consistent areas of thicker soil cover were encountered in northeast and southern portions of the property. Descriptions of the soil and rock units encountered are provided below.

4.3.2 Soil and Rock Conditions

4.3.2.1 Colluvium

Colluvium was encountered on or at the bottom of hillslopes at the site and is interpreted as slope wash deposits. The colluvium consisted of silty sand, sandy silt, silt with sand, elastic silt and lean clay with sand with varying percentages of fine, subrounded to subangular gravel. Colluvium up to 12 feet thick was encountered in test pit TP-8, but typically ranged from approximately 1 to 5 feet thick and was thicker at the bottom of slopes. The colluvium was typically covered with approximately 6 to 12 inches of rooted topsoil. Based on the backhoe action and pocket penetrometer tests in the sidewalls of the excavations, we estimate the consistency of the fine-grained colluvium to be soft to medium stiff and the relative density of the coarse-grained colluvium to be loose to medium dense.

Moisture contents in the colluvium varied from approximately 25 to 42 percent based on 12 tests. Atterberg limit testing was conducted on two samples of fine-grained colluvium yielding liquid limits of 43 to 48 and plastic limits of 23 to 34 indicating silt to lean clay soil classifications.

4.3.2.2 Residual Soil

Materials interpreted as residual soil consisting of silty sand, sandy silt, and lean clay with varying percentages of sand and fine gravel was encountered at the surface or underlying colluvium at the site. Residual soils are completely weathered and decomposed in-place bedrock that has experienced minimal transport by water or other means. Residual soil was encountered at the ground surface in most of our explorations but was encountered underlying colluvium at depths ranging from approximately 4 to 12 feet bgs in test pits TP-1a, TP-5a, TP-6a, TP-8, and TP-14. The residual soil extends to the maximum depths explored in test pit TP-8 (13 feet bgs), TP-83 (11 feet bgs), TP-84 (10 feet bgs), TP-85 (10 feet bgs), and TP-108 (10 feet bgs). Based on the backhoe action during test pit excavation, we estimate the consistency of the fine-grained residual soil is soft to very stiff and the relative density of the coarse-grained residual soil is loose to dense.

Moisture contents in the residual soil varied from 20 to 38 percent based on six tests. Atterberg limits testing was conducted on two samples of fine-grained residual soil yielding liquid limits of 46 to 49 and plastic limits of 26 to 31 indicating a soil classification of silt.

4.3.2.3 Oligocene Basaltic Andesite of Elkhorn Mountain

Bedrock interpreted as Oligocene-age Basaltic Andesite of Elkhorn Mountain was observed in numerous outcrops across the site and was encountered in most of our test pits either near the surface or at depths of up to approximately 8 feet bgs. The basaltic andesite varied from fresh to highly weathered, moderately weak to strong (R2-R4), with closely to moderately spaced fractures. The basaltic andesite was typically rippable with a toothed bucket to between 1 to 2 feet below top of rock with moderate effort; however, in approximately 40 test pits less than approximately 0.5 feet from the top of the basaltic andesite was rippable. Moisture contents in the basaltic andesite varied 9.0 to 9.4 percent based on two tests.

4.3.2.4 Oligocene Volcaniclastic Sedimentary Rock

Volcaniclastic breccia, interpreted as Oligocene-age Volcaniclastic Sedimentary Rock, was encountered at depths ranging from approximately 3 to 13 feet bgs in test pits TP-1a through TP-6a, TP-9a, TP-6, TP-7, TP-19, and TP-20. Volcaniclastic breccia was encountered in the northwest and southern limits of our explorations and stratigraphically underlies the basaltic andesite; no outcrops of volcaniclastic breccia were observed at the surface during our explorations. The breccia consists of angular, medium sand to coarse gravel-sized fragments of igneous rocks in a weakly-cemented, fine-grained matrix. The breccia was typically moderately to highly weathered, thin-bedded, gray-brown to red-brown, and very weak to moderately weak (R1-R2), with closely spaced fractures. The breccia was typically rippable to at least 1 foot below top of rock with minimal effort.

We did not directly observe the contact between the basaltic andesite and the volcaniclastic rocks during our explorations and reconnaissance and were therefore unable to measure the orientation directly. However, based on the elevations where we encountered the top of the volcaniclastic rock, we anticipate the contact between the overlying basaltic andesite to be either relatively flat lying or up to approximately 5 to 6 degrees (approximately 10 percent) with a south to southeast dip direction.

4.3.3 Groundwater

Subsurface water seepage was encountered in test pit TP-1 at a depth of approximately 7.5 feet bgs, and in TP-52 at approximately 6.4 feet bgs. No other test pits encountered seepage during our explorations. Based on local well logs that are primarily screened in the basaltic andesite and volcaniclastic breccia, we anticipate regional groundwater levels to be approximately 50 to 100 feet bgs at the site. We anticipate shallowly infiltrating precipitation and surface runoff can become perched within the upper soils at the site during the wetter months of the year and may approach the ground surface during periods of heavy rain.

4.3.4 Limitations

The subsurface information used for this study represents conditions at discrete locations within the project site. Actual conditions in other areas could vary. The nature and extent of any variations in subsurface conditions may not become evident until construction begins. If significant variations are observed at that time, we may need to modify our conclusions and recommendations accordingly to reflect actual site conditions.

7.4 Retaining Structures

In addition to the wall systems discussed in the Geotechnical Report , we understand that gabion baskets/cribbing may be used as facing for MSE walls. In this case, the design recommendations from *Section 7.4.2 MSE Wall Design Parameters* of the Geotechnical Report remain valid.

Gabion facing should meet the specifications provided in Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge, and Municipal Construction (WSS) WSS 8-24.3(3) – Gabion Cribbing and be filled with stone meeting the specifications provided in WSS 9-27.3(6) - Stone or alternative materials as discussed below in *Gabion Fill and Construction.*

8.0 Earthwork Recommendations

The following presents supplemental recommendations in addition to those described in *Section 8.0* of the Geotechnical Report.

8.3.1 Rock Excavations and Cuts

In addition to the general earthwork and excavation recommendations provided in *Sections 8.0* and *8.3* of the Geotechnical Report, the following specific considerations may be necessary for excavations and cuts into bedrock. We note that the two bedrock materials encountered at the site, basaltic andesite, that are pervasive throughout most of the site and volcaniclastic sedimentary rock that is in the southern and far northern portion of the site will behave very differently from one another. The basaltic andesite will typical be represented by a hard basalt bedrock; whereas, the volcaniclastic sedimentary rock will act more like a stiff soil. The following discussion primarily relates to the basaltic andesite, except where specifically noted.

8.3.1.1 Rock Excavation

The basaltic andesite bedrock is hard and expected to be very difficult to excavate. During excavation of test pits TP-43 to TP-114 with a relatively large excavator (roughly 45,000-pound Komatsu PC-200), the excavator could only rip 0.5 to 2 feet into the rock. We anticipate the rock will not be easily excavated beyond this upper surface, and that large dozers with rippers, rock hammers and blasting will be required to excavate the rock below those depths.

The volcaniclastic rocks are generally very weak and are expected to be minimally to moderately difficult to excavate. During excavation of test pits TP-1a to TP-9a with a medium-sized, steel-track excavator, the excavator encountered refusal at some, but not all, of the test pit sites after ripping approximately 0.5 to 3 feet into the rock. However, minimal effort was required in other test pits. We anticipate that in some locations, large dozers with rippers may be required to excavate this unit below several feet.

8.3.1.2 Permanent Rock Cuts

Based on our understanding of the subsurface conditions and review of the preliminary grading plans, which shows cuts at a 2 horizontal to 1 vertical (2H:1V) inclination, proposed permanent cuts into bedrock at that inclination will be globally stable and will be suitable for construction according to the proposed plans and the recommendations in this report. We also anticipate that steeper permanent cuts into basaltic andesite bedrock, up to near vertical, may be globally stable. However, steeper cuts should be evaluated on a case-by-case basis to verify their global stability, but also to evaluate local stability (e.g., rockfall hazard). Furthermore, non-geotechnical considerations, such as trip-and-fall hazards, maintenance access, etc. should also be evaluated by the project team in concert with Hart Crowser.

For planning purposes, it is reasonable to assume that from a geotechnical perspective permanent cuts up to 1H:1V are globally stable when excavated into basaltic andesite bedrock. However, permanent cuts into bedrock that are steeper than 2H:1V may locally expose areas of lower quality rock, which could require additional reinforcement, such as rock bolting, and should be evaluated on a case-by-case basis. Additionally, refer to *Section 8.3.1.4 Volcaniclastic Sedimentary Rock Excavations* for discussion regarding cuts in the southeast portion of the site (near Lots #149 to #153), where the basaltic andesite bedrock may not be encountered.

8.3.1.3 Temporary Rock Cuts

Temporary cuts into basaltic andesite bedrock that will be permanently buttressed by retaining walls (e.g., houses with daylight basements) are likely to be stable at inclinations ranging from 1H:1V to near vertical. However, the stability of such cuts should be evaluated on a case-by-case basis during construction.

For planning purposes, it is reasonable to assume that from a geotechnical perspective temporary cuts up to 1/2H:1V are globally stable when excavated into basaltic andesite bedrock.

8.3.1.4 Volcaniclastic Sedimentary Rock Excavations

If mass grading exposes the contact between the basaltic andesite and the underlying volcaniclastic rocks at an adverse (out of slope) orientation, then these cuts may have the potential for global instability and should be further evaluated by Hart Crowser. Based on our subsurface explorations and review of the most recent proposed grading plan (Figure 3), most of the project area is unlikely to encounter this condition; however, as outlined above in our addendum to *Section 4.3.2.4 Oligocene Volcaniclastic Sedimentary Rock*, we anticipate the contact between the basaltic andesite and the underlying volcaniclastic rocks to be either relatively flat lying or up to approximately 5 to 6 degrees (approximately 10 percent) with a south to southeast dip direction, which has the potential to create adverse orientations within large cut slopes.

Specifically, we anticipate the potential for cuts to expose this stratigraphic condition near the south to southeast portion of the project area near lots #149 to #153 in cuts proposed to be generally 5 to 10 feet, but up to approximately 13 feet tall. Based on our explorations, the stratigraphic contact between the two geologic units also has the potential to be exposed near the north end of the (approximately lot #38 and northward); however, if exposed, we do not anticipate an adverse orientation in this location.

For planning purposes, we recommend permanent cuts in this area be kept at a 2H:1V inclination.

8.4.1 On-Site Soils and Bedrock Spoils

8.4.1.1 On-Site Soils

In general, the overburden native materials in the project area consist of fine-grained materials. During periods of dry weather, the native soils may be used as fill, provided they are properly moisture conditioned and oversized materials (greater than 6 inches) are removed.

We note that the *in situ* moisture contents of the site soils (colluvium and residual soil) varied from approximately 20 to 42 percent. The Atterberg limits of these same materials indicated liquid limits of 43 to 49 and plastic limits of 23 to 34. Some of the natural moisture contents were near the liquid limits, which would indicate the soil was too wet to place as fill, as it would tend to pump and rut. Therefore, regardless of the weather it may be necessary to dry the site soils prior to placing as fill. Also, during periods of wet weather, it will likely be infeasible to use the native soil as a structural fill. The earthwork contractor should plan accordingly.

8.4.1.2 On-Site Soils and Bedrock Spoils

Bedrock spoils from excavations may be used as structural fill, provided they are processed/crushed to a gradation appropriate for their planned use, per the WSS. We note that depending upon usage some changes to the WSS gradational tolerances may potentially be feasible if the design of the project element is adjusted to account for any changes. For example, if crushed rock larger than typically allowed for MSE backfill is used, then increased geogrid reinforcement strength may be required to account for greater installation damage. These sorts of the design changes based on the actual material gradations produced in the field will need to be evaluated on a case-by-case basis.

For use as general fill, bedrock materials should generally be processed to a well-graded crushed material with nominal sizes between 1 and 6 inches, and/or meeting the gradations of the materials described in S*ection 8.4.2 Imported Select Structural Fill* of the Geotechnical Report.

8.4.8 Gabion Fill and Construction

Gabion baskets for MSE wall facings should be constructed to meet the specifications of WSS 8-24.3(3) – Gabion Cribbing and should be filled with stone with a degradation factor of at least 30, a minimum fracture percentage of 75 percent and meet the gradation specifications provided in WSS 9-27.3(6) – Stone. The material should have nominal sizes between 4 and 8 inches. Additionally, the gabion baskets should be filled in lifts not exceeding 14 inches thick and following the general recommendations of *Section 8.5 Fill Placement and Compaction* of our original report. The unit weight of the filled gabion baskets must be at least 100 pounds per cubic foot (pcf) as described in WSS 8-24.3(3)F.

Other gradations of gabion rock may be acceptable provided that they meet the minimum unit weight noted above and are approved by our office. Special measures, such as separation fabrics, may be required to prevent the migration of fines, and sand- and gravel-sized particle.

Limitations

We have prepared this addendum for the exclusive use of CJ Dens Lacamas I, LLC and their authorized agents for the CJ Dens East Subdivision in Camas, Washington. This memorandum is intended to summarize our updated geotechnical findings and recommendations for the proposed subdivision based on additional explorations and analysis following our original report. However, conditions can vary between exploration locations and our conclusions should not be construed as a warranty or guarantee of subsurface conditions.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this memorandum was prepared. No warranty, express or implied, should be understood.

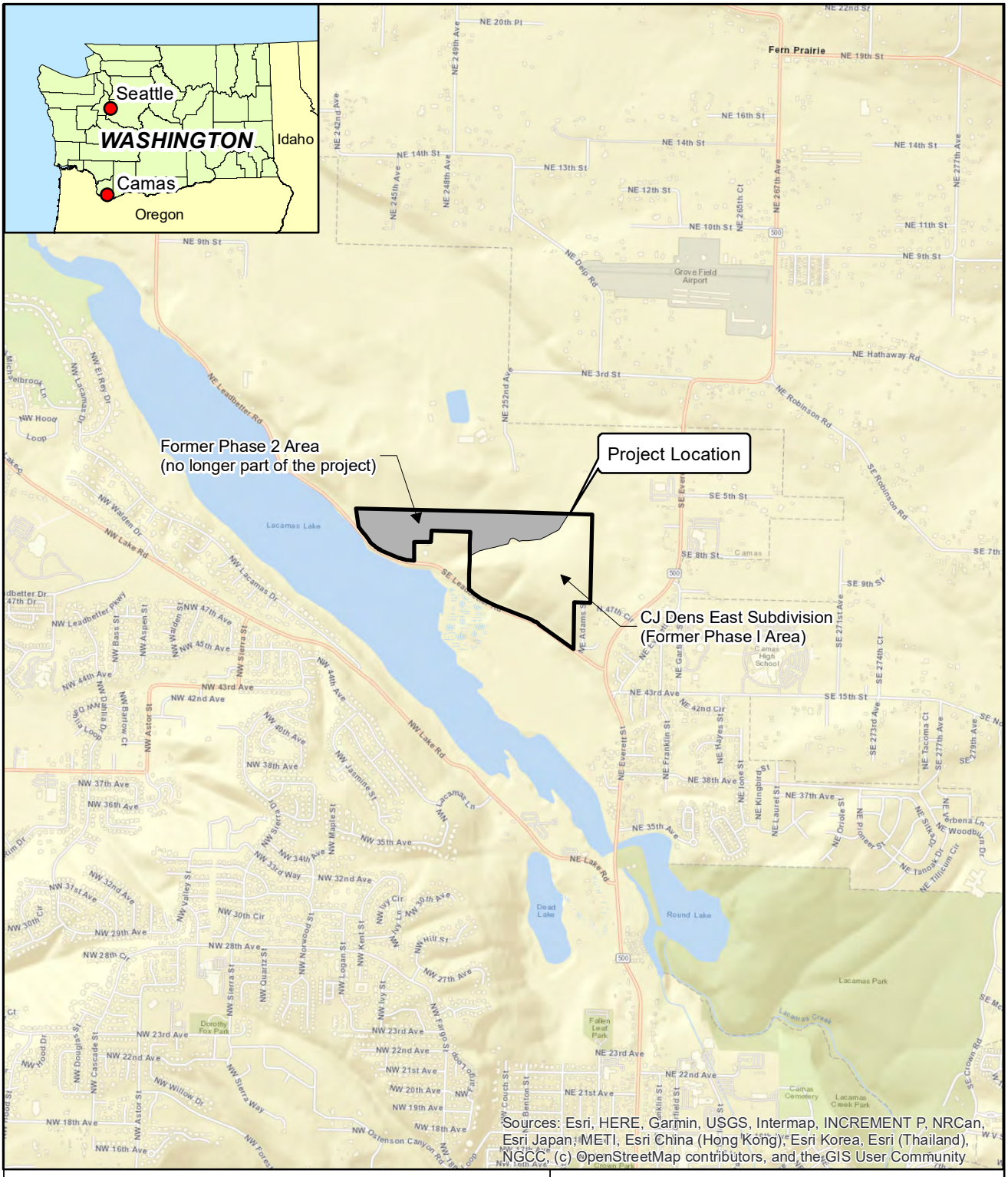
Any electronic form, facsimile, or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by Hart Crowser and will serve as the official document of record.

Attachments:
Figure 1 – Vicinity Map
Figure 2 – Existing Site Plan
Figure 3 – Proposed Site Plan
Figure 4 – Depth to Rock
Figure 5 – Generalized Subsurface Conditions Cross Section A-A'
Figure 6 – Generalized Subsurface Conditions Cross Section B-B'
Figure 7 – Generalized Subsurface Conditions Cross Section C-C'
Figure 8 – Typical Cut and Fill Slope Cross Section
Attachment A-1 – 2015 Field Explorations
Attachment A-2 – 2016 and later Field Explorations

References

Evarts, R.C. and J.E. O'Connor 2008. Geologic map of the Camas quadrangle, Clark County, Washington, and Multnomah County, Oregon: U.S. Geological Survey Scientific Investigations Map 3017, 31 p., 1:24,000 scale.

Washington State Department of Transportation (WSDOT) 2020. *Standard Specifications for Road, Bridge, and Municipal Construction*, Publication M 41-10.



0 1,000 2,000 4,000 Feet

N

CJ Dens East Subdivision
Camas, Washington

Vicinity Map

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Figure
1

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LEGEND

- Test Pit (October 2017)
- Test Pit (May 2016)
- Test Pit (November 2015)
- Phase 2 Hand Auger Boring
- Phase 2 Test Pit
- Cross Section
- Former Phase II Area (No Longer Included in Project)
- Bedrock Outcrop and Talus
- Existing Contour

0 150 300 600 Feet

N

Note: Feature locations are approximate.

CJ Dens East Subdivision
Camas, Washington

Existing Site Plan

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Figure **2**

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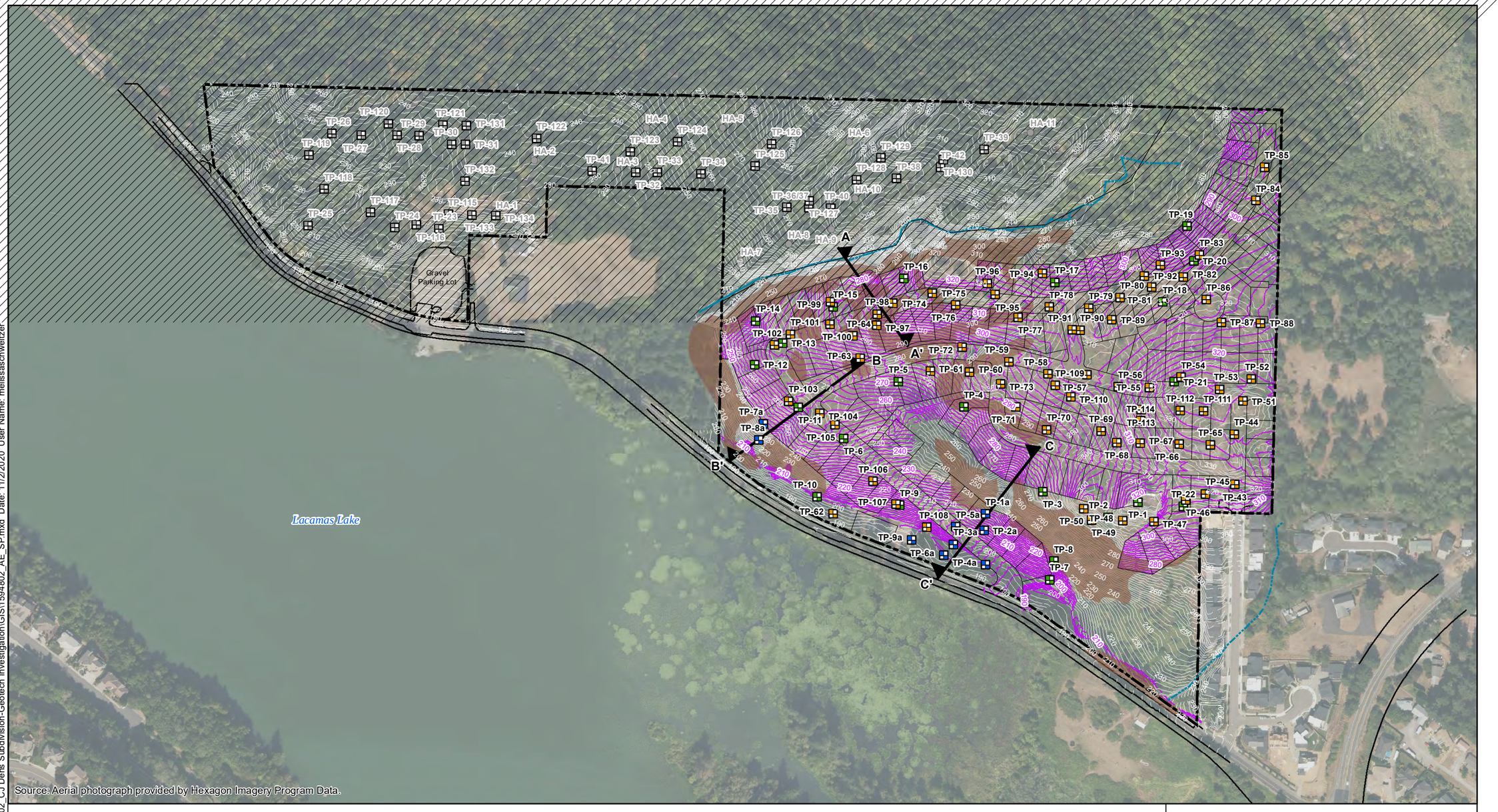

LEGEND

- Test Pit (October 2017)
- Test Pit (May 2016)
- Test Pit (November 2015)
- Phase 2 Hand Auger Boring
- Phase 2 Test Pit
- Former Phaser II Area (No Longer Included in Project)
- Bedrock Outcrop and Talus
- Cross Section
- Existing Contour
- Proposed Lot
- Proposed Grading Contour

0 150 300 600 Feet

N

Note: Feature locations are approximate.

CJ Dens East Subdivision
Camas, Washington

Proposed Site Plan

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Figure
3

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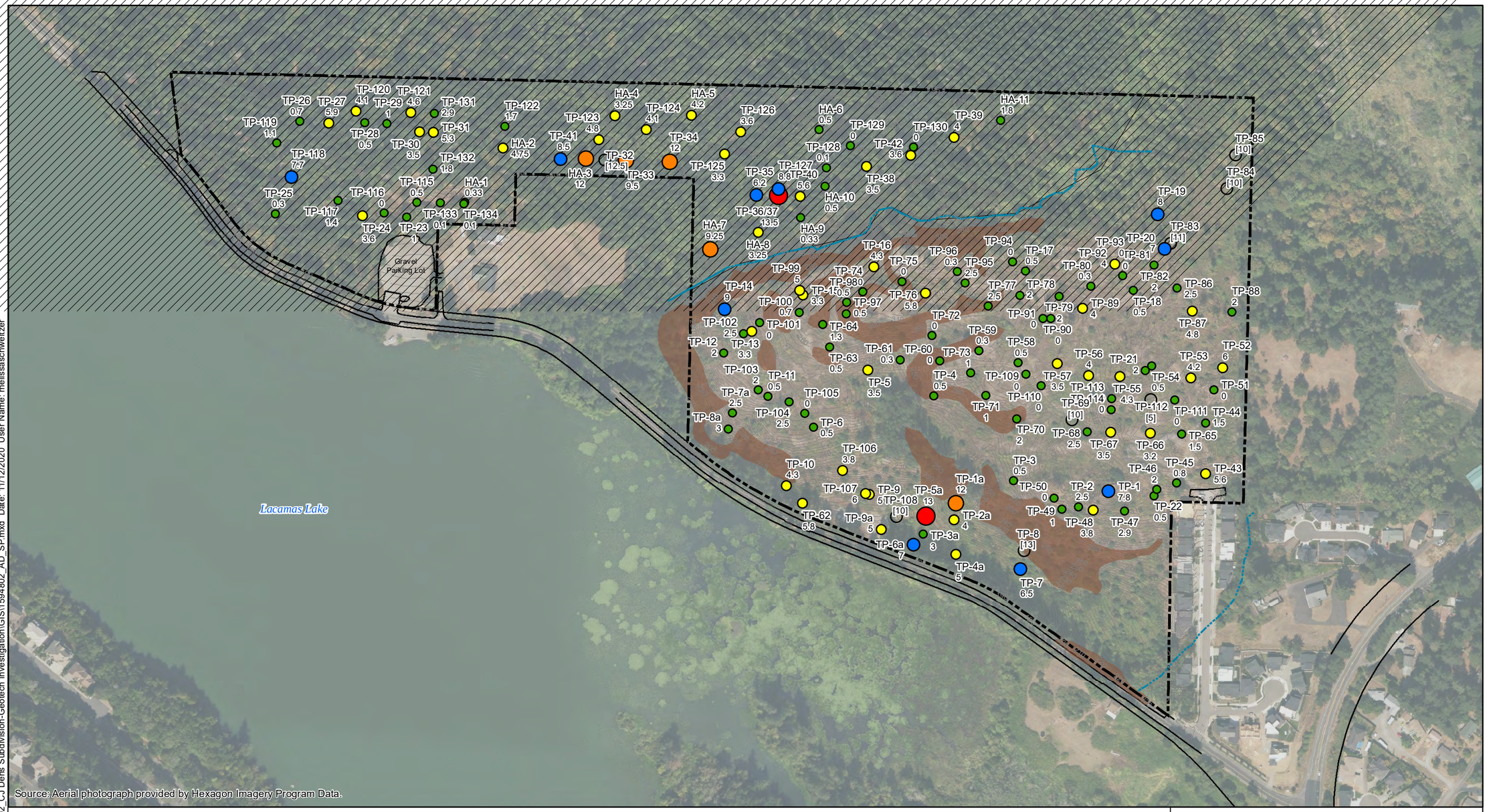

LEGEND

Depth to Rock Range
- 0 to 3 feet
- 3 to 6 feet
- 6 to 9 feet
- 9 to 12 feet
- >12 feet
- Not Encountered

- Former Phaser II Area (No Longer Included in Project)
- Bedrock Outcrop and Talus
- Existing Contour
- TP-49 Exploration Number
- 1.0 Depth to Rock
- [5] Termination Depth

0 150 300 600 Feet

N

Note: Feature locations are approximate.

CJ Dens East Subdivision
Camas, Washington

Depth to Rock

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Figure **4**

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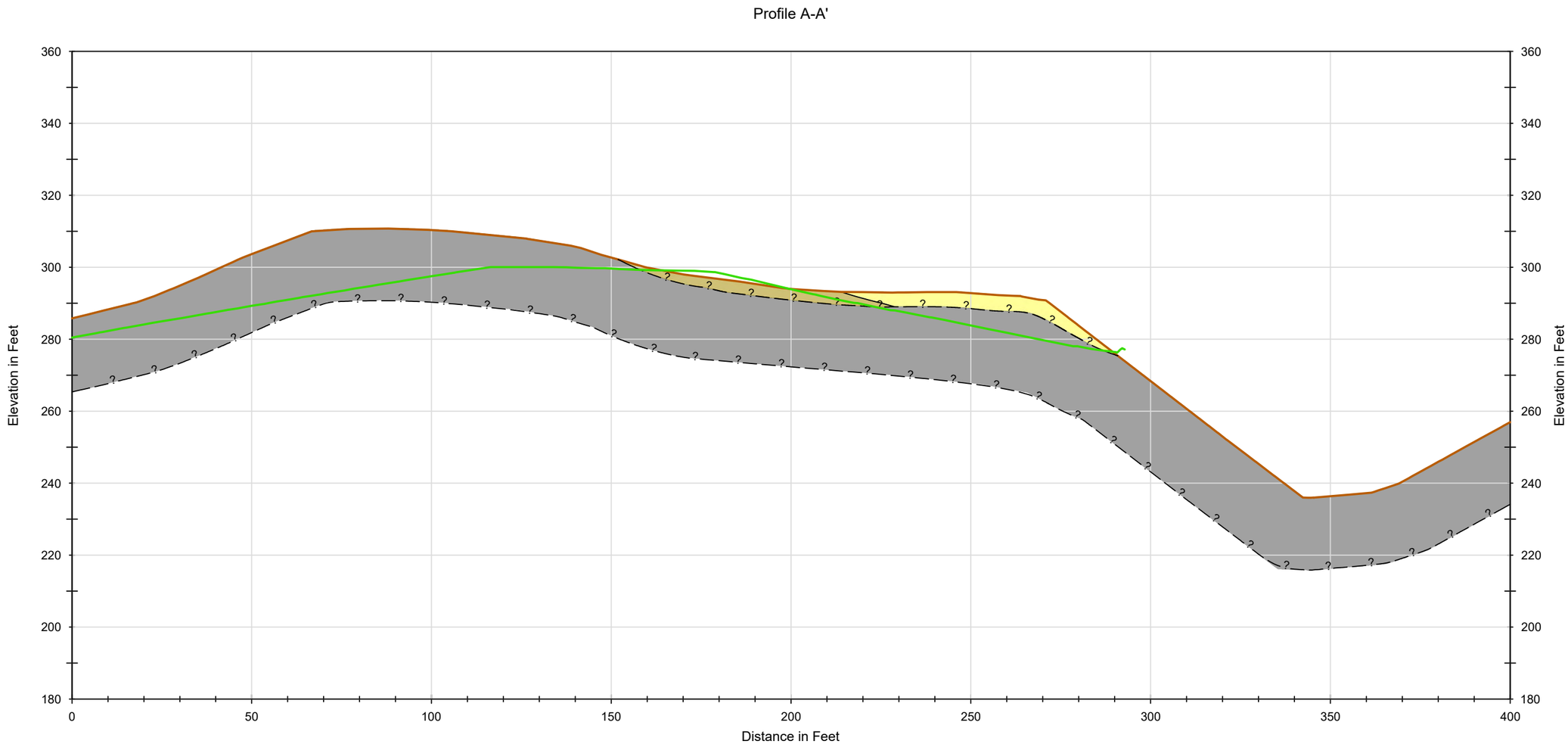

NOTE

This subsurface profile is generalized from materials observed in test pit explorations and surface exposures. Variations may exist between profile and actual conditions.

LEGEND

- Existing Surface Profile
- Proposed Surface Profile
- Colluvium
- Residual Soil
- Basaltic Andesite

Sources: Existing contours generated from elevation contours provided by Group Mackenzie, 1/19/11. Proposed contours generated from elevation contours provided by Mackenzie, 6/7/16.

0 30 60

Horizontal and Vertical Scale in Feet

CJ Dens East Subdivision
Camas, Washington

Generalized Subsurface Conditions
Cross Section A-A'

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Figure **5**

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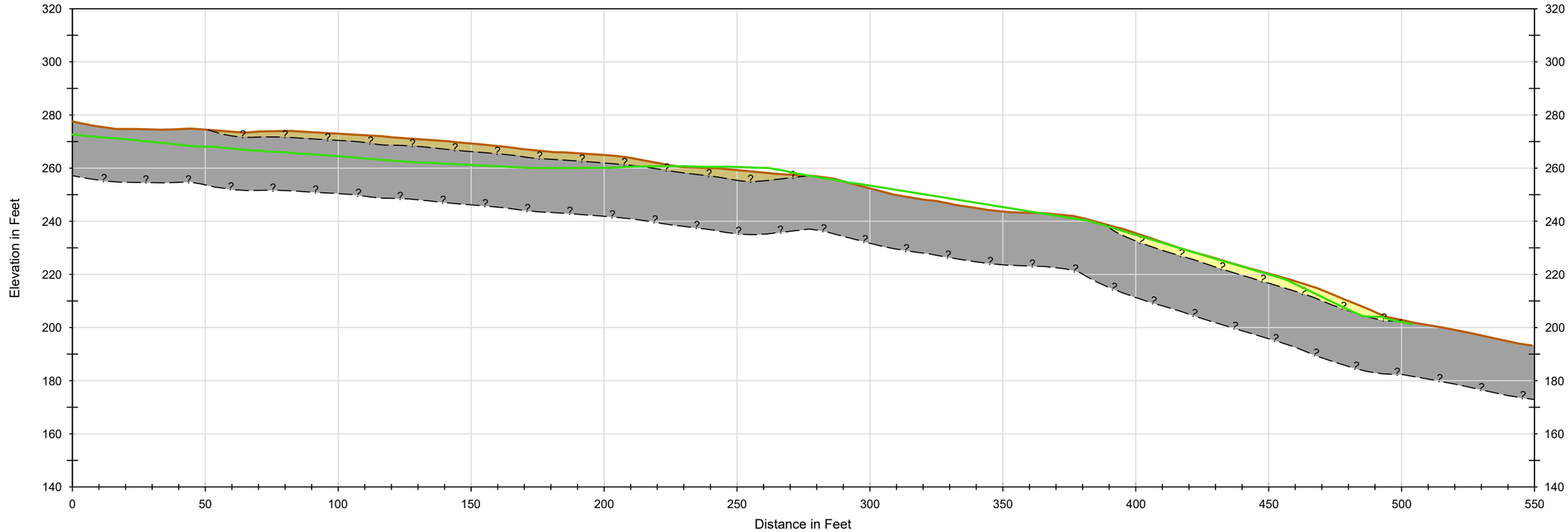
Profile B-B'



LEGEND

- Existing Surface Profile
- Proposed Surface Profile
- Colluvium
- Residual Soil
- Basaltic Andesite

NOTE

This subsurface profile is generalized from materials observed in test pit explorations and surface exposures. Variations may exist between profile and actual conditions.

0 40 80
Horizontal and Vertical Scale in Feet

Sources: Existing contours generated from elevation contours provided by Group Mackenzie, 1/19/11. Proposed contours generated from elevation contours provided by Mackenzie, 6/7/16.

CJ Dens East Subdivision
Camas, Washington

Generalized Subsurface Conditions
Cross Section B-B'

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Figure
6

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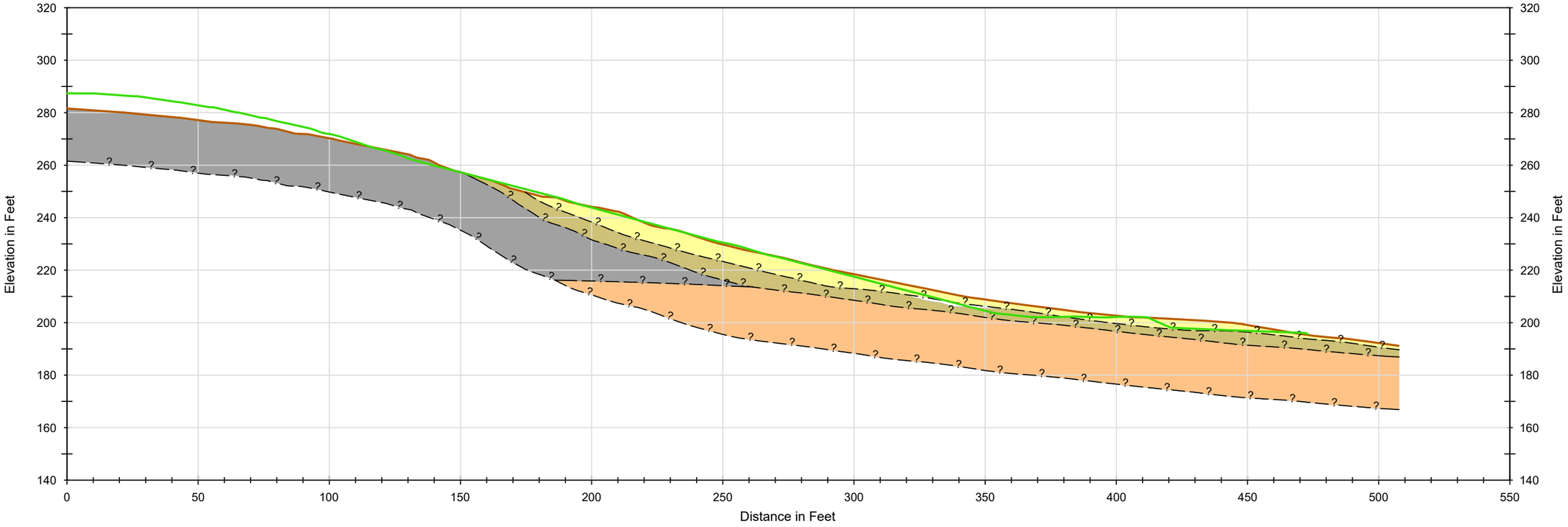
Profile C-C'



LEGEND

- Existing Surface Profile
- Proposed Surface Profile
- Colluvium
- Residual Soil
- Basaltic Andesite
- Volcaniclastic Sedimentary Rock

NOTE

This subsurface profile is generalized from materials observed in test pit explorations and surface exposures. Variations may exist between profile and actual conditions.

0 40 80
Horizontal and Vertical Scale in Feet

Sources: Existing contours generated from elevation contours provided by Group Mackenzie, 1/19/11. Proposed contours generated from elevation contours provided by Mackenzie, 6/7/16.

CJ Dens East Subdivision
Camas, Washington

Generalized Subsurface Conditions
Cross Section C-C'

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Figure
7

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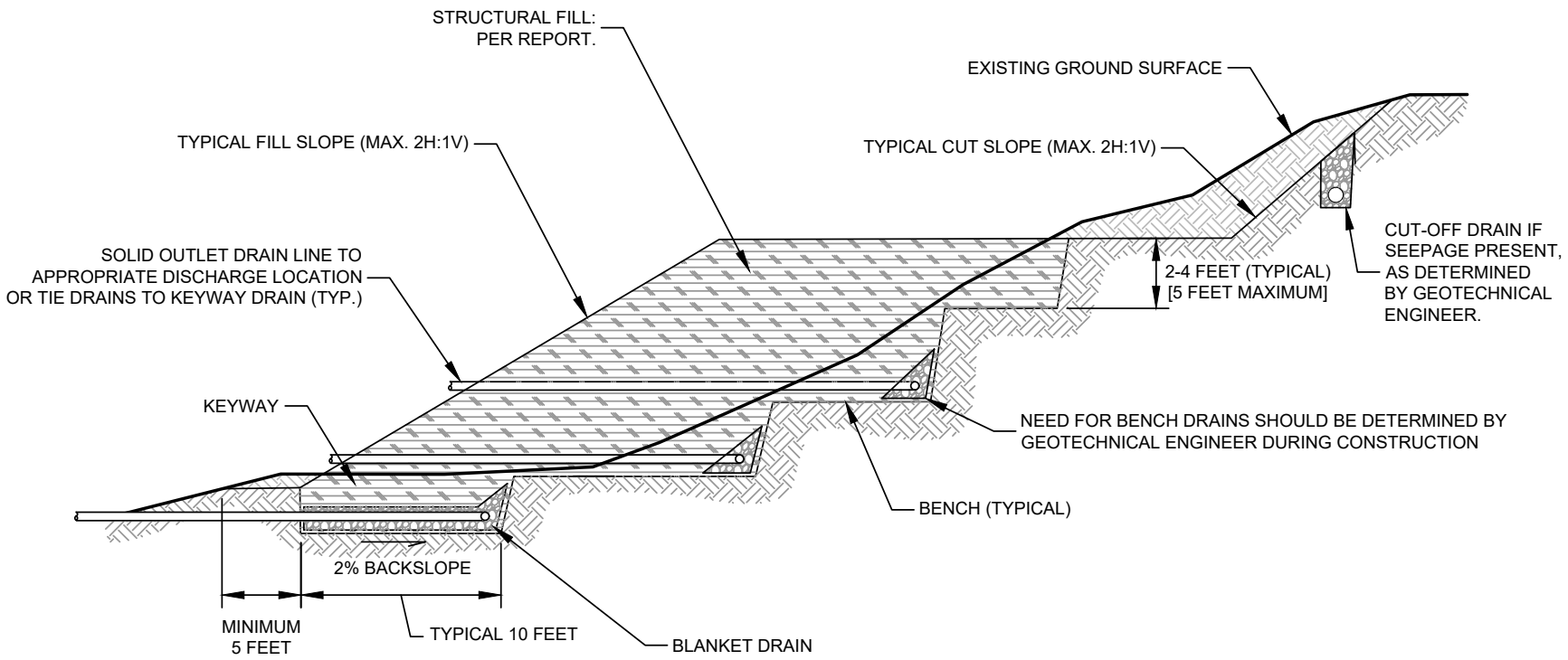
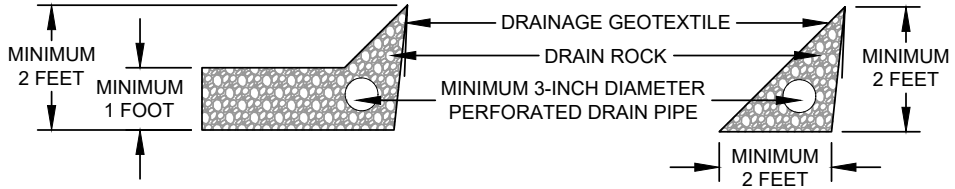


NOTES:
1. DRAWING IS NOT TO SCALE.
2. SLOPES AND PROFILES SHOWN ARE SCHEMATIC.
3. DRAWING REPRESENTS TYPICAL FILL AND CUT SLOPE SECTION, AND IS NOT SITE-SPECIFIC.

TYPICAL DRAIN SECTION DETAIL



CJ Dens East Subdivision
Camas, Washington

Typical Cut and Fill Slope Cross-Section

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HARTCROWSER
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Figure
8

ATTACHMENT A-1
2015 Field Explorations

KEY TO EXPLORATION LOGS

HARTCROWSER

SOIL CLASSIFICATION CHART

MATERIAL TYPES	MAJOR DIVISIONS		GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	GW	WELL-GRADED GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES, >12% FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	SW	WELL-GRADED SAND
			SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	CL	LEAN CLAY
			ML	SILT
		ORGANIC	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	CH	FAT CLAY
			MH	ELASTIC SILT
		ORGANIC	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS			PT	PEAT

Note: Multiple symbols are used to indicate borderline or dual classifications

OTHER MATERIAL SYMBOLS

- Concrete
- Asphalt
- Topsoil

MOISTURE MODIFIERS

- Dry - Absence of moisture, dusty, dry to the touch
- Moist - Damp, but no visible water
- Wet - Visible free water or saturated, usually soil is obtained from below the water table

SEEPAGE MODIFIERS

- None -
- Slow - < 1 gpm
- Moderate - 1-3 gpm
- Heavy - > 3 gpm

CAVING MODIFIERS

- None -
- Minor - isolated
- Moderate - frequent
- Severe - general

MINOR CONSTITUENTS

- Trace - < 5% (silt/clay)
- Occasional - < 15% (sand/gravel)
- With - 5-15% (silt/clay) in sand or gravel
  15-30% (sand/gravel) in silt or clay

SAMPLE TYPES

- Dames & Moore
- Standard Penetration Test (SPT)
- Shelby Tube
- Bulk or Grab

LABORATORY/ FIELD TESTS

- ATT - Atterberg Limits
- CP - Laboratory Compaction Test
- CA - Chemical Analysis (Corrosivity)
- CN - Consolidation
- DD - Dry Density
- DS - Direct Shear
- HA - Hydrometer Analysis
- OC - Organic Content
- PP - Pocket Penetrometer (TSF)
- P200 - Percent Passing No. 200 Sieve
- SA - Sieve Analysis
- SW - Swell Test
- TV - Torvane Shear
- UC - Unconfined Compression

GROUNDWATER SYMBOLS

- Water Level (at time of drilling)
- Water Level (at end of drilling)
- Water Level (after drilling)

STRATIGRAPHIC CONTACT

- ——— Distinct contact between soil strata or geologic units
- – – – Gradual or approximate change between soil strata or geologic units

Notes:

Blowcount (N) is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted) per ASTM D-1586. See exploration log for hammer weight and drop.

When the Dames & Moore (D&M) sampler was driven with a 140-pound hammer (denoted on logs as D+M 140), the field blow counts (N-value) shown on the logs have been reduced by 50% to approximate SPT N-values.

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

Refer to the report text and exploration logs for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the exploration locations at the time the explorations were made. The logs are not warranted to be representative of the subsurface conditoins at other locations or times.

KEY TO EXPLORATION LOGS - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:48 - F:\NOTEBOOKS\11594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\11594802_EXPLORATIONS.GPJ

Figure A-1

KEY TO BEDROCK TERMS (1 of 2)
(WSDOT, 2014)

HARTCROWSER
8910 SW Gemini Drive
Beaverton, Oregon 97008

Weathered State of Rock

Term	Description	Grade
Fresh	No visible signs of rock material weathering; perhaps slight discoloration in major discontinuity surfaces.	I
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering, and may be somewhat weaker externally than in its fresh condition.	II
Moderately Weathered	Less than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as a continuous framework or as corestones.	III
Highly Weathered	More than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as discontinuous framework or as corestone.	IV
Completely Weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.	V
Residual Soil	All rock material is converted to soil. The mass structure and material fabric is destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI

Relative Rock Strength

Grade	Description	Field Identification	Uniaxial Compressive Strength
R0	Extremely Weak	Indented by thumbnail.	0.04 to 0.15 ksi
R1	Very Weak	Specimen crumbles under sharp blow with point of geological hammer, and can be cut with a pocket knife.	0.15 to 3.6 ksi
R2	Moderately Weak	Shallow cuts or scrapes can be made in a specimen with a pocket knife. Geological hammer point indents deeply with firm blow.	3.6 to 7.3 ksi
R3	Moderately Strong	Specimen cannot be scraped or cut with a pocket knife, shallow indentation can be made under firm blows from a hammer point.	7.3 to 15 ksi
R4	Strong	Specimen breaks with one firm blow from the hammer end of a geological hammer.	15 to 29 ksi
R5	Very Strong	Specimen requires many blows of a geological hammer to break intact sample.	Greater than 29 ksi

Discontinuities

Discontinuity Spacing		Discontinuity Condition	
Description	**Spacing**	**Condition**	**Description**
Very Widely Spaced	Greater than 10 feet.	Excellent Condition	Very rough surfaces, no separation, hard discontinuity wall.
Widely Spaced	3 to 10 feet.	Good Condition	Slightly rough surfaces, separation less than 0.05 inches, hard discontinuity wall.
Moderately Spaced	1 to 3 feet.	Fair Condition	Slightly rough surface, separation greater than 0.05 inches, soft discontinuity wall.
Closely Spaced	2 to 12 inches	Poor Condition	Slickensided surfaces, or soft gouge less than 0.2 inches thick, or open discontinuities 0.05 to 0.2 inches.
Very Closely Spaced	Less than 2 inches	Very Poor Condition	Soft gouge greater than 0.2 inches, or open discontinuities greater than 0.2 inches.

Figure A-2

KEY TO BEDROCK TERMS (2 of 2)
(WSDOT, 2014)

HARTCROWSER
8910 SW Gemini Drive
Beaverton, Oregon 97008

Grain Size

Grain Size	Description	Criteria
Less than 0.04 inches	Fine grained	Few crystal boundaries/ grains distinguishable in the field or with a hand lens.
0.04 to 0.2 inches	Medium grained	Most crystal boundaries/ grains distinguishable with the aid of a hand lens.
Greater than 0.2 inches	Coarse grained	Most crystal boundaries/ grains distinguishable with the naked eye.

Igneous Rock Textures

Texture	Grain Size
Pegmatitic	Very large; diameters greater than 0.8 in.
Phaneritic	Can be seen with the naked eye
Porphyritic	Grained of two widely different sizes
Aphanitic	Cannot be seen with the naked eye
Glassy	No grains present

Pyroclastic Rocks

Rock Name	Characteristics
Pyroclastic Breccia	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which *angular* pyroclasts predominate.
Agglomerate	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which *rounded* pyroclasts predominate.
Lapilli Tuff	Pyroclastic rock whose average pyroclast size is 0.08 to 2.5 inches.
Ash Tuff	Pyroclastic rock whose average pyroclast size is less than 0.08 inches.

Degree of Vesicularity

Designation	Percentage of Cavities (by volume) of Total Sample
Slightly Vesicular	5 to 10 Percent
Moderately Vesicular	10 to 25 Percent
Highly Vesicular	25 to 50 Percent
Scoriaceous	Greater than 50 Percent

OTHER TERMS:

Core Recover (CR) = the ratio of core recovered to the core run length expressed as a percentage.

Rock Quality Designation (RQD) = the percentage of rock core recovered in intact pieces of 4 inches or more in length in the length of a core run. Does not include mechanical breaks caused by drilling.

Fracture Frequency (FF) = the number of natural fractures per foot in the length of core recovered.

REFERENCE:

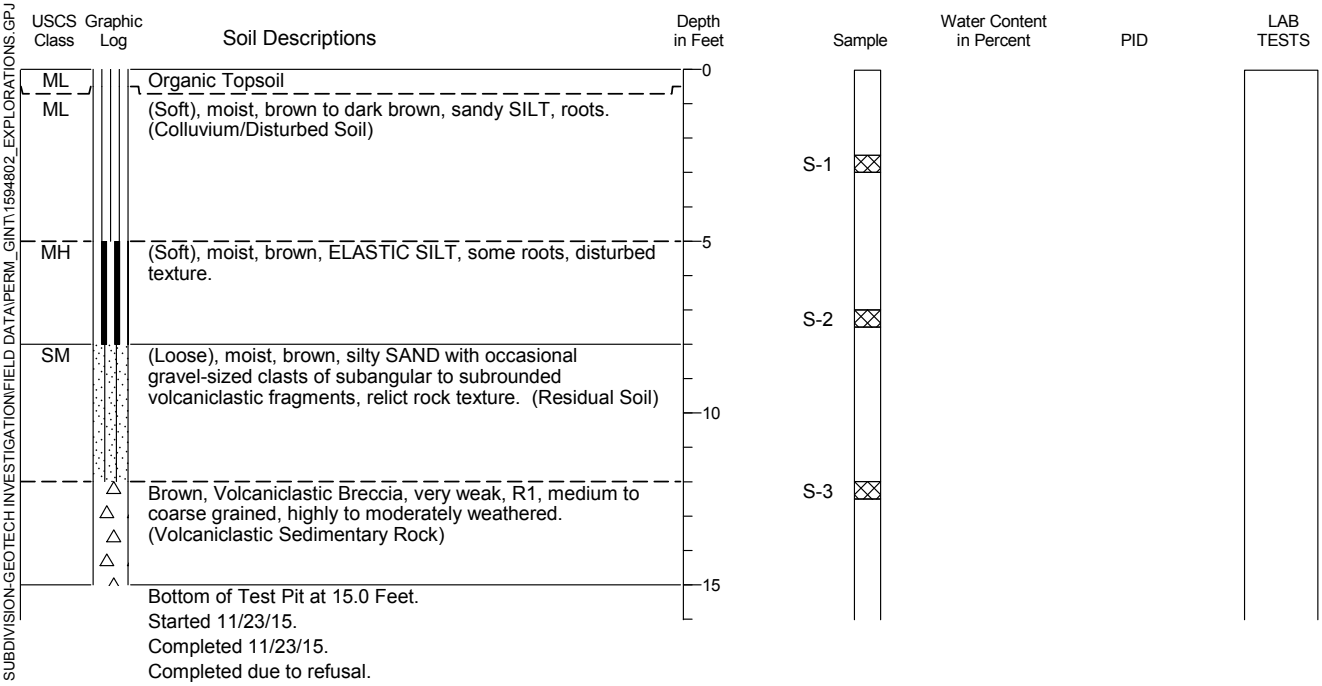
Washington State Department of Transportation (WSDOT), 2014. *Geotechnical Design Manual*, Publication M 46-03.02, August, 2014.

Figure A-2

Test Pit Log TP-1a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

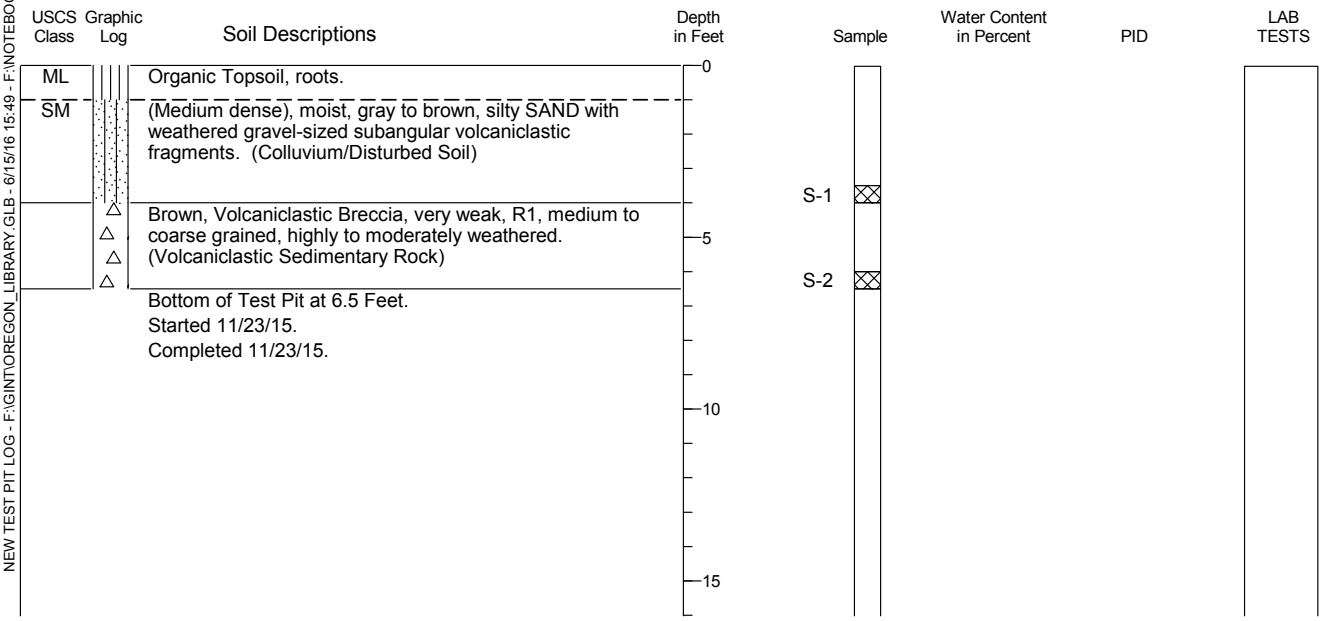
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-2a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

15948-02 12/15

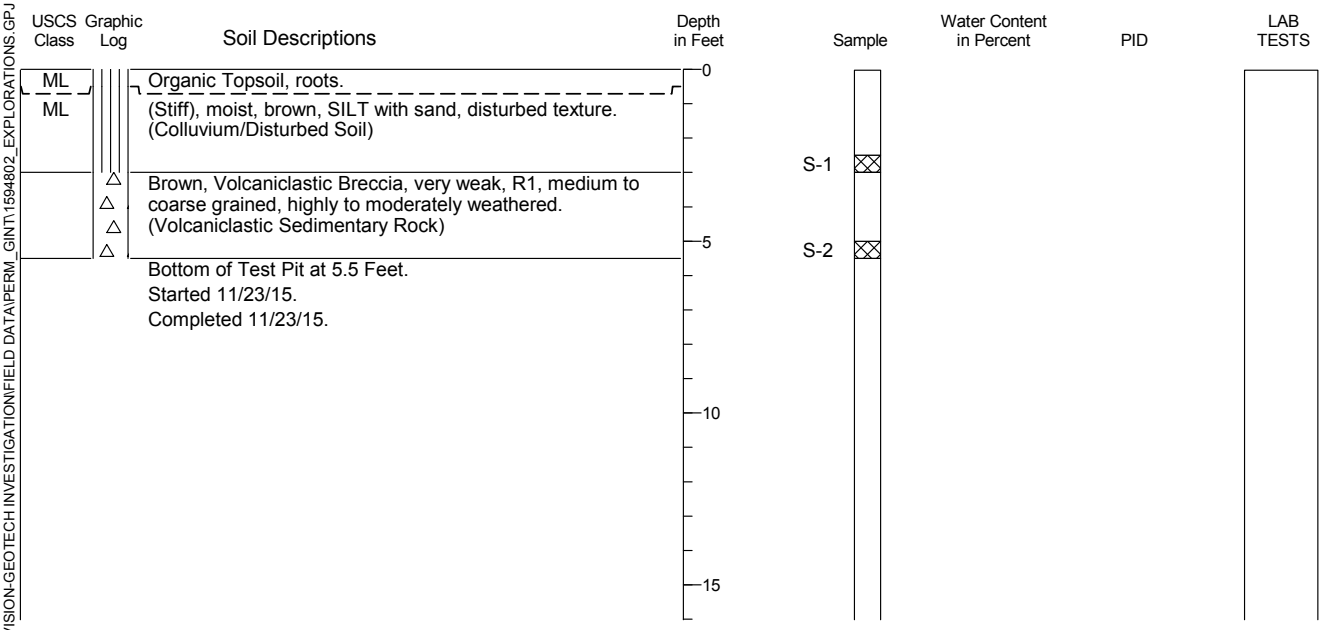
Figure A-3

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-3a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

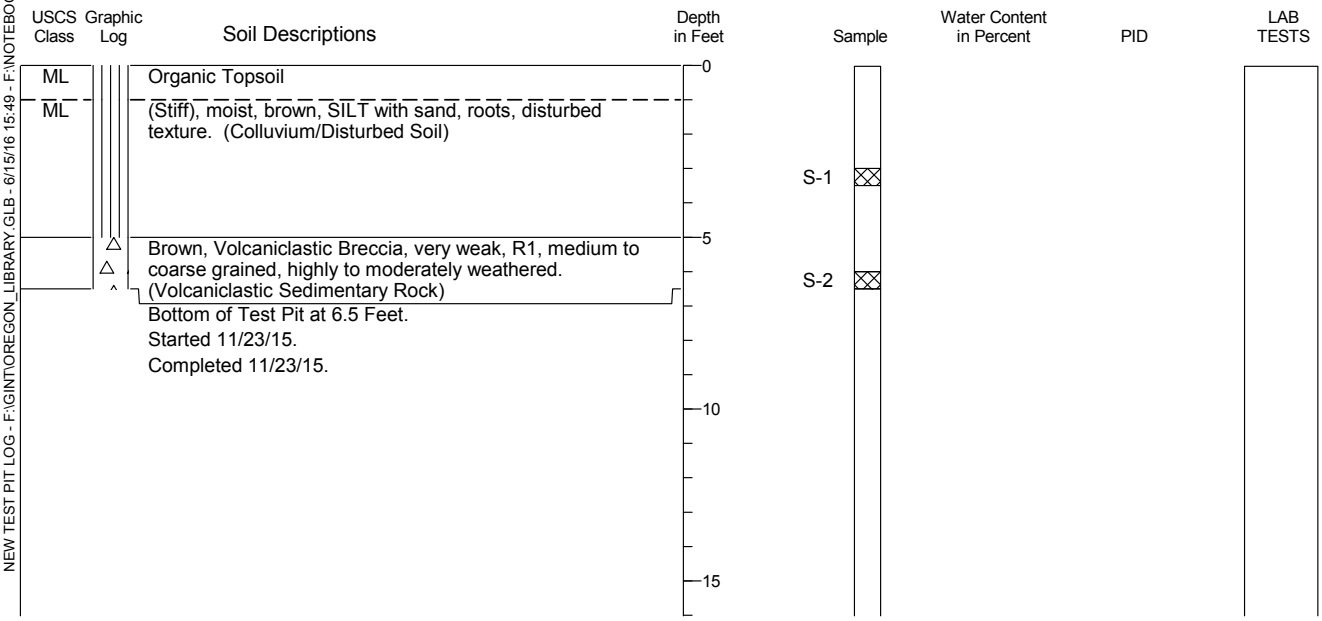
Horizontal Datum: N/A
Vertical Datum: N/A



Test Pit Log TP-4a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

15948-02 *12/15*

Figure A-4

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH IN\VESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-5a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
ML		Organic Topsoil, roots, dark brown.	0				
SM		(Loose), moist, brown to dark brown, silty SAND, roots, weathered residual soil fragments in fine-grained matrix. (Colluvium/Disturbed Soil)					
CL		(Medium stiff), moist, brown, LEAN CLAY with sand.		S-1			
			5				
SM		(Loose), moist, brown, silty SAND with hard gravel-sized clasts of subangular to subrounded volcaniclastic fragments, relict rock texture. (Residual Soil)		S-2			
			10				
				S-3			
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)		S-4			
		Bottom of Test Pit at 13.5 Feet.	15				
		Started 11/23/15.					
		Completed 11/23/15.					
		Completed due to refusal.					

Test Pit Log TP-6a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM/ML		(Loose to medium stiff), dark brown, moist, silty SAND to sandy SILT, roots.	0				
ML		(Medium stiff), moist, brown, SILT with sand, small roots, disturbed texture. (Colluvium/Disturbed Soil)					
		Abundant roots and rootlets from 3.0 to 4.0 feet.		S-1			
SM		(Medium dense to dense), moist, light brown to brown, silty SAND, relict rock texture. (Residual Soil)	5				
				S-2			
		Brown, Volcaniclastic Breccia, very weak, R1, medium to coarse grained, highly to moderately weathered. (Volcaniclastic Sedimentary Rock)		S-3			
		Bottom of Test Pit at 9.5 Feet.	10				
		Started 11/23/15.					
		Completed 11/23/15.					
		Completed due to refusal.					
			15				

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

15948-02 12/15

Figure A-5

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH IN\VESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-7a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM/ML		Organic Topsoil, roots.	0				
GM		(Loose), moist, brown, GRAVEL with silt and sand. (Colluvium)		S-1			
		Gray, Basaltic Andesite, moderately strong, R3, moderately to slightly weathered. (Basaltic Andesite of Elkhorn Mountain)		S-2			
		Bottom of Test Pit at 3.5 Feet.	5				
		Started 11/23/15.					
		Completed 11/23/15.					
		Completed due to refusal.	10				
			15				

Test Pit Log TP-8a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
SM/ML		Organic Topsoil, roots, dark brown.	0				
SM		(Loose), moist, brown, sandy SILT with angular to subangular gravel and cobbles. (Colluvium)		S-1			
		Gray, Basaltic Andesite, moderately strong, R3, moderately to slightly weathered. (Basaltic Andesite of Elkhorn Mountain)		S-2			
		Bottom of Test Pit at 3.5 Feet.	5				
		Started 11/23/15.					
		Completed 11/23/15.					
		Completed due to refusal.	10				
			15				

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

15948-02 12/15

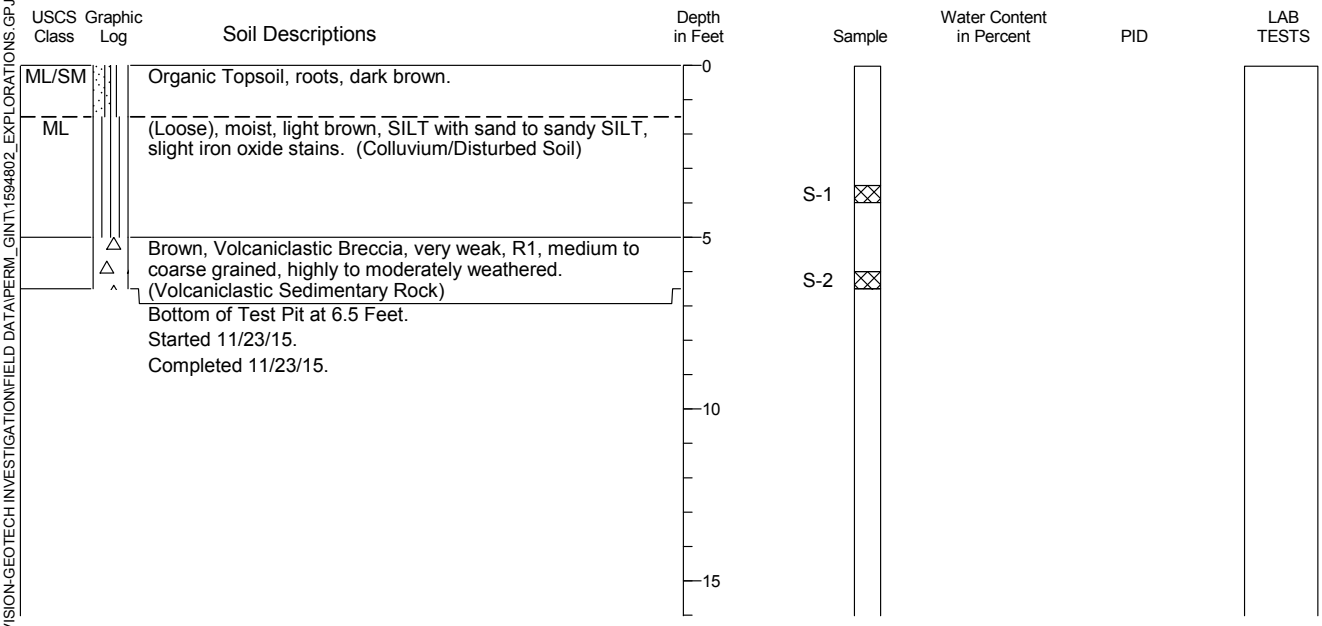
Figure A-6

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH IN\VESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

Test Pit Log TP-9a

Location: Camas, Washington
Approximate Ground Surface Elevation (feet): N/A
Logged By: A. Jones Reviewed By: R. Pirot

Horizontal Datum: N/A
Vertical Datum: N/A



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

15948-02 *12/15*

Figure A-7

NEW TEST PIT LOG - F:\GINT\OREGON_LIBRARY.GLB - 6/15/16 15:49 - F:\NOTEBOOKS\1594802_CAMAS SUBDIVISION-GEOTECH IN\VESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS.GPJ

ATTACHMENT A-2
2016 and later Field Explorations

Sample Description

Identification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. ASTM D 2488 visual-manual identification methods were used as a guide. Where laboratory testing confirmed visual-manual identifications, then ASTM D 2487 was used to classify the soils.

Relative Density/Consistency

Soil density/consistency in borings is related primarily to the standard penetration resistance (N). Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

SAND or GRAVEL Relative Density	N (Blows/Foot)	SILT or CLAY Consistency	N (Blows/Foot)
Very loose	0 to 4	Very soft	0 to 1
Loose	5 to 10	Soft	2 to 4
Medium dense	11 to 30	Medium stiff	5 to 8
Dense	31 to 50	Stiff	9 to 15
Very dense	>50	Very stiff	16 to 30
		Hard	>30

Moisture

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

USCS Soil Classification Chart (ASTM D 2487)

Major Divisions			Symbols Graph	Symbols USCS	Typical Descriptions
Coarse Grained Soils: More than 50% of Material Retained on No. 200 Sieve	Gravel and Gravelly Soils: More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravels (<5% fines)		GW	Well-Graded Gravel; Well-Graded Gravel with Sand
				GP	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Gravels (5-12% fines)		GW-GM	Well-Graded Gravel with Silt; Well-Graded Gravel with Silt and Sand
				GW-GC	Well-Graded Gravel with Clay; Well-Graded Gravel with Clay and Sand
				GP-GM	Poorly Graded Gravel with Silt; Poorly Graded Gravel with Silt and Sand
				GP-GC	Poorly Graded Gravel with Clay; Poorly Graded Gravel with Clay and Sand
		Gravels with Fines (>12% fines)		GM	Silty Gravel; Silty Gravel with Sand
				GC	Clayey Gravel; Clayey Gravel with Sand
	Sand and Sandy Soils: More than 50% of Coarse Fraction Passing No. 4 Sieve	Sands with few Fines (<5% fines)		SW	Well-Graded Sand; Well-Graded Sand with Gravel
				SP	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Sands (5-12% fines)		SW-SM	Well-Graded Sand with Silt Well-Graded Sand with Silt and Gravel
				SW-SC	Well-Graded Sand with Clay; Well-Graded Sand with Clay and Gravel
				SP-SM	Poorly Graded Sand with Silt; Poorly Graded Sand with Silt and Gravel
				SP-SC	Poorly Graded Sand with Clay; Poorly Graded Sand with Clay and Gravel
		Sands with Fines (>12% fines)		SM	Silty Sand; Silty Sand with Gravel
				SC	Clayey Sand; Clayey Sand with Gravel
Fine Grained Soils: More than 50% of Material Passing No. 200 Sieve	Silts			ML	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
				MH	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
	Silty Clay (based on Atterberg Limits)			CL-ML	Silty Clay; Silty Clay with Sand or Gravel; Gravelly or Sandy Silty Clay
	Clays			CL	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
				CH	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
	Organics			OL/OH	Organic Soil; Organic Soil with Sand or Gravel; Sandy or Gravelly Organic Soil
Highly Organic (>50% organic material)				PT	Peat - Decomposing Vegetation - Fibrous to Amorphous Texture

Minor Constituents

	Estimated Percentage
Sand, Gravel	
Trace	<5
Few	5 - 15
Cobbles, Boulders	
Trace	<5
Few	5 - 10
Little	15 - 25
Some	30 - 45

Soil Test Symbols

%F	Percent Passing No. 200 Sieve
AL	Atterberg Limits (%)
	Liquid Limit (LL)
	Water Content (WC)
	Plastic Limit (PL)
CA	Chemical Analysis
CAUC	Consolidated Anisotropic Undrained Compression
CAUE	Consolidated Anisotropic Undrained Extension
CBR	California Bearing Ratio
CIDC	Consolidated Drained Isotropic Triaxial Compression
CIUC	Consolidated Isotropic Undrained Compression
CK0DC	Consolidated Drained k0 Triaxial Compression
CK0DSS	Consolidated k0 Undrained Direct Simple Shear
CK0UC	Consolidated k0 Undrained Compression
CK0UE	Consolidated k0 Undrained Extension
CRSCN	Constant Rate of Strain Consolidation
DS	Direct Shear
DSS	Direct Simple Shear
DT	In Situ Density
GS	Grain Size Classification
HYD	Hydrometer
ILCN	Incremental Load Consolidation
K0CN	k0 Consolidation
kc	Constant Head Permeability
kf	Falling Head Permeability
MD	Moisture Density Relationship
OC	Organic Content
OT	Tests by Others
P	Pressuremeter
PID	Photoionization Detector Reading
PP	Pocket Penetrometer
SG	Specific Gravity
TRS	Torsional Ring Shear
TV	Torvane
UC	Unconfined Compression
UUC	Unconsolidated Undrained Triaxial Compression
VS	Vane Shear
WC	Water Content (%)

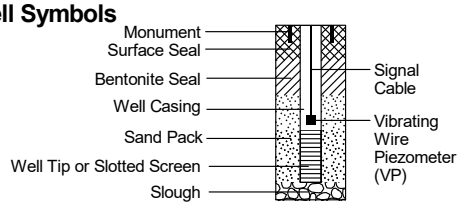
Groundwater Indicators

- Groundwater Level on Date or At Time of Drilling (ATD)
- Groundwater Level on Date Measured in Piezometer
- Groundwater Seepage (Test Pits)

Sample Symbols

- 1.5" I.D. Split Spoon
- 3.25" O.D. Split Spoon
- Modified California Sampler
- Rock Core Run
- Sonic Core
- Thin-walled Sampler
- Grab
- Cuttings
- Push Probe

Well Symbols



HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Key to Exploration Logs

Figure **A-8**
Sheet **1 of 1**

KEY TO EXP LOGS (SOIL ONLY) - F:\GINT\HC_LIBRARY.GLB - 11/2/20 18:32 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

KEY TO EXP LOGS (SOIL/ROCK) WSDOT-2 - F:\GINT\HC_LIBRARY.GLB - 11/2/20 19:29 - F:\NOTEBOOKS\1594802_CJ DENS SUBDIVISION-GEOTECH INVESTIGATION\FIELD DATA\PERM_GINT\1594802_EXPLORATIONS-EASTSUBDIVISION.GPJ - melissaschweitzer

Weathered State of Rock

Term	Description	Grade
Fresh	No visible signs of rock material weathering; perhaps slight discoloration in major discontinuity surfaces.	I
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering, and may be somwhat weaker externally than in its fresh condition	II
Moderately Weathered	Less than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as a continuous framework or as corestones.	III
Highly Weathered	More than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as discontinuous framework or as corestone.	IV
Completely Weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.	V
Residual Soil	All rock material is converted to soil. The mass structure and material fabric is destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI

Relative Rock Strength

Grade	Description	Field Identification	Uniaxial Compressive Strength
R0	Extremely Weak	Indented by thumbnail.	0.04 to 0.15 ksi
R1	Very Weak	Specimen crumbles under sharp blow with point of geological hammer, and can be cut with a pocket knife.	0.15 to 3.6 ksi
R2	Moderately Weak	Shallow cuts or scrapes can be made in a specimen with a pocket knife. Geological hammer point indents deeply with firm blow.	3.6 to 7.3 ksi
R3	Moderately Strong	Specimen cannot be scraped or cut with a pocket knife, shallow indentation can be made under firm blows from a hammer point.	7.3 to 15 ksi
R4	Strong	Specimen breaks with one firm blow from the hammer end of a geological hammer.	15 to 29 ksi
R5	Very Strong	Specimen requires many blows of a geological hammer to break intact sample.	Greater than 29 ksi

Discontinuities

Discontinuity Spacing		Discontinuity Condition	
Description	**Spacing**	**Condition**	**Description**
Very Widely Spaced	Greater than 10 feet	Excellent Condition	Very rough surfaces, no separation, hard discontinuity wall.
Widely Spaced	3 to 10 feet	Good Condition	Slightly rough surfaces, separation less than 0.05 inches, hard discontinuity wall.
Moderately Spaced	1 to 3 feet	Fair Condition	Slightly rough surface, separation greater than 0.05 inches, soft discontinuity wall.
Closely Spaced	2 to 12 inches	Poor Condition	Slickensided surfaces, or soft gouge less than 0.2 inches thick, or open discontinuities 0.05 to 0.2 inches.
Very Closely Spaced	Less than 2 inches	Very Poor Condition	Soft gouge greater than 0.2 inches, or open discontinuities greater than 0.2 inches.

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Grain Size

Grain Size	Description	Criteria
Less than 0.04 inches	Fine grained	Few crystal boundaries/grains distinguishable in the field or with a hand lens.
0.04 to 0.2 inches	Medium grained	Most crystal boundaries/ grains distinguishable with the aid of a hand lens.
Greater than 0.2 inches	Coarse grained	Most crystal boundaries/ grains distinguishable with the naked eye.

Igneous Rock Textures

Texture	Grain Size
Pegmatitic	Very large; diameters greater than 0.8 in.
Phaneritic	Can be seen with the naked eye
Porphyritic	Grained of two widely different sizes
Aphanitic	Cannot be seen with the naked eye
Glassy	No grains present

Pyroclastic Rocks

Rock Name	Characteristics
Pyroclastic Breccia	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which angular pyroclasts predominate.
Agglomerate	Pyroclastic rock whose average pyroclast size exceeds 2.5 inches and in which rounded pyroclasts predominate.
Lapilli Tuff	Pyroclastic rock whose average pyroclast size is 0.08 to 2.5 inches.
Ash Tuff	Pyroclastic rock whose average pyroclast size is less than 0.08 inches.

Degree of Vesicularity

Designation	Percentage of Cavities (by volume) of Total Sample
Slightly Vesicular	5 to 10 Percent
Moderately Vesicular	10 to 25 Percent
Highly Vesicular	25 to 50 Percent
Scoriaceous	Greater than 50 Percent

Other Terms:

Core Recover (CR) = the ratio of core recovered to the core run length expressed as a percentage.

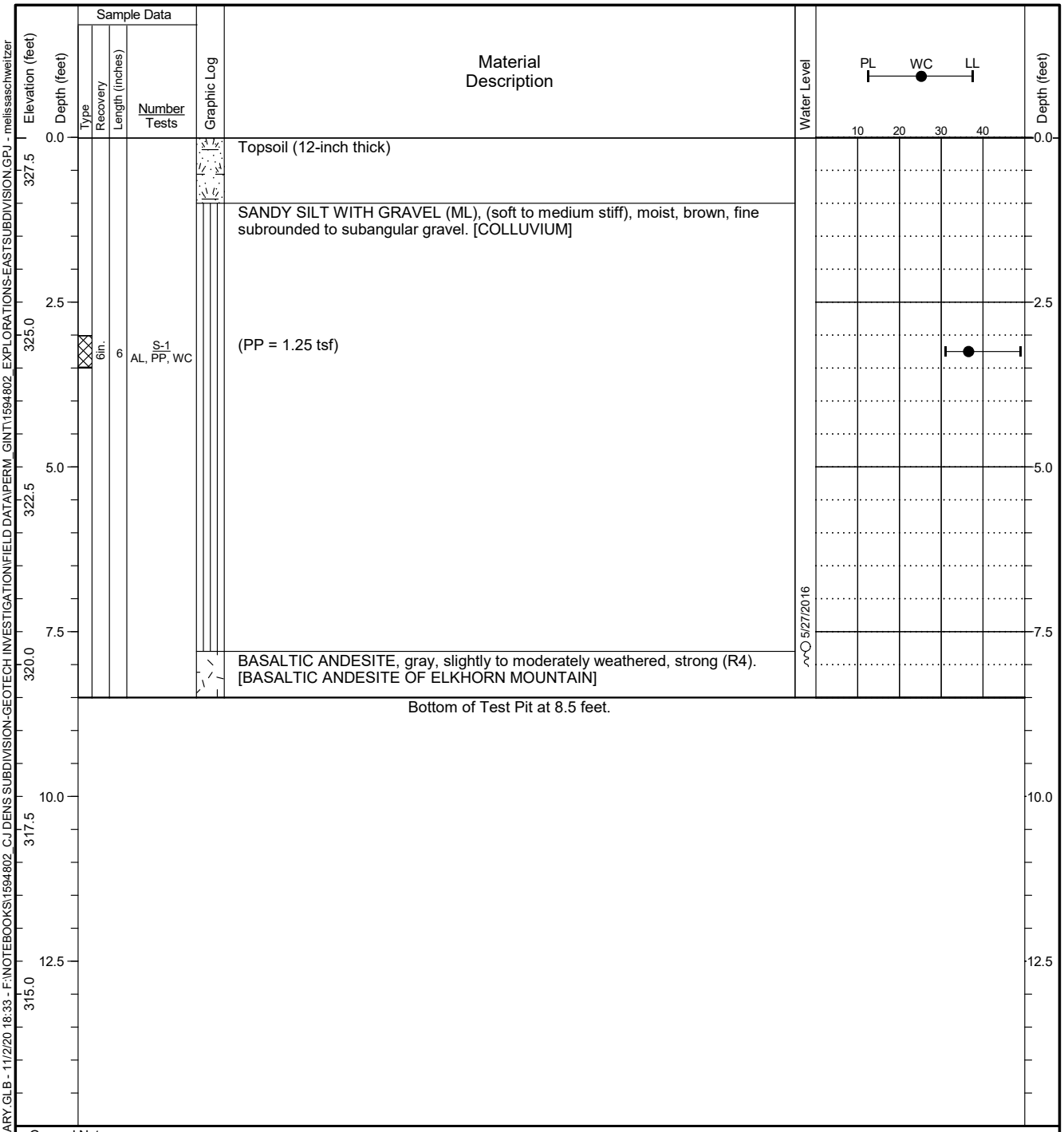
Rock Quality Designation (RQD) = the percentage of rock core recovered in intact pieces of 4 inches or more in length in the length of a core run. Does not include mechanical breaks caused by drilling.

Fracture Frequency (FF) = the number of natural fractures per foot in the length of core recovered.

Reference:

Washington State Department of Transportation (WSDOT), 2014. *Geotechnical Design Manual*, Publication M 46-03.10, August, 2014.

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614371 Long: -122.410712 (WGS 84) Total Depth: 8.5 feet Depth to Seepage: 7.8 feet
Ground Surface Elevation: 328 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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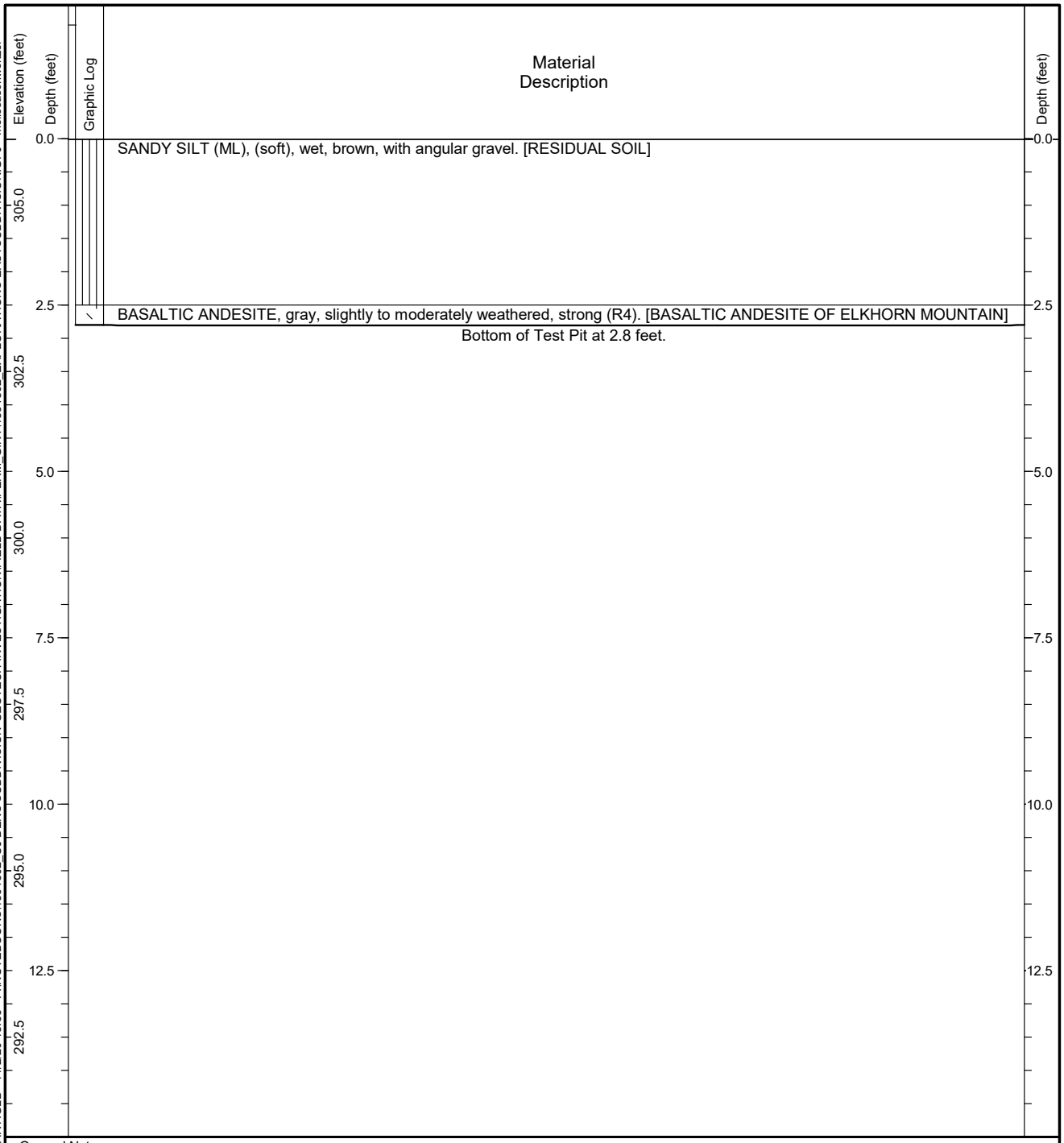
HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-1**	Figure **A-9** Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614228 Long: -122.411086 (WGS 84) Total Depth: 2.8 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 306 feet (NAVD 88)
Comments:



General Notes:
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3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-2

Figure **A-10**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614445 Long: -122.411925 (WGS 84) Total Depth: 3 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 280 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	WC (10 20 30 40)	Depth (feet)
280.0	0.0						Topsoil (6-inch thick)		0.0
							BASALTIC ANDESITE, gray, slightly to moderately weathered, strong (R4), closely spaced discontinuities, highly fractured from 0.5 to 1.0 feet. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]		
277.5	2.5		6in.	6	S-1 WC			●	2.5
							Bottom of Test Pit at 3.0 feet.		
275.0	5.0								5.0
272.5	7.5								7.5
270.0	10.0								10.0
267.5	12.5								12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-3

Figure **A-11**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615186 Long: -122.412964 (WGS 84) Total Depth: 2.6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 282 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
282.0	0.0		Topsoil (6-inch thick)	0.0
280.0	2.5		BASALTIC ANDESITE, gray, slightly to moderately weathered, strong (R4), moderately spaced discontinuities, highly fractured from 0.5 to 1.0 feet. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
			Bottom of Test Pit at 2.6 feet.	
277.5	5.0			5.0
275.0	7.5			7.5
272.5	10.0			10.0
270.0	12.5			12.5
267.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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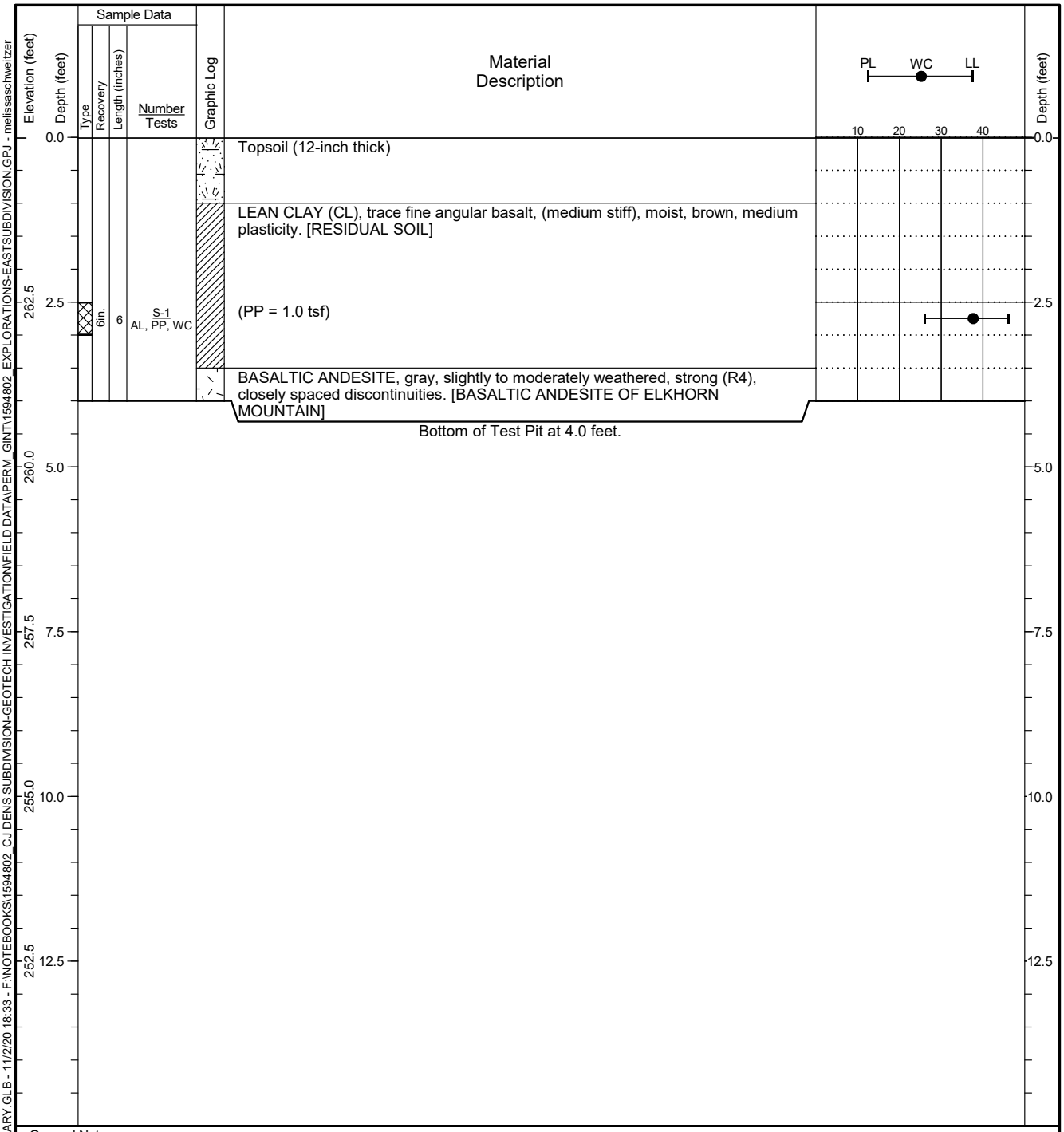
Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-4

Figure **A-12**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615400 Long: -122.413806 (WGS 84) Total Depth: 4 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 265 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-5

Figure **A-13**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614879 Long: -122.414485 (WGS 84) Total Depth: 2.3 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 258 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	WC (10 20 30 40)	Depth (feet)
257.5	0.0						Topsoil (6-inch thick)		0.0
							BASALTIC ANDESITE, brown to gray, moderately weathered, moderately weak (R2), closely spaced discontinuities, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]		
		3	6in.	4	S-1 WC			•	
255.0	2.5						Bottom of Test Pit at 2.3 feet.		2.5
252.5	5.0								5.0
250.0	7.5								7.5
247.5	10.0								10.0
245.0	12.5								12.5

General Notes:
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4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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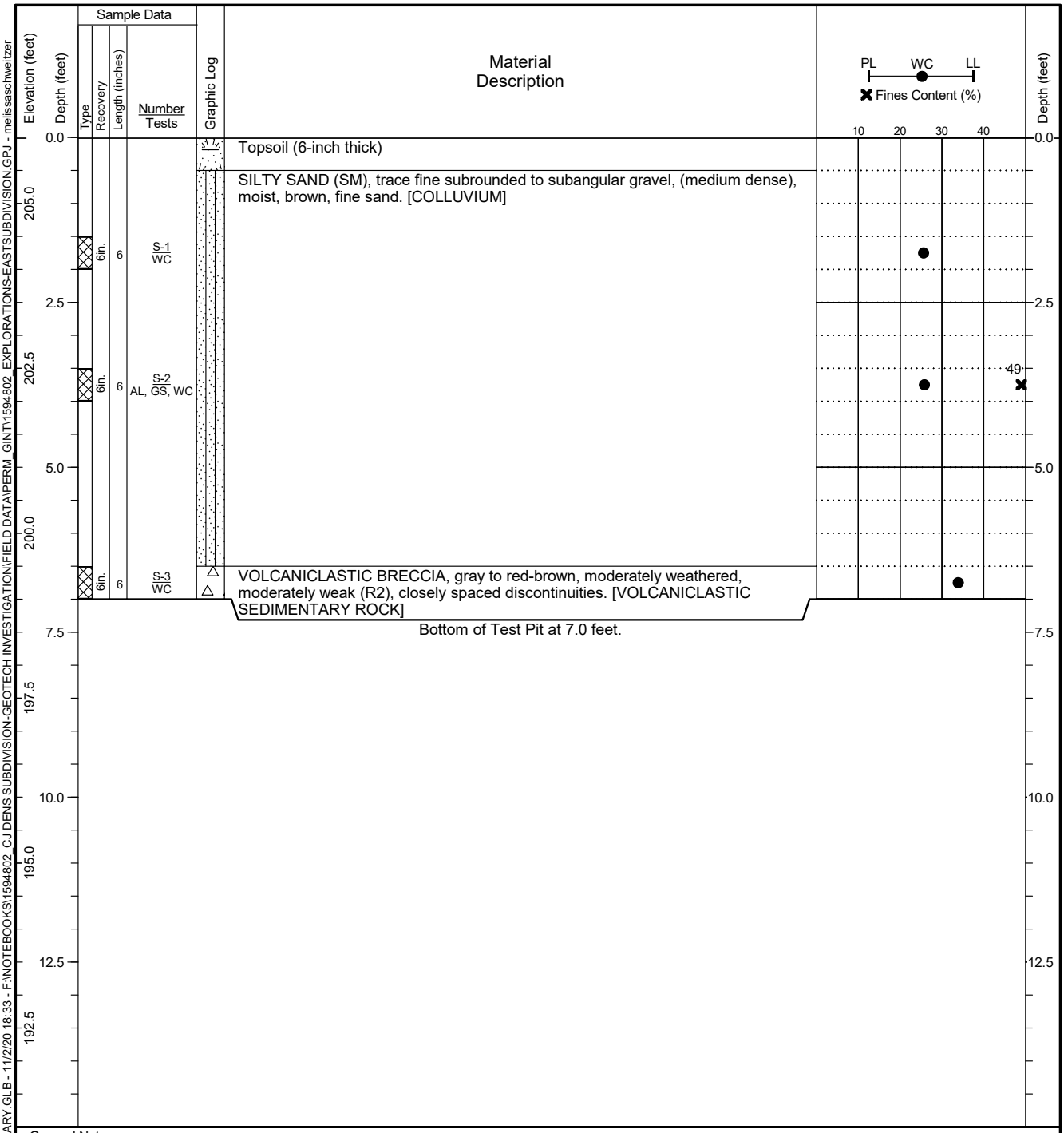
Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-6

Figure **A-14**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.613657 Long: -122.411810 (WGS 84) Total Depth: 7 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 206 feet (NAVD 88)
Comments:



General Notes:
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3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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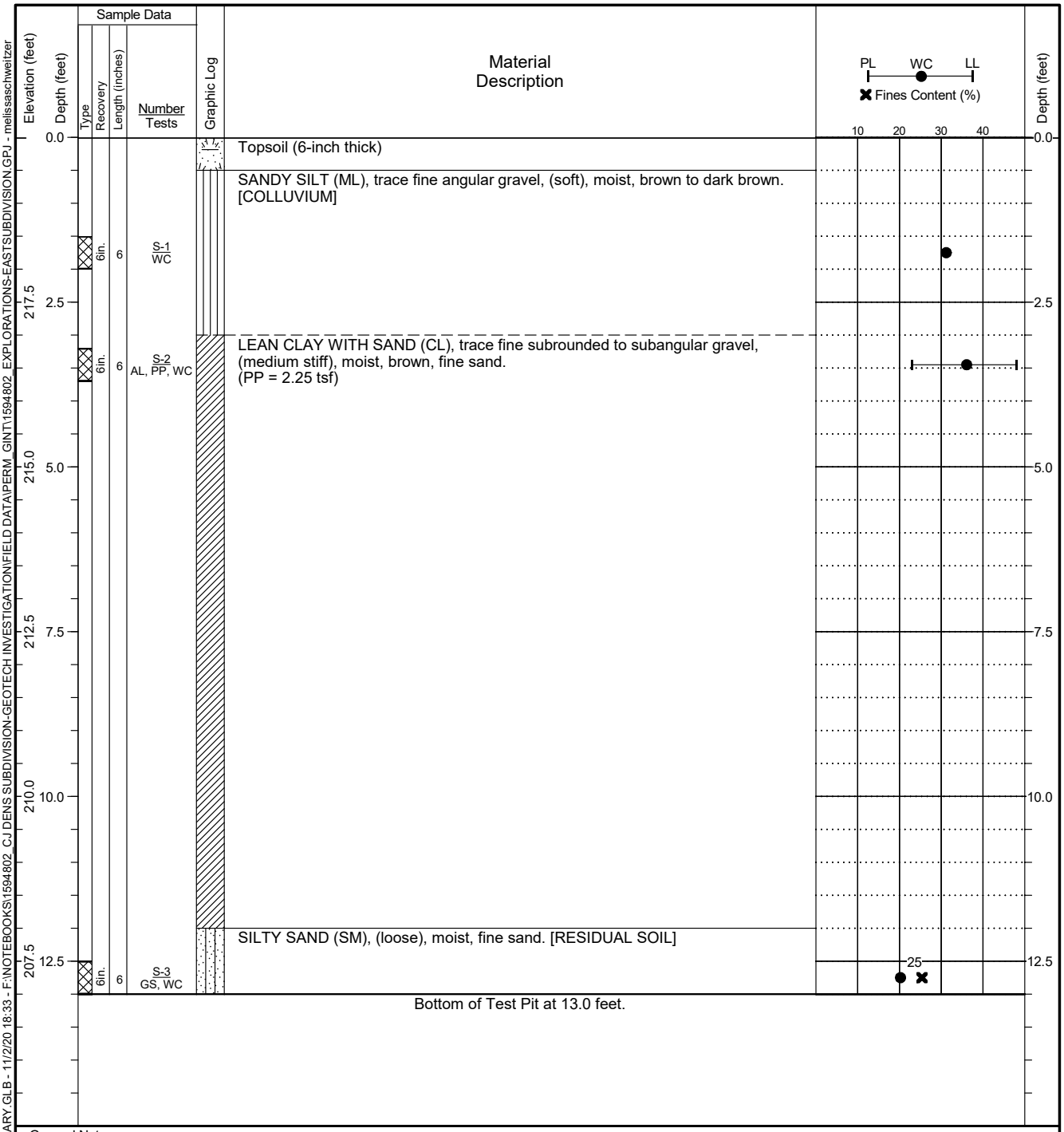
Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-7

Figure **A-15**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.613824 Long: -122.411764 (WGS 84) Total Depth: 13 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 220 feet (NAVD 88)
Comments:



General Notes:
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3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-8

Figure **A-16**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614293 Long: -122.413752 (WGS 84) Total Depth: 7 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 204 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Sample Data: Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	WC (10 20 30 40)	Depth (feet)
202.5	0.0						Topsoil (6-inch thick)		0.0
							SILT WITH SAND (ML), trace angular gravel, (soft), moist, brown, fine sand, low plasticity. [COLLUVIUM]		
200.0	2.5								2.5
		6in.		6	S-1 / WC			●	
197.5	5.0	6in.		6	S-2		BASALTIC ANDESITE, gray to brown, moderately weathered, moderately weak (R2), closely spaced discontinuities. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]		5.0
							Bottom of Test Pit at 7.0 feet.		
195.0	7.5								7.5
192.5	10.0								10.0
190.0	12.5								12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
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4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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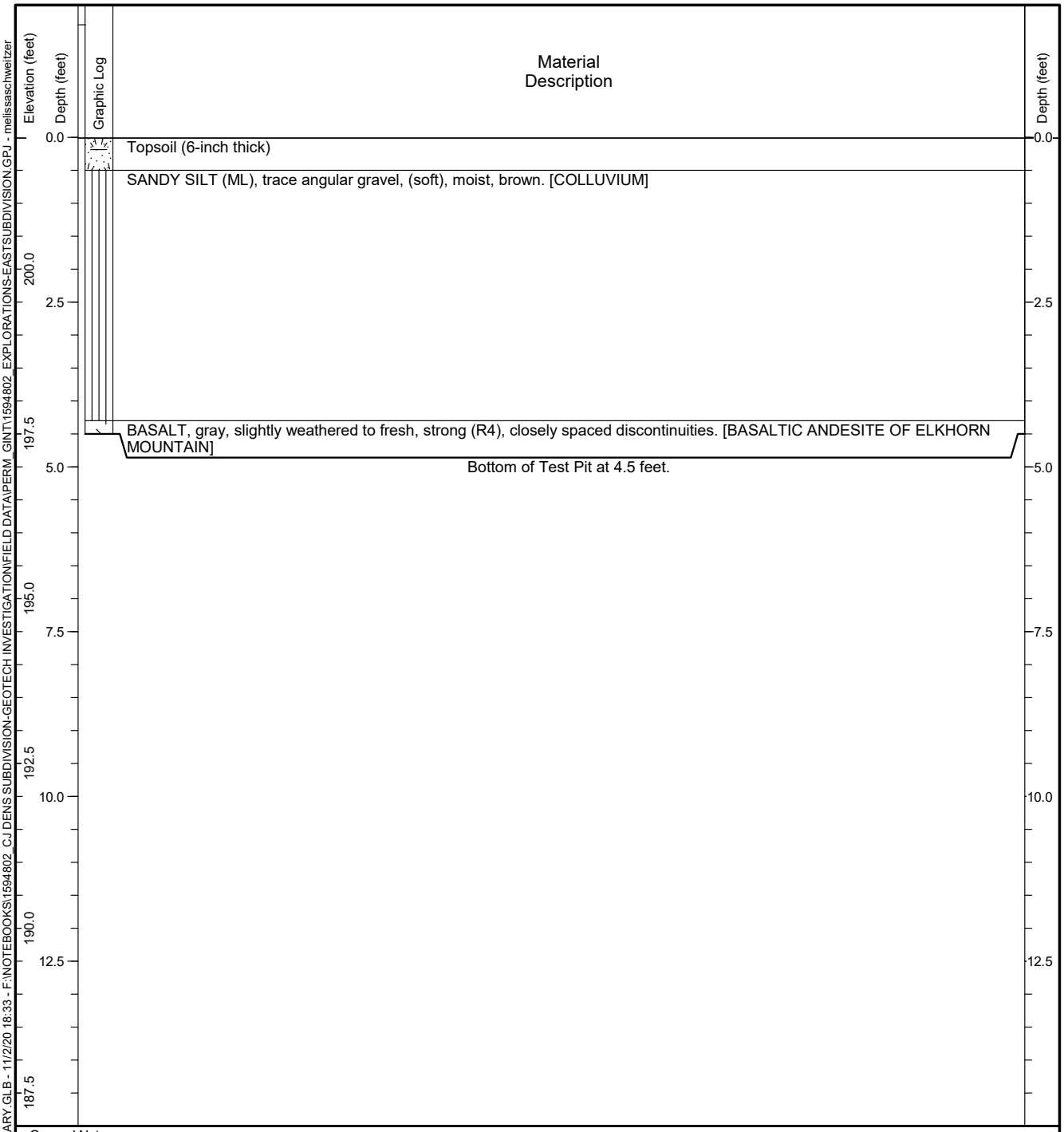
Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-9

Figure **A-17**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614351 Long: -122.414811 (WGS 84) Total Depth: 4.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 202 feet (NAVD 88)
Comments:



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3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-10

Figure **A-18**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615146 Long: -122.415074 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 258 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
257.5	0.0		Topsoil (6-inch thick)	0.0
			BASALTIC ANDESITE, gray, fresh to slightly weathered, strong (R4), closely spaced discontinuities. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
			Bottom of Test Pit at 2.0 feet.	
255.0	2.5			2.5
252.5	5.0			5.0
250.0	7.5			7.5
247.5	10.0			10.0
245.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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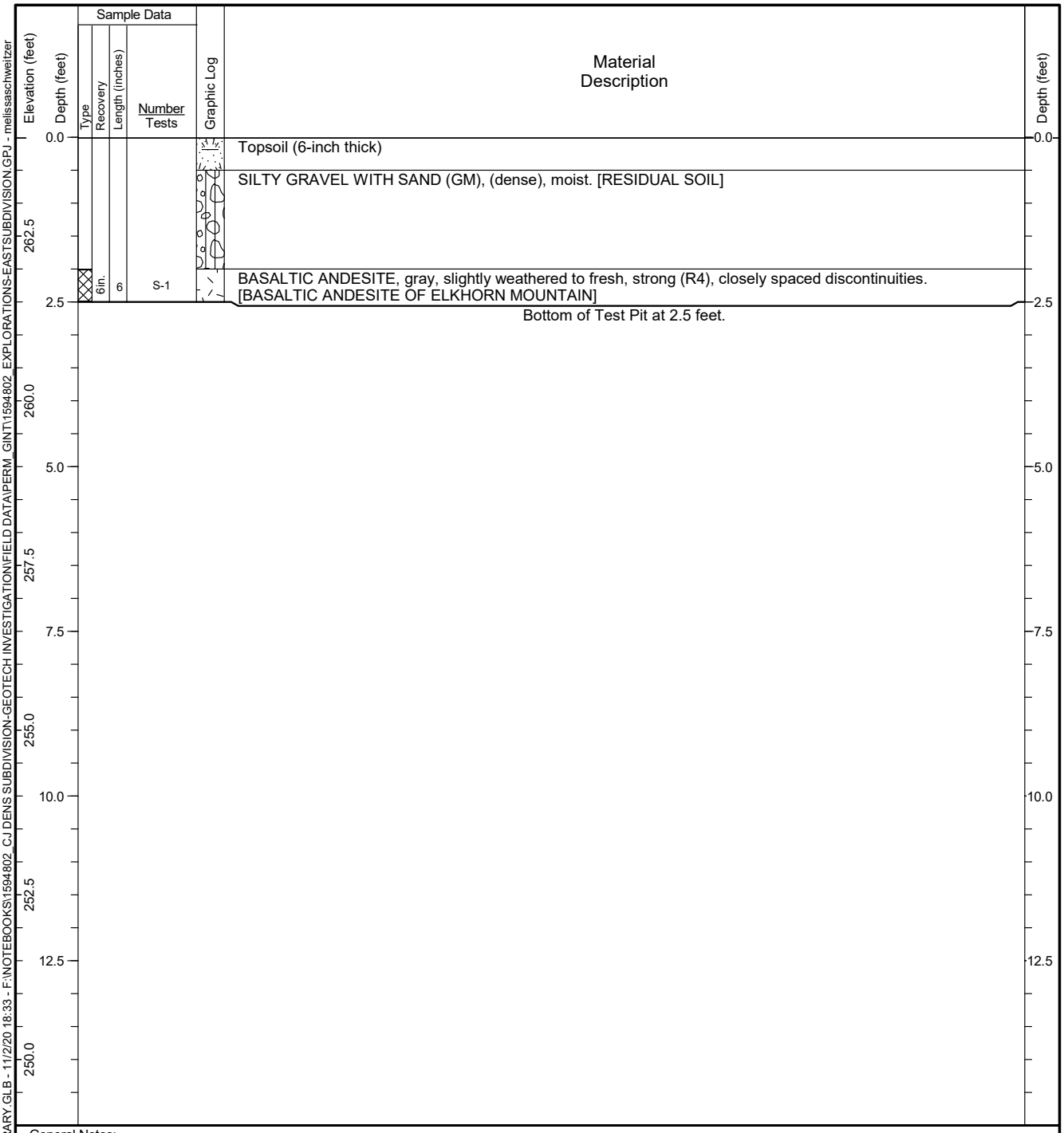
Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-11

Figure **A-19**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615521 Long: -122.415646 (WGS 84) Total Depth: 2.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 264 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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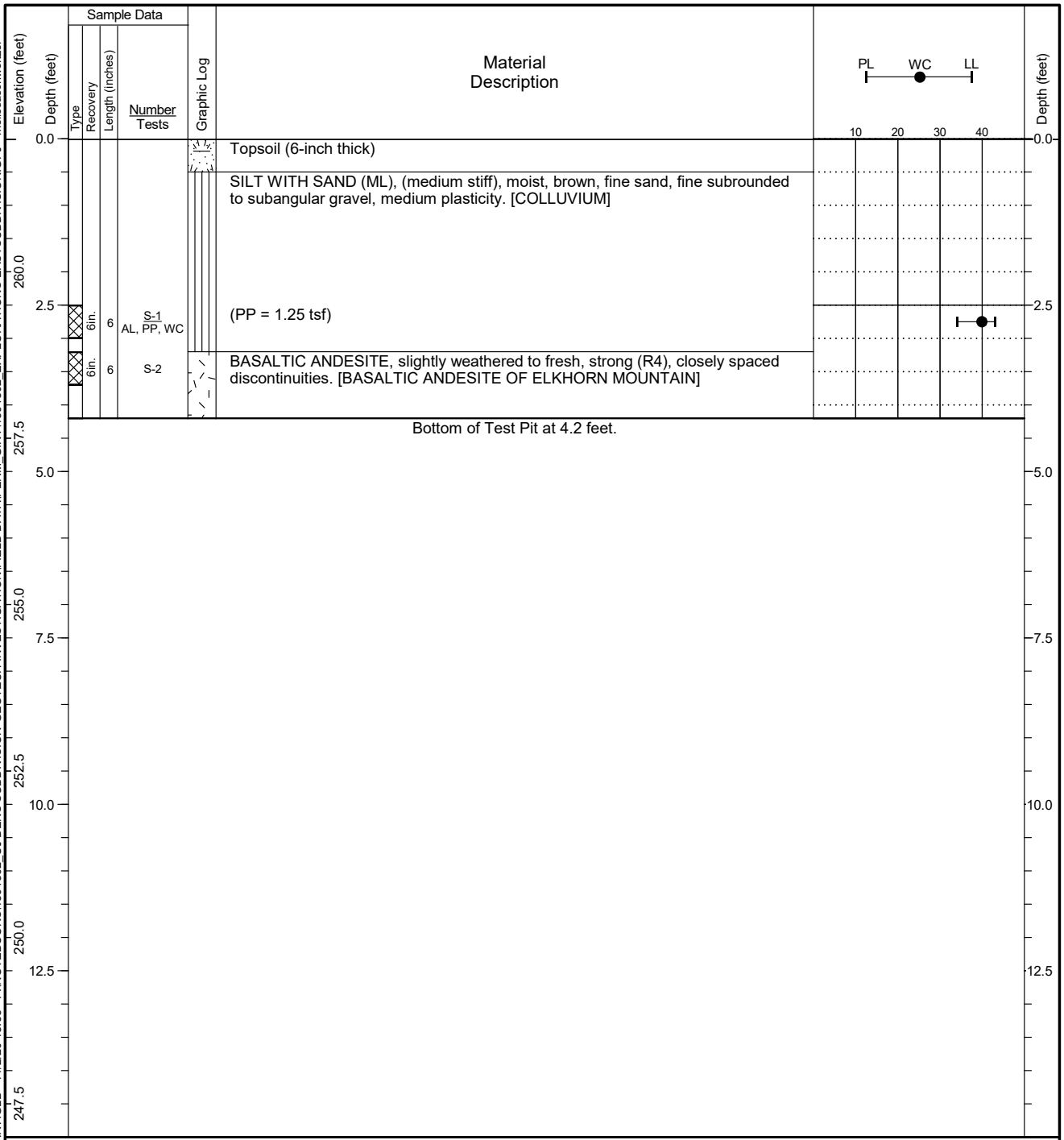
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-12

Figure **A-20**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615721 Long: -122.415296 (WGS 84) Total Depth: 4.2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 262 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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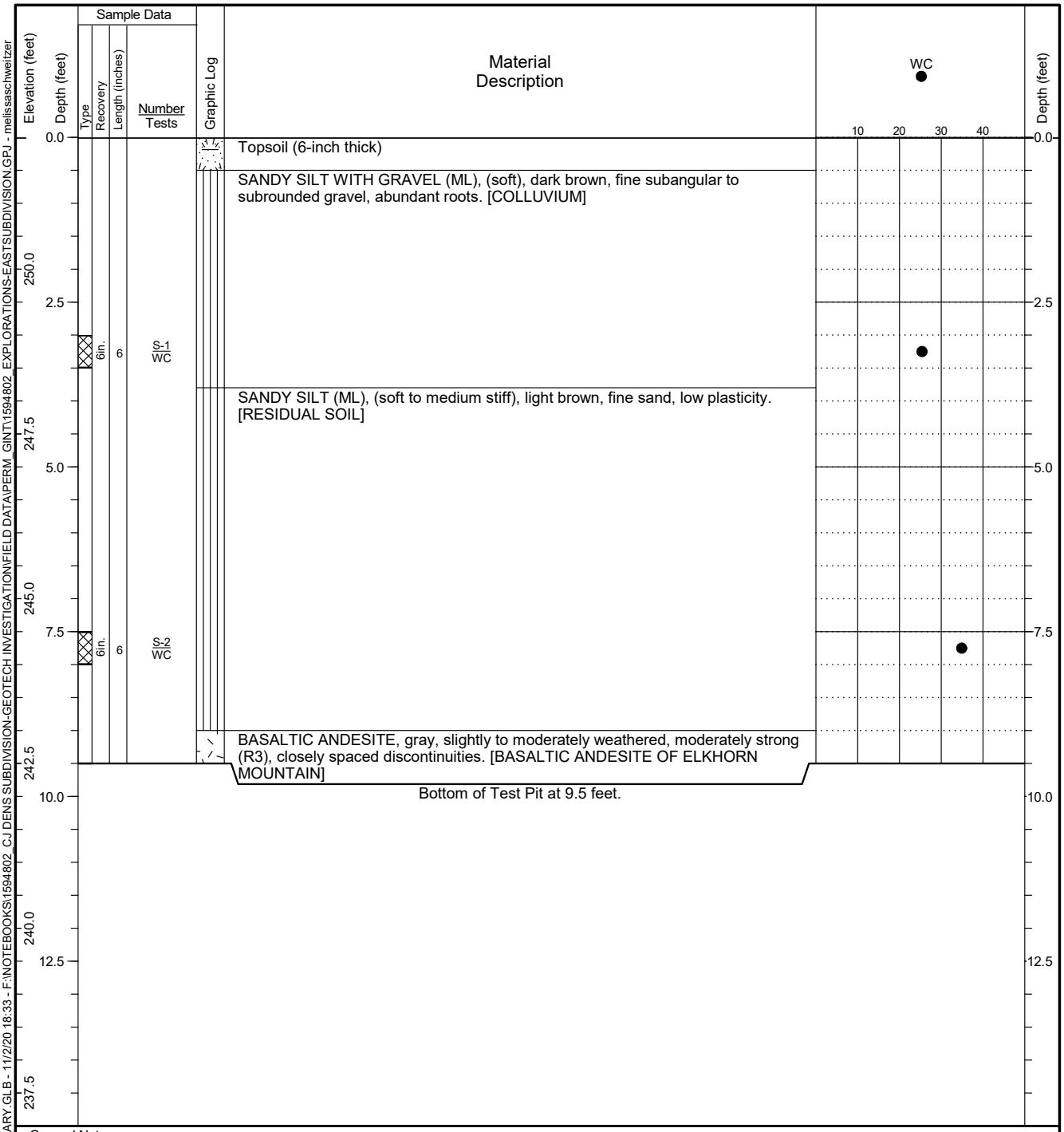
Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-13

Figure **A-21**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615912 Long: -122.415649 (WGS 84) Total Depth: 9.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 252 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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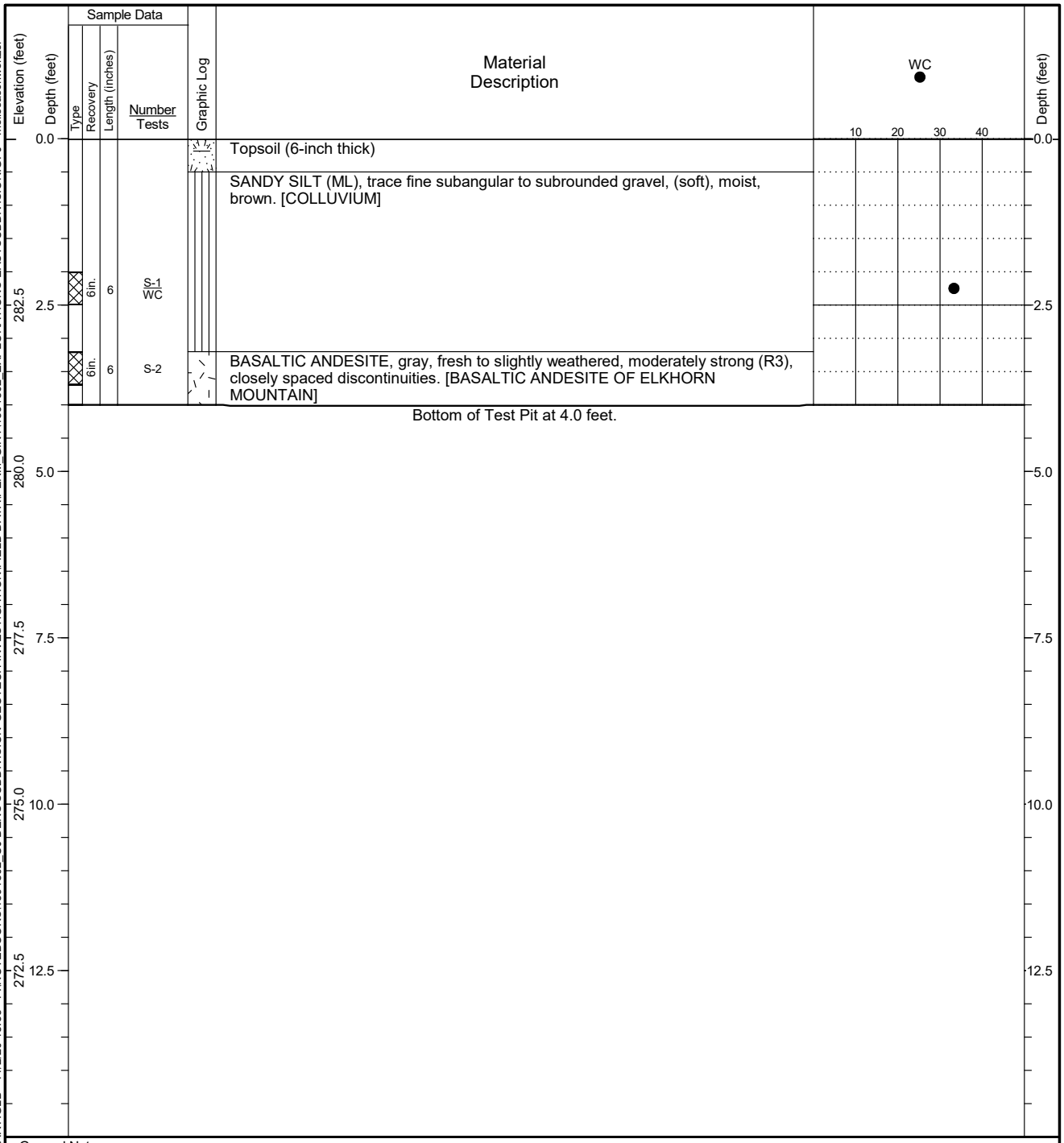
Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-14

Figure **A-22**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616057 Long: -122.414660 (WGS 84) Total Depth: 4 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 285 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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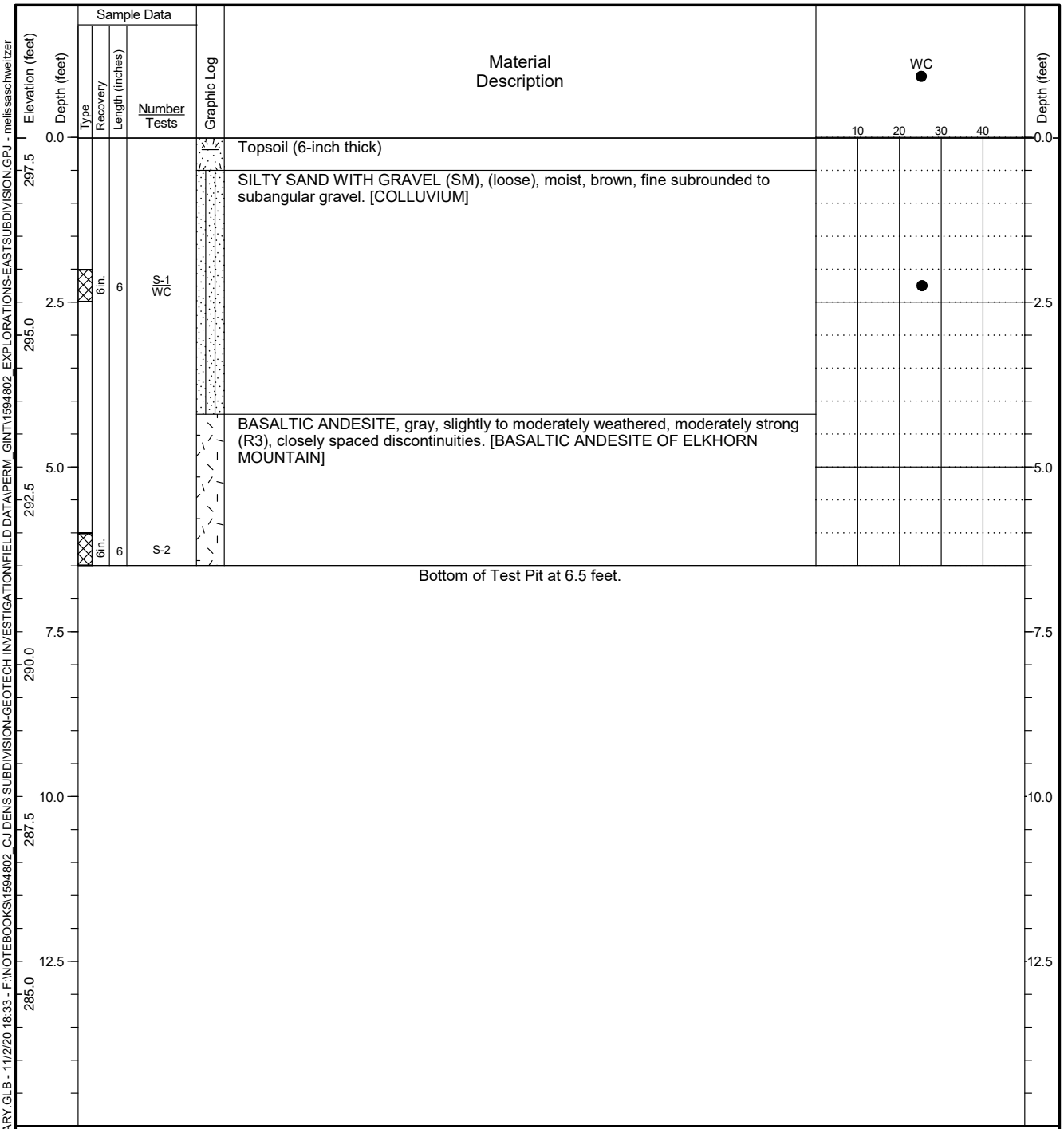
Figure **A-23**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616324 Long: -122.413767 (WGS 84) Total Depth: 6.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 298 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-16

Figure **A-24**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616322 Long: -122.411837 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 302 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
300.0	0.0		Topsoil (6-inch thick)	0.0
			BASALTIC ANDESITE, gray, fresh to slightly weathered, strong (R4), moderately spaced discontinuities. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
			Bottom of Test Pit at 2.0 feet.	
297.5	2.5			2.5
295.0	5.0			5.0
292.5	7.5			7.5
290.0	10.0			10.0
287.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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Figure **A-25**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616170 Long: -122.410459 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 310 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
	0.0		Topsoil (6-inch thick)	0.0
			BASALTIC ANDESITE, gray, fresh to slightly weathered, strong (R4), closely spaced discontinuities. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
			Bottom of Test Pit at 2.0 feet.	
307.5	2.5			2.5
305.0	5.0			5.0
302.5	7.5			7.5
300.0	10.0			10.0
297.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
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Test Pit Log
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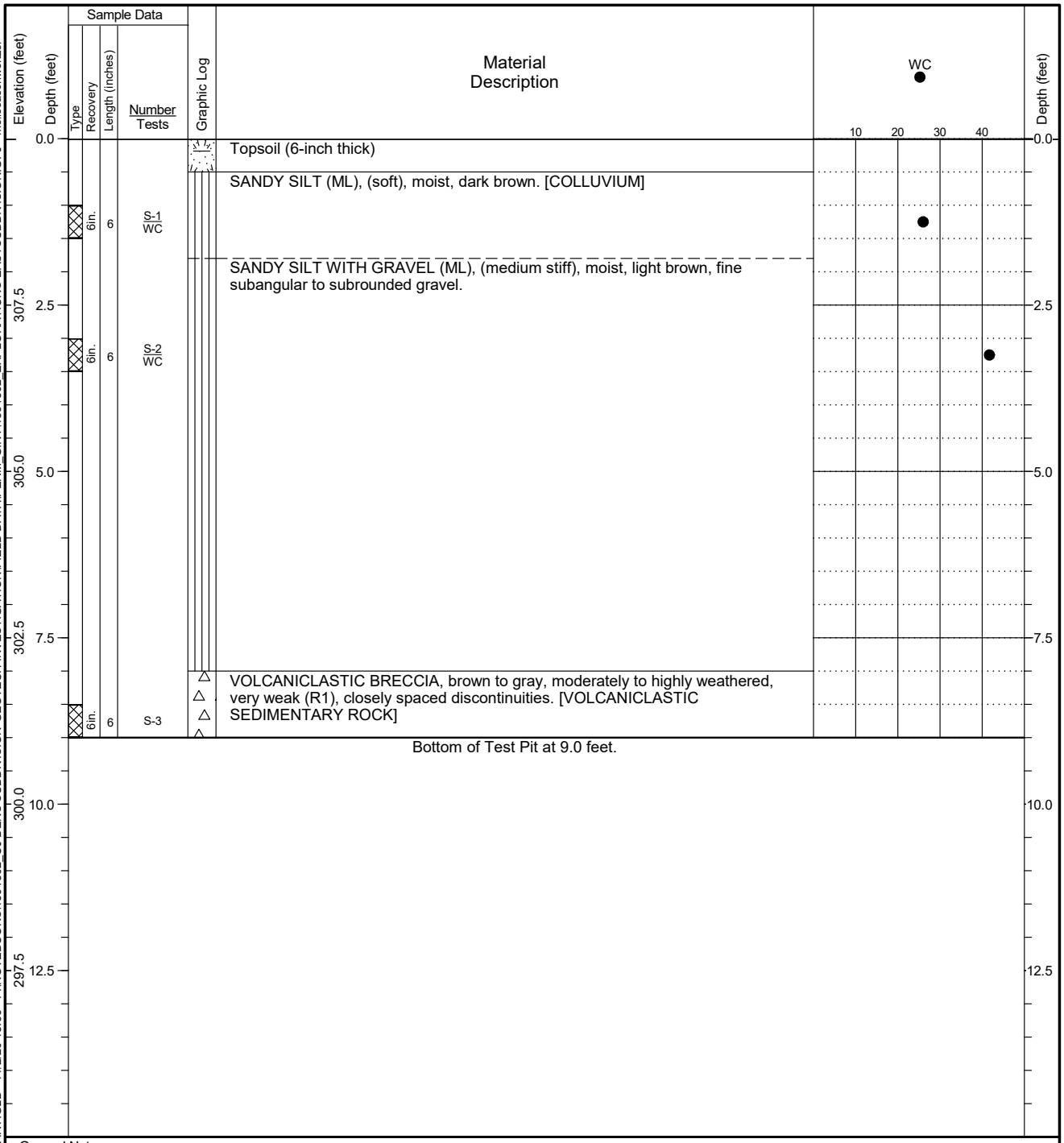
Figure **A-26**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616855 Long: -122.410170 (WGS 84) Total Depth: 9 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 310 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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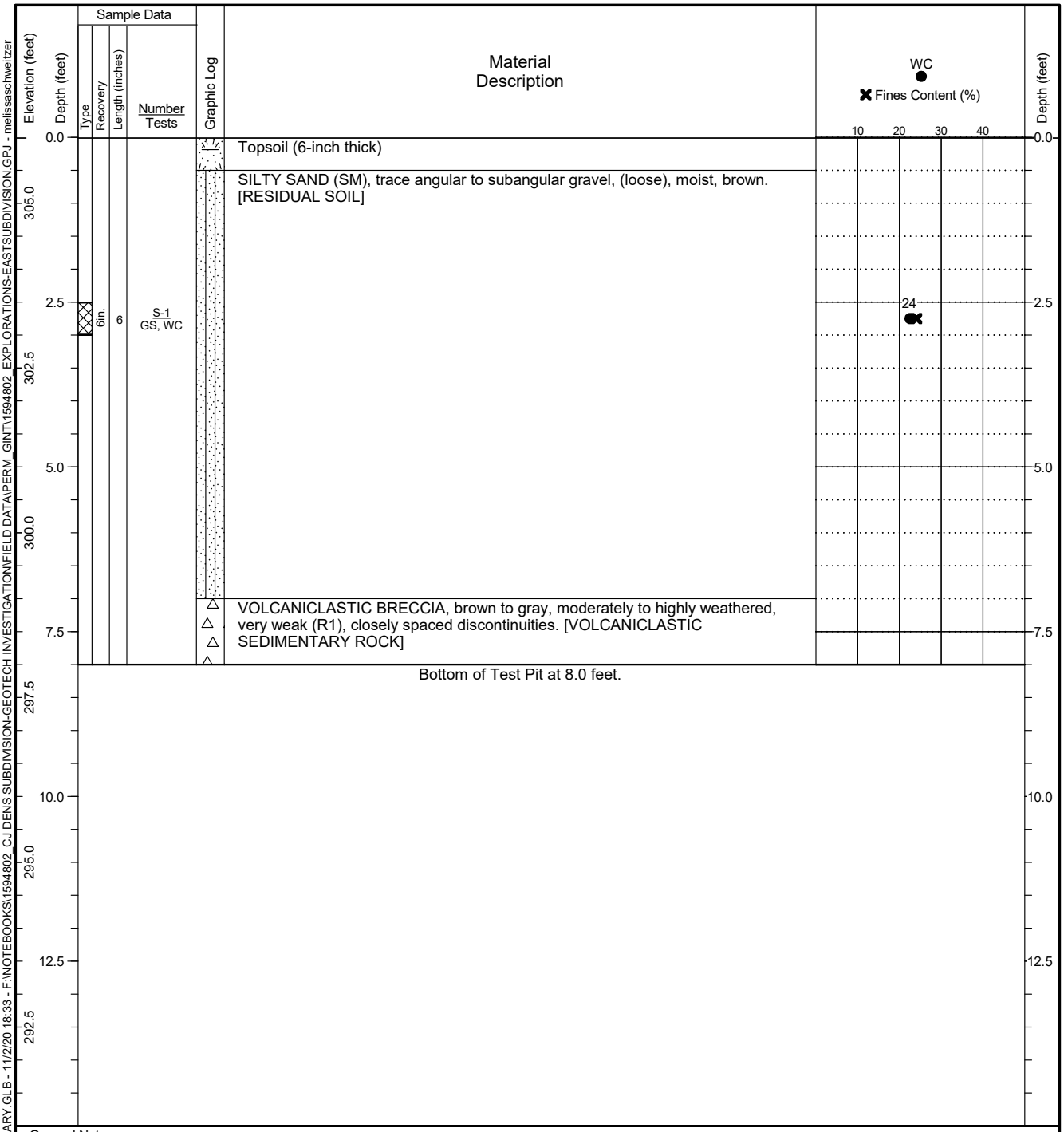
Figure **A-27**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616546 Long: -122.410071 (WGS 84) Total Depth: 8 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 306 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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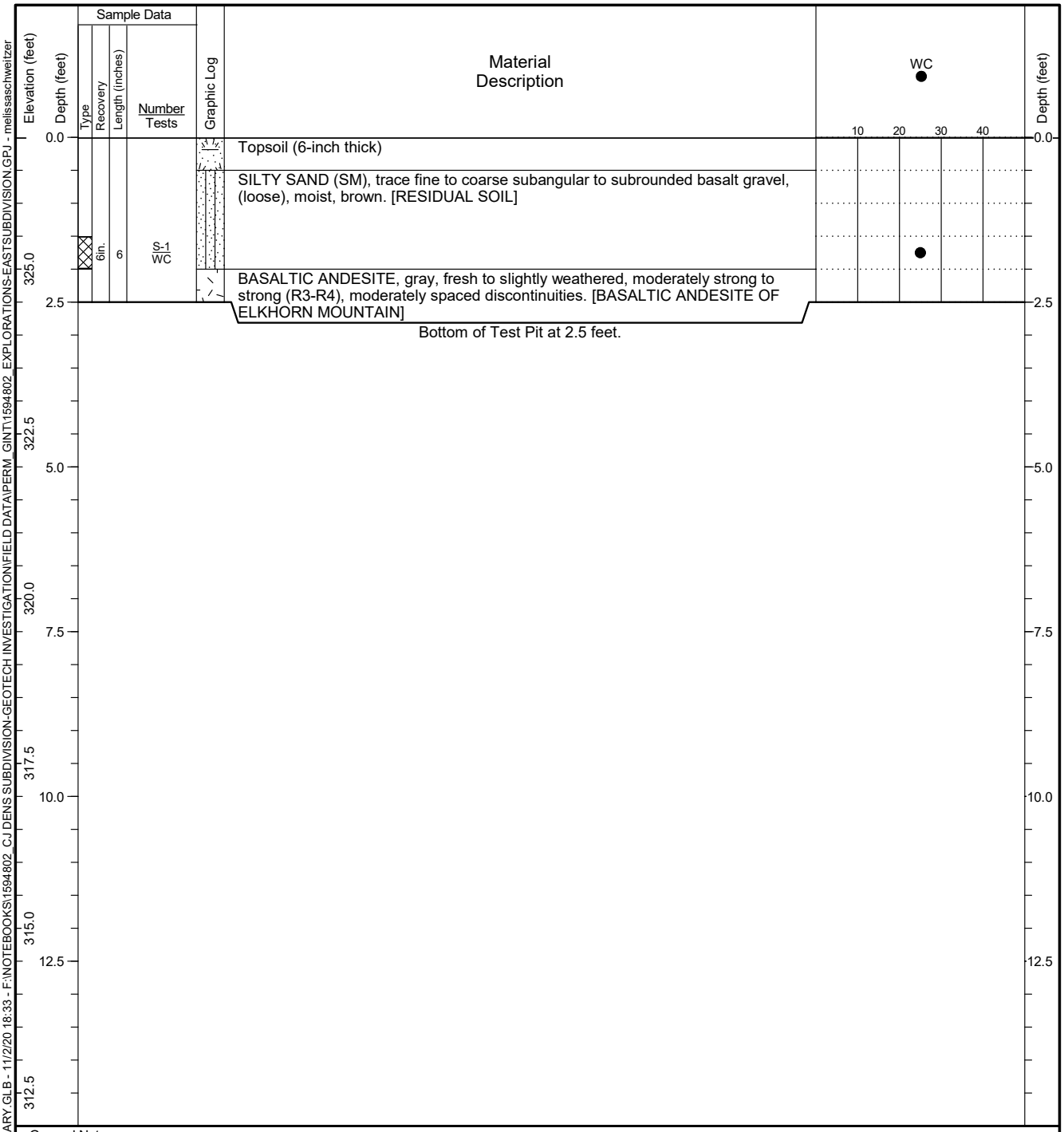
Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-20

Figure **A-28**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615457 Long: -122.410283 (WGS 84) Total Depth: 2.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 327 feet (NAVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
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4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
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Test Pit Log
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Figure **A-29**
Sheet **1 of 1**

Date Started: 5/27/16 Date Completed: 5/27/16 Contractor/Crew: Tapani, Inc.
Logged by: A. Jones Checked by: A. Pyrch Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614343 Long: -122.410129 (WGS 84) Total Depth: 2.6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 312 feet (NAVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
312.0	0.0		Topsoil (6-inch thick)	0.0
310.0	2.5		BASALTIC ANDESITE, gray, fresh to slightly weathered, strong (R4), closely spaced discontinuities, highly fractured and moderately weathered from 0.5 to 1.0 feet. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
			Bottom of Test Pit at 2.6 feet.	
307.5	5.0			5.0
305.0	7.5			7.5
302.5	10.0			10.0
300.0	12.5			12.5
297.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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Figure **A-30**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614550 Long: -122.409480 (WGS 84) Total Depth: 5.6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 323.57 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
323.5	0.0		Topsoil (8-inch thick)	0.0
			no rootlets observed below approximately 0.5 feet	
322.5			SILT (ML), (soft), moist, red-brown, low plasticity. [RESIDUAL SOIL]	
	2.5			2.5
320.0			BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
	5.0			5.0
			Refusal at 5.6 feet. Due to strong, BASALTIC ANDESITE	
317.5	7.5			7.5
315.0	10.0			10.0
312.5	12.5			12.5
310.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
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Test Pit Log
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Figure **A-31**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615000 Long: -122.409500 (WGS 84) Total Depth: 3.6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 328.65 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
	0.0		Topsoil (6-inch thick)	0.0
327.5			SILT (ML), (soft), moist, red-brown, low plasticity. [RESIDUAL SOIL] no rootlets observed below approximately 0.67 feet	
	2.5		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
325.0			Refusal at 3.6 feet. Due to strong, BASALTIC ANDESITE	
	5.0			5.0
322.5				
	7.5			7.5
320.0				
	10.0			10.0
317.5				
	12.5			12.5
315.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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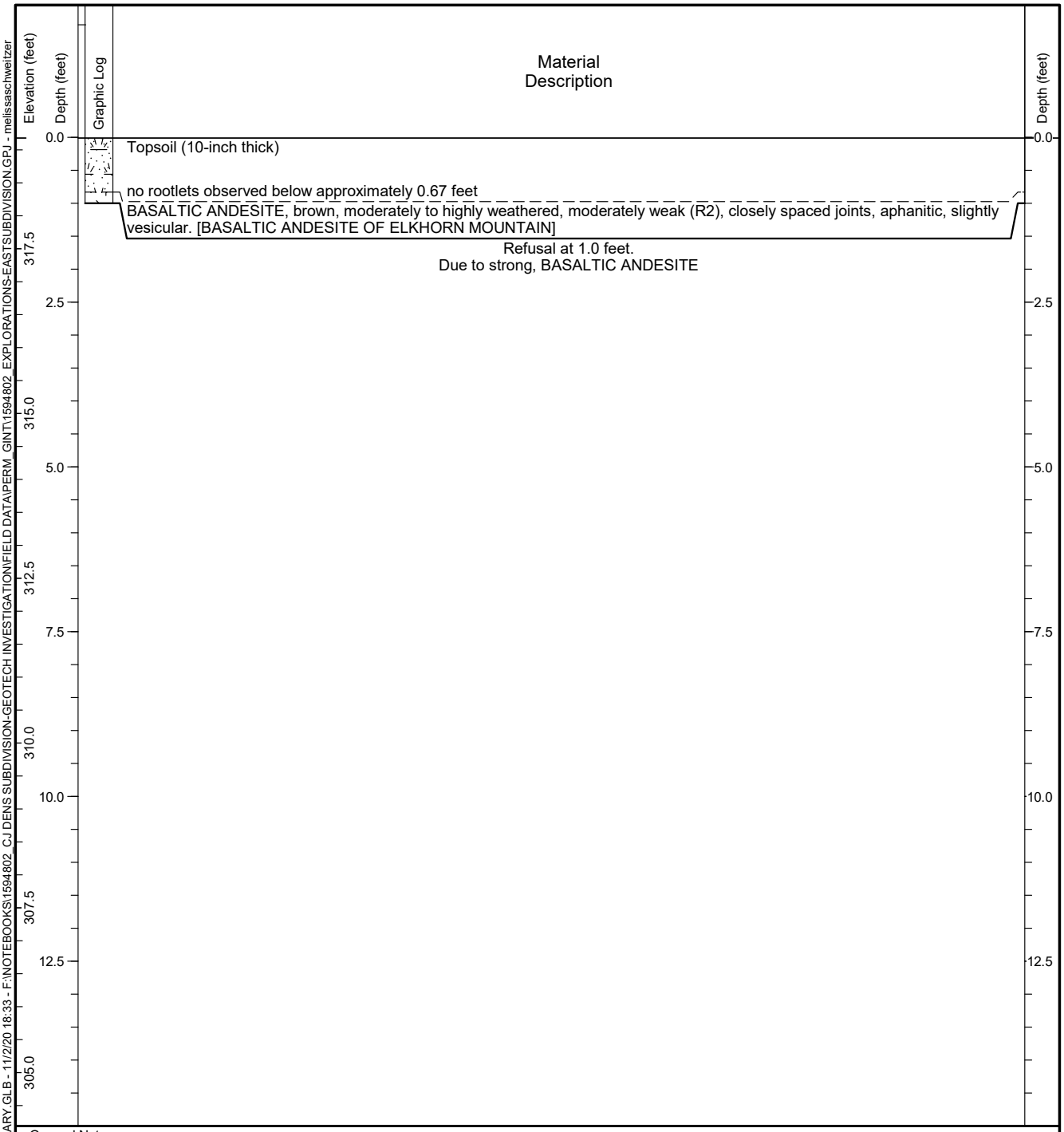
Figure **A-32**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614460 Long: -122.409850 (WGS 84) Total Depth: 1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 319.19 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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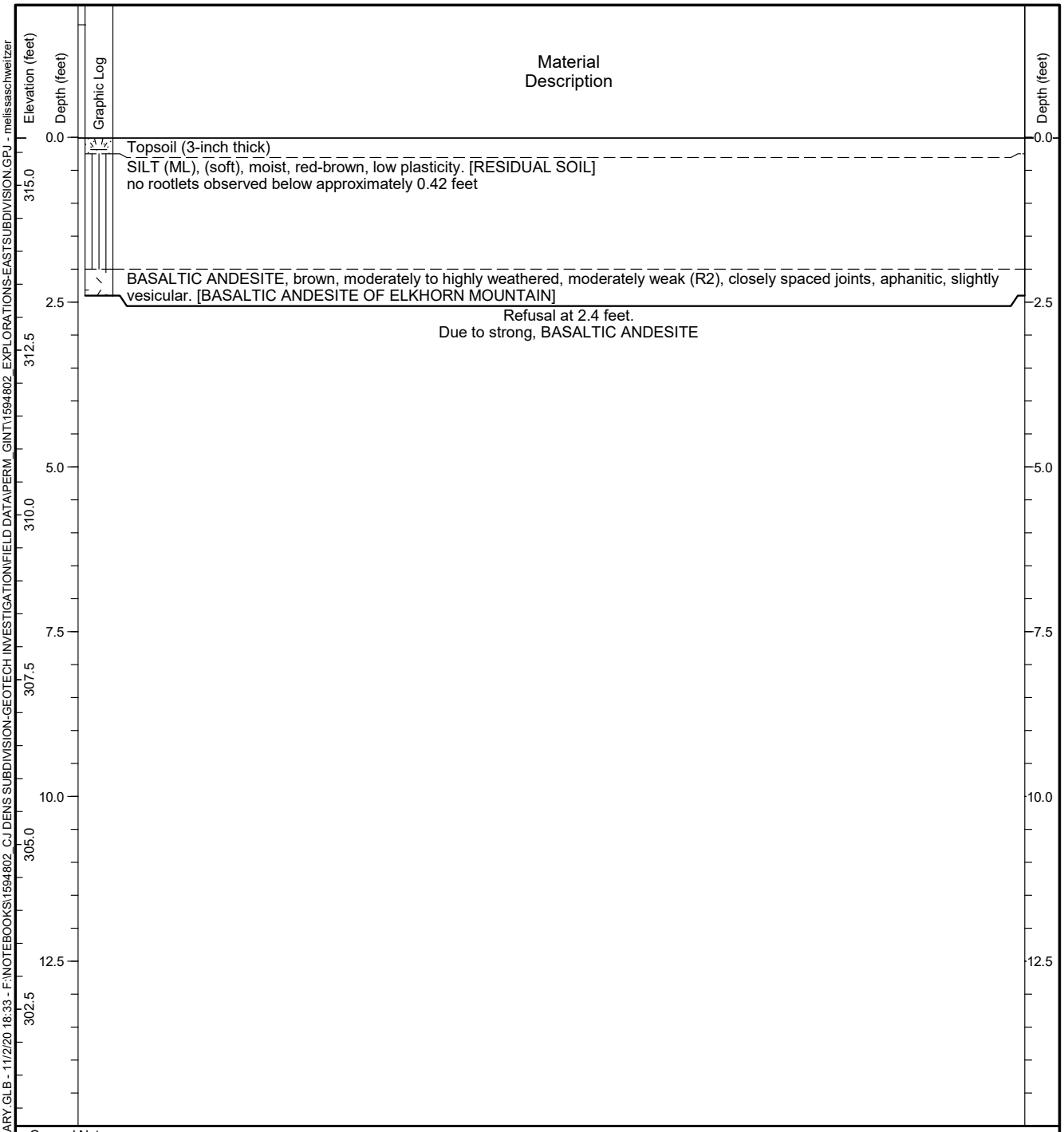
Figure **A-33**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614400 Long: -122.410100 (WGS 84) Total Depth: 2.4 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 315.73 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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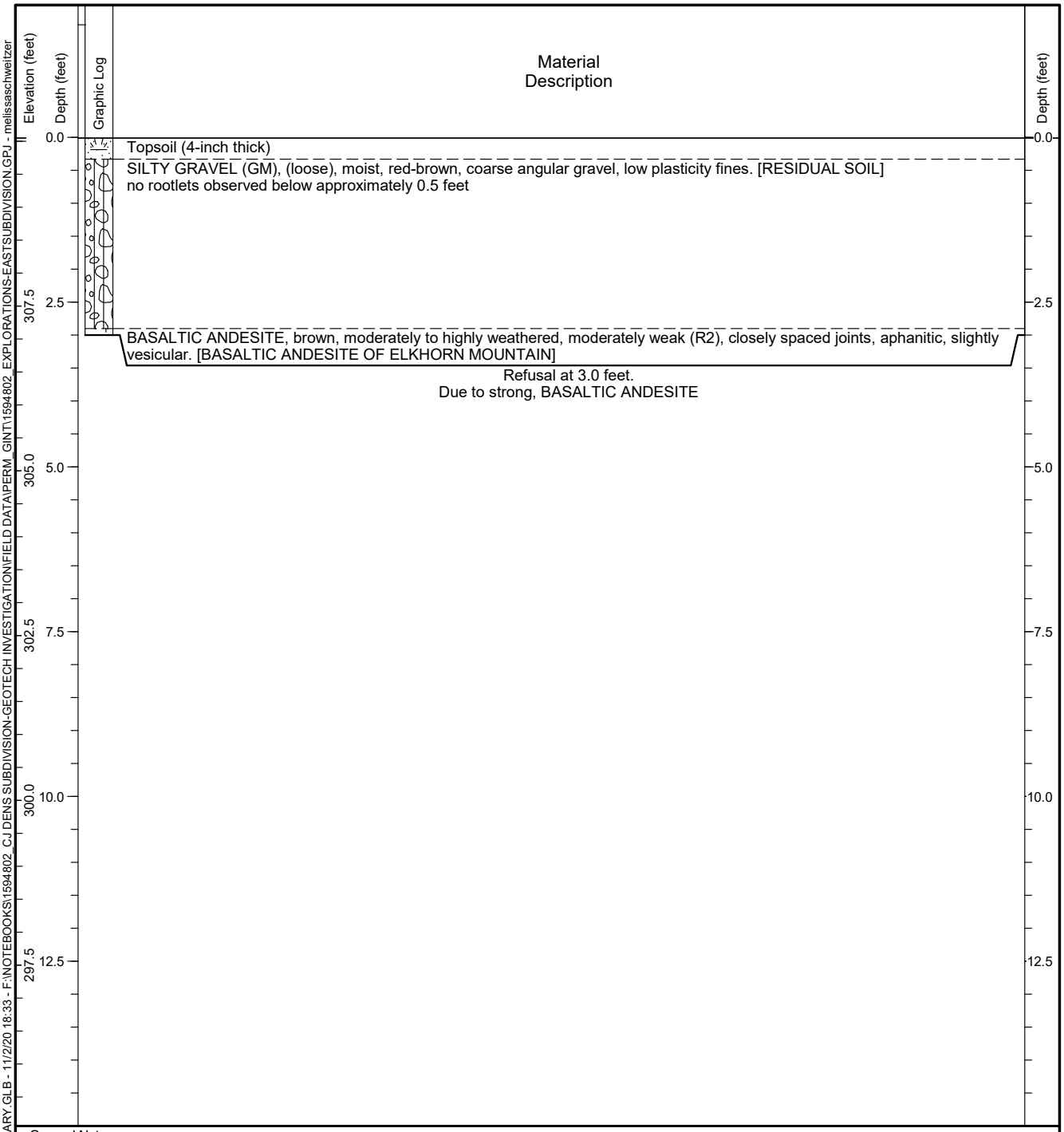
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-46

Figure **A-34**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614200 Long: -122.410500 (WGS 84) Total Depth: 3 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 310.06 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-47

Figure **A-35**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614200 Long: -122.410900 (WGS 84) Total Depth: 6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 312.97 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
312.5	0.0		Topsoil (6-inch thick)	0.0
			SILT (ML), (soft), moist, red-brown, low plasticity. [RESIDUAL SOIL]	
310.0	2.5		no rootlets observed below approximately 2.5 feet	2.5
			BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
307.5	5.0			5.0
			Refusal at 6.0 feet. Due to strong, BASALTIC ANDESITE	
305.0	7.5			7.5
302.5	10.0			10.0
300.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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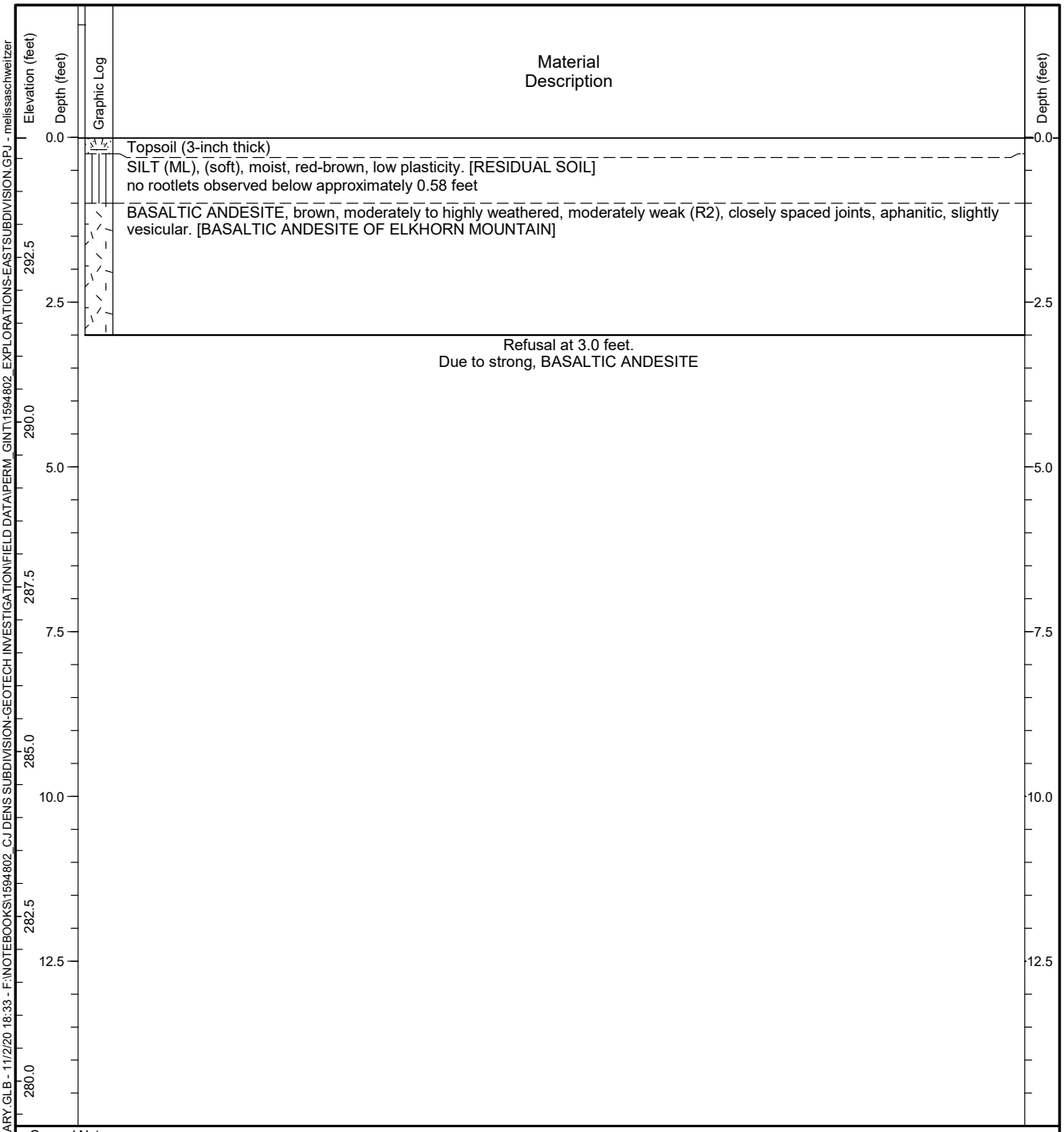
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-48

Figure **A-36**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614200 Long: -122.411300 (WGS 84) Total Depth: 3 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 294.32 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-49**	Figure **A-37** Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614300 Long: -122.411400 (WGS 84) Total Depth: 0.1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 303.33 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
302.5	0.0		BASALTIC ANDESITE, brown, slightly weathered, moderately strong (R3), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
			Refusal at 0.1 feet. Due to strong, BASALTIC ANDESITE	
300.0	2.5			2.5
297.5	5.0			5.0
295.0	7.5			7.5
292.5	10.0			10.0
290.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-50

Figure **A-38**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615300 Long: -122.409400 (WGS 84) Total Depth: 0.1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 333.90 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
332.5	0.0		BASALTIC ANDESITE, brown, slightly weathered, moderately strong (R3), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
			Refusal at 0.1 feet. Due to strong, BASALTIC ANDESITE	
330.0	2.5			2.5
327.5	5.0			5.0
325.0	7.5			7.5
322.5	10.0			10.0
320.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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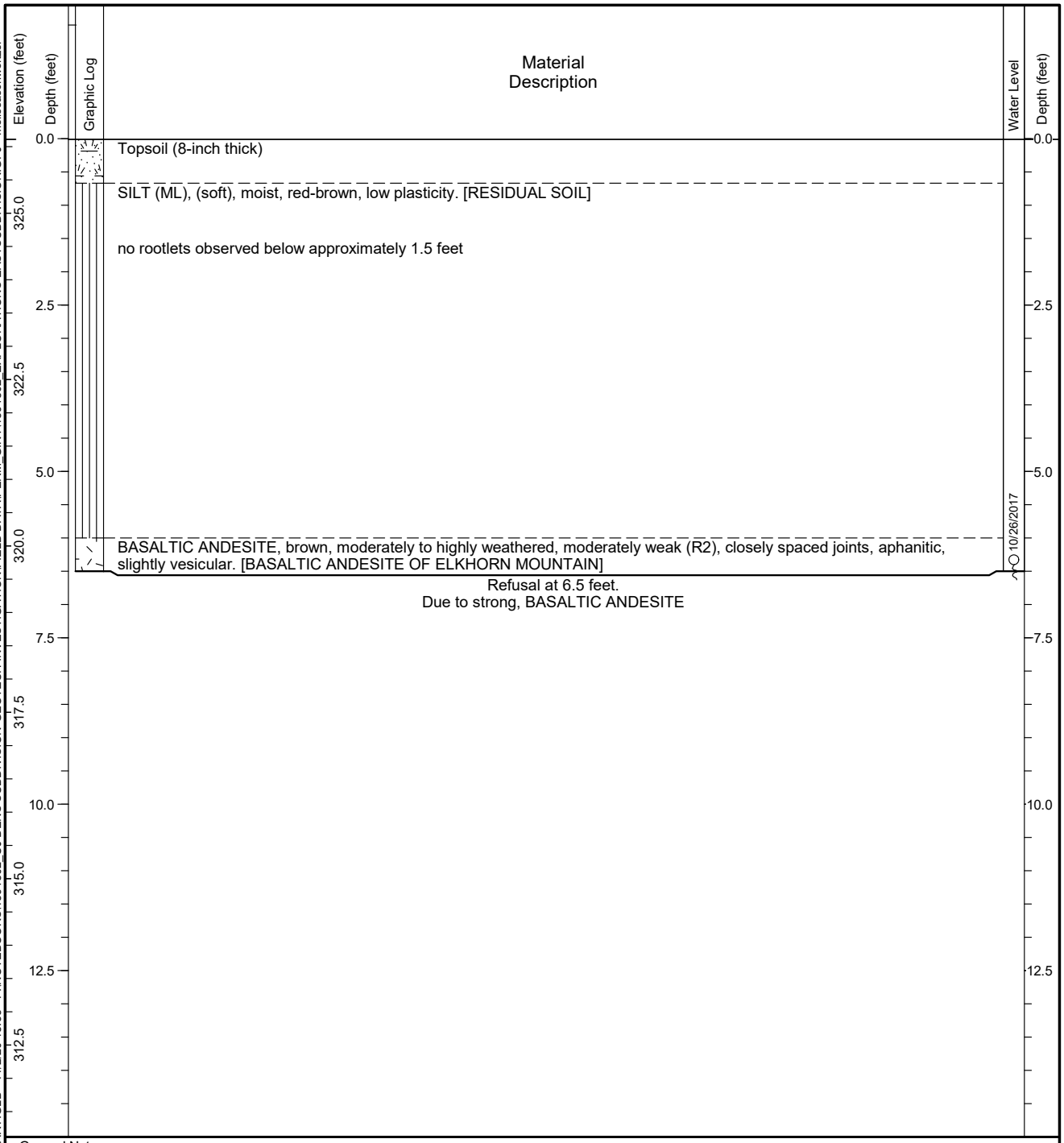
Figure **A-39**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615500 Long: -122.409300 (WGS 84) Total Depth: 6.5 feet Depth to Seepage: 6.4 feet
Ground Surface Elevation: 326.12 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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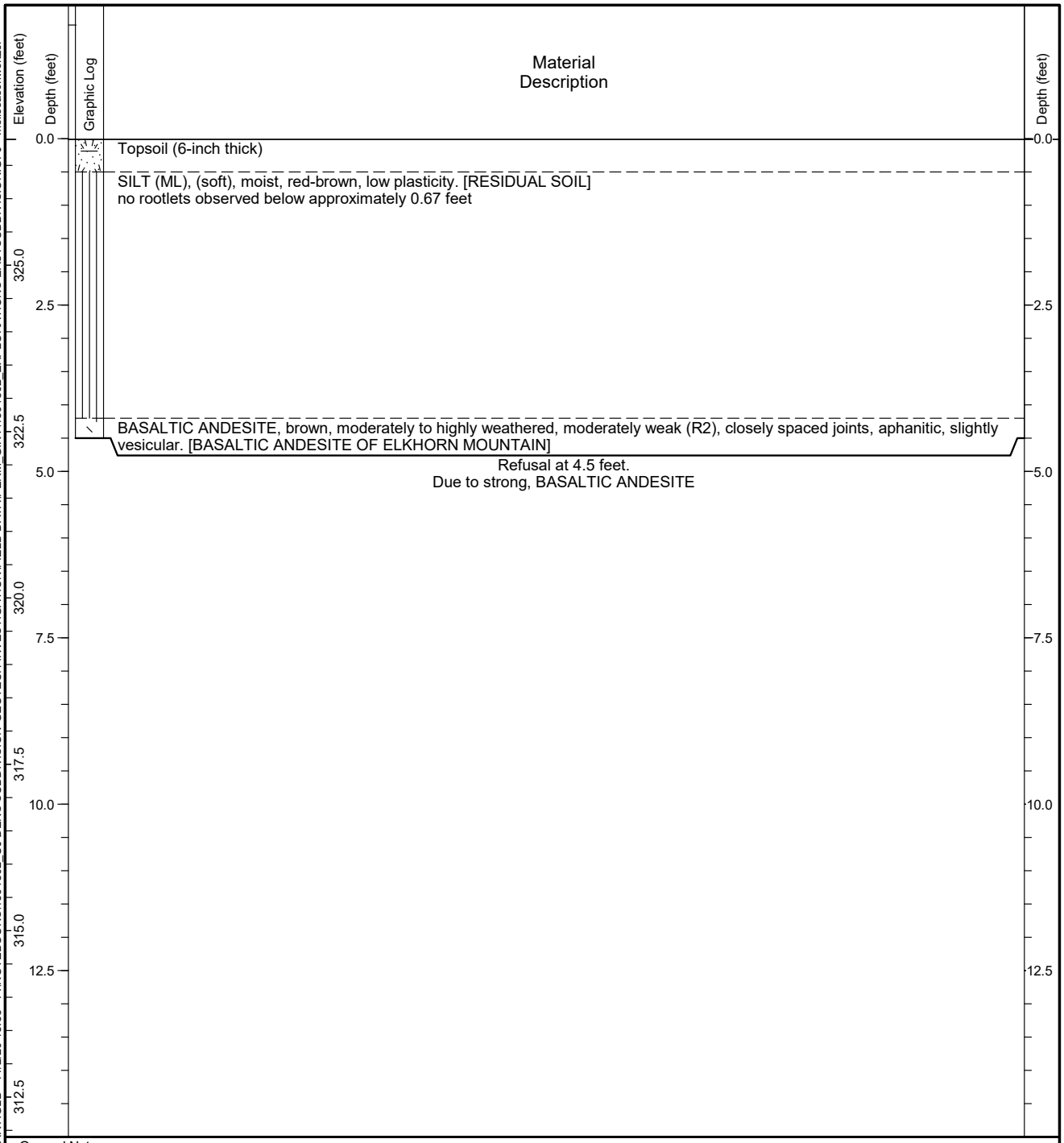
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-52

Figure **A-40**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615400 Long: -122.409700 (WGS 84) Total Depth: 4.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 326.90 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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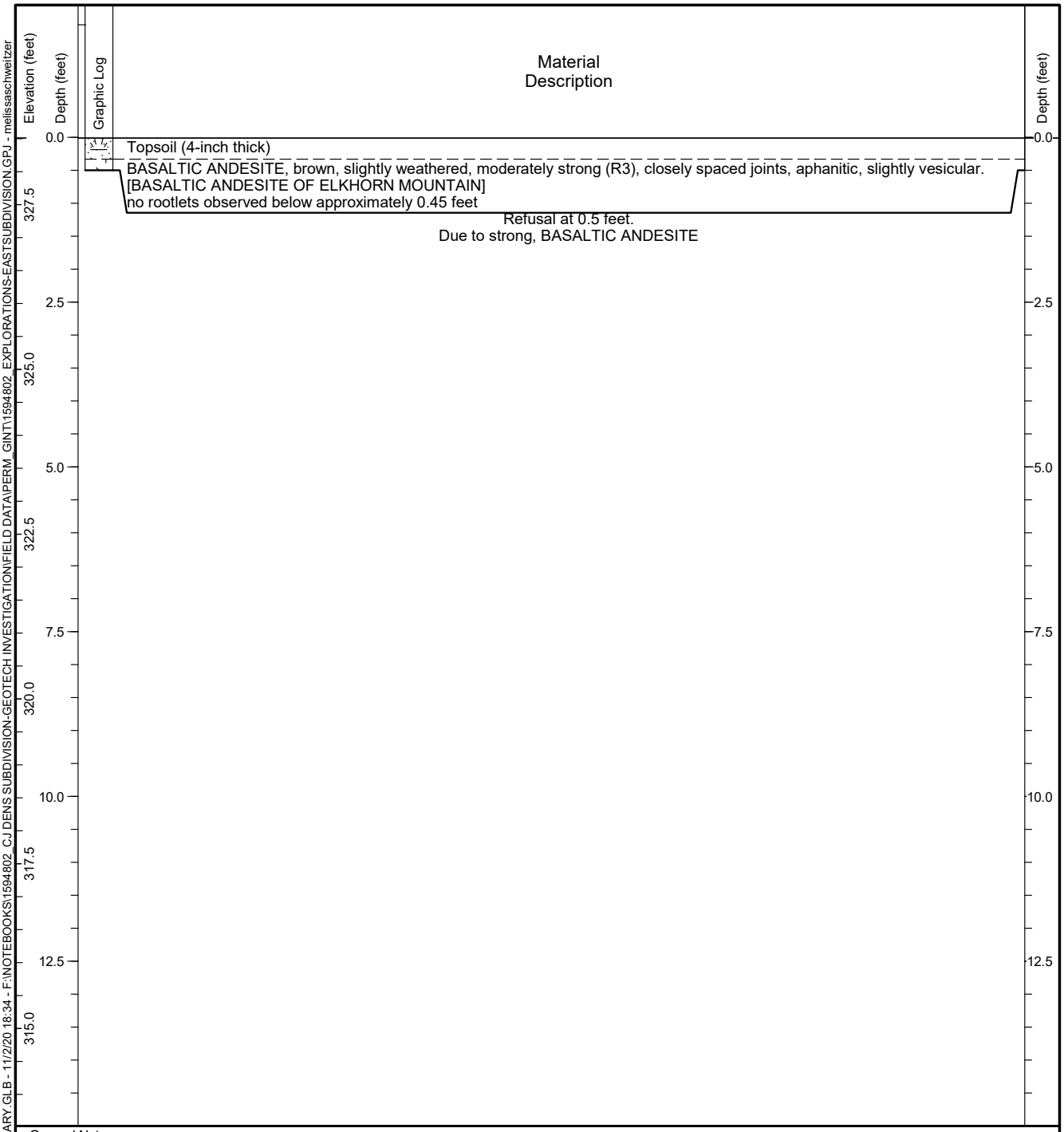
Figure **A-41**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615500 Long: -122.410200 (WGS 84) Total Depth: 0.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 328.52 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-54

Figure **A-42**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615400 Long: -122.410600 (WGS 84) Total Depth: 6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 318.65 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
318.5	0.0		Topsoil (12-inch thick) no rootlets observed below approximately 0.5 feet	0.0
317.5			SILT (ML), (soft), moist, red-brown, low plasticity. [RESIDUAL SOIL]	
	2.5			2.5
315.0			GRAVELLY SILT (ML), (soft), moist, red-brown, coarse angular gravel, low plasticity.	
	5.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	5.0
312.5			Refusal at 6.0 feet. Due to strong, BASALTIC ANDESITE	
	7.5			7.5
310.0				
	10.0			10.0
307.5				
	12.5			12.5
305.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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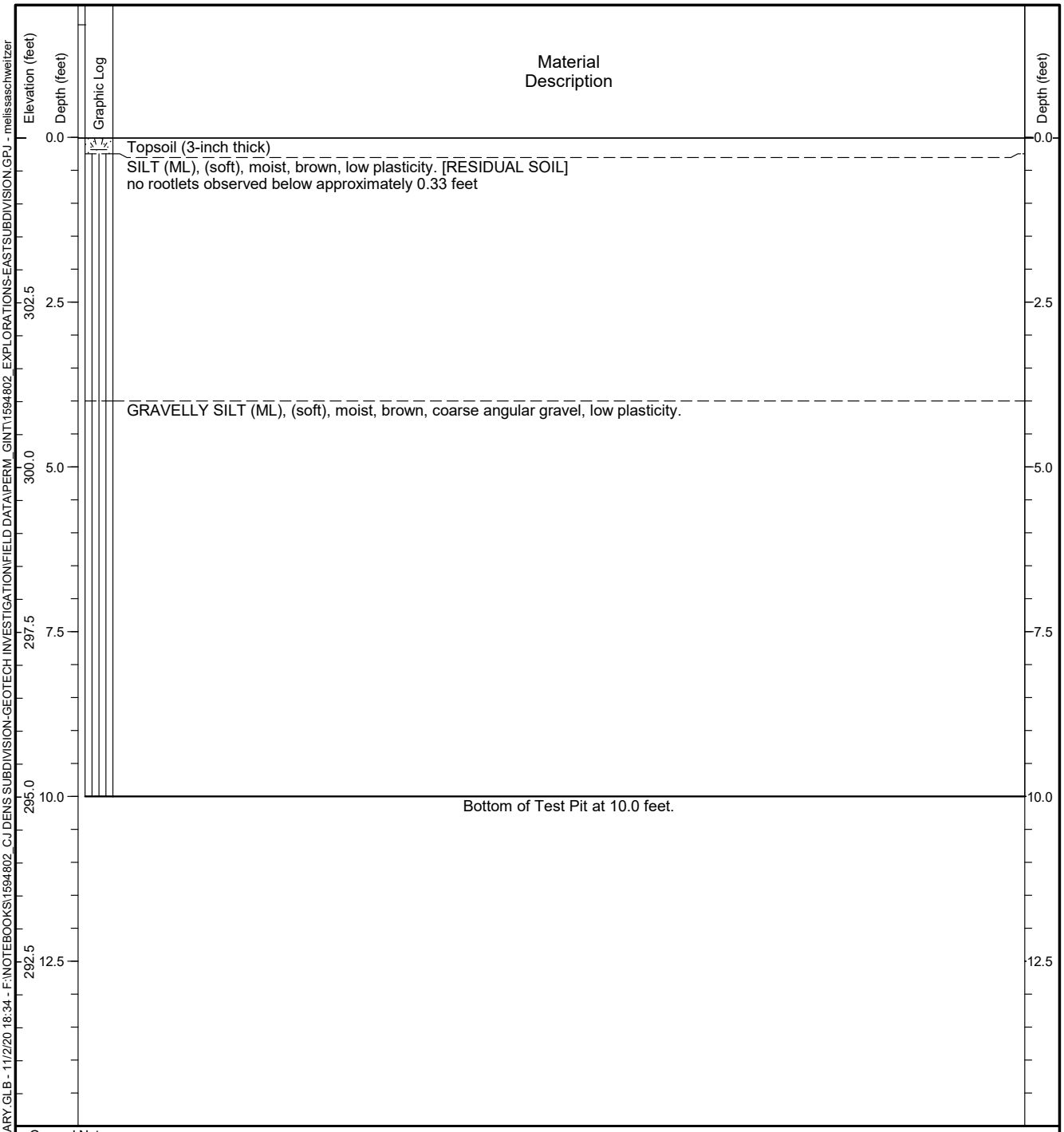
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-55

Figure **A-43**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615400 Long: -122.411000 (WGS 84) Total Depth: 10 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 305.01 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-56

Figure **A-44**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615500 Long: -122.411400 (WGS 84) Total Depth: 3.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 307.45 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
305.0	0.0		Topsoil (6-inch thick)	0.0
			SILT (ML), (soft), moist, brown, low plasticity. [RESIDUAL SOIL]	
			no rootlets observed below approximately 1.5 feet	
302.5	2.5			2.5
			Refusal at 3.5 feet. Due to strong, BASALTIC ANDESITE	
300.0	5.0			5.0
297.5	7.5			7.5
295.0	10.0			10.0
	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-57

Figure **A-45**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615500 Long: -122.411900 (WGS 84) Total Depth: 2.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 310.00 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
	0.0		Topsoil (6-inch thick)	0.0
			no rootlets observed below approximately 0.5 feet	
307.5	2.5		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
			Refusal at 2.5 feet. Due to strong, BASALTIC ANDESITE	
305.0	5.0			5.0
302.5	7.5			7.5
300.0	10.0			10.0
297.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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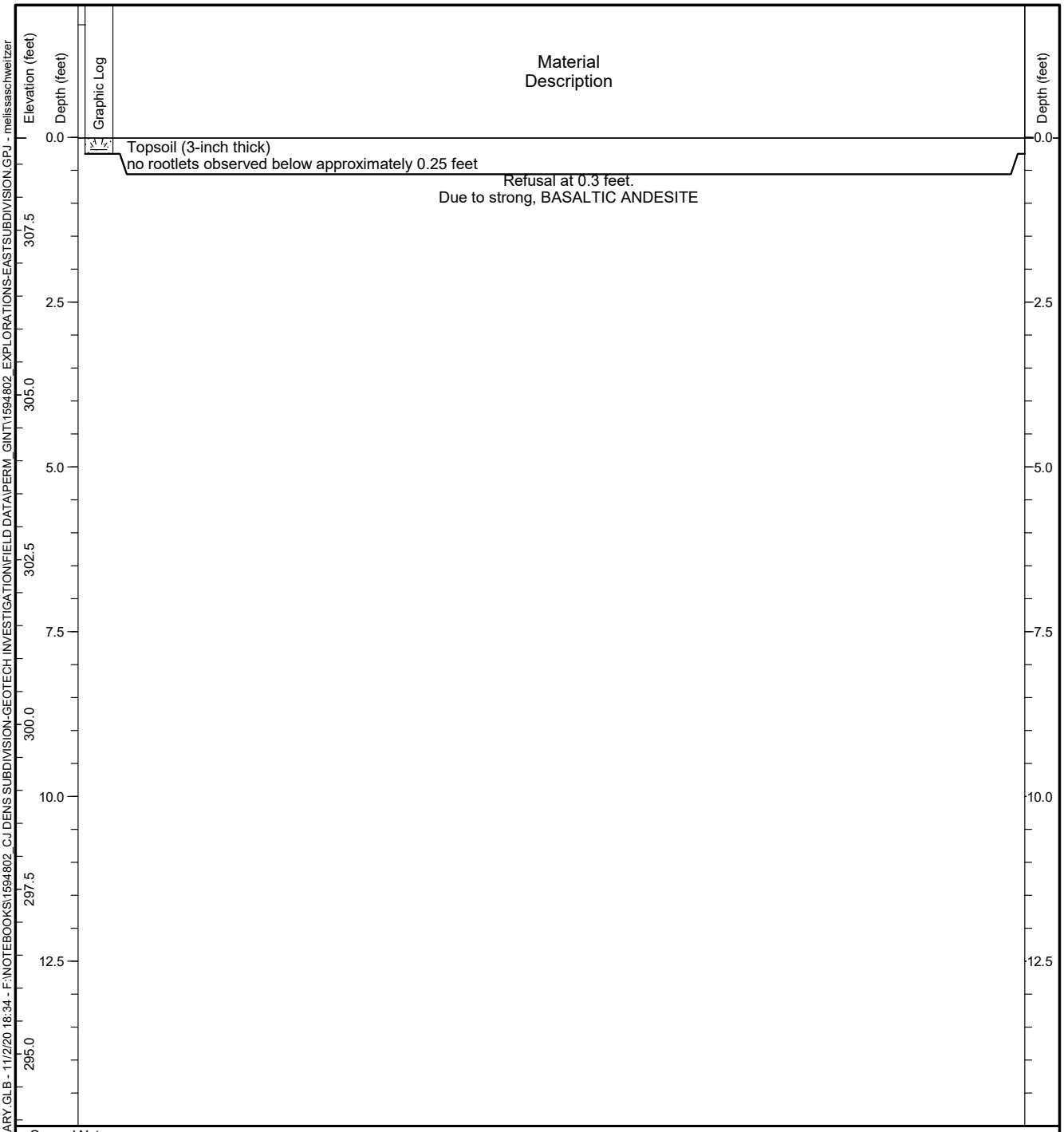
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-58

Figure **A-46**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615600 Long: -122.412400 (WGS 84) Total Depth: 0.25 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 308.91 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-59**	Figure **A-47** Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615500 Long: -122.412900 (WGS 84) Total Depth: 3.1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 297.15 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
295.0	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
			no rootlets observed below approximately 1.2 feet	
292.5	2.5			2.5
			Refusal at 3.1 feet. Due to strong, BASALTIC ANDESITE	
290.0	5.0			5.0
287.5	7.5			7.5
285.0	10.0			10.0
282.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-60

Figure **A-48**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615500 Long: -122.413400 (WGS 84) Total Depth: 10.6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 274.20 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
272.5	0.0		Topsoil (3-inch thick)	0.0
			BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
			no rootlets observed below approximately 0.58 feet	
270.0	2.5			2.5
267.5	5.0			5.0
265.0	7.5			7.5
262.5	10.0			10.0
260.0	12.5		Refusal at 10.6 feet. Due to strong, BASALTIC ANDESITE	12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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Figure **A-49**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614200 Long: -122.414600 (WGS 84) Total Depth: 7 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 194.69 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
192.5	0.0		Topsoil (2-inch thick)	0.0
			SILT (ML), (soft), moist, red-brown, low plasticity. [RESIDUAL SOIL]	
			no rootlets observed below approximately 1.6 feet	
190.0	2.5			2.5
187.5	5.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	5.0
	7.5		Refusal at 7.0 feet. Due to strong, BASALTIC ANDESITE	7.5
185.0	10.0			10.0
182.5	12.5			12.5
180.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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Figure **A-50**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615600 Long: -122.414300 (WGS 84) Total Depth: 0.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 279.38 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
	0.0		Topsoil (6-inch thick) no rootlets observed below approximately 0.5 feet	0.0
277.5			Refusal at 0.5 feet. Due to strong, BASALTIC ANDESITE	
	2.5			2.5
275.0				
	5.0			5.0
272.5				
	7.5			7.5
270.0				
	10.0			10.0
267.5				
	12.5			12.5
265.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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Figure **A-51**
Sheet **1 of 1**

Date Started: 10/26/17 Date Completed: 10/26/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615800 Long: -122.414400 (WGS 84) Total Depth: 2.75 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 288.09 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
287.5	0.0		Topsoil (6-inch thick)	0.0
			SILT (ML), (soft), moist, red-brown, low plasticity. [RESIDUAL SOIL] no rootlets observed below approximately 0.67 feet	
			BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
285.0	2.5		Refusal at 2.8 feet. Due to strong, BASALTIC ANDESITE	2.5
282.5	5.0			5.0
280.0	7.5			7.5
277.5	10.0			10.0
275.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
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Test Pit Log
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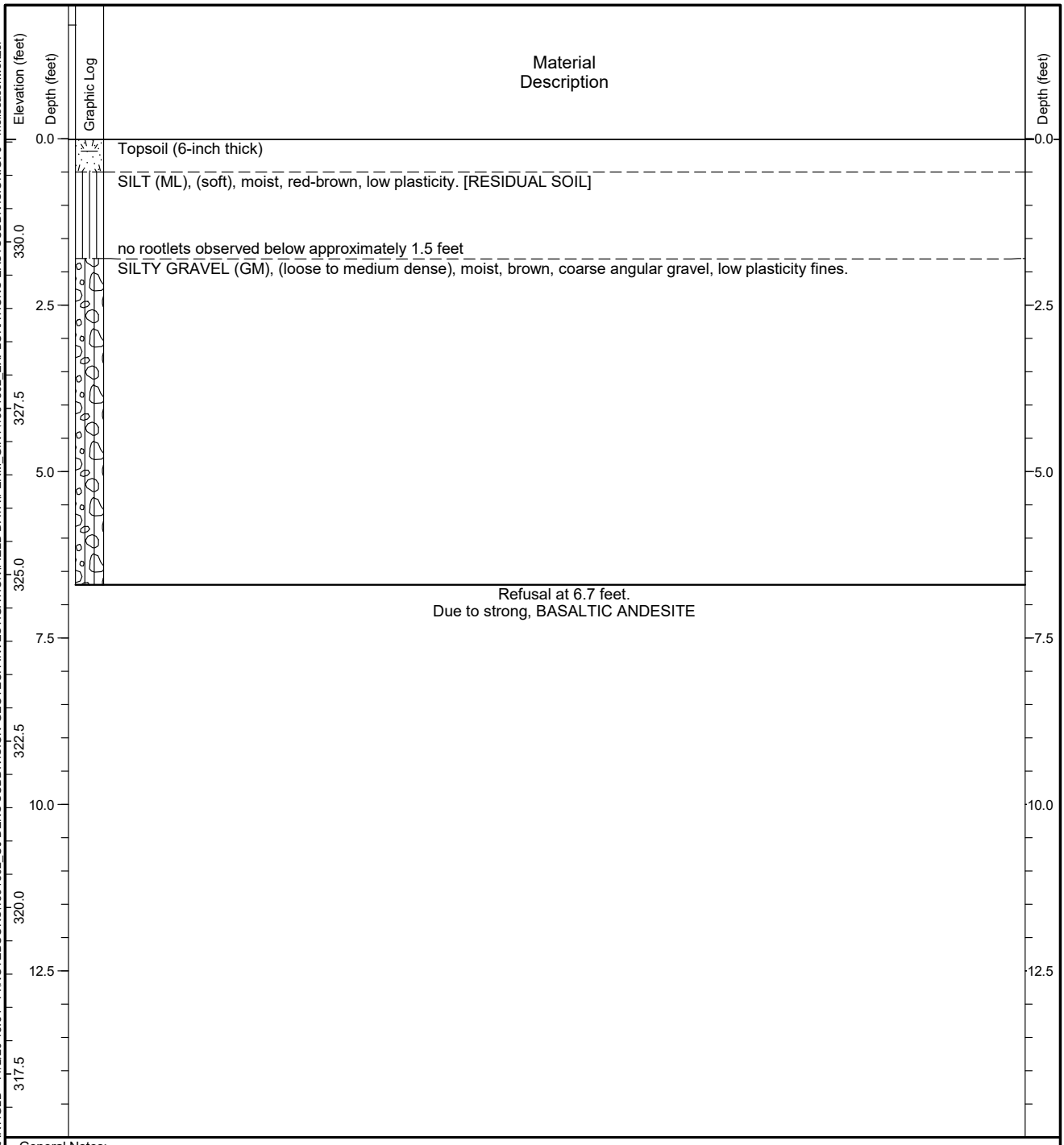
Figure **A-52**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614900 Long: -122.409800 (WGS 84) Total Depth: 6.7 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 331.55 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-65**	Figure **A-53** Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614900 Long: -122.410200 (WGS 84) Total Depth: 3.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 329.32 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
327.5	0.0		Topsoil (4-inch thick)	0.0
			SILT (ML), (soft), moist, red-brown, low plasticity. [RESIDUAL SOIL]	
	2.5		SILTY GRAVEL (GM), (medium dense), moist, brown, coarse angular gravel, low plasticity fines.	2.5
			no rootlets observed below approximately 2.5 feet	
325.0			BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
	5.0		Refusal at 3.5 feet. Due to strong, BASALTIC ANDESITE	5.0
322.5	7.5			7.5
320.0	10.0			10.0
317.5	12.5			12.5
315.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
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Test Pit Log
TP-66

Figure **A-54**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614900 Long: -122.410700 (WGS 84) Total Depth: 6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 316.79 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
315.0	0.0		Topsoil (4-inch thick)	0.0
			SILT (ML), (soft), moist, red-brown, low plasticity. [RESIDUAL SOIL]	
312.5	2.5		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
			no rootlets observed below approximately 4 feet	
310.0	5.0		Refusal at 6.0 feet. Due to strong, BASALTIC ANDESITE	5.0
307.5	7.5			7.5
305.0	10.0			10.0
302.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
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Test Pit Log
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Figure **A-55**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614900 Long: -122.411000 (WGS 84) Total Depth: 5.1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 307.00 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
305.0	0.0		Topsoil (30-inch thick)	0.0
			no rootlets observed below approximately 1.08 feet	
302.5	2.5		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
	5.0		Refusal at 5.1 feet. Due to strong, BASALTIC ANDESITE	5.0
300.0	7.5			7.5
297.5	10.0			10.0
295.0	12.5			12.5
292.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
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Test Pit Log
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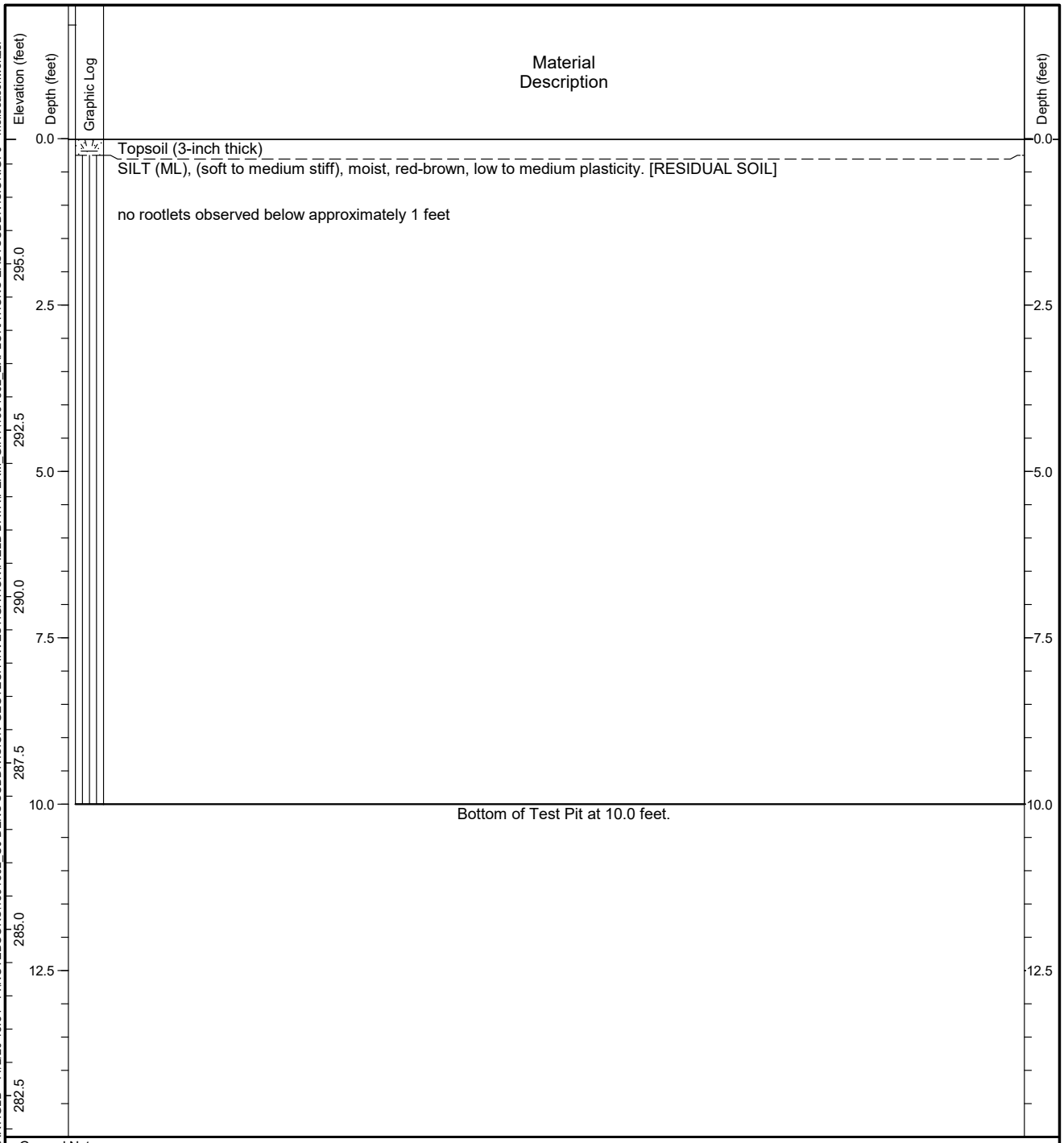
Figure **A-56**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615000 Long: -122.411200 (WGS 84) Total Depth: 10 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 296.88 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
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Test Pit Log
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Figure **A-57**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615000 Long: -122.411900 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 292.23 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
292.0	0.0		Topsoil (7-inch thick)	0.0
			SILT (ML), (soft), moist, brown, low to medium plasticity. [RESIDUAL SOIL] no rootlets observed below approximately 0.83 feet	
290.0	2.5		Refusal at 2.0 feet. Due to strong, BASALTIC ANDESITE	2.5
287.5	5.0			5.0
285.0	7.5			7.5
282.5	10.0			10.0
280.0	12.5			12.5
277.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
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Test Pit Log
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Figure **A-58**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615200 Long: -122.412300 (WGS 84) Total Depth: 3.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 299.25 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
297.5	0.0		Topsoil (12-inch thick)	0.0
	2.5		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN] no rootlets observed below approximately 1.17 feet	2.5
295.0	5.0		Refusal at 3.5 feet. Due to strong, BASALTIC ANDESITE	5.0
292.5	7.5			7.5
290.0	10.0			10.0
287.5	12.5			12.5
285.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
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Test Pit Log
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Figure **A-59**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615723 Long: -122.413005 (WGS 84) Total Depth: 3.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 283.30 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
282.5	0.0		Topsoil (6-inch thick)	0.0
			SILT (ML), (soft), moist, red-brown, low plasticity. [RESIDUAL SOIL]	
			no rootlets observed below approximately 1 feet	
280.0	2.5		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
			Refusal at 3.5 feet. Due to strong, BASALTIC ANDESITE	
277.5	5.0			5.0
275.0	7.5			7.5
272.5	10.0			10.0
270.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
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Test Pit Log
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Figure **A-60**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615400 Long: -122.412500 (WGS 84) Total Depth: 0 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 300.14 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
300.0	0.0		Refusal at 0.0 feet. Due to strong, BASALTIC ANDESITE	0.0
297.5	2.5			2.5
295.0	5.0			5.0
292.5	7.5			7.5
290.0	10.0			10.0
287.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-73

Figure **A-61**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616100 Long: -122.413900 (WGS 84) Total Depth: 0 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 309.08 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
307.5	0.0		Refusal at 0.0 feet. Due to strong, BASALTIC ANDESITE	0.0
305.0	2.5			2.5
302.5	5.0			5.0
300.0	7.5			7.5
297.5	10.0			10.0
295.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-74

Figure **A-62**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616200 Long: -122.413400 (WGS 84) Total Depth: 5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 311.84 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
310.0	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
	2.5		no rootlets observed below approximately 3.5 feet	2.5
307.5	5.0		Refusal at 5.0 feet. Due to strong, BASALTIC ANDESITE	5.0
305.0	7.5			7.5
302.5	10.0			10.0
300.0	12.5			12.5
297.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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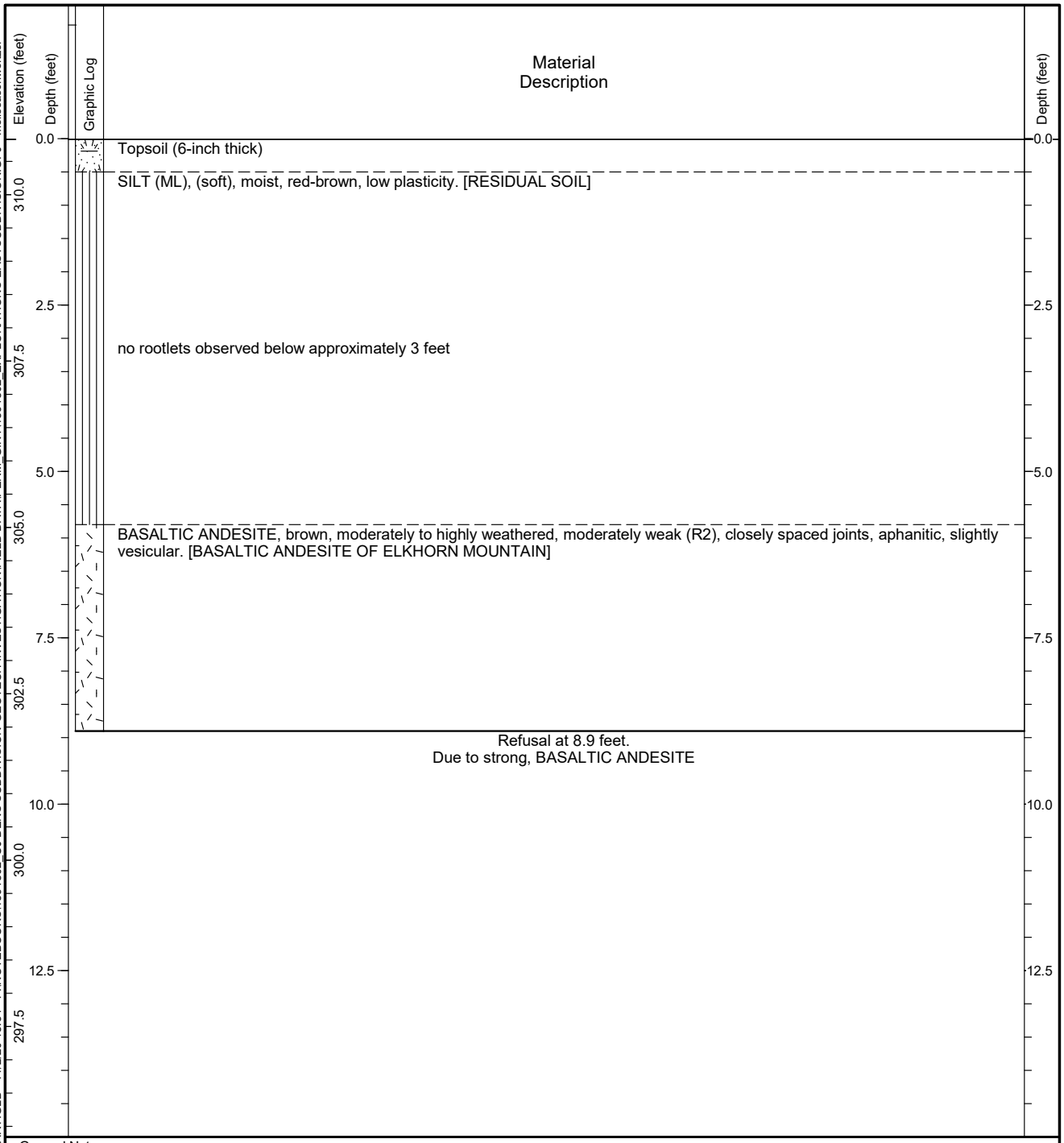
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-75

Figure **A-63**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616100 Long: -122.413100 (WGS 84) Total Depth: 8.9 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 310.84 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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Figure **A-64**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616000 Long: -122.412300 (WGS 84) Total Depth: 5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 298.63 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
298.5	0.0		Topsoil (6-inch thick)	0.0
			SILT (ML), (soft), moist, brown, low plasticity. [RESIDUAL SOIL]	
297.5				
	2.5		no rootlets observed below approximately 2.5 feet	2.5
295.0			BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	
	5.0		Refusal at 5.0 feet. Due to strong, BASALTIC ANDESITE	5.0
292.5				
	7.5			7.5
290.0				
	10.0			10.0
287.5				
	12.5			12.5
285.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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Figure **A-65**
Sheet **1 of 1**

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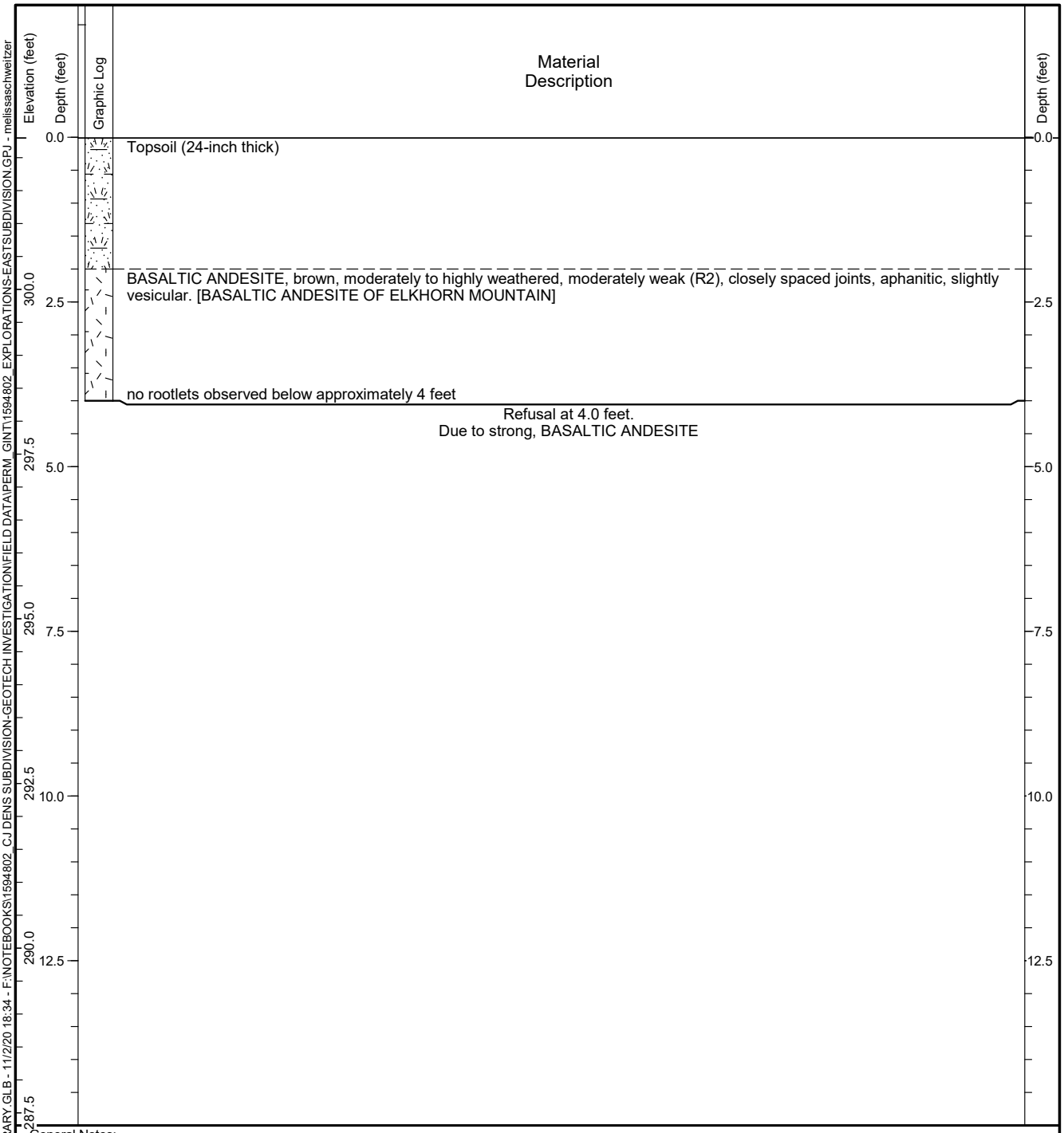
Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616100 Long: -122.411900 (WGS 84) Total Depth: 4 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 302.31 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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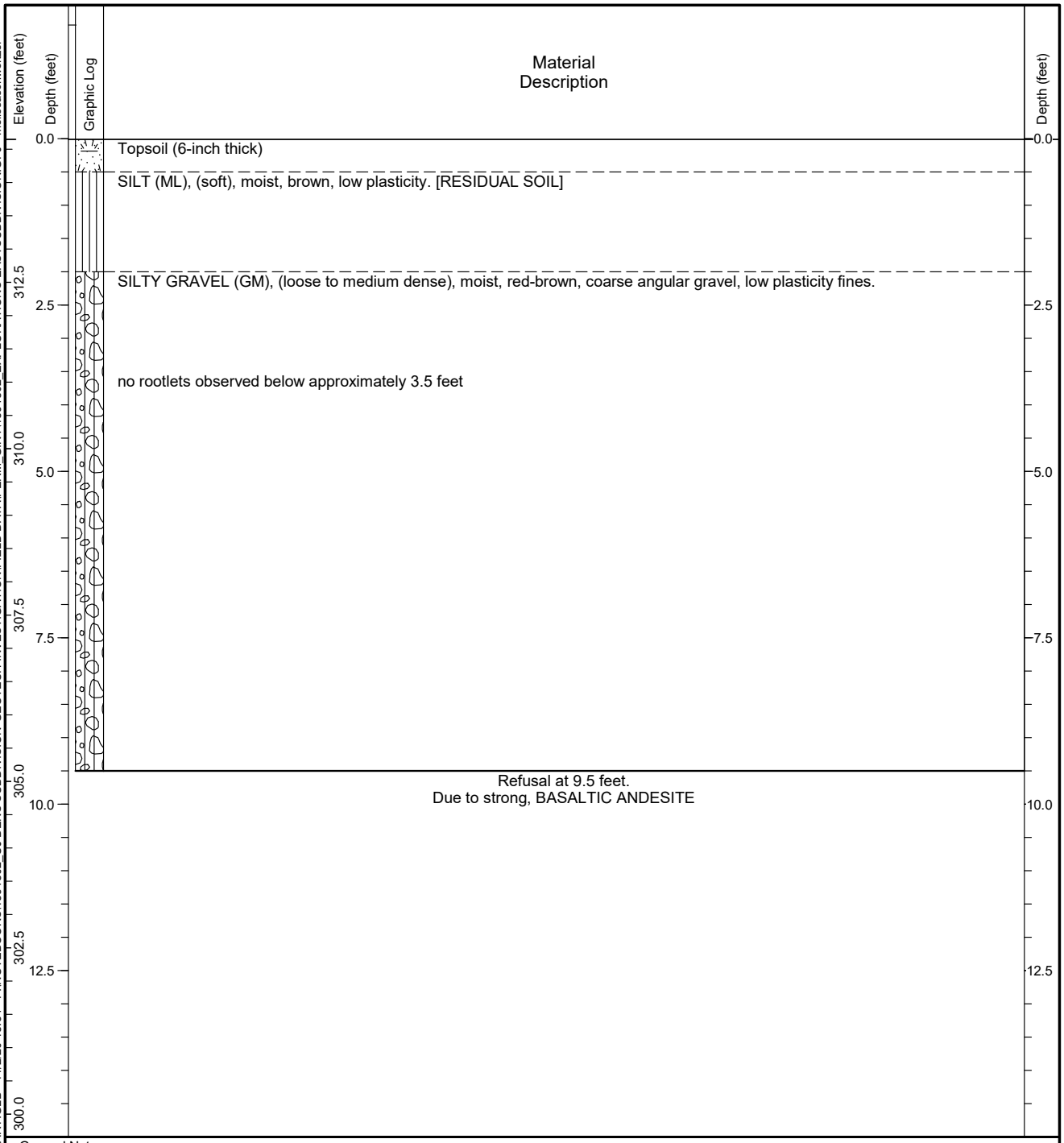
Figure **A-66**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616100 Long: -122.411400 (WGS 84) Total Depth: 9.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 314.66 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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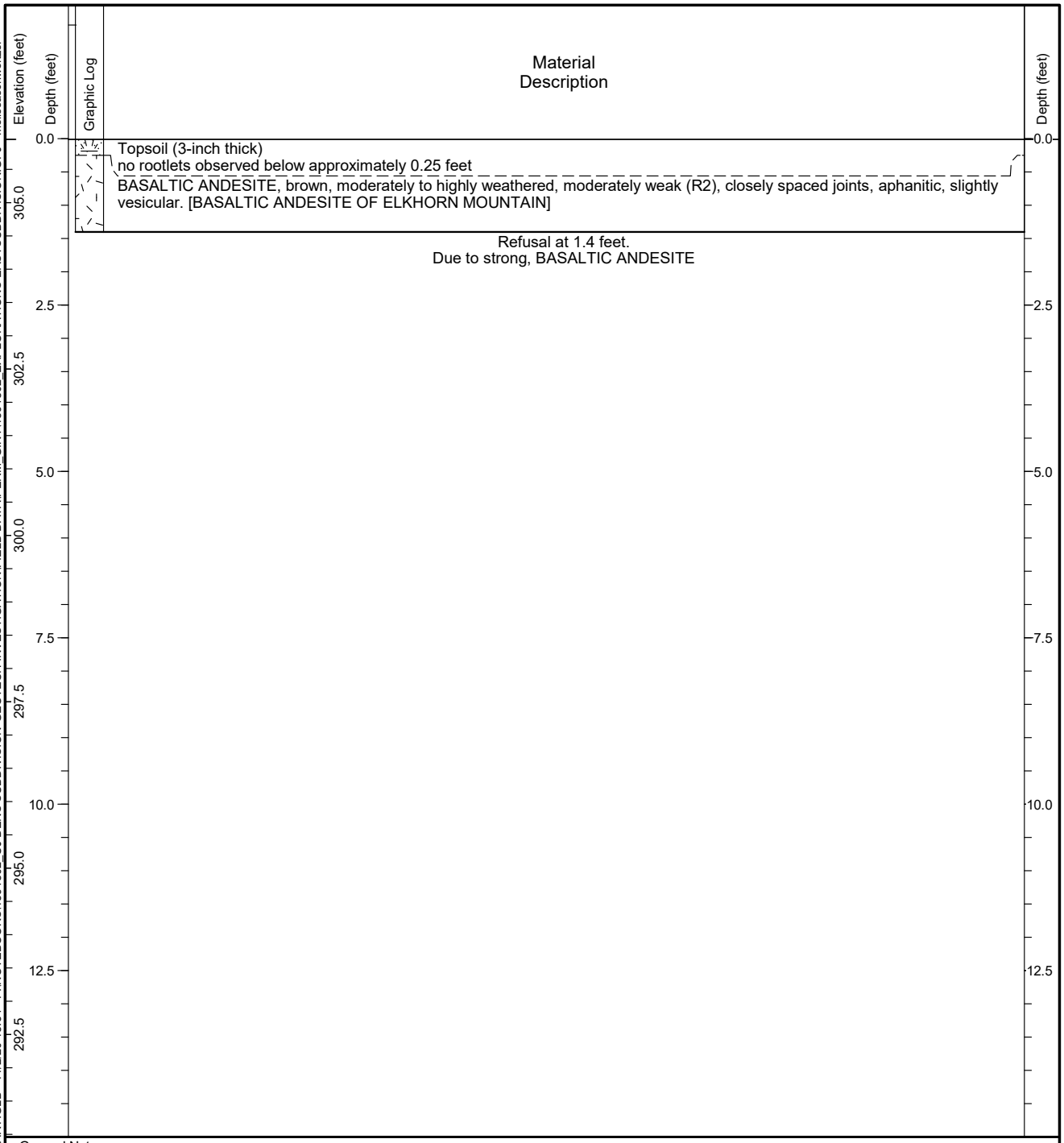
Figure **A-67**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616200 Long: -122.411000 (WGS 84) Total Depth: 1.4 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 305.96 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich	Project: CJ Dens East Subdivision Location: Camas, Washington Project No.: 15948-02	Test Pit Log **TP-80**	Figure **A-68** Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616300 Long: -122.410600 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 304.20 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
302.5	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
			Refusal at 2.0 feet. Due to strong, BASALTIC ANDESITE	
300.0	2.5			2.5
297.5	5.0			5.0
295.0	7.5			7.5
292.5	10.0			10.0
290.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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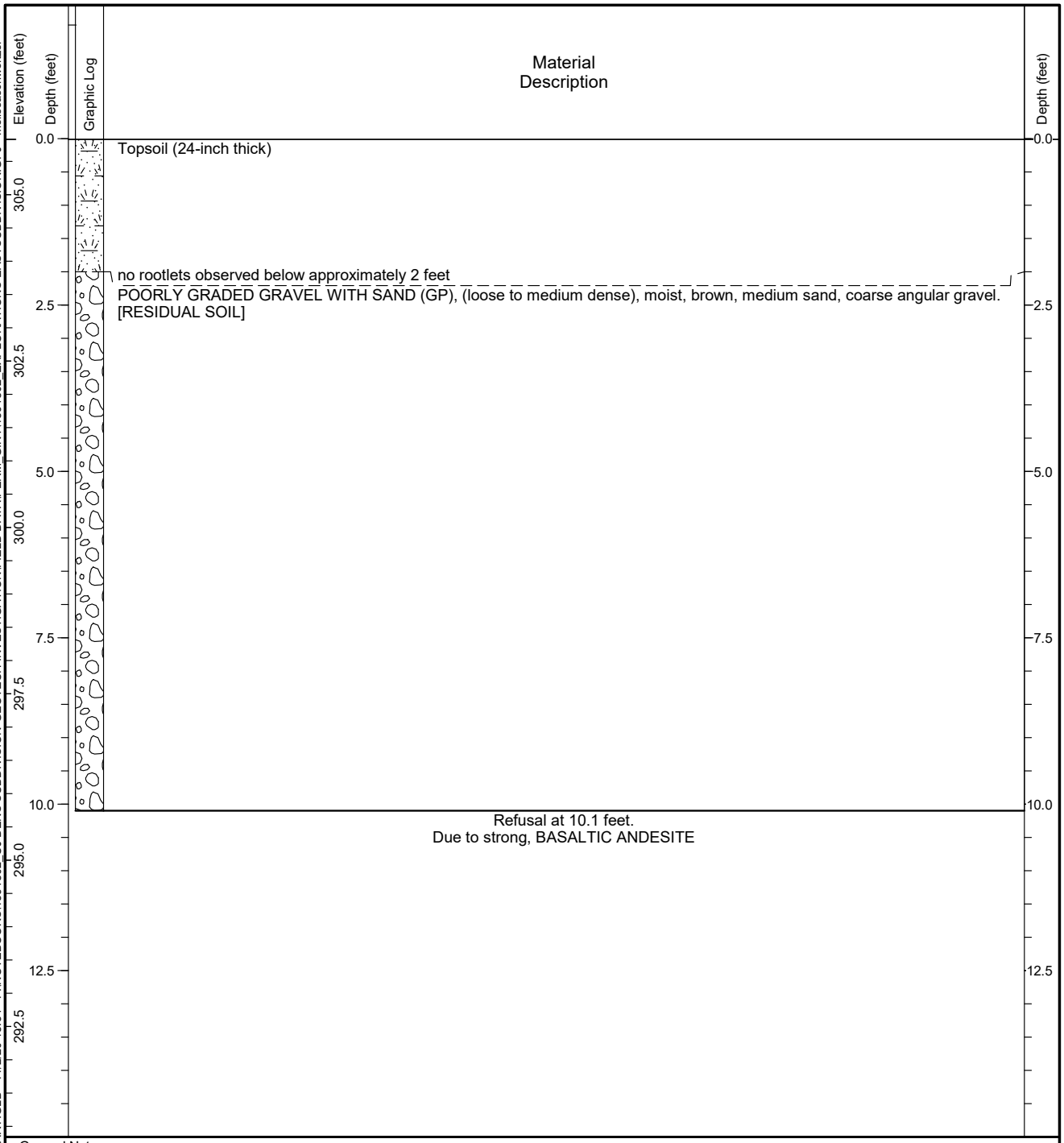
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-81

Figure **A-69**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616400 Long: -122.410200 (WGS 84) Total Depth: 10.1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 305.84 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-82

Figure **A-70**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616600 Long: -122.410000 (WGS 84) Total Depth: 11 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 305.54 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
305.0	0.0		Topsoil (6-inch thick)	0.0
			SILTY SAND (SM), (medium dense), moist, brown, medium to coarse sand. [RESIDUAL SOIL] no rootlets observed below approximately 0.67 feet	
302.5	2.5			2.5
300.0	5.0			5.0
297.5	7.5			7.5
295.0	10.0			10.0
			Bottom of Test Pit at 11.0 feet.	
292.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-83

Figure **A-71**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.617100 Long: -122.409300 (WGS 84) Total Depth: 10 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 302.15 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
300.0	0.0		Topsoil (12-inch thick)	0.0
	2.5		SILTY SAND (SM), (medium dense), moist, brown, medium to coarse sand. [RESIDUAL SOIL] no rootlets observed below approximately 3 feet	2.5
297.5	5.0			5.0
295.0	7.5			7.5
292.5	10.0		Bottom of Test Pit at 10.0 feet.	10.0
290.0	12.5			12.5
287.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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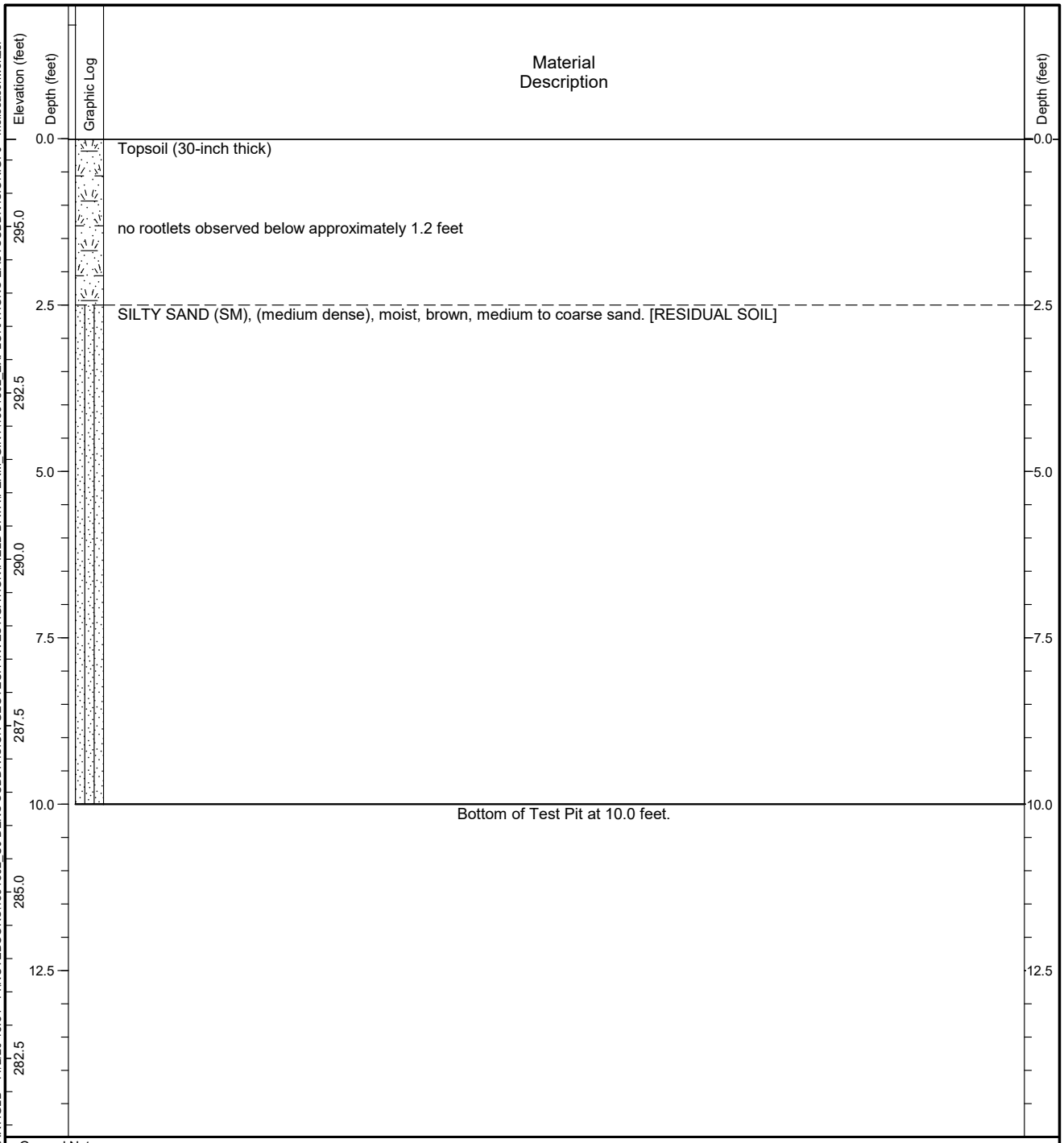
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-84

Figure **A-72**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.617400 Long: -122.409200 (WGS 84) Total Depth: 10 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 296.32 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-85

Figure **A-73**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616200 Long: -122.409900 (WGS 84) Total Depth: 3.1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 318.72 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
	0.0		Topsoil (12-inch thick)	0.0
317.5			SILT (ML), (soft), moist, brown, low plasticity. [RESIDUAL SOIL]	
			no rootlets observed below approximately 2 feet	
	2.5		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
315.0			Refusal at 3.1 feet. Due to strong, BASALTIC ANDESITE	
	5.0			5.0
312.5				
	7.5			7.5
310.0				
	10.0			10.0
307.5				
	12.5			12.5
305.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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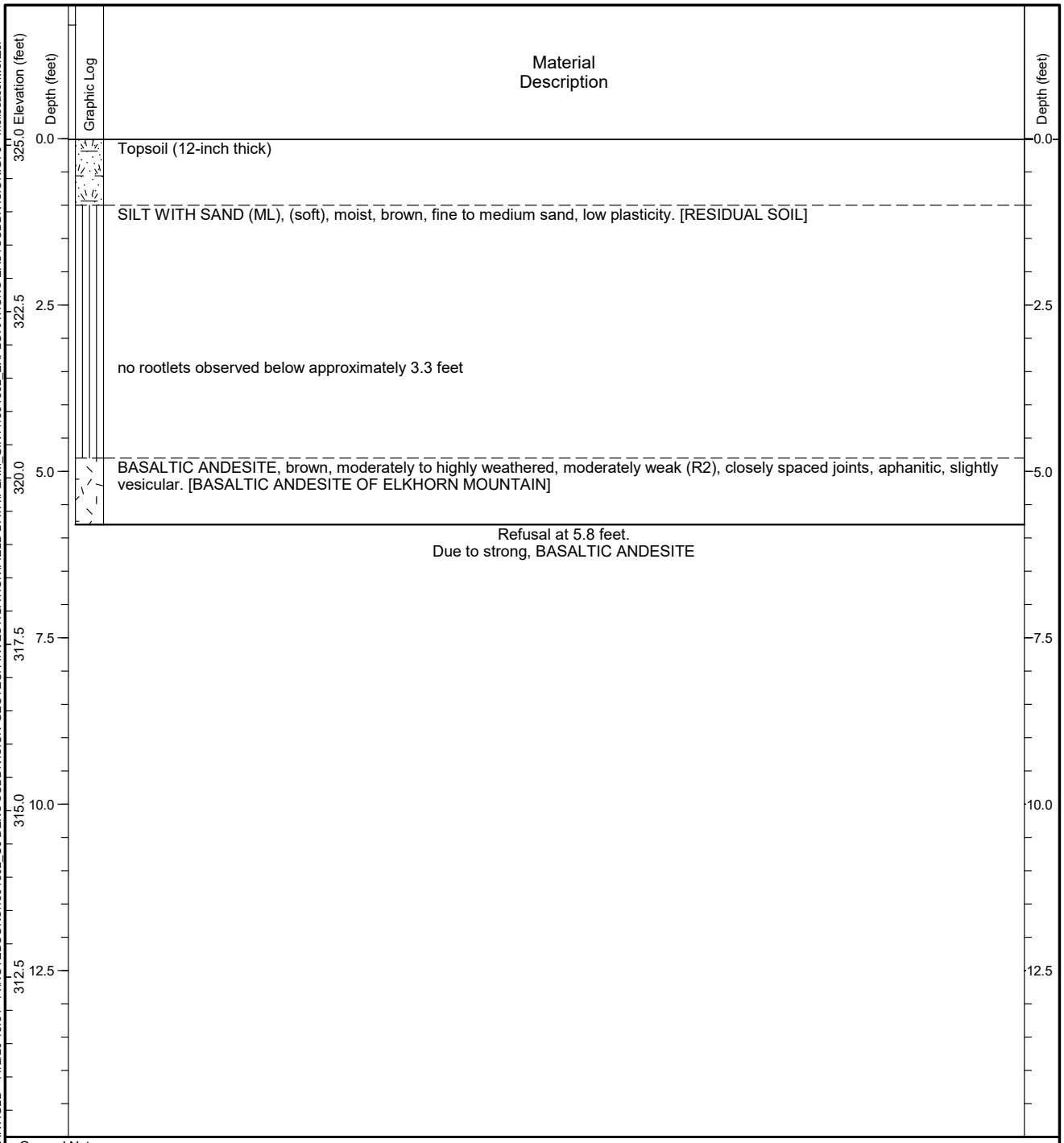
HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-86

Figure **A-74**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616000 Long: -122.409700 (WGS 84) Total Depth: 5.8 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 325.10 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-87

Figure **A-75**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616000 Long: -122.409200 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 318.65 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
	0.0		Topsoil (24-inch thick)	0.0
317.5			no rootlets observed below approximately 1.5 feet	
	2.5		Refusal at 2.0 feet. Due to strong, BASALTIC ANDESITE	2.5
315.0				
	5.0			5.0
312.5				
	7.5			7.5
310.0				
	10.0			10.0
307.5				
	12.5			12.5
305.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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HARTCROWSER A division of Haley & Aldrich

Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-88

Figure **A-76**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616000 Long: -122.411100 (WGS 84) Total Depth: 5.2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 309.66 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
307.5	0.0		Topsoil (48-inch thick)	0.0
	2.5		no rootlets observed below approximately 4 feet BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	2.5
305.0	5.0		Refusal at 5.2 feet. Due to strong, BASALTIC ANDESITE	5.0
302.5	7.5			7.5
300.0	10.0			10.0
297.5	12.5			12.5
295.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-89

Figure **A-77**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615900 Long: -122.411500 (WGS 84) Total Depth: 0 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 315.01 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
312.5	0.0		Refusal at 0.0 feet. Due to strong, BASALTIC ANDESITE	0.0
	2.5			2.5
310.0	5.0			5.0
	7.5			7.5
307.5	10.0			10.0
305.0	12.5			12.5
302.5				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-90

Figure **A-78**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615900 Long: -122.411600 (WGS 84) Total Depth: 0 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 309.83 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
307.5	0.0		Refusal at 0.0 feet. Due to strong, BASALTIC ANDESITE	0.0
305.0	2.5			2.5
302.5	5.0			5.0
300.0	7.5			7.5
297.5	10.0			10.0
295.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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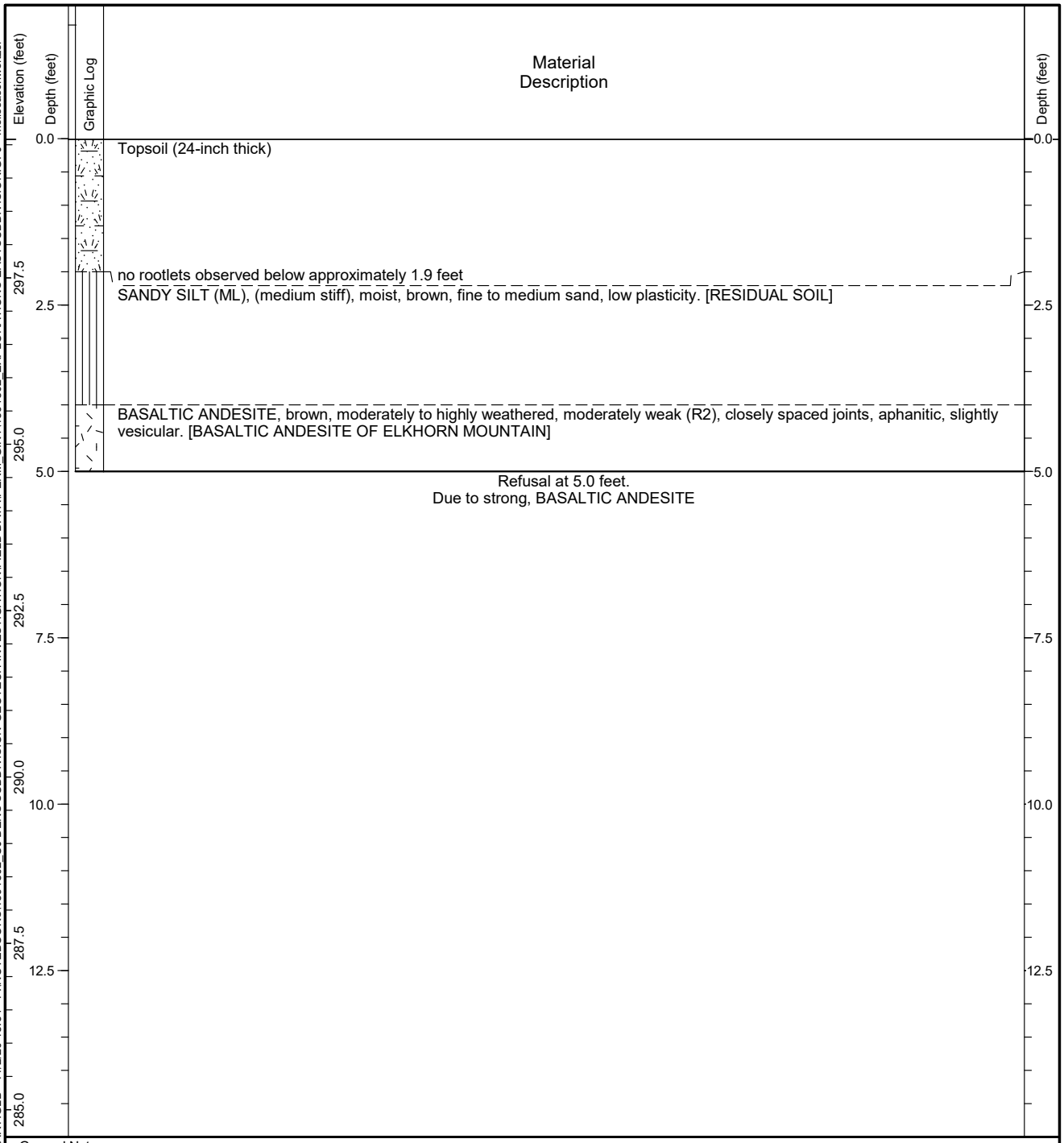
Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-91

Figure **A-79**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616400 Long: -122.410700 (WGS 84) Total Depth: 5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 299.59 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-92

Figure **A-80**
Sheet **1 of 1**

Date Started: 10/27/17 Date Completed: 10/27/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616500 Long: -122.410500 (WGS 84) Total Depth: 4.9 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 299.64 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
297.5	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
	2.5		Organic rich soil observed within discontinuities from approximately 2 to 4 feet	2.5
295.0	5.0		Refusal at 4.9 feet. Due to strong, BASALTIC ANDESITE	5.0
292.5	7.5			7.5
290.0	10.0			10.0
287.5	12.5			12.5
285.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
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Test Pit Log
TP-93

Figure **A-81**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616400 Long: -122.412000 (WGS 84) Total Depth: 0 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 299.27 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
297.5	0.0		Refusal at 0.0 feet. Due to strong, BASALTIC ANDESITE	0.0
295.0	2.5			2.5
292.5	5.0			5.0
290.0	7.5			7.5
287.5	10.0			10.0
285.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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Figure **A-82**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616200 Long: -122.412600 (WGS 84) Total Depth: 2.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 317.41 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
315.0	0.0		Topsoil (7-inch thick)	0.0
			SILT WITH SAND (ML), (soft), moist, brown, fine to medium sand, low plasticity. [RESIDUAL SOIL] no rootlets observed below approximately 0.92 feet	
312.5	2.5		Refusal at 2.5 feet. Due to strong, BASALTIC ANDESITE	2.5
310.0	5.0			5.0
307.5	7.5			7.5
305.0	10.0			10.0
302.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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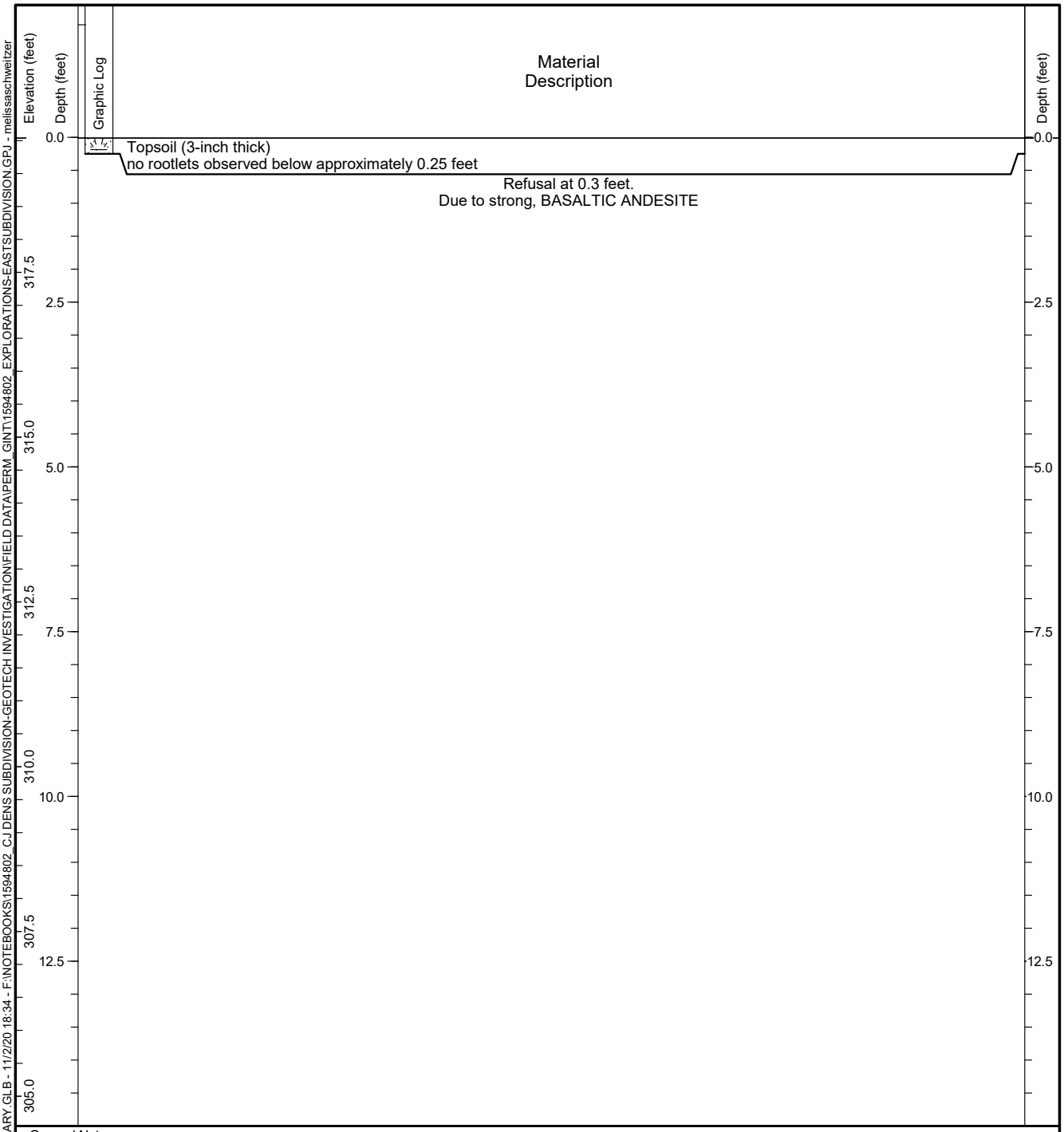
Figure **A-83**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616300 Long: -122.412700 (WGS 84) Total Depth: 0.25 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 319.55 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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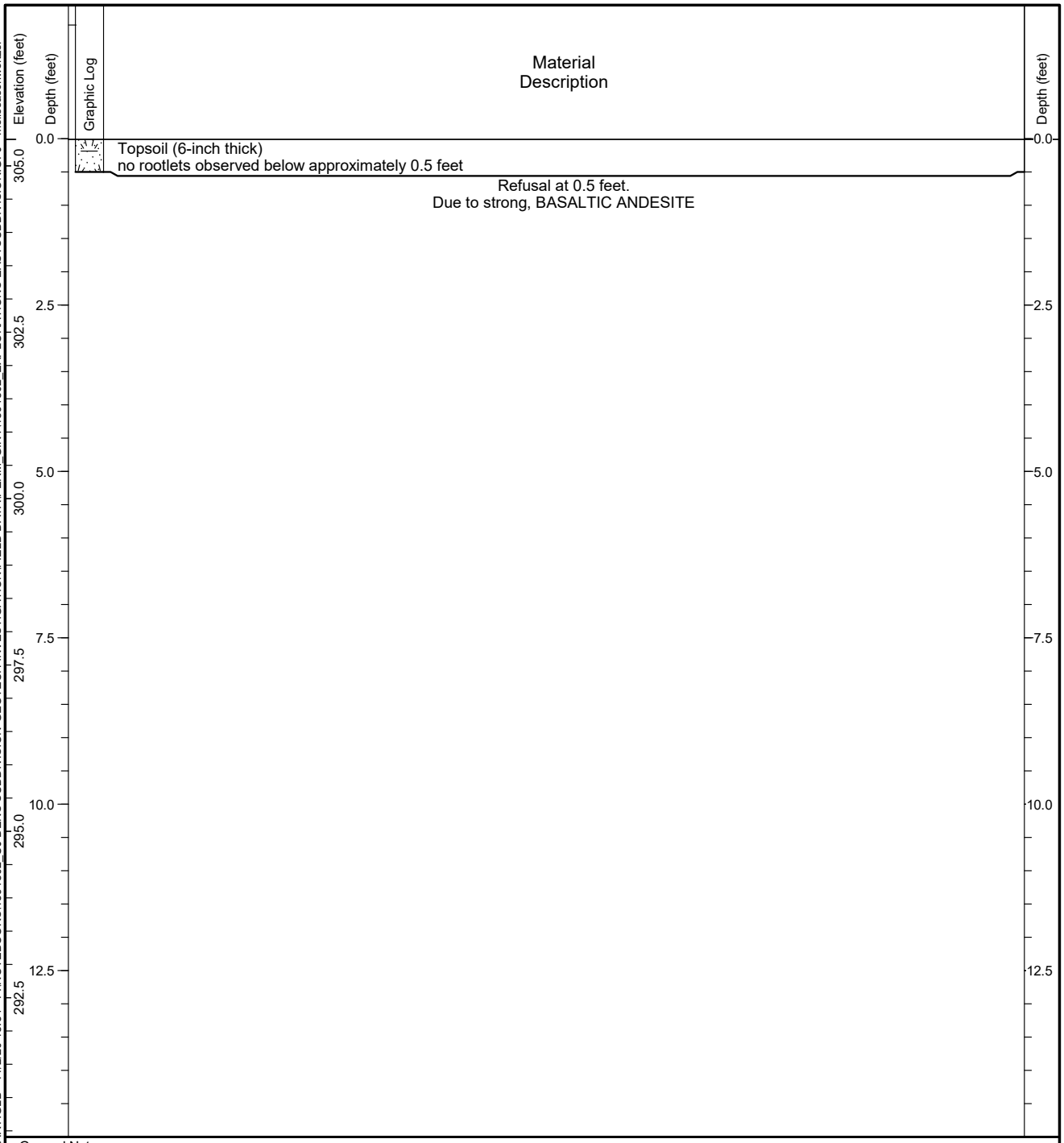
Figure **A-84**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615900 Long: -122.414100 (WGS 84) Total Depth: 0.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 305.41 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
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Project No.: 15948-02

Test Pit Log
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Figure **A-85**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616000 Long: -122.414100 (WGS 84) Total Depth: 0.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 302.41 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
300.0	0.0		Topsoil (6-inch thick) no rootlets observed below approximately 0.5 feet	0.0
			Refusal at 0.5 feet. Due to strong, BASALTIC ANDESITE	
297.5	2.5			2.5
295.0	5.0			5.0
292.5	7.5			7.5
290.0	10.0			10.0
287.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
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Test Pit Log
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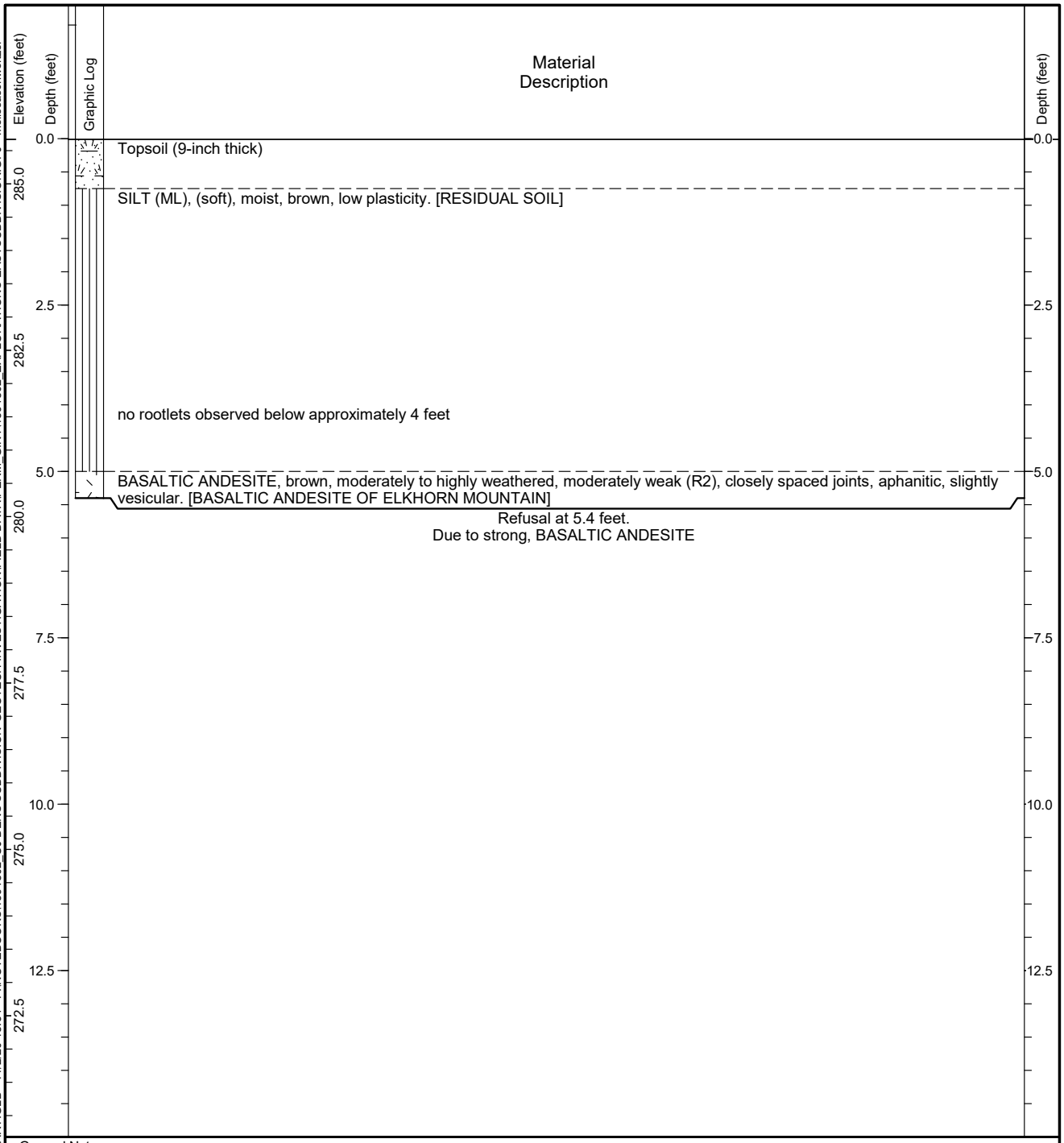
Figure **A-86**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.616100 Long: -122.414700 (WGS 84) Total Depth: 5.4 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 285.68 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Test Pit Log
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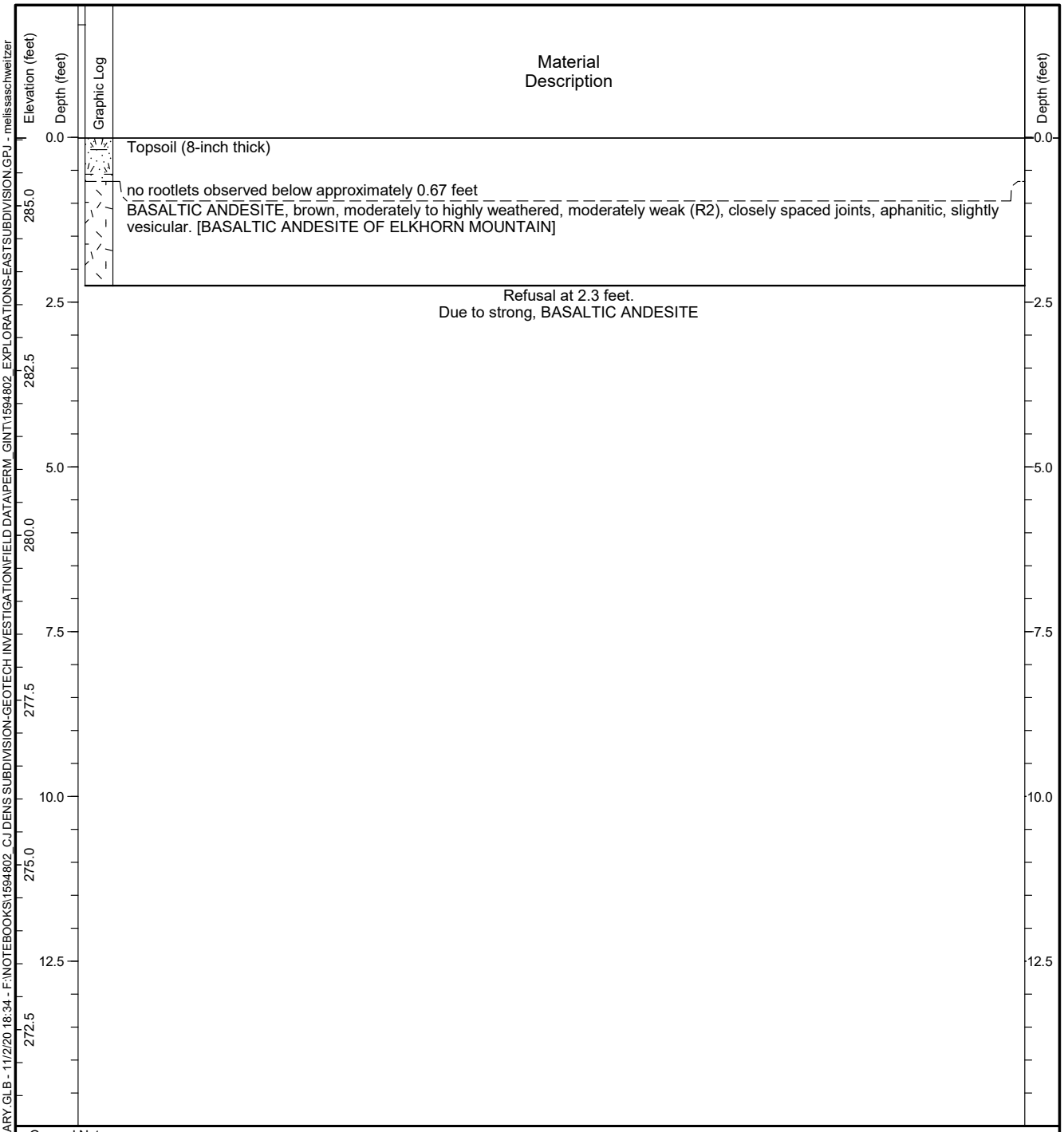
Figure **A-87**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615900 Long: -122.414700 (WGS 84) Total Depth: 2.25 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 286.04 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
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Test Pit Log
TP-100

Figure **A-88**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615800 Long: -122.415200 (WGS 84) Total Depth: 1 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 267.76 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
267.5	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
			Refusal at 1.0 feet. Due to strong, BASALTIC ANDESITE	
265.0	2.5			2.5
262.5	5.0			5.0
260.0	7.5			7.5
257.5	10.0			10.0
255.0	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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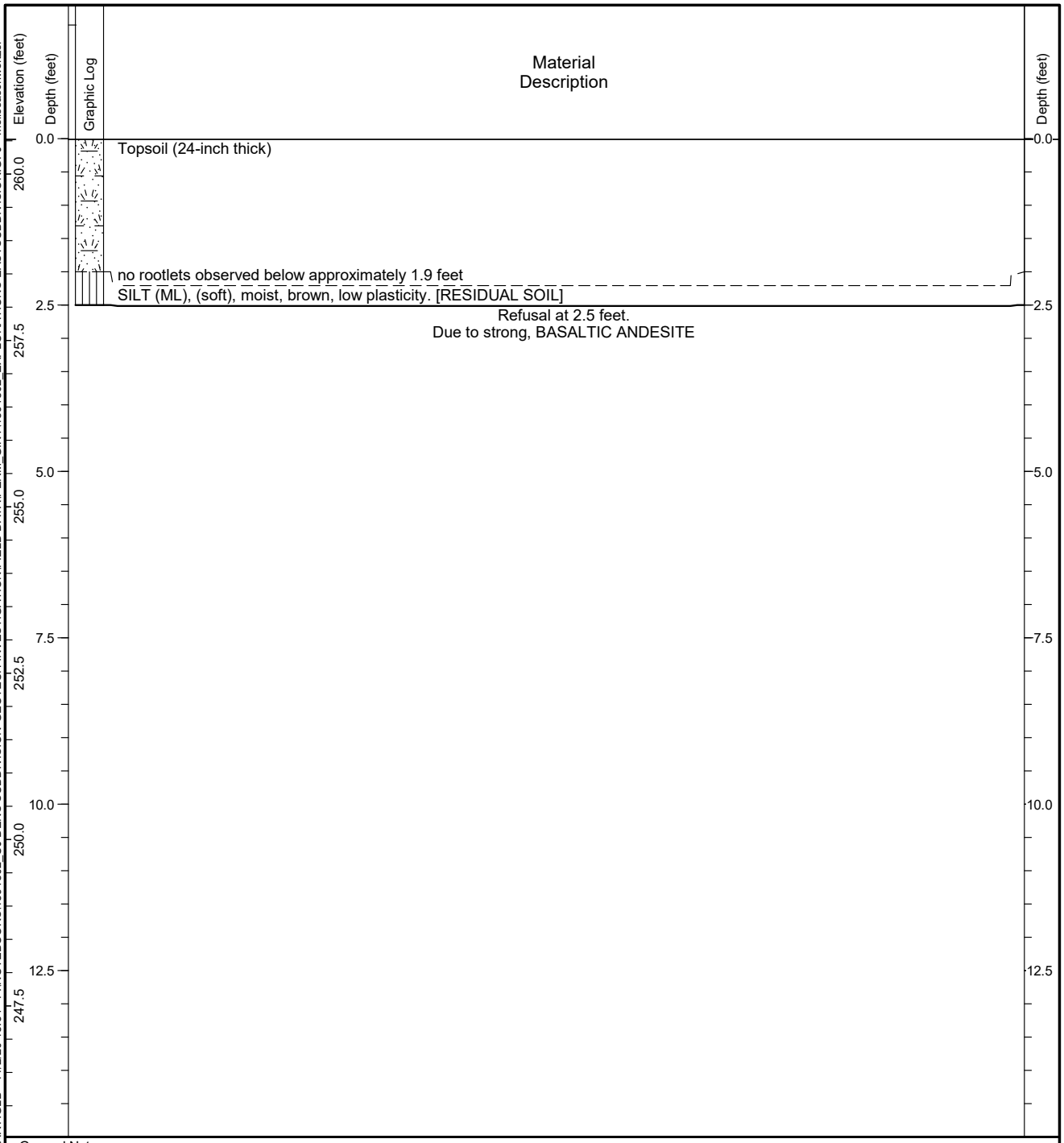
Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-101

Figure **A-89**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615700 Long: -122.415400 (WGS 84) Total Depth: 2.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 260.53 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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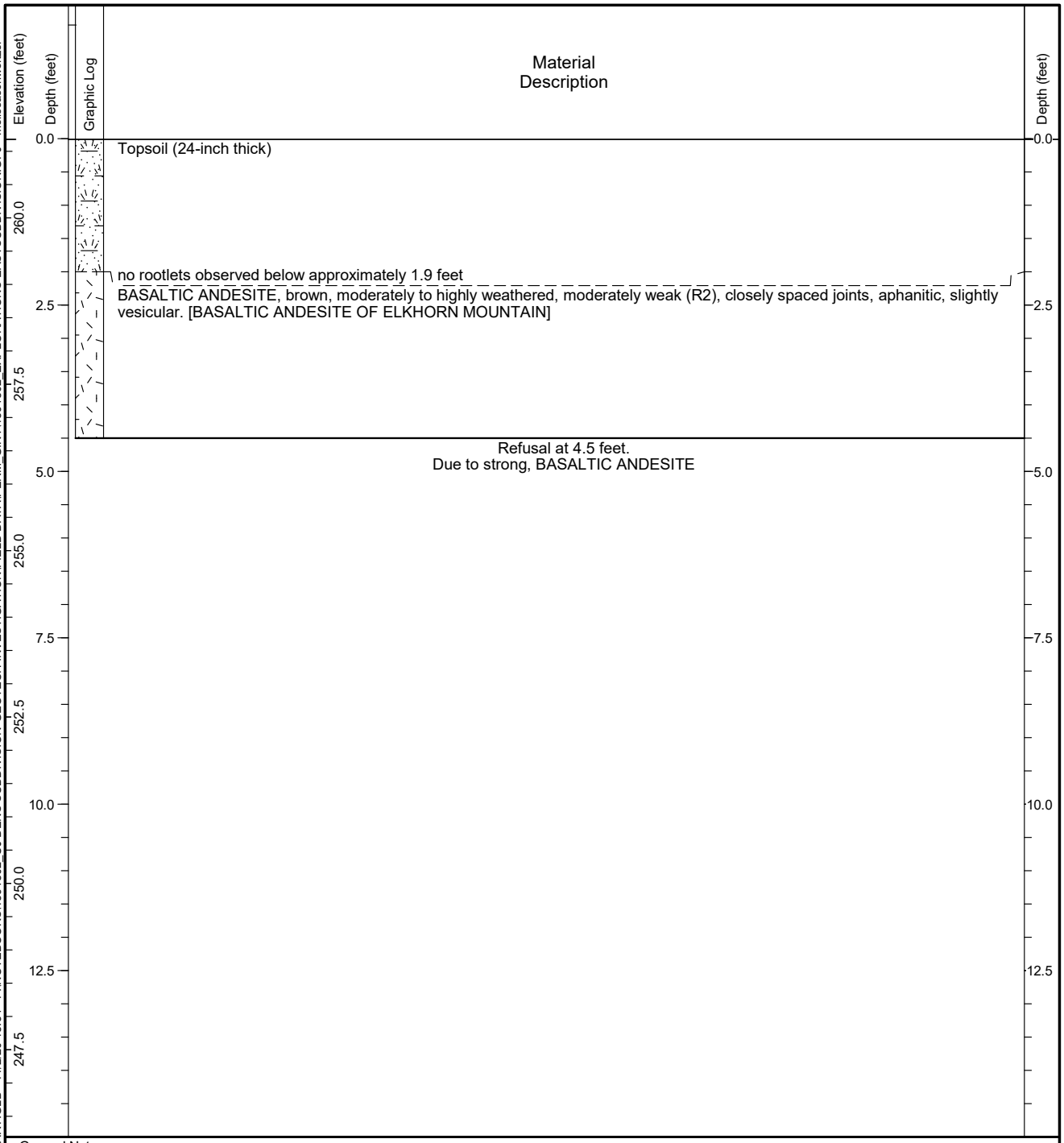
Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-102

Figure **A-90**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615200 Long: -122.415200 (WGS 84) Total Depth: 4.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 261.19 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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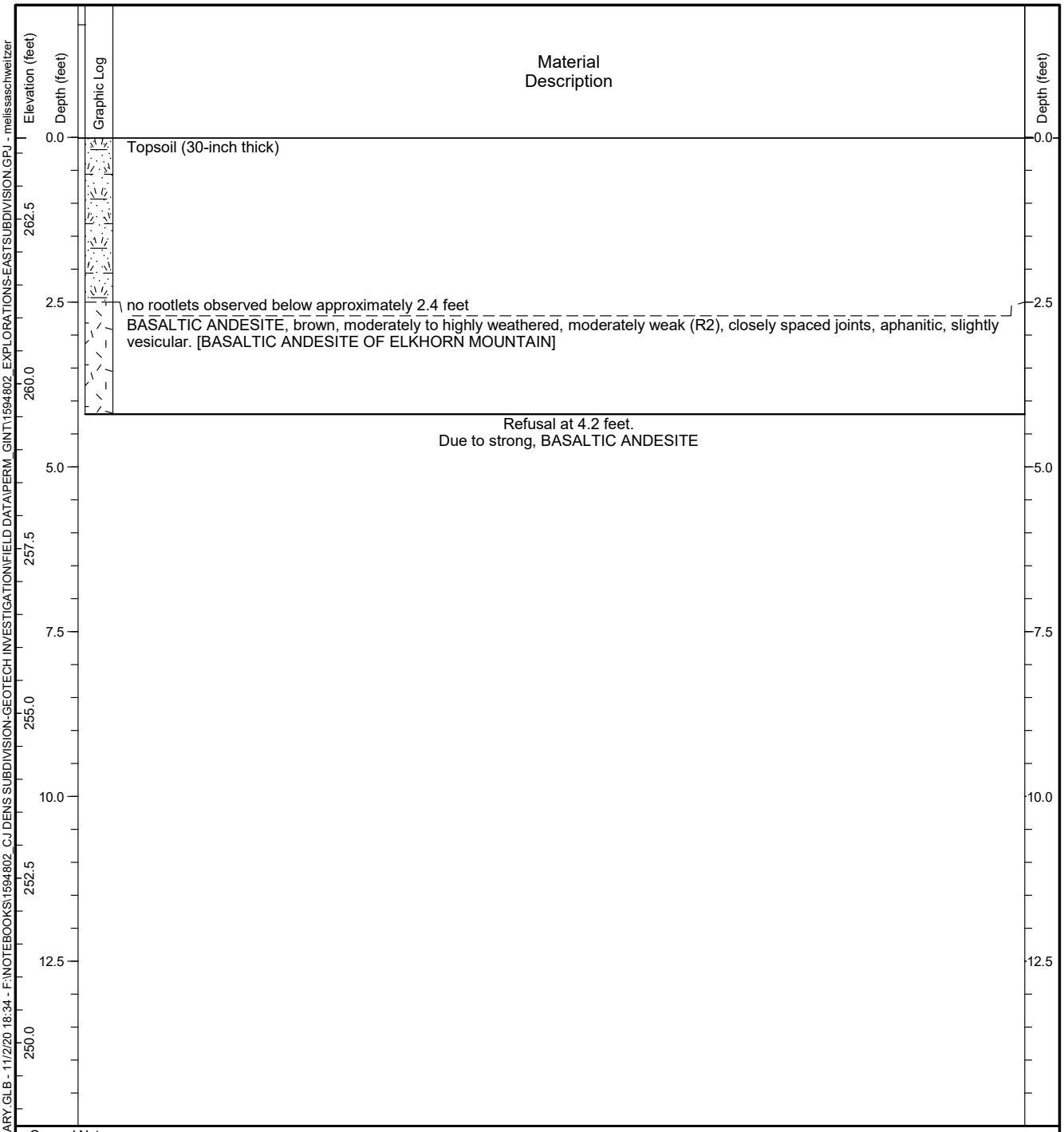
Figure **A-91**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615100 Long: -122.414800 (WGS 84) Total Depth: 4.2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 263.74 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
TP-104

Figure **A-92**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615000 Long: -122.414600 (WGS 84) Total Depth: 3 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 264.12 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
262.5	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
	2.5			2.5
			Refusal at 3.0 feet. Due to strong, BASALTIC ANDESITE	
260.0	5.0			5.0
257.5	7.5			7.5
255.0	10.0			10.0
252.5	12.5			12.5
250.0				

General Notes:
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4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
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Test Pit Log
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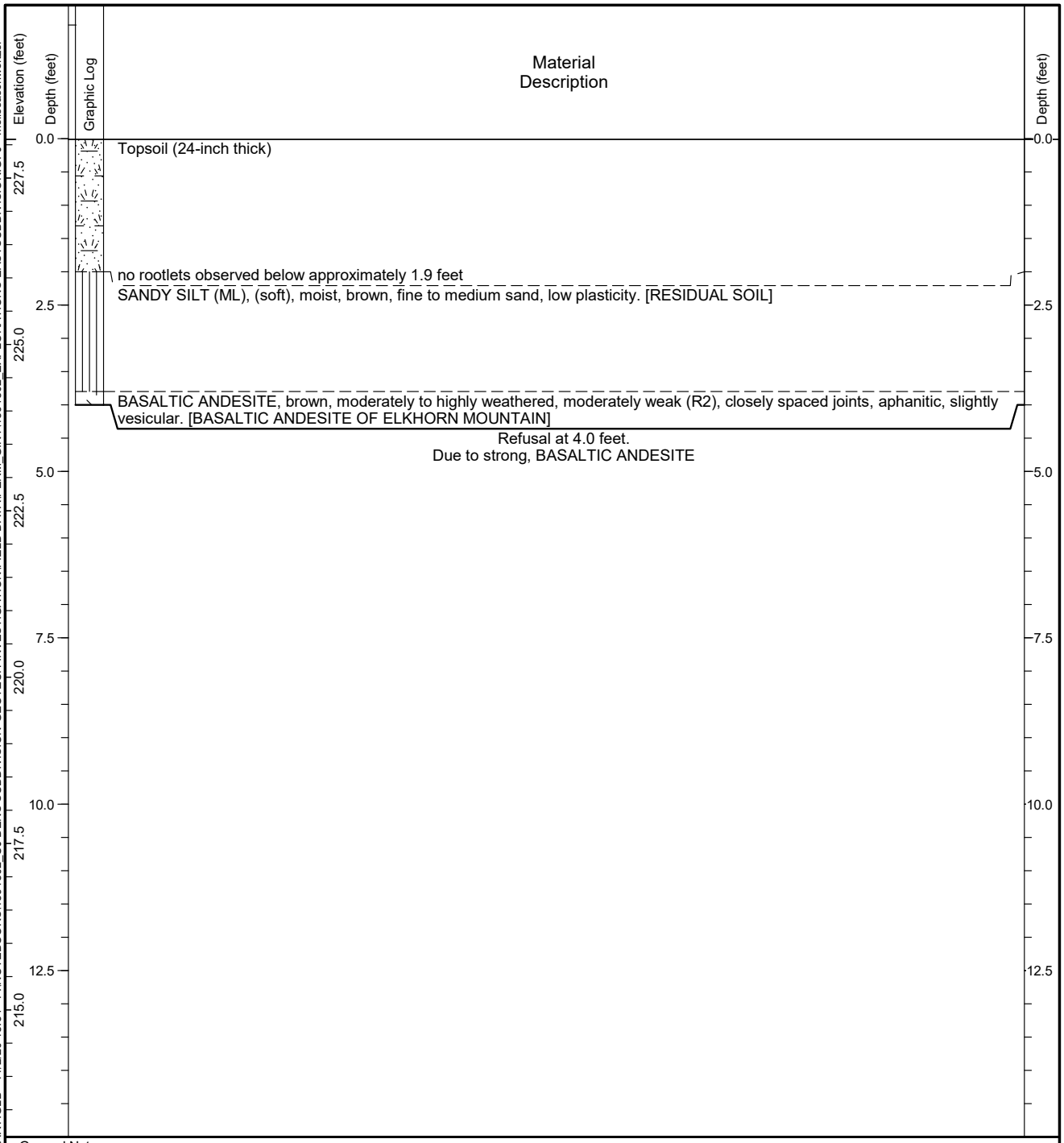
Figure **A-93**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614500 Long: -122.414100 (WGS 84) Total Depth: 4 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 228.09 feet (NGVD 88)
Comments:



General Notes:
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2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
Project No.: 15948-02

Test Pit Log
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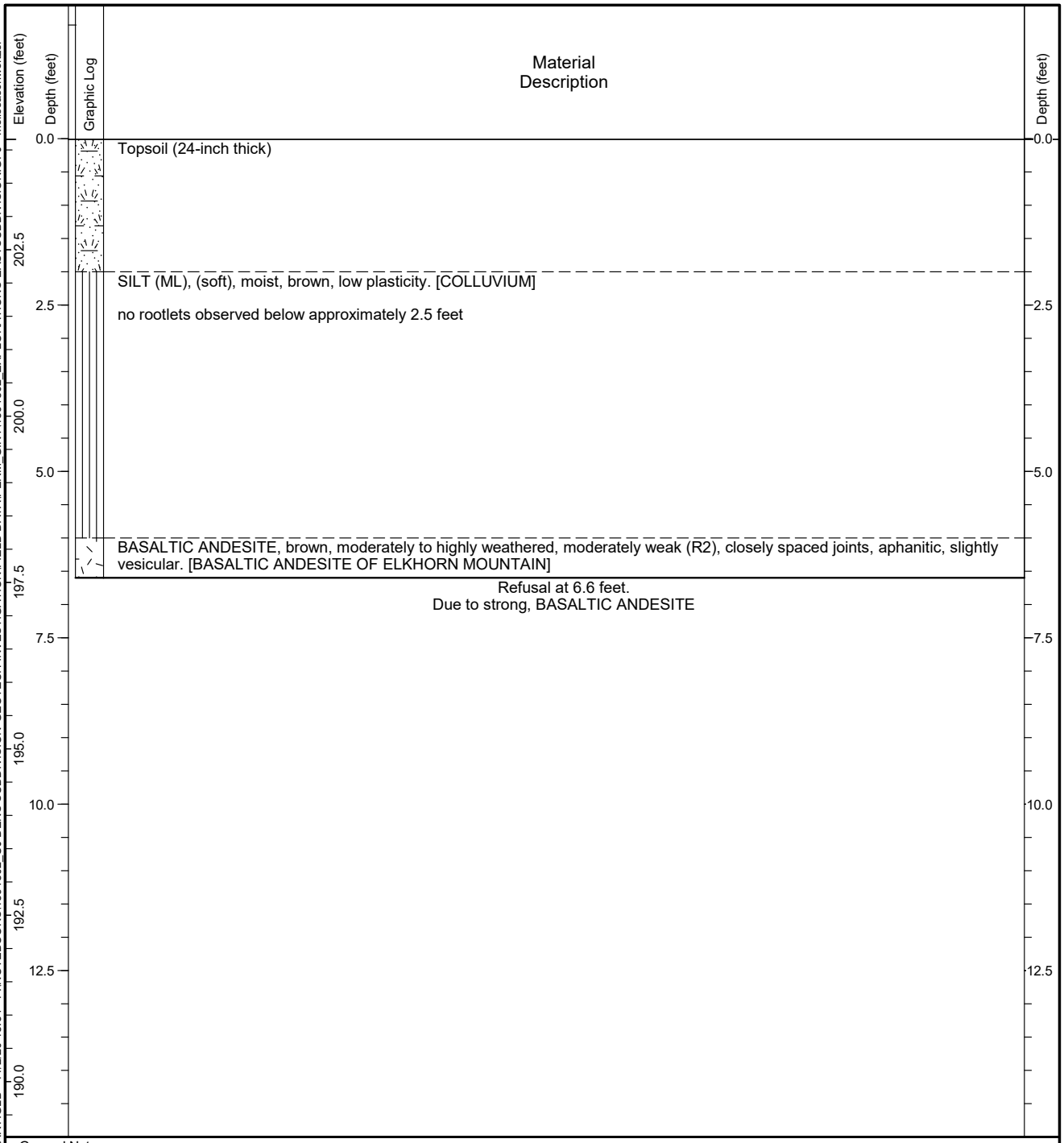
Figure **A-94**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614300 Long: -122.413800 (WGS 84) Total Depth: 6.6 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 204.17 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
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3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
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Test Pit Log
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Figure **A-95**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.614100 Long: -122.413400 (WGS 84) Total Depth: 10 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 195.83 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
195.0	0.0		Topsoil (2-inch thick)	0.0
			SILTY SAND (SM), (loose), moist, brown, fine to medium sand, low plasticity fines. [RESIDUAL SOIL]	
			no rootlets observed below approximately 0.5 feet	
192.5	2.5			2.5
190.0	5.0			5.0
187.5	7.5			7.5
185.0	10.0		Bottom of Test Pit at 10.0 feet.	10.0
182.5	12.5			12.5

General Notes:
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4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
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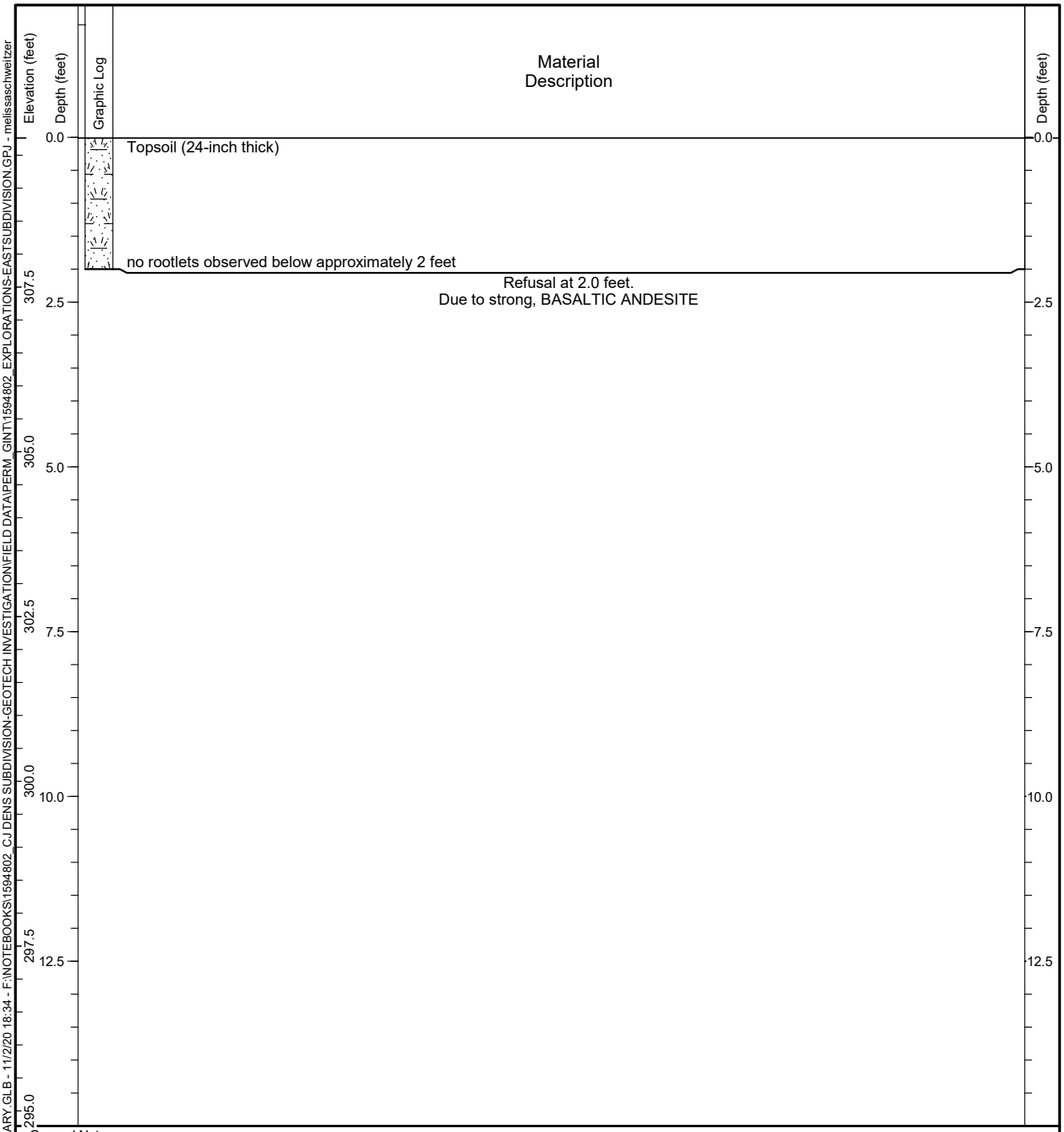
Test Pit Log
TP-108

Figure **A-96**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615400 Long: -122.411800 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 309.77 feet (NGVD 88)
Comments:



General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
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4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
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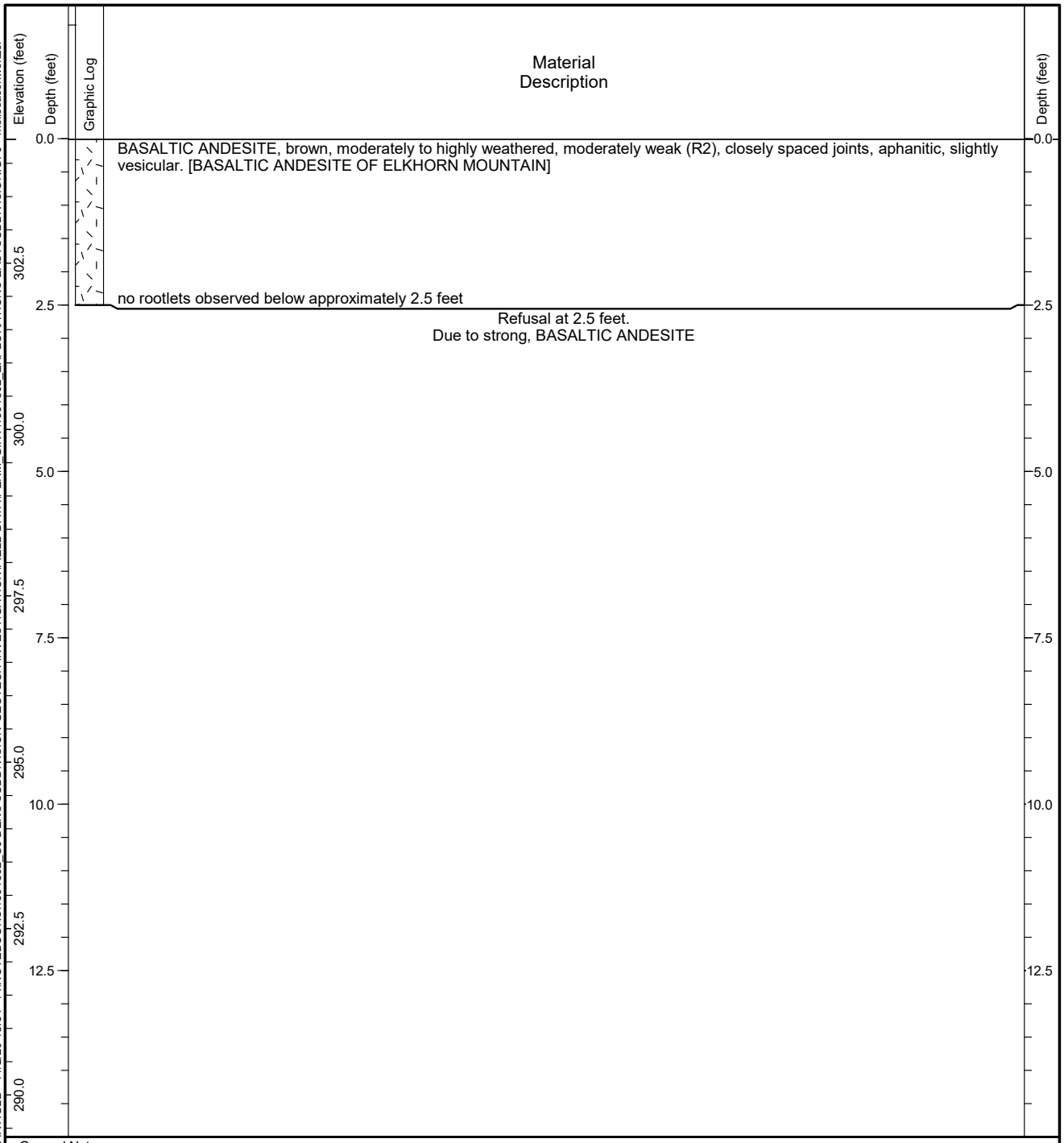
Test Pit Log
TP-109

Figure **A-97**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615300 Long: -122.411600 (WGS 84) Total Depth: 2.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 304.37 feet (NGVD 88)
Comments:



General Notes:
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3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Test Pit Log
TP-110

Figure **A-98**
Sheet **1 of 1**

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Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615200 Long: -122.409900 (WGS 84) Total Depth: 2 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 336.05 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
335.0	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN]	0.0
			no rootlets observed below approximately 2 feet	
332.5	2.5		Refusal at 2.0 feet. Due to strong, BASALTIC ANDESITE	2.5
330.0	5.0			5.0
327.5	7.5			7.5
325.0	10.0			10.0
322.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
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5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
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Test Pit Log
TP-111

Figure **A-99**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615200 Long: -122.410200 (WGS 84) Total Depth: 5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 332.01 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
330.0	0.0		Topsoil (12-inch thick)	0.0
			SANDY SILT (ML), (soft), moist, brown, fine to medium sand, low plasticity. [RESIDUAL SOIL]	
			no rootlets observed below approximately 1.33 feet	
327.5	2.5			2.5
325.0	5.0		Bottom of Test Pit at 5.0 feet.	5.0
322.5	7.5			7.5
320.0	10.0			10.0
317.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
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Test Pit Log
TP-112

Figure **A-100**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615200 Long: -122.410700 (WGS 84) Total Depth: 0.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 325.17 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
325.0	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN] no rootlets observed below approximately 0.5 feet	0.0
			Refusal at 0.5 feet. Due to strong, BASALTIC ANDESITE	
322.5	2.5			2.5
320.0	5.0			5.0
317.5	7.5			7.5
315.0	10.0			10.0
312.5	12.5			12.5

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
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Test Pit Log
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Figure **A-101**
Sheet **1 of 1**

Date Started: 10/30/17 Date Completed: 10/30/17 Contractor/Crew: Tapani, Inc.
Logged by: J. Robinson Checked by: R. Rosenberg Rig Model/Type: Komatsu PC-200
Location: Lat: 45.615100 Long: -122.410700 (WGS 84) Total Depth: 0.5 feet Depth to Seepage: Not Encountered
Ground Surface Elevation: 323.50 feet (NGVD 88)
Comments:

Elevation (feet)	Depth (feet)	Graphic Log	Material Description	Depth (feet)
322.5	0.0		BASALTIC ANDESITE, brown, moderately to highly weathered, moderately weak (R2), closely spaced joints, aphanitic, slightly vesicular. [BASALTIC ANDESITE OF ELKHORN MOUNTAIN] no rootlets observed below approximately 0.5 feet	0.0
			Refusal at 0.5 feet. Due to strong, BASALTIC ANDESITE	
320.0	2.5			2.5
	5.0			5.0
317.5				
	7.5			7.5
315.0				
	10.0			10.0
312.5				
	12.5			12.5
310.0				

General Notes:
1. Refer to Figure A-8 for explanation of descriptions and symbols.
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4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

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Project: CJ Dens East Subdivision
Location: Camas, Washington
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Figure **A-102**
Sheet **1 of 1**

Appendix H: Maintenance & Operations

Appendix V-A: BMP Maintenance Tables

Ecology intends the facility-specific maintenance standards contained in this section to be conditions for determining if maintenance actions are required as identified through inspection. Recognizing that Permittees have limited maintenance funds and time, Ecology does not require that a Permittee perform all these maintenance activities on all their stormwater BMPs. We leave the determination of importance of each maintenance activity and its priority within the stormwater program to the Permittee. We do expect, however, that sufficient maintenance will occur to ensure that the BMPs continue to operate as designed to protect ground and surface waters.

Ecology doesn't intend that these measures identify the facility's required condition at all times between inspections. In other words, exceedance of these conditions at any time between inspections and/or maintenance does not automatically constitute a violation of these standards. However, based upon inspection observations, the Permittee shall adjust inspection and maintenance schedules to minimize the length of time that a facility is in a condition that requires a maintenance action.

Table V-A.1: Maintenance Standards - Detention Ponds

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash & Debris	Any trash and debris which exceed 1 cubic feet per 1,000 square feet. In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site
	Poisonous Vegetation and noxious weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations. (Apply requirements of adopted IPM policies for the use of herbicides).	No danger of poisonous vegetation where maintenance personnel or the public might normally be. (Coordinate with local health department) Complete eradication of noxious weeds may not be possible. Compliance with State or local eradication policies required
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants (Coordinate removal/cleanup with local water quality response agency).	No contaminants or pollutants present.
	Rodent Holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired. (Coordinate with local health department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)
	Beaver Dams	Dam results in change or function of the facility.	Facility is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies)
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted IPM policies
	Tree Growth and Hazard Trees	Tree growth does not allow maintenance and inspection access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements). If trees are not interfering with access or maintenance, do not remove If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements)	Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood). Remove hazard Trees
Side Slopes of Pond	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes should be stabilized using appropriate erosion control measure(s); e.g.,rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed engineer in the state of Washington should be consulted to resolve source of erosion.
Storage Area	Sediment	Accumulated sediment that exceeds 10% of the designed pond depth unless otherwise specified or affects inletting or outletting condition of the facility.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.

Table V-A.1: Maintenance Standards - Detention Ponds (continued)

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
	Liner (if Applicable)	Liner is visible and has more than three 1/4-inch holes in it.	Liner repaired or replaced. Liner is fully covered.
Ponds Berms (Dikes)	Settlements	Any part of berm which has settled 4 inches lower than the design elevation If settlement is apparent, measure berm to determine amount of settlement Settling can be an indication of more severe problems with the berm or outlet works. A licensed engineer in the state of Washington should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Goethechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway and Berms over 4 feet in height	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping. Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed engineer in the state of Washington should be consulted for proper berm/spillway restoration.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/Spillway	Emergency Overflow/Spillway	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil at the top of out flow path of spillway. (Rip-rap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.
	Erosion	See "Side Slopes of Pond"	

Table V-A.2: Maintenance Standards - Infiltration

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash & Debris	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Poisonous/Noxious Vegetation	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Contaminants and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Rodent Holes	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Storage Area	Sediment	Water ponding in infiltration pond after rainfall ceases and appropriate time allowed for infiltration. Treatment basins should infiltrate Water Quality Design Storm Volume within 48 hours, and empty within 24 hours after cessation of most rain events.	Sediment is removed and/or facility is cleaned so that infiltration system works according to design.

Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults) (continued)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

Table V-A.4: Maintenance Standards - Control Structure/Flow Restrictor

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall. Structure is not in upright position (allow up to 10% from plumb). Connections to outlet pipe are not watertight and show signs of rust. Any holes - other than designed holes - in the structure.	Structure securely attached to wall and outlet pipe. Structure in correct position. Connections to outlet pipe are water tight; structure repaired or replaced and works as designed. Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing. Gate cannot be moved up and down by one maintenance person. Chain/rod leading to gate is missing or damaged. Gate is rusted over 50% of its surface area.	Gate is watertight and works as designed. Gate moves up and down easily and is watertight. Chain is in place and works as designed. Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)
Catch Basin	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

Table V-A.5: Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%. Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin). Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Basin replaced or repaired to design standards. Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening. Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation blocking opening to basin. No vegetation or root growth present.
	Contamination and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place, meets the design standards, and is installed and aligned with the flow path.

Table V-A.6: Maintenance Standards - Debris Barriers (e.g., Trash Racks)

Maintenance Components	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
Metal	Damaged/ Missing Bars.	Bars are bent out of shape more than 3 inches. Bars are missing or entire barrier missing. Bars are loose and rust is causing 50% deterioration to any part of barrier.	Bars in place with no bends more than 3/4 inch. Bars in place according to design. Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe

Table V-A.7: Maintenance Standards - Energy Dissipators

Maintenance Components	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
External:			
Rock Pad	Missing or Moved Rock	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad replaced to design standards.
	Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.
Dispersion Trench	Pipe Plugged with Sediment	Accumulated sediment that exceeds 20% of the design depth.	Pipe cleaned/flushed so that it matches design.
	Not Discharging Water Properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench). Intent is to prevent erosion damage.	Trench redesigned or rebuilt to standards.
	Perforations Plugged.	Over 1/2 of perforations in pipe are plugged with debris and sediment.	Perforated pipe cleaned or replaced.
	Water Flows Out Top of "Distributor" Catch Basin.	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm or its causing or appears likely to cause damage.	Facility rebuilt or redesigned to standards.
	Receiving Area Over-Saturated	Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Internal:			
Manhole/Chamber	Worn or Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to 1/2 of original size or any concentrated worn spot exceeding one square foot which would make structure unsound.	Structure replaced to design standards.
	Other Defects	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

Table V-A.8: Maintenance Standards - Typical Biofiltration Swale

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Recommended Maintenance to Correct Problem
General	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.	Remove sediment deposits on grass treatment area of the bio-swale. When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased.
	Standing Water	When water stands in the swale between storms and does not drain freely.	Any of the following may apply: remove sediment or trash blockages, improve grade from head to foot of swale, remove clogged check dams, add underdrains or convert to a wet biofiltration swale.
	Flow spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire swale width.	Level the spreader and clean so that flows are spread evenly over entire swale width.

MACKENZIE. 60 YEARS
DESIGN DRIVEN I CLIENT FOCUSED

October 21, 2020

City of Camas
Attention: Jim (Curleigh) Carothers
616 NE Fourth Ave
Camas, WA 98607

Re: **CJ Dens East Subdivision**
Trip Update Letter
Project Number 2200389.00

Dear Jim Curleigh:

Mackenzie has prepared this trip update letter for revisions to the plat for the CJ Dens Subdivision (SUB10-03), originally approved for 289 lots on September 26, 2014. The site area has been reduced to now include only the east portion of the subdivision with 152 lots. A copy of the proposed plat is attached.

With development of the site, access will be at one (1) new intersection on Leadbetter Road at N Elk Street and through the existing intersection of N Adams Street with Leadbetter Road. Two (2) stubs will be provided to undeveloped parcels to the north and east for future connectivity.

Trip Generation

A Transportation Impact Analysis (TIA) dated August 18, 2010 presented trip generation for the original development proposal for 297 lots. The trip generation estimates presented in the August 2010 TIA lots were based on data from the Institute of Transportation Engineers' (ITE) *Trip Generation Manual,* 8th Edition for the "Single-Family Detached Housing" (LIC 210) use. That data is now superseded by data for the same use presented in ITE's *Trip Generation Manual,* 10th Edition. Table 1 presents a comparison of trip generation for the 2010 and 2020 development proposals.

TABLE 1 –TRIP GENERATION COMPARISON

ITE Code	ITE Land Use	Scenario	Size	AM Peak Hour			PM Peak Hour			Daily
				In	Out	Total	In	Out	Total	
210	Single-Family Detached Housing	August 2010 TIA	297 DU	54	164	218	176	104	280	2,831
		2020 Proposal	152 DU	28	85	113	96	56	152	1,528
		Net Difference	-145 DU	-26	-79	-105	-80	-48	-128	-1,303

As presented in Table 1, the current proposal for 152 single-family lots is estimated to generate 105 fewer AM peak hour, 128 fewer PM peak hour, and 1,303 fewer daily trips compared with the 2010 proposal for 297 single-family lots.

Trip Distribution & Assignment

We have assumed the same distribution of trips as shown in Figure 8 of the original TIA. A copy of the distribution is attached for reference. With the updated trip generation, new assignment figures have been prepared showing trips to all intersections impacted by 25 or more AM or PM peak hour trips. These figures also reflect the change in access to the development from four (4) access points to two access points to Leadbetter Road.

Impact and Mitigation

In order to address the City's street standards, including Neighborhood Transportation Management, we have estimated the volumes on each roadway in the subdivision at opening. Table 2 presents the highest estimated volume on internal roadways with the two (2) road connections to Leadbetter Road.

TABLE 2 – INTERNAL ROADWAY VOLUMES

Roadway	AM Peak Hour	PM Peak Hour	Daily
N Adams Street	69	93	938
N Elk Street	44	59	588
N 50th Avenue	28	37	375
N 49th Avenue	44	60	600
N 48th Avenue	20	27	272

As presented in Table 2, N Adams Street is the only internal roadway that is estimated to have more than 700 daily trips.

With future connections planned at the north (N 50th Avenue) and east (N 49th Avenue), we do not anticipate any internal road segment would have more than 700 daily trips after these future connections are made.

The City's Neighborhood Traffic Management Guidelines require any neighborhood or local streets reaching the threshold of 700 vehicles per day to mitigate the impact of the new development with traffic calming strategies. Adams Street is expected to exceed the 700-daily-trip threshold with development of the proposed 152 single-family lots at opening. Adams Street is approximately 800 feet long and an additional 370 feet will be constructed with the proposed subdivision. Because most of N Adams Street is already constructed, the total length will be relatively short, and the alignment will be linear, appropriate traffic calming measures include chokers or speed cushions. Because future road connections will result in volumes below the threshold, these traffic calming measures are not recommended for the interim condition.

Everett Street is an existing two-lane roadway. The City's Six Year Transportation Improvement Program (2021-2026) includes an improvement project to widen Everett Street with bike lanes. Funding for this improvement project has not been secured. However, construction of a new roundabout at Everett Street and Lake Road is currently underway. No changes in traffic patterns for the proposed subdivision are expected with the improvements on Everett Street.

The City's 2035 Comprehensive Plan presents a future east-west arterial extending west of Everett Drive and parallel to Leadbetter Road. Once this new arterial is constructed, Leadbetter Road will be converted to a public trail, and all site traffic will be diverted to the new east-west arterial.

The 2035 Comprehensive Plan also includes an extension of NE 242nd Avenue from NE 28th Street and continuing south as the new east-west arterial. With this change, traffic volumes on NE 232nd Avenue are expected to decrease as the new NE 242nd Avenue extension will serve as a more direct, parallel route to NE 232nd Avenue.

No other changes in traffic patterns are anticipated with the transportation network changes presented in the City's 2035 Comprehensive Plan.

Conditions of Approval

The September 2014 decision and staff report for SUB10-03 required the installation of traffic calming features for any street with 700 or more ADT. The traffic calming features must be consistent with the City's adopted Neighborhood Traffic Management Plan. Adams Street is expected to be impacted by more than 700 daily trips with the development of 152 single-family lots in the interim. With this project, traffic calming measures on N Adams Street such as chokers or speed cushions have been identified. However, future connections will be provided to the north and east which will decrease the future average daily traffic on N Adams Street. Therefore, these traffic calming measures are not recommended for the interim condition.

Please contact me at bahrend@mcknze.com or 971-346-3781 if you have any questions regarding the information presented in this letter.

Sincerely,

Brent Ahrend, PE
Traffic Engineer

Enclosure(s): Proposed Plat, Trip Generation Excerpt, Trip Distribution & Assignment Figures

c: Carl Lawson – CJ Dens Lacamas II, LLC
John Meier, Alex Burzynski – AKS Engineering & Forestry
Janet Jones –Mackenzie

AKS ENGINEERING & FORESTRY, LLC
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360.882.0419
WWW.AKS-ENG.COM

ENGINEERING • SURVEYING • NATURAL RESOURCES
FORESTRY • PLANNING • LANDSCAPE ARCHITECTURE

PROPOSED PLAT - OVERVIEW
CJ DENS EAST SUBDIVISION
CJ DENS LACAMAS I LLC
CAMAS, WASHINGTON

JOB NUMBER:	5504
DATE:	10/14/2020
DRAWING BY:	CJS
CHECKED BY:	MPS
APPROVED BY:	JMH

PA-1.0

DEVELOPMENT STANDARDS

AVERAGE LOT AREA	NONE*
MINIMUM LOT SIZE	5,250 SQUARE FEET
MAXIMUM LOT SIZE	64,000 SQUARE FEET
MINIMUM LOT WIDTH	60 FEET
MINIMUM LOT DEPTH	80 FEET
MAXIMUM BUILDING LOT COVERAGE	50%**
MAXIMUM BUILDING HEIGHT	35 FEET
MINIMUM FRONT YARD SETBACK	10** FEET
MINIMUM FRONT YARD - GARAGE	18** FEET
MINIMUM SIDE YARD	5 FEET
MINIMUM STREET SIDE YARD	10 FEET
MINIMUM REAR YARD	15** FEET
MINIMUM LOT FRONTAGE ON CUL-DE-SAC	30 FEET

* THE PROPOSED DEVELOPMENT IS USING DENSITY TRANSFER STANDARDS. NO AVERAGE LOT AREA IS REQUIRED.
** THESE STANDARDS VARY FROM THE CODE AS ALLOWED BY CMC SECTION 18.09.060(D). THE CITY HAS APPROVED THESE VARIANCES IN PRINCIPLE, ASSUMING THE FINAL DEVELOPMENT PROVIDES SOME ACTIVE OPEN SPACE AND TREE MITIGATION PLANTINGS.

STATISTICS

TOTAL GROSS AREA:	2,161,423 SF (49.62 AC)
NATURAL AREA TRACTS:	663,808 SF (15.93 AC)
OPEN SPACE TRACTS:	36,111 SF (0.88 AC)
STORMWATER TRACTS:	218,713 SF (5.18 AC)
ACCESS TRACTS:	18,023 SF (0.41 AC)
PARKING TRACTS:	11,255 SF (0.26 AC)
FUTURE RIGHT-OF-WAY:	16,477 SF (0.38 AC)
RIGHT-OF-WAY AREA:	336,287 SF (7.72 AC)
AVERAGE LOT AREA:	6,840 SF

DENSITY CALCULATIONS

TOTAL GROSS AREA:	2,161,423 SF (49.62 AC)
NATURAL & OPEN SPACE AREAS:	731,937 SF (16.80 AC)
NET SITE AREA:	1,429,486 SF (32.82 AC)
MAXIMUM LOTS ALLOWED (32.82 AC X 5.8):	190 LOTS
PROPOSED LOTS:	152 LOTS
PROPOSED DENSITY (152 LOTS / 32.82 AC):	4.63 LOTS/NET ACRE

TRACT AREA & PURPOSE

TRACT A:	313,639 SF	NATURAL AREA
TRACT B:	131,101 SF	NATURAL AREA
TRACT C:	1,428 SF	PARKING
TRACT D:	2,500 SF	ACCESS
TRACT E:	1,590 SF	PARKING
TRACT F:	1,536 SF	ACCESS
TRACT G:	7,978 SF	OPEN SPACE
TRACT H:	1,515 SF	PARKING
TRACT I:	3,151 SF	OPEN SPACE
TRACT J:	15,039 SF	OPEN SPACE
TRACT K:	1,557 SF	PARKING
TRACT L:	4,934 SF	ACCESS
TRACT M:	2,245 SF	PARKING
TRACT N:	1,460 SF	PARKING
TRACT O:	2,017 SF	ACCESS
TRACT P:	3,160 SF	ACCESS
TRACT Q:	3,877 SF	ACCESS
TRACT R:	1,460 SF	PARKING
TRACT S:	11,943 SF	OPEN SPACE
TRACT T:	7,812 SF	STORMWATER FACILITY
TRACT U:	249,086 SF	NATURAL AREA
TRACT V:	16,477 SF	FUTURE ROW DEDICATION

PROPOSED PLAT (SOUTH)
CJ DENS EAST SUBDIVISION
CJ DENS LACAMAS I LLC
CAMAS, WASHINGTON
PA-1.1
DEVELOPMENT STANDARDS
AVERAGE LOT AREA NONE*
MINIMUM LOT SIZE 5,250 SQUARE FEET
MAXIMUM LOT SIZE 6,000 SQUARE FEET
MINIMUM LOT WIDTH 60 FEET
MINIMUM LOT DEPTH 80 FEET
MAXIMUM BUILDING LOT COVERAGE 50%**
MAXIMUM BUILDING HEIGHT 35 FEET
MINIMUM FRONT YARD SETBACK 10** FEET
MINIMUM FRONT YARD - GARAGE 18** FEET
MINIMUM SIDE YARD 5 FEET
MINIMUM STREET SIDE YARD 15 FEET
MINIMUM REAR YARD 15** FEET
MINIMUM LOT FRONTAGE ON CUL-DE-SAC 30 FEET
* THE PROPOSED DEVELOPED IS USING DENSITY TRANSFER STANDARDS; NO AVERAGE LOT AREA IS REQUIRED.
** THESE STANDARDS VARY FROM THE CODE AS ALLOWED BY CMC SECTION 18.09.060(D). THE CITY HAS APPROVED THESE VARIANCES IN PRIOR PHASES AND THE PLAT WILL PROVIDE SOME ACTIVE OPEN SPACE AND TREE MITIGATION PLANTINGS.
SCALE: 1"=50 FEET
ORIGINAL PAGE SIZE: 22" x 34"
N ADAMS ST
N 49TH AVE
N 48TH AVE
N ELK DR
NE LEADBETTER RD
LACAMAS LAKE
SEE SHEET PA-1.3
SEE SHEET PA-1.2
TRACT A NATURAL AREA
TRACT H PARKING
TRACT I OPEN SPACE
TRACT J OPEN SPACE
TRACT K PARKING
TRACT L ACCESS
TRACT O PARKING
10' FRONT SETBACK (TYP)
18' GARAGE SETBACK (TYP)
15' REAR YARD SETBACK (TYP)
200' SHORELINE BUFFER
100' RESIDENTIAL SHORELINE SETBACK
PARCEL SERIAL NO. 178099-000
PARCEL SERIAL NO. 178118-009
PARCEL SERIAL NO. 178118-010
PARCEL SERIAL NO. 178118-011
PARCEL SERIAL NO. 178118-012
PARCEL SERIAL NO. 178118-013
PARCEL SERIAL NO. 178118-014
PARCEL SERIAL NO. 178118-015
PARCEL SERIAL NO. 178118-016
PEGRAM KENYON PHASE 3 SUB 96-111 PG 3/3
60' EXISTING ROW 23' EXISTING PAVED WIDTH
28' PAVED
52' ROW
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WWW.AKS-ENG.COM

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FORESTRY • PLANNING • LANDSCAPE ARCHITECTURE

PROPOSED PLAT (WEST)
CJ DENS EAST SUBDIVISION
CJ DENS LACAMAS I LLC
CAMAS, WASHINGTON

JOB NUMBER: 5504
DATE: 10/14/2020
DESIGNED BY: CJS
DRAWN BY: MPJ
CHECKED BY: JMH

PA-1.2

SCALE: 1"=50 FEET
ORIGINAL PAGE SIZE: 22" x 34"

DEVELOPMENT STANDARDS

AVERAGE LOT AREA	NONE*
MINIMUM LOT SIZE	5,250 SQUARE FEET
MAXIMUM LOT SIZE	6,000 SQUARE FEET
MINIMUM LOT WIDTH	60 FEET
MINIMUM LOT DEPTH	80 FEET
MAXIMUM BUILDING LOT COVERAGE	50%**
MAXIMUM BUILDING HEIGHT	35 FEET
MINIMUM FRONT YARD SETBACK	10** FEET
MINIMUM FRONT YARD - GARAGE	18** FEET
MINIMUM SIDE YARD	5 FEET
MINIMUM STREET SIDE YARD	10 FEET
MINIMUM REAR YARD	15** FEET
MINIMUM LOT FRONTAGE ON CUL-DE-SAC	30 FEET

* THE PROPOSED DEVELOPMENT IS USING DENSITY TRANSFER STANDARDS. NO AVERAGE LOT AREA IS REQUIRED.
** THESE STANDARDS VARY FROM THE CODE AS ALLOWED BY CMC SECTION 18.09.060(D). THE CITY HAS APPROVED THESE VARIANCES IN PRINCIPLE, ASSUMING THE FINAL DESIGN PROVIDES SOME ACTIVE OPEN SPACE AND FREE MITIGATION PLANTINGS.

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PROPOSED PLAT (NORTH)
CJ DENS EAST SUBDIVISION
CJ DENS LACAMAS I LLC
CAMAS, WASHINGTON

JOB NUMBER:	5504
DATE:	10/14/2020
DRAWING BY:	CAS
CHECKED BY:	MPS
APPROVED BY:	JMH

PA-1.3

SCALE: 1"=50 FEET
ORIGINAL PAGE SIZE 22" x 34"

DEVELOPMENT STANDARDS

AVERAGE LOT AREA	NONE*
MINIMUM LOT SIZE	5,200 SQUARE FEET
MAXIMUM LOT SIZE	8,000 SQUARE FEET
MINIMUM LOT WIDTH	60 FEET
MINIMUM LOT DEPTH	80 FEET
MAXIMUM BUILDING LOT COVERAGE	50%**
MAXIMUM BUILDING HEIGHT	35 FEET
MINIMUM FRONT YARD SETBACK	10** FEET
MINIMUM FRONT YARD – GARAGE	18** FEET
MINIMUM SIDE YARD	5 FEET
MINIMUM STREET SIDE YARD	15 FEET
MINIMUM REAR YARD	15** FEET
MINIMUM LOT FRONTAGE ON CUL-DE-SAC	30 FEET

* THE PROPOSED DEVELOPED IS USING DENSITY TRANSFER STANDARDS. NO AVERAGE LOT AREA IS REQUIRED.

** THESE STANDARDS VARY FROM THE CODE AS ALLOWED BY CMC SECTION 18.09.060(D). THE CITY HAS APPROVED THESE VARIANCES IN PRINCIPLE, ASSUMING THE DEVELOPMENT PROVIDES SOME ACTIVE OPEN SPACE AND TREE MITIGATION PLANTINGS.

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CELEBRATING 50 YEARS

TRANSPORTATION IMPACT ANALYSIS

CJ DENS CAMAS SUBDIVISION
Camas, Washington

Prepared For
CJ Dens Land Co.

Completed On
August 18, 2010

Submittal To
City of Camas

Project Number
2050186.01

GROUP MACKENZIE
Since 1960

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4. SITE DEVELOPMENT

TRIP GENERATION

Trip generation calculations were prepared using the ITE *Trip Generation* Report, 8th Edition. Trip generation estimates for the site were calculated based on fitted curve equations for Land Use Code 210, Single Family Detached Housing. The following table presents the anticipated trip generation for daily, AM peak hour of adjacent street traffic, and PM peak hour of adjacent street traffic periods based on the 297 new dwelling units proposed.

TABLE 4 – TRIP GENERATION CHARACTERISTICS

Land Use (ITE Code)	Dwelling Units	ADT	AM Peak Hour		PM Peak Hour	
			Enter	Exit	Enter	Exit
Single Family Detached Housing (210)	297	2,831	54	164	176	104

For purposes of this analysis, all trips are assumed to be automobile trips.

TRIP DISTRIBUTION AND ASSIGNMENT

Distribution of site trips is based on existing EMME/2 model data provided by RTC. Specifically, the trip assignment patterns from the existing model's Transportation Analysis Zone (TAZ) 483 are used. TAZ 483 includes all four subject parcels comprising the subdivision site.

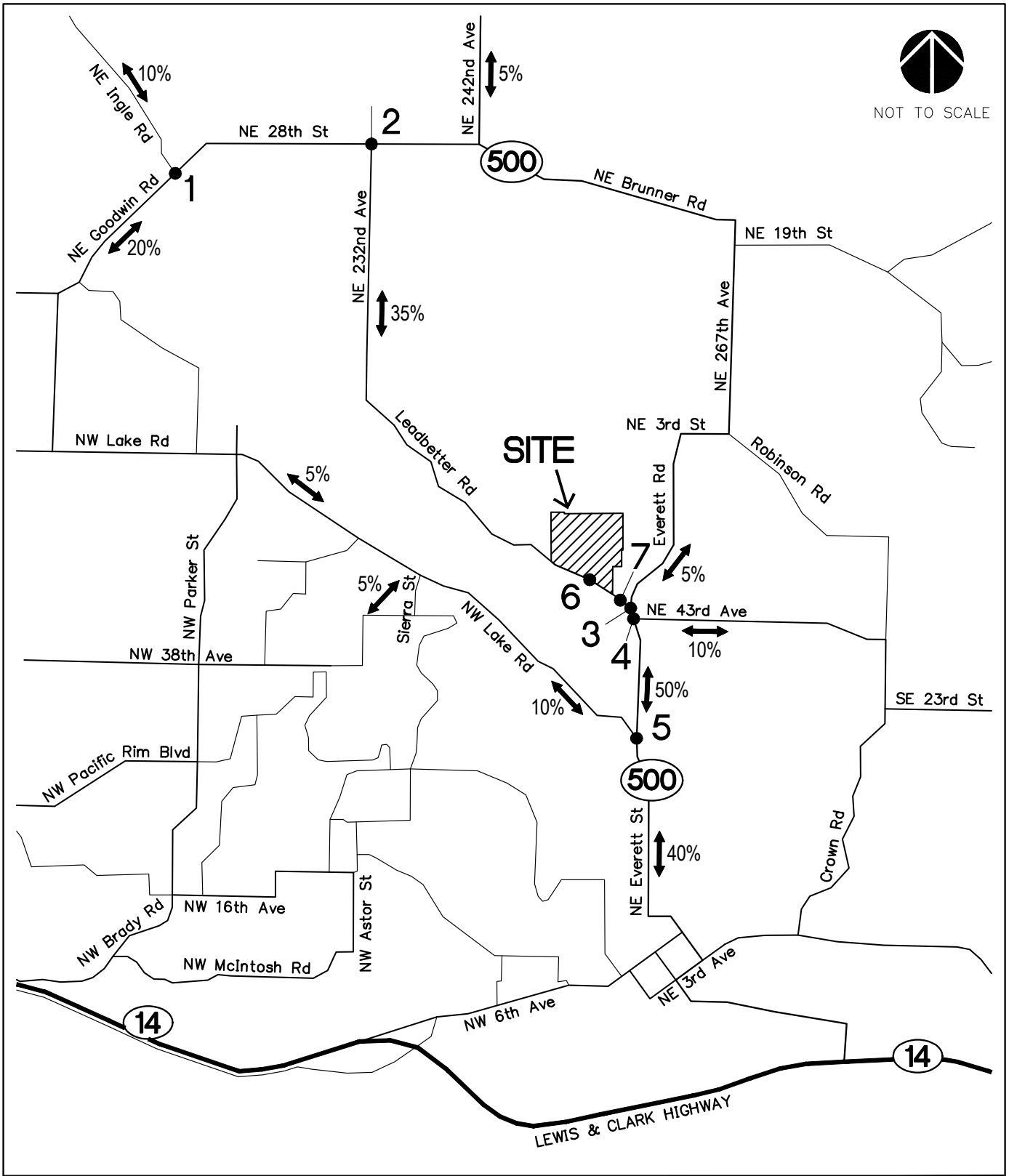
From the site accesses on Leadbetter Road, it is estimated 35% of site trips will travel to and from the north/west and 65% to and from the south/east. Further distribution is estimated as follows, and as depicted on Figure 8.

- 20% to/from the west on NE Goodwin Road
- 10% to/from the northwest on NE Ingle Road
- 5% to/from the north on NE 242nd Avenue (SR 500)
- 5% to/from the northeast toward Everett Road (SR 500) via Leadbetter Road
- 10% to/from the east on NE 43rd Avenue, primarily to and from the schools
- 40% to/from the south on NE Everett Street (SR 500), between the subdivision and downtown Camas
- 5% to/from the neighborhoods southwest of NW Lake Road
- 5% to/from the west on NW Lake Road

These distribution percentages are applied to the trip generation values to yield the site trip assignments. These are presented in Figure 9.

POST-DEVELOPMENT TRAFFIC

Post-development traffic is the sum of pre-development traffic volumes and site-generated traffic. Figure 10 presents 2018 post-development traffic volumes. Figure 12 presents 2030 future post-development traffic conditions, which add an additional 12 years of background growth to the 2018 post-development volumes.



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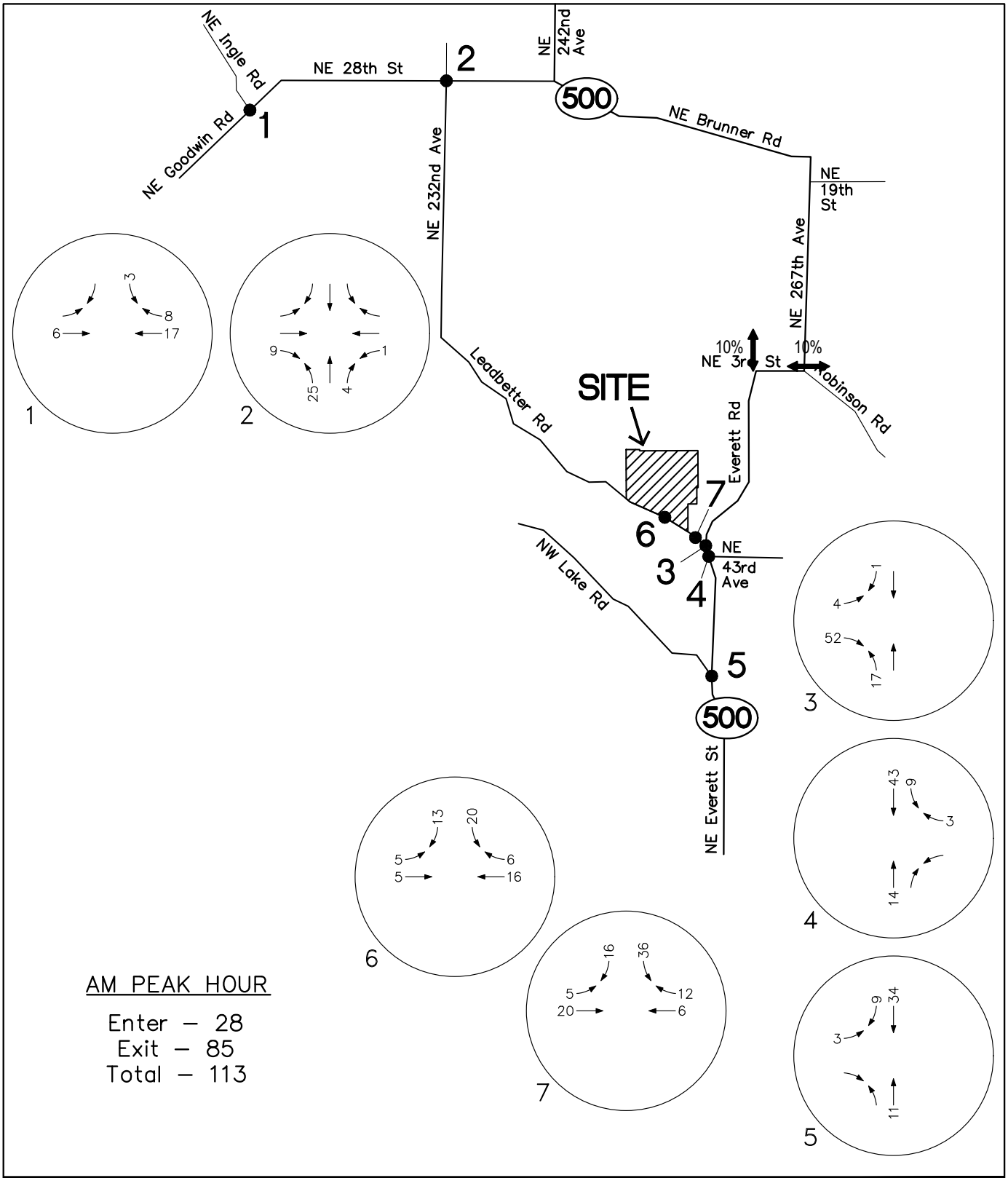
TRIP DISTRIBUTION

CJ DENS EAST SUBDIVISION
CAMAS, WASHINGTON

FIGURE 1



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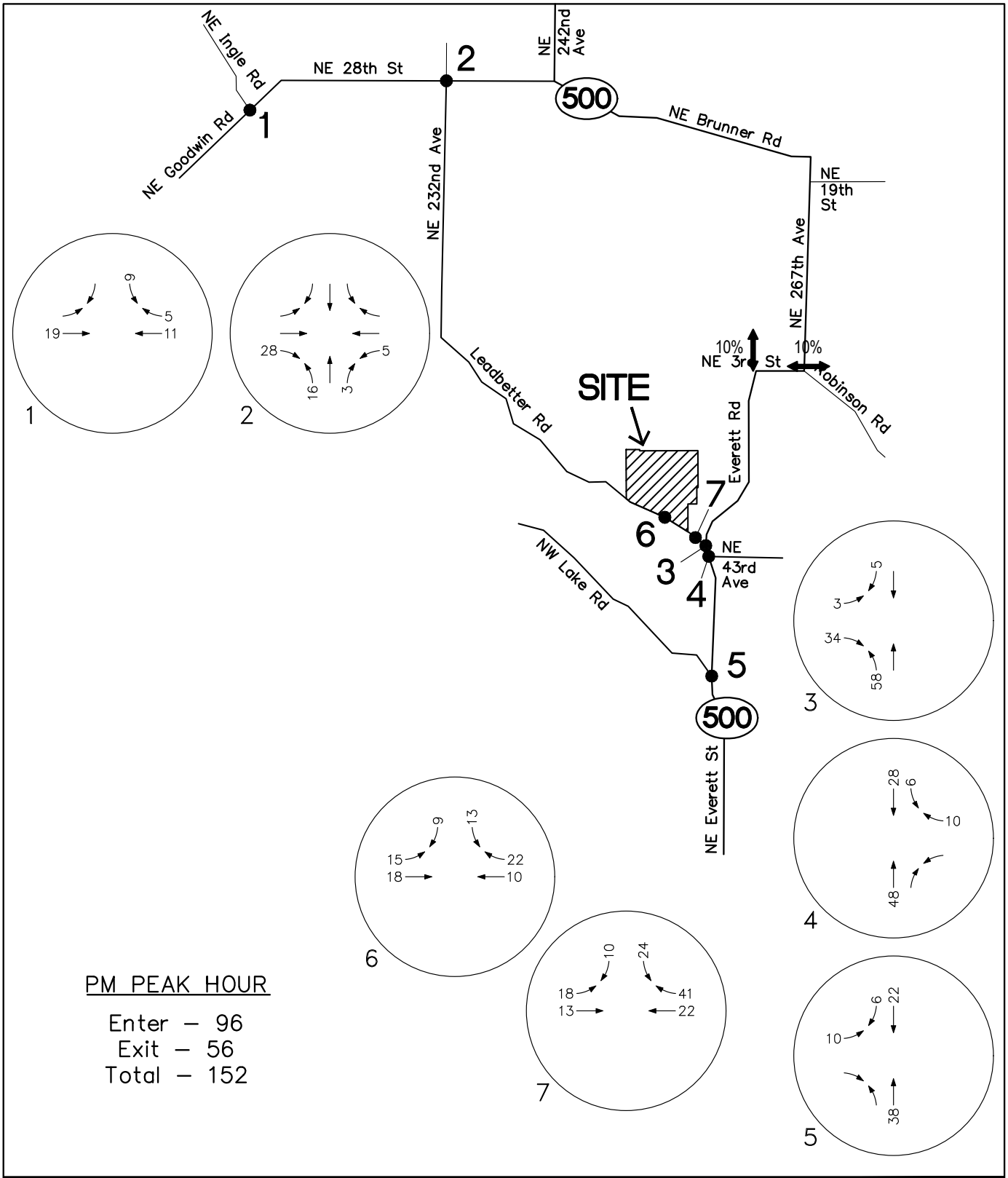
PROJECT TRIP ASSIGNMENT
AM PEAK HOUR

CJ DENS EAST SUBDIVISION
CAMAS, WASHINGTON

FIGURE
2A



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PROJECT TRIP ASSIGNMENT
PM PEAK HOUR

CJ DENS EAST SUBDIVISION
CAMAS, WASHINGTON

FIGURE 2B

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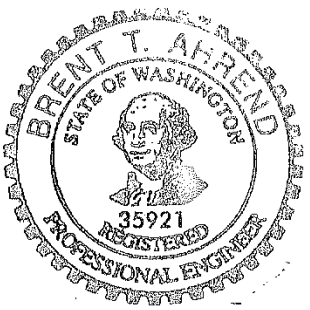
CELEBRATING 50 YEARS

TRANSPORTATION IMPACT ANALYSIS

CJ DENS CAMAS SUBDIVISION
Camas, Washington



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1. INTRODUCTION

This transportation impact analysis has been prepared for the CJ Dens Camas Subdivision on Leadbetter Road in Camas, Washington. Four contiguous parcels comprise the currently undeveloped 85-acre site bounded by Leadbetter Road to the south and west, by a firearms club and firing range property to the interior south, by undeveloped light industrial/business park properties to the north, and by partially-developed residential properties to the east. Land use zone Residential-7,500 (R-7.5), in which the proposed single-family residential subdivision is an allowed use, is applied to all four parcels. A pre-application conference was held with city staff on March 18, 2010. Figure 1 is a vicinity map indicating the subdivision location.

PROJECT DESCRIPTION

The proposed CJ Dens Camas Subdivision will consist of up to 297 single-family lots. The subdivision is anticipated to include development of all required public infrastructure, including streets, sidewalks, and utilities. This analysis assumes all lots are developed in a single phase. Access will be to Leadbetter Road via three new public street connections and one existing public street connection. Public street stubs along the north site boundary will allow for future connections to local streets when adjacent properties develop. Once connections to the north are made, access to Leadbetter Road will be eliminated to allow the city to convert the road to a trail as is indicated on the City of Camas Park, Recreation and Open Space Comprehensive Plan (dated December 17, 2007). Figure 2 presents the proposed site plan.

SCOPE OF REPORT

In conformance with the City of Camas Transportation Impact Study and Neighborhood Traffic Management Guidelines (Guidelines, dated October 28, 2002, and revised September 18, 2007), this analysis includes:

- Intersection impact analysis
- Sight distance review
- Collision history assessment
- Pedestrian and bicycle facilities review
- Transit service review
- Turn lane warrant analysis
- Signal warrant analysis
- Volume and speed surveys on Leadbetter Road to determine daily traffic volumes (ADT) and 85th percentile speeds

Based on a review of the applicable standards and discussions with city staff, the study area for this analysis includes the following intersections:

- NE Ingle Road/NE Goodwin Road
- NE 28th Street/NE 232nd Avenue
- NE Everett Street (SR 500)/NE Leadbetter Road
- NE Everett Street (SR 500)/NE 43rd Avenue
- NE Everett Street (SR 500)/NE Lake Road
- NW Leadbetter Road/NW Fargo Street (New West Site Access)

- NW Leadbetter Road/NW Benton Street (New Middle Site Access)
- Leadbetter Road/North Division Street (New East Site Access)
- NE Leadbetter Road/NE Adams Street (Existing East Site Access)

In conformance with the Guidelines, the study will analyze traffic operations during weekday AM and PM peak hour periods at the above intersections for the following development scenarios:

- 2010 Existing
- 2018 Pre-Development (Build-Out Year)
- 2018 Post-Development (Build-Out Year with Project Trips)
- 2030 Future Year

The analysis years are proposed to include build-out of the subdivision in 2018, which reflects an anticipated project approval in 2011 and a maximum seven-year phased development.

The City of Camas has not completed transportation planning for the recent north urban growth area (UGA) expansion in which the CJ Dens Camas Subdivision is located. To aid this planning, city staff requested during scoping of this analysis that additional intersections be included. The purpose was to address impacts on intersections not yet analyzed with impacts from the UGA. This subdivision is only a small percentage of the trip potential from the UGA, so any analysis would not provide a complete picture for the city.

Because the city is amid the process of updating the transportation planning for the newly annexed properties surrounding and including the site, it was determined this development would not be required to analyze the following intersections initially identified for analysis in this study:

- NE 232nd Avenue/NE 9th Street
- NE Everett Road (SR 500)/NE 3rd Street
- NE Everett Street (SR 500)/NE 38th Avenue
- NE Everett Street (SR 500)/NE 35th Avenue
- NE Everett Street (SR 500)/NE 22nd Avenue
- NE Everett Street (SR 500)/NE 19th Avenue
- NE Everett Street (SR 500)/NE 15th Avenue
- NE Everett Street (SR 500)/NE 14th Avenue
- NW Lake Road/NW Lacamas Lane
- NW Lake Road/NW Sierra Street
- NW Lake Road/NW Leadbetter Drive

The analysis scenarios beyond the 2010 existing conditions include background traffic growth and previously approved (in-process) project traffic. They do not include the new roadway alignments contemplated in the City of Camas Transportation Comprehensive Plan or the Six-Year Street Priorities, 2009-2014. The streets in the north UGA are only conceptual alignments with uncertain construction timelines. Other funded street improvements are outside of the study area and not expected to have an impact on study area intersection volumes. This study assumes only the current roadway alignments will be available to serve the full build out of the proposed subdivision. If additional roadway connections become available, the impact from this development on analyzed intersections would be less.

2. EXISTING CONDITIONS

SITE CONDITIONS

Four contiguous parcels comprise the approximately 85-acre development site. They are identified on Clark County Account Numbers 177905-000, 17906-000, 178172-000, and 178236-000. The parcels are generally undeveloped except for a small gravel parking lot that serves a boat launch on Lacamas Lake. The site surrounds three sides of an adjacent parcel owned and maintained by the Camas-Washougal Wildlife League.

TRANSPORTATION FACILITIES

The following table is a summary of the roadway functional classifications, as presented on the Clark County Arterial Atlas and the city's Comprehensive Transportation Map, and of the provided travel facilities, as identified by Group Mackenzie staff.

TABLE 1 – ROADWAY CHARACTERISTICS

Roadway	Roadway Classification (County/City)	Posted Speed	Travel Lanes	Bike Lanes	On-Street Parking	Sidewalks
NE Ingle Road	Rural Minor Collector/ 2-Lane Collector	50 mph	2	No	No	No
NE Goodwin Road	Urban Collector Arterial-Rural Major Collector/ Proposed 4- or 5-Lane Arterial	50 mph	2	No	No	No
NE 28th Street	Rural Major Collector/ Proposed 4- or 5-Lane Arterial	50 mph	2	No	No	No
NE 232nd Avenue	Rural Major Collector/ Two-Lane Arterial	45 mph / 40 mph	2	No	No	No
Leadbetter Road	Rural Major Collector/ Local Access	40 mph	2	No	No	No
NE Adams Street	(n/a) / Local Access	25 mph	2	No	Yes	Yes
NE Everett Street/ Road (SR 500)	State Route/ 2- or 3-Lane Arterial	35 mph	2/3	No	No	No
NE 43rd Avenue/ SE 15th Street	Rural Minor Collector/ 2- or 3-Lane Arterial	25 mph	2	No	No	Partial
Lake Road	(n/a) / 2- or 3-Lane Arterial	35 mph	2	Yes	No	No

NE Goodwin Road/NE Ingle Road is a "T" intersection with stop control on Ingle Road. The free movements on Goodwin Road share a single lane on each approach. The single-lane Ingle Road approach widens to provide separate lanes for left and right turns.

NE 28th Street/NE 232nd Avenue is a four-way intersection with stop control on the northbound and southbound 232nd Avenue approaches. All movements share a single lane on each approach. The southbound approach is a single-lane private street that is slightly offset from the public northbound approach.

NE Everett Street (SR 500)/NE Leadbetter Road is a "T" intersection with stop control on Leadbetter Road. A northbound center turn lane separates left turning movements from through movements. Southbound Everett Street and eastbound Leadbetter Road movements share a single lane. The Everett Street alignment curves in the vicinity of the intersection with a radius of approximately 1,000 feet, Leadbetter Road intersects on the outside of this curve. Everett Street slopes downhill from north to south at approximately 6% to 7%.

NE Everett Street (SR 500)/NE 43rd Avenue (SE 15th Street) is a "T" intersection controlled by a traffic signal. The signal operates under actuated control with a cycle length of 60 approximately seconds. Separate lanes are provided for each movement on each approach. The northbound Everett Street right-turn lane is channelized with yield control. The southbound Everett Street left-turn movement is protected. Everett Street slopes downhill from north to south at approximately 6% to 7%. 43rd Avenue slopes downhill from east to west at approximately 5% as it approaches the intersection. Traffic to and from Lacamas Heights Elementary School and Camas High School, both located east of this intersection, travels through this intersection.

NE Everett Street (SR 500)/NE Lake Road is a "T" intersection controlled by a traffic signal. The signal operates under actuated control with cycle lengths of approximately 115 seconds in the AM peak hour and 95 seconds in the PM peak hour. Separate lanes are provided for each movement on the eastbound and northbound approaches, the southbound Everett Street movements share a single lane. The northbound Everett Street left-turn movement is protected.

Existing intersection lane configurations are identified in Figure 3.

PLANNED IMPROVEMENTS

The 2011-2016 City of Camas Six-Year Street Priorities identifies five study area road segments for improvements:

- 16 – NE 43rd Avenue
- 26 – NE Goodwin Road/NE 28th Street
- 27 – NE 28th Street
- 30 – NE 232nd Avenue
- 35 – SR-500 (Everett Street/Everett Road)

The 2011-2016 City of Camas Six-Year Street Priorities additionally identifies two road segments for new construction.

- 31 – NE 9th Street
- 34 – New East/West Arterial

Because these projects are neither identified for specific improvements nor funded as part of the city's Capital Facilities Plan, they are not assumed constructed for the build-out analysis.

The subject site is within an area recently annexed by the City of Camas, and the city has yet to adopt a new TIF Study or CFP for transportation improvements for the area. As such, no specific public transportation improvements are identified for the study area at this time, and none of the planned improvements are assumed as part of the current study. Instead, the existing road alignments and lane configurations are assumed to remain in place.

Although a future east-west arterial roadway (Priority Project No. 34) has been identified north of the site as an arterial replacement for the existing Leadbetter Road alignment, the timing for construction of such a new roadway is uncertain. For this reason, our analysis will assume Leadbetter Road remains in its current location and provides access to the site. At the time the new arterial roadway is constructed, site access would then be provided to the north and Leadbetter would be closed. Analysis of this condition would be prepared by the city in conjunction with the UGA planning.

EXISTING TRAFFIC CONDITIONS

Existing traffic turning movement counts were conducted at the existing study area intersections by Quality Counts in May 2010 on midweek days during the 7:00 – 9:00 AM and 4:00 – 6:00 PM peak travel periods at three intersections. January 2010 count data were obtained for the same peak periods at two intersections on NE Everett Street (SR 500). The existing weekday AM and PM peak hour volumes are presented in Figure 4.

Twenty-four-hour surveys of traffic volumes and speeds were conducted on Leadbetter Road at two locations on two different midweek days in May 2010. The first location, west of the boat launch area, is near the proposed location of NW Fargo Street, the westernmost public street connection to Leadbetter Road. The second location, west of NE Adams Street, is approximately halfway between the two proposed eastern public street connections (NW Benton Street and North Division Street) to Leadbetter Road. The traffic volumes and speeds observed are summarized in the following table.

TABLE 2 – ROADWAY VOLUMES AND SPEEDS

Roadway Segment	Direction	85th Percentile Speed	Average Daily Traffic (ADT)
Leadbetter Road 213' West of Boat Launch Driveway	Eastbound	49 mph	626
	Westbound		627
	Total	--	1,253
Leadbetter Road 783' Northwest of NE Adams Street	Eastbound	50 mph	729
	Westbound		754
	Total	--	1,483

The average of the two days' data, 1,368 vehicles, is treated as the roadway ADT. The higher directional volumes observed during peak hours northwest of Adams Street are treated as the existing roadway peak hour volumes for operations analysis.

As identified in Table 1, the posted speed limit along this segment of Leadbetter Road is 40 mph. The higher speeds are likely a result of the current rural character of the roadway, which includes limited development and infrequent access locations. Approximately 15% of drivers exceed the posted speed by 10 mph or more. As the area develops and driver expectations change, we would expect travel speeds to reduce.

PEDESTRIAN AND BICYCLE FACILITIES

Currently, sidewalks and bike lanes are not provided along Leadbetter Road. Sidewalks will be provided along all internal streets in the subdivision. No sidewalks or bike lanes will be provided along the site frontage on Leadbetter Road as the road will be abandoned in the future for conversion to be a bike and pedestrian trail as depicted in the City of Camas Park, Recreation and Open Space Comprehensive Plan (December 2007) for this area. Development of this trail will provide pedestrian and bicycle connections to other facilities for subdivision residents.

STUDENT TRANSPORTATION

The CJ Dens Camas Subdivision lies within the Camas School District. Children living in the subdivision will likely attend Lacamas Heights Elementary, Liberty Middle School, and Camas High School. All portions of the site are located at least one-half mile's walk away from Lacamas Heights Elementary School, so school bus service will likely be provided to all students living within the subdivision. The school district will determine the specific number and location of bus stops in and around the subdivision.

TRANSIT SERVICE

Transit service in the area is provided by C-Tran. No regularly scheduled transit service is currently provided along Leadbetter Road, and no regularly serviced transit stops exist within one mile of the site. The nearest such stops are located at the Fisher's Landing Transit Center and in downtown Camas. These stops are served by routes #41 and #92.

Route #41-Camas/Washougal Limited runs on weekdays between the Delta Park/Vanport MAX Station in Portland and east Washougal. Route #92-Camas/Washougal runs on weekdays and weekends between the Fisher's Landing Transit Center and east Washougal. The Camas Connector provides transit service on a reservation basis to/from Camas High School and in the area south of the Everett Street (SR 500)/NE 43rd Avenue intersection.

COLLISION ANALYSIS

One way to gauge relative safety of an intersection or roadway segment is to identify the frequency of collisions occurring there. A simple average collision rate, the number of collisions divided by the number of years of data, can be helpful and the City of Camas requires further study be undertaken when the average rate is 2 (or more) collisions per year. Collision frequency may also consider the number of vehicles entering the intersection or roadway segment. This leads to the concept known as "collision rate," which is usually expressed in terms of the number of collisions occurring per one million vehicles entering the intersection (mev) or in terms of the number of collisions occurring per one million vehicle miles traveled along the segment (mvm). Locations having a collision rate less than 1.0/mev or 1.0/mvm are generally considered relatively safe. At collision rates higher than 1.0/mev or 1.0/mvm, consideration may be given to correcting identifiable operational problems.

Collision data for the study area were obtained from the Washington State Department of Transportation (WSDOT) for January 2007 through December 2009. Collision reports for the study area locations are summarized in the Table 3. Detailed reports are located in the appendix.

Collision rates were calculated in accordance with standard guidelines; these calculations may be found in the appendix. The following table presents calculated collision rates at the study locations for the three-year data period. Annual traffic entering the intersections or segments was estimated by multiplying the average annual daily traffic (AADT) by 365. Intersection AADT volumes were estimated as ten times the observed PM peak hour volume of the intersection. Segment AADT volumes were determined from the speed and volume surveys performed in May 2010.

TABLE 3 – ANNUAL COLLISION TOTALS AND COLLISION RATES

Intersection	2007	2008	2009	Total	Annual Average	AADT	Collision Rate per MEV
NE Ingle Road/ NE Goodwin Road	2	0	0	2	0.67	7,280	0.25
NE 28th Street/ NE 232nd Avenue	0	1	0	1	0.33	5,820	0.16
NE Everett Street (SR 500)/ NE Leadbetter Road	0	0	0	0	0.00	5,080	0.00
NE Everett Street (SR 500)/ NE 43rd Avenue	1	3	2	6	2.00	7,430	0.74
NE Everett Street (SR 500)/ NE Lake Road	1	0	1	2	0.67	11,570	0.16
Segment	**2007**	**2008**	**2009**	**Total**	**Annual Average**	**AADT**	**Collision Rate per MVM**
Leadbetter Road between NE 232nd Avenue and NE Everett Street (SR 500): Segment Length = 1.66 miles	5	4	5	14	4.67	1,368	5.63

There were a total of 25 collisions reported at the study area locations. Annual averages and collision rates at four intersections are below the threshold rates of 2.0/year and 1.0/mev, respectively, and no further consideration for safety mitigation measures is warranted at these locations.

The first of two locations with annual averages or collision rates exceeding the noted thresholds is the NE Everett Street (SR 500)/NE 43rd Avenue signalized intersection, where the annual average is 2.00/year. The collision rate is below the threshold of 1.0/mev and in one of the six reported collisions, the driver's ability was impaired by alcohol. Therefore, no further consideration for safety mitigation measures is warranted at this location.

The second of two locations with annual averages or collision rates exceeding the noted thresholds is the segment of Leadbetter Road that the CJ Dens Camas Subdivision will access. The annual average of 4.67 per year and the rate of 5.63/mvm exceed minimum thresholds for safety review.

Leadbetter Road experiences low traffic volumes with a daily average of 1,368 vehicles, so just one collision has a large impact on the collision rate. A review of the 14 collision reports provided by WSDOT for the analyzed segment of Leadbetter Road reveals the following statistics and trends.

Collision Types

- 11 of the 14 collisions are identified as fixed object collision types, which generally indicates that a vehicle left the travel lane and collided with a roadside object such as a ditch, embankment, guardrail, utility pole, sign post, or mailbox.
- Only one collision, an improper U-turn, involved more than one vehicle.

Collision Severity

- Seven of the 14 collisions resulted in injuries to vehicle occupants. One incident resulted in two injuries; the remainder resulted in a single injury.
- Two of the seven injury collisions resulted in a serious injury, four resulted in evident injury, and one resulted in possible injury.
- No fatalities were recorded in the 14 collision reports.

Contributing Circumstances

- Four of the 14 collision reports indicate alcohol may have been a contributing factor to the collisions, and another report indicates a driver was apparently asleep at the wheel.
- Excessive speed is noted as a contributing factor in four more incidents.
- Distracted drivers were involved in three incidents, including two of those involving alcohol.

With the high frequencies of single-vehicle collisions and travel speeds above the posted limit, there is little that can be done to reduce the number of collisions other than enforcement. With development of the subdivision along the north side of Leadbetter Road, we expect travel speeds would slow due to the more urban nature of the development.

City of Camas staff have indicated that Leadbetter Road will be closed in the future when the new east/west arterial, currently shown on the city's Six-Year Street Priorities, 2011-2016 map as a schematic alignment north of the CJ Dens property, opens in the future. With this eventual street closure in mind, we do not recommend applying extensive high-cost safety mitigation measures that may improve conditions for only a short period. In the interim, low-cost safety mitigation measures are recommended.

- Increased enforcement actions may reduce the number of collisions involving alcohol or excessive speed.
- Since many drivers currently exceed the posted speed limit, sight distances may be limited along the roadway. The CJ Dens Camas Subdivision development will attempt to maximize available sight distance by trimming roadside vegetation at the proposed access streets.
- The existing roadway and surroundings lend a somewhat rural characteristic to the segment. With development of the CJ Dens Camas Subdivision, the roadway will take on a more urban characteristic. The increased development density and the increased number of intersections along the roadway segment are anticipated to encourage drivers to be more alert and to reduce their speed.

These mitigation measures are anticipated to improve safety along the Leadbetter Road segment until such time as it is closed to through traffic.

3. PRE-DEVELOPMENT CONDITIONS

An estimate of future traffic conditions in the absence of the proposed development is generated for comparison to the scenario including the proposed development. The February 2010 traffic report prepared by Charbonneau Engineering for the Camas High School Expansion (CHS study) analyzed two of the study area intersections with a build-out year of 2015. At these intersections, NE Everett Street (SR 500)/NE 43rd Avenue and NE Everett Street (SR 500)/NE Lake Road, we have added three years of background growth to arrive at the 2018 future year traffic conditions. The 2015 total traffic volumes are presented in Figure 6 of the CHS study; a copy is provided in the In-Process Traffic section of the appendix. This alternate approach to forecasting future traffic conditions was judged appropriate to reduce the need for data collection and intersection analysis in this case because the CHS study was also based on traffic counts collected within the most recent 12-month period.

At all other study area intersections, recent analyses have not been conducted, so a full assessment of background growth and in-process traffic was conducted, and these were added to existing traffic counts to arrive at the pre-development scenario.

BACKGROUND TRAFFIC GROWTH

Background growth is general growth in traffic not related to traffic from specific projects. EMME/2 models provided by the Southwest Washington Regional Transportation Council (RTC) indicate recent general growth in the area of this study ranging between 1.5% and 8.0%. As a reasonable overall estimate, an annual growth rate of 2.0% will be applied for this study. Copies of the existing and future EMME/2 models are provided in the appendix.

Either three or eight years of background growth at 2.0% per year were applied to existing volumes for the 2018 future year traffic conditions. (See above for distinction between three or eight years of growth.) At all intersections an additional 12 years of growth at 2.0% per year were added to the total 2018 traffic volumes to estimate 2030 traffic conditions. Background growth traffic volumes at the study area intersections are presented in Figures 6 and 11 for the 2018 and 2030 analysis years, respectively.

IN-PROCESS TRAFFIC

In-process traffic is traffic that will be generated by approved projects that have not been completed at the time of analysis. City staff have identified 11 in-process projects that may impact intersections within the study area. These are listed along with the approximate extent of project completion reached:

- Camas High School Expansion – 0% complete
- Deerhaven Subdivision – 0% complete
- Hidden Meadows Subdivision – 0% complete
- The Hills at Round Lake – 0% complete
- Lacamas Pointe – 9% complete
- Lacamas Meadows PRD – residential homes 40% complete, Grass Valley Elementary School open at 92% capacity; applied as 76% complete in AM peak hour, 53% complete in PM peak hour

- Lakeridge North Subdivision – 22% complete
- Millshore Downs Subdivision – 0% complete
- North Hills Subdivision – 0% complete
- Two Creeks at Camas Meadows – unknown % complete, assumed to be 0%
- Vintage View on the Lake/The Village at Round Lake – 27% complete

The trip generation estimates, assignments, and/or distributions from these projects provided by city staff are included in the appendix.

Figure 5 presents a cumulative summary of the in-process traffic volumes for the AM and PM peak hours as they impact study area intersections. All the in-process volumes from projects noted above as "0% complete" are included in the summation. In-process traffic volumes from projects noted above as having been partially developed are included in the summation at a prorated rate according to the estimated extent of completion.

Because the 2015 total traffic scenario analyzed in the CHS study already accounted for in-process traffic volumes, no in-process traffic is added to the Everett Street (SR 500)/NE 43rd Avenue or Everett Street (SR 500)/NE Lake Road intersections.

PRE-DEVELOPMENT TRAFFIC VOLUMES

Pre-development traffic is the sum of existing volumes, background growth, and in-process traffic. Trips from the proposed development are not included in this scenario. Figure 7 presents the 2018 AM and PM pre-development traffic volumes.

4. SITE DEVELOPMENT

TRIP GENERATION

Trip generation calculations were prepared using the ITE *Trip Generation* Report, 8th Edition. Trip generation estimates for the site were calculated based on fitted curve equations for Land Use Code 210, Single Family Detached Housing. The following table presents the anticipated trip generation for daily, AM peak hour of adjacent street traffic, and PM peak hour of adjacent street traffic periods based on the 297 new dwelling units proposed.

TABLE 4 – TRIP GENERATION CHARACTERISTICS

Land Use (ITE Code)	Dwelling Units	ADT	AM Peak Hour		PM Peak Hour	
			Enter	Exit	Enter	Exit
Single Family Detached Housing (210)	297	2,831	54	164	176	104

For purposes of this analysis, all trips are assumed to be automobile trips.

TRIP DISTRIBUTION AND ASSIGNMENT

Distribution of site trips is based on existing EMME/2 model data provided by RTC. Specifically, the trip assignment patterns from the existing model's Transportation Analysis Zone (TAZ) 483 are used. TAZ 483 includes all four subject parcels comprising the subdivision site.

From the site accesses on Leadbetter Road, it is estimated 35% of site trips will travel to and from the north/west and 65% to and from the south/east. Further distribution is estimated as follows, and as depicted on Figure 8.

- 20% to/from the west on NE Goodwin Road
- 10% to/from the northwest on NE Ingle Road
- 5% to/from the north on NE 242nd Avenue (SR 500)
- 5% to/from the northeast toward Everett Road (SR 500) via Leadbetter Road
- 10% to/from the east on NE 43rd Avenue, primarily to and from the schools
- 40% to/from the south on NE Everett Street (SR 500), between the subdivision and downtown Camas
- 5% to/from the neighborhoods southwest of NW Lake Road
- 5% to/from the west on NW Lake Road

These distribution percentages are applied to the trip generation values to yield the site trip assignments. These are presented in Figure 9.

POST-DEVELOPMENT TRAFFIC

Post-development traffic is the sum of pre-development traffic volumes and site-generated traffic. Figure 10 presents 2018 post-development traffic volumes. Figure 12 presents 2030 future post-development traffic conditions, which add an additional 12 years of background growth to the 2018 post-development volumes.

ACCESS ANALYSIS

The site will access Leadbetter Road at four locations: Fargo Street, Benton Street, Division Street, and the existing Adams Street. The site does not have frontage on any public streets other than Leadbetter Road. Proposed internal streets will provide circulation among the subdivision parcels connected to Benton, Division, and Adams Streets. Three internal street stubs will be extended to the north site boundary to allow connections to future developments. These street stubs will serve as the primary accesses to the subdivision once the City of Camas opens a new east-west arterial north of the site and closes Leadbetter Road.

The city's General Guidelines for Geometry of Roadway from the *Design Standards Manual* indicates intersection spacing on a two-lane local neighborhood roadway should be 270 feet. Of the four access intersections the nearest two, Division Street and Adams Street, are located approximately 325 feet apart, measured along Leadbetter Road between intersecting centerlines. Spacing between other intersection pairs exceeds this distance. The intersection spacing standard is met.

SIGHT DISTANCE ANALYSIS

The city's sight distance standards reference the American Association of State Highway and Transportation Officials' *A Policy on Geometric Design of Highways and Streets* ("AASHTO"), the most recent edition published in 2004. Sight distance for left and right turns from a minor stop-controlled street are based on the vehicular speed on the major uncontrolled roadway, as described in AASHTO Exhibits 9-55 and 9-58, respectively. The sight distance recommendations provide sufficient time for the minor-street vehicle to accelerate from a stop and complete a turn without unduly interfering with major-road traffic operations.

Two speed studies on Leadbetter Road near the proposed accesses indicate the 85th percentile speed is 49 to 50 mph. Based on AASHTO, using a design speed of 50 mph, minimum sight distances of 555 feet to the west for left turns and 480 feet to the east for right turns is recommended for vehicles exiting the subdivision and entering Leadbetter Road.

Based on the review of the proposed site plan, it appears adequate site distances can be provided at the proposed intersections. The proposed subdivision will comply with the required vision clearance triangles at all access intersections. Vegetation and signage are limited by city code within the vision clearance triangles. The developer will perform vegetation clearing and limited site grading at the access points along the Leadbetter Road frontage to provide minimum sight distances when the site develops. New landscaping and roadway signs must be placed to comply with the vision clearance requirements in Camas Code such that there are no obstructions within the clear vision area.

5. INTERSECTION AND ROADWAY ANALYSIS

INTERSECTION CAPACITY AND LEVEL OF SERVICE

Intersection capacity calculations were conducted using the methodology presented in the Transportation Research Board's *Highway Capacity Manual*, 2000 edition (HCM). Synchro software, Version 7 (Trafficware Ltd. © 1993-2007), which applies HCM methodology, was used to prepare the capacity and level of service (LOS) calculations.

The City of Camas considers "C" the minimum acceptable LOS for local or minor streets and "D" the minimum acceptable LOS for collector and arterial roadways. Sites whose related traffic contributes to traffic levels exceeding the minimum LOS must identify the appropriate improvement or mitigation measures.

OPERATION ANALYSIS

Operation analyses were performed for the weekday AM and PM peak hour at study area intersections for the following four scenarios:

- 2010 Existing
- 2018 Pre-Development (Build-Out Year)
- 2018 Post-Development (Build-Out Year with Project Trips)
- 2030 Future Year

Calculation results are summarized in the following table. Results for signalized intersections are reported for the intersection as a whole. Results for unsignalized intersections are reported for the noted stop-controlled approach. Calculation sheets are included in the appendix.

Capacity results are determined based on a variety of inputs. The following assumptions were made for these analyses.

- Signal phase definitions and phase rotation patterns were provided by WSDOT. Copies of the plans are provided in the appendix.
- Duration times for minimum green, yellow (amber), all-red, and pedestrian sequences were provided by WSDOT for signalized intersections. Copies of the signal timing plans are provided in the appendix. Cycle lengths and phase splits were optimized.
- The heavy vehicle percentages observed in the 2010 existing counts for each intersection movement were applied to the same movements for all scenarios.
- The peak hour factor (PHF) was adjusted in some scenarios to reflect the attenuation of short-duration peaks as traffic volumes increase over time:
  - The PHF observed in the 2010 existing counts for each intersection as a whole was applied to the 2010 Existing scenario.
  - A PHF of at least 0.85 (AM) or 0.90 (PM) was applied to the 2018 pre-development and 2018 post-development scenarios. If the existing PHF was higher, it was applied.
  - A PHF of at least 0.90 (AM) or 0.95 (PM) was applied to the 2030 future year scenario. If the existing PHF was higher, it was applied.

TABLE 5 – INTERSECTION OPERATION ANALYSIS – AM AND PM PEAK HOURS																
Intersection	Intersection Control and Movement		Time Period	2010 Existing			2018 Pre-Development			2018 Post-Development			2030 Future Year			
				v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS	
NE Ingle Road/ NE Goodwin Road	"T" Inter	SB LT	AM	0.20	11.6	B	0.26	13.0	B	0.27	13.9	B	0.35	16.1	C	
			PM	0.28	14.4	B	0.42	18.2	C	0.52	22.4	C	0.98	81.9	F	
NE 28th Street/ NE 232nd Avenue	Two-Way Stop	NB	AM	0.11	11.7	B	0.16	12.9	B	0.29	14.4	B	0.36	17.0	C	
			PM	0.13	13.1	B	0.19	15.1	C	0.29	17.5	C	0.43	24.5	C	
NE Everett Street (SR 500)/NE Leadbetter Road	"T" Inter	EB	AM	0.13	10.7	B	0.18	11.3	B	0.37	13.5	B	0.42	15.1	C	
			PM	0.07	9.6	A	0.12	10.3	B	0.23	11.6	B	0.29	12.9	B	
NE Everett Street (SR 500)/ NE 43rd Avenue	Signal-ized "T" Inter	Inte r	AM	0.49	15.1	B	0.43	12.7	B	0.48	13.5	B	0.57	15.1	B	
			PM	0.39	14.1	B	0.41	15.1	B	0.48	10.5	B	0.57	12.2	B	
NE Everett Street (SR 500)/ NE Lake Road	Signal-ized "T" Inter	Inte r	AM	0.81	31.8	C	0.80	29.3	C	0.84	34.6	C	0.98	58.2	E	
			PM	0.47	13.6	B	0.49	14.0	B	0.54	14.8	B	0.65	18.0	B	
NW Leadbetter Road Road/NW Fargo Street (New West Access)	"T" Inter	SB	AM							0.08	10.1	B	0.08	10.3	B	
			PM							0.05	10.3	B	0.05	10.6	B	
NW Leadbetter Road/ NW Benton Street (New Middle Access)	"T" Inter	SB	AM							0.04	10.0	B	0.04	10.2	B	
			PM							0.03	10.2	B	0.03	10.5	B	
Leadbetter Road/ N Division Street (New East Access)	"T" Inter	SB	AM							0.06	10.2	B	0.06	10.4	B	
			PM							0.04	10.5	B	0.04	10.8	B	
NE Leadbetter Road/NE Adams Street (Existing East Access)	"T" Inter	SB	AM				0.02	9.6	A	0.09	10.5	B	0.09	10.8	B	
			PM				0.01	9.6	A	0.06	10.9	B	0.06	11.3	B	

The **NE Ingle Road/NE Goodwin Road** intersection is anticipated to operate at acceptable levels of service through the 2018 post-development scenario. In the 2030 future year PM peak hour scenario the southbound stop-controlled Ingle Road approach is at LOS "F" and is nearly at capacity. Future plans by the City of Camas to widen Goodwin Road to five lanes may improve operations at this intersection, but as timetable for this project is indefinite, the existing lane configuration has been assumed in this analysis.

The **NE 28th Street/NE 232nd Avenue** intersection is anticipated to operate at acceptable levels of service under all scenarios.

The **NE Everett Street (SR 500)/NE Leadbetter Road** intersection is anticipated to operate at acceptable levels of service under all scenarios.

The **NE Everett Street (SR 500)/NE 43rd Avenue** intersection is anticipated to operate at acceptable levels of service under all scenarios.

The **NE Everett Street (SR 500)/NE Lake Road** intersection is anticipated to operate at acceptable levels of service through the 2018 post-development scenario. In the 2030 future year AM peak hour scenario the intersection is at LOS "E" and is nearly at capacity. Future plans by the City of Camas to widen Everett Street to three lanes may improve operations at this intersection, but as timetable for this project is indefinite, the existing lane configuration has been assumed in this analysis.

The four site access intersections on Leadbetter Road, Fargo Street, Benton Street, Division Street, and Adams Street, are anticipated to operate at acceptable levels of service under all scenarios.

Traffic generated by development of the CJ Dens Camas Subdivision is not anticipated to degrade levels of service at any existing or proposed intersections below acceptable levels, so no mitigating roadway improvements are anticipated or proposed.

SIGNAL WARRANT ANALYSIS

Guidelines for installation of traffic signals are presented in the 2009 Edition of the Federal Highway Administration's *Manual on Uniform Traffic Control Devices* (MUTCD). These guidelines are referred to as signal warrants. The MUTCD identifies nine signal warrants that present criteria for consideration of a traffic signal. Typically, an intersection will first meet the peak hour volume signal warrant (MUTCD Warrant 3). For this reason, it is the first warrant reviewed, although meeting it alone is generally not considered sufficient justification for installing a traffic signal. If the peak hour warrant is met, then other warrants may be reviewed.

Peak hour warrants were reviewed for the NE Everett Street (SR 500)/NE Leadbetter Road intersection. None of the projected peak hour volumes in any scenario meet the minimum peak hour volume thresholds for a signal. Furthermore, because most of the eastbound stop-controlled Leadbetter Road traffic turns right at the intersection, no significant delay is anticipated on this approach.

Copies of the peak hour signal warrant worksheets are provided in the appendix.

TURN LANE GUIDELINES

Exclusive left- and right-turn lanes can improve intersection operation by reducing delay for through traffic and reducing the potential for rear-end collisions. The City of Camas follows AASHTO guidelines for installation of turn lanes, which provide recommendations for two-lane local roadways such as Leadbetter Road. Except in special cases with exceptional volumes, AASHTO does not recommend auxiliary turn lanes be provided on rural local roads. For urban local roads AASHTO suggests advantages to providing auxiliary turn lanes only in commercial areas. Neither the rural criteria nor the urban criteria apply, so no auxiliary left- or right-turn lanes are warranted for Leadbetter Road with the subdivision development.

6. SUMMARY

This transportation impact analysis has been prepared in support of a 297 single-family residential subdivision in Camas, Washington named the CJ Dens Camas Subdivision. The site lies within an undeveloped area recently annexed into the City of Camas. The site will access Leadbetter Road via three new public street connections and one existing public street connection. Public street stubs along the north site boundary will allow for future connections to local streets when adjacent properties develop and Leadbetter Road is converted to a bicycle and pedestrian trail. All access streets have been designed in conformance with intersection spacing standards.

Transportation planning for this recently annexed area of the City of Camas is incomplete. Since the purpose of this study is to determine the impacts of the subdivision on transportation facilities within the vicinity, this study assumes only the current roadway alignments will be available to serve the full build out of the proposed subdivision. It is anticipated a revised study may be necessary once planning for this area is complete.

Roadway volume counts indicate ADT on Leadbetter Road is approximately 1,368 vehicles and the 85th percentile speed is approximately 50 mph. The posted speed limit is 40 mph. As the area develops and driver expectations change, it is anticipated volumes will increase and travel speeds will decrease.

This development will support alternate modes of travel with internal sidewalks and with future connections to Leadbetter Road after its conversion to a bike/pedestrian trail. The Camas School District will provide bus service to students residing in the subdivision. No transit service exists within one mile of the site.

A safety review within the study area indicates a high collision rate only along Leadbetter Road. Many of the Leadbetter Road collisions noted excessive speed or distracted/ impaired drivers as contributing circumstances. With the eventual closure of Leadbetter Road as a through route, safety improvements would not provide a long-term benefit to the traveling public. Short-term low-cost improvements are proposed below.

Subdivision development is anticipated to generate 218 weekday AM peak hour trips, 280 weekday PM peak hour trips, and 2,831 average weekday trips. Trip distribution was based on patterns shown in the existing RTC model for the local TAZ 483. In general, 35% of site trips will travel to/from the north/west and 65% to/from the south/east.

To determine the future pre-development traffic conditions, in-process traffic assignments were provided by city staff, and an annual background growth rate of 2.0% was determined from RTC models. A build-out year of 2018 was used, anticipating project approval in 2011 and a maximum seven-year phased development. Unsignalized intersection volumes were based on May 2010 counts, pro-rated in-process traffic, and eight years of background growth. Signalized intersection volumes were based on January 2010 counts, a Charbonneau Engineering study for Camas High School with a 2015 build-out year and three years of background growth.

The study analyzed traffic operations at the following intersections:

- NE Ingle Road/NE Goodwin Road
- NE 28th Street/NE 232nd Avenue

- NE Everett Street (SR 500)/NE Leadbetter Road
- NE Everett Street (SR 500)/NE 43rd Avenue – signalized
- NE Everett Street (SR 500)/NE Lake Road – signalized
- NW Leadbetter Road/NW Fargo Street (New West Site Access)
- NW Leadbetter Road/NW Benton Street (New Middle Site Access)
- Leadbetter Road/N Division Street (New East Site Access)
- NE Leadbetter Road/NE Adams Street (Existing East Site Access)

The study analyzed weekday AM and PM peak hour periods during the following scenarios:

- 2010 Existing
- 2018 Pre-Development (Build-Out Year)
- 2018 Post-Development (Build-Out Year with Project Trips)
- 2030 Future Year

The City of Camas considers "C" the minimum acceptable LOS for local or minor streets and "D" the minimum acceptable LOS for collector and arterial roadways. All study area intersections are calculated with LOS "C" or better during the 2018 post-development scenarios. The 2030 future year scenarios indicate potential future LOS deficiencies during the AM peak hour at NE Everett Street (SR 500)/NE Lake Road and during the PM peak hour at NE Ingle Road/NE Goodwin Road.

Site traffic is not anticipated to degrade LOS below acceptable levels at any study area intersection, so no mitigating roadway improvements are anticipated or proposed.

Peak hour traffic signal warrants were reviewed for the NE Everett Street (SR 500)/NE Leadbetter Road intersection. None of the projected peak hour volumes in any scenario meet the minimum peak hour volume thresholds for a signal, and no significant delay is anticipated on the eastbound stop-controlled approach. No traffic signal installations are warranted or proposed.

Turn lane warrants were reviewed at the site access intersections along Leadbetter Road. Neither the rural criteria (for the existing condition) nor the urban criteria (for the post-development condition) apply, so no auxiliary left- or right-turn lanes on Leadbetter Road are warranted or proposed.

RECOMMENDATIONS

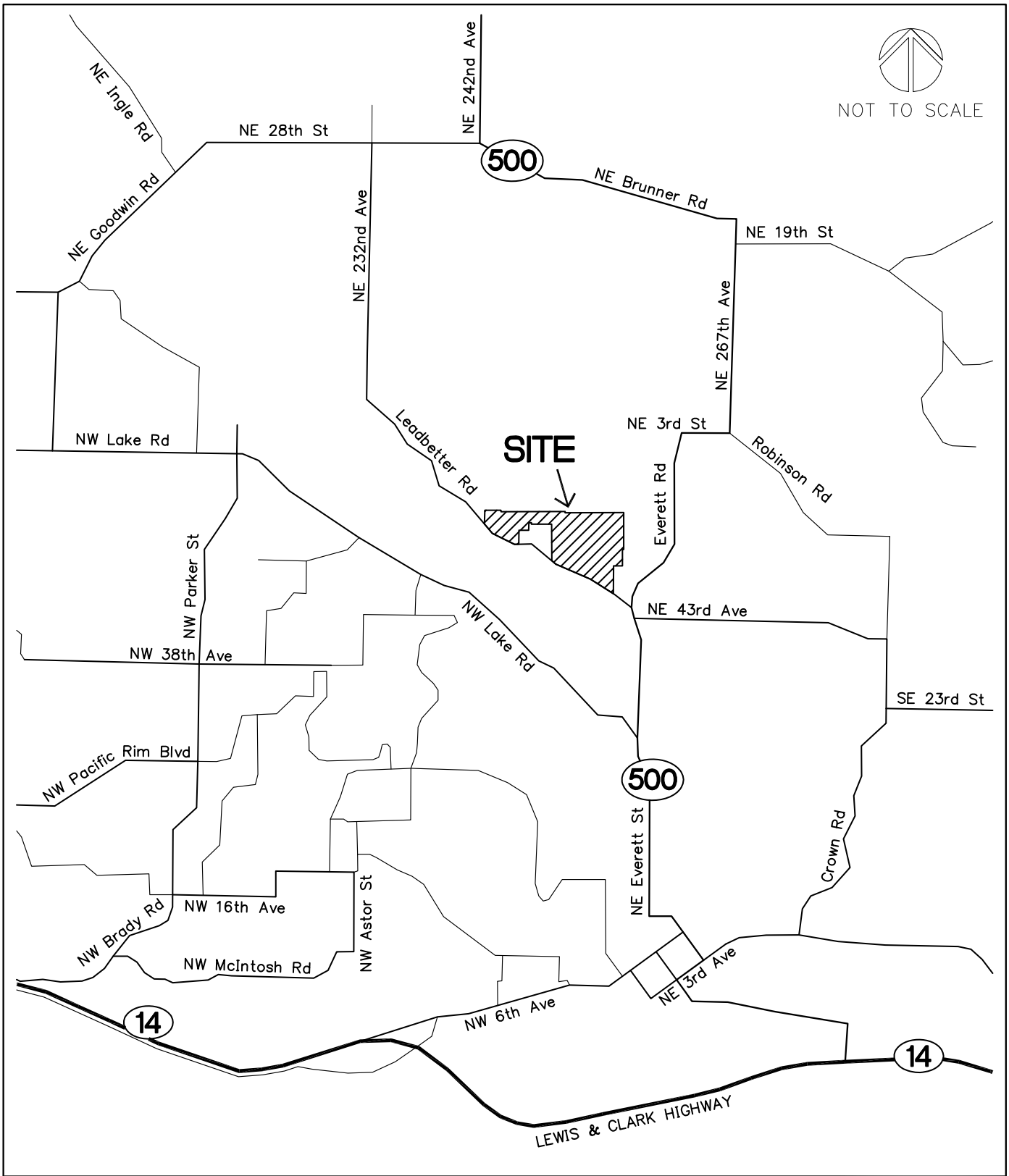
1. Increase enforcement actions along Leadbetter Road to reduce the number of collisions involving alcohol or excessive speed.
2. Clear existing roadside vegetation and perform limited site grading as is feasible along the Leadbetter Road frontage to ensure minimum sight distances, 480 feet to the east and 555 feet to the west, will be provided at each new access street (Fargo, Benton and Division Streets) when the site develops.
3. In general, intensive and/or expensive roadway improvements along Leadbetter Road are discouraged because the City of Camas has identified the road for eventual closure once a new east/west arterial opens north of the site. Any benefits derived from improvements may improve conditions for only a short period so that the cost effectiveness of such improvements would diminish.

7. APPENDIX

A. Figures
B. Traffic Count Summaries
C. Collision Rate Calculations and Reports
D. In-Process Traffic
E. Background Growth (RTC Model)
F. Signal Plans
G. Capacity Calculations
H. Warrant Analysis
I. Scoping

APPENDIX A

Figures



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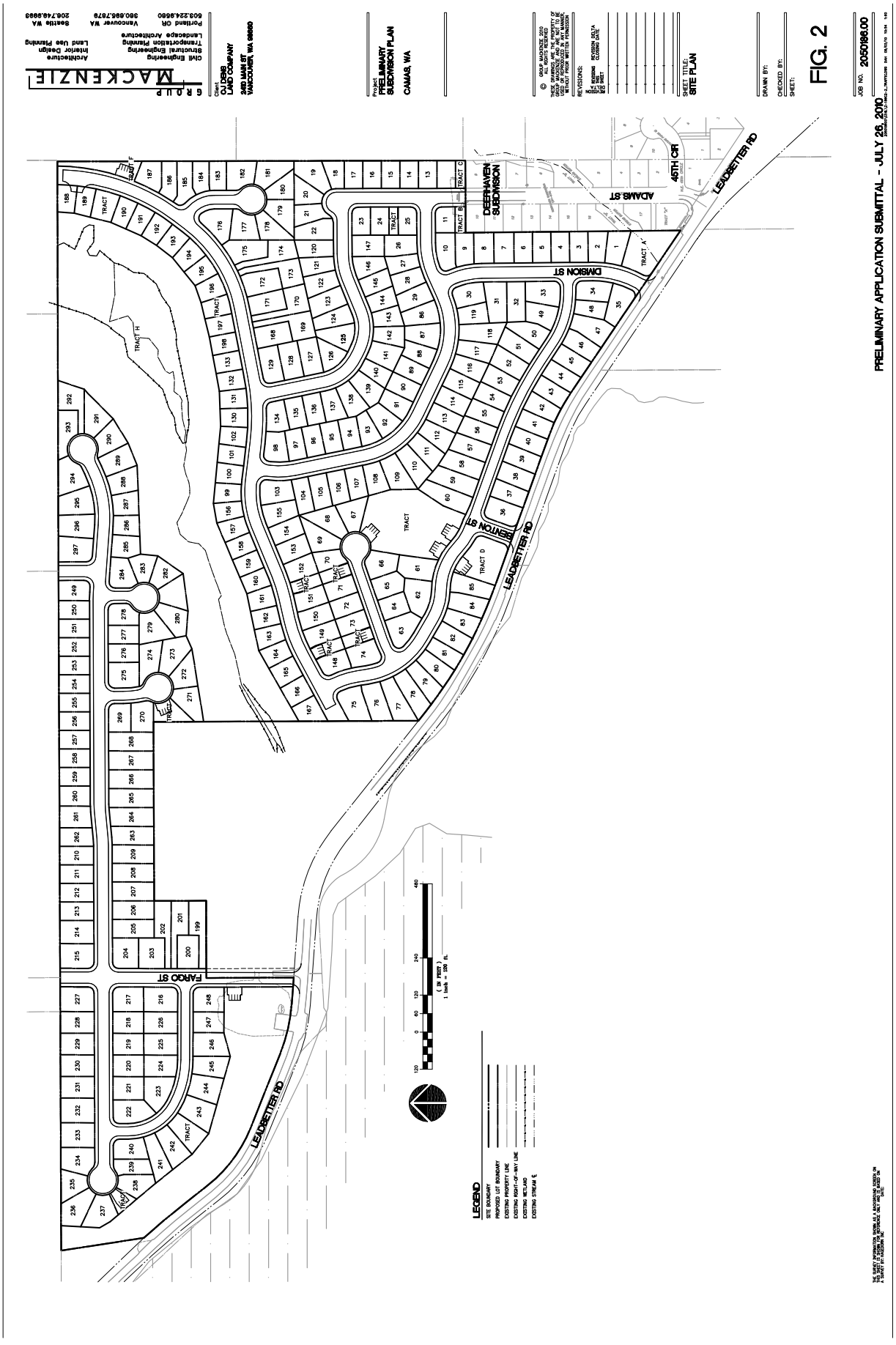
DATE: 08.03.10
DRAWN BY: DAH
CHECKED BY: BTA
JOB NO: 2050186.01

VICINITY MAP

CJ DENS RESIDENTIAL SUBDIVISION
CAMAS, WASHINGTON

FIGURE 1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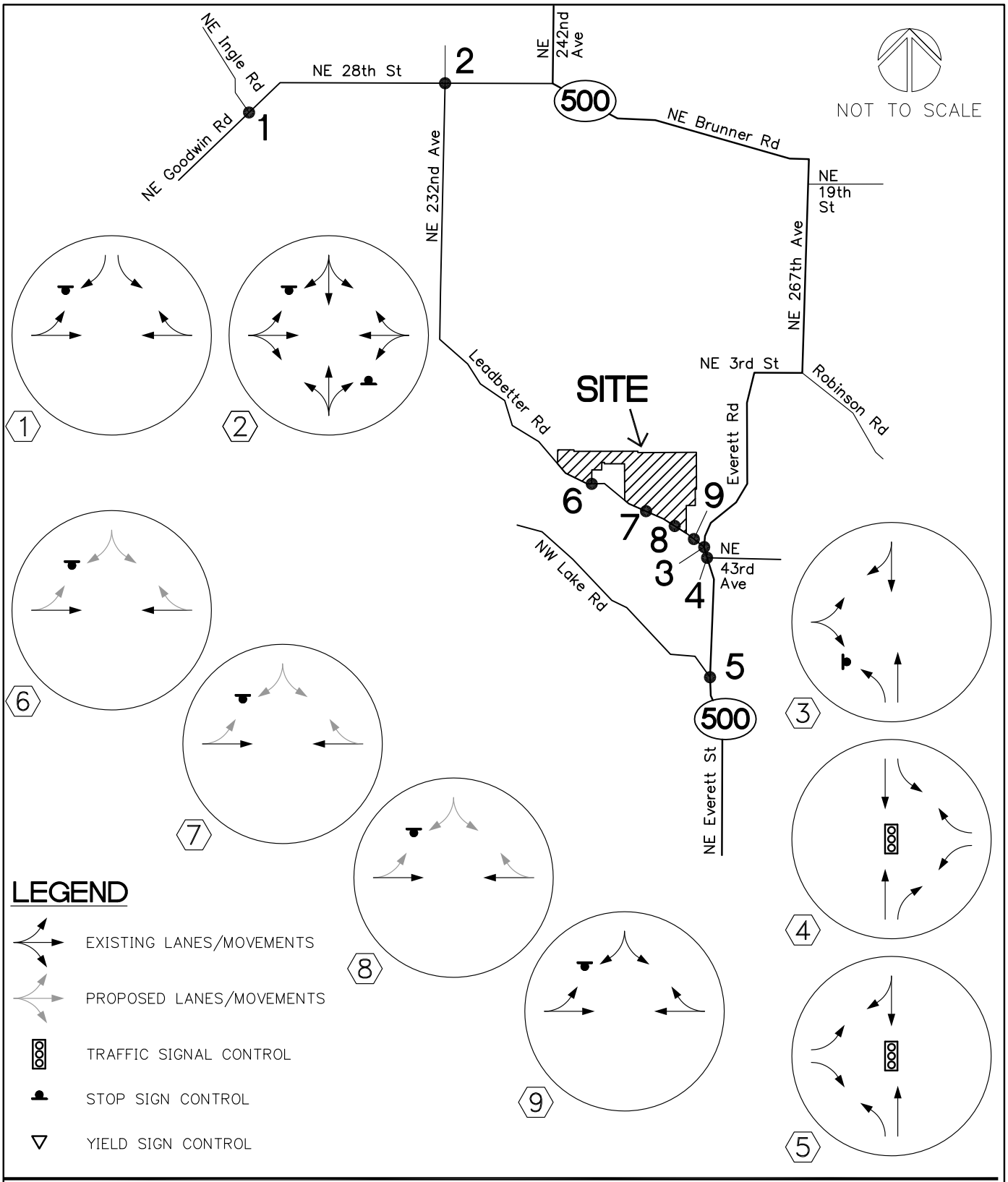
Structural Engineering
Transportation Planning
Landscape Architecture
Architecture
Interior Design
Land Use Planning
Portland OR 503.224.9560
Vancouver WA 360.695.7879
Seattle WA 206.749.9993
Client:
OLDEN LAND COMPANY
2401 MAIN ST
VANCOUVER, WA 98660
Project:
PRELIMINARY SUBDIVISION PLAN
CAMAS, WA
SHEET TITLE:
SITE PLAN
REVISIONS:
DRAWN BY:
CHECKED BY:
SHEET:
FIG. 2
JOB NO. 2050198.00
PRELIMINARY APPLICATION SUBMITTAL - JULY 26, 2010
DEERHAVEN SUBDIVISION
LEADBETTER RD
ADAMS ST
45TH CIR
DIXON ST
BENTON ST
FARGO ST
TRACT A
TRACT B
TRACT C
TRACT D
TRACT H
LEGEND
SITE BOUNDARY
PROPOSED LOT BOUNDARY
EXISTING PROPERTY LINE
EXISTING RIGHT-OF-WAY LINE
EXISTING WETLAND
EXISTING STREAM



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EXISTING TRAFFIC CONTROL AND LANE CONFIGURATIONS

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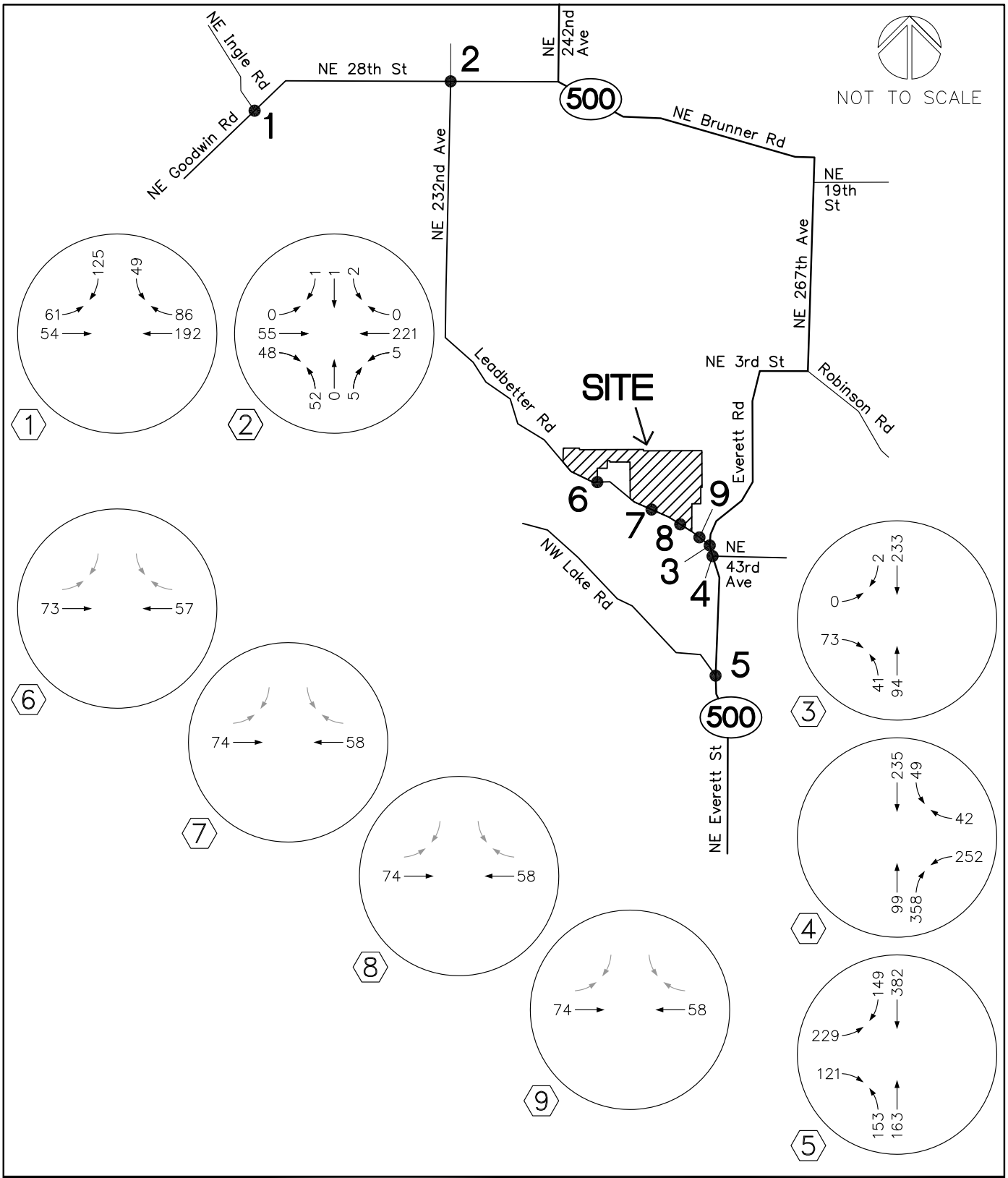
FIGURE 3



GROUP MACKENZIE Portland OR 503.224.9560 Vancouver WA 360.695.7879 Seattle WA 206.749.9993	DATE: 08.03.10 DRAWN BY: DAH/KLA CHECKED BY: BTA JOB NO: 2050186.01	2010 EXISTING TRAFFIC VOLUMES - AM PEAK HOUR CJ DENS RESIDENTIAL SUBDIVISION CAMAS, WASHINGTON	FIGURE 4A

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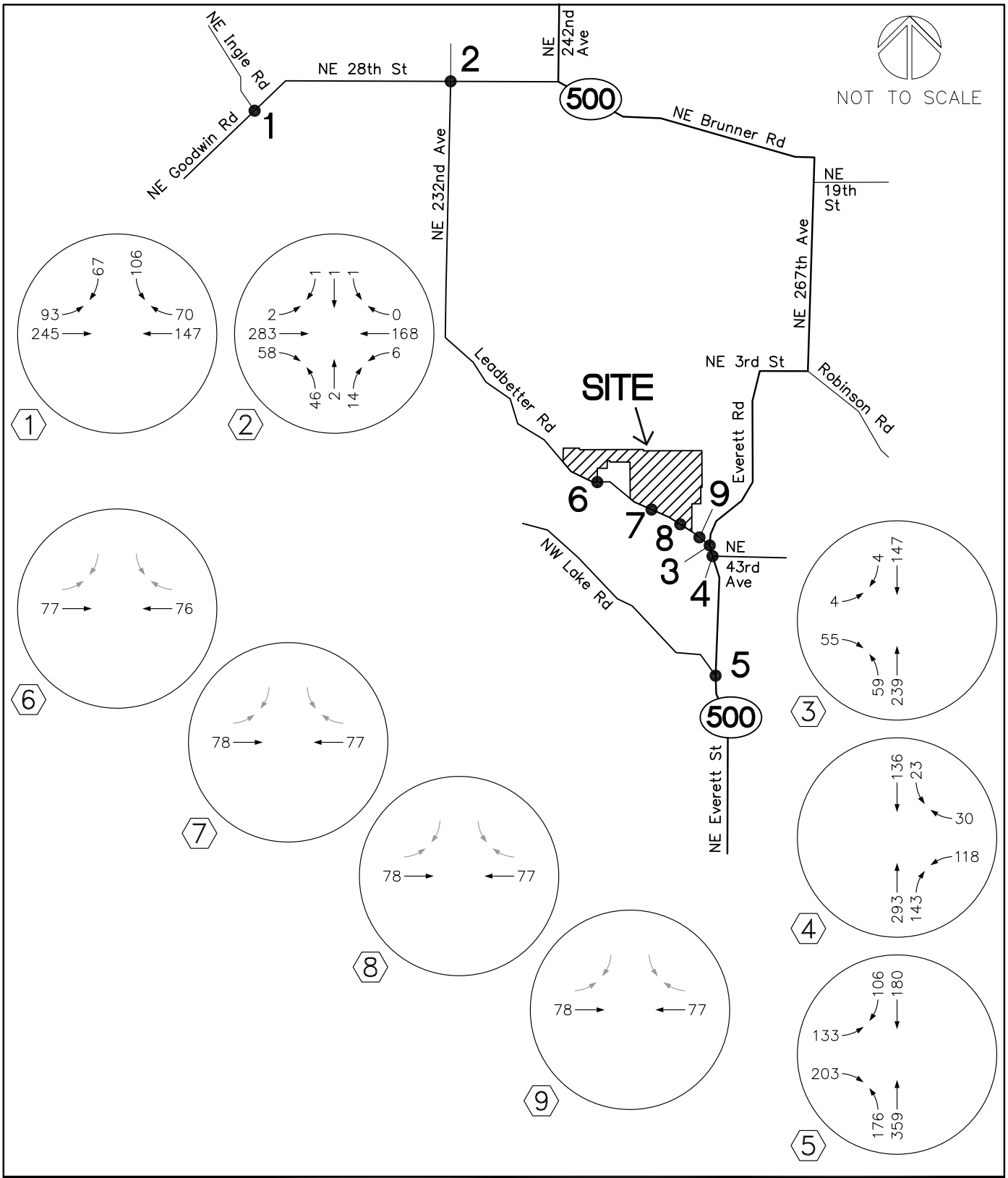

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2010 EXISTING TRAFFIC VOLUMES - PM PEAK HOUR

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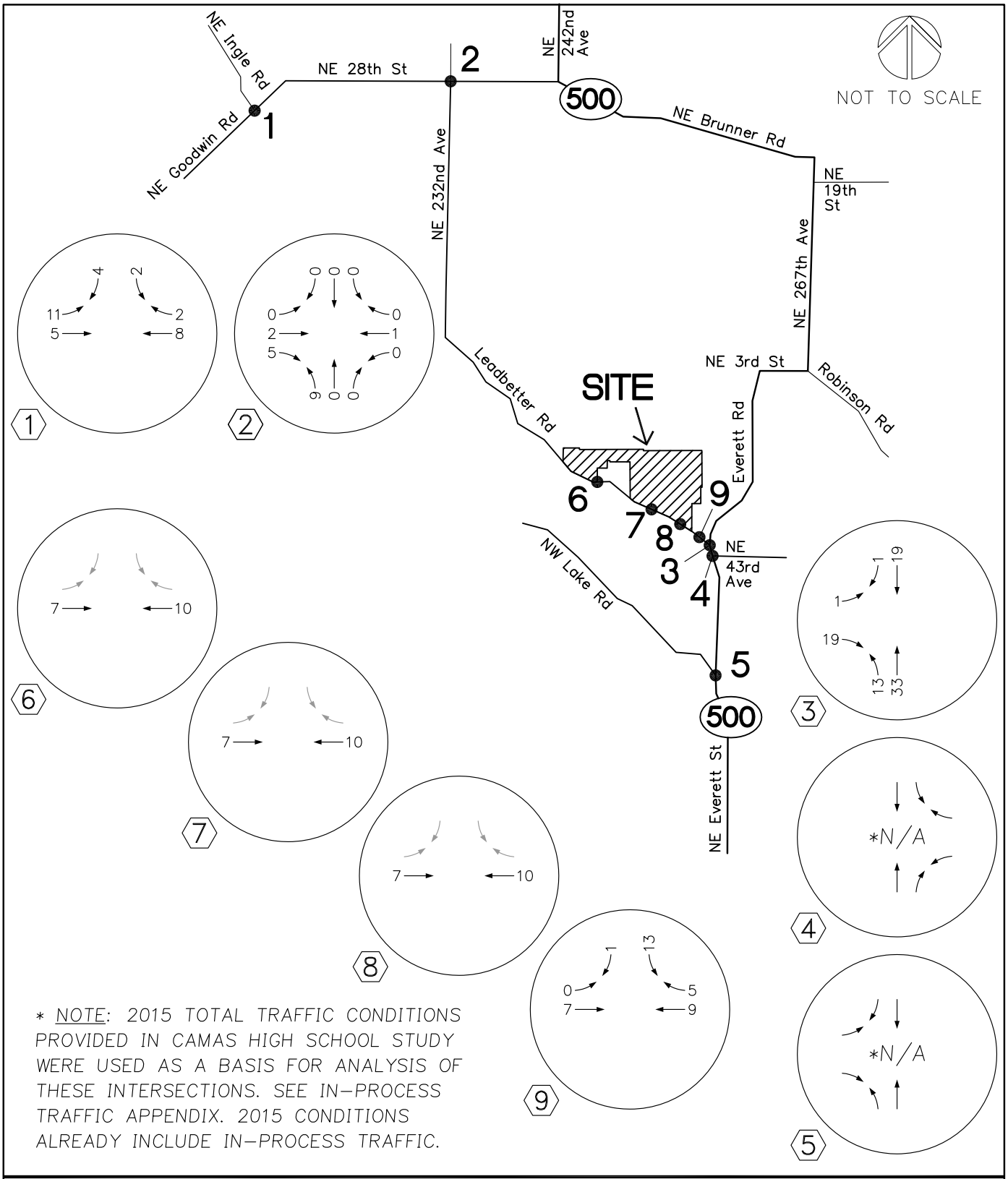
CAMAS, WASHINGTON

FIGURE 4B



* NOTE: 2015 TOTAL TRAFFIC CONDITIONS PROVIDED IN CAMAS HIGH SCHOOL STUDY WERE USED AS A BASIS FOR ANALYSIS OF THESE INTERSECTIONS. SEE IN-PROCESS TRAFFIC APPENDIX. 2015 CONDITIONS ALREADY INCLUDE IN-PROCESS TRAFFIC.

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IN-PROCESS TRAFFIC VOLUMES - AM PEAK HOUR

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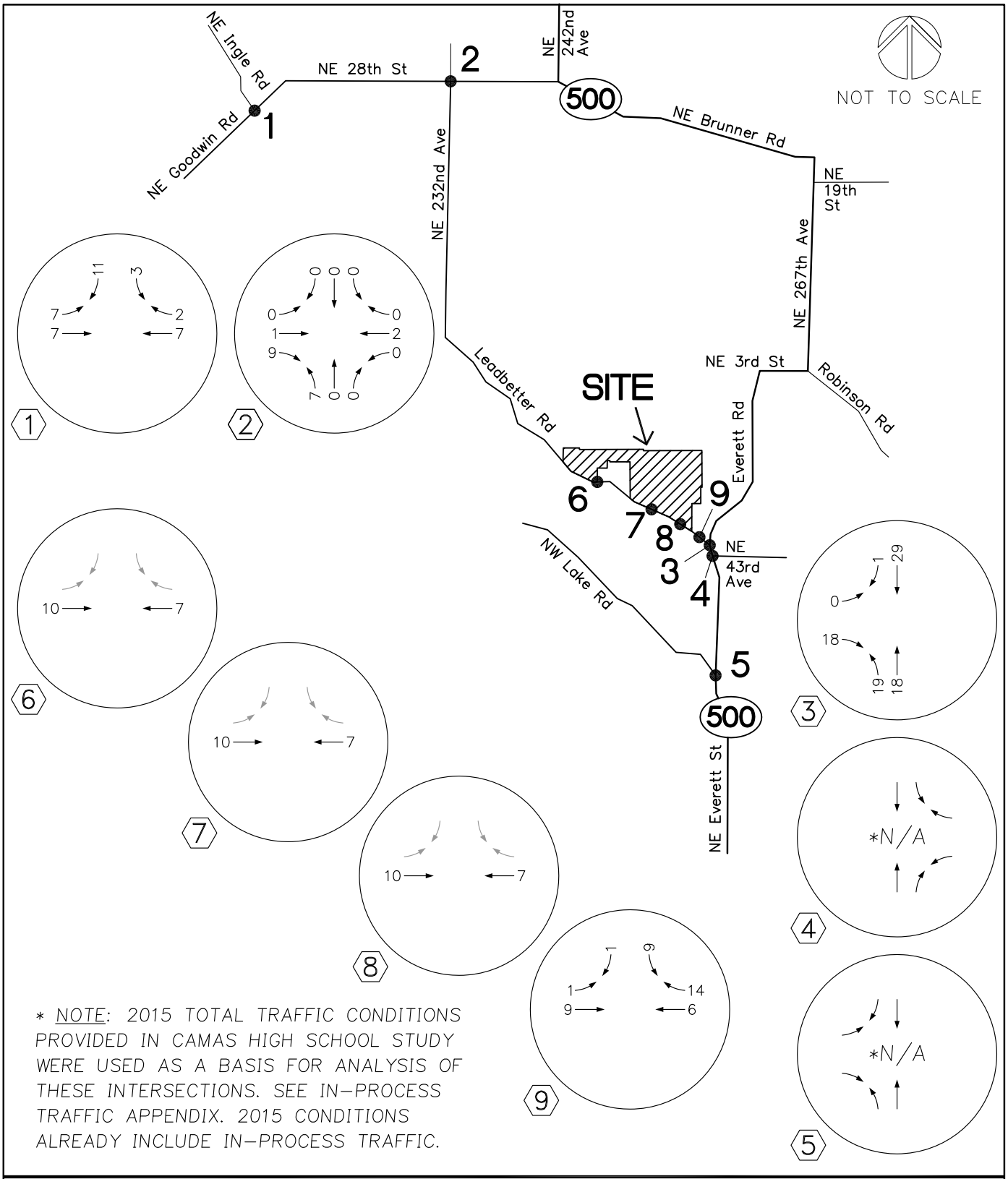
CAMAS, WASHINGTON

FIGURE 5A



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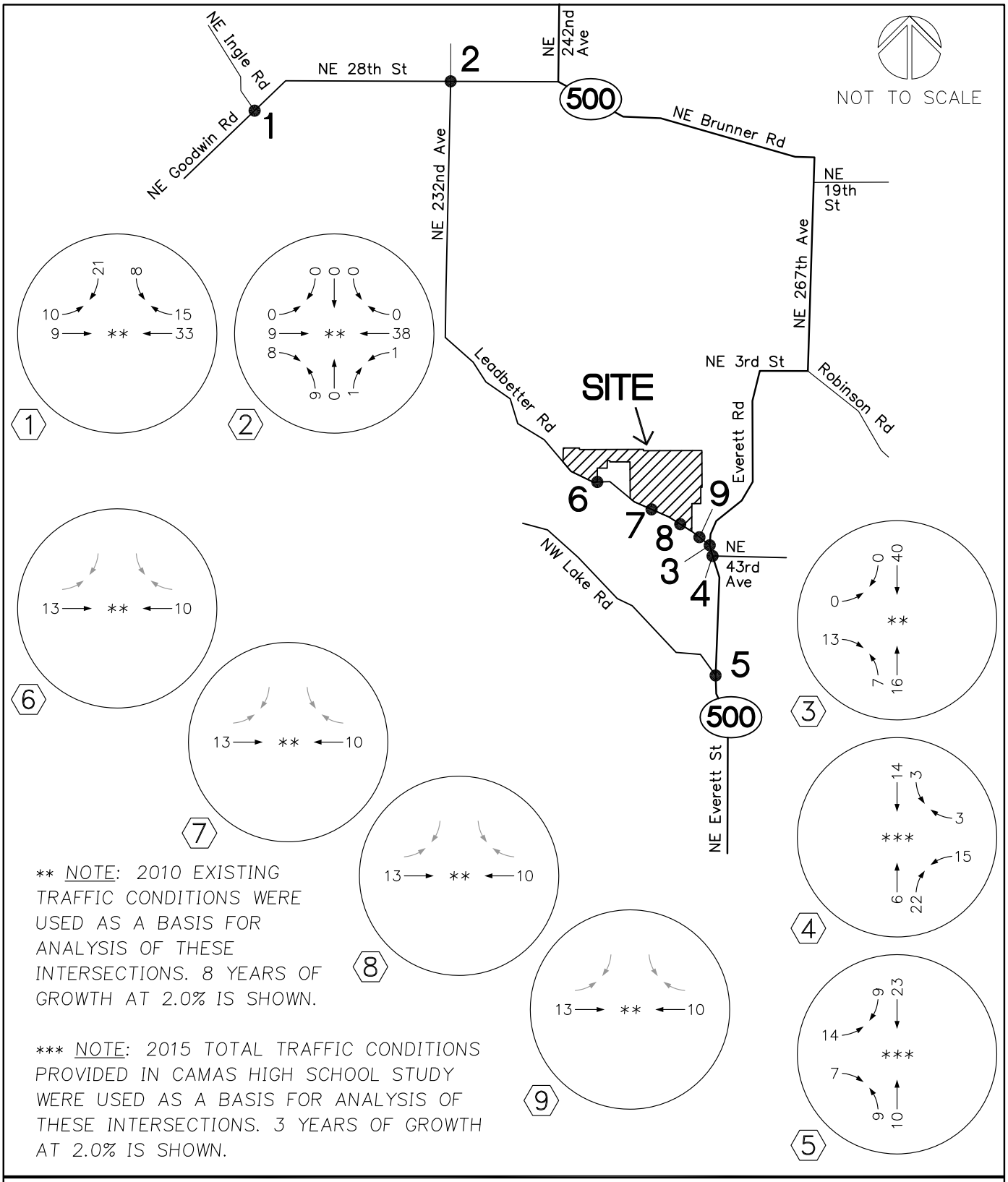
IN-PROCESS TRAFFIC VOLUMES - PM PEAK HOUR

CJ DENS RESIDENTIAL SUBDIVISION
CAMAS, WASHINGTON

FIGURE 5B



GROUP MACKENZIE

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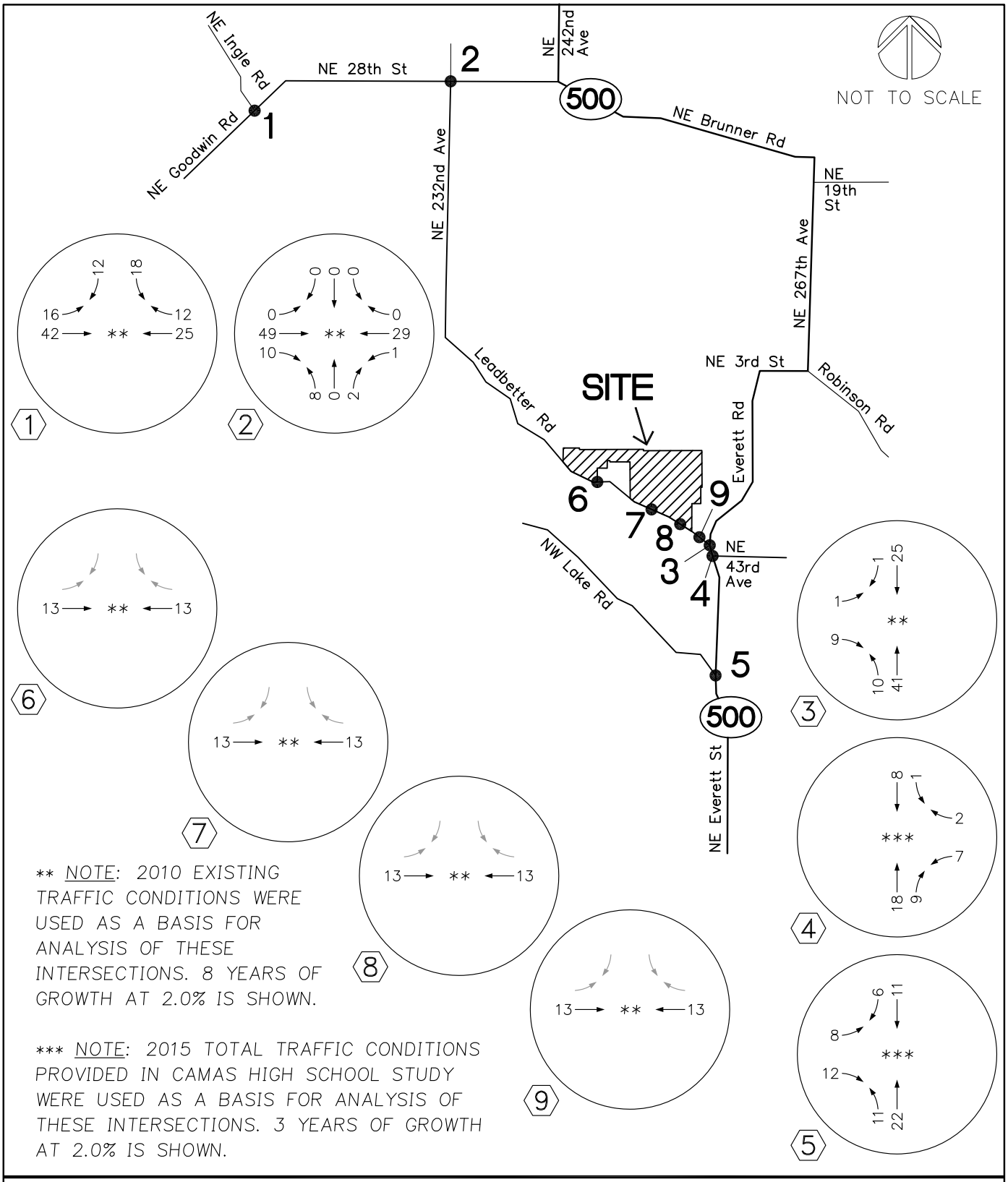
DATE: 08.03.10
DRAWN BY: DAH/KLA
CHECKED BY: BTA
JOB NO: 2050186.01

BACKGROUND GROWTH VOLUMES - AM PEAK HOUR

CJ DENS RESIDENTIAL SUBDIVISION
CAMAS, WASHINGTON

FIGURE 6A



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DATE: 08.03.10
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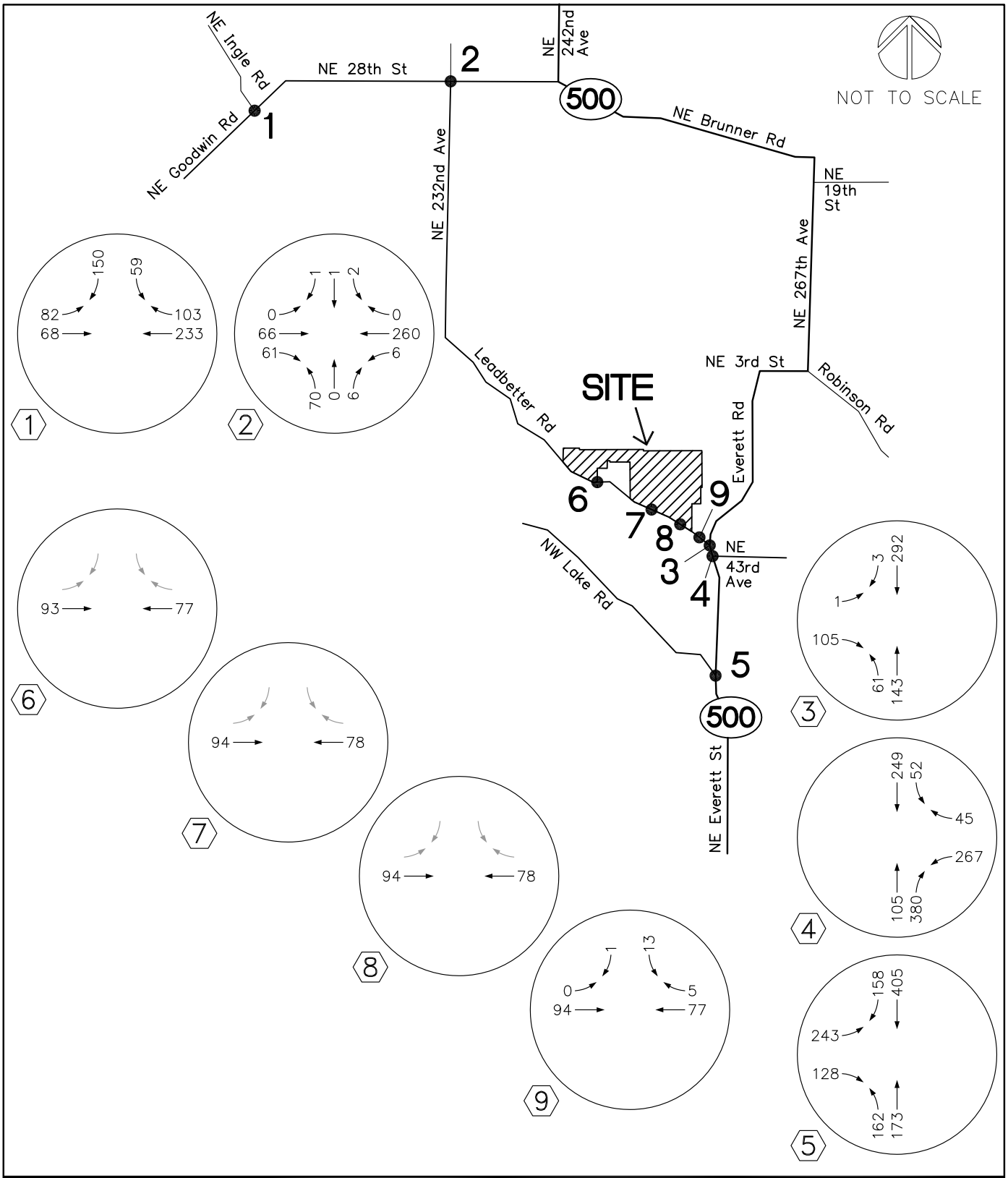
JOB NO: 2050186.01

BACKGROUND GROWTH VOLUMES - PM PEAK HOUR

CJ DENS RESIDENTIAL SUBDIVISION
CAMAS, WASHINGTON

FIGURE 6B



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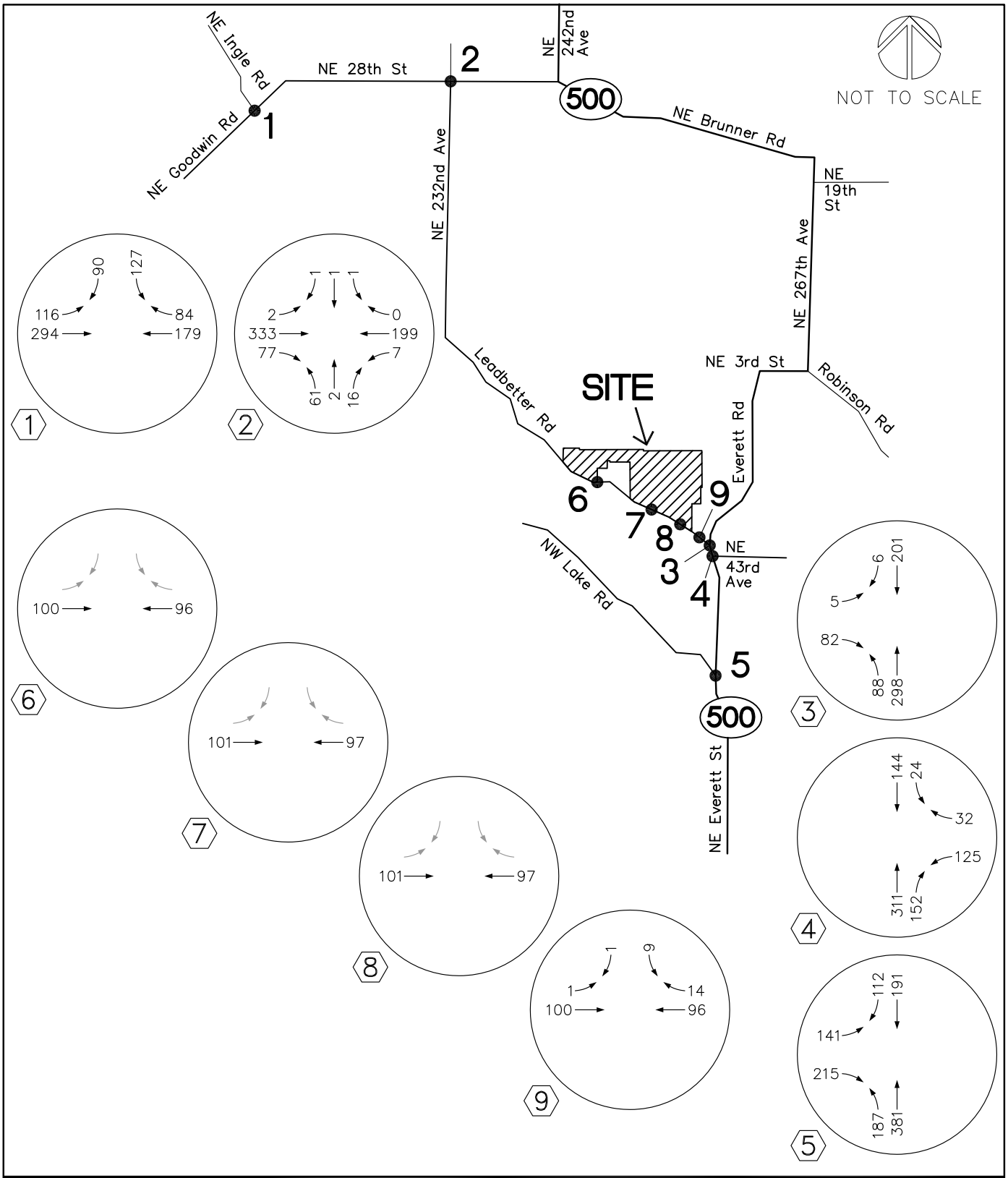
JOB NO: 2050186.01

2018 PRE-DEVELOPMENT VOLUMES - AM PEAK HOUR

CJ DENS RESIDENTIAL SUBDIVISION
CAMAS, WASHINGTON

FIGURE 7A



GROUP MACKENZIE Portland OR 503.224.9560 Vancouver WA 360.695.7879 Seattle WA 206.749.9993	DATE: 08.03.10 DRAWN BY: DAH/KLA CHECKED BY: BTA JOB NO: 2050186.01	2018 PRE-DEVELOPMENT VOLUMES - PM PEAK HOUR CJ DENS RESIDENTIAL SUBDIVISION CAMAS, WASHINGTON	FIGURE 7B

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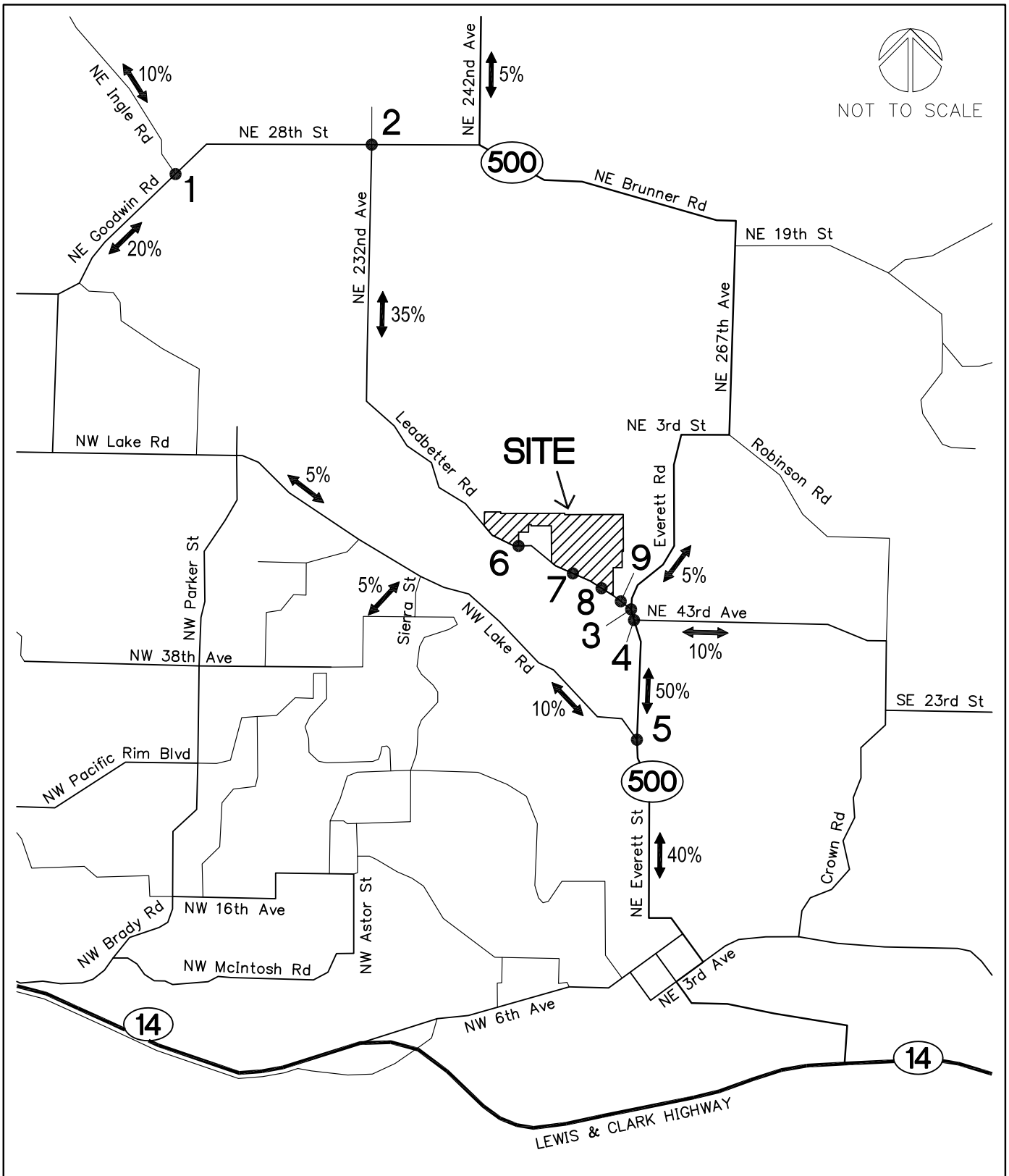

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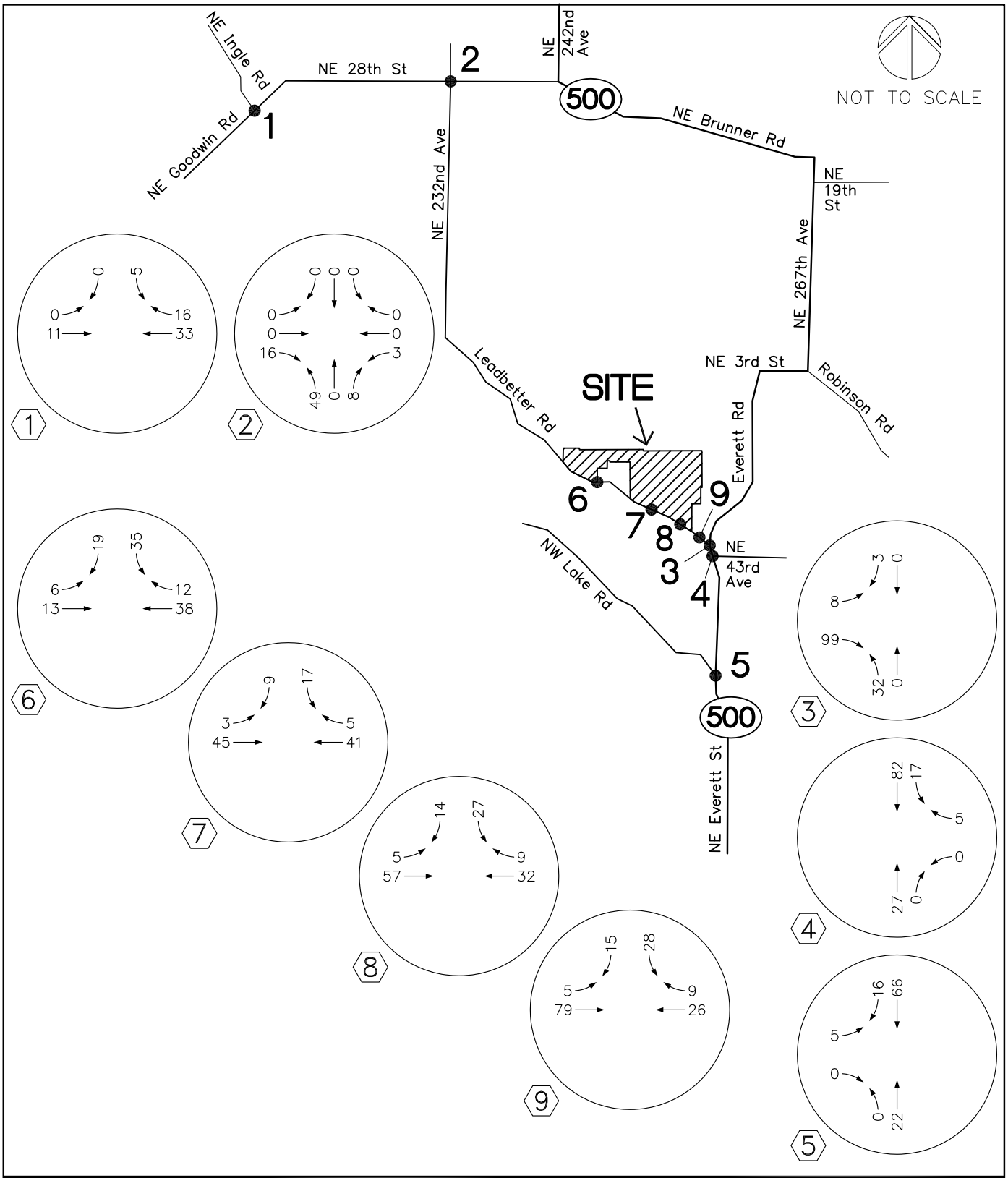
DATE: 08.03.10
DRAWN BY: DAH
CHECKED BY: BTA
JOB NO: 2050186.01

SITE TRIP DISTRIBUTION

CJ DENS RESIDENTIAL SUBDIVISION
CAMAS, WASHINGTON

FIGURE 8



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DATE: 08.03.10
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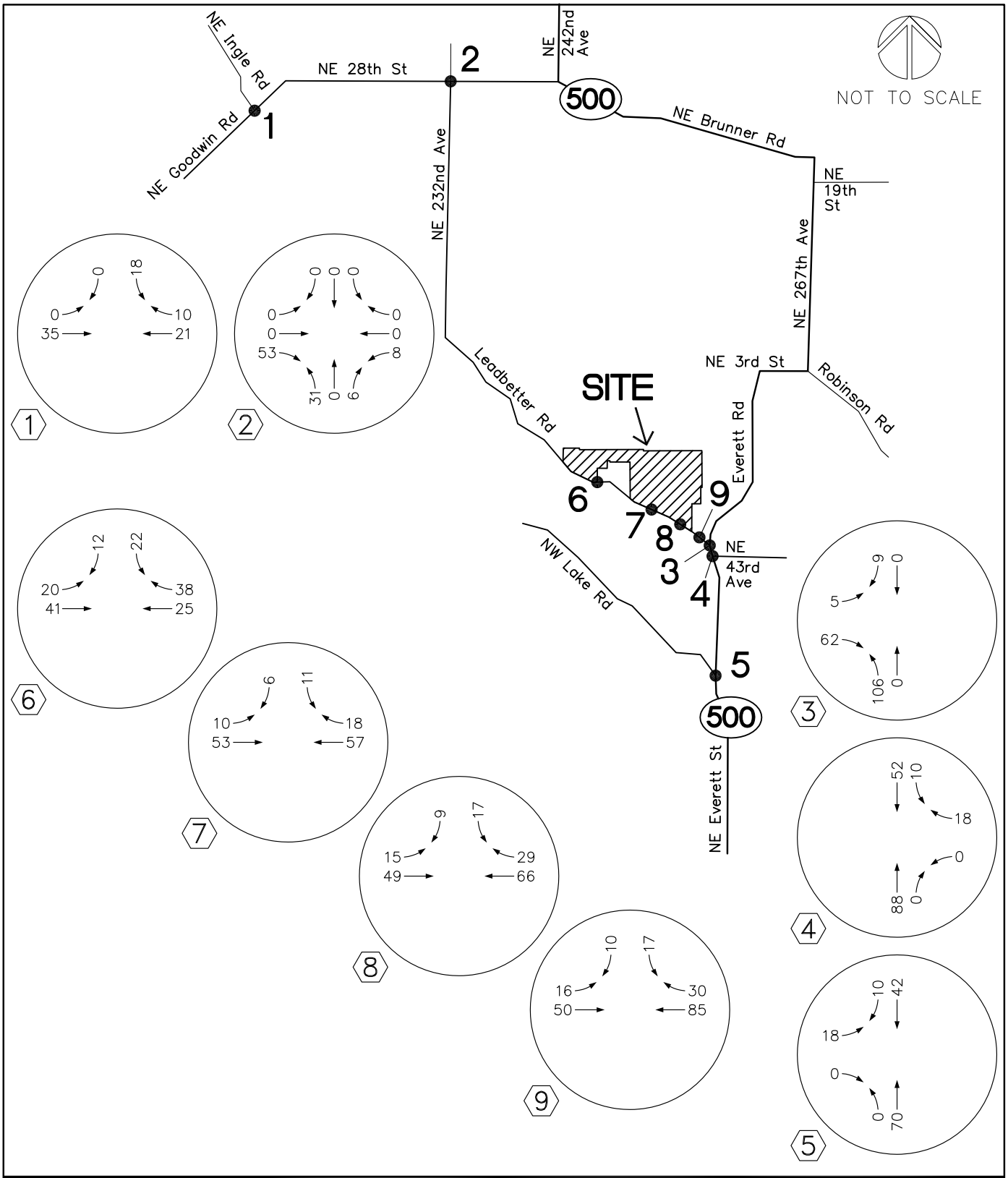
JOB NO: 2050186.01

SITE TRIP ASSIGNMENTS - AM PEAK HOUR

CJ DENS RESIDENTIAL SUBDIVISION
CAMAS, WASHINGTON

FIGURE 9A



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DATE: 08.03.10
DRAWN BY: DAH/KLA
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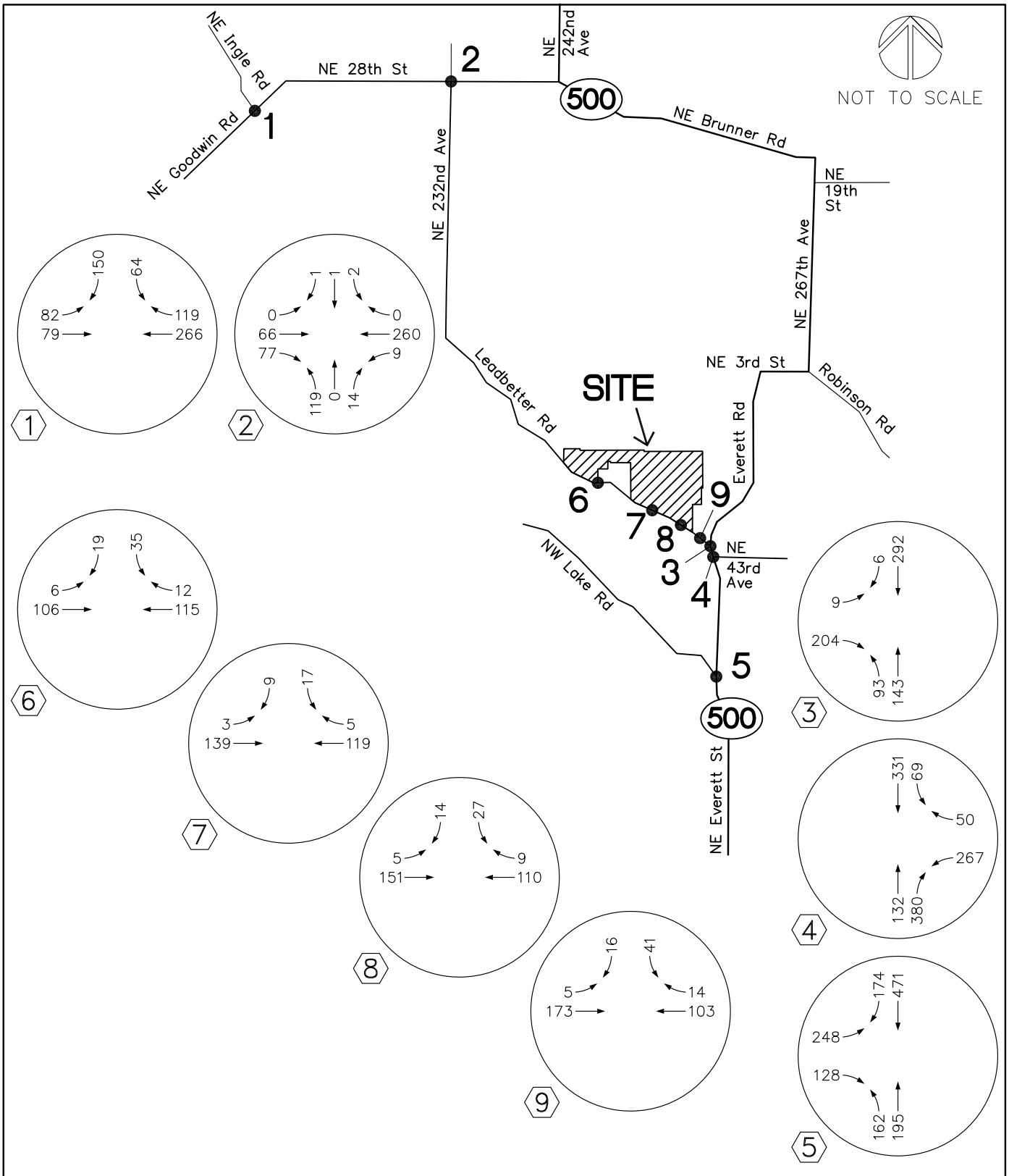
JOB NO: 2050186.01

SITE TRIP ASSIGNMENTS - PM PEAK HOUR

CJ DENS RESIDENTIAL SUBDIVISION
CAMAS, WASHINGTON

FIGURE 9B



GROUP MACKENZIE Portland OR 503.224.9560 Vancouver WA 360.695.7879 Seattle WA 206.749.9993	DATE: 08.03.10 DRAWN BY: DAH/KLA CHECKED BY: BTA JOB NO: 2050186.01	2018 POST-DEVELOPMENT VOLUMES - AM PEAK HOUR CJ DENS RESIDENTIAL SUBDIVISION CAMAS, WASHINGTON	FIGURE 10A

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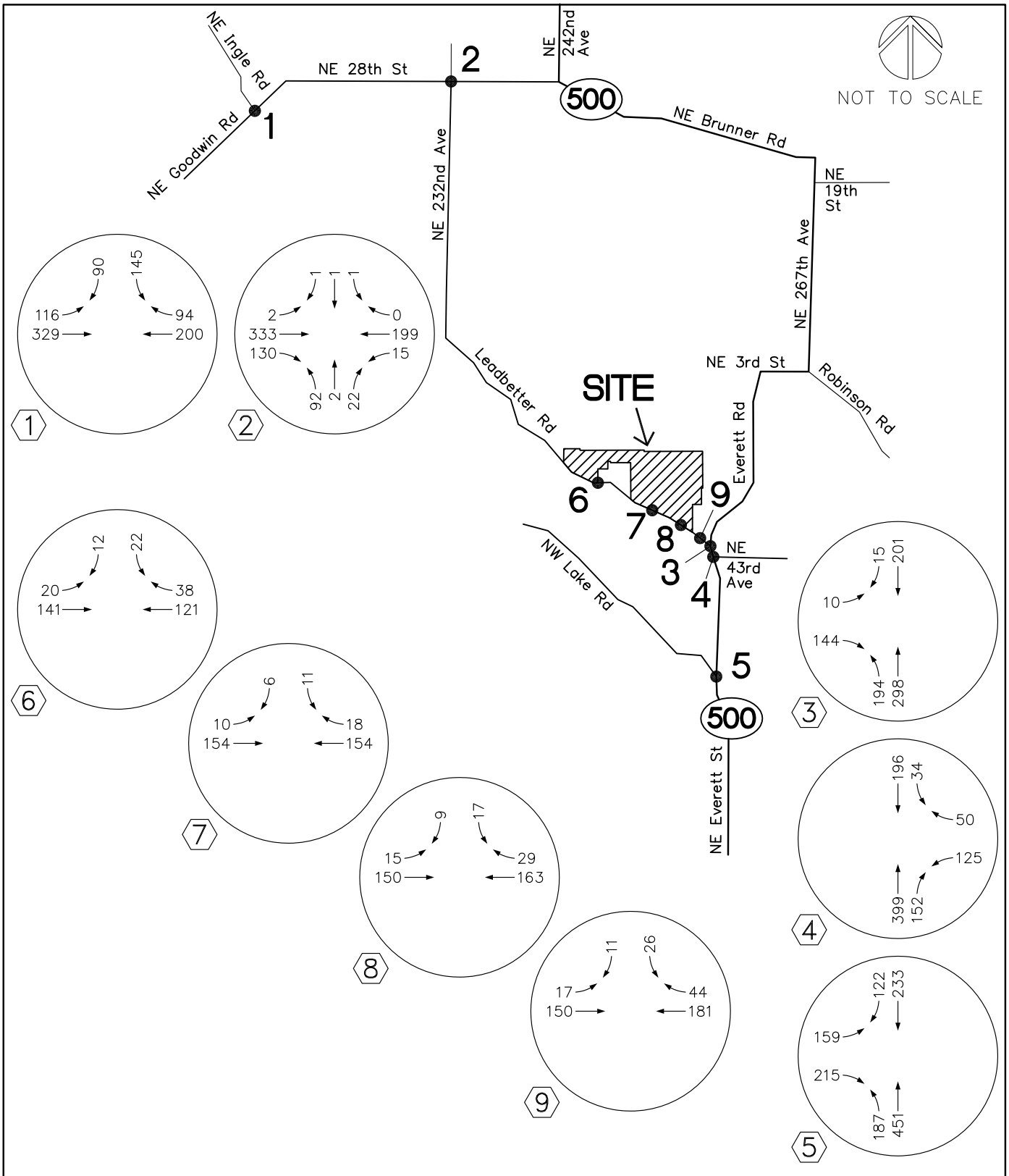

GROUP MACKENZIE Portland OR 503.224.9560 Vancouver WA 360.695.7879 Seattle WA 206.749.9993	DATE: 08.03.10 DRAWN BY: DAH/KLA CHECKED BY: BTA JOB NO: 2050186.01	2018 POST-DEVELOPMENT VOLUMES - PM PEAK HOUR CJ DENS RESIDENTIAL SUBDIVISION CAMAS, WASHINGTON	FIGURE 10B

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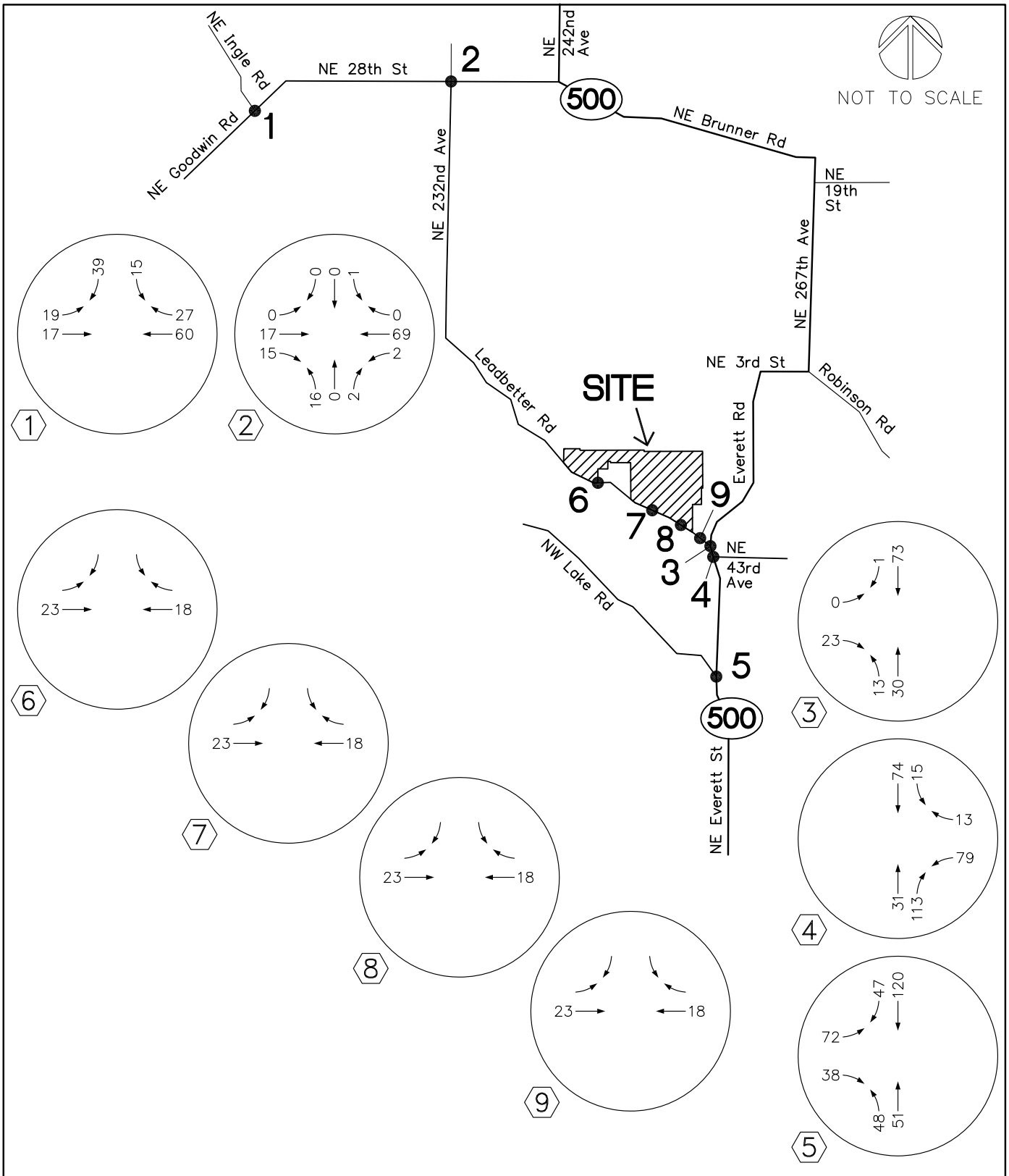

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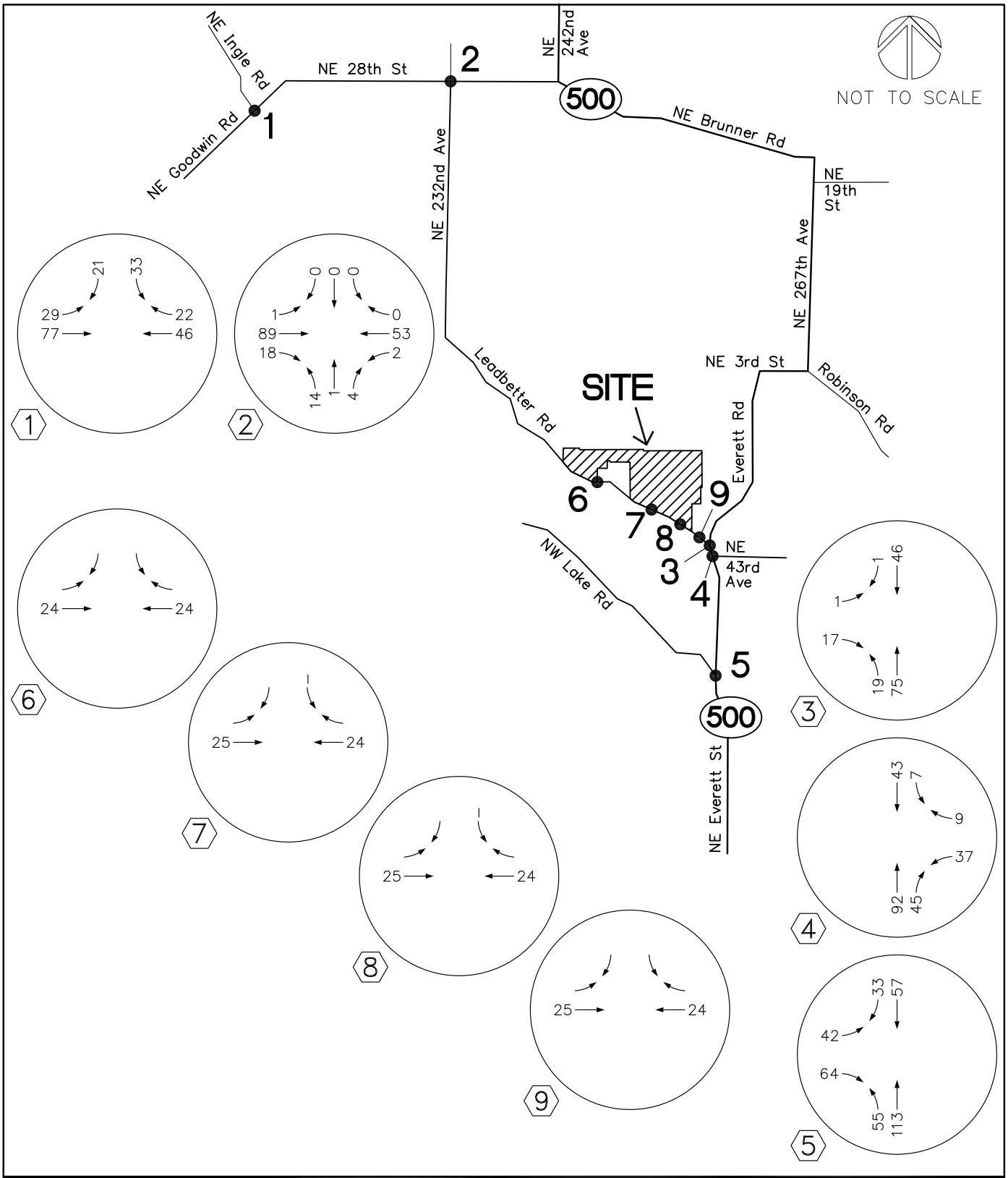
JOB NO: 2050186.01

BACKGROUND GROWTH VOLUMES (12 YEARS AT 2.0%) - AM PEAK HOUR

CJ DENS RESIDENTIAL SUBDIVISION
CAMAS, WASHINGTON

FIGURE 11A



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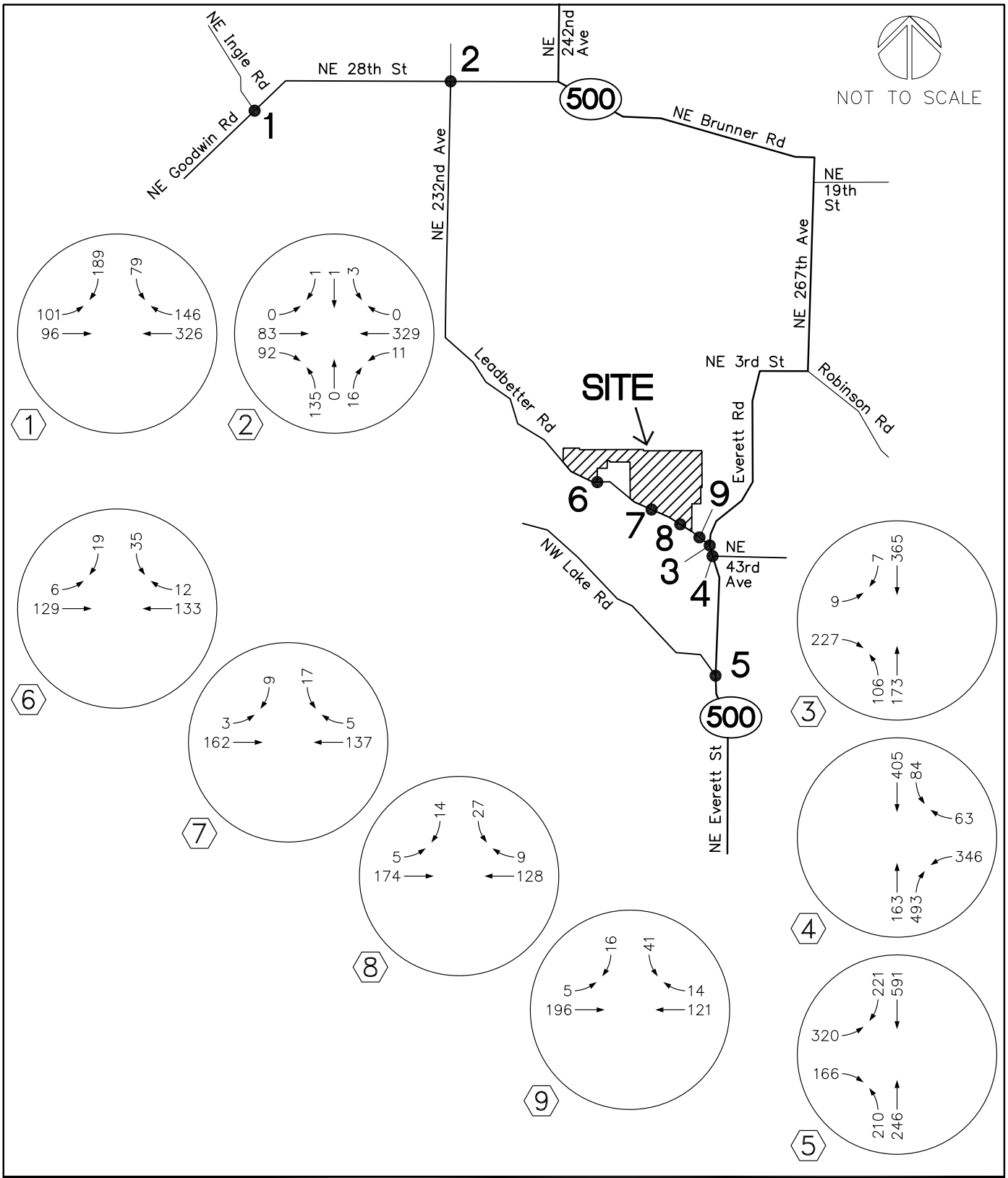
CHECKED BY: BTA
JOB NO: 2050186.01

BACKGROUND GROWTH VOLUMES (12 YEARS AT 2.0%) - PM PEAK HOUR

CJ DENS RESIDENTIAL SUBDIVISION
CAMAS, WASHINGTON

FIGURE 11B



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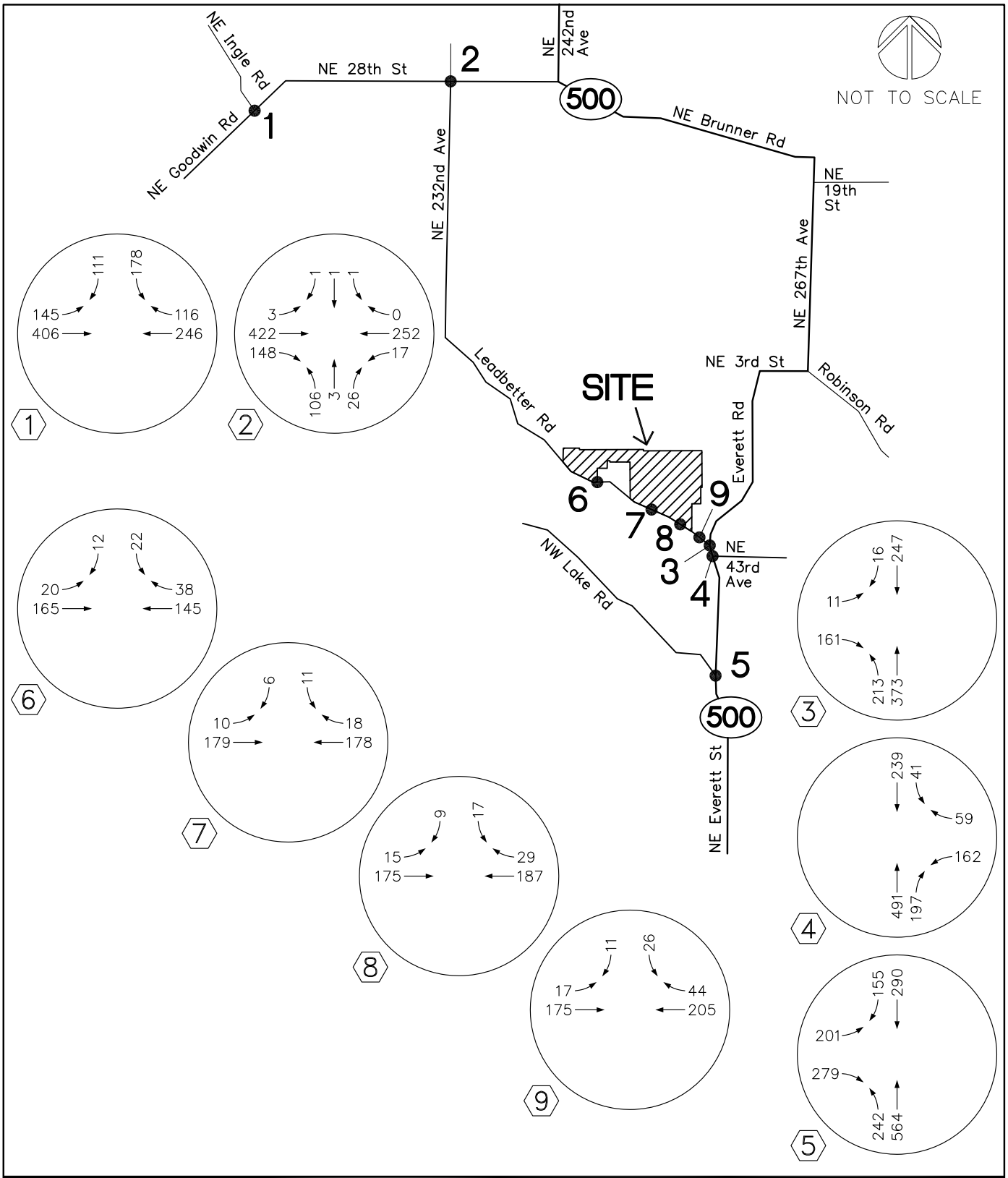
DRAWN BY: DAH/KLA
CHECKED BY: BTA
JOB NO: 2050186.01

2030 FUTURE VOLUMES - AM PEAK HOUR

CJ DENS RESIDENTIAL SUBDIVISION
CAMAS, WASHINGTON

FIGURE 12A



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DATE: 08.03.10
DRAWN BY: DAH/KLA
CHECKED BY: BTA
JOB NO: 2050186.01

2030 FUTURE VOLUMES - PM PEAK HOUR

CJ DENS RESIDENTIAL SUBDIVISION
CAMAS, WASHINGTON

FIGURE 12B

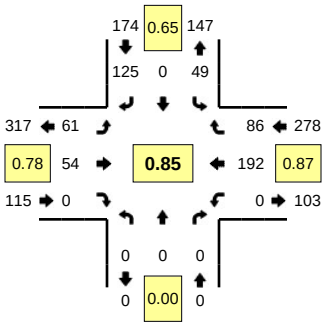
APPENDIX B

Traffic Count Summaries

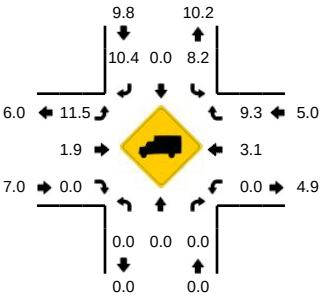
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

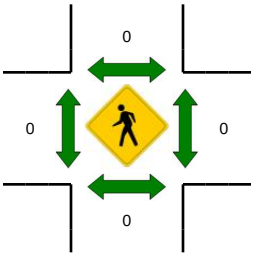
LOCATION: Ingle Rd -- Goodwin Rd
CITY/STATE: Camas, WA

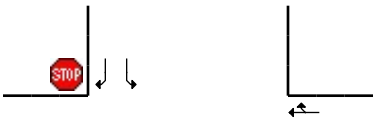
QC JOB #: 10502001
DATE: 5/6/2010

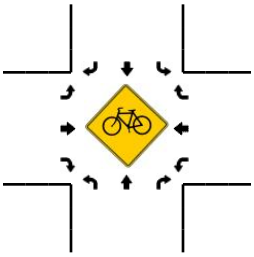


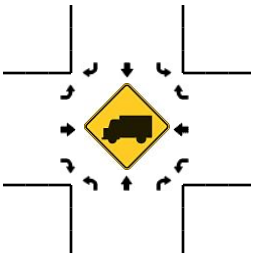
Peak-Hour: 7:05 AM -- 8:05 AM
Peak 15-Min: 7:25 AM -- 7:40 AM

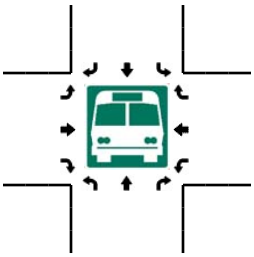












5-Min Count Period Beginning At	Ingle Rd (Northbound)			Ingle Rd (Southbound)			Goodwin Rd (Eastbound)			Goodwin Rd (Westbound)			Total	Hourly Totals
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
7:00 AM	0	0	0	2	0	7	3	6	0	0	9	6	33	
7:05 AM	0	0	0	6	0	4	2	6	0	0	9	7	34	
7:10 AM	0	0	0	5	0	8	4	8	0	0	14	8	47	
7:15 AM	0	0	0	3	0	14	0	6	0	0	13	10	46	
7:20 AM	0	0	0	2	0	9	4	3	0	0	21	7	46	
7:25 AM	0	0	0	3	0	18	5	5	0	0	21	6	58	
7:30 AM	0	0	0	5	0	17	6	4	0	0	17	8	57	
7:35 AM	0	0	0	1	0	23	5	5	0	0	12	6	52	
7:40 AM	0	0	0	4	0	10	6	3	0	0	12	8	43	
7:45 AM	0	0	0	8	0	7	12	6	0	0	24	8	65	
7:50 AM	0	0	0	5	0	5	5	3	0	0	21	7	46	
7:55 AM	0	0	0	2	0	4	6	3	0	0	13	2	30	557
8:00 AM	0	0	0	5	0	6	6	2	0	0	15	9	43	567
8:05 AM	0	0	0	3	0	7	2	3	0	0	12	4	31	564
8:10 AM	0	0	0	2	0	5	1	6	0	0	9	9	32	549
8:15 AM	0	0	0	4	0	7	0	6	0	0	19	3	39	542
8:20 AM	0	0	0	1	0	3	1	6	0	0	12	4	27	523
8:25 AM	0	0	0	0	0	7	4	6	0	0	18	5	40	505
8:30 AM	0	0	0	1	0	8	4	2	0	0	8	1	24	472
8:35 AM	0	0	0	0	0	8	1	5	0	0	16	13	43	463
8:40 AM	0	0	0	2	0	3	4	9	0	0	13	1	32	452
8:45 AM	0	0	0	2	0	7	3	5	0	0	13	6	36	423
8:50 AM	0	0	0	6	0	6	5	4	0	0	16	5	42	419
8:55 AM	0	0	0	3	0	5	2	4	0	0	10	5	29	418

Peak 15-Min Flowrates	Northbound			Southbound			Eastbound			Westbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
All Vehicles	0	0	0	36	0	232	64	56	0	0	200	80	668
Heavy Trucks	0	0	0	0	0	8	12	0	0	0	12	0	32
Pedestrians		0			0			0			0		0
Bicycles													
Railroad													
Stopped Buses													

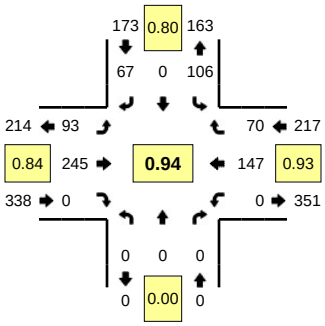
Comments:

Report generated on 5/11/2010 11:22 AM

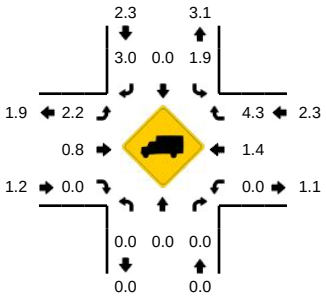
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

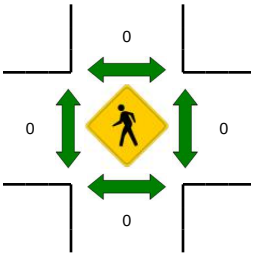
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

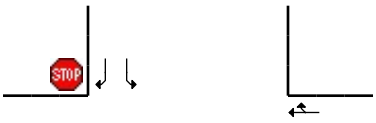
LOCATION: Ingle Rd -- Goodwin Rd | **QC JOB #:** 10502002
CITY/STATE: Camas, WA | **DATE:** 5/5/2010

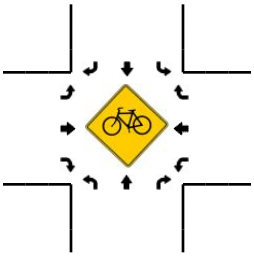


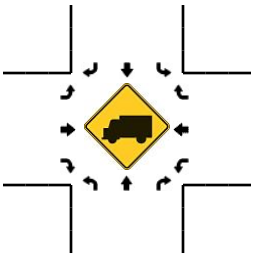
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

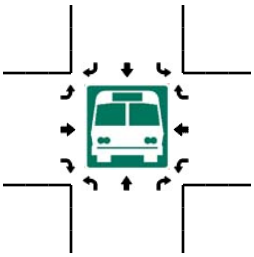












5-Min Count Period Beginning At	Ingle Rd (Northbound)				Ingle Rd (Southbound)				Goodwin Rd (Eastbound)				Goodwin Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	5	0	4	0	9	21	0	0	0	10	3	0	52	
4:05 PM	0	0	0	0	6	0	5	0	13	13	0	0	0	12	5	0	54	
4:10 PM	0	0	0	0	4	0	5	0	9	14	0	0	0	6	4	0	42	
4:15 PM	0	0	0	0	16	0	2	0	4	15	0	0	0	11	2	0	50	
4:20 PM	0	0	0	0	11	0	7	0	9	19	0	0	0	18	4	0	68	
4:25 PM	0	0	0	0	9	0	10	0	2	17	0	0	0	15	4	0	57	
4:30 PM	0	0	0	0	5	0	10	0	7	23	0	0	0	13	4	0	62	
4:35 PM	0	0	0	0	6	0	3	0	6	12	0	0	0	7	7	0	41	
4:40 PM	0	0	0	0	4	0	4	0	9	19	0	0	0	13	5	0	54	
4:45 PM	0	0	0	0	9	0	6	0	5	25	0	0	0	15	5	0	65	
4:50 PM	0	0	0	0	4	0	0	0	8	22	0	0	0	13	3	0	50	
4:55 PM	0	0	0	0	17	0	5	0	2	20	0	0	0	11	4	0	59	654
5:00 PM	0	0	0	0	6	0	6	0	3	25	0	0	0	14	13	0	67	669
5:05 PM	0	0	0	0	7	0	5	0	18	18	0	0	0	7	9	0	64	679
5:10 PM	0	0	0	0	6	0	4	0	10	27	0	0	0	12	4	0	63	700
5:15 PM	0	0	0	0	8	0	11	0	6	16	0	0	0	16	4	0	61	711
5:20 PM	0	0	0	0	14	0	6	0	5	19	0	0	0	10	6	0	60	703
5:25 PM	0	0	0	0	14	0	6	0	6	21	0	0	0	14	7	0	68	714
5:30 PM	0	0	0	0	6	0	5	0	4	21	0	0	0	5	3	0	44	696
5:35 PM	0	0	0	0	6	0	6	0	14	12	0	0	0	19	7	0	64	719
5:40 PM	0	0	0	0	9	0	7	0	12	19	0	0	0	11	5	0	63	728
5:45 PM	0	0	0	0	10	0	11	0	5	19	0	0	0	8	4	0	57	720
5:50 PM	0	0	0	0	7	0	6	0	5	19	0	0	0	11	5	0	53	723
5:55 PM	0	0	0	0	6	0	3	0	8	13	0	0	0	8	4	0	42	706

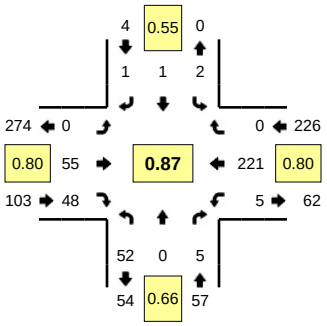
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	76	0	60	0	124	280	0	0	0	132	104	0	776
Heavy Trucks	0	0	0		0	0	0		4	4	0		0	4	4		16
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Comments:

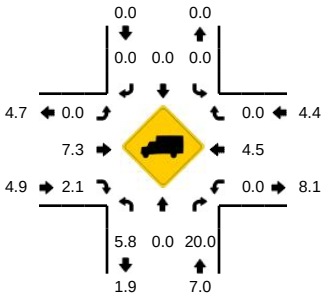
Report generated on 5/11/2010 11:22 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

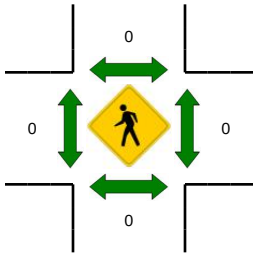
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

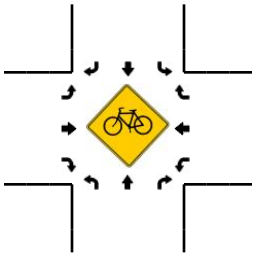
LOCATION: 232nd Ave -- 28th St | **QC JOB #:** 10502003
CITY/STATE: Camas, WA | **DATE:** 5/6/2010

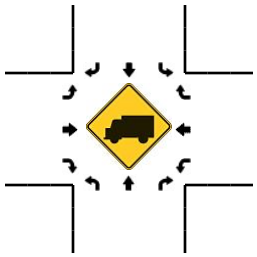


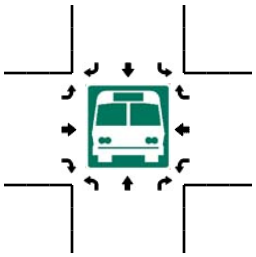
Peak-Hour: 7:05 AM -- 8:05 AM
Peak 15-Min: 7:40 AM -- 7:55 AM











5-Min Count Period Beginning At	232nd Ave (Northbound)				232nd Ave (Southbound)				28th St (Eastbound)				28th St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	4	0	0	0	0	0	1	0	0	8	5	0	0	8	0	0	26	
7:05 AM	5	0	1	0	0	0	0	0	0	4	3	0	1	16	0	0	30	
7:10 AM	2	0	3	0	1	0	0	0	0	8	6	0	0	15	0	0	35	
7:15 AM	9	0	0	0	1	0	0	0	0	4	9	0	0	15	0	0	38	
7:20 AM	7	0	0	0	0	0	0	0	0	4	2	0	1	22	0	0	36	
7:25 AM	6	0	0	0	0	0	0	0	0	5	2	0	3	20	0	0	36	
7:30 AM	2	0	0	0	0	0	1	0	0	5	4	0	0	19	0	0	31	
7:35 AM	3	0	0	0	0	0	0	0	0	4	1	0	0	16	0	0	24	
7:40 AM	4	0	0	0	0	0	0	0	0	1	4	0	0	21	0	0	30	
7:45 AM	6	0	0	0	0	0	0	0	0	5	7	0	0	22	0	0	40	
7:50 AM	1	0	0	0	0	0	0	0	0	5	8	0	0	28	0	0	42	
7:55 AM	4	0	1	0	0	0	0	0	0	3	2	0	0	8	0	0	18	386
8:00 AM	3	0	0	0	0	1	0	0	0	7	0	0	0	19	0	0	30	390
8:05 AM	2	0	0	0	0	1	1	0	0	4	0	0	2	14	0	0	24	384
8:10 AM	5	0	0	0	0	1	0	0	0	7	3	0	0	15	0	0	31	380
8:15 AM	2	0	0	0	0	0	2	0	0	7	1	0	0	12	0	0	24	366
8:20 AM	5	0	1	0	0	0	0	0	0	6	4	0	0	12	0	0	28	358
8:25 AM	1	0	0	0	0	0	1	0	0	6	3	0	0	18	0	0	29	351
8:30 AM	1	0	1	0	0	0	0	0	0	1	1	0	0	8	0	0	12	332
8:35 AM	4	0	1	0	0	0	1	0	0	1	3	0	0	20	0	0	30	338
8:40 AM	2	0	1	0	0	0	0	0	0	6	3	0	0	15	0	0	27	335
8:45 AM	4	0	0	0	0	0	1	0	0	8	2	0	1	11	0	0	27	322
8:50 AM	3	0	1	0	0	0	0	0	0	3	2	0	2	17	0	0	28	308
8:55 AM	2	1	0	0	0	0	2	0	0	5	3	0	0	10	0	0	23	313

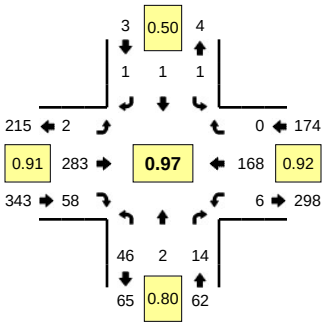
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	44	0	0	0	0	0	0	0	0	44	76	0	0	284	0	0	448
Heavy Trucks	4	0	0		0	0	0		0	0	0		0	16	0		20
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Comments:

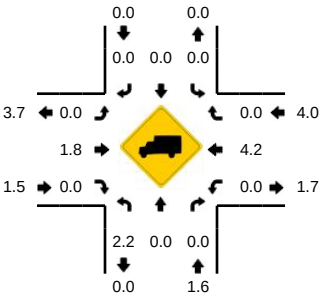
Report generated on 5/11/2010 11:22 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

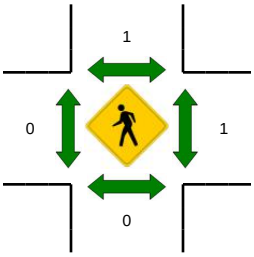
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

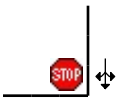
LOCATION: 232nd Ave -- 28th St | **QC JOB #:** 10502004
CITY/STATE: Camas, WA | **DATE:** 5/5/2010

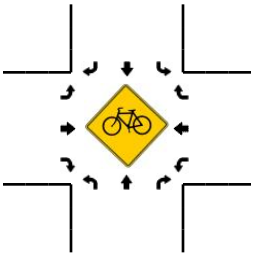


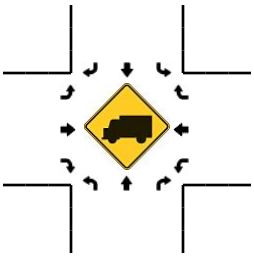
Peak-Hour: 4:40 PM -- 5:40 PM
Peak 15-Min: 4:55 PM -- 5:10 PM

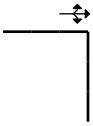


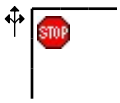


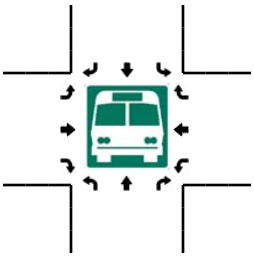












5-Min Count Period Beginning At	232nd Ave (Northbound)				232nd Ave (Southbound)				28th St (Eastbound)				28th St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	4	0	1	0	0	0	1	0	0	23	2	0	1	12	0	0	44	
4:05 PM	2	0	1	0	0	0	0	0	0	12	7	0	1	11	0	0	34	
4:10 PM	1	1	1	0	0	0	1	0	2	18	1	0	0	9	0	0	34	
4:15 PM	5	1	0	0	0	0	0	0	0	22	11	0	0	7	0	0	46	
4:20 PM	4	0	1	0	0	0	0	0	0	20	2	0	0	18	0	0	45	
4:25 PM	4	0	2	0	0	1	0	0	0	17	7	0	1	19	0	0	51	
4:30 PM	4	0	1	0	0	0	0	0	0	25	3	0	0	11	0	0	44	
4:35 PM	0	1	0	0	0	0	0	0	0	15	7	0	0	15	0	0	38	
4:40 PM	8	0	3	0	0	1	0	0	0	24	1	0	2	12	0	0	51	
4:45 PM	3	1	0	0	0	0	0	0	0	29	5	0	0	18	0	0	56	
4:50 PM	5	0	0	0	0	0	0	0	1	19	1	0	0	11	0	0	37	
4:55 PM	3	1	0	0	0	0	0	0	0	29	10	0	0	13	0	0	56	536
5:00 PM	6	0	0	0	0	0	0	0	0	22	6	0	0	22	0	0	56	548
5:05 PM	4	0	3	0	1	0	0	0	0	18	3	0	0	9	0	0	38	552
5:10 PM	2	0	2	0	0	0	0	0	0	34	2	0	0	16	0	0	56	574
5:15 PM	1	0	0	0	0	0	1	0	0	23	6	0	1	13	0	0	45	573
5:20 PM	4	0	1	0	0	0	0	0	0	18	7	0	0	14	0	0	44	572
5:25 PM	4	0	3	0	0	0	0	0	0	27	8	0	0	10	0	0	52	573
5:30 PM	3	0	1	0	0	0	0	0	0	20	8	0	0	15	0	0	47	576
5:35 PM	3	0	1	0	0	0	0	0	1	20	1	0	3	15	0	0	44	582
5:40 PM	3	0	0	0	0	0	0	0	0	23	2	0	0	14	0	0	42	573
5:45 PM	5	0	0	0	0	0	1	0	0	17	2	0	1	10	0	0	36	553
5:50 PM	3	0	0	0	0	0	0	0	0	22	7	0	2	6	0	0	40	556
5:55 PM	2	0	0	0	0	0	0	0	0	15	6	0	1	9	0	0	33	533

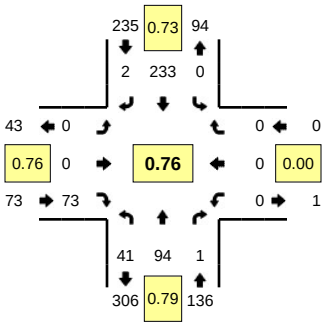
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	52	4	12	0	4	0	0	0	0	276	76	0	0	176	0	0	600
Heavy Trucks	4	0	0		0	0	0		0	0	0		0	4	0		8
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Comments:

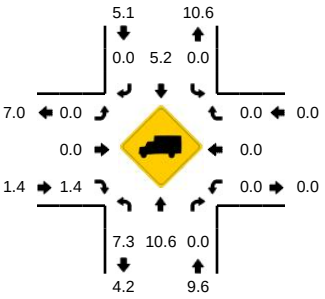
Report generated on 5/11/2010 11:22 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

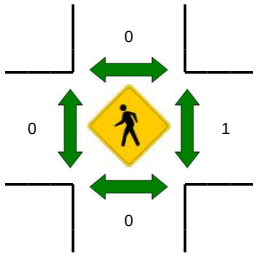
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

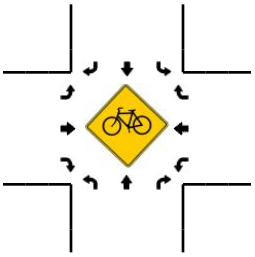
LOCATION: NE Everett St/SR-500 -- Leadbetter Rd | **QC JOB #:** 10502005
CITY/STATE: Camas, WA | **DATE:** 5/6/2010

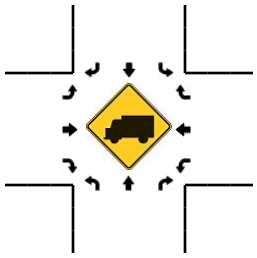


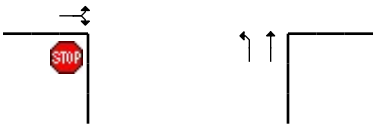
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:15 AM -- 7:30 AM

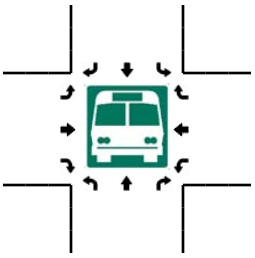












5-Min Count Period Beginning At	NE Everett St/SR-500 (Northbound)				NE Everett St/SR-500 (Southbound)				Leadbetter Rd (Eastbound)				Leadbetter Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	2	6	0	0	0	17	0	0	0	0	3	0	0	0	0	0	28	
7:05 AM	4	5	0	0	0	23	0	0	0	0	5	0	0	0	0	0	37	
7:10 AM	4	8	0	0	0	11	0	0	0	0	5	0	0	0	0	0	28	
7:15 AM	6	13	0	0	0	21	1	0	0	0	6	0	0	0	0	0	47	
7:20 AM	4	7	0	0	0	27	0	0	0	0	9	0	0	0	0	0	47	
7:25 AM	3	10	0	0	0	32	0	0	0	0	7	0	0	0	0	0	52	
7:30 AM	2	9	0	0	0	17	0	0	0	0	7	0	0	0	0	0	35	
7:35 AM	4	5	0	0	0	19	1	0	0	0	4	0	0	0	0	0	33	
7:40 AM	5	8	1	0	0	14	0	0	0	0	3	0	0	0	0	0	31	
7:45 AM	3	5	0	0	0	19	0	0	0	0	4	0	0	0	0	0	31	
7:50 AM	1	12	0	0	0	22	0	0	0	0	11	0	0	0	0	0	46	
7:55 AM	3	6	0	0	0	11	0	0	0	0	9	0	0	0	0	0	29	444
8:00 AM	2	2	0	0	0	12	1	0	0	0	2	0	0	0	0	0	19	435
8:05 AM	2	9	0	0	0	12	0	0	1	0	3	0	0	0	0	0	27	425
8:10 AM	3	4	0	0	0	14	0	0	0	0	3	0	0	0	0	0	24	421
8:15 AM	5	5	0	0	0	18	0	0	0	0	5	0	0	0	0	0	33	407
8:20 AM	1	4	0	0	0	15	0	0	0	0	0	0	0	0	0	0	20	380
8:25 AM	1	10	0	0	0	15	0	0	0	0	4	0	0	0	0	0	30	358
8:30 AM	4	11	0	1	0	18	0	0	0	0	4	0	0	0	0	0	38	361
8:35 AM	2	7	0	0	0	17	0	0	2	0	0	0	0	0	0	0	28	356
8:40 AM	2	7	0	0	0	8	2	0	2	0	1	0	0	0	0	0	22	347
8:45 AM	1	8	0	0	0	15	1	0	2	0	3	0	0	0	0	0	30	346
8:50 AM	3	9	0	0	0	15	0	0	0	0	7	0	0	0	0	0	34	334
8:55 AM	3	10	0	0	0	22	0	0	0	0	2	0	0	0	0	0	37	342

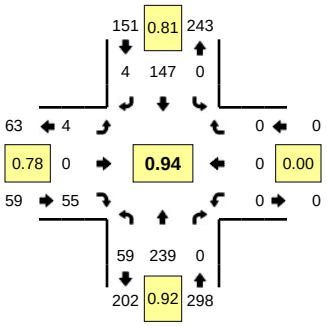
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	52	120	0	0	0	320	4	0	0	0	88	0	0	0	0	0	584
Heavy Trucks	4	8	0		0	4	0		0	0	0		0	0	0		16
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Comments:

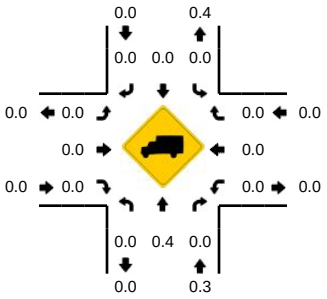
Report generated on 5/11/2010 11:22 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

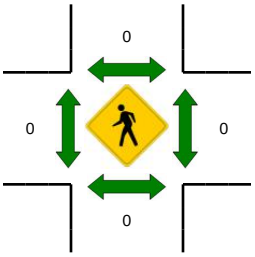
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

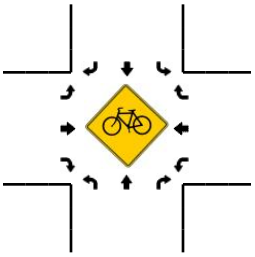
LOCATION: NE Everett St/SR-500 -- Leadbetter Rd | **QC JOB #:** 10502006
CITY/STATE: Camas, WA | **DATE:** 5/5/2010

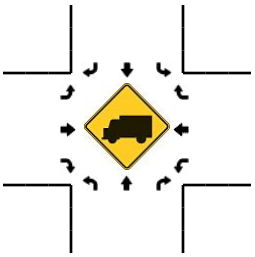


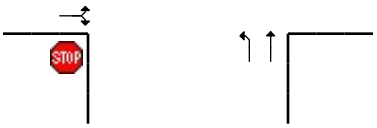
Peak-Hour: 4:05 PM -- 5:05 PM
Peak 15-Min: 4:10 PM -- 4:25 PM

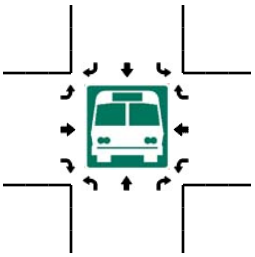












5-Min Count Period Beginning At	NE Everett St/SR-500 (Northbound)				NE Everett St/SR-500 (Southbound)				Leadbetter Rd (Eastbound)				Leadbetter Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	4	16	0	0	0	16	0	0	0	0	2	0	0	0	0	0	38	
4:05 PM	5	19	0	0	0	14	1	0	0	0	3	0	0	0	0	0	42	
4:10 PM	3	26	0	0	0	14	1	0	1	0	8	0	0	0	0	0	53	
4:15 PM	6	13	0	0	0	15	1	0	0	0	1	0	0	0	0	0	36	
4:20 PM	5	16	0	0	0	16	0	0	1	0	8	0	0	0	0	0	46	
4:25 PM	4	20	0	0	0	8	1	0	0	0	5	0	0	0	0	0	38	
4:30 PM	2	19	0	0	0	15	0	0	0	0	5	0	0	0	0	0	41	
4:35 PM	11	21	0	0	0	13	0	0	1	0	5	0	0	0	0	0	51	
4:40 PM	2	22	0	0	0	6	0	0	1	0	6	0	0	0	0	0	37	
4:45 PM	5	20	0	0	0	11	0	0	0	0	3	0	0	0	0	0	39	
4:50 PM	3	22	0	0	0	12	0	0	0	0	3	0	0	0	0	0	40	
4:55 PM	5	22	0	0	0	9	0	0	0	0	1	0	0	0	0	0	37	498
5:00 PM	8	19	0	0	0	14	0	0	0	0	7	0	0	0	0	0	48	508
5:05 PM	4	18	0	0	0	10	0	0	0	0	3	0	0	0	0	0	35	501
5:10 PM	3	22	0	0	0	14	0	0	0	0	4	0	0	0	0	0	43	491
5:15 PM	4	15	0	0	0	16	0	0	0	0	1	0	0	0	0	0	36	491
5:20 PM	5	19	0	0	0	7	0	0	0	0	6	0	0	0	0	0	37	482
5:25 PM	6	18	0	0	0	9	0	0	0	0	6	0	0	0	0	0	39	483
5:30 PM	5	11	0	0	0	5	0	0	0	0	9	0	0	0	0	0	30	472
5:35 PM	4	16	0	0	0	8	0	0	0	0	4	0	0	0	0	0	32	453
5:40 PM	6	19	0	0	0	12	0	0	0	0	2	0	0	0	0	0	39	455
5:45 PM	6	15	0	0	0	11	0	0	0	0	2	0	0	0	0	0	34	450
5:50 PM	1	16	0	0	0	15	0	0	0	0	8	0	0	0	0	0	40	450
5:55 PM	4	13	0	0	0	6	0	0	0	0	3	0	0	0	0	0	26	439

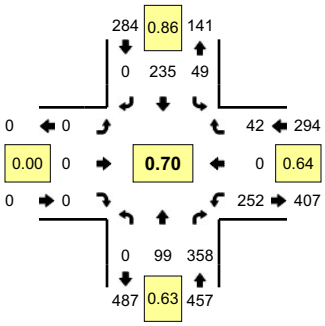
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	56	220	0	0	0	180	8	0	8	0	68	0	0	0	0	0	540
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Comments:

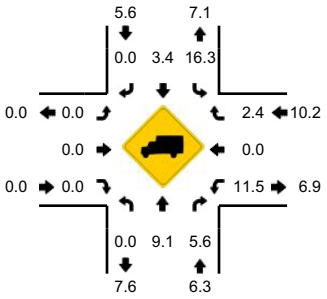
Report generated on 5/11/2010 11:22 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

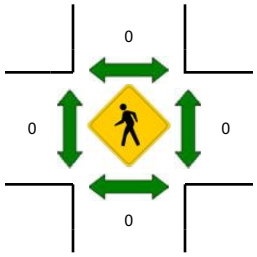
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

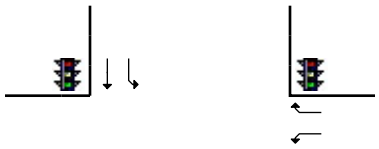
LOCATION: SR 500/NE Everett St -- NE 43rd Ave/SE 15th St | **QC JOB #:** 10475503
CITY/STATE: Camas, WA | **DATE:** 1/22/2010

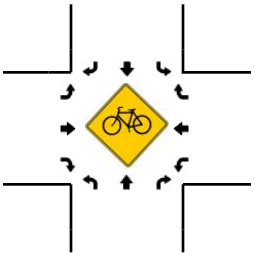


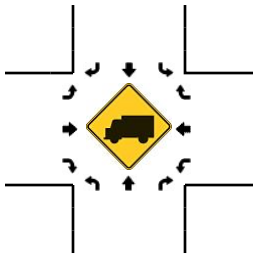
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:40 AM -- 7:55 AM

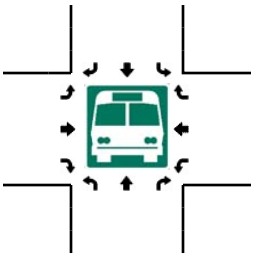












5-Min Count Period Beginning At	SR 500/NE Everett St (Northbound)				SR 500/NE Everett St (Southbound)				NE 43rd Ave/SE 15th St (Eastbound)				NE 43rd Ave/SE 15th St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	5	22	0	5	12	0	0	0	0	0	0	8	0	1	0	53	
7:05 AM	0	6	30	0	10	15	0	0	0	0	0	0	8	0	1	0	70	
7:10 AM	0	6	32	0	6	19	0	0	0	0	0	0	23	0	0	0	86	
7:15 AM	0	6	10	0	2	19	0	0	0	0	0	0	31	0	3	0	71	
7:20 AM	0	7	10	0	1	29	0	0	0	0	0	0	20	0	2	0	69	
7:25 AM	0	6	16	0	0	18	0	0	0	0	0	0	11	0	1	0	52	
7:30 AM	0	12	19	0	2	31	0	0	0	0	0	0	10	0	6	0	80	
7:35 AM	0	10	41	0	5	19	0	0	0	0	0	0	14	0	2	0	91	
7:40 AM	0	7	66	0	3	23	0	0	0	0	0	0	27	0	6	0	132	
7:45 AM	0	14	43	0	4	19	0	0	0	0	0	0	30	0	7	0	117	
7:50 AM	0	9	39	0	5	18	0	0	0	0	0	0	42	0	7	0	120	
7:55 AM	0	11	30	0	6	13	0	0	0	0	0	0	28	0	6	0	94	1035
8:00 AM	0	10	7	0	0	9	0	0	0	0	0	0	18	0	3	0	47	1029
8:05 AM	0	6	5	0	0	17	0	0	0	0	0	0	4	0	1	0	33	992
8:10 AM	0	7	6	0	0	18	0	0	0	0	0	0	3	0	0	0	34	940
8:15 AM	0	2	5	0	0	21	0	0	0	0	0	0	3	0	2	0	33	902
8:20 AM	0	7	6	0	0	21	0	0	0	0	0	0	8	0	0	0	42	875
8:25 AM	0	6	8	0	1	20	0	0	0	0	0	0	9	0	0	0	44	867
8:30 AM	0	4	7	0	0	16	0	0	0	0	0	0	11	0	2	0	40	827
8:35 AM	0	7	12	0	2	11	0	0	0	0	0	0	13	0	1	0	46	782
8:40 AM	0	5	5	0	0	15	0	0	0	0	0	0	11	0	0	0	36	686
8:45 AM	0	7	12	0	1	17	0	0	0	0	0	0	11	0	2	0	50	619
8:50 AM	0	11	6	0	0	30	0	0	0	0	0	0	13	0	3	0	63	562
8:55 AM	0	16	8	0	2	20	0	0	0	0	0	0	9	0	0	0	55	523

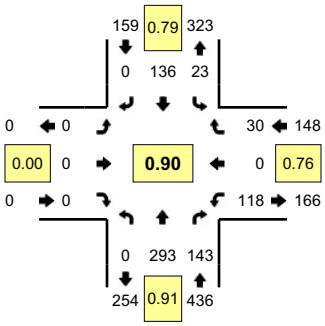
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	120	592	0	48	240	0	0	0	0	0	0	396	0	80	0	1476
Heavy Trucks	0	16	0		0	8	0		0	0	0		0	0	0		24
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Comments:

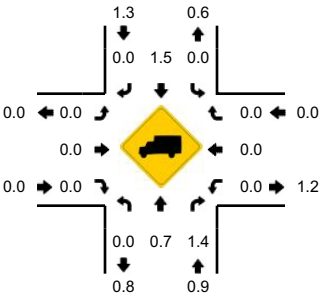
Report generated on 1/26/2010 4:38 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

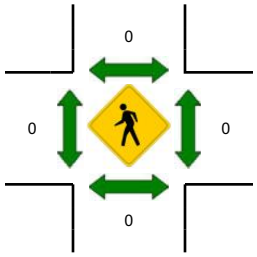
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

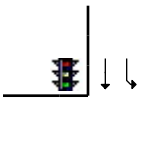
LOCATION: SR 500/NE Everett St -- NE 43rd Ave/ SE 15th St | **QC JOB #:** 10475504
CITY/STATE: Camas, WA | **DATE:** 1/20/2010

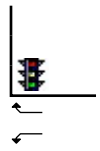


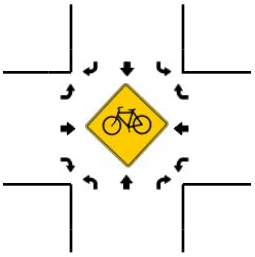
Peak-Hour: 4:20 PM -- 5:20 PM
Peak 15-Min: 4:35 PM -- 4:50 PM

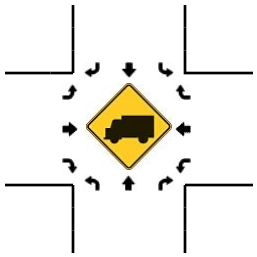


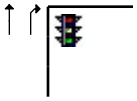


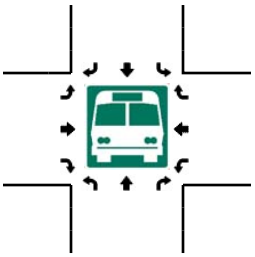












5-Min Count Period Beginning At	SR 500/NE Everett St (Northbound)				SR 500/NE Everett St (Southbound)				NE 43rd Ave/ SE 15th St (Eastbound)				NE 43rd Ave/ SE 15th St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	15	10	0	1	18	0	0	0	0	0	0	10	0	2	0	56	
4:05 PM	0	18	16	0	1	16	0	0	0	0	0	0	9	0	4	0	64	
4:10 PM	0	19	11	0	0	10	0	0	0	0	0	0	9	0	3	0	52	
4:15 PM	0	20	10	0	0	17	0	0	0	0	0	0	3	0	0	0	50	
4:20 PM	0	19	7	0	5	23	0	0	0	0	0	0	7	0	3	0	64	
4:25 PM	0	21	13	0	1	11	0	0	0	0	0	0	13	0	4	0	63	
4:30 PM	0	21	12	0	2	11	0	0	0	0	0	0	14	0	1	0	61	
4:35 PM	0	29	14	0	1	17	0	0	0	0	0	0	14	0	3	0	78	
4:40 PM	0	24	16	0	3	12	0	0	0	0	0	0	9	0	1	0	65	
4:45 PM	0	22	12	0	6	8	0	0	0	0	0	0	9	0	7	0	64	
4:50 PM	0	30	12	0	1	10	0	0	0	0	0	0	8	0	7	0	68	
4:55 PM	0	25	7	0	0	7	0	0	0	0	0	0	4	0	3	0	46	731
5:00 PM	0	17	15	0	2	8	0	0	0	0	0	0	7	0	0	0	49	724
5:05 PM	0	30	12	0	0	10	0	0	0	0	0	0	10	0	1	0	63	723
5:10 PM	0	27	10	0	1	9	0	0	0	0	0	0	13	0	0	0	60	731
5:15 PM	0	28	13	0	1	10	0	0	0	0	0	0	10	0	0	0	62	743
5:20 PM	0	23	5	0	0	9	0	0	0	0	0	0	7	0	0	0	44	723
5:25 PM	0	19	5	0	3	5	0	0	0	0	0	0	5	0	1	0	38	698
5:30 PM	0	27	9	0	0	15	0	0	0	0	0	0	6	0	2	0	59	696
5:35 PM	0	22	6	0	0	17	0	0	0	0	0	0	4	0	0	0	49	667
5:40 PM	0	21	3	0	3	12	0	0	0	0	0	0	9	0	1	0	49	651
5:45 PM	0	20	7	0	2	10	0	0	0	0	0	0	6	0	5	0	50	637
5:50 PM	0	21	12	0	1	10	0	0	0	0	0	0	7	0	2	0	53	622
5:55 PM	0	13	11	0	2	18	0	0	0	0	0	0	8	0	1	0	53	629

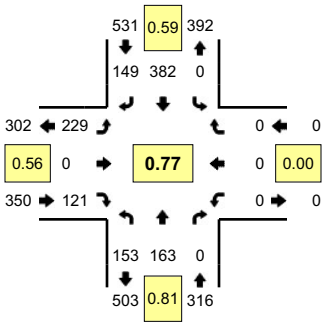
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	300	168	0	40	148	0	0	0	0	0	0	128	0	44	0	828
Heavy Trucks	0	0	0		0	8	0		0	0	0		0	0	0		8
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Comments:

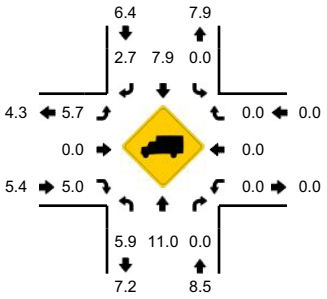
Report generated on 1/26/2010 4:38 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

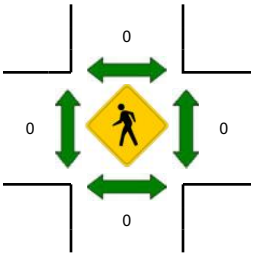
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

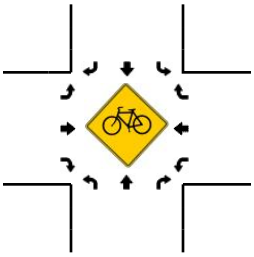
LOCATION: SR 500/NE Everett St -- NE Lake Rd | **QC JOB #:** 10475505
CITY/STATE: Camas, WA | **DATE:** 1/20/2010

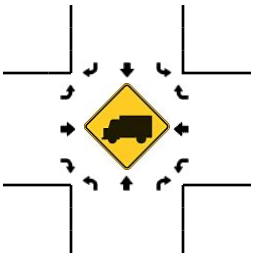


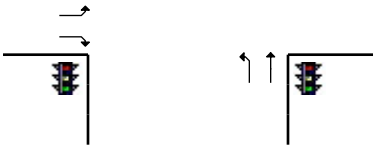
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:10 AM -- 7:25 AM

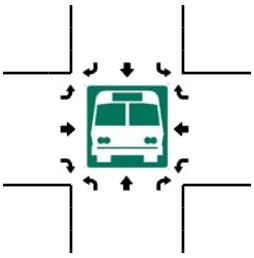












5-Min Count Period Beginning At	SR 500/NE Everett St (Northbound)				SR 500/NE Everett St (Southbound)				NE Lake Rd (Eastbound)				NE Lake Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	6	15	0	0	0	16	4	0	35	0	4	0	0	0	0	0	80	
7:05 AM	8	25	0	0	0	19	7	0	47	0	4	0	0	0	0	0	110	
7:10 AM	11	23	0	0	0	28	5	0	57	0	4	0	0	0	0	0	128	
7:15 AM	10	17	0	0	0	45	21	0	34	0	10	0	0	0	0	0	137	
7:20 AM	8	4	0	0	0	57	29	0	15	0	12	0	0	0	0	0	125	
7:25 AM	12	10	0	0	0	52	22	0	5	0	5	0	0	0	0	0	106	
7:30 AM	9	14	0	0	0	42	21	0	7	0	21	0	0	0	0	0	114	
7:35 AM	17	10	0	0	0	24	9	0	4	0	16	0	0	0	0	0	80	
7:40 AM	21	13	0	0	0	15	7	0	8	0	11	0	0	0	0	0	75	
7:45 AM	23	13	0	0	0	35	8	0	6	0	14	0	0	0	0	0	99	
7:50 AM	11	7	0	0	0	25	9	0	7	0	12	0	0	0	0	0	71	
7:55 AM	17	12	0	0	0	24	7	0	4	0	8	0	0	0	0	0	72	1197
8:00 AM	10	11	0	0	0	13	6	0	2	0	9	0	0	0	0	0	51	1168
8:05 AM	17	6	0	0	0	17	4	0	0	0	6	0	0	0	0	0	50	1108
8:10 AM	14	7	0	0	0	22	7	0	0	0	4	0	0	0	0	0	54	1034
8:15 AM	11	11	0	0	0	22	6	0	3	0	10	0	0	0	0	0	63	960
8:20 AM	12	9	0	0	0	21	7	0	4	0	4	0	0	0	0	0	57	892
8:25 AM	10	7	0	0	0	15	5	0	3	0	6	0	0	0	0	0	46	832
8:30 AM	12	6	0	0	0	22	3	0	6	0	10	0	0	0	0	0	59	777
8:35 AM	11	17	0	0	0	25	19	0	6	0	10	0	0	0	0	0	88	785
8:40 AM	6	11	0	0	0	20	8	0	5	0	14	0	0	0	0	0	64	774
8:45 AM	17	19	0	0	0	26	6	0	6	0	20	0	0	0	0	0	94	769
8:50 AM	16	13	0	0	0	33	12	0	1	0	16	0	0	0	0	0	91	789
8:55 AM	9	10	0	0	0	19	7	0	5	0	26	0	0	0	0	0	76	793

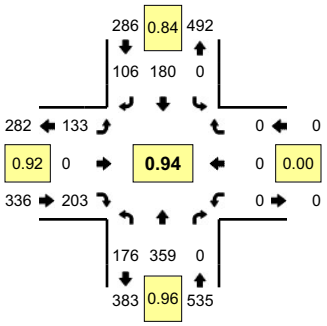
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	116	176	0	0	0	520	220	0	424	0	104	0	0	0	0	0	1560
Heavy Trucks	8	28	0		0	96	12		20	0	8		0	0	0		172
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Comments:

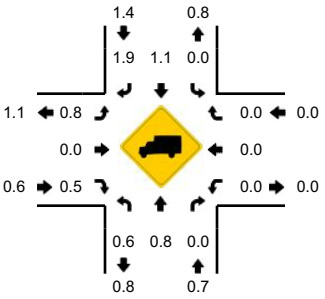
Report generated on 1/26/2010 4:38 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

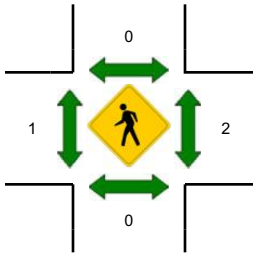
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

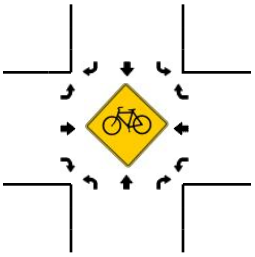
LOCATION: SR 500/NE Everett St -- NE Lake Rd | **QC JOB #:** 10475506
CITY/STATE: Camas, WA | **DATE:** 1/20/2010

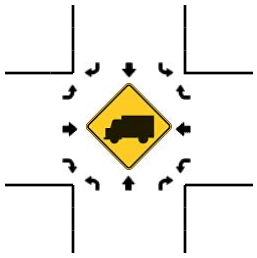


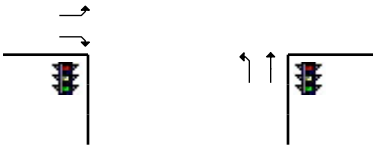
Peak-Hour: 4:20 PM -- 5:20 PM
Peak 15-Min: 4:35 PM -- 4:50 PM

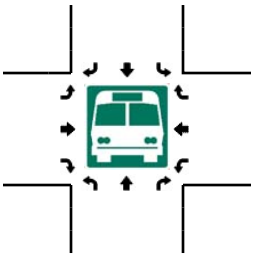












5-Min Count Period Beginning At	SR 500/NE Everett St (Northbound)				SR 500/NE Everett St (Southbound)				NE Lake Rd (Eastbound)				NE Lake Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	10	22	0	0	0	22	13	0	10	0	14	0	0	0	0	0	91	
4:05 PM	21	27	0	0	0	16	11	0	13	0	19	0	0	0	0	0	107	
4:10 PM	6	30	0	0	0	11	11	0	10	0	17	0	0	0	0	0	85	
4:15 PM	16	20	0	0	0	16	3	0	7	0	23	0	0	0	0	0	85	
4:20 PM	11	26	0	0	0	26	5	0	8	0	20	0	0	0	0	0	96	
4:25 PM	14	36	0	0	0	16	9	0	11	0	18	0	0	0	0	0	104	
4:30 PM	8	18	0	0	0	17	11	0	19	0	16	0	0	0	0	0	89	
4:35 PM	14	39	0	0	0	27	10	0	8	0	14	0	0	0	0	0	112	
4:40 PM	22	23	0	0	0	10	9	0	15	0	17	0	0	0	0	0	96	
4:45 PM	14	31	0	0	0	14	13	0	11	0	16	0	0	0	0	0	99	
4:50 PM	18	28	0	0	0	13	8	0	9	0	18	0	0	0	0	0	94	
4:55 PM	18	35	0	0	0	9	3	0	7	0	19	0	0	0	0	0	91	1149
5:00 PM	10	28	0	0	0	9	6	0	8	0	16	0	0	0	0	0	77	1135
5:05 PM	16	30	0	0	0	14	8	0	15	0	16	0	0	0	0	0	99	1127
5:10 PM	21	38	0	0	0	13	15	0	9	0	17	0	0	0	0	0	113	1155
5:15 PM	10	27	0	0	0	12	9	0	13	0	16	0	0	0	0	0	87	1157
5:20 PM	19	27	0	0	0	19	4	0	7	0	18	0	0	0	0	0	94	1155
5:25 PM	22	17	0	0	0	8	6	0	13	0	18	0	0	0	0	0	84	1135
5:30 PM	16	30	0	0	0	18	6	0	7	0	18	0	0	0	0	0	95	1141
5:35 PM	20	31	0	0	0	18	5	0	3	0	17	0	0	0	0	0	94	1123
5:40 PM	9	24	0	0	0	18	9	0	12	0	23	0	0	0	0	0	95	1122
5:45 PM	13	26	0	0	0	15	6	0	7	0	13	0	0	0	0	0	80	1103
5:50 PM	17	19	0	0	0	8	7	0	15	0	10	0	0	0	0	0	76	1085
5:55 PM	3	14	0	0	0	23	12	0	11	0	19	0	0	0	0	0	82	1076

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	200	372	0	0	0	204	128	0	136	0	188	0	0	0	0	0	1228
Heavy Trucks	4	0	0		0	4	4		0	0	0		0	0	0		12
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Comments:

Report generated on 1/26/2010 4:38 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Single Page Summary Page 1 of 1

LOCATION: Leadbetter Road 213' West of Boat Launch Dwy
SPECIFIC LOCATION: 10 ft from
CITY/STATE: Camas, WA

QC JOB #: 10502402
DIRECTION: EB/WB
DATE: May 05 2010

VOLUME DATA (EB/WB)

Start Time	EB Morning	EB Evening	Hourly Totals Morning	Hourly Totals Evening	WB Morning	WB Evening	Hourly Totals Morning	Hourly Totals Evening	Combined Totals Morning	Combined Totals Evening
12:00	0	8			0	3				
12:15	0	9			0	11				
12:30	0	5			0	8				
12:45	0	8	0	30	0	8	0	30	0	60
01:00	0	4			1	12				
01:15	1	10			0	7				
01:30	2	12			1	4				
01:45	0	18	3	44	0	7	2	30	5	74
02:00	0	8			0	15				
02:15	0	12			0	14				
02:30	0	9			0	13				
02:45	0	7	0	36	0	20	0	62	0	98
03:00	0	10			0	18				103
03:15	1	15			0	15				107
03:30	0	12			0	16				113
03:45	0	11	1	48	0	22	0	71	1	119
04:00	0	11			0	14				116
04:15	1	14			0	15				115
04:30	1	19			1	20				126
04:45	1	8	3	52	0	15	1	64	4	116
05:00	2	13		54	0	15		65		119 ← PM
05:15	1	14			4	11				115
05:30	2	15			1	13				104
05:45	0	13	5	55	1	12	6	51	11	106
06:00	8	11			2	17				
06:15	9	9			3	13				
06:30	12	4			5	9				
06:45	22	8	51	32	7	7	17	46	68	78
07:00	13	4			8	6				
07:15	22	7			16	6			105	
07:30	14	7			8	6			110 AM	
07:45	23	8	72	26	10	10	42	28	114 ←	54
08:00	9	2			7	18			109	
08:15	9	5			8	9			88	
08:30	10	5			6	9				
08:45	15	4	43	16	8	7	29	43	72	59
09:00	4	3			9	9				
09:15	5	3			6	5				
09:30	6	1			4	5				
09:45	3	2	18	9	5	1	24	20	42	29
10:00	11	2			7	1				
10:15	10	4			4	1				
10:30	6	0			13	1				
10:45	10	2	37	8	7	1	31	4	68	12
11:00	6	0			3	3				
11:15	5	0			4	0				
11:30	10	1			9	2				
11:45	13	2	34	3	5	0	21	5	55	8
Day Total	267	359	626		173	454	627		440	813
Percent	42.7%	57.3%			27.6%	72.4%			35.1%	64.9%

PM PEAK

AM PEAK

Quality Counts
TRANSPORTATION DATA COLLECTION

EB Totals		WB Totals		Combined Totals	
PEAK HOUR (7-9 AM):	72	PEAK HOUR (7-9 AM):	42	PEAK HOUR (7-9 AM):	114
PEAK HOUR (4-6 PM):	55	PEAK HOUR (4-6 PM):	64	PEAK HOUR (4-6 PM):	116
PEAK HOUR (AM):	7:00 AM	PEAK HOUR (AM):	7:00 AM	PEAK HOUR (AM):	7:00 AM
PEAK HOUR (PM):	5:00 PM	PEAK HOUR (PM):	3:00 PM	PEAK HOUR (PM):	3:00 PM

Report generated on 5/11/2010 11:41 AM SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

LOCATION: Leadbetter Road 213' West of Boat Launch Dwy **QC JOB #:** 10502402
SPECIFIC LOCATION: 10 ft from **DIRECTION:** EB/WB
CITY/STATE: Camas, WA **DATE:** May 05 2010

FHWA VEHICLE CLASSIFICATION DATA (EB/WB)

Start Time	1	2	3	4	5	6	7	8	9	10	11	12	13	None
12:00 AM	0	0	0	0	0	0	**0**	0	**0**	**0**	**0**	**0**	**0**	0
1:00 AM	0	5	0	0	0	0	0	0	0	0	0	0	0	0
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	0
4:00 AM	**1**	3	0	0	0	0	0	0	0	0	0	0	0	0
5:00 AM	0	3	7	0	1	0	0	0	0	0	0	0	0	0
6:00 AM	1	50	11	1	5	0	0	0	0	0	0	0	0	0
7:00 AM	0	**76**	**27**	1	7	**2**	0	0	0	0	0	0	0	**1**
8:00 AM	0	54	13	**2**	1	2	0	0	0	0	0	0	0	0
9:00 AM	0	24	13	0	4	1	0	0	0	0	0	0	0	0
10:00 AM	0	47	16	0	3	2	0	0	0	0	0	0	0	0
11:00 AM	0	33	10	0	**9**	1	0	**1**	0	0	0	0	0	1
12:00 PM	0	41	17	0	1	0	**0**	1	**0**	**0**	**0**	**0**	**0**	0
1:00 PM	0	53	19	0	1	**1**	0	0	0	0	0	0	0	0
2:00 PM	0	64	22	**2**	**7**	1	0	0	0	0	0	0	0	**2**
3:00 PM	0	76	**38**	1	4	0	0	0	0	0	0	0	0	0
4:00 PM	0	**83**	26	0	5	0	0	**2**	0	0	0	0	0	0
5:00 PM	**2**	77	22	0	4	0	0	0	0	0	0	0	0	1
6:00 PM	0	57	17	0	3	0	0	1	0	0	0	0	0	0
7:00 PM	0	35	15	0	2	0	0	1	0	0	0	0	0	1
8:00 PM	0	42	16	0	1	0	0	0	0	0	0	0	0	0
9:00 PM	0	20	7	0	2	0	0	0	0	0	0	0	0	0
10:00 PM	0	9	2	0	1	0	0	0	0	0	0	0	0	0
11:00 PM	0	4	3	0	1	0	0	0	0	0	0	0	0	0
Day Total	4	857	301	7	62	10	0	6	0	0	0	0	0	6
Percent	0.3%	68.4%	24.0%	0.6%	4.9%	0.8%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%

SPEED DATA (EB/WB)

Start Time	1-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70	71-75	76-999
12:00 AM	0	**0**	0	0	0	0	0	0	0	0	0	**0**	**0**	**0**
1:00 AM	0	0	0	0	0	1	2	2	0	0	0	0	0	0
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0
4:00 AM	0	0	0	0	0	2	0	1	1	0	0	0	0	0
5:00 AM	0	0	0	0	0	3	1	3	3	1	0	0	0	0
6:00 AM	0	0	0	0	1	7	28	22	10	0	0	0	0	0
7:00 AM	**1**	0	0	1	1	6	**36**	**45**	**21**	2	**1**	0	0	0
8:00 AM	0	0	0	1	4	8	30	22	4	**3**	0	0	0	0
9:00 AM	0	0	**1**	1	1	12	11	9	5	2	0	0	0	0
10:00 AM	0	0	1	2	**5**	**18**	22	12	6	2	0	0	0	0
11:00 AM	1	0	0	**3**	4	10	22	11	3	1	0	0	0	0
12:00 PM	0	0	**0**	0	3	11	27	13	6	0	0	**0**	**0**	**0**
1:00 PM	0	0	0	1	**6**	**18**	23	22	4	0	0	0	0	
2:00 PM	**2**	0	0	1	3	14	35	29	6	**8**	0	0	0	
3:00 PM	0	0	0	0	3	16	37	**44**	17	1	1	0	0	
4:00 PM	0	0	0	2	5	12	38	39	**18**	2	0	0	0	
5:00 PM	1	0	0	0	1	8	**41**	42	10	2	1	0	0	
6:00 PM	0	0	0	2	4	10	23	28	8	1	**2**	0	0	
7:00 PM	1	**1**	0	**3**	1	11	16	15	4	2	0	0	0	
8:00 PM	0	0	0	3	1	11	32	12	0	0	0	0	0	
9:00 PM	0	0	0	0	2	11	8	7	0	1	0	0	0	
10:00 PM	0	0	0	0	0	1	5	4	2	0	0	0	0	
11:00 PM	0	0	0	0	1	0	3	2	2	0	0	0	0	
Day Total	6	1	2	20	46	190	440	385	130	28	5	0	0	0
Percent	0.5%	0.1%	0.2%	1.6%	3.7%	15.2%	35.1%	30.7%	10.4%	2.2%	0.4%	0.0%	0.0%	0.0%

VOLUME DATA (EB/WB)

Start Time	EB	WB	Total
12:00 AM	0	0	0
1:00 AM	3	2	5
2:00 AM	0	0	0
3:00 AM	1	0	1
4:00 AM	3	1	4
5:00 AM	5	6	11
6:00 AM	51	17	68
7:00 AM	**72**	**42**	**114**
8:00 AM	43	29	72
9:00 AM	18	24	42
10:00 AM	37	31	68
11:00 AM	34	21	55
12:00 PM	30	30	60
1:00 PM	44	30	74
2:00 PM	36	62	98
3:00 PM	48	**71**	**119**
4:00 PM	52	64	116
5:00 PM	**55**	51	106
6:00 PM	32	46	78
7:00 PM	26	28	54
8:00 PM	16	43	59
9:00 PM	9	20	29
10:00 PM	8	4	12
11:00 PM	3	5	8
Day Total	626	627	1253
Percent	50.0%	50.0%	

PEAK HOUR (AM): 7:00 AM
PEAK HOUR (PM): 3:00 PM

AVERAGE SPEED: 43 MPH
MODAL SPEED: 43 MPH
MEDIAN SPEED: 44 MPH
85th PERCENTILE: 49 MPH
POSTED SPEED: 0 MPH

TOTAL TRUCKS: 85 (6.8%)
(Class 4 thru 13)

Quality Counts TRANSPORTATION DATA COLLECTION

Type of report: Tube Count - Single Page Summary

LOCATION: Leadbetter Road 783' NW of NE Adams St
SPECIFIC LOCATION: 0 ft from
CITY/STATE: Camas,, WA

QC JOB #: 10502401
DIRECTION: EB/WB
DATE: May 12 2010

VOLUME DATA (EB/WB)

Start Time	EB Morning	EB Evening	Hourly Totals Morning	Hourly Totals Evening	WB Morning	WB Evening	Hourly Totals Morning	Hourly Totals Evening	Combined Totals Morning	Combined Totals Evening
12:00	2	9			0	10				
12:15	0	8			0	5				
12:30	1	4			1	11				
12:45	1	12	4	33	0	10	1	36	5	69
01:00	3	5			0	4				
01:15	0	6			0	8				
01:30	0	5			0	9				
01:45	2	9	5	25	0	9	0	30	5	55
02:00	1	15			1	12				
02:15	0	11			0	25				
02:30	1	10			0	17				
02:45	0	21	2	57	0	16	1	70	3	127
03:00	1	8			0	19				
03:15	0	19			0	15				125
03:30	0	22			0	32				152
03:45	0	8	1	57	0	29	0	95	1	152
04:00	1	14			0	19				158
04:15	0	14			1	16				154
04:30	0	27			1	14				141
04:45	0	16	1	71	0	21	2	70	3	141
05:00	2	15			0	17				140
05:15	2	20		(78)	1	25	PM PHF=0.95	(77)		155 ←
05:30	0	16			1	15				145
05:45	0	17	4	68	1	16	3	73	7	141
06:00	4	11			1	14				134
06:15	7	17			7	17				123
06:30	9	17			6	6				
06:45	19	12	39	57	9	8	23	45	62	102
07:00	11	9			12	10				
07:15	22	13	AM PHF=0.87		12	18			100	
07:30	17	13			20	10			122	
07:45	24	7	(74)	42	14	10	(58)	48	132 ← AM	90
08:00	14	5			8	11			131	
08:15	14	12			13	8			124	
08:30	7	3			10	7				
08:45	10	5	45	25	6	13	37	39	82	64
09:00	9	5			8	3				
09:15	8	3			7	2				
09:30	7	4			9	4				
09:45	2	4	26	16	12	2	36	11	62	27
10:00	6	4			5	7				
10:15	11	0			5	4				
10:30	4	1			8	1				
10:45	7	1	28	6	7	4	25	16	53	22
11:00	5	2			4	1				
11:15	5	1			8	2				
11:30	7	4			8	0				
11:45	15	1	32	8	9	4	29	7	61	15
Day Total	261	465	726		215	540	755		476	1005
Percent	36.0%	64.0%			28.5%	71.5%			32.1%	67.9%

PM PEAK

AM PEAK

Quality Counts TRANSPORTATION DATA COLLECTION

EB Totals		WB Totals		Combined Totals	
PEAK HOUR (7-9 AM):	74	PEAK HOUR (7-9 AM):	58	PEAK HOUR (7-9 AM):	132
PEAK HOUR (4-6 PM):	71	PEAK HOUR (4-6 PM):	73	PEAK HOUR (4-6 PM):	141
PEAK HOUR (AM):	7:00 AM	PEAK HOUR (AM):	7:00 AM	PEAK HOUR (AM):	7:00 AM
PEAK HOUR (PM):	4:00 PM	PEAK HOUR (PM):	3:00 PM	PEAK HOUR (PM):	3:00 PM

Report generated on 5/14/2010 3:31 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

LOCATION: Leadbetter Road 783' NW of NE Adams St **QC JOB #:** 10502401
SPECIFIC LOCATION: 0 ft from **DIRECTION:** EB/WB
CITY/STATE: Camas,, WA **DATE:** May 12 2010

FHWA VEHICLE CLASSIFICATION DATA (EB/WB)

Start Time	1	2	3	4	5	6	7	8	9	10	11	12	13	None
12:00 AM	0	5	0	0	0	0	**0**	0	**0**	**0**	**0**	**0**	**0**	0
1:00 AM	0	5	0	0	0	0	0	0	0	0	0	0	0	0
2:00 AM	0	3	0	0	0	0	0	0	0	0	0	0	0	0
3:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	0
4:00 AM	0	2	1	0	0	0	0	0	0	0	0	0	0	0
5:00 AM	**2**	2	1	0	2	0	0	0	0	0	0	0	0	0
6:00 AM	1	45	10	**1**	3	0	0	**2**	0	0	0	0	0	0
7:00 AM	1	**91**	**30**	0	**8**	**1**	0	0	0	0	0	0	0	1
8:00 AM	1	57	19	1	2	1	0	1	0	0	0	0	0	0
9:00 AM	2	37	18	0	3	0	0	0	0	0	0	0	0	**2**
10:00 AM	2	41	8	0	0	0	0	1	0	0	0	0	0	1
11:00 AM	0	40	15	0	4	0	0	1	0	0	0	0	0	1
12:00 PM	3	37	19	0	3	**1**	**0**	4	**0**	**0**	**0**	**0**	**0**	2
1:00 PM	5	29	17	0	2	0	0	0	0	0	0	0	0	2
2:00 PM	6	86	26	**1**	3	0	0	2	0	0	0	0	0	**3**
3:00 PM	10	92	**40**	1	**7**	0	0	1	0	0	0	0	0	1
4:00 PM	8	**98**	25	0	3	0	0	**6**	0	0	0	0	0	1
5:00 PM	**14**	96	25	0	3	0	0	2	0	0	0	0	0	1
6:00 PM	14	70	16	0	2	0	0	0	0	0	0	0	0	0
7:00 PM	11	65	14	0	2	0	0	0	0	0	0	0	0	0
8:00 PM	0	57	7	0	0	0	0	0	0	0	0	0	0	0
9:00 PM	1	18	6	0	2	0	0	0	0	0	0	0	0	0
10:00 PM	0	18	4	0	0	0	0	0	0	0	0	0	0	0
11:00 PM	0	9	6	0	0	0	0	0	0	0	0	0	0	0
Day Total	81	1004	307	4	49	3	0	20	0	0	0	0	0	15
Percent	5.5%	67.7%	20.7%	0.3%	3.3%	0.2%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%

SPEED DATA (EB/WB)

Start Time	1-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70	71-75	76-999
12:00 AM	0	0	0	0	0	0	2	1	0	2	0	**0**	0	**0**
1:00 AM	0	0	0	0	0	0	1	3	0	0	**1**	0	0	0
2:00 AM	0	0	0	0	0	0	2	0	0	0	1	0	0	0
3:00 AM	0	0	0	0	1	0	0	0	0	0	0	0	0	0
4:00 AM	0	0	0	0	0	0	1	1	1	0	0	0	0	0
5:00 AM	0	0	0	0	0	1	2	3	0	1	0	0	0	0
6:00 AM	0	**1**	0	1	2	8	13	15	**20**	2	0	0	0	0
7:00 AM	1	0	0	0	2	9	**42**	**53**	19	**5**	0	0	**1**	0
8:00 AM	0	0	0	1	2	7	26	29	14	2	1	0	0	0
9:00 AM	**2**	0	**1**	1	2	**13**	14	16	9	4	0	0	0	0
10:00 AM	0	0	0	1	2	7	17	20	5	1	0	0	0	0
11:00 AM	0	0	0	**2**	**3**	7	25	12	10	2	0	0	0	0
12:00 PM	1	0	**1**	1	2	17	24	13	9	1	0	0	0	0
1:00 PM	1	1	0	3	3	11	23	7	3	2	0	1	0	0
2:00 PM	**3**	**3**	0	4	**8**	**24**	31	36	13	5	0	0	0	0
3:00 PM	1	1	0	2	8	17	**60**	41	**16**	4	**2**	0	0	0
4:00 PM	1	1	0	2	4	24	36	**53**	16	3	0	0	**1**	0
5:00 PM	1	1	0	**6**	6	16	45	49	13	2	2	0	0	0
6:00 PM	1	1	0	6	4	16	34	24	7	**6**	1	1	1	0
7:00 PM	1	1	0	0	6	11	34	21	12	3	0	**2**	0	**1**
8:00 PM	0	0	0	0	4	9	16	25	5	4	1	0	0	0
9:00 PM	0	0	0	0	1	2	13	8	1	2	0	0	0	0
10:00 PM	0	0	0	0	1	1	13	3	2	2	0	0	0	0
11:00 PM	0	0	0	0	0	2	6	5	2	0	0	0	0	0
Day Total	13	10	2	30	61	202	480	438	177	53	9	4	3	1
Percent	0.9%	0.7%	0.1%	2.0%	4.1%	13.6%	32.4%	29.5%	11.9%	3.6%	0.6%	0.3%	0.2%	0.1%

VOLUME DATA (EB/WB)

Start Time	EB	WB	Total
12:00 AM	4	1	5
1:00 AM	5	0	5
2:00 AM	2	1	3
3:00 AM	1	0	1
4:00 AM	1	2	3
5:00 AM	4	3	7
6:00 AM	39	23	62
7:00 AM	**74**	**58**	**132**
8:00 AM	45	37	82
9:00 AM	26	36	62
10:00 AM	28	25	53
11:00 AM	32	29	61
12:00 PM	33	36	69
1:00 PM	25	30	55
2:00 PM	57	70	127
3:00 PM	57	**95**	**152**
4:00 PM	**71**	70	141
5:00 PM	68	73	141
6:00 PM	57	45	102
7:00 PM	45	47	92
8:00 PM	25	39	64
9:00 PM	16	11	27
10:00 PM	6	16	22
11:00 PM	8	7	15
Day Total	729	754	1483
Percent	49.2%	50.8%	

PEAK HOUR (AM): 7:00 AM
PEAK HOUR (PM): 3:00 PM

AVERAGE SPEED: 44 MPH
MODAL SPEED: 43 MPH
MEDIAN SPEED: 44 MPH
85th PERCENTILE: 50 MPH
POSTED SPEED: 35 MPH

TOTAL TRUCKS: 76 (5.1%)
(Class 4 thru 13)

Quality Counts TRANSPORTATION DATA COLLECTION

APPENDIX C

Collision Rate Calculations and Reports

COLLISION RATE CALCULATIONS

NE Goodwin Road / NE Ingle Road (Unsignalized)

Existing 2010 PM Peak Hour Volume = 728 vehicles

Million Entering Vehicles (MEV) =

$$\left(\frac{ADT*365}{1{,}000{,}000}\right) \approx \left(\frac{Peak\,Hour\,Volume*10*365}{1{,}000{,}000}\right) = \left(\frac{728*10*365}{1{,}000{,}000}\right) = 2.66 \text{ MEV}$$

Collision Rate per Year (using WSDOT data Jan. 2007 – Dec. 2009) =

$$\left(\frac{\left(Total\ number\ of\ collisions \,/\, Number\ of\ Years\right)}{MEV}\right) = \left(\frac{2\,collisions \,/\, 3\,years}{2.66\,MEV}\right) = \mathbf{0.25}$$

NE 28th Street / NE 232nd Avenue (Unsignalized)

Average Daily Traffic Volume = 582 vehicles

Million Entering Vehicles (MEV) =

$$\left(\frac{ADT*365}{1{,}000{,}000}\right) = \left(\frac{582*10*365}{1{,}000{,}000}\right) = 2.12 \text{ MEV}$$

Collision Rate per Year (using WSDOT data Jan. 2007 – Dec. 2009) =

$$\left(\frac{\left(Total\ number\ of\ collisions \,/\, Number\ of\ Years\right)}{MEV}\right) = \left(\frac{1\,collision \,/\, 3\,years}{2.12\,MEV}\right) = \mathbf{0.16}$$

COLLISION RATE CALCULATIONS

SR 500 (NE Everett Street) / NE Leadbetter Road (Unsignalized)

PM Peak Hour Volume = 508 vehicles

Million Entering Vehicles (MEV) =

$$\left(\frac{ADT*365}{1{,}000{,}000}\right) \approx \left(\frac{Peak\,Hour\,Volume*10*365}{1{,}000{,}000}\right) = \left(\frac{508*10*365}{1{,}000{,}000}\right) = 1.85 \text{ MEV}$$

No collisions reported by WSDOT Jan. 2007 – Dec. 2009.
Collision Rate per Year = **0.00**

SR 500 (NE Everett Street) / NE 43rd Avenue (Signalized)

PM Peak Hour Volume = 743 vehicles

Million Entering Vehicles (MEV) =

$$\left(\frac{ADT*365}{1{,}000{,}000}\right) \approx \left(\frac{Peak\,Hour\,Volume*10*365}{1{,}000{,}000}\right) = \left(\frac{743*10*365}{1{,}000{,}000}\right) = 2.71 \text{ MEV}$$

Collision Rate per Year (using WSDOT data Jan. 2007 – Dec. 2009) =

$$\left(\frac{\left(Total\ number\ of\ collisions \,/\, Number\ of\ Years\right)}{MEV}\right) = \left(\frac{6\,collisions \,/\, 3\,years}{2.71\,MEV}\right) = \mathbf{0.74}$$

COLLISION RATE CALCULATIONS

SR 500 (NE Everett Street) / NE Lake Road (Signalized)

PM Peak Hour Volume = 1,157 vehicles

Million Entering Vehicles (MEV) =

$$\left(\frac{ADT*365}{1{,}000{,}000}\right)\approx\left(\frac{Peak\,Hour\,Volume*10*365}{1{,}000{,}000}\right)=\left(\frac{1{,}157*10*365}{1{,}000{,}000}\right)=4.22\ \text{MEV}$$

Collision Rate per Year (using WSDOT data Jan. 2007 – Dec. 2009) =

$$\left(\frac{\left(Total\ number\ of\ collisions \,/\, Number\ of\ Years\right)}{MEV}\right)=\left(\frac{2\ collisions \,/\, 3\ years}{4.22\ MEV}\right)=\mathbf{0.16}$$

NE Leadbetter Road, between NE Everett Street (SR 500) and NE 232nd Avenue (Segment)

Annual Daily Traffic Volume (average of two 24-hour counts) = (1,253 + 1,483) / 2 = 1,368 vehicles

Million Vehicle-Miles (MVM) =

$$\left(\frac{ADT*365*Segment\,Length}{1{,}000{,}000}\right)=\left(\frac{1{,}368*365*1.66}{1{,}000{,}000}\right)=0.83\ \text{MVM}$$

Collision Rate per Year (using WSDOT data Jan. 2007 – Dec. 2009) =

$$\left(\frac{\left(Total\ number\ of\ collisions \,/\, Number\ of\ Years\right)}{MVM}\right)=\left(\frac{14\ collisions \,/\, 3\ years}{0.83\ MVM}\right)=\mathbf{5.63}$$

REPORTED COLLISIONS THAT OCCURRED AT OR ON THE FOLLOWING INTERSECTIONS/ROAD SEGMENTS (SEE COLUMN B "INTERSECTION OR SEGMENT")
01/01/04 - 12/31/09

NE GOODWIN ROAD / NE INGLE ROAD

*REPORT NUMBER	INTERSECTION OR SEGMENT	JURIS-DICTION	PRIMARY TRAFFIC-WAY	MILE POST	INTERSEC-TING TRAFFIC-WAY	CO ONLY: INTERSEC-TING COUNTY ROAD MILEPOST	DATE	TIME	MOST SEVERE SOBRIETY TYPE	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	#PEDAL	FIRST COLLISION TYPE	FIRST OBJECT STRUCK	SECOND COLLISION TYPE	SECOND OBJECT STRUCK	JUNCTION RELATION-SHIP	WEATHER	ROADWAY SURFACE CONDITIONS	LIGHTING CONDITIONS	VEHICLE 1 TYPE	VEHICLE 2 TYPE	VEH 1 ACTION	VEH 2 ACTION	PEDCYCLIST ACTION (UNIT 1)	PEDCYCLIST CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 1 (UNIT 2)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEH 2 COMP DIR FROM	VEH 2 COMP DIR TO
2737462	NE GOODWIN RD AND NE INGLE RD	County Road	93350	2.240	30730	1.870	01/22/07	11:21 PM	Had NOT Been Drinking	Possible Injury	4	0	1		Fixed object	Roadway Ditch			At Intersection and Related	Fog or Smog or Smoke	Dry	Dark-Street Lights On	Truck (Flatbed, Van, etc.)		Going Straight Ahead				Other		North-west	South-east		
2983759	NE GOODWIN RD AND NE INGLE RD	County Road	93350	2.240	30730	1.870	07/30/07	12:24 PM	Had NOT Been Drinking	No Injury	0	0	2		From same direction - both going straight - one stopped - rear-end				At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	Passenger Car	Passenger Car	Going Straight Ahead	Stopped for Traffic			Driver Interacting with Passengers, Anim	None	West	East	West	Vehicle Stopped

*As of 1/1/2009 Citizen Reports (Report #'s beginning with "C") are no longer being captured.

UNDER 23 UNITED STATES CODE - SECTION 409, THIS DATA CANNOT BE USED IN DISCOVERY OR AS EVIDENCE AT TRIAL IN ANY ACTION FOR DAMAGES AGAINST THE WSDOT, OR THE JURISDICTIONS INVOLVED IN THE DATA

REPORTED COLLISIONS THAT OCCURRED AT OR ON THE FOLLOWING INTERSECTIONS/ROAD SEGMENTS (SEE COLUMN B "INTERSECTION OR SEGMENT")
01/01/04 - 12/31/09

NE 28TH STREET / NE 232ND AVENUE

*REPORT NUMBER	INTERSECTION OR SEGMENT	JURIS-DICTION	PRIMARY TRAFFIC-WAY	MILE POST	INTER-SECTING TRAFFIC-WAY	CO ONLY: INTERSECTING COUNTY ROAD MILEPOST	DATE	TIME	MOST SEVERE SOBRIETY TYPE	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	FIRST COLLISION TYPE	FIRST OBJECT STRUCK	SECOND COLLISION TYPE	SECOND OBJECT STRUCK	JUNCTION RELATIONSHIP	WEATHER	ROADWAY SURFACE CONDITIONS	LIGHTING CONDITIONS	VEHICLE 1 TYPE	VEHICLE 2 TYPE	VEH 1 ACTION	VEH 2 ACTION	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 1 (UNIT 2)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEH 2 COMP DIR FROM	VEH 2 COMP DIR TO
3166051	NE 28TH ST AND NE 232ND AVE	County Road	93350	3.090	30950	2.890	08/16/08	1:33 PM	Had NOT Been Drinking	No Injury	0	0	3	Entering at angle		One car leaving driveway access		At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	Pickup, Panel Truck or Vanette under 10,000 lb	Passenger Car	Making Left Turn	Going Straight Ahead	Did Not Grant RW to Vehicle	None	South	West	West	East

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01/01/04 - 12/31/09

NE EVERETT STREET (STATE ROUTE 500) / NE 43RD AVENUE (SE 15TH STREET)

*REPORT NUMBER	INTERSECTION OR SEGMENT	JURIS-DICTION	CITY	MILE POST	DATE	TIME	MOST SEVERE SOBRIETY TYPE	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	FIRST COLLISION TYPE	FIRST OBJECT STRUCK	SECOND COLLISION TYPE	SECOND OBJECT STRUCK	JUNCTION RELATION-SHIP	WEATHER	ROAD-WAY SURFACE CONDI-TIONS	LIGHT-ING CONDI-TIONS	SR ONLY: IMPACT LOCATION	SR ONLY: VEH 1 COMP DIR	SR ONLY: VEH 1 MP DIR	SR ONLY: VEH 1 MOVE-MENT	SR ONLY: VEH 2 COMP DIR	SR ONLY: VEH 2 MP DIR	SR ONLY: VEH 2 MOVE-MENT	VEH 1 TYPE	VEH 2 TYPE	VEH 1 ACTION	VEH 2 ACTION	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 2 (UNIT 1)	MV DRIVER CONT CIRC 1 (UNIT 2)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEH 2 COMP DIR FROM	VEH 2 COMP DIR TO
2474337	SR 500 AT MP 17.26 (INTERSECTION OF LEADBETTER ROAD)	State Route	Camas	17.33	02/18/07	3:02 AM	HBD - Ability Impaired	Evident Injury	1	0	1	Fixed object	Curb, Raised Traffic Island or Raised Median Curb	Fixed object	Wood Sign Post	At Inter-section and Related	Raining	Wet	Dark-Street Lights On	Right Shoulder Decreasing Milepost	North	Decreasing milepost of major roadway	Moving Straight	Unknown	Unknown or Not Applicable	Unknown or Not Applicable	Pickup, Panel Truck or Vanette under 10,000 lb		Going Straight Ahead		Under Influence of Alcohol			South	North		
2983969	SR 500 AT MP 17.26 (INTERSECTION OF LEADBETTER ROAD)	State Route	Camas	17.33	03/21/08	2:35 PM	Had NOT Been Drinking	No Injury	0	0	3	From same direction - both going straight - both moving - rear-end				At Inter-section and Not Related	Overcast	Dry	Daylight	Lane 1 Increasing Milepost	S	Increasing milepost of major roadway	Moving Straight	S	Increasing milepost of major roadway	Moving Straight	Passenger Car	Passenger Car	Slowing	Going Straight Ahead	None		Follow Too Closely	North	South	North	South
2755311	SR 500 AT MP 17.26 (INTERSECTION OF LEADBETTER ROAD)	State Route	Camas	17.33	05/21/08	1:30 PM	Had NOT Been Drinking	Evident Injury	1	0	2	From opposite direction - one left turn - one straight				At Inter-section and Related	Overcast	Dry	Daylight	Lane 1 Decreasing Milepost	S	Increasing milepost of major roadway	Turning Left	N	Decreasing milepost of major roadway	Moving Straight	School Bus	Passenger Car	Making Left Turn	Going Straight Ahead	Did Not Grant RW to Vehicle	Other Driver Distractions Inside Vehicle	None	North	East	South	North
2984105	SR 500 AT MP 17.26 (INTERSECTION OF LEADBETTER ROAD)	State Route	Camas	17.33	06/12/08	11:20 AM	Had NOT Been Drinking	No Injury	0	0	2	From opposite direction - one left turn - one straight				At Inter-section and Related	Clear or Partly Cloudy	Dry	Daylight	Lane 1 Decreasing Milepost	South	Increasing milepost of major roadway	Turning Left	North	Decreasing milepost of major roadway	Moving Straight	Pickup, Panel Truck or Vanette under 10,000 lb	Pickup, Panel Truck or Vanette under 10,000 lb	Making Left Turn	Going Straight Ahead	Did Not Grant RW to Vehicle		None	North	East	South	North
E018209	SR 500 AT MP 17.26 (INTERSECTION OF LEADBETTER ROAD)	State Route	Camas	17.33	04/14/09	6:20 PM	Had NOT Been Drinking	No Injury	0	0	2	From opposite direction - one left turn - one straight				At Inter-section and Related	Raining	Wet	Daylight	Lane 1 Decreasing Milepost	South	Increasing milepost of major roadway	Turning Left	North	Decreasing milepost of major roadway	Moving Straight	Pickup, Panel Truck or Vanette under 10,000 lb	Pickup, Panel Truck or Vanette under 10,000 lb	Making Left Turn	Going Straight Ahead	Disregard Yield Sign - Flashing Yellow	Inattention	None	North	East	South	North
E031616	SR 500 AT MP 17.26 (INTERSECTION OF LEADBETTER ROAD)	State Route	Camas	17.33	11/02/09	7:11 AM	Had NOT Been Drinking	Evident Injury	1	0	2	From opposite direction - one left turn - one straight				At Inter-section and Related	Clear or Partly Cloudy	Dry	Daylight	Lane 1 Decreasing Milepost	North	Decreasing milepost of major roadway	Moving Straight	South	Increasing milepost of major roadway	Turning Left	Pickup, Panel Truck or Vanette under 10,000 lb	Passenger Car	Going Straight Ahead	Making Left Turn	None		Did Not Grant RW to Vehicle	South	North	North	East

*As of 1/1/2009 Citizen Reports (Report #'s beginning with "C") are no longer be

Prepared by:
WSDOT / TDO / CDAB / MB
June 23, 2010

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01/01/04 - 12/31/09

NE EVERETT STREET (STATE ROUTE 500) / NE LAKE ROAD

*REPORT NUMBER	INTERSECTION OR SEGMENT	JURIS-DICTION	CITY	MILE POST	DATE	TIME	MOST SEVERE SOBRIETY TYPE	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	FIRST COLLISION TYPE	FIRST OBJECT STRUCK	SECOND COLLISION TYPE	JUNCTION RELATION-SHIP	WEATHER	ROAD-WAY SURFACE CONDI-TIONS	LIGHT-ING CONDI-TIONS	SR ONLY: IMPACT LOCATION	SR ONLY: VEH 1 COMP DIR	SR ONLY: VEH 1 MP DIR	SR ONLY: VEH 1 MOVE-MENT	SR ONLY: VEH 2 COMP DIR	SR ONLY: VEH 2 MP DIR	SR ONLY: VEH 2 MOVE-MENT	VEH 1 TYPE	VEH 2 TYPE	VEH 1 ACTION	VEH 2 ACTION	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 2 (UNIT 1)	MV DRIVER CONT CIRC 1 (UNIT 2)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEH 2 COMP DIR FROM	VEH 2 COMP DIR TO
2474349	SR 500 AT MP 17.90 (INTERSECTION OF LAKE ROAD)	State Route	Camas	17.90	04/17/07	3:50 PM	Unknown	Possible Injury	1	0	2	From same direction - one right turn - one straight			At Inter-section and Related	Raining	Wet	Daylight	Intersecting Road Increasing Milepost	East	Entering major roadway from the right	Moving Straight	East	Entering major roadway from the right	Stopped in Traffic - Legally Standing	Pickup, Panel Truck or Vanette under 10,000 lb	Passenger Car	Going Straight Ahead	Stopped for Traffic	Follow Too Closely		None	West	East	West	Vehicle Stopped
3253038	SR 500 AT MP 17.90 (INTERSECTION OF LAKE ROAD)	State Route	Camas	17.90	02/24/09	3:00 PM	Unknown	No Injury	0	0	2	Same direction -- both turning right -- both moving -- sideswipe			At Inter-section and Related	Raining	Wet	Daylight	Lane 1 Increasing Milepost	East	Entering major roadway from the right	Turning Right	East	Entering major roadway from the right	Turning Right	Pickup, Panel Truck or Vanette under 10,000 lb	Passenger Car	Making Right Turn	Making Right Turn	Improper Passing	Improper Turn	None	West	South	West	South

*As of 1/1/2009 Citizen Reports (Report #'s beginning with "C") are no longer bei

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REPORTED COLLISIONS THAT OCCURRED AT OR ON THE FOLLOWING INTERSECTIONS/ROAD SEGMENTS (SEE COLUMN B "INTERSECTION OR SEGMENT")
01/01/04 - 12/31/09

SEGMENT OF LEADBETTER ROAD BETWEEN NE 232ND AVENUE (NW END) AND EVERETT STREET/STATE ROUTE 500 (SE END)

LOCATION AND JURISDICTION	*REPORT NUMBER	INTERSECTION OR SEGMENT	JURISDICTION	CITY	PRIMARY TRAFFIC-WAY	BLOCK NUMBER	MILE POST	DIST FROM REF POINT	MI or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	DATE	TIME	MOST SEVERE SOBRIETY TYPE	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	#PEDAL	FIRST COLLISION TYPE	FIRST OBJECT STRUCK	SECOND COLLISION TYPE	SECOND OBJECT STRUCK	JUNCTION RELATIONSHIP	WEATHER	ROADWAY SURFACE CONDITIONS	LIGHTING CONDITIONS	VEHICLE 1 TYPE	VEHICLE 2 TYPE	VEH 1 ACTION	VEH 2 ACTION	PEDCYCLIST ACTION (UNIT 2)	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 2 (UNIT 1)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEH 2 COMP DIR FROM	VEH 2 COMP DIR TO
NW END OF LEADBETTER ROAD (232nd)	2983865	NE LEADBETTER RD FROM SR 500 TO NE 232ND AVE	City Street	Camas	NE LEADBETTER RD AT NE 232 AVE	23200						03/21/09	2:38 PM	Had NOT Been Drinking	No Injury	0	0	2		From same direction - all others				At Driveway	Clear or Partly Cloudy	Dry	Daylight	Pickup, Panel Truck or Vanette under 10,000 lb	Pickup, Panel Truck or Vanette under 10,000 lb	Making U-Turn	Going Straight Ahead		Improper U-Turn		South	South	South	North
CITY OF CAMAS COLLISION REPORTS	2984039	NE LEADBETTER RD FROM SR 500 TO NE 232ND AVE	City Street	Camas	NE LEADBETTER RD	100		0.2	M	S	SE 232 AVE	09/01/08	2:45 AM	HBD - Sobriety Unknown	Serious Injury	2	0	1		Fixed object	Mailbox	Fixed object	Guardrail - Face	Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Dark-No Street Lights	Pickup, Panel Truck or Vanette under 10,000 lb		Going Straight Ahead			Other		South	North		
	E015413	NE LEADBETTER RD FROM SR 500 TO NE 232ND AVE	City Street	Camas	SE LEADBETTER RD	811						02/21/09	10:30 PM	HBD - Ability Impaired	No Injury	0	0	1		Fixed object	Roadway Ditch			At Driveway but Not Related	Overcast	Dry	Dark-No Street Lights	Pickup, Panel Truck or Vanette under 10,000 lb		Going Straight Ahead			Under Influence of Alcohol	Driver Operating Handheld Telecom-munications	East	West		
	E016767	NE LEADBETTER RD FROM SR 500 TO NE 232ND AVE	City Street	Camas	SE LEADBETTER	811						03/20/09	8:00 PM	Had NOT Been Drinking	Possible Injury	1	0	1		Fixed object	Earth Bank or Ledge			Not at Intersection and Not Related	Raining	Wet	Dark-No Street Lights	Passenger Car		Going Straight Ahead			Driver Distractions Outside Vehicle		East	West		
	2984030	NE LEADBETTER RD FROM SR 500 TO NE 232ND AVE	City Street	Camas	SE LEADBETTER DR	808						06/30/08	1:46 PM	Had NOT Been Drinking	Evident Injury	1	0	1		Vehicle over-turned				Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	Truck (Flatbed,Van,etc)		Going Straight Ahead			Other		East	West		
	2984099	NE LEADBETTER RD FROM SR 500 TO NE 232ND AVE	City Street	Camas	SE LEADBETTER RD	800						09/18/09	4:19 PM	Had NOT Been Drinking	No Injury	0	0	1		Fixed object	Guardrail - Face	Fixed object	Guardrail - Through, Over or Under	Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	Pickup, Panel Truck or Vanette under 10,000 lb		Going Straight Ahead			Exceeding Reas. Safe Speed		South-east	West		
	2984084	NE LEADBETTER RD FROM SR 500 TO NE 232ND AVE	City Street	Camas	NE LEADBETTER RD	1000		0.6	M	W	NE ADAMS ST	09/06/08	3:05 PM	HBD - Ability Impaired	No Injury	0	0	1		Fixed object	Roadway Ditch	Fixed object	Earth Bank or Ledge	Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	Pickup, Panel Truck or Vanette under 10,000 lb		Going Straight Ahead			Under Influence of Alcohol		East	West		
	2984046	NE LEADBETTER RD FROM SR 500 TO NE 232ND AVE	City Street	Camas	SE LEADBETTER RD	800		0.25	F	W	NE EVERETT ST	11/10/08	9:40 PM	HBD - Ability Impaired	No Injury	0	0	1		Fixed object	Guardrail - Face			Not at Intersection and Not Related	Clear or Partly Cloudy	Wet	Dark-No Street Lights	Pickup, Panel Truck or Vanette under 10,000 lb		Going Straight Ahead			Under Influence of Alcohol	Driver Eating or Drinking	East	West		
SE END OF LEADBETTER ROAD (SR 500)	2983890	NE LEADBETTER RD FROM SR 500 TO NE 232ND AVE	City Street	Camas	SE LEADBETTER RD	811		800	F	N	NE EVERETT ST	12/15/09	7:18 PM	Had NOT Been Drinking	Evident Injury	1	0	1		Fixed object	Wood Sign Post	Vehicle over-turned		Not at Intersection and Not Related	Raining	Wet	Dark-No Street Lights	Passenger Car		Going Straight Ahead			Other		South	North		

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01/01/04 - 12/31/09

SEGMENT OF LEADBETTER ROAD BETWEEN NE 232ND AVENUE (NW END) AND EVERETT STREET/STATE ROUTE 500 (SE END)

LOCATION AND JURISDICTION	*REPORT NUMBER	INTERSECTION OR SEGMENT	JURISDICTION	CITY	PRIMARY TRAFFICWAY	BLOCK NUMBER	MILE POST	DIST FROM REF POINT	MI or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	DATE	TIME	MOST SEVERE SOBRIETY TYPE	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	#PEDAL	FIRST COLLISION TYPE	FIRST OBJECT STRUCK	SECOND COLLISION TYPE	SECOND OBJECT STRUCK	JUNCTION RELATIONSHIP	WEATHER	ROADWAY SURFACE CONDITIONS	LIGHTING CONDITIONS	VEHICLE 1 TYPE	VEHICLE 2 TYPE	VEH 1 ACTION	VEH 2 ACTION	PEDCYCLIST ACTION (UNIT 2)	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 2 (UNIT 1)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEH 2 COMP DIR FROM	VEH 2 COMP DIR TO
SE END OF LEADBETTER ROAD (SR 500)	2577621	NE LEADBETTER RD FROM SR 500 TO NE 232ND AVE	County Road		30950		0.25					02/05/07	10:46 AM	Had NOT Been Drinking	No Injury	0	0	1		Fixed object	Utility Pole			Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	Passenger Car		Going Straight Ahead			Apparently Asleep		West	East		
>> CLARK COUNTY COLLISION REPORTS <<	2983767	NE LEADBETTER RD FROM SR 500 TO NE 232ND AVE	County Road		30950		0.65					09/30/07	11:26 AM	Had NOT Been Drinking	No Injury	0	0	1		Fixed object	Roadway Ditch			Not at Intersection and Not Related	Raining	Wet	Daylight	Passenger Car		Going Straight Ahead			None		South-west	North		
	2577329	NE LEADBETTER RD FROM SR 500 TO NE 232ND AVE	County Road		30950		0.75					12/08/07	1:30 AM	Unknown	Serious Injury	1	0	1		Fixed object	Guardrail - Through, Over or Under	Vehicle over-turned		Not at Intersection and Not Related	Overcast	Dry	Dark-No Street Lights	Pickup, Panel Truck or Vanette under 10,000 lb		Going Straight Ahead			Exceeding Stated Speed Limit		East	West		
	2736620	NE LEADBETTER RD FROM SR 500 TO NE 232ND AVE	County Road		30950		0.95					09/12/07	6:16 PM	Had NOT Been Drinking	Evident Injury	1	0	1		Fixed object	Roadway Ditch	Vehicle over-turned		Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	Motorcycle		Going Straight Ahead			Exceeding Reas. Safe Speed		North-west	South-east		
NW END OF LEADBETTER ROAD (232nd)	2737987	NE LEADBETTER RD FROM SR 500 TO NE 232ND AVE	County Road		30950		1.66					02/13/07	3:13 PM	Had NOT Been Drinking	Evident Injury	1	0	1		Vehicle over-turned				Not at Intersection and Not Related	Clear or Partly Cloudy	Wet	Daylight	Passenger Car		Going Straight Ahead			Exceeding Reas. Safe Speed		East	North		

*As of 1/1/2009 Citizen Reports (Report #'s beginning with "C") are no longer being captured.

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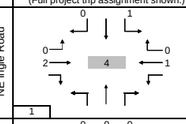
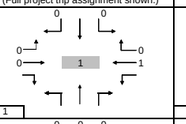
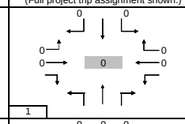
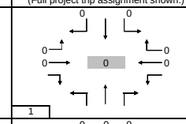
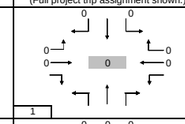
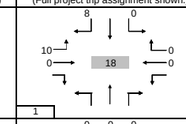
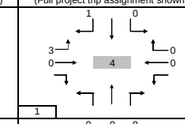
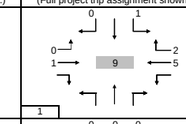
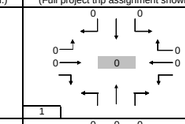
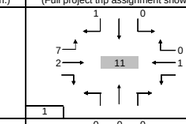
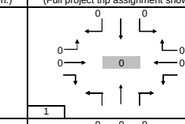
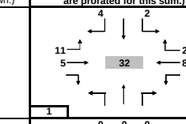
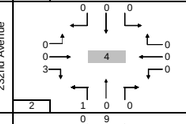
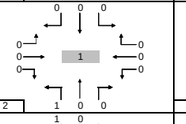
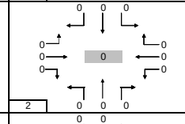
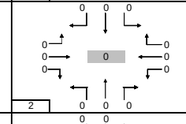
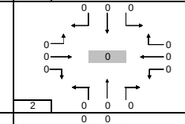
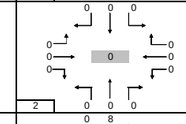
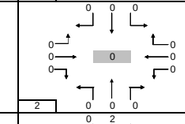
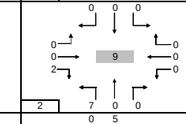
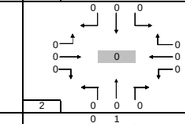
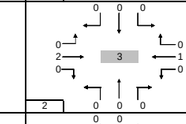
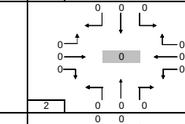
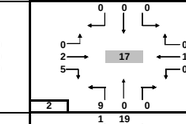
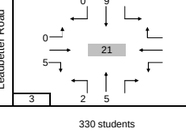
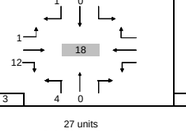
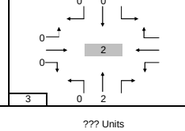
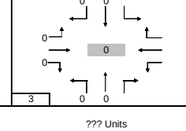
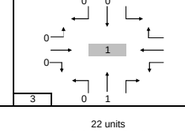
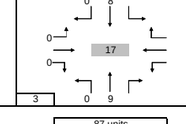
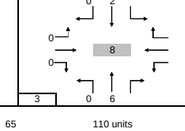
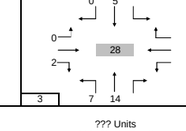
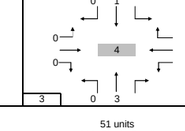
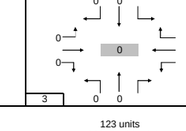
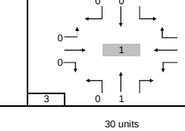
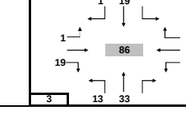
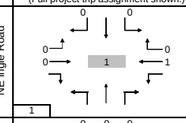
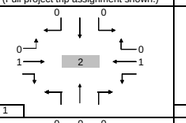
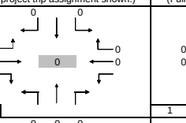
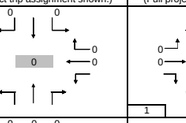
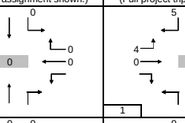
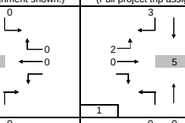
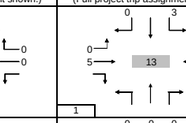
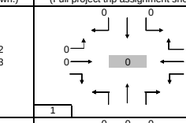
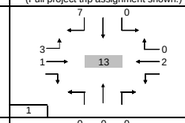
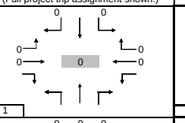
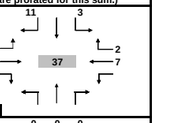
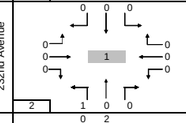
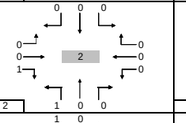
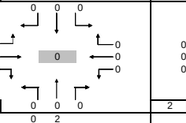
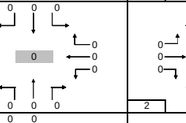
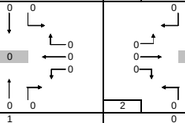
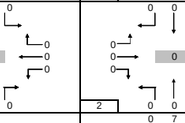
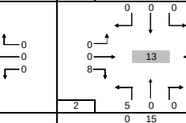
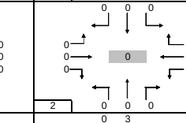
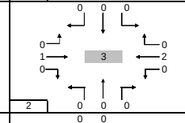
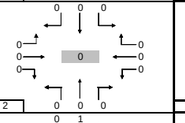
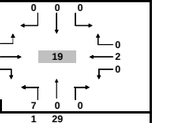
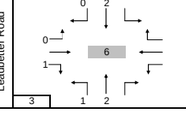
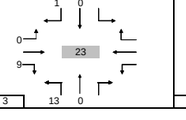
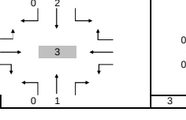
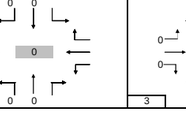
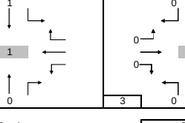
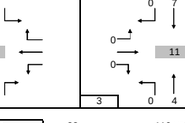
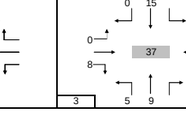
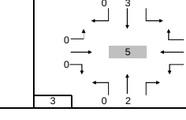
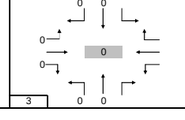
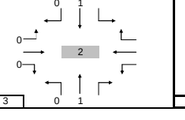
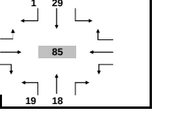
APPENDIX D

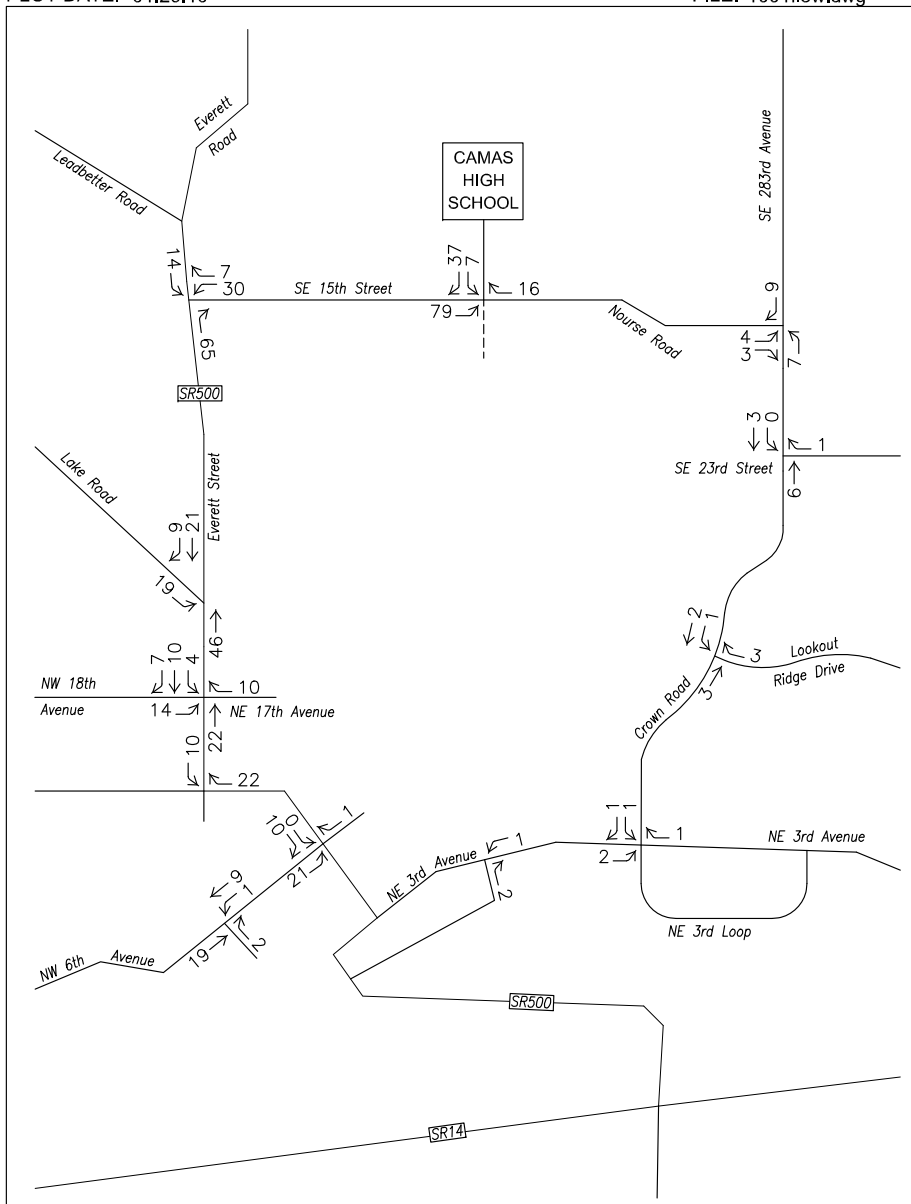
In-Process Traffic

AM

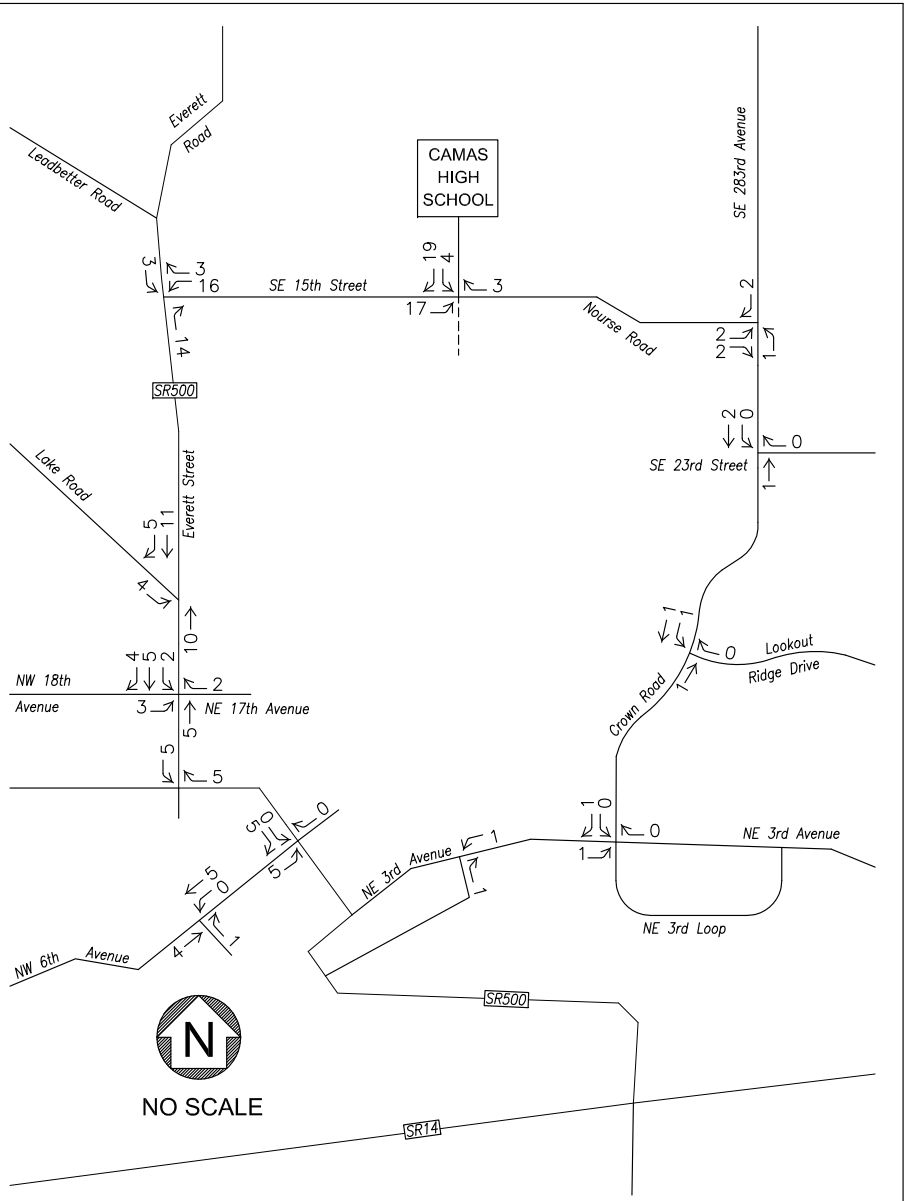
	Camas HS Expansion Charbonneau (Full project trip assignment shown.)	Deerhaven Charbonneau (Full project trip assignment shown.)	Hidden Meadows CTS (Full project trip assignment shown.)	The Hills @ Round Lake Charbonneau (Full project trip assignment shown.)	Lacamas Pointe CTS (Full project trip assignment shown.)	Lacamas Meadows PRD Charbonneau (Full project trip assignment shown.)	Lakeridge North CTS (Full project trip assignment shown.)	Millshore Downs HDJ (Full project trip assignment shown.)	North Hills HLA (Full project trip assignment shown.)	Two Creeks at Camas Meadows (Full project trip assignment shown.)	Vintage View/The Village at Round Lake CTS (Full project trip assignment shown.)	**TOTAL IN-PROCESS TRIPS (Totals for partially complete projects are prorated for this sum.)**
NE Goodwin Road / NE Ingle Road												
NE 28th Street / NE 232nd Avenue												
Everett (SR 500) / Leadbetter Road												
	330 students #530: High School 0% complete	27 units #210: Single-Family Detached Housing 0% complete	??? Units ??? ITE Code 0% complete	??? Units #210: Single-Family Detached Housing & #220: Apartment 0% complete	22 units #210: Single-Family Detached Housing 9% complete	87 units #210: Single-Family Detached Housing 41% complete 84 units #230: Residential Condo/Townhouse 39% complete 600 students #520: Elementary School 92% complete Entire Development 77% complete	65 AM peak hour trips 37 AM peak hour trips 252 AM peak hour trips	110 units #210: Single-Family Detached Housing 22% complete	??? Units #210: Single-Family Detached Housing 0% complete	51 units #210: Single-Family Detached Housing 0% complete	123 units #230: Residential Condominium/ Townhouse 0% complete	30 units #210: Single-Family Detached Housing 27% complete	

PM	Camas HS Expansion Charbonneau (Full project trip assignment shown.)	Deerhaven Charbonneau (Full project trip assignment shown.)	Hidden Meadows CTS (Full project trip assignment shown.)	The Hills @ Round Lake Charbonneau (Full project trip assignment shown.)	Lacamas Pointe CTS (Full project trip assignment shown.)	Lacamas Meadows PRD Charbonneau (Full project trip assignment shown.)	Lakeridge North CTS (Full project trip assignment shown.)	Millshore Downs HDJ (Full project trip assignment shown.)	North Hills HLA (Full project trip assignment shown.)	Two Creeks at Camas Meadows (Full project trip assignment shown.)	Vintage View/The Village at Round Lake CTS (Full project trip assignment shown.)	**TOTAL IN-PROCESS TRIPS (Totals for partially complete projects are prorated for this sum.)**
NE Goodwin Road / NE Ingle Road												
NE 28th Street / NE 232nd Avenue												
Everett (SR 500) / Leadbetter Road												
	330 students #530: High School 0% complete	27 units #210: Single-Family Detached Housing 0% complete	??? Units ??? ITE Code 0% complete	??? Units #210: Single-Family Detached Housing & #220: Apartment 0% complete	22 units #210: Single-Family Detached Housing 9% complete	87 units #210: Single-Family Detached Housing 41% complete 84 units #230: Residential Condo/Townhouse 39% complete 600 students #520: Elementary School 92% complete Entire Development 53% complete	88 PM peak hour trips 44 PM peak hour trips 44 PM peak hour trips	110 units #210: Single-Family Detached Housing 22% complete	??? Units #210: Single-Family Detached Housing 0% complete	51 units #210: Single-Family Detached Housing 0% complete	123 units #230: Residential Condominium/ Townhouse 0% complete	30 units #210: Single-Family Detached Housing 27% complete	

PLOT DATE: 01.29.10 FILE: 1001flow.dwg



AM PEAK HOUR



NO SCALE

PM PEAK HOUR

CHARBONNEAU ENGINEERING LLC

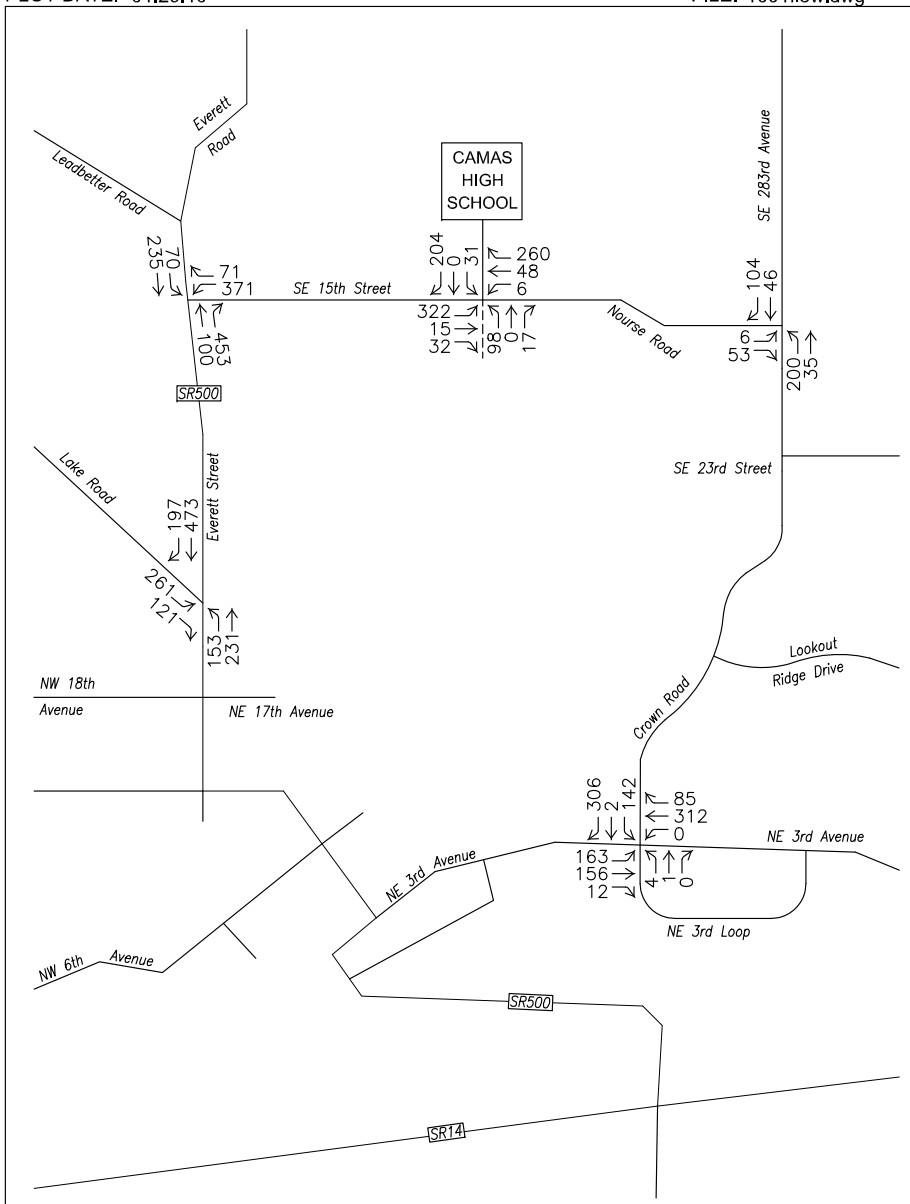
PROJECT: 10-01

NOTES: Trip generation based on High School (ITE 530) trip rates.

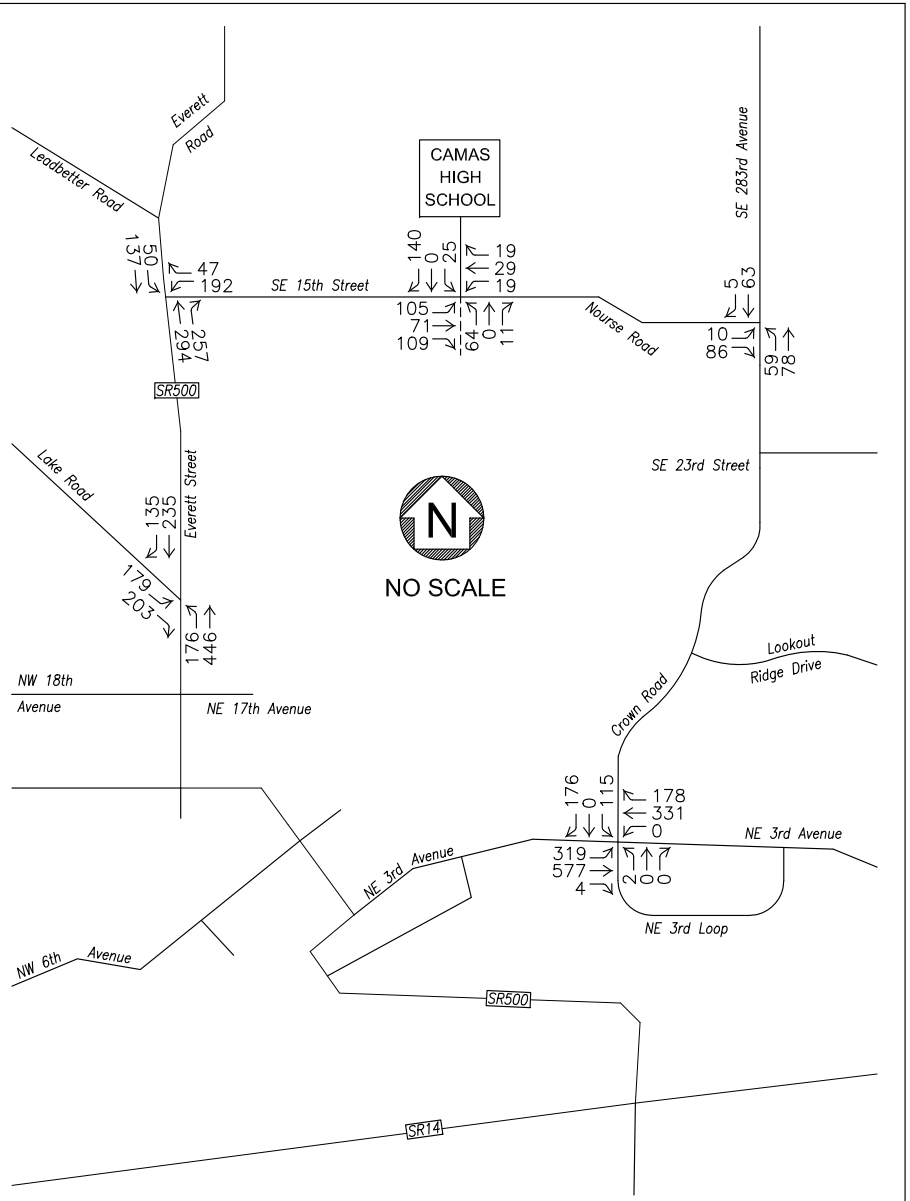
TRIP ASSIGNMENT
CAMAS HIGH SCHOOL EXPANSION

FIGURE 5

PLOT DATE: 01.29.10 FILE: 1001flow.dwg



AM PEAK HOUR



PM PEAK HOUR

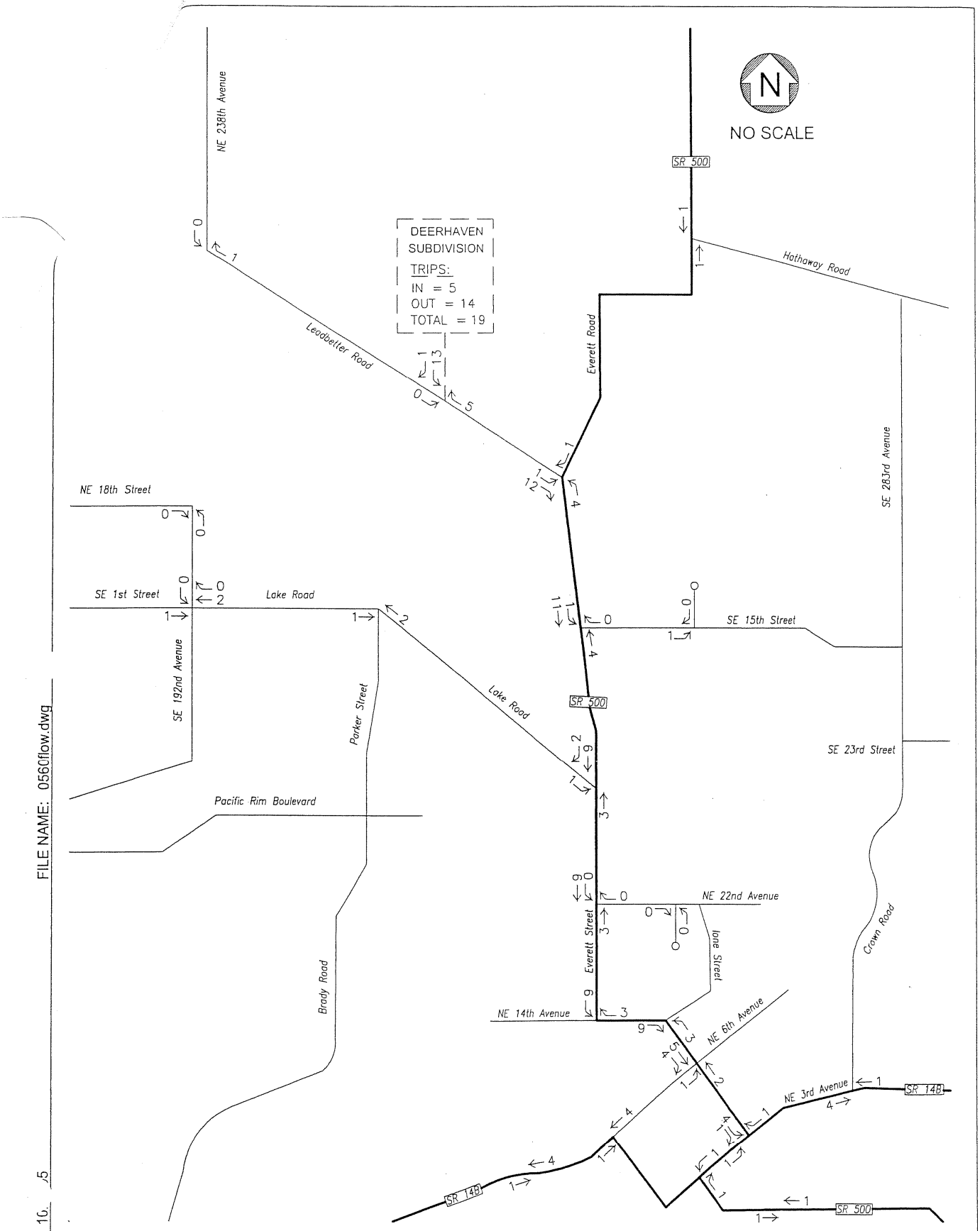
CHARBONNEAU ENGINEERING LLC

PROJECT: 10-01

NOTES: Total Traffic = Background Traffic + Trip Assignment.

2015 TOTAL TRAFFIC
CAMAS HIGH SCHOOL EXPANSION

FIGURE 6

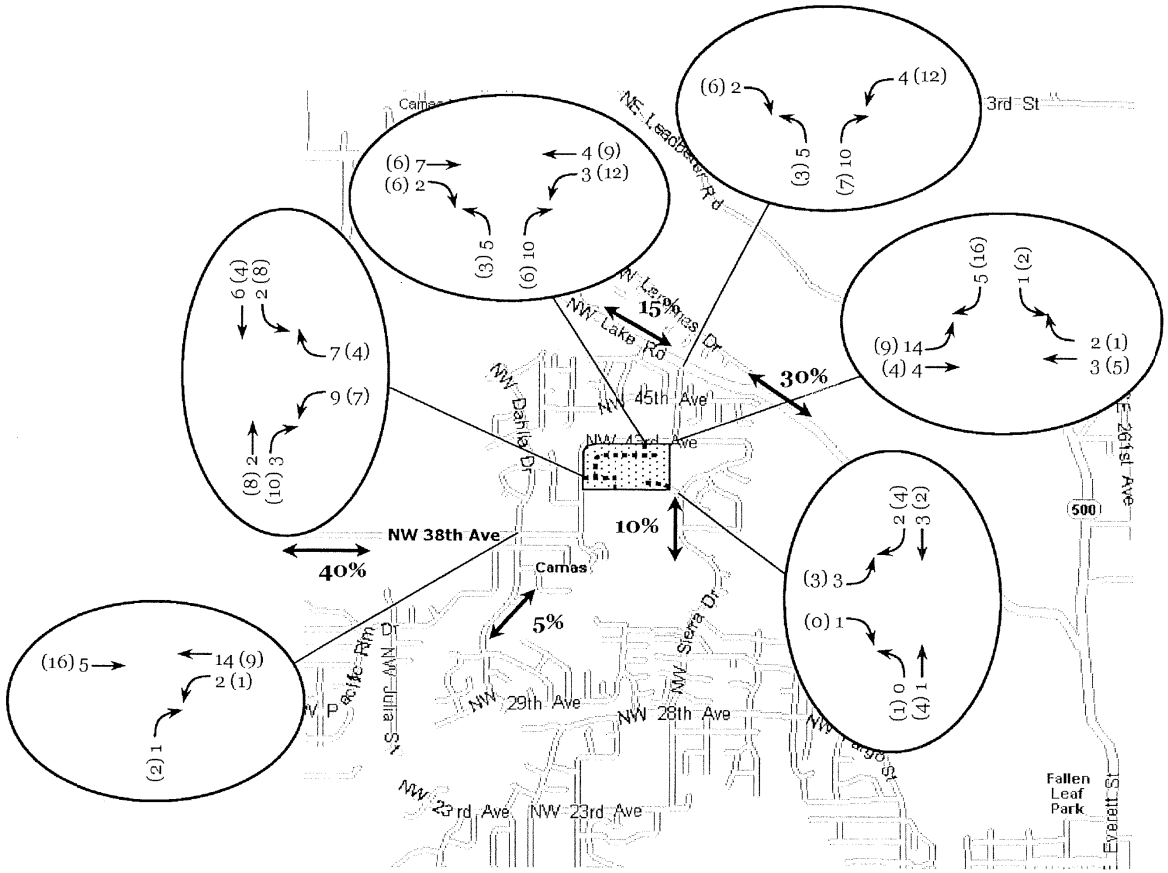


FILE NAME: 0560flow.dwg

PLOT DATE: 10.15

CHARBONNEAU ENGINEERING LLC PROJECT: 05-60	NOTES: Trip generation based on Single-Family Residential (ITE 210) trip rates.	TRIP ASSIGNMENT AM PEAK HOUR DEERHAVEN SUBDIVISION	FIGURE 5a

Figure 8: Weekday Peak Hour Traffic Volumes Generated By Hidden Meadows



Generated Site Traffic

	In	Out
AM Peak	12	35
PM Peak	40	23

N

Drawing Not To Scale

Traffic Signal

Stop Sign

Proposed Site

Proposed Roadway

AM(PM) Peak Hour Volumes

OR05.023.T01 Hidden Meadows

CTS ENGINEERS

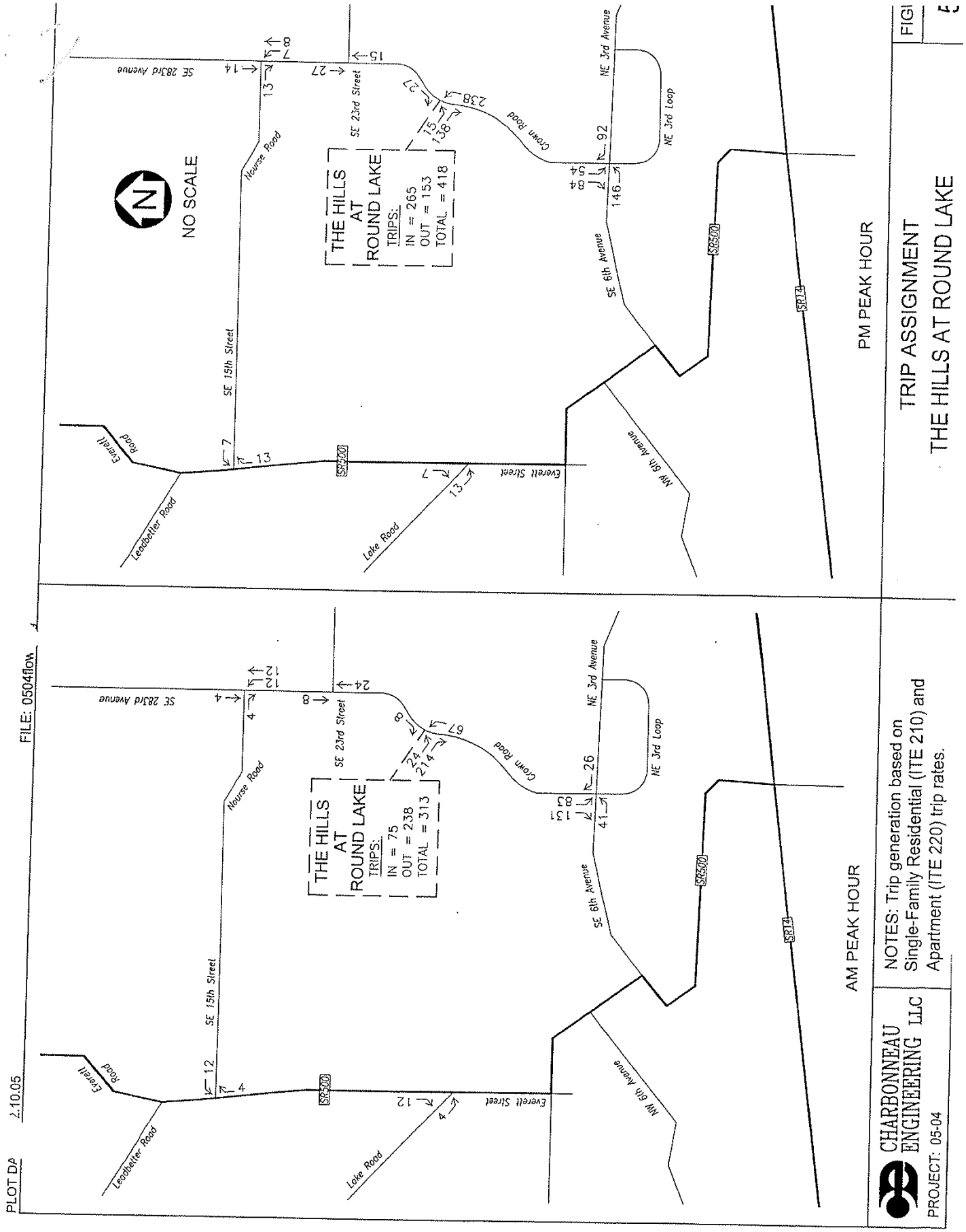
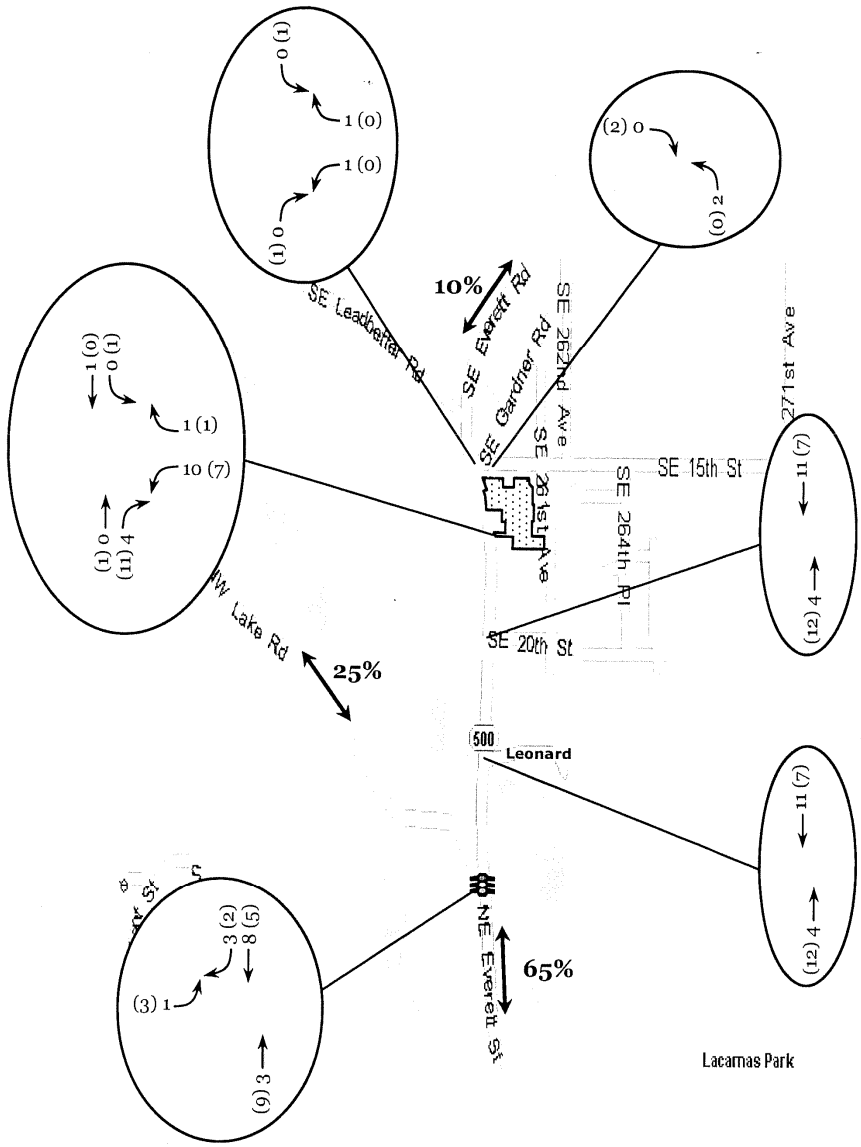

TRIP ASSIGNMENT
THE HILLS AT ROUND LAKE
PM PEAK HOUR
AM PEAK HOUR
NO SCALE
THE HILLS AT ROUND LAKE
TRIPS:
IN = 265
OUT = 153
TOTAL = 418
THE HILLS AT ROUND LAKE
TRIPS:
IN = 75
OUT = 238
TOTAL = 313
SE 28Jrd Avenue
Nourse Road
SE 23rd Street
Crown Road
NE 3rd Avenue
NE 3rd Loop
SE 15th Street
Everett Road
Leadbetter Road
Everett Street
Lake Road
SE 6th Avenue
NW 6th Avenue
SR-500
SR-14
NOTES: Trip generation based on Single-Family Residential (ITE 210) and Apartment (ITE 220) trip rates.
CHARBONNEAU ENGINEERING LLC
PROJECT: 05-04
FILE: 0504flow
2.10.05
PLOT DA

Figure 8: Weekday Peak Hour Traffic Volumes Generated By La Camas Pointe



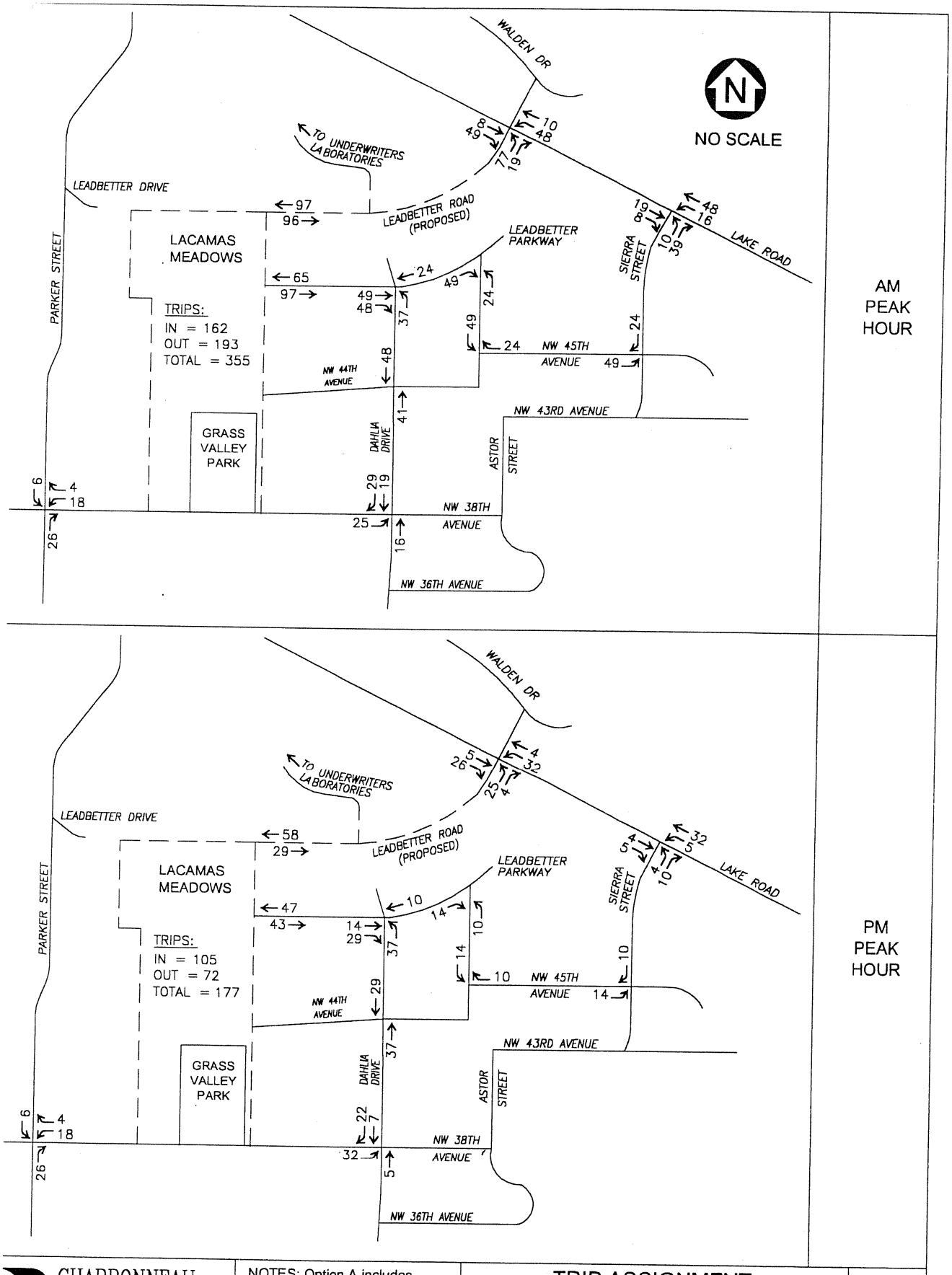
Site Generated Traffic

	In	Out
AM Peak	4	13
PM Peak	14	8

Traffic Signal
Stop Sign
Proposed Site
Proposed Roadway
AM(PM) Peak Hour Volumes

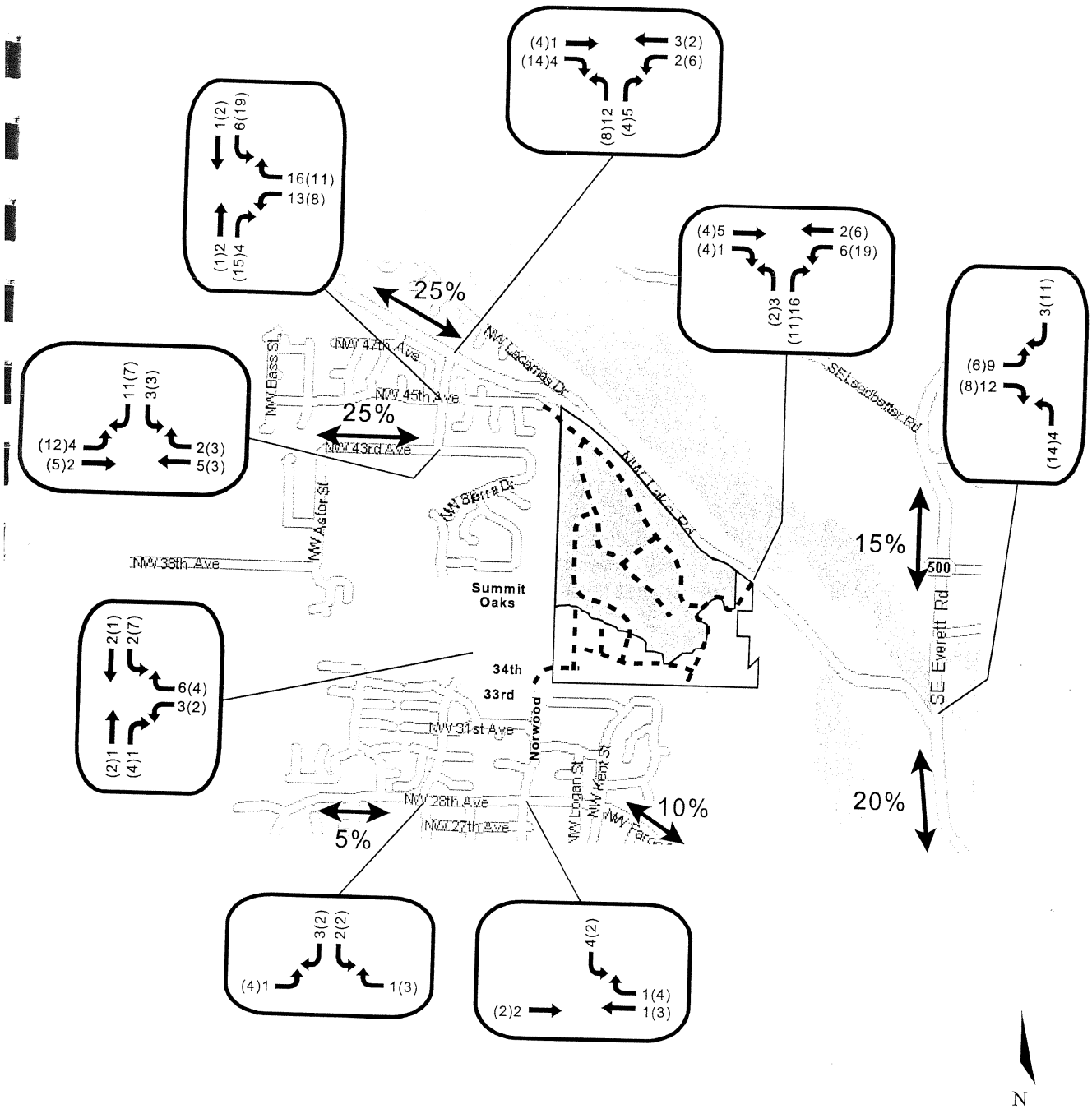
CTS ENGINEERS

OR05.034.T01 La Camas Pointe



CHARBONNEAU ENGINEERING LLC PROJECT: 04-35	NOTES: Option A includes development of an elementary school, residential homes and the Leadbetter Road alignment.	TRIP ASSIGNMENT - OPTION A - LACAMAS MEADOWS	FIGURE 5a

Figure 7: Weekday Peak Hour Traffic Volumes Generated by Lakeridge North Subdivision (110 Single-Family Homes)



Proposed Site
Lakeridge Site

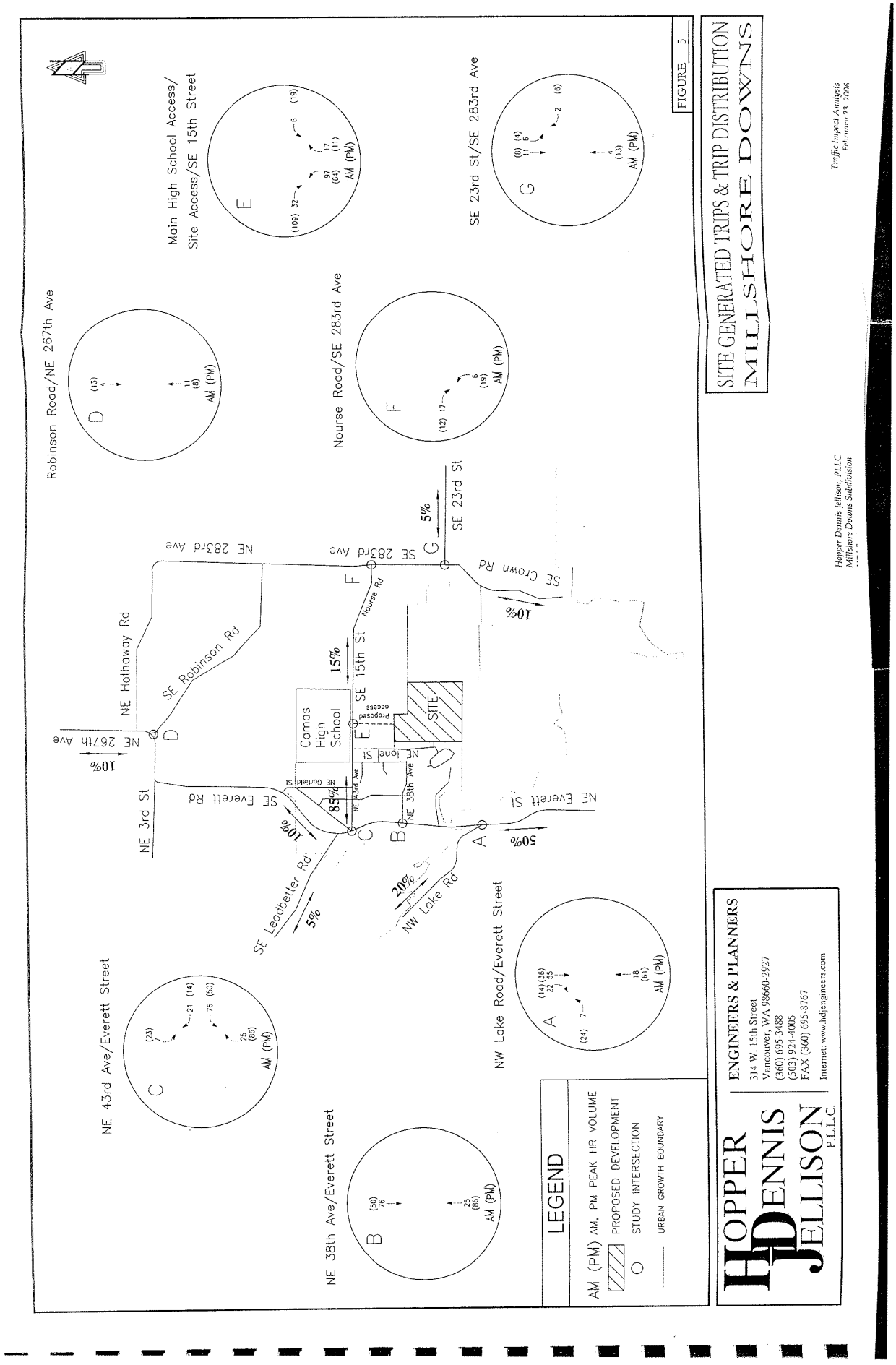
Lakeridge North Subdivision

	IN	OUT
AM	21	62
PM	71	40

Traffic Signal
Stop Sign
Proposed Roadway
AM(PM) Peak Hour Volumes

Drawing not to scale.

CTS


SITE GENERATED TRIPS & TRIP DISTRIBUTION
MILLSHORE DOWNS
FIGURE 5
Traffic Impact Analysis
February 23, 2021
Hopper Dennis Jellison, PLLC
Millshore Downs Subdivision
HOPPER DENNIS JELLISON P.L.L.C.
ENGINEERS & PLANNERS
314 W. 15th Street
Vancouver, WA 98660-2927
(360) 695-3488
(503) 924-4005
FAX (360) 695-8767
Internet: www.hdjengineers.com
LEGEND
AM (PM) AM, PM PEAK HR VOLUME
PROPOSED DEVELOPMENT
STUDY INTERSECTION
URBAN GROWTH BOUNDARY
Robinson Road/NE 267th Ave
Main High School Access/
Site Access/SE 15th Street
Nourse Road/SE 283rd Ave
SE 23rd St/SE 283rd Ave
NE 43rd Ave/Everett Street
NW Lake Road/Everett Street
NE 38th Ave/Everett Street
NE 267th Ave
NE Holloway Rd
SE Robinson Rd
NE 3rd St
SE Everett Rd
SE Leadbetter Rd
NW Lake Rd
NE Everett St
NE 283rd Ave
SE 283rd Ave
SE 23rd St
SE Crown Rd
Nourse Rd
SE 15th St
Proposed access
Comas High School
SITE
NE Ione St
NE 38th Ave
NE 43rd Ave
NE Garfield St
10%
15%
8%
5%
20%
50%

NE 43rd Avenue/SE Nourse Road is a two-lane arterial roadway with additional turn pockets at major intersections. The posted speed limit is 25 mph from NE Everett Street to SE 271st Avenue. East of SE 271st Avenue, the speed limit changes to 40 mph. Intermittent sidewalks exist along both sides of the roadway.

SE 283rd Avenue/SE Crown Road is a two-lane arterial roadway with a posted speed limit of 40 mph. Some intermittent shoulders exist along the roadway.

NE 3rd Avenue is a four-lane arterial roadway with additional turn pockets at major intersections. The posted speed limit is 25 mph west of East First Avenue. East of East First Avenue, the speed limit changes to 40 mph. Sidewalks exist along both sides of the roadway.

TRIP GENERATION

Estimates of daily, A.M. peak hour, and P.M. peak hour trips generated by the proposed project were developed from rates published in "Trip Generation, 8th Edition" (Institute of Transportation Engineers, 2008). The proposed development is expected to generate 478 new daily trips, 37 new A.M. peak hour (10 in, 27 out), and 51 new P.M. peak hour (32 in, 19 out) trips. Table 1 summarizes the trip generation for North Hills Subdivision developmentt.

Table 1. Trip Generation Summary for North Hills Subdivision

	Average Daily	A.M. Peak			P.M. Peak		
		In	Out	Total	In	Out	Total
Single Family Residential (ITE Code 210)							
Rate per unit	9.57	0.19	0.56	0.75	0.64	0.37	1.01
	488	10	28	38	33	19	52
Existing Single family (ITE Code 210)							
Rate per unit	9.57	0.19	0.56	0.75	0.64	0.37	1.01
1 existing single family unit	10	0	1	1	1	0	1
Net new trips	478	10	27	37	32	19	51

Camas City Staff
February 11, 2010

TRIP DISTRIBUTION

A generalized trip distribution pattern for the A.M. and P.M. peak hour was developed from the existing traffic counts, previous traffic studies, locations of major employment centers, and logical travel paths to and from major travel corridors. The trip distribution patter is listed below:

- SE 283rd Avenue to and from the north – 5%
- NE Everett Street to and from the north – 10%
- Camas High School – 5%
- NE Lake Road – 10%
- NE Everett Street to and from the south – 20%
- SE Crown Road to and from the south – 50%

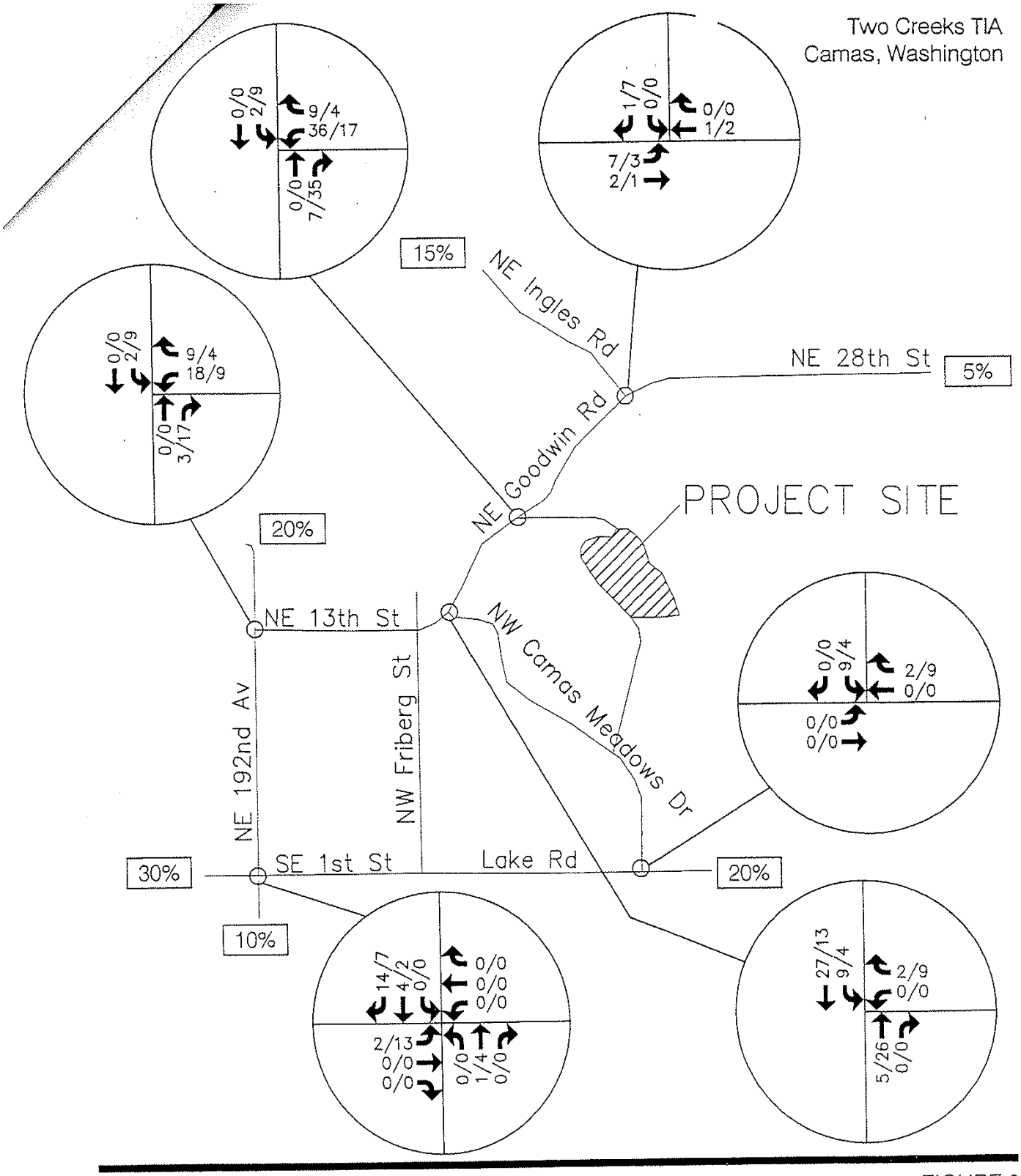
Based on the trip distribution pattern above, the project-generated trip impact at the following study area intersection was calculated:

- NE Everett Street (SR 500)/NE 43rd Avenue
- NE Everett Street (SR 500)/NE Lake Road
- SE 277th Avenue/ SE Nourse Road
- SE 283rd Avenue/SE Crown Road/SE Nourse Road
- SE Crown Road/NE 3rd Avenue

Table 2 summarizes the A.M. and P.M. peak hour traffic impacts created by the North Hills Subdivision at the study area intersections.

Table 2. Project Trip Impact Summary

	A.M. Peak			P.M. Peak		
	In	Out	Total	In	Out	Total
NE Everett St/NE 43rd Av	4	11	15	12	8	20
NE Everett St/NE Lake Rd	3	8	11	9	6	15
SE 277th Av/SE Nourse Rd	10	27	37	32	19	51
SE 283rd Av/SE Crown Rd/SE Nourse Rd	5	15	20	18	10	28
SE Crown Rd/NE 3rd Av	5	14	19	16	9	25



LEGEND

5/10 A.M. and P.M. Peak Hour Traffic Volumes

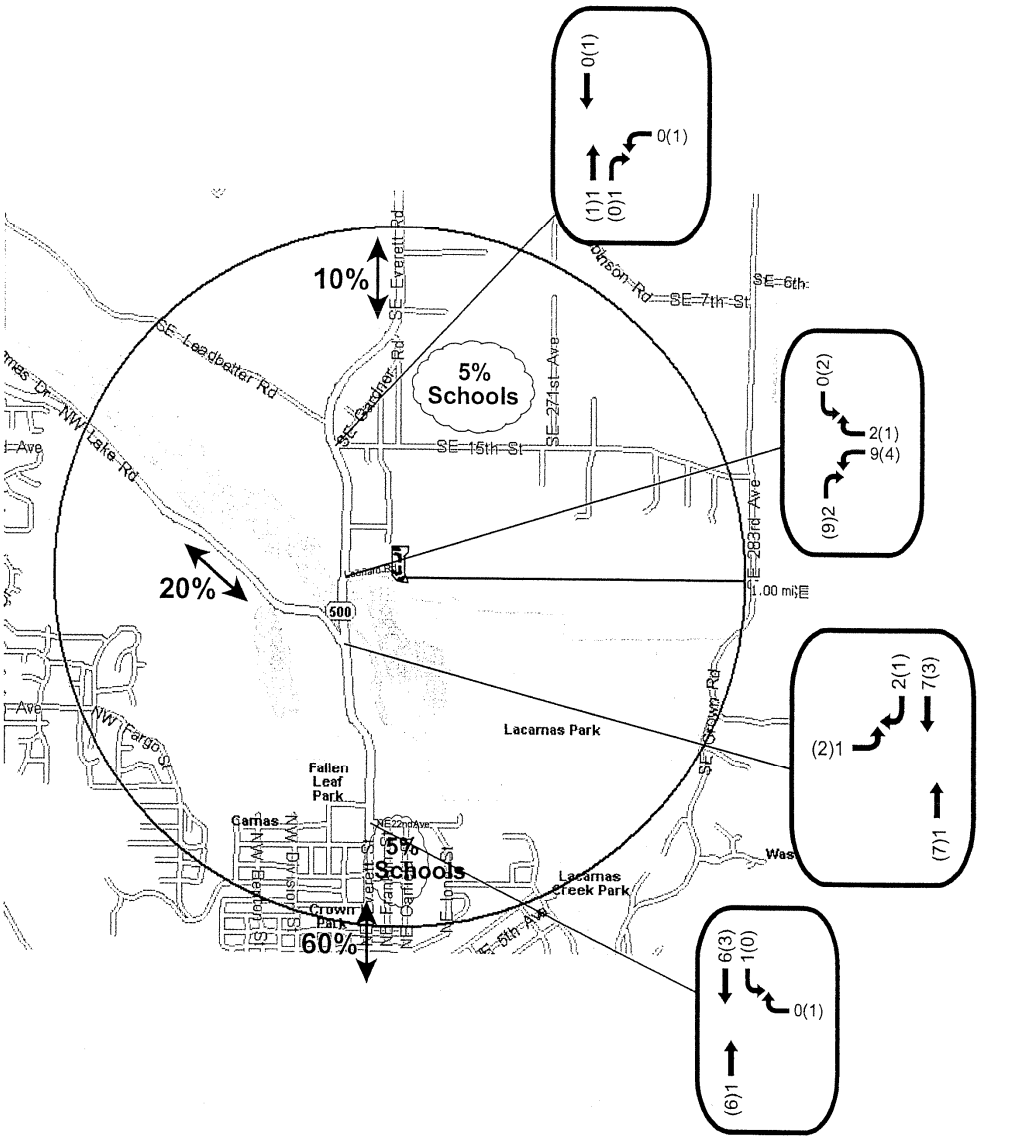
40% A.M. and P.M. Peak Hour Trip Distribution

NOT TO SCALE

FIGURE 6
Trip Distribution and Assignment
Alternative 2 (123 UNITS)
ALT. #1 WAS 112 UNITS

304031.0Figures.dwg

Figure 7: Weekday Peak Hour Traffic Volumes Generated By Vintage View On The Lake



	IN	OUT
AM	2	11
PM	11	5

Traffic Signal
Stop Sign
Proposed Roadway
AM(PM) Peak Hour Volumes

Project Site

Drawing Not To Scale

Vintage View PUD

cts Engineers, Inc.

APPENDIX E

Background Growth (RTC Models)

RTC

RECEIVED
APR 27 2010
VANCOUVER
GROUP MACKENZIE

MEMORANDUM

To: David Holt, Group Mackenzie
From: Mark Harrington, Transportation Analyst
Date: April 23, 2010
Subject: **Select Zone of TAZ 483 – CJ Dens Camas Subdivision – Project 2050186.01**

Enclosed are plots showing auto volumes and distributions (additional volumes) during the PM peak 1 hour for the years 2000 and 2030. TAZ 483 was selected for auto assignment. These assignments are based on the 2030 MTP model. If you have any questions, please contact me.

- Scenario 4210: 2000 Base HWY w/ 2000 Demand – TAZ 483 (12 plots)
- Scenario 9010: 2030 MTP w/ 2030 GMA Demand – TAZ 483 (12 plots)
- TAZ Map
- Land Use

TAZ	2000 HH	2000 Retail	2000 Other	2000 Total	2030 HH	2030 Retail	2030 Other	2030 Total
483	81	12	12	24	936	846	2,573	3,419

An invoice will be sent to you under a separate cover for 2 hours of staff time and other costs.

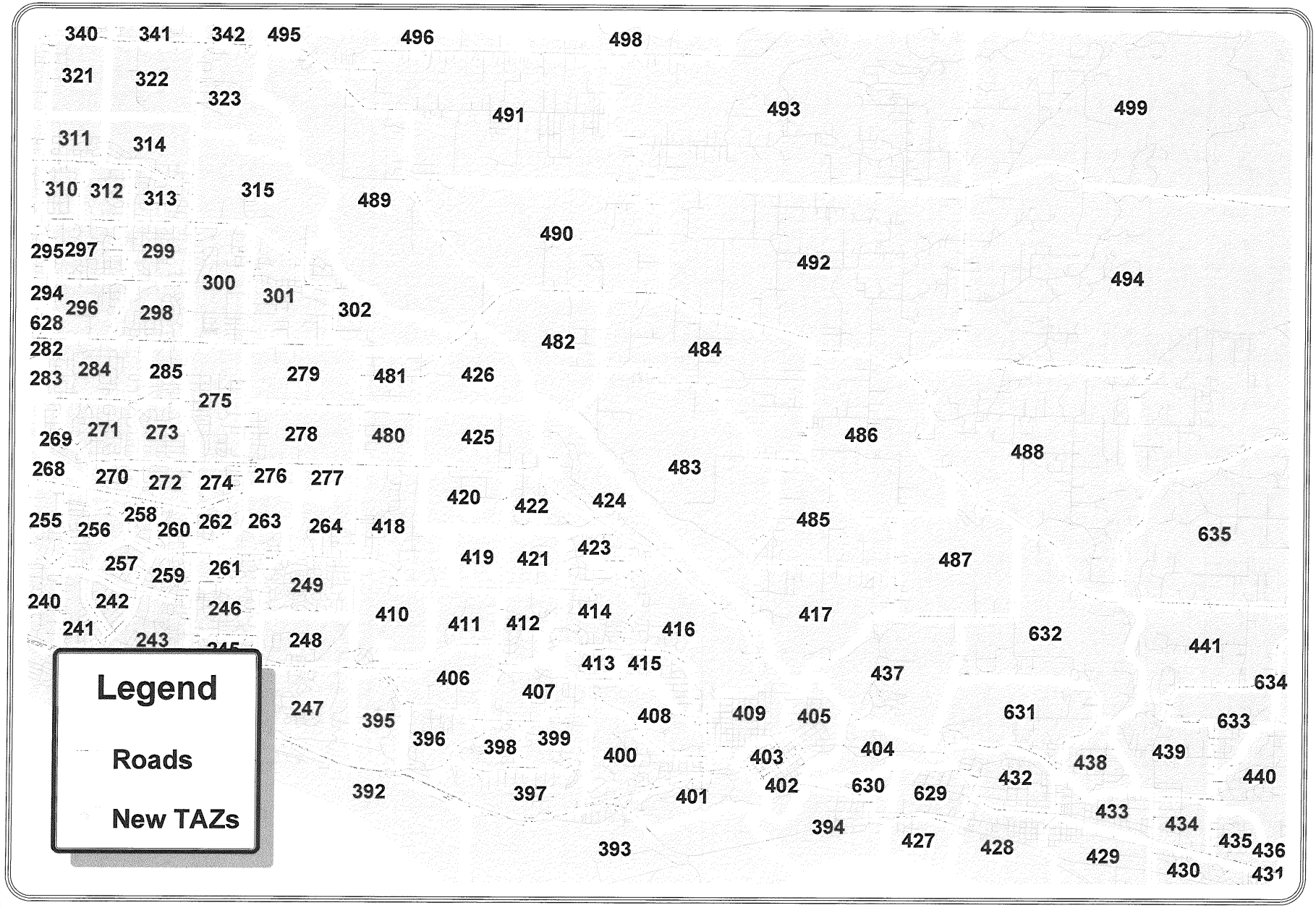
If you have any questions, please let me know.

Enclosures:

cc: Patty Raedy, RTC

Southwest Washington Regional Transportation Council
1300 Franklin Street, Floor 4 P.O. Box 1366 Vancouver, Washington 98666-1366 360-397-6067 fax: 360-397-6132 http://www.rtc.wa.gov/

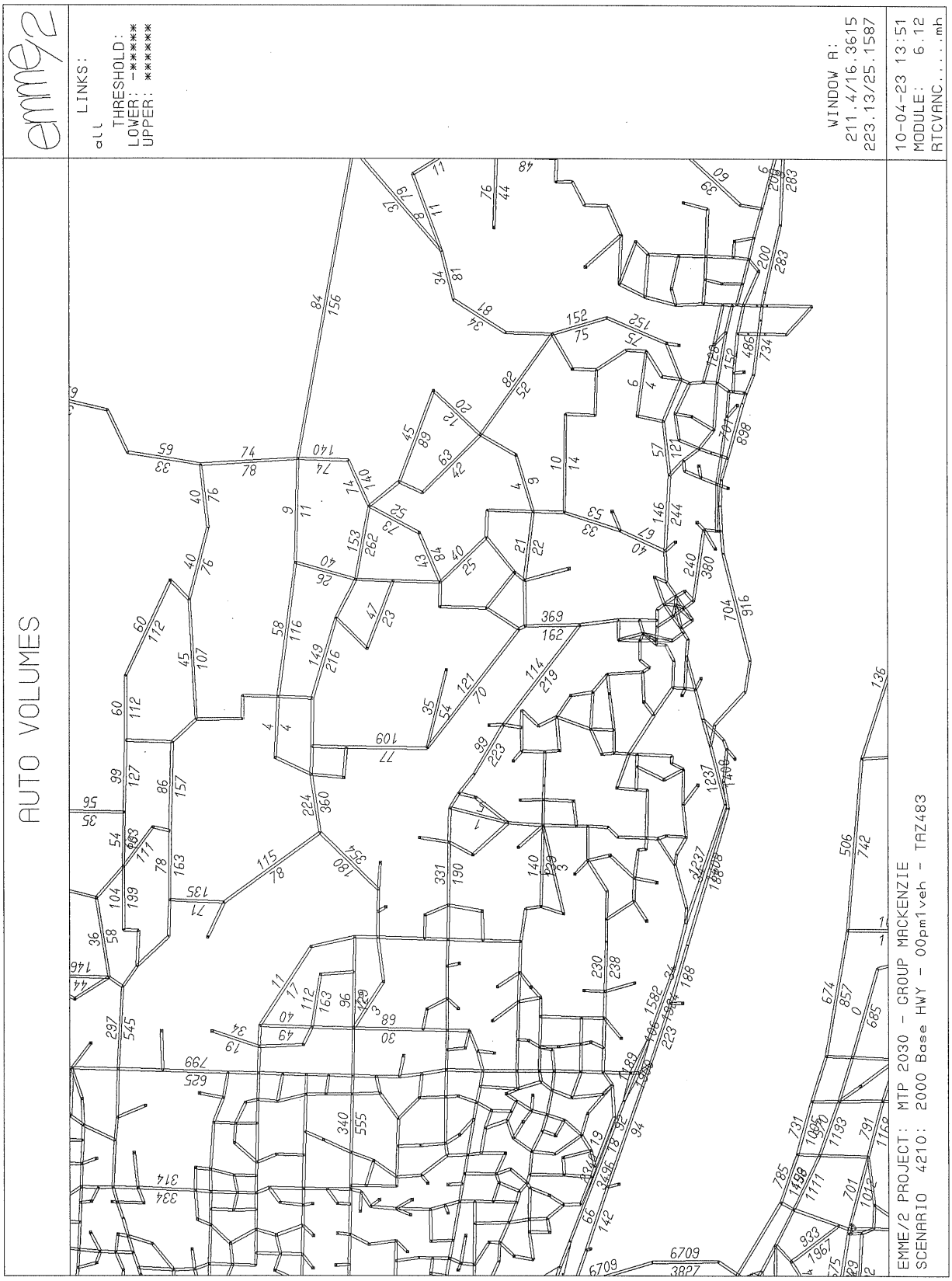
TAZ MAP



Legend

Roads

New TAZs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223.13/25.1587
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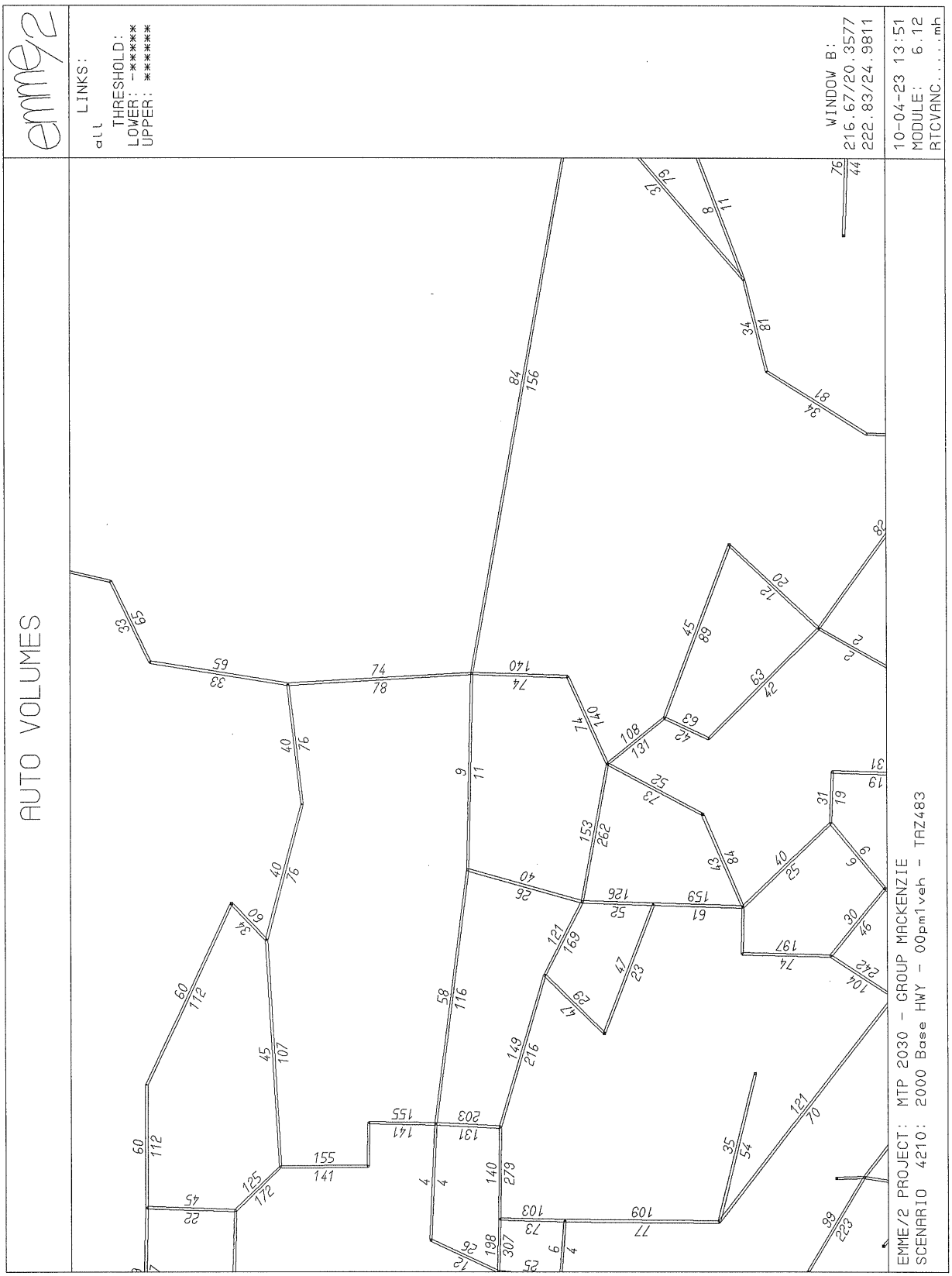
SCENARIO 4210: 2000 Base HWY - 00pm1veh - TAZ483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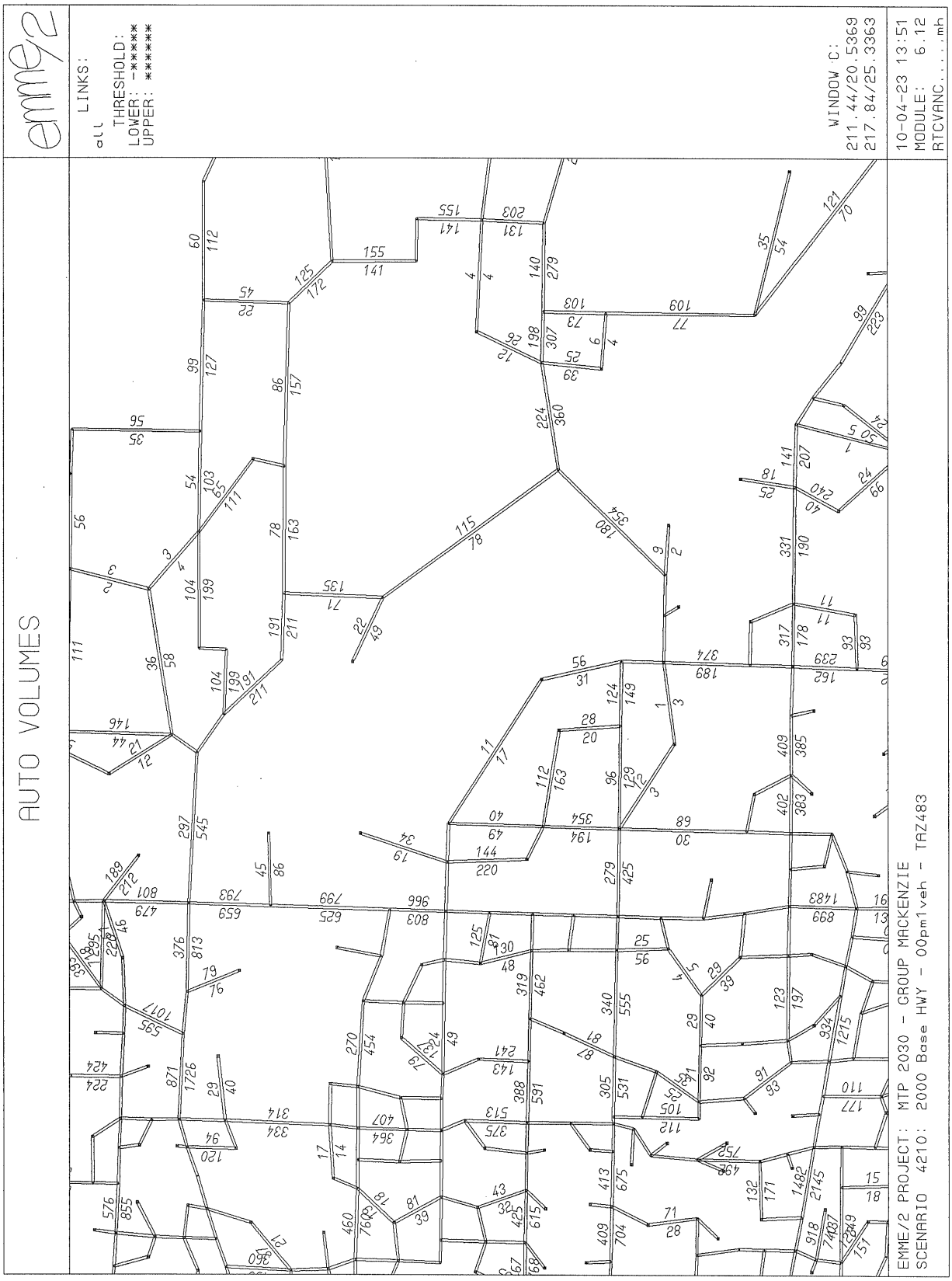
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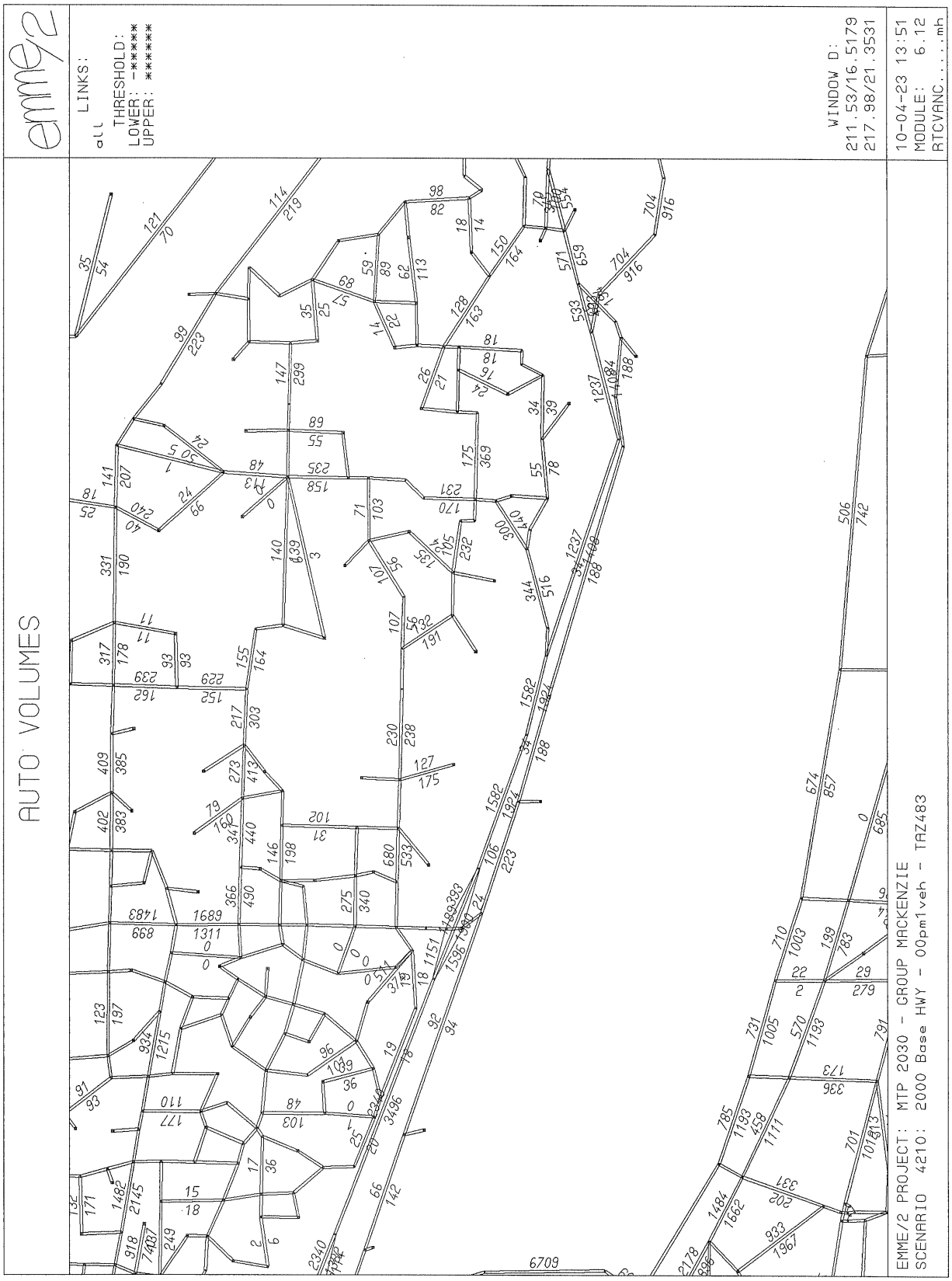
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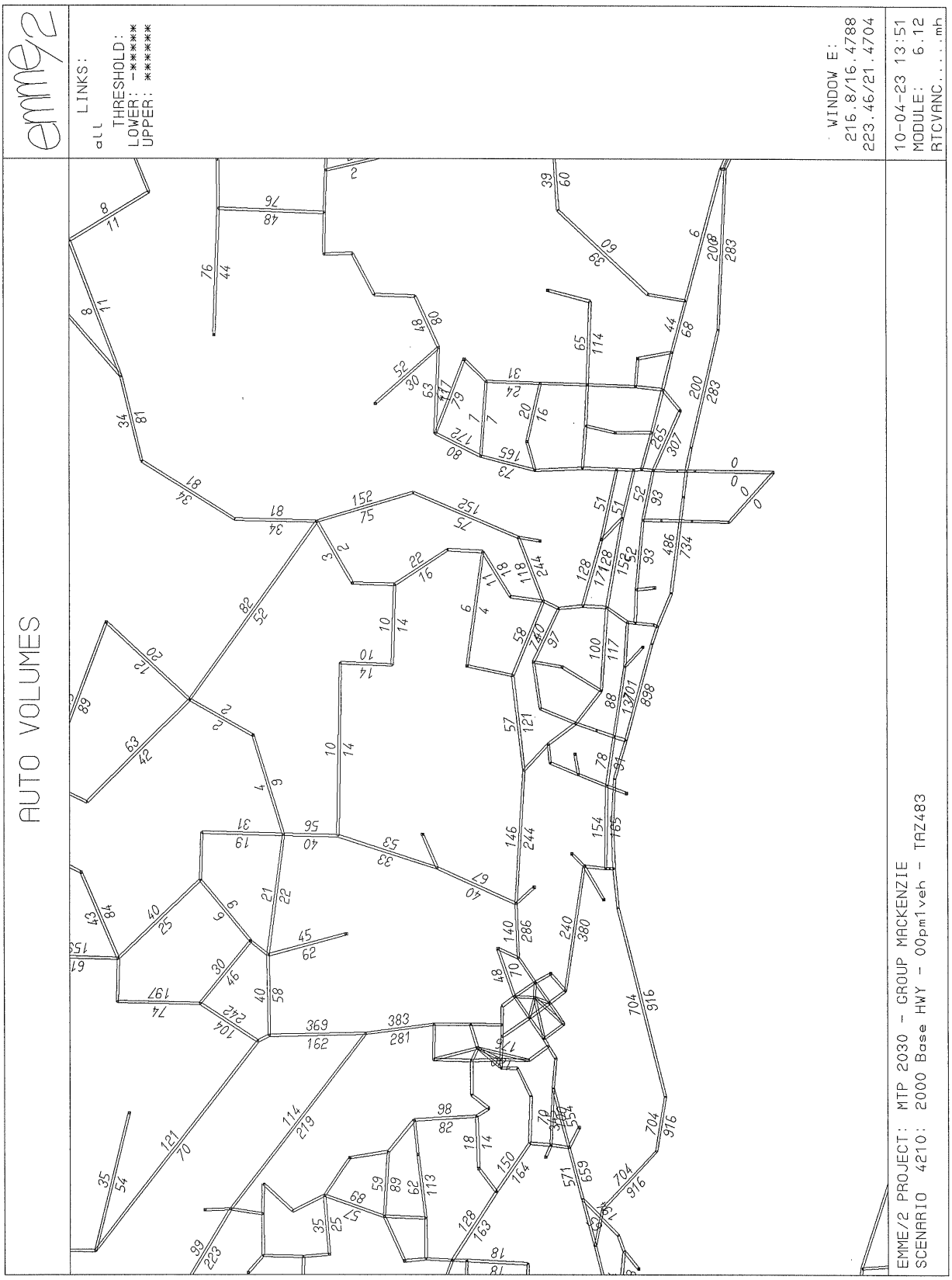
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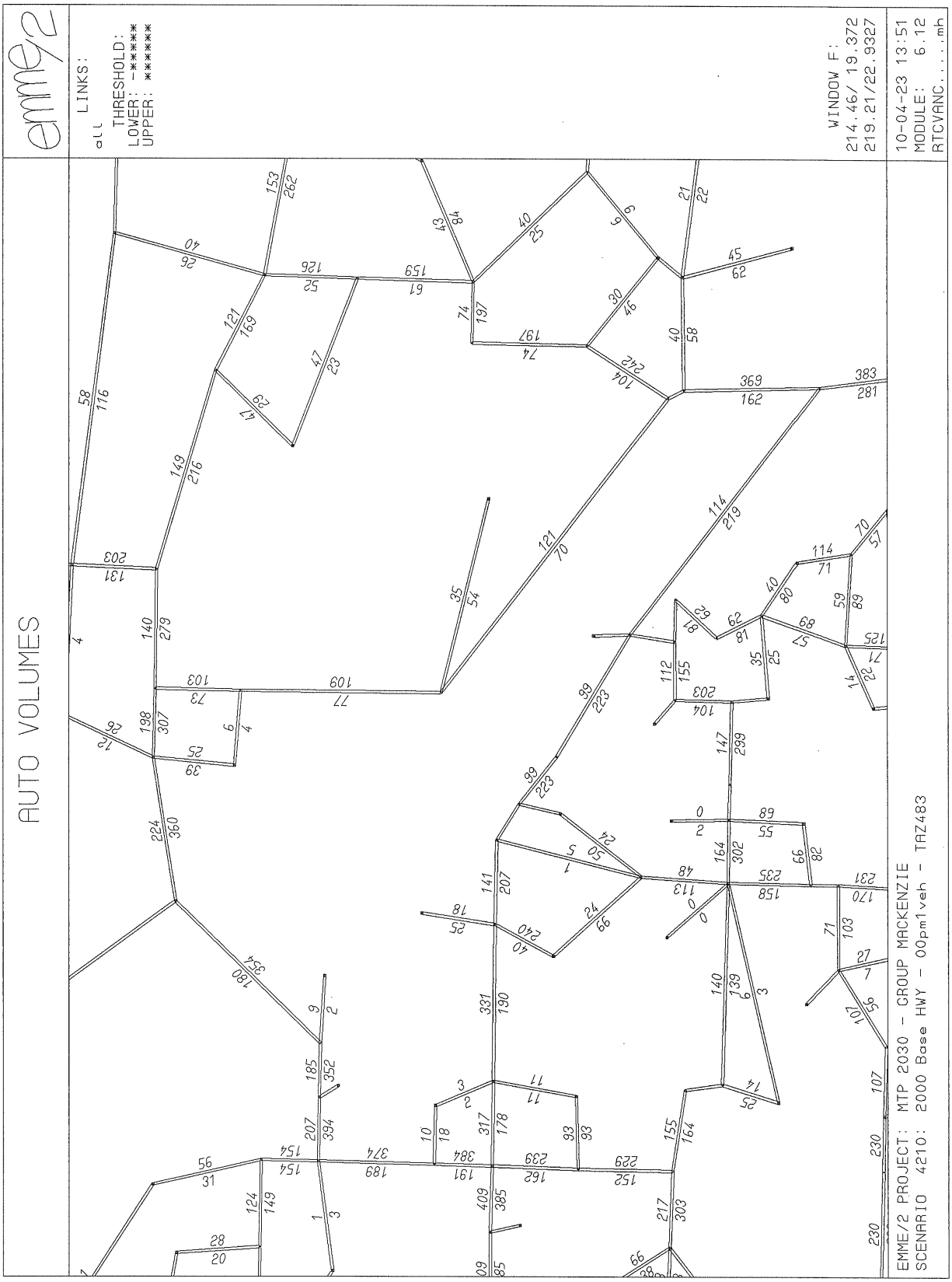
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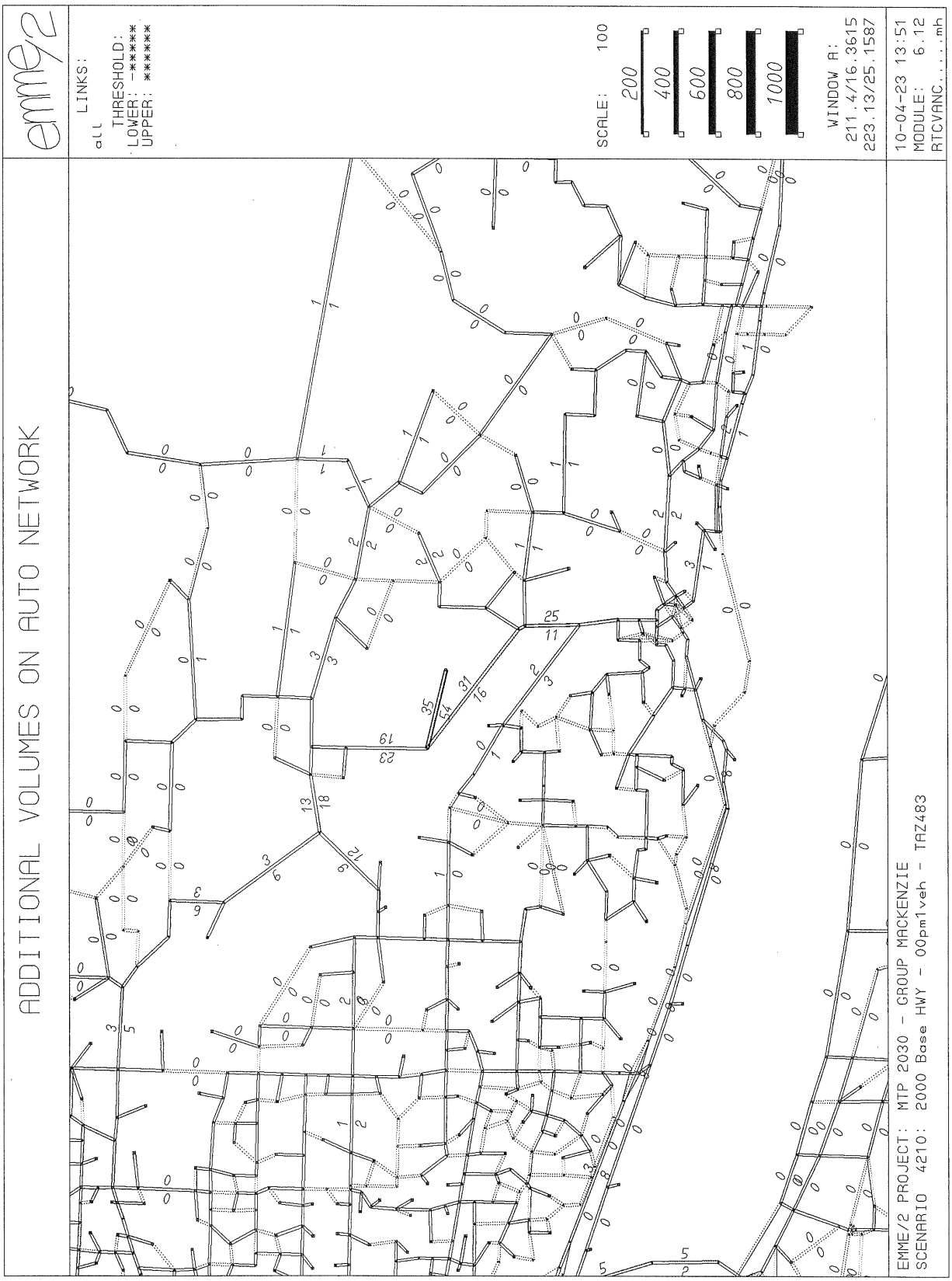
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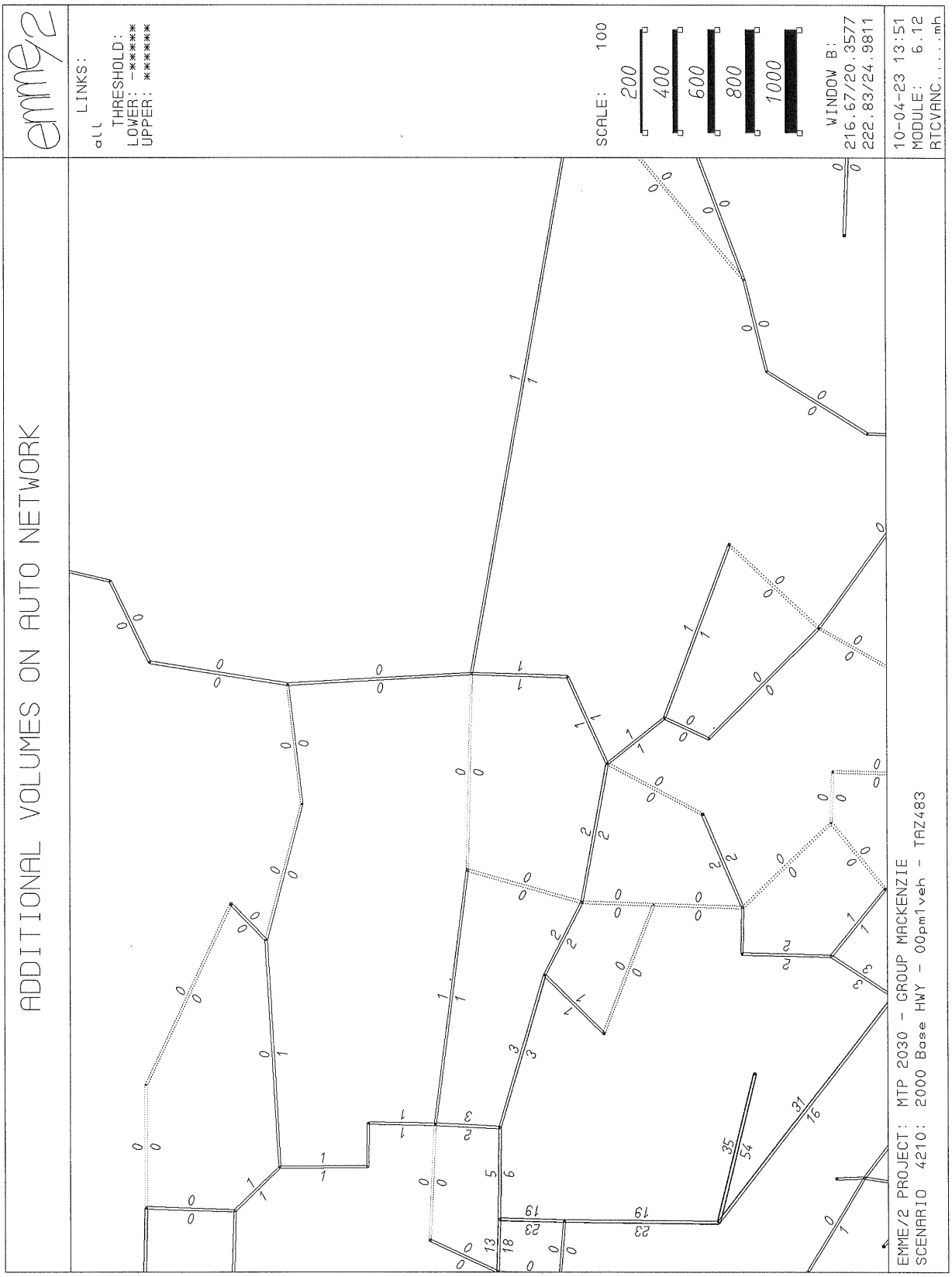
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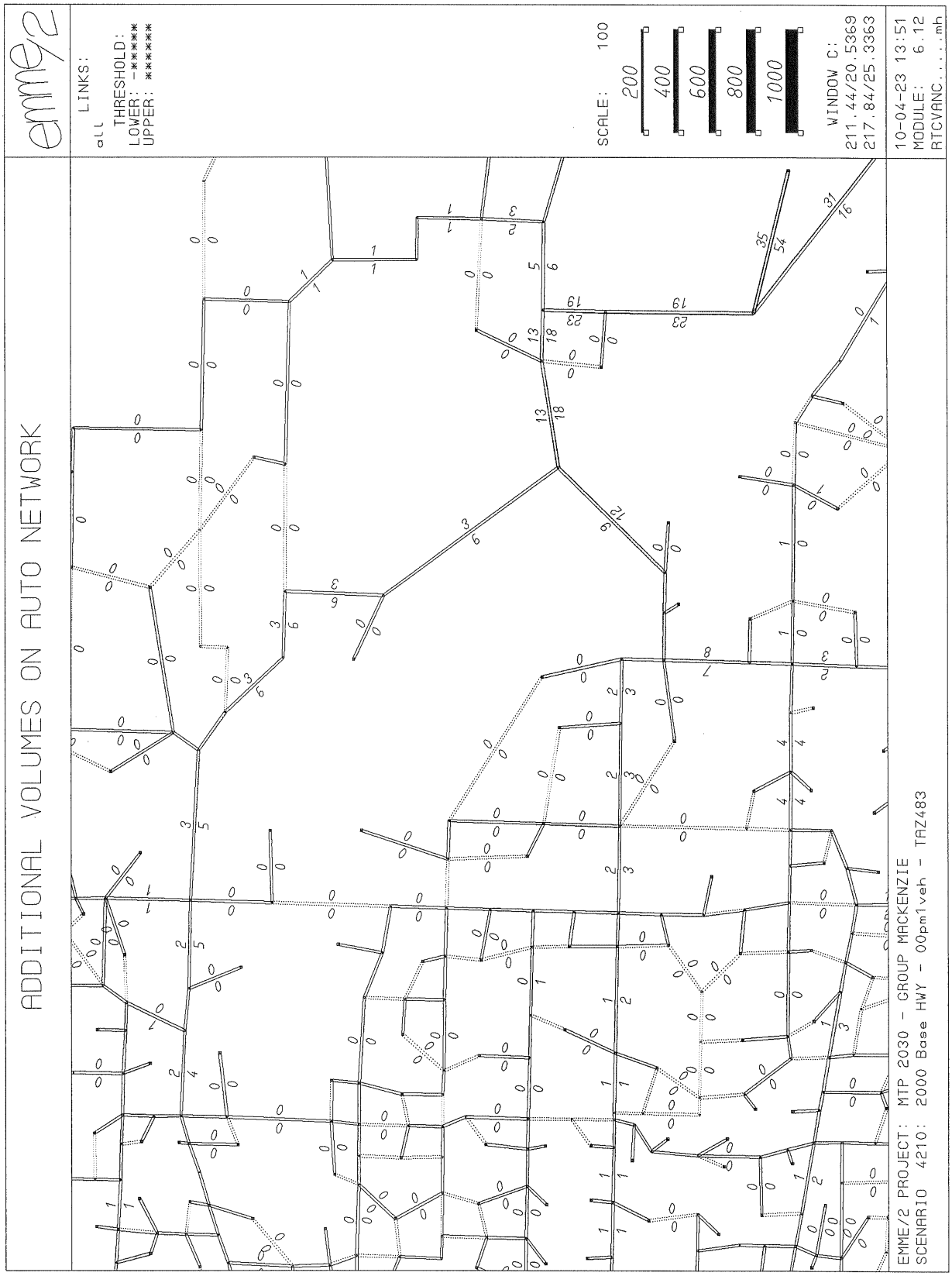
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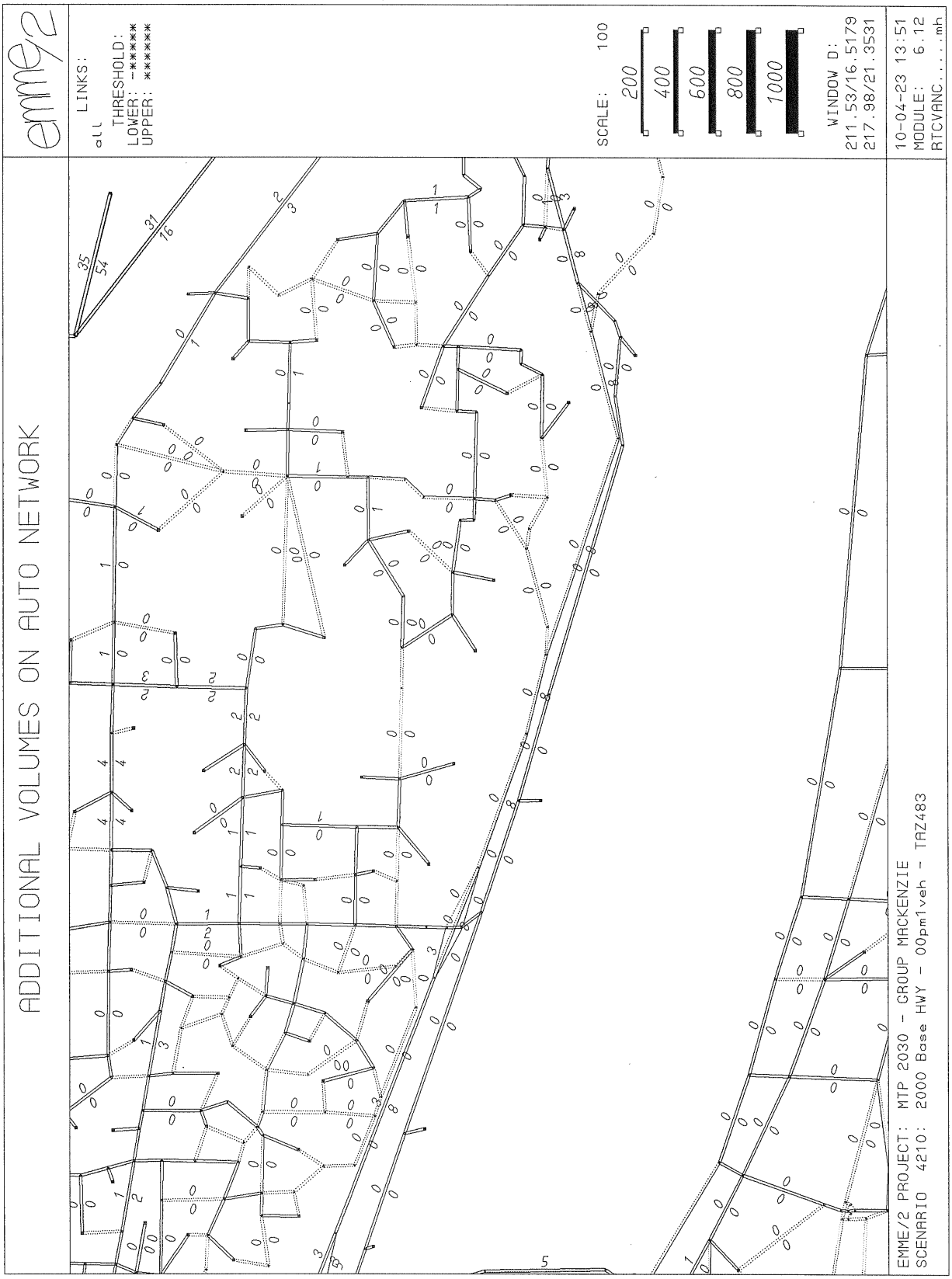
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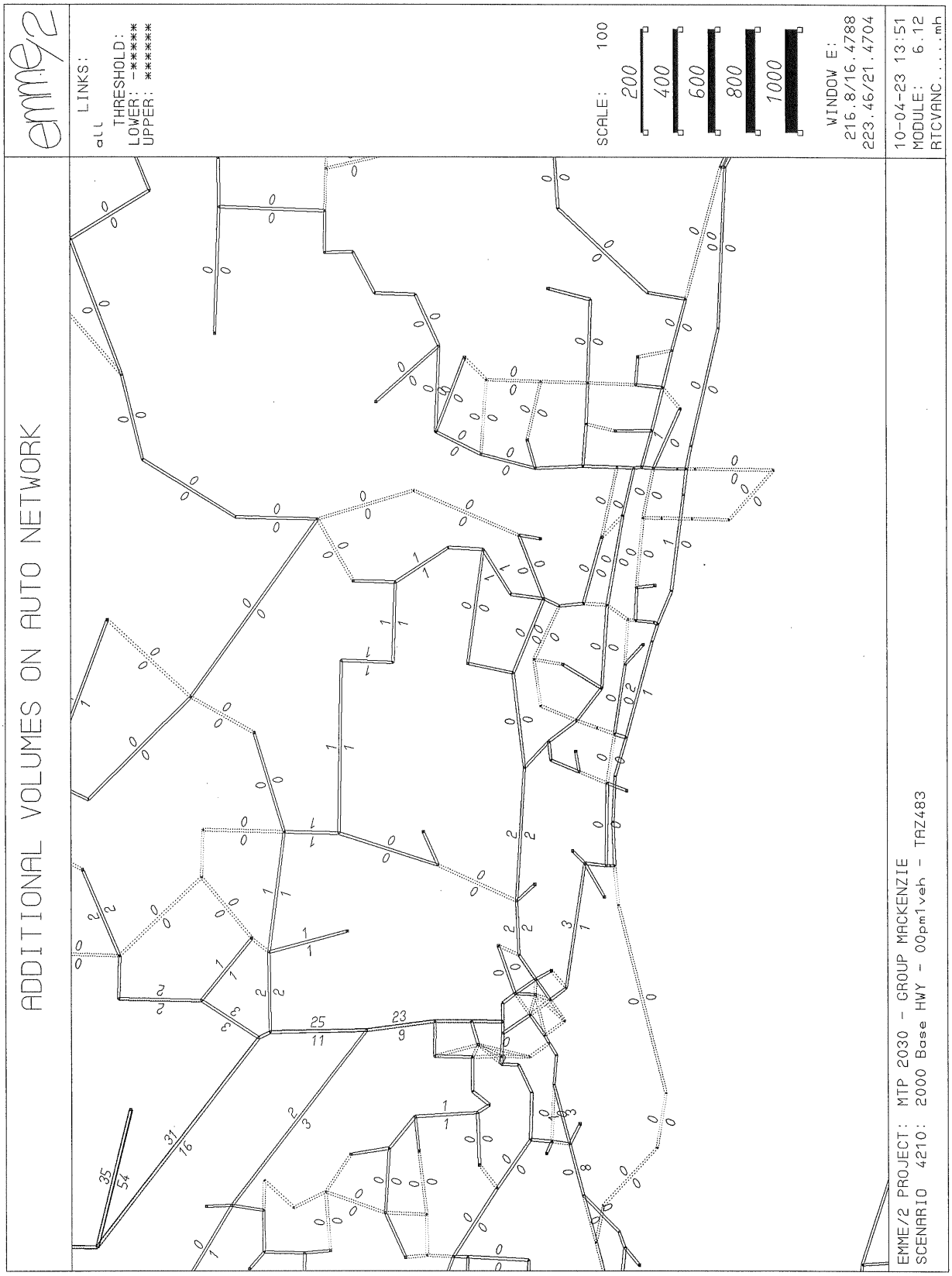
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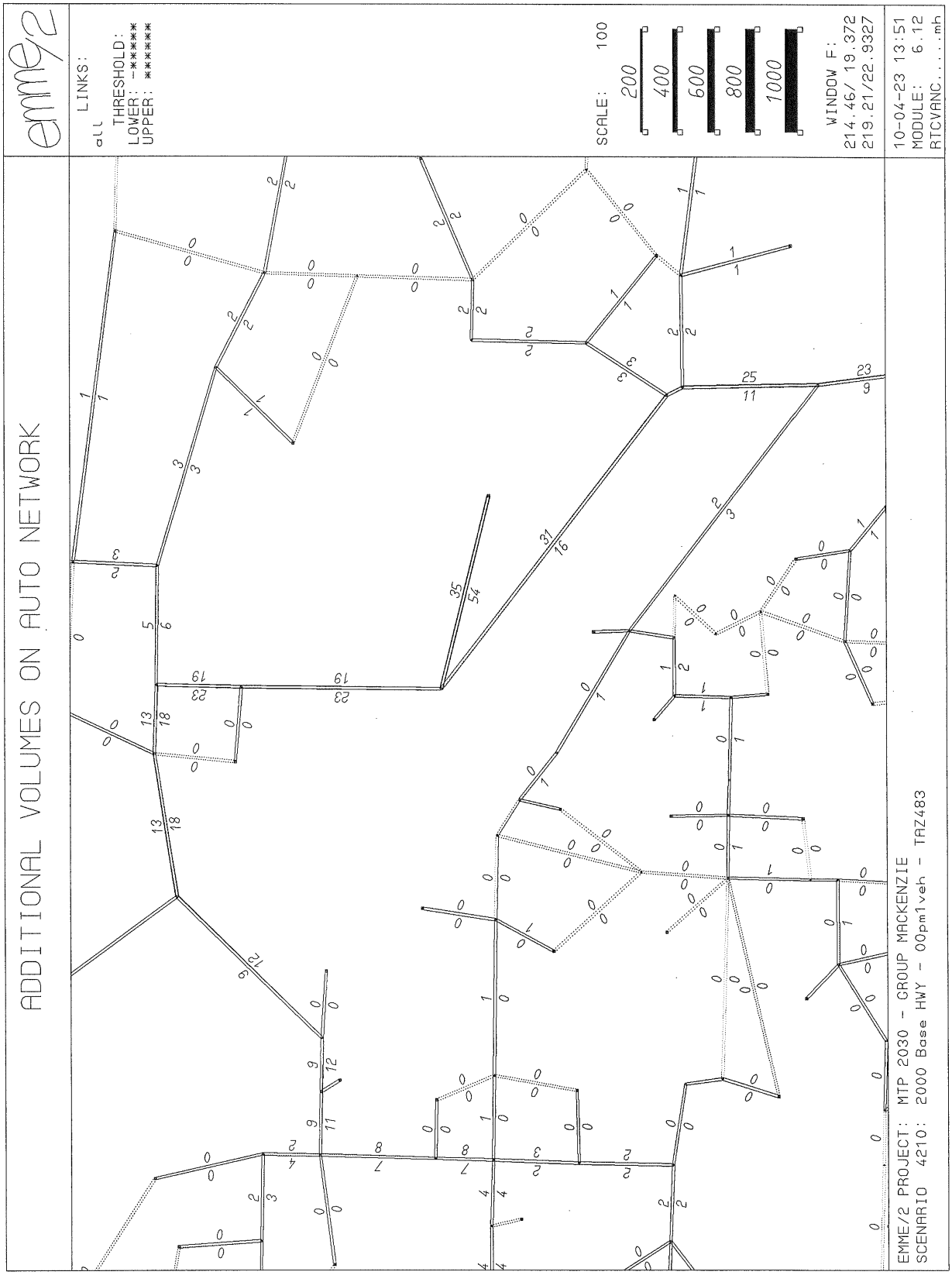
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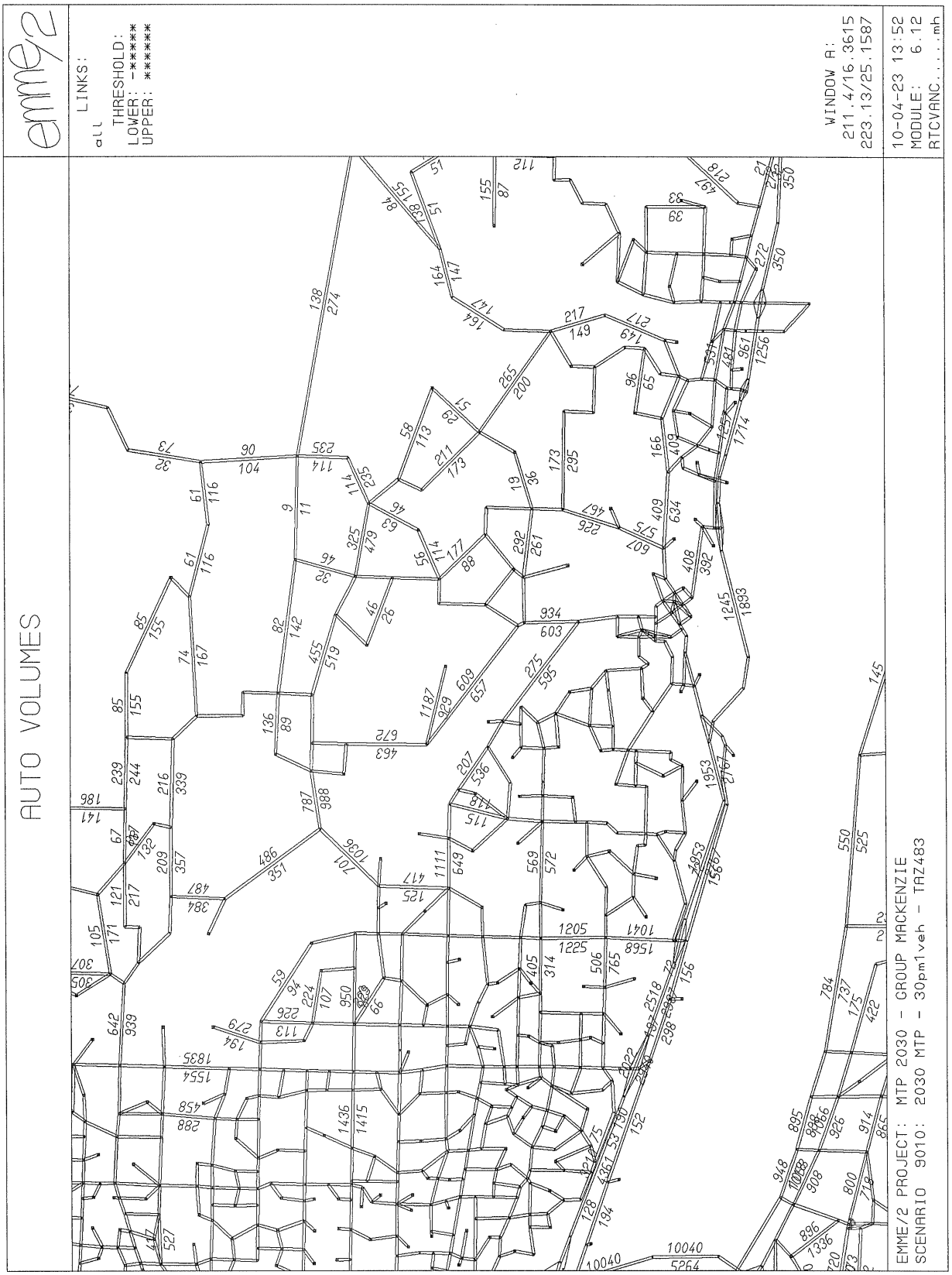
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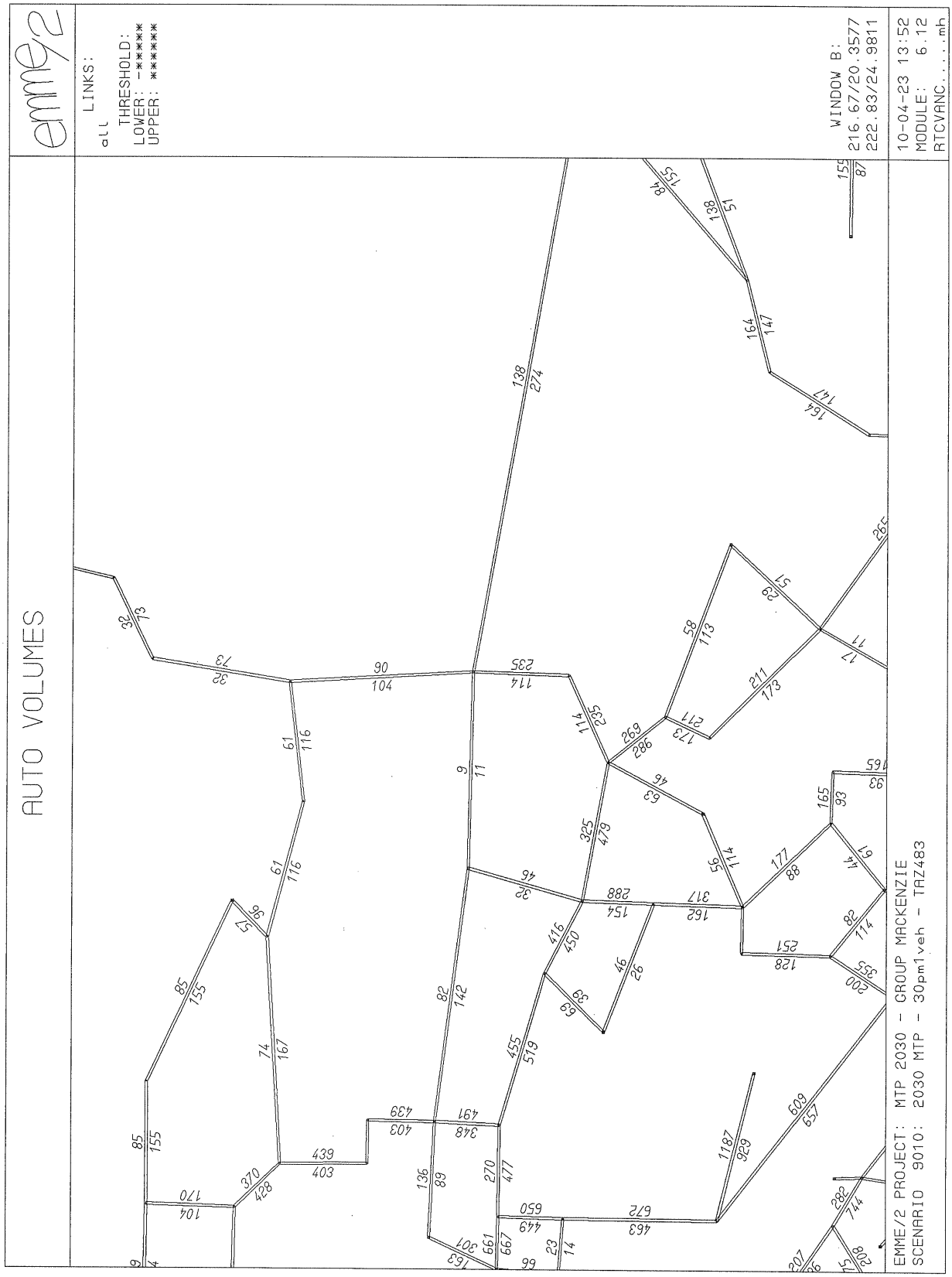
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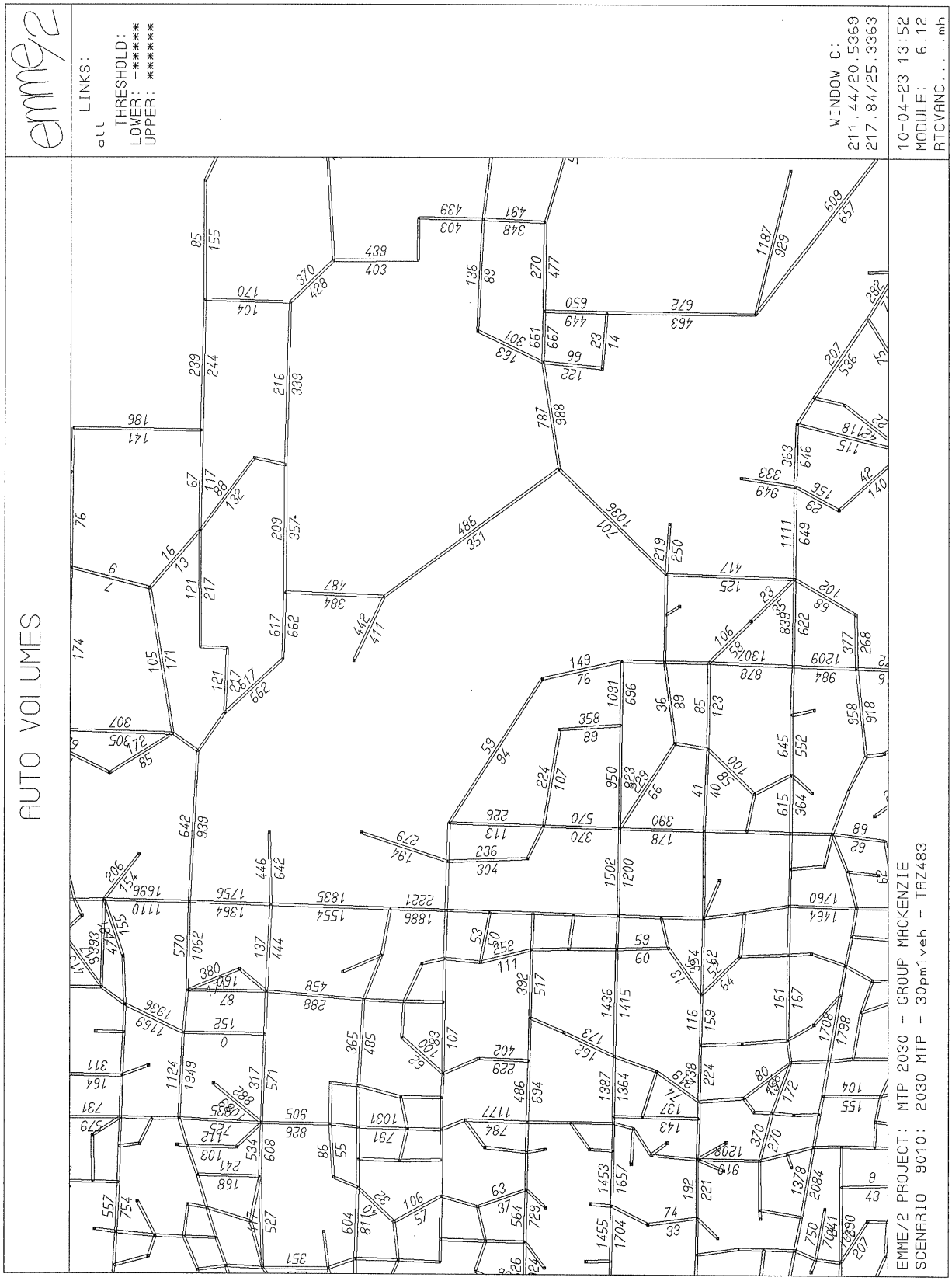
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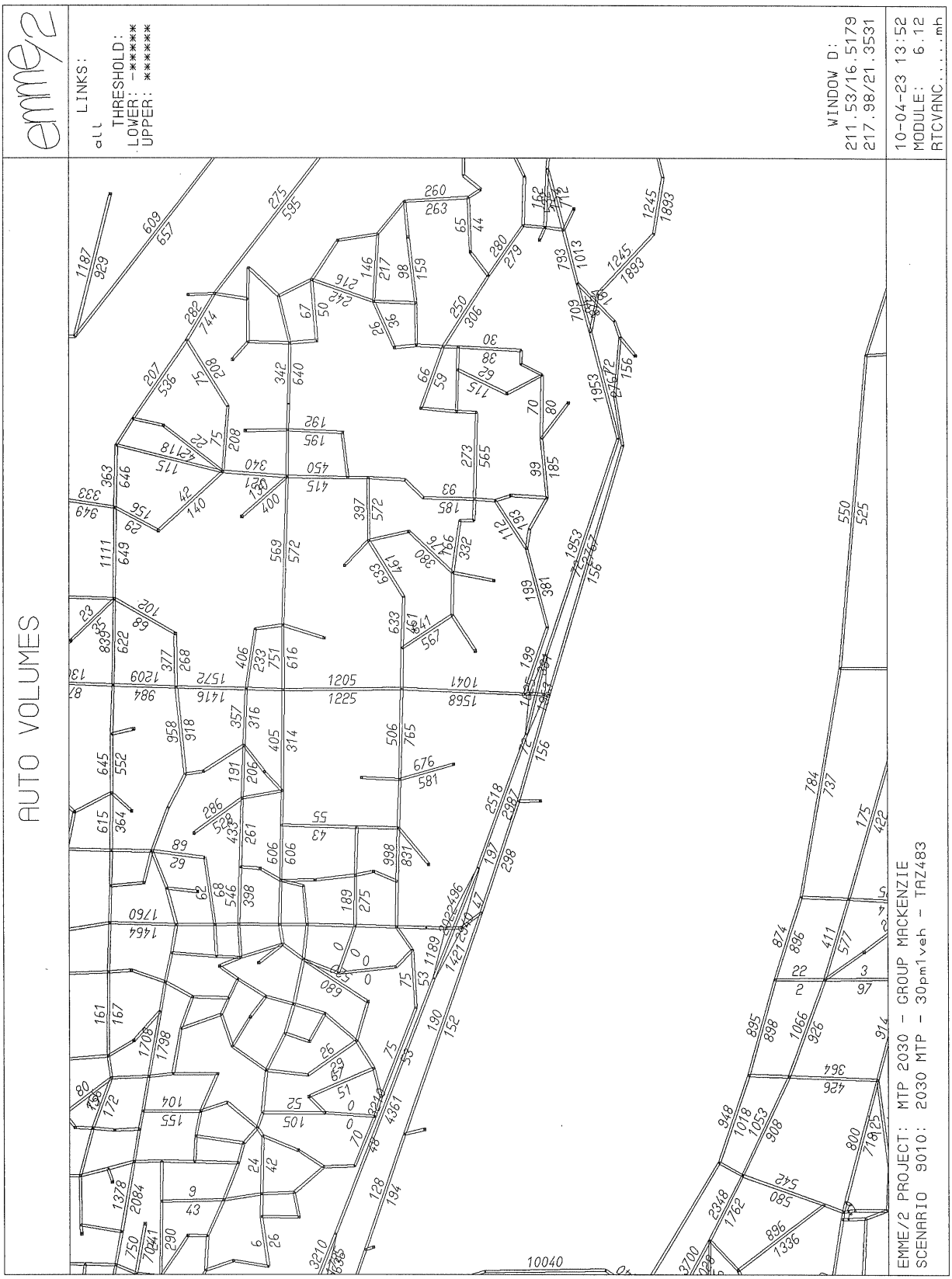
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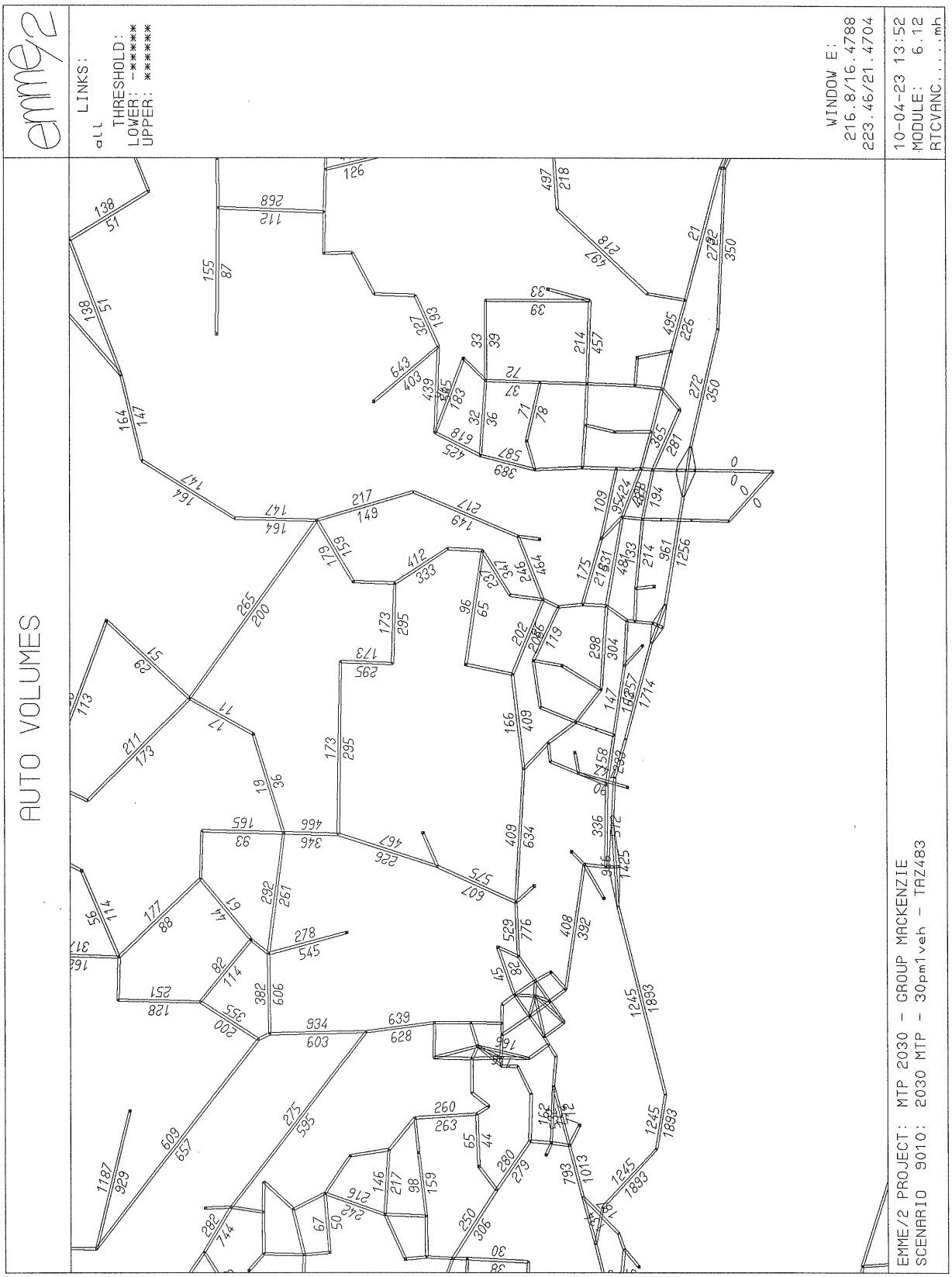
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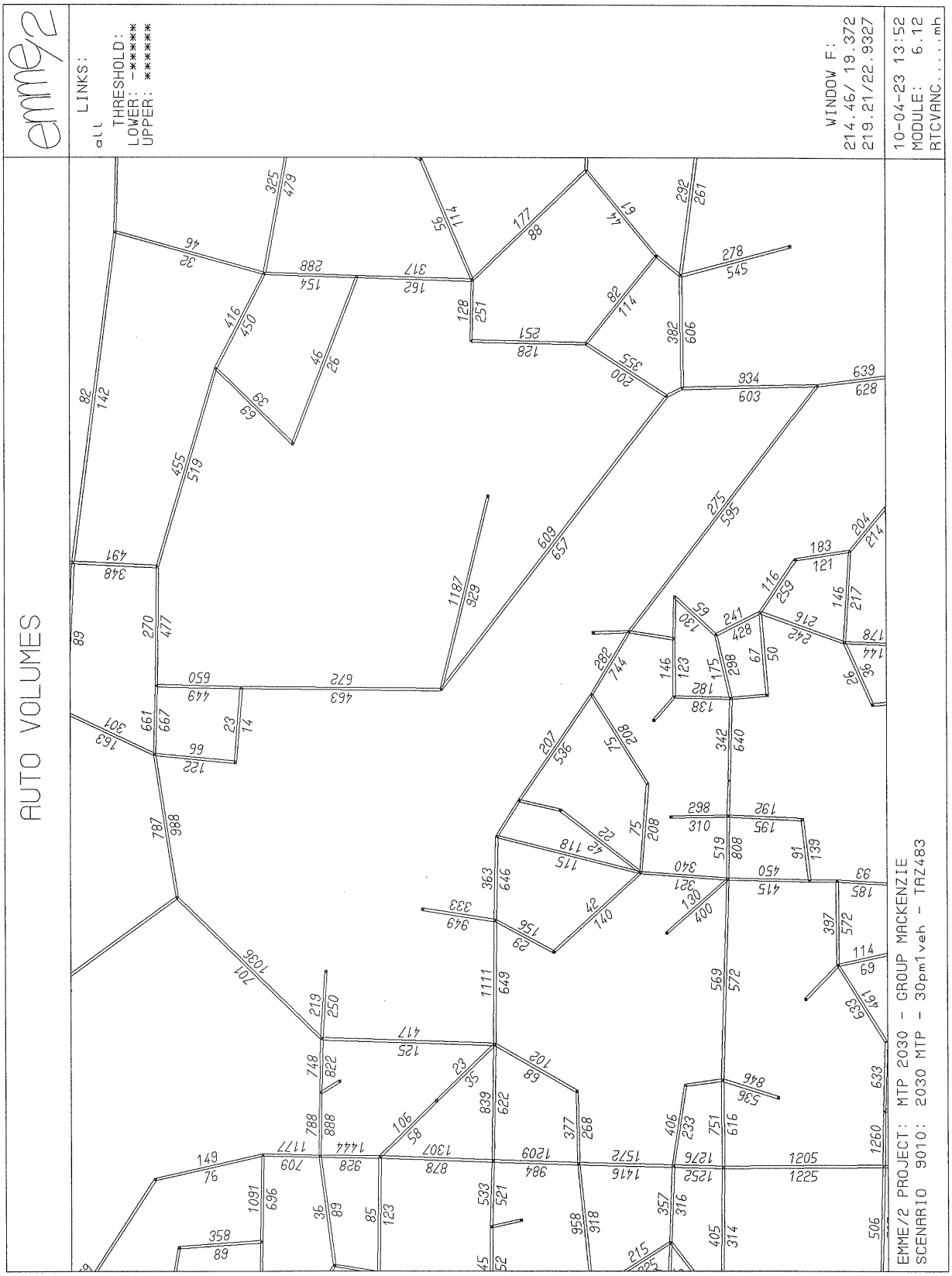
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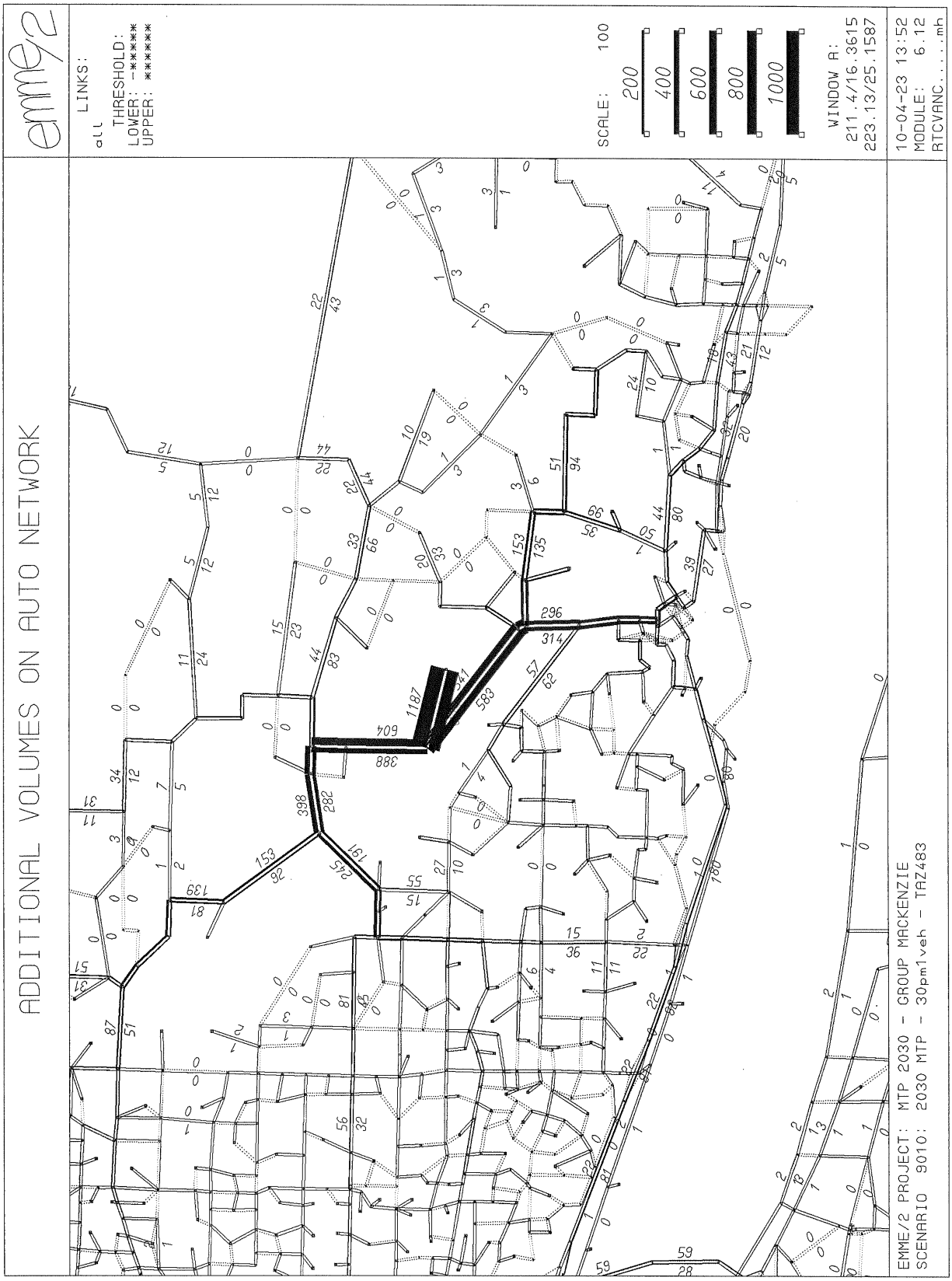
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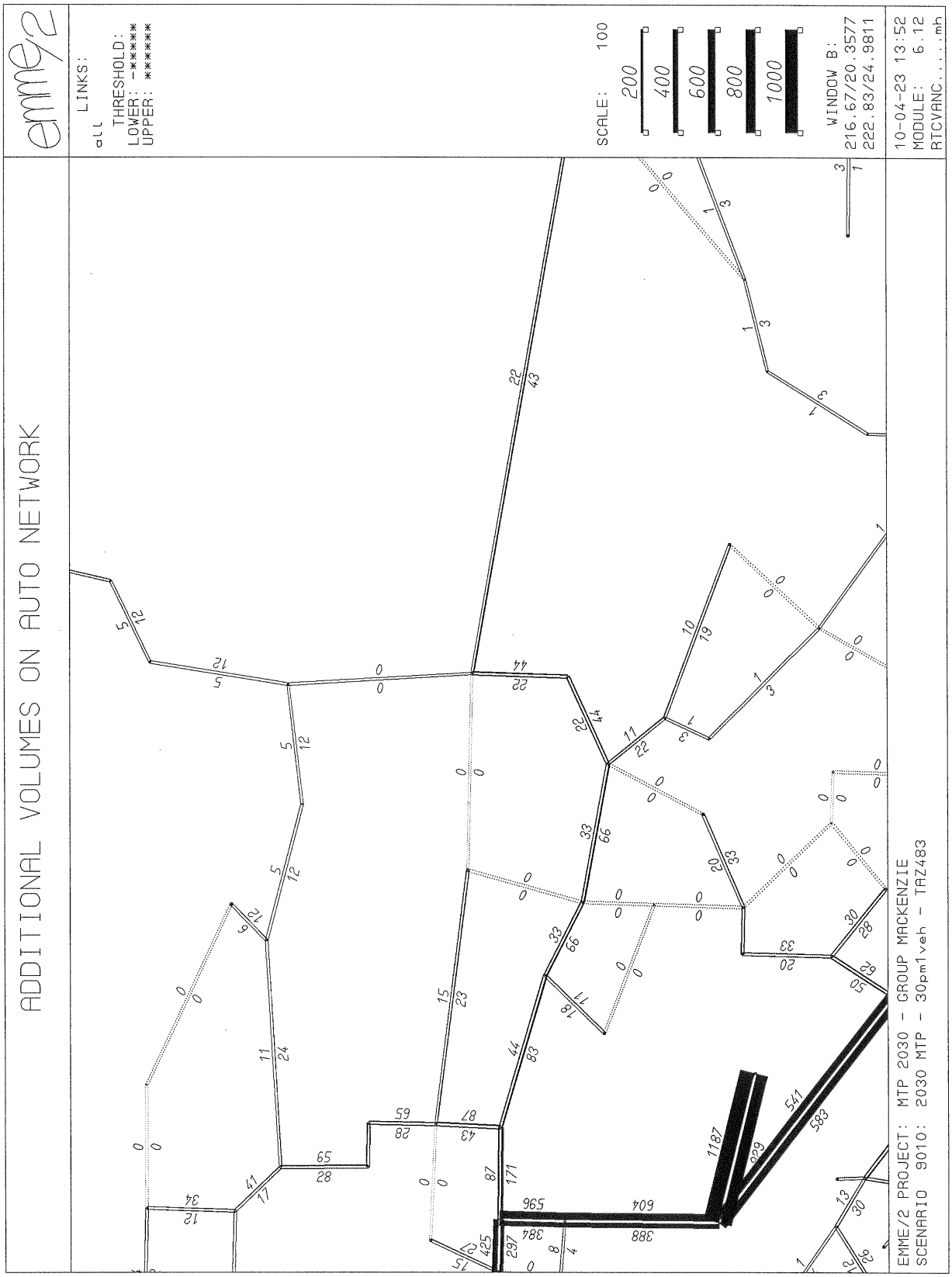
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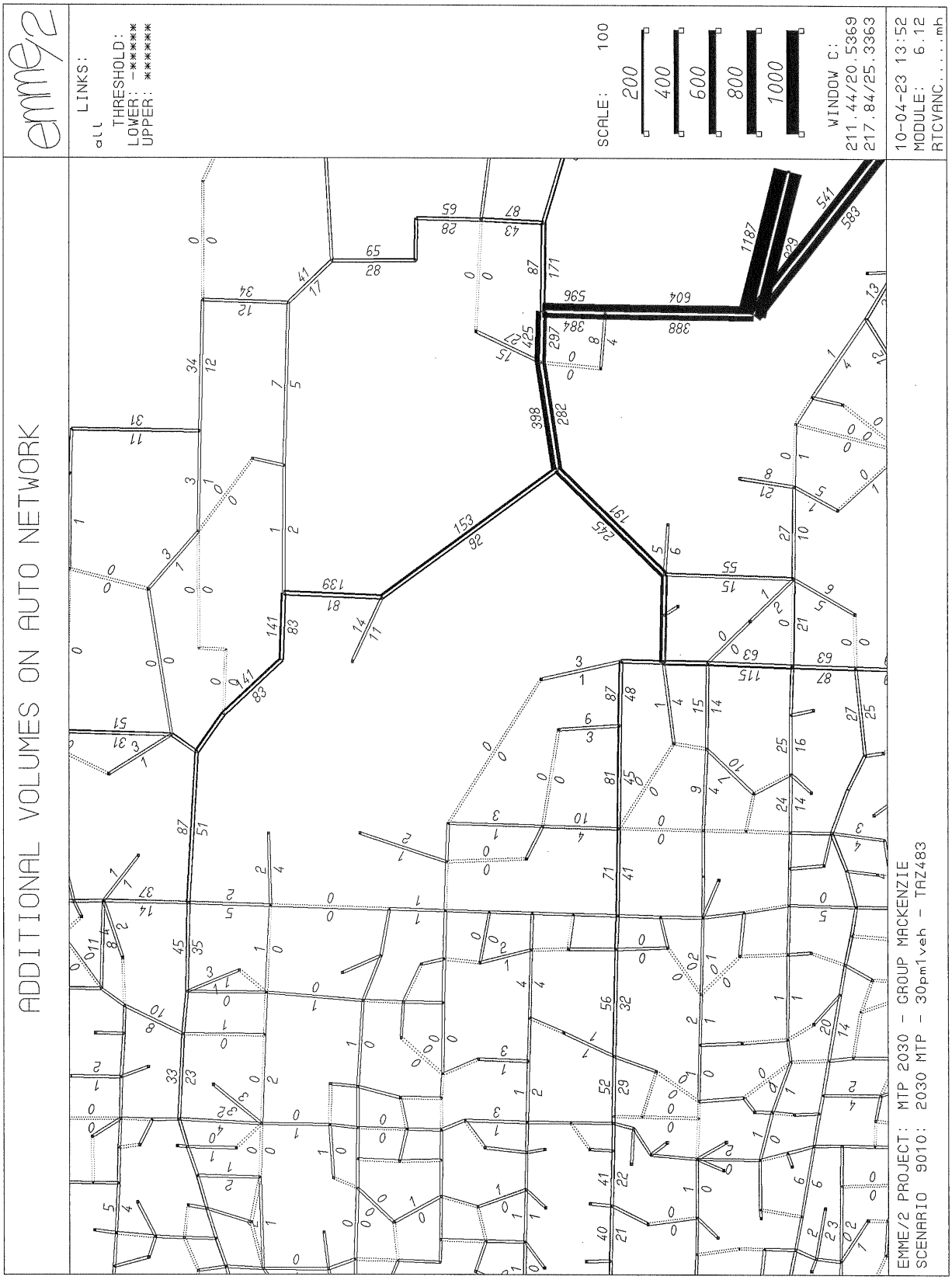
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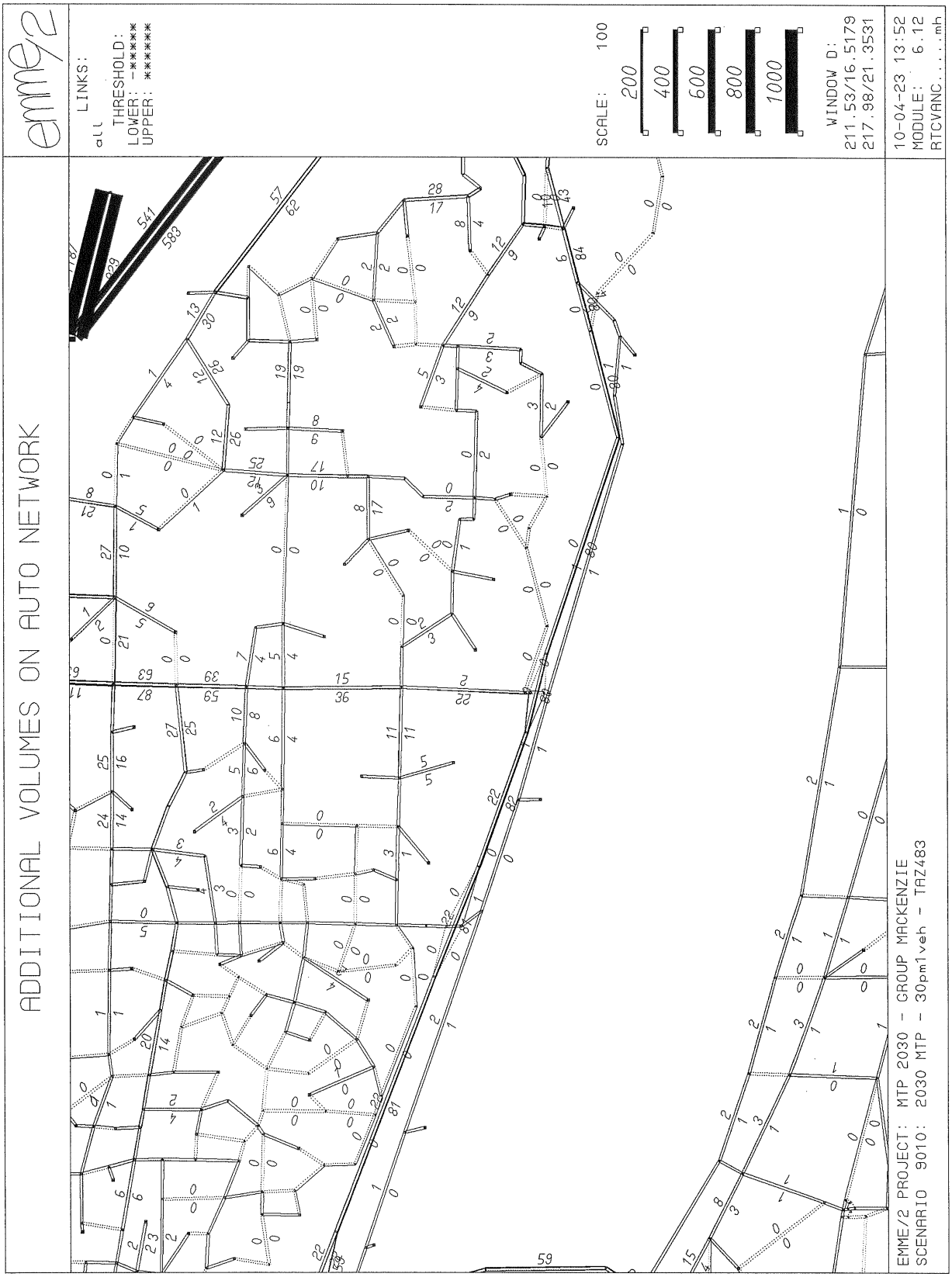
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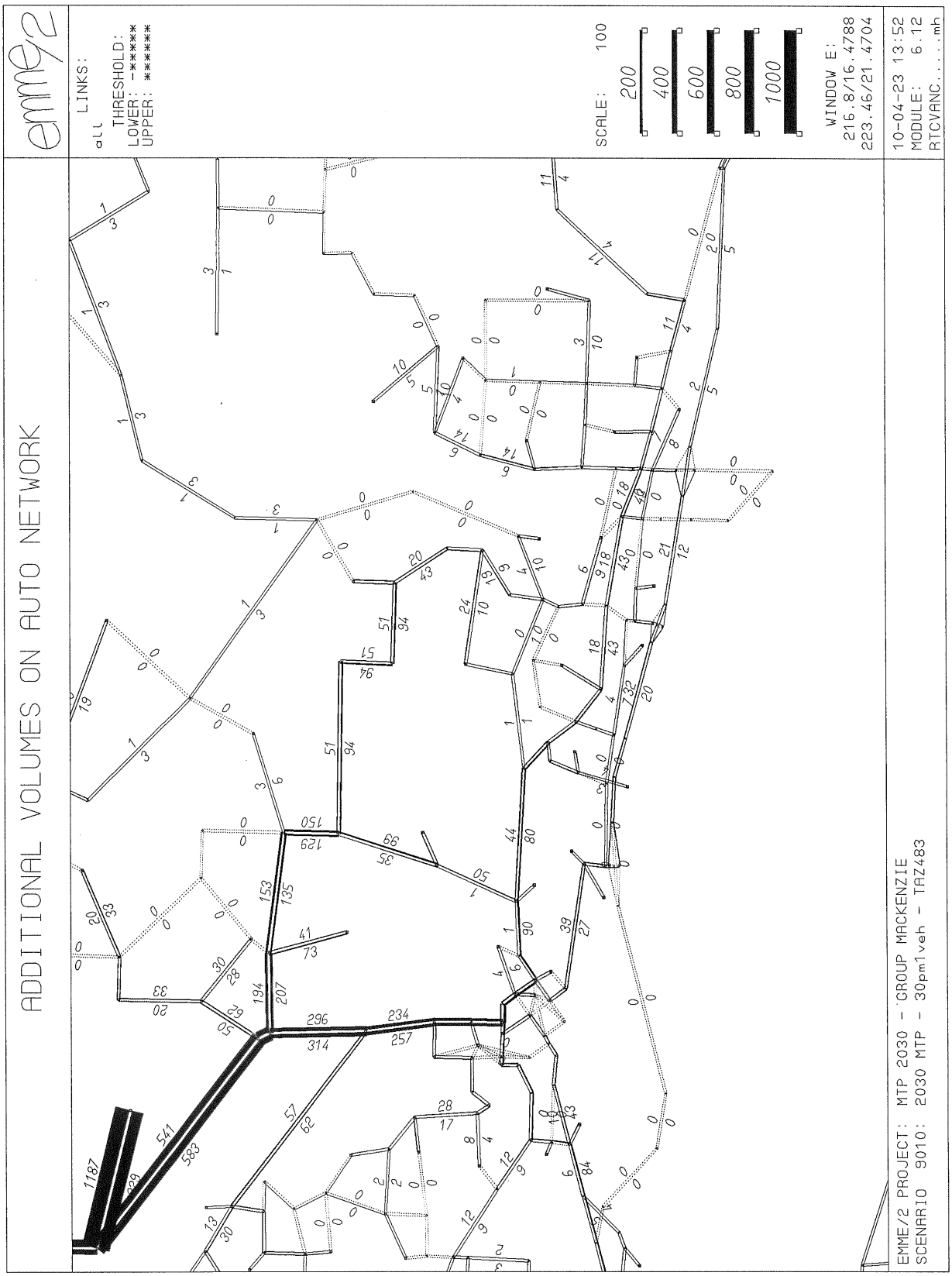
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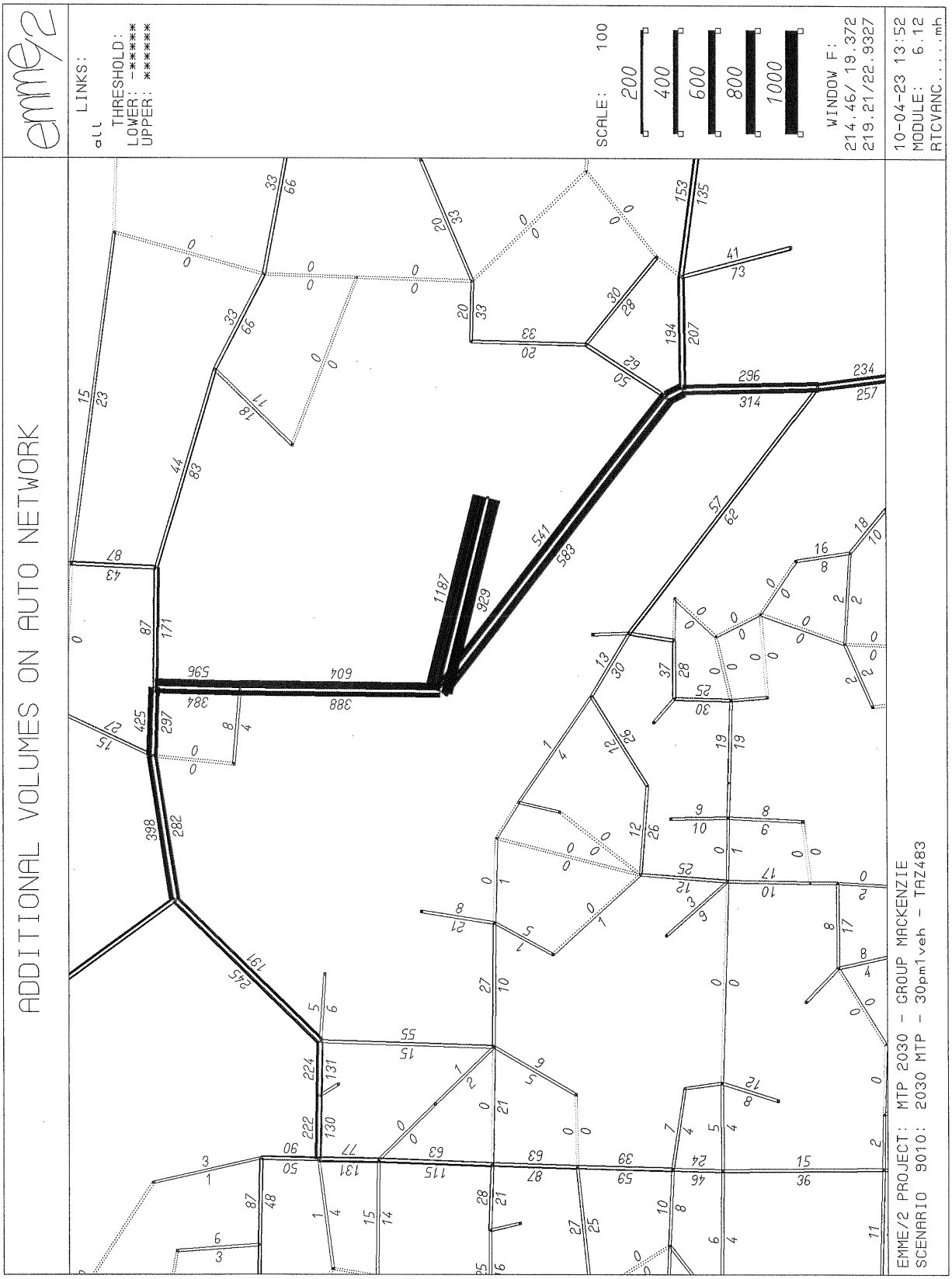
RTCVANC.....mh
EMME/2 PROJECT: MTP 2030 - GROUP MACKENZIE
SCENARIO 9010: 2030 MTP - 30pm1veh - TAZ483


emme/2
LINKS:
all
THRESHOLD:
LOWER: ******
UPPER: ******
SCALE: 100
200
400
600
800
1000
WINDOW F:
214.46/ 19.372
219.21/22.9327
10-04-23 13:52
MODULE: 6.12
RTCVANC.....mh
ADDITIONAL VOLUMES ON AUTO NETWORK
EMME/2 PROJECT: MTP 2030 - GROUP MACKENZIE
SCENARIO 9010: 2030 MTP - 30pm1veh - TAZ483

APPENDIX F

Signal Plans

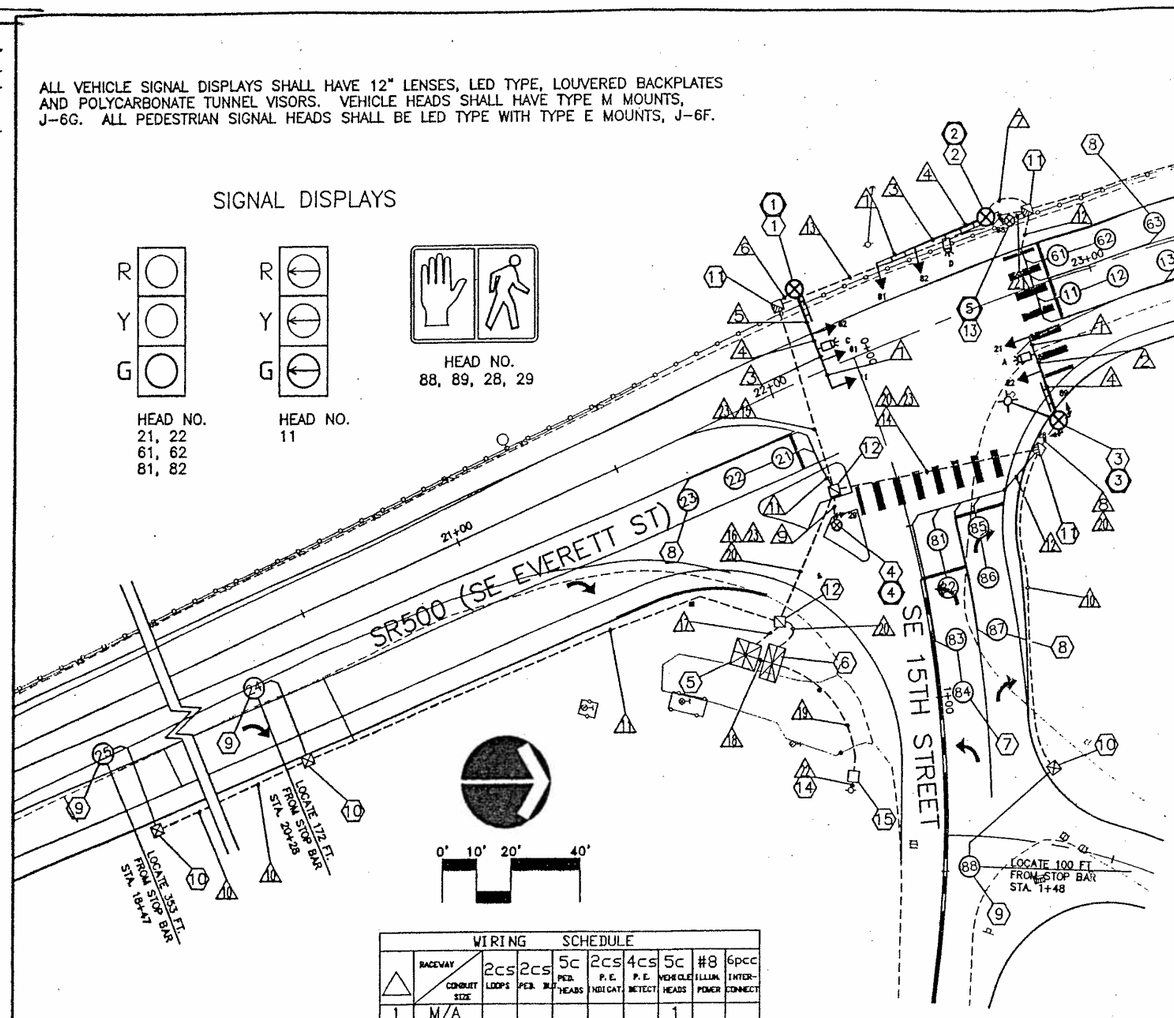
ALL VEHICLE SIGNAL DISPLAYS SHALL HAVE 12" LENSES, LED TYPE, LOUVERED BACKPLATES AND POLYCARBONATE TUNNEL VISORS. VEHICLE HEADS SHALL HAVE TYPE M MOUNTS, J-6G. ALL PEDESTRIAN SIGNAL HEADS SHALL BE LED TYPE WITH TYPE E MOUNTS, J-6F.

SIGNAL DISPLAYS

HEAD NO.
21, 22
61, 62
81, 82

HEAD NO.
11

HEAD NO.
88, 89, 28, 29



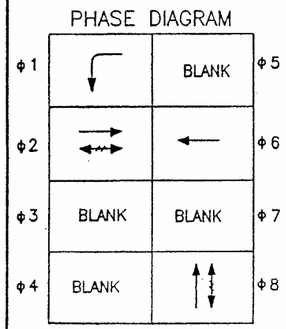
LEGEND

- VEHICLE SIGNAL DISPLAY
- PED. SIGNAL DISPLAY
- SIGNAL STANDARD, TYPE PS
- SIGNAL STANDARD, TYPE PPB
- SIGNAL STANDARD, TYPE II
- SIGNAL STANDARD, TYPE III
- JUNCTION BOX TYPE 1
- JUNCTION BOX TYPE 2
- JUNCTION BOX TYPE 3
- MODIFIED TYPE 2 DETECTOR LOOP
- MODIFIED TYPE 1 DETECTOR LOOP
- CONSTRUCTION NOTE
- SIGNAL STANDARD NOTE, SEE SIGNAL STANDARD DETAIL CHART, SHEET C6.4.
- WIRE NOTE
- SIGN MOUNTED ON MAST ARM
- INSTALL CONTROLLER CABINET ON PAD FOUNDATION.
- INSTALL MODIFIED TYPE B SERVICE CABINET. SEE DETAILS SHEET C6.7 AND C6.8.
- PRE-EMPT DETECTOR & INDICATOR
- EXISTING UTILITY POLE
- CONDUIT & CONDUCTOR
- CROSSWALK

CONSTRUCTION NOTES

1. INSTALL TYPE II SIGNAL STANDARD COMPLETE WITH VEHICLE SIGNAL DISPLAYS, TERMINAL CABINET, PRE-EMPT DETECTOR/INDICATOR, SIGN PER DETAIL SHEET C6.4.
2. INSTALL TYPE II SIGNAL STANDARD COMPLETE WITH VEHICLE SIGNAL DISPLAYS, PED SIGNAL DISPLAY, TERMINAL CABINET, PRE-EMPT DETECTOR/INDICATOR, SIGNS PER DETAILS ON SHEET C6.4.
3. INSTALL TYPE III SIGNAL STANDARD COMPLETE WITH VEHICLE SIGNAL DISPLAYS, PED SIGNAL DISPLAYS, TWO PPB-M PED PUSHBUTTONS, TERMINAL CABINET, PRE-EMPT DETECTOR/INDICATOR, 400 WATT HPS TYPE III LUMINAIRE WITH MEDIUM CUTOFF, SIGN PER DETAIL ON SHEET C6.4.
4. INSTALL TYPE PS SIGNAL STANDARD COMPLETE WITH PED SIGNAL DISPLAY, ONE PPB-M PED PUSHBUTTON.
5. CONSTRUCT CONTROLLER CABINET FOUNDATION, SEE DETAIL SHEETS C6.7, C6.8 AND STANDARD PLAN J-6C. INSTALL CONTROLLER CABINET AND WSDOT APPROVED CONTROLLER. (REFER TO SPECIAL PROVISIONS).
6. INSTALL MODIFIED TYPE B SERVICE. SEE DETAILS ON SHEETS C6.7 AND C6.8. SEE BREAKER SCHEDULE, SHEET C6.6.
7. INSTALL MODIFIED TYPE 1 LOOP DETECTOR SET (50'). SEE SHEET C6.6
8. INSTALL MODIFIED TYPE 1 LOOP DETECTOR SET (30'). SEE SHEET C6.6
9. INSTALL MODIFIED TYPE 2 LOOP DETECTOR. SEE SHEET C6.6
10. INSTALL TYPE 1 JUNCTION BOX, STANDARD PLAN J-11a.
11. INSTALL TYPE 2 JUNCTION BOX., STANDARD PLAN J-11a.
12. INSTALL TYPE 3 JUNCTION BOX (DUAL LID). SEE SHEET C6.5 AND STANDARD PLAN J-11a.
13. INSTALL TYPE PPB PED PUSH-BUTTON STANDARD COMPLETE WITH ONE PPB-M PED PUSH BUTTON.
14. CONTRACTOR TO INSTALL 3" DIA. 24" RADIUS SWEEP FROM PEDESTAL TO UTILITY POLE AS DIRECTED BY CLARK P.U.
15. INSTALL PEDESTAL, TYPE AS SPECIFIED BY CLARK P.U. PEDESTAL TO BE LOCATED 3 FT. WEST OF EXISTING UTILITY POLE.

PHASE DIAGRAM



EMERGENCY VEHICLE PRE-EMPTION ASSIGNMENTS

A = φ2
C = φ1 & φ6

WIRING SCHEDULE

	RACEWAY CONDUIT SIZE	2cs LOOPS	2cs PED. W.B.	5c PED. HEADS	2cs P.E. INDICAT.	4cs P.E. DETECT.	5c VEHICLE HEADS	#8 ILLUM. POWER	6pcc INTER-CONNECT
1	M/A						1		
2	M/A				1	1	1		
3	M/A						2		
4	M/A				1	1	2		
5	M/A				1	1	3		
6	2"				1	1	2		
7	2"			1	1	1	1		
8	2"		2	1	1	1	1		
9	1¼"		1	1					
10	1"	1							
11	1"	2							
12	1½"	4							
13	2½"	6	1	1	1	1	1		
14	2"	5	2	1	1	1	1		
15	3"	6	1	1	2	2	3		
16	2-3"	13	4	3	3	3	4		
17	2-3"	15	4	3	3	3	4		
18	1¼"	POWER TO CONTROLLER 2-#6							
19	3"	POWER TO SERVICE CABINET 3-#2							
20	1¼"							2	
21	1"		1						
22	3"	POWER TO SERVICE CABINET BY P.U.D.							
23	2"	SPARE							
24									
25									
26									

FOR APPROVAL 6/3/02

CHARBONNEAU ENGINEERING LLC
8270 SW Cheadle Road, Suite 411 Portland, OR 97223
TEL (503)293-1119 FAX (503)293-1119

NO.	DATE	BY	REVISION COMMENTS	Design	Drawn	Checked	Date	Initial Issue Date:
				TAR	JKC	FRC		

REGISTERED PROFESSIONAL ENGINEER
FRANK R. CHARBONNEAU
OREGON
17388
EXPIRES: 12/31/03
Expires: September 30, 2002

CAMAS HIGH SCHOOL SR500 IMPROVEMENTS

TRAFFIC SIGNAL PLAN
SR500 & SE 15TH ST.

otak Incorporated
105 W Evergreen Blvd. #300
Vancouver, Wa 98660-3123
Phone: (360) 737-9615
FAX (360) 737-9651
Internet: WWW.Otak.COM

10642 0642C61
Project No. Drawing No.

C6.1 OF
Sheet No.

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Phase Times [1.1.1]

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Min Grn	4	5				5		4								
Gap, Ext	3.5	4.5				4.5		3.5								
Max 1	20	40				40		40								
Max 2	15	33				52		20								
Yel Clr	3	4				4		3								
Red Clr	2	1				1		1								
Walk		7						7								
Ped Clr		12						12								
Red Revt	2	2				2		2								
Add Init		2				2										
Max Init	4	20				20		4								
Gap Reduction																
Time B4		20				20										
Cars B4																
Time To		10				10										
ReducBy																
Min Gap	3.5	3.5				3.5		3.5								
DyMaxLim																
Max Step																

Phase Options [1.1.2]

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Enable	1	1				1		1								
Min Recall		1				1										
Max Recall																
Ped Recall																
Soft Recall																
Lock Calls																
A Flash Entry																
A Flash Exit																
Dual Entry																
Enable Sim Gap																
Gaur Passage																
Rest In Walk																
Cond Service																
Non-Act 1																
Non-Act 2																
Add Init Calc																

WIRING SCHEDULE

RUN NO.	RACEWAY CONDUIT SIZE	#14 LOOP WIRES	2cs LOOPS	2cs PED. BUTTON	5c PED. HEADS	2cs PE INDICAT.	4cs PE DETECT.	5c VEHICLE HEADS	#8 ILLUM. POWER	#2 POWER	#6 POWER	#10pb ILLUM.
1	MAST ARM					1	1	1				
2	MAST ARM					1	1	2				
3	MAST ARM					1	1	3				
4	MAST ARM											2
5	ILLUMINATION	2										
6	1.5" PVC		1									
7	2" PVC		2									
8	2" PVC		2									
9	4" PVC (e)		2									
10	4" PVC (e)		3									
11	1.5" PVC	8										
12	1.5" PVC	4		2	1	1	1	2				
13	4" RGS								2			
14	1.5" RGS											
15	1.5" PVC	11										
16	3" PVC (e)		2	2	1	1	1	2	2 (e)			
17	2" PVC (e)		9	3	2	2	2	4				
18	4" RGS (e)								2			
19	2" PVC (e)			1	1	1	1	2				
20	3" RGS			2	1							
21	2" RGS			2	1							
22	3" RGS (e)		2	2								
23	2" PVC (e)		1									
24	4" PVC (e)		6									
25	4" RGS		9	3	2	2	2	4				
26	4" RGS		8	3	2	2	2	3				
27	2" RGS (e)								4 2 (e)			
28	2" RGS									3		
29	1" RGS										2	
30	2" PVC (e)		2						2			
31	2" PVC								6 4 (e)			
32	2" RGS											
33	3" RGS			1	1	2	2	3				
34	MAST ARM							2				
35	MAST ARM							3				
36	2" RGS (e)	FOR FUTURE USE										
37	3" RGS (e)	FOR FUTURE USE										
38	4" PVC (e)	FOR FUTURE USE										
39	4" RGS (e)	FOR FUTURE USE										
40	2" RGS (e)	FOR FUTURE USE										
41	4" PVC (e)	FOR FUTURE USE										
42	1" PVC	FOR TELEPHONE SERVICE										

BREAKER SCHEDULE

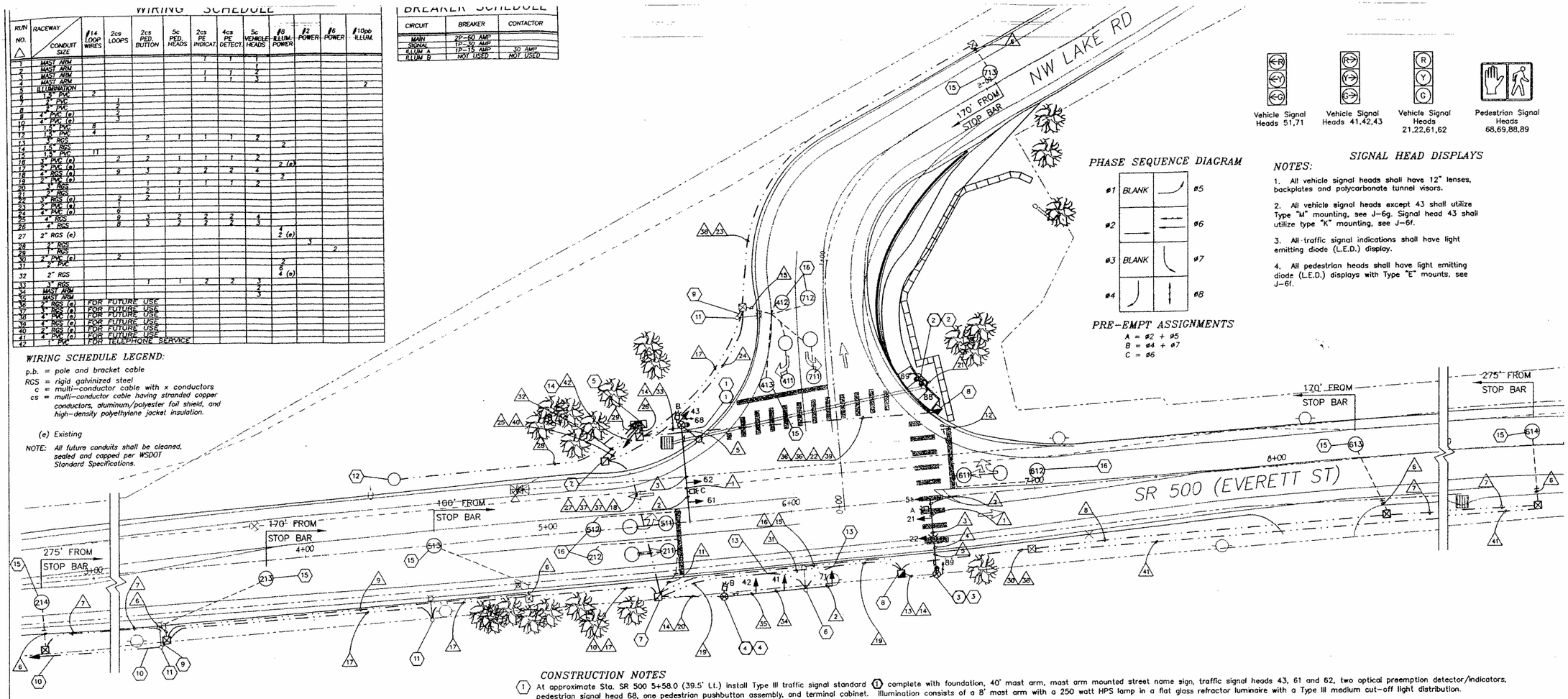
CIRCUIT	BREAKER	CONTACTOR
MAIN	2P-60 AMP	
SIGNAL	1P-30 AMP	
ILLUM A	1P-15 AMP	30 AMP
ILLUM B	NOT USED	NOT USED

WIRING SCHEDULE LEGEND:

p.b. = pole and bracket cable
RGS = rigid galvinized steel
c = multi-conductor cable with x conductors
cs = multi-conductor cable having stranded copper conductors, aluminum/polyester foil shield, and high-density polyethylene jacket insulation.

(e) Existing

NOTE: All future conduits shall be cleaned, sealed and capped per WSDOT Standard Specifications.



Vehicle Signal Heads 51,71

Vehicle Signal Heads 41,42,43

Vehicle Signal Heads 21,22,61,62

Pedestrian Signal Heads 68,69,88,89

PHASE SEQUENCE DIAGRAM

PRE-EMPT ASSIGNMENTS

A = ø2 + ø5
B = ø4 + ø7
C = ø6

SIGNAL HEAD DISPLAYS

NOTES:

1. All vehicle signal heads shall have 12" lenses, backplates and polycarbonate tunnel visors.
2. All vehicle signal heads except 43 shall utilize Type "M" mounting, see J-6g. Signal head 43 shall utilize type "K" mounting, see J-6f.
3. All traffic signal indications shall have light emitting diode (L.E.D.) display.
4. All pedestrian heads shall have light emitting diode (L.E.D.) displays with Type "E" mounts, see J-6f.

LEGEND

- TYPE III TRAFFIC SIGNAL STANDARD WITH TERMINAL CABINET
- TYPE 1 TRAFFIC SIGNAL STANDARD
- CONTROLLER CABINET SERVICE CABINET
- EXISTING TYPE 1 ELECTRICAL JUNCTION BOX.
- TYPE 1 ELECTRICAL JUNCTION BOX, SEE STANDARD PLAN J-11a
- TYPE 2 ELECTRICAL JUNCTION BOX, SEE STANDARD PLAN J-11a
- TYPE 3 ELECTRICAL JUNCTION BOX, SEE STANDARD PLAN J-11a AND TRAFFIC SIGNAL DETAILS SHEET 10.
- PEDESTRIAN PUSHBUTTON
- PEDESTRIAN DISPLAY
- VEHICLE SIGNAL DISPLAY SECTIONS
- STREET NAME SIGN
- OPTICAL PREEMPTION DETECTOR & INDICATOR
- CONDUIT & CONDUCTOR
- CROSSWALK STRIPE, SEE STANDARD PLAN H-5c
- STOP BAR
- (XXX) MODIFIED TYPE1 DETECTOR LOOP, SEE SHEET 11.
- (XXX) MODIFIED TYPE 2 DETECTOR LOOP, SEE SHEET 11.
- (X) CONSTRUCTION NOTE
- X WIRE NOTE
- (X) SIGNAL STANDARD NOTE, SEE TRAFFIC SIGNAL DETAIL SHEET 9.

CONSTRUCTION NOTES

1. At approximate Sta. SR 500 5+58.0 (39.5' Lt.) install Type III traffic signal standard (1) complete with foundation, 40' mast arm, mast arm mounted street name sign, traffic signal heads 43, 61 and 62, two optical preemption detector/indicators, pedestrian signal head 68, one pedestrian pushbutton assembly, and terminal cabinet. Illumination consists of a 8' mast arm with a 250 watt HPS lamp in a flat glass refractor luminaire with a Type III medium cut-off light distribution.
2. At approximate Sta. SR 500 6+57.4 (48.5' Lt.) install Type 1 signal standard (2) complete with foundation, pedestrian signal heads 69 and 88 and two pedestrian pushbutton assemblies.
3. At approximate Sta. SR 500 6+56.9 (31.2' Rt.) install Type III traffic signal standard (3) complete with foundation, 31' mast arm, mast arm mounted street name sign, traffic signal heads 21, 22 and 51, optical preemption detector/indicator, pedestrian signal head 89, one pedestrian pushbutton assembly and terminal cabinet. Illumination consists of a 16' mast arm with a 250 watt HPS lamp in a flat glass refractor luminaire with a Type III medium cut-off light distribution.
4. At approximate Sta. SR 500 5+69.0 (31.7' Rt.) install Type III traffic signal standard (4) complete with foundation, 45' mast arm, mast arm mounted street name sign, traffic signal heads 41, 42 and 71, optical preemption detector/indicator and terminal cabinet. Signal standard shall be designed to accept future 16' luminaire arm mounted at 35 feet. See traffic signal detail sheet. Provide wiring for future luminaire, but do not connect to power source. Future luminaire wiring shall be labeled.
5. At approximate Sta. SR 500 5+40.0 (40.6' Lt.) install controller/service cabinet on a new foundation, see detail Sheet 9. Service shall be a Type B modified, see standard detail J-3b.
6. Remove existing aluminum street light pole, luminaire arm, luminaire fixture, and screw in foundation. Hole left by pole removal shall be backfilled and compacted according to section 2-09.3(1) of the WSDOT Standard Specifications. Remove existing street light wiring between light pole and splice point located in adjacent junction box. Protect existing conduit stubouts during pole removal. See note (13).
7. Remove and replace existing junction box with new Type III junction box. Trim or extend conduit stubouts to provide a minimum 6 inches of clearance between stubout and junction box lid.
8. Remove and replace existing junction box with new Type II junction box. Trim or extend conduit stubouts to provide a minimum 6 inches of clearance between stubout and junction box lid.
9. Maintain and protect existing street light wiring.
10. Disconnect existing service wire from power source and street light pole. Abandon wiring.
11. Maintain and protect existing street light pole.
12. Run specified conduit and wire to CPU power pole. Attach 10' of RGS conduit to utility pole with stand-offs, per Clark Public Utility requirements. Contractor to provide the Utility Company with 25 feet of RGS conduit , stand-offs, and weather head to complete the installation. Coil 30' of extra wire. Coordinate in advance with CPU for power connection
13. Trim existing conduit and connect in new conduit to form a straight continous pathway between junction boxes. Abandon sections of conduit not re-used. See note (6) .
14. Install conduit for telephone connection from controller cabinet to nearest verizon utility pole or service point on east side of SR 500. Contractor shall utilize one of the existing empty 3" RGS conduits to run the new 1" conduit across the south leg of SR 500. See note (37). No trenching across SR 500 will be allowed. Contractor to insure connection is operational at system turn on. Coordinate service in advance with Randy Scriber, Verizon (503-666-6154).
15. Modified 6' Dia. type 2 detector loop. See loop detail Sheet 11.
16. Modified 30' Dia. type 1 detector loop. See loop detail Sheet 11.

20' 10' 0' 20' 40'
SCALE: 1" = 20'

DKS Associates
TRANSPORTATION SOLUTIONS
1400 SW Fifth Avenue, Suite 500 Telephone: (503) 243-3500
Portland, Oregon 97201-5592 Fax: (503) 243-1934

JAMES R. SCRIBER STATE OF WASHINGTON 39179 REGISTERED PROFESSIONAL ENGINEER
EXPIRES: MAY 24, 2005

CITY OF CAMAS
616 NE 4th AVE. CAMAS, WA 98607 PH:(360) 834-3451

DEPARTMENT OF PUBLIC WORKS
SR 500 AND LAKE ROAD
TRAFFIC SIGNAL PLAN

SCALE: 1"=20'	DATE: 9/22/2003	SHT. 5 of 14
DRAWN BY: JCLD	PROJECT NO.	DRAWING NO.
DESIGNED BY: RXS/DMB	S-335A	600-43
APPROVED BY: DMB		

Phase Times [1.1.1]

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Min Grn		5		4	4	5	4	4								
Gap, Ext		4.5		3.5	3.5	4.5	3.5	3.5								
Max 1		45		35	25	50	35	20								
Max 2		50		40	30	50	40	20								
Yel Clr		4		3	3	4	3	3								
Red Clr		1		1	2	1	1	1								
Walk						7		7								
Ped Clr						16		12								
Red Revt		2		2	2	2	2	2								
Add Init		2				2										
Max Init		20		4	4	20	4	4								
Gap Reduction																
Time B4		20				20										
Cars B4																
Time To		10				10										
ReducBy																
Min Gap		3.5		3.5	3.5	3.5	3.5	3.5								
DyMaxLim																
Max Step																

Phase Options [1.1.2]

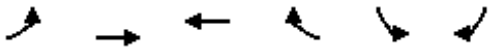
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Enable		1		1	1	1	1	1								
Min Recall		1				1										
Max Recall																
Ped Recall																
Soft Recall																
Lock Calls																
A Flash Entry																
A Flash Exit																
Dual Entry																
Enable Sim Gap																
Gaur Passage																
Rest In Walk																
Cond Service																
Non-Act 1																
Non-Act 2																
Add Init Calc																

APPENDIX G

Capacity Calculations

HCM Unsignalized Intersection Capacity Analysis
1: NE Goodwin Rd & NE Ingle Rd

8/17/2010



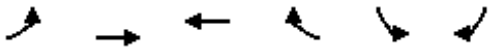
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	61	54	192	86	49	125
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	72	64	226	101	58	147
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	327				484	276
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	327				484	276
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	94				88	80
cM capacity (veh/h)	1178				499	744

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	135	327	205
Volume Left	72	0	58
Volume Right	0	101	147
cSH	1178	1700	1035
Volume to Capacity	0.06	0.19	0.20
Queue Length 95th (ft)	5	0	18
Control Delay (s)	4.6	0.0	11.6
Lane LOS	A		B
Approach Delay (s)	4.6	0.0	11.6
Approach LOS			B

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	34.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: NE Goodwin Rd & NE Ingle Rd

8/18/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	93	245	147	70	106	67
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	99	261	156	74	113	71
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	231				652	194
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	231				652	194
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				72	92
cM capacity (veh/h)	1337				401	845

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	360	231	184
Volume Left	99	0	113
Volume Right	0	74	71
cSH	1337	1700	654
Volume to Capacity	0.07	0.14	0.28
Queue Length 95th (ft)	6	0	29
Control Delay (s)	2.7	0.0	14.4
Lane LOS	A		B
Approach Delay (s)	2.7	0.0	14.4
Approach LOS			B

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
2: NE 28th St & NE 232nd Ave

8/17/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	55	48	5	221	1	52	1	5	2	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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
Hourly flow rate (vph)	1	63	55	6	254	1	60	1	6	2	1	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	255			118			361	360	91	366	387	255
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	255			118			361	360	91	366	387	255
tC, single (s)	4.1			4.1			7.2	6.5	6.4	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.5	3.5	4.0	3.3
p0 queue free %	100			100			90	100	99	100	100	100
cM capacity (veh/h)	1322			1482			583	568	919	588	548	789

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	120	261	67	5
Volume Left	1	6	60	2
Volume Right	55	1	6	1
cSH	1322	1482	602	616
Volume to Capacity	0.00	0.00	0.11	0.01
Queue Length 95th (ft)	0	0	9	1
Control Delay (s)	0.1	0.2	11.7	10.9
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	0.2	11.7	10.9
Approach LOS			B	B

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	26.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
2: NE 28th St & NE 232nd Ave

8/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	2	283	58	6	168	1	46	2	14	1	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	2	292	60	6	173	1	47	2	14	1	1	1
Pedestrians					1						1	
Lane Width (ft)					12.0						8.0	
Walking Speed (ft/s)					4.0						4.0	
Percent Blockage					0						0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	175			352			513	513	323	529	543	175
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	175			352			513	513	323	529	543	175
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			90	100	98	100	100	100
cM capacity (veh/h)	1413			1218			468	464	722	449	447	873

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	354	180	64	3
Volume Left	2	6	47	1
Volume Right	60	1	14	1
cSH	1413	1218	508	535
Volume to Capacity	0.00	0.01	0.13	0.01
Queue Length 95th (ft)	0	0	11	0
Control Delay (s)	0.1	0.3	13.1	11.8
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	0.3	13.1	11.8
Approach LOS			B	B

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Leadbetter Rd & Everett Rd (SR 500)

8/17/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	1	73	41	94	233	2
Sign Control	Stop			Free	Free	
Grade	0%			6%	-7%	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	1	96	54	124	307	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				360		
pX, platoon unblocked						
vC, conflicting volume	539	308	309			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	539	308	309			
tC, single (s)	6.4	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	100	87	96			
cM capacity (veh/h)	484	734	1223			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	97	54	124	309
Volume Left	1	54	0	0
Volume Right	96	0	0	3
cSH	729	1223	1700	1700
Volume to Capacity	0.13	0.04	0.07	0.18
Queue Length 95th (ft)	11	3	0	0
Control Delay (s)	10.7	8.1	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.7	2.5		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	30.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Leadbetter Rd & Everett Rd (SR 500)

8/18/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	4	55	59	239	147	4
Sign Control	Stop			Free	Free	
Grade	0%			6%	-7%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	4	59	63	254	156	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				360		
pX, platoon unblocked	0.99					
vC, conflicting volume	538	159	161			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	527	159	161			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	93	96			
cM capacity (veh/h)	487	892	1431			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	63	63	254	161
Volume Left	4	63	0	0
Volume Right	59	0	0	4
cSH	844	1431	1700	1700
Volume to Capacity	0.07	0.04	0.15	0.09
Queue Length 95th (ft)	6	3	0	0
Control Delay (s)	9.6	7.6	0.0	0.0
Lane LOS	A	A		
Approach Delay (s)	9.6	1.5		0.0
Approach LOS	A			

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	24.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
4: NE 43rd Ave & NE Everett St (SR 500)

8/17/2010

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	252	42	99	358	49	235
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-7%		5%			-6%
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1668	1639	1700	1485	1603	1900
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1668	1639	1700	1485	1603	1900
Peak-hour factor, PHF	0.70	0.70	0.70	0.70	0.70	0.70
Adj. Flow (vph)	360	60	141	511	70	336
RTOR Reduction (vph)	0	41	0	342	0	0
Lane Group Flow (vph)	360	19	141	169	70	336
Heavy Vehicles (%)	12%	2%	9%	6%	16%	3%
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	14.8	14.8	15.5	15.5	2.5	23.0
Effective Green, g (s)	14.8	14.8	15.5	15.5	2.5	23.0
Actuated g/C Ratio	0.32	0.32	0.33	0.33	0.05	0.49
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.5	3.5	4.5	4.5	3.5	4.5
Lane Grp Cap (vph)	527	518	563	492	86	934
v/s Ratio Prot	c0.22		0.08		c0.04	c0.18
v/s Ratio Perm		0.01		0.11		
v/c Ratio	0.68	0.04	0.25	0.34	0.81	0.36
Uniform Delay, d1	14.0	11.1	11.4	11.8	21.9	7.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.8	0.0	0.4	0.7	43.2	0.4
Delay (s)	17.7	11.1	11.8	12.5	65.2	7.8
Level of Service	B	B	B	B	E	A
Approach Delay (s)	16.8		12.4			17.7
Approach LOS	B		B			B

Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	46.8	Sum of lost time (s)	9.0
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: NE 43rd Ave & NE Everett St (SR 500)

8/18/2010

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	118	30	293	143	23	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-7%		5%			-6%
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1868	1672	1834	1559	1859	1919
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1868	1672	1834	1559	1859	1919
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	131	33	326	159	26	151
RTOR Reduction (vph)	0	27	0	80	0	0
Lane Group Flow (vph)	131	6	326	79	26	151
Heavy Vehicles (%)	0%	0%	1%	1%	0%	2%
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	7.3	7.3	21.8	21.8	0.6	27.4
Effective Green, g (s)	7.3	7.3	21.8	21.8	0.6	27.4
Actuated g/C Ratio	0.17	0.17	0.50	0.50	0.01	0.63
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.5	3.5	4.5	4.5	3.5	4.5
Lane Grp Cap (vph)	312	279	915	778	26	1203
v/s Ratio Prot	c0.07		c0.18		c0.01	0.08
v/s Ratio Perm		0.00		0.05		
v/c Ratio	0.42	0.02	0.36	0.10	1.00	0.13
Uniform Delay, d1	16.3	15.2	6.7	5.8	21.6	3.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1	0.0	0.4	0.1	176.5	0.1
Delay (s)	17.4	15.2	7.1	5.9	198.1	3.4
Level of Service	B	B	A	A	F	A
Approach Delay (s)	17.0		6.7			32.0
Approach LOS	B		A			C

Intersection Summary			
HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	43.7	Sum of lost time (s)	14.0
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Lake Rd & NE Everett St (SR 500)

8/17/2010

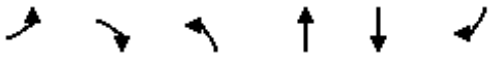
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	229	121	153	163	382	149
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.96	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1703	1538	1703	1712	1715	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1703	1538	1703	1712	1715	
Peak-hour factor, PHF	0.77	0.77	0.77	0.77	0.77	0.77
Adj. Flow (vph)	297	157	199	212	496	194
RTOR Reduction (vph)	0	87	0	0	11	0
Lane Group Flow (vph)	297	70	199	212	679	0
Heavy Vehicles (%)	6%	5%	6%	11%	8%	3%
Turn Type		custom	Prot			
Protected Phases	7	4	5	2	6	
Permitted Phases						
Actuated Green, G (s)	20.0	20.0	14.7	62.7	43.0	
Effective Green, g (s)	20.0	20.0	14.7	62.7	43.0	
Actuated g/C Ratio	0.22	0.22	0.16	0.68	0.47	
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.5	3.5	3.5	4.5	4.5	
Lane Grp Cap (vph)	371	335	273	1171	804	
v/s Ratio Prot	c0.17	0.05	c0.12	0.12	c0.40	
v/s Ratio Perm						
v/c Ratio	0.80	0.21	0.73	0.18	0.84	
Uniform Delay, d1	34.0	29.4	36.6	5.2	21.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	12.0	0.4	9.7	0.1	8.8	
Delay (s)	46.0	29.7	46.3	5.4	30.2	
Level of Service	D	C	D	A	C	
Approach Delay (s)	40.4			25.2	30.2	
Approach LOS	D			C	C	

Intersection Summary			
HCM Average Control Delay	31.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	91.7	Sum of lost time (s)	14.0
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Lake Rd & NE Everett St (SR 500)

8/18/2010



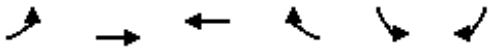
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	133	203	176	359	180	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.95	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1787	1599	1787	1881	1780	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1787	1599	1787	1881	1780	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	141	216	187	382	191	113
RTOR Reduction (vph)	0	173	0	0	21	0
Lane Group Flow (vph)	141	43	187	382	283	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	2%
Turn Type		custom	Prot			
Protected Phases	7	4	5	2	6	
Permitted Phases						
Actuated Green, G (s)	10.3	10.3	12.0	32.8	15.8	
Effective Green, g (s)	10.3	10.3	12.0	32.8	15.8	
Actuated g/C Ratio	0.20	0.20	0.23	0.63	0.30	
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.5	3.5	3.5	4.5	4.5	
Lane Grp Cap (vph)	353	316	412	1184	540	
v/s Ratio Prot	c0.08	0.03	c0.10	0.20	c0.16	
v/s Ratio Perm						
v/c Ratio	0.40	0.14	0.45	0.32	0.52	
Uniform Delay, d1	18.2	17.2	17.2	4.5	15.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.9	0.2	0.9	0.3	1.5	
Delay (s)	19.1	17.5	18.2	4.8	16.5	
Level of Service	B	B	B	A	B	
Approach Delay (s)	18.1			9.2	16.5	
Approach LOS	B			A	B	

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	52.1	Sum of lost time (s)	14.0
Intersection Capacity Utilization	44.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
1: NE Goodwin Rd & NE Ingle Rd

8/18/2010



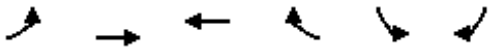
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	82	68	233	103	59	150
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	96	80	274	121	69	176
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	395				608	335
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	395				608	335
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	91				83	74
cM capacity (veh/h)	1111				410	689

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	176	395	246
Volume Left	96	0	69
Volume Right	0	121	176
cSH	1111	1700	960
Volume to Capacity	0.09	0.23	0.26
Queue Length 95th (ft)	7	0	26
Control Delay (s)	5.0	0.0	13.0
Lane LOS	A		B
Approach Delay (s)	5.0	0.0	13.0
Approach LOS			B

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	40.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: NE Goodwin Rd & NE Ingle Rd

8/18/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	116	294	179	84	127	90
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	123	313	190	89	135	96
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	280				795	235
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	280				795	235
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	90				58	88
cM capacity (veh/h)	1283				322	801

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	436	280	231
Volume Left	123	0	135
Volume Right	0	89	96
cSH	1283	1700	551
Volume to Capacity	0.10	0.16	0.42
Queue Length 95th (ft)	8	0	51
Control Delay (s)	3.0	0.0	18.2
Lane LOS	A		C
Approach Delay (s)	3.0	0.0	18.2
Approach LOS			C

Intersection Summary			
Average Delay	5.8		
Intersection Capacity Utilization	53.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
2: NE 28th St & NE 232nd Ave

8/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	66	61	6	260	1	70	1	6	2	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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
Hourly flow rate (vph)	1	76	70	7	299	1	80	1	7	2	1	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	300			146			428	427	111	434	461	299
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	300			146			428	427	111	434	461	299
tC, single (s)	4.1			4.1			7.2	6.5	6.4	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.5	3.5	4.0	3.3
p0 queue free %	100			100			85	100	99	100	100	100
cM capacity (veh/h)	1273			1448			526	520	896	528	497	745

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	147	307	89	5
Volume Left	1	7	80	2
Volume Right	70	1	7	1
cSH	1273	1448	543	560
Volume to Capacity	0.00	0.00	0.16	0.01
Queue Length 95th (ft)	0	0	14	1
Control Delay (s)	0.1	0.2	12.9	11.5
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	0.2	12.9	11.5
Approach LOS			B	B

Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	31.5%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
2: NE 28th St & NE 232nd Ave

8/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	2	333	77	7	199	1	61	2	16	1	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	2	343	79	7	205	1	63	2	16	1	1	1
Pedestrians					1						1	
Lane Width (ft)					12.0						8.0	
Walking Speed (ft/s)					4.0						4.0	
Percent Blockage					0						0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	207			423			609	609	384	627	648	207
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	207			423			609	609	384	627	648	207
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			84	99	98	100	100	100
cM capacity (veh/h)	1375			1147			403	409	667	385	389	838

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	425	213	81	3
Volume Left	2	7	63	1
Volume Right	79	1	16	1
cSH	1375	1147	439	471
Volume to Capacity	0.00	0.01	0.19	0.01
Queue Length 95th (ft)	0	0	17	0
Control Delay (s)	0.1	0.3	15.1	12.7
Lane LOS	A	A	C	B
Approach Delay (s)	0.1	0.3	15.1	12.7
Approach LOS			C	B

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Leadbetter Rd & Everett Rd (SR 500)

8/18/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	1	105	61	143	292	3
Sign Control	Stop			Free	Free	
Grade	0%			6%	-7%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	1	124	72	168	344	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				360		
pX, platoon unblocked						
vC, conflicting volume	657	345	347			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	657	345	347			
tC, single (s)	6.4	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	100	82	94			
cM capacity (veh/h)	407	700	1185			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	125	72	168	347
Volume Left	1	72	0	0
Volume Right	124	0	0	4
cSH	695	1185	1700	1700
Volume to Capacity	0.18	0.06	0.10	0.20
Queue Length 95th (ft)	16	5	0	0
Control Delay (s)	11.3	8.2	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	11.3	2.5		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	35.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Leadbetter Rd & Everett Rd (SR 500)

8/18/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	82	88	298	201	6
Sign Control	Stop			Free	Free	
Grade	0%			6%	-7%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	5	87	94	317	214	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				360		
pX, platoon unblocked	0.95					
vC, conflicting volume	721	217	220			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	682	217	220			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	89	93			
cM capacity (veh/h)	371	828	1361			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	93	94	317	220
Volume Left	5	94	0	0
Volume Right	87	0	0	6
cSH	773	1361	1700	1700
Volume to Capacity	0.12	0.07	0.19	0.13
Queue Length 95th (ft)	10	6	0	0
Control Delay (s)	10.3	7.8	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.3	1.8		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	31.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
4: NE 43rd Ave & NE Everett St (SR 500)

8/18/2010

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	267	45	105	380	52	249
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-7%		5%			-6%
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1668	1639	1700	1485	1603	1900
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1668	1639	1700	1485	1603	1900
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	314	53	124	447	61	293
RTOR Reduction (vph)	0	37	0	298	0	0
Lane Group Flow (vph)	314	16	124	149	61	293
Heavy Vehicles (%)	12%	2%	9%	6%	16%	3%
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	13.6	13.6	15.3	15.3	3.1	23.4
Effective Green, g (s)	13.6	13.6	15.3	15.3	3.1	23.4
Actuated g/C Ratio	0.30	0.30	0.33	0.33	0.07	0.51
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.5	3.5	4.5	4.5	3.5	4.5
Lane Grp Cap (vph)	493	485	565	494	108	967
v/s Ratio Prot	c0.19		0.07		c0.04	c0.15
v/s Ratio Perm		0.01		0.10		
v/c Ratio	0.64	0.03	0.22	0.30	0.56	0.30
Uniform Delay, d1	14.1	11.5	11.1	11.4	20.8	6.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.8	0.0	0.3	0.6	7.2	0.3
Delay (s)	16.9	11.6	11.4	12.0	28.0	6.9
Level of Service	B	B	B	B	C	A
Approach Delay (s)	16.1		11.9			10.5
Approach LOS	B		B			B

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	46.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	35.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: NE 43rd Ave & NE Everett St (SR 500)

8/18/2010

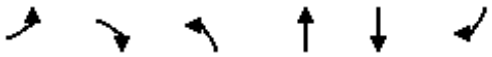
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	125	32	311	152	24	144
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-7%		5%			-6%
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1868	1672	1834	1559	1859	1919
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1868	1672	1834	1559	1859	1919
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	139	36	346	169	27	160
RTOR Reduction (vph)	0	30	0	85	0	0
Lane Group Flow (vph)	139	6	346	84	27	160
Heavy Vehicles (%)	0%	0%	1%	1%	0%	2%
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	7.5	7.5	21.9	21.9	0.6	27.5
Effective Green, g (s)	7.5	7.5	21.9	21.9	0.6	27.5
Actuated g/C Ratio	0.17	0.17	0.50	0.50	0.01	0.62
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.5	3.5	4.5	4.5	3.5	4.5
Lane Grp Cap (vph)	318	285	913	776	25	1199
v/s Ratio Prot	c0.07		c0.19		c0.01	0.08
v/s Ratio Perm		0.00		0.05		
v/c Ratio	0.44	0.02	0.38	0.11	1.08	0.13
Uniform Delay, d1	16.4	15.2	6.8	5.9	21.7	3.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1	0.0	0.5	0.1	205.9	0.1
Delay (s)	17.5	15.2	7.3	6.0	227.6	3.5
Level of Service	B	B	A	A	F	A
Approach Delay (s)	17.0		6.9			35.8
Approach LOS	B		A			D

Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	44.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	34.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Lake Rd & NE Everett St (SR 500)

8/18/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	243	128	162	173	405	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.96	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1703	1538	1703	1712	1715	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1703	1538	1703	1712	1715	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	286	151	191	204	476	186
RTOR Reduction (vph)	0	97	0	0	11	0
Lane Group Flow (vph)	286	54	191	204	651	0
Heavy Vehicles (%)	6%	5%	6%	11%	8%	3%
Turn Type		custom	Prot			
Protected Phases	7	4	5	2	6	
Permitted Phases						
Actuated Green, G (s)	17.0	17.0	13.8	54.8	36.0	
Effective Green, g (s)	17.0	17.0	13.8	54.8	36.0	
Actuated g/C Ratio	0.21	0.21	0.17	0.68	0.45	
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.5	3.5	3.5	4.5	4.5	
Lane Grp Cap (vph)	358	324	291	1161	764	
v/s Ratio Prot	c0.17	0.04	c0.11	0.12	c0.38	
v/s Ratio Perm						
v/c Ratio	0.80	0.17	0.66	0.18	0.85	
Uniform Delay, d1	30.3	26.1	31.3	4.7	20.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	12.1	0.3	5.5	0.1	9.7	
Delay (s)	42.4	26.4	36.8	4.9	29.7	
Level of Service	D	C	D	A	C	
Approach Delay (s)	36.8			20.3	29.7	
Approach LOS	D			C	C	

Intersection Summary			
HCM Average Control Delay	29.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	80.8	Sum of lost time (s)	14.0
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Lake Rd & NE Everett St (SR 500)

8/18/2010

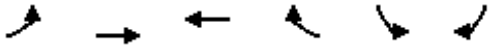
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	141	215	187	381	191	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.95	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1787	1599	1787	1881	1781	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1787	1599	1787	1881	1781	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	150	229	199	405	203	119
RTOR Reduction (vph)	0	184	0	0	21	0
Lane Group Flow (vph)	150	45	199	405	301	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	2%
Turn Type		custom	Prot			
Protected Phases	7	4	5	2	6	
Permitted Phases						
Actuated Green, G (s)	10.6	10.6	12.4	33.9	16.5	
Effective Green, g (s)	10.6	10.6	12.4	33.9	16.5	
Actuated g/C Ratio	0.20	0.20	0.23	0.63	0.31	
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.5	3.5	3.5	4.5	4.5	
Lane Grp Cap (vph)	354	317	414	1192	549	
v/s Ratio Prot	c0.08	0.03	c0.11	0.22	c0.17	
v/s Ratio Perm						
v/c Ratio	0.42	0.14	0.48	0.34	0.55	
Uniform Delay, d1	18.8	17.7	17.8	4.6	15.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.0	0.2	1.0	0.3	1.7	
Delay (s)	19.7	17.9	18.8	4.9	17.1	
Level of Service	B	B	B	A	B	
Approach Delay (s)	18.7			9.5	17.1	
Approach LOS	B			A	B	

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	53.5	Sum of lost time (s)	14.0
Intersection Capacity Utilization	46.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
9: Leadbetter Rd & NE Adams St

8/18/2010



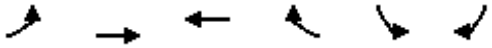
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	1	94	77	5	13	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	1	108	89	6	15	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	94				202	91
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	94				202	91
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				98	100
cM capacity (veh/h)	1506				790	969

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	109	94	16
Volume Left	1	0	15
Volume Right	0	6	1
cSH	1506	1700	800
Volume to Capacity	0.00	0.06	0.02
Queue Length 95th (ft)	0	0	2
Control Delay (s)	0.1	0.0	9.6
Lane LOS	A		A
Approach Delay (s)	0.1	0.0	9.6
Approach LOS			A

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	15.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Leadbetter Rd & NE Adams St

8/18/2010



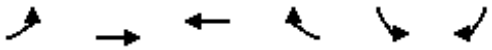
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	1	100	96	14	9	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	1	105	101	15	9	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	116				216	108
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	116				216	108
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1479				775	948

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	106	116	11
Volume Left	1	0	9
Volume Right	0	15	1
cSH	1479	1700	790
Volume to Capacity	0.00	0.07	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.1	0.0	9.6
Lane LOS	A		A
Approach Delay (s)	0.1	0.0	9.6
Approach LOS			A

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	16.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: NE Goodwin Rd & NE Ingle Rd

8/18/2010



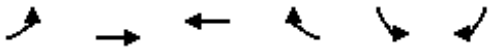
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	82	79	266	119	64	150
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	96	93	313	140	75	176
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	453				669	383
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	453				669	383
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	91				80	73
cM capacity (veh/h)	1057				376	647

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	189	453	252
Volume Left	96	0	75
Volume Right	0	140	176
cSH	1057	1700	923
Volume to Capacity	0.09	0.27	0.27
Queue Length 95th (ft)	8	0	28
Control Delay (s)	4.9	0.0	13.9
Lane LOS	A		B
Approach Delay (s)	4.9	0.0	13.9
Approach LOS			B

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	43.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: NE Goodwin Rd & NE Ingle Rd

8/18/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	116	329	200	94	145	90
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	123	350	213	100	154	96
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	313				860	263
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	313				860	263
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	90				48	88
cM capacity (veh/h)	1248				294	773

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	473	313	250
Volume Left	123	0	154
Volume Right	0	100	96
cSH	1248	1700	477
Volume to Capacity	0.10	0.18	0.52
Queue Length 95th (ft)	8	0	75
Control Delay (s)	2.9	0.0	22.4
Lane LOS	A		C
Approach Delay (s)	2.9	0.0	22.4
Approach LOS			C

Intersection Summary			
Average Delay	6.7		
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
2: NE 28th St & NE 232nd Ave

8/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	66	77	9	260	1	119	1	14	2	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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
Hourly flow rate (vph)	1	76	89	10	299	1	137	1	16	2	1	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	300			164			444	443	120	459	487	299
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	300			164			444	443	120	459	487	299
tC, single (s)	4.1			4.1			7.2	6.5	6.4	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.5	3.5	4.0	3.3
p0 queue free %	100			99			73	100	98	100	100	100
cM capacity (veh/h)	1273			1426			512	508	885	502	480	745

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	166	310	154	5
Volume Left	1	10	137	2
Volume Right	89	1	16	1
cSH	1273	1426	536	540
Volume to Capacity	0.00	0.01	0.29	0.01
Queue Length 95th (ft)	0	1	30	1
Control Delay (s)	0.1	0.3	14.4	11.7
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	0.3	14.4	11.7
Approach LOS			B	B

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
2: NE 28th St & NE 232nd Ave

8/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	2	333	130	15	199	1	92	2	22	1	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	2	343	134	15	205	1	95	2	23	1	1	1
Pedestrians					1						1	
Lane Width (ft)					12.0						8.0	
Walking Speed (ft/s)					4.0						4.0	
Percent Blockage					0						0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	207			477			653	653	411	677	719	207
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	207			477			653	653	411	677	719	207
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			75	99	96	100	100	100
cM capacity (veh/h)	1375			1095			375	383	644	350	351	838

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	479	222	120	3
Volume Left	2	15	95	1
Volume Right	134	1	23	1
cSH	1375	1095	407	435
Volume to Capacity	0.00	0.01	0.29	0.01
Queue Length 95th (ft)	0	1	30	1
Control Delay (s)	0.0	0.7	17.5	13.3
Lane LOS	A	A	C	B
Approach Delay (s)	0.0	0.7	17.5	13.3
Approach LOS			C	B

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Leadbetter Rd & Everett Rd (SR 500)

8/18/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	9	204	93	143	292	6
Sign Control	Stop			Free	Free	
Grade	0%			6%	-7%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	11	240	109	168	344	7
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				360		
pX, platoon unblocked						
vC, conflicting volume	734	347	351			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	734	347	351			
tC, single (s)	6.4	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	97	66	91			
cM capacity (veh/h)	353	698	1181			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	251	109	168	351
Volume Left	11	109	0	0
Volume Right	240	0	0	7
cSH	671	1181	1700	1700
Volume to Capacity	0.37	0.09	0.10	0.21
Queue Length 95th (ft)	43	8	0	0
Control Delay (s)	13.5	8.4	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	13.5	3.3		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	44.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Leadbetter Rd & Everett Rd (SR 500)

8/18/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	144	194	298	201	15
Sign Control	Stop			Free	Free	
Grade	0%			6%	-7%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	11	153	206	317	214	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				360		
pX, platoon unblocked	0.99					
vC, conflicting volume	952	222	230			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	945	222	230			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	81	85			
cM capacity (veh/h)	244	820	1344			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	164	206	317	230
Volume Left	11	206	0	0
Volume Right	153	0	0	16
cSH	711	1344	1700	1700
Volume to Capacity	0.23	0.15	0.19	0.14
Queue Length 95th (ft)	22	14	0	0
Control Delay (s)	11.6	8.2	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	11.6	3.2		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	41.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
4: NE 43rd Ave & NE Everett St (SR 500)

8/18/2010

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	267	50	132	380	69	331
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-7%		5%			-6%
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1668	1639	1700	1485	1603	1900
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1668	1639	1700	1485	1603	1900
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	314	59	155	447	81	389
RTOR Reduction (vph)	0	42	0	294	0	0
Lane Group Flow (vph)	314	17	155	153	81	389
Heavy Vehicles (%)	12%	2%	9%	6%	16%	3%
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	14.0	14.0	16.5	16.5	3.6	25.1
Effective Green, g (s)	14.0	14.0	16.5	16.5	3.6	25.1
Actuated g/C Ratio	0.29	0.29	0.34	0.34	0.07	0.52
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.5	3.5	4.5	4.5	3.5	4.5
Lane Grp Cap (vph)	485	477	583	509	120	991
v/s Ratio Prot	c0.19		0.09		c0.05	c0.20
v/s Ratio Perm		0.01		0.10		
v/c Ratio	0.65	0.04	0.27	0.30	0.68	0.39
Uniform Delay, d1	14.9	12.2	11.4	11.6	21.7	6.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.1	0.0	0.4	0.6	14.5	0.4
Delay (s)	18.0	12.3	11.8	12.2	36.2	7.4
Level of Service	B	B	B	B	D	A
Approach Delay (s)	17.1		12.1			12.3
Approach LOS	B		B			B

Intersection Summary			
HCM Average Control Delay	13.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	48.1	Sum of lost time (s)	9.0
Intersection Capacity Utilization	39.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: NE 43rd Ave & NE Everett St (SR 500)

8/18/2010

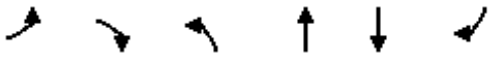
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	125	50	399	152	34	196
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-7%		5%			-6%
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1868	1672	1834	1559	1859	1919
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1868	1672	1834	1559	1859	1919
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	139	56	443	169	38	218
RTOR Reduction (vph)	0	47	0	84	0	0
Lane Group Flow (vph)	139	9	443	85	38	218
Heavy Vehicles (%)	0%	0%	1%	1%	0%	2%
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	7.5	7.5	23.0	23.0	1.3	29.3
Effective Green, g (s)	7.5	7.5	23.0	23.0	1.3	29.3
Actuated g/C Ratio	0.16	0.16	0.50	0.50	0.03	0.64
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.5	3.5	4.5	4.5	3.5	4.5
Lane Grp Cap (vph)	306	274	921	783	53	1228
v/s Ratio Prot	c0.07		c0.24		c0.02	0.11
v/s Ratio Perm		0.01		0.05		
v/c Ratio	0.45	0.03	0.48	0.11	0.72	0.18
Uniform Delay, d1	17.3	16.1	7.5	6.0	22.1	3.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	0.1	0.7	0.1	38.0	0.1
Delay (s)	18.6	16.2	8.2	6.1	60.1	3.5
Level of Service	B	B	A	A	E	A
Approach Delay (s)	17.9		7.6			11.9
Approach LOS	B		A			B

Intersection Summary			
HCM Average Control Delay	10.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	45.8	Sum of lost time (s)	14.0
Intersection Capacity Utilization	42.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Lake Rd & NE Everett St (SR 500)

8/18/2010



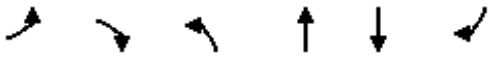
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	248	128	162	195	471	174
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.96	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1703	1538	1703	1712	1717	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1703	1538	1703	1712	1717	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	292	151	191	229	554	205
RTOR Reduction (vph)	0	77	0	0	9	0
Lane Group Flow (vph)	292	74	191	229	750	0
Heavy Vehicles (%)	6%	5%	6%	11%	8%	3%
Turn Type		custom	Prot			
Protected Phases	7	4	5	2	6	
Permitted Phases						
Actuated Green, G (s)	21.0	21.0	15.0	72.0	52.0	
Effective Green, g (s)	21.0	21.0	15.0	72.0	52.0	
Actuated g/C Ratio	0.21	0.21	0.15	0.71	0.51	
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.5	3.5	3.5	4.5	4.5	
Lane Grp Cap (vph)	351	317	250	1208	875	
v/s Ratio Prot	c0.17	0.05	c0.11	0.13	c0.44	
v/s Ratio Perm						
v/c Ratio	0.83	0.23	0.76	0.19	0.86	
Uniform Delay, d1	38.8	33.8	41.8	5.1	21.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	15.7	0.4	13.3	0.1	8.9	
Delay (s)	54.5	34.2	55.1	5.2	30.7	
Level of Service	D	C	E	A	C	
Approach Delay (s)	47.6			27.9	30.7	
Approach LOS	D			C	C	

Intersection Summary			
HCM Average Control Delay	34.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	102.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Lake Rd & NE Everett St (SR 500)

8/18/2010



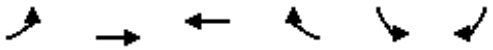
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	159	215	187	451	233	122
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.95	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1787	1599	1787	1881	1788	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1787	1599	1787	1881	1788	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	169	229	199	480	248	130
RTOR Reduction (vph)	0	182	0	0	18	0
Lane Group Flow (vph)	169	47	199	480	360	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	2%
Turn Type		custom	Prot			
Protected Phases	7	4	5	2	6	
Permitted Phases						
Actuated Green, G (s)	11.7	11.7	12.6	36.6	19.0	
Effective Green, g (s)	11.7	11.7	12.6	36.6	19.0	
Actuated g/C Ratio	0.20	0.20	0.22	0.64	0.33	
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.5	3.5	3.5	4.5	4.5	
Lane Grp Cap (vph)	365	326	393	1201	593	
v/s Ratio Prot	c0.09	0.03	c0.11	0.26	c0.20	
v/s Ratio Perm						
v/c Ratio	0.46	0.14	0.51	0.40	0.61	
Uniform Delay, d1	20.0	18.7	19.6	5.0	16.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.1	0.2	1.2	0.4	2.3	
Delay (s)	21.1	18.9	20.8	5.4	18.3	
Level of Service	C	B	C	A	B	
Approach Delay (s)	19.9			9.9	18.3	
Approach LOS	B			A	B	

Intersection Summary			
HCM Average Control Delay	14.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	57.3	Sum of lost time (s)	14.0
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
6: Leadbetter Road & Fargo St

8/18/2010



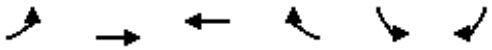
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	6	106	115	12	35	19
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	7	122	132	14	40	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	146				275	139
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	146				275	139
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	98
cM capacity (veh/h)	1436				713	910

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	129	146	62
Volume Left	7	0	40
Volume Right	0	14	22
cSH	1436	1700	771
Volume to Capacity	0.00	0.09	0.08
Queue Length 95th (ft)	0	0	7
Control Delay (s)	0.4	0.0	10.1
Lane LOS	A		B
Approach Delay (s)	0.4	0.0	10.1
Approach LOS			B

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	21.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
6: Leadbetter Road & Fargo St

8/18/2010



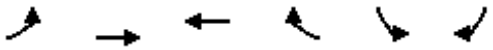
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	20	141	121	38	22	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	21	148	127	40	23	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	167				338	147
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	167				338	147
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				96	99
cM capacity (veh/h)	1410				649	900

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	169	167	36
Volume Left	21	0	23
Volume Right	0	40	13
cSH	1410	1700	720
Volume to Capacity	0.01	0.10	0.05
Queue Length 95th (ft)	1	0	4
Control Delay (s)	1.1	0.0	10.3
Lane LOS	A		B
Approach Delay (s)	1.1	0.0	10.3
Approach LOS			B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	30.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
7: Leadbetter Rd & Benton St

8/18/2010



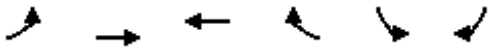
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	3	139	119	5	17	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	3	160	137	6	20	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	143				306	140
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	143				306	140
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	99
cM capacity (veh/h)	1440				685	909

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	163	143	30
Volume Left	3	0	20
Volume Right	0	6	10
cSH	1440	1700	749
Volume to Capacity	0.00	0.08	0.04
Queue Length 95th (ft)	0	0	3
Control Delay (s)	0.2	0.0	10.0
Lane LOS	A		B
Approach Delay (s)	0.2	0.0	10.0
Approach LOS			B

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	20.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
7: Leadbetter Rd & Benton St

8/18/2010



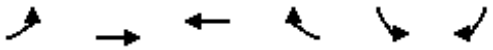
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	10	154	154	18	11	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	162	162	19	12	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	181				355	172
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	181				355	172
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	99
cM capacity (veh/h)	1394				640	873

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	173	181	18
Volume Left	11	0	12
Volume Right	0	19	6
cSH	1394	1700	706
Volume to Capacity	0.01	0.11	0.03
Queue Length 95th (ft)	1	0	2
Control Delay (s)	0.5	0.0	10.2
Lane LOS	A		B
Approach Delay (s)	0.5	0.0	10.2
Approach LOS			B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	26.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
8: Leadbetter Rd & Division St

8/18/2010



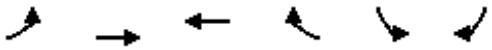
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	151	110	9	27	14
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	6	174	126	10	31	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	137				317	132
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	137				317	132
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				95	98
cM capacity (veh/h)	1447				675	918

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	179	137	47
Volume Left	6	0	31
Volume Right	0	10	16
cSH	1447	1700	742
Volume to Capacity	0.00	0.08	0.06
Queue Length 95th (ft)	0	0	5
Control Delay (s)	0.3	0.0	10.2
Lane LOS	A		B
Approach Delay (s)	0.3	0.0	10.2
Approach LOS			B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	22.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
8: Leadbetter Rd & Division St

8/18/2010



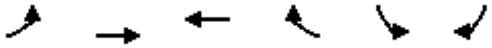
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	15	150	163	29	17	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	16	158	172	31	18	9
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	202				376	187
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	202				376	187
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				97	99
cM capacity (veh/h)	1370				619	856

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	174	202	27
Volume Left	16	0	18
Volume Right	0	31	9
cSH	1370	1700	685
Volume to Capacity	0.01	0.12	0.04
Queue Length 95th (ft)	1	0	3
Control Delay (s)	0.8	0.0	10.5
Lane LOS	A		B
Approach Delay (s)	0.8	0.0	10.5
Approach LOS			B

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	30.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Leadbetter Rd & NE Adams St

8/18/2010



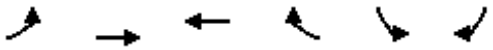
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	173	103	14	41	16
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	6	199	118	16	47	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	134				337	126
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	134				337	126
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				93	98
cM capacity (veh/h)	1450				658	924

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	205	134	66
Volume Left	6	0	47
Volume Right	0	16	18
cSH	1450	1700	716
Volume to Capacity	0.00	0.08	0.09
Queue Length 95th (ft)	0	0	8
Control Delay (s)	0.2	0.0	10.5
Lane LOS	A		B
Approach Delay (s)	0.2	0.0	10.5
Approach LOS			B

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	23.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Leadbetter Rd & NE Adams St

8/18/2010



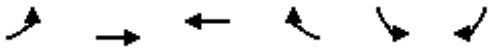
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	17	150	181	44	26	11
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	18	158	191	46	27	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	237				407	214
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	237				407	214
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				95	99
cM capacity (veh/h)	1330				593	827

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	176	237	39
Volume Left	18	0	27
Volume Right	0	46	12
cSH	1330	1700	648
Volume to Capacity	0.01	0.14	0.06
Queue Length 95th (ft)	1	0	5
Control Delay (s)	0.9	0.0	10.9
Lane LOS	A		B
Approach Delay (s)	0.9	0.0	10.9
Approach LOS			B

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: NE Goodwin Rd & NE Ingle Rd

8/18/2010



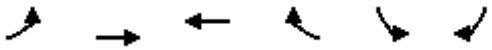
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	101	96	326	146	79	189
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	112	107	362	162	88	210
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	524				774	443
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	524				774	443
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	89				72	65
cM capacity (veh/h)	993				318	598

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	219	524	298
Volume Left	112	0	88
Volume Right	0	162	210
cSH	993	1700	848
Volume to Capacity	0.11	0.31	0.35
Queue Length 95th (ft)	10	0	40
Control Delay (s)	5.2	0.0	16.1
Lane LOS	A		C
Approach Delay (s)	5.2	0.0	16.1
Approach LOS			C

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	51.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: NE Goodwin Rd & NE Ingle Rd

8/18/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	145	406	246	116	178	111
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	154	432	262	123	189	118
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	385				1064	323
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	385				1064	323
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	87				12	83
cM capacity (veh/h)	1173				214	715

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	586	385	307
Volume Left	154	0	189
Volume Right	0	123	118
cSH	1173	1700	315
Volume to Capacity	0.13	0.23	0.98
Queue Length 95th (ft)	11	0	257
Control Delay (s)	3.4	0.0	81.9
Lane LOS	A		F
Approach Delay (s)	3.4	0.0	81.9
Approach LOS			F

Intersection Summary			
Average Delay	21.2		
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
2: NE 28th St & NE 232nd Ave

8/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	83	92	11	329	1	135	1	16	3	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			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
Hourly flow rate (vph)	1	92	102	12	366	1	150	1	18	3	1	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	367			194			538	537	143	554	587	366
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	367			194			538	537	143	554	587	366
tC, single (s)	4.1			4.1			7.2	6.5	6.4	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.5	3.5	4.0	3.3
p0 queue free %	100			99			66	100	98	99	100	100
cM capacity (veh/h)	1203			1391			443	449	859	433	420	684

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	196	379	169	6
Volume Left	1	12	150	3
Volume Right	102	1	18	1
cSH	1203	1391	467	464
Volume to Capacity	0.00	0.01	0.36	0.01
Queue Length 95th (ft)	0	1	41	1
Control Delay (s)	0.1	0.3	17.0	12.9
Lane LOS	A	A	C	B
Approach Delay (s)	0.1	0.3	17.0	12.9
Approach LOS			C	B

Intersection Summary				
Average Delay	4.1			
Intersection Capacity Utilization	43.7%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
2: NE 28th St & NE 232nd Ave

8/18/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	422	148	17	252	1	106	3	26	1	1	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	3	435	153	18	260	1	109	3	27	1	1	1
Pedestrians					1						1	
Lane Width (ft)					12.0						8.0	
Walking Speed (ft/s)					4.0						4.0	
Percent Blockage					0						0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	262			588			814	814	512	843	890	261
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	262			588			814	814	512	843	890	261
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			62	99	95	100	100	100
cM capacity (veh/h)	1313			997			291	308	565	265	278	782

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	591	278	139	3
Volume Left	3	18	109	1
Volume Right	153	1	27	1
cSH	1313	997	321	347
Volume to Capacity	0.00	0.02	0.43	0.01
Queue Length 95th (ft)	0	1	53	1
Control Delay (s)	0.1	0.7	24.5	15.5
Lane LOS	A	A	C	C
Approach Delay (s)	0.1	0.7	24.5	15.5
Approach LOS			C	C

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Leadbetter Rd & Everett Rd (SR 500)

8/18/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	9	227	106	173	365	7
Sign Control	Stop			Free	Free	
Grade	0%			6%	-7%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	10	252	118	192	406	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				360		
pX, platoon unblocked						
vC, conflicting volume	837	409	413			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	837	409	413			
tC, single (s)	6.4	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	97	61	89			
cM capacity (veh/h)	302	644	1119			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	262	118	192	413
Volume Left	10	118	0	0
Volume Right	252	0	0	8
cSH	618	1119	1700	1700
Volume to Capacity	0.42	0.11	0.11	0.24
Queue Length 95th (ft)	53	9	0	0
Control Delay (s)	15.1	8.6	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	15.1	3.3		0.0
Approach LOS	C			

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Leadbetter Rd & Everett Rd (SR 500)

8/18/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	11	161	213	373	247	16
Sign Control	Stop			Free	Free	
Grade	0%			6%	-7%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	12	171	227	397	263	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				360		
pX, platoon unblocked	0.92					
vC, conflicting volume	1121	271	280			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1087	271	280			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	78	82			
cM capacity (veh/h)	181	770	1289			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	183	227	397	280
Volume Left	12	227	0	0
Volume Right	171	0	0	17
cSH	638	1289	1700	1700
Volume to Capacity	0.29	0.18	0.23	0.16
Queue Length 95th (ft)	30	16	0	0
Control Delay (s)	12.9	8.4	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	12.9	3.0		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	46.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
4: NE 43rd Ave & NE Everett St (SR 500)

8/18/2010

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	346	63	163	493	84	405
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-7%		5%			-6%
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1668	1639	1700	1485	1603	1900
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1668	1639	1700	1485	1603	1900
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	384	70	181	548	93	450
RTOR Reduction (vph)	0	46	0	371	0	0
Lane Group Flow (vph)	384	24	181	177	93	450
Heavy Vehicles (%)	12%	2%	9%	6%	16%	3%
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	15.9	15.9	16.4	16.4	4.5	25.9
Effective Green, g (s)	15.9	15.9	16.4	16.4	4.5	25.9
Actuated g/C Ratio	0.31	0.31	0.32	0.32	0.09	0.51
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.5	3.5	4.5	4.5	3.5	4.5
Lane Grp Cap (vph)	522	513	549	479	142	969
v/s Ratio Prot	c0.23		0.11		0.06	c0.24
v/s Ratio Perm		0.01		0.12		
v/c Ratio	0.74	0.05	0.33	0.37	0.65	0.46
Uniform Delay, d1	15.6	12.2	13.0	13.2	22.4	8.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.5	0.0	0.6	0.8	10.8	0.6
Delay (s)	21.1	12.2	13.6	14.1	33.2	8.6
Level of Service	C	B	B	B	C	A
Approach Delay (s)	19.7		14.0			12.8
Approach LOS	B		B			B

Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	50.8	Sum of lost time (s)	9.0
Intersection Capacity Utilization	48.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: NE 43rd Ave & NE Everett St (SR 500)

8/18/2010

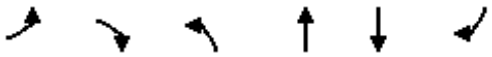
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	162	59	491	197	41	239
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-7%		5%			-6%
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1868	1672	1834	1559	1859	1919
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1868	1672	1834	1559	1859	1919
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	171	62	517	207	43	252
RTOR Reduction (vph)	0	51	0	104	0	0
Lane Group Flow (vph)	171	11	517	103	43	252
Heavy Vehicles (%)	0%	0%	1%	1%	0%	2%
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	8.2	8.2	23.4	23.4	1.3	29.7
Effective Green, g (s)	8.2	8.2	23.4	23.4	1.3	29.7
Actuated g/C Ratio	0.17	0.17	0.50	0.50	0.03	0.63
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.5	3.5	4.5	4.5	3.5	4.5
Lane Grp Cap (vph)	327	292	915	778	52	1215
v/s Ratio Prot	c0.09		c0.28		c0.02	0.13
v/s Ratio Perm		0.01		0.07		
v/c Ratio	0.52	0.04	0.57	0.13	0.83	0.21
Uniform Delay, d1	17.6	16.1	8.2	6.3	22.7	3.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	0.1	1.1	0.1	65.7	0.1
Delay (s)	19.3	16.1	9.3	6.4	88.4	3.8
Level of Service	B	B	A	A	F	A
Approach Delay (s)	18.5		8.5			16.1
Approach LOS	B		A			B

Intersection Summary			
HCM Average Control Delay	12.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	46.9	Sum of lost time (s)	14.0
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Lake Rd & NE Everett St (SR 500)

8/18/2010



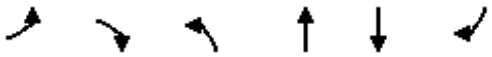
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	320	166	210	246	591	221
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.96	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1703	1538	1703	1712	1716	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1703	1538	1703	1712	1716	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	356	184	233	273	657	246
RTOR Reduction (vph)	0	64	0	0	8	0
Lane Group Flow (vph)	356	120	233	273	895	0
Heavy Vehicles (%)	6%	5%	6%	11%	8%	3%
Turn Type		custom	Prot			
Protected Phases	7	4	5	2	6	
Permitted Phases						
Actuated Green, G (s)	26.0	26.0	17.0	87.0	65.0	
Effective Green, g (s)	26.0	26.0	17.0	87.0	65.0	
Actuated g/C Ratio	0.21	0.21	0.14	0.71	0.53	
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.5	3.5	3.5	4.5	4.5	
Lane Grp Cap (vph)	363	328	237	1221	914	
v/s Ratio Prot	c0.21	0.08	c0.14	0.16	c0.52	
v/s Ratio Perm						
v/c Ratio	0.98	0.37	0.98	0.22	0.98	
Uniform Delay, d1	47.8	41.0	52.4	6.0	27.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	42.0	0.8	53.5	0.2	24.6	
Delay (s)	89.7	41.8	105.8	6.1	52.5	
Level of Service	F	D	F	A	D	
Approach Delay (s)	73.4			52.0	52.5	
Approach LOS	E			D	D	

Intersection Summary			
HCM Average Control Delay	58.2	HCM Level of Service	E
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	122.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	85.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Lake Rd & NE Everett St (SR 500)

8/18/2010



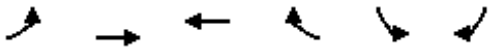
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	201	279	242	564	290	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.95	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1787	1599	1787	1881	1787	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1787	1599	1787	1881	1787	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	212	294	255	594	305	163
RTOR Reduction (vph)	0	234	0	0	18	0
Lane Group Flow (vph)	212	60	255	594	450	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	2%
Turn Type		custom	Prot			
Protected Phases	7	4	5	2	6	
Permitted Phases						
Actuated Green, G (s)	13.5	13.5	14.9	44.1	24.2	
Effective Green, g (s)	13.5	13.5	14.9	44.1	24.2	
Actuated g/C Ratio	0.20	0.20	0.22	0.66	0.36	
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.5	3.5	3.5	4.5	4.5	
Lane Grp Cap (vph)	362	324	400	1246	649	
v/s Ratio Prot	c0.12	0.04	c0.14	0.32	c0.25	
v/s Ratio Perm						
v/c Ratio	0.59	0.18	0.64	0.48	0.69	
Uniform Delay, d1	24.0	22.0	23.4	5.6	18.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.6	0.3	3.5	0.5	3.7	
Delay (s)	26.6	22.3	26.9	6.1	21.8	
Level of Service	C	C	C	A	C	
Approach Delay (s)	24.1			12.3	21.8	
Approach LOS	C			B	C	

Intersection Summary			
HCM Average Control Delay	18.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	66.6	Sum of lost time (s)	14.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
6: Leadbetter Road & Fargo St

8/18/2010



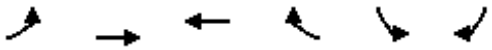
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	6	129	133	12	35	19
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	7	143	148	13	39	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	161				311	154
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	161				311	154
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	98
cM capacity (veh/h)	1418				680	892

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	150	161	60
Volume Left	7	0	39
Volume Right	0	13	21
cSH	1418	1700	742
Volume to Capacity	0.00	0.09	0.08
Queue Length 95th (ft)	0	0	7
Control Delay (s)	0.4	0.0	10.3
Lane LOS	A		B
Approach Delay (s)	0.4	0.0	10.3
Approach LOS			B

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	22.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
6: Leadbetter Road & Fargo St

8/18/2010



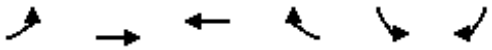
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	20	165	145	38	22	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	21	174	153	40	23	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	193				388	173
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	193				388	173
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				96	99
cM capacity (veh/h)	1381				607	871

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	195	193	36
Volume Left	21	0	23
Volume Right	0	40	13
cSH	1381	1700	680
Volume to Capacity	0.02	0.11	0.05
Queue Length 95th (ft)	1	0	4
Control Delay (s)	0.9	0.0	10.6
Lane LOS	A		B
Approach Delay (s)	0.9	0.0	10.6
Approach LOS			B

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	33.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
7: Leadbetter Rd & Benton St

8/18/2010



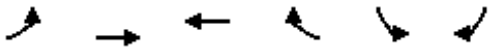
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	3	162	137	5	17	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	3	180	152	6	19	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	158				342	155
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	158				342	155
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	99
cM capacity (veh/h)	1422				654	891

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	183	158	29
Volume Left	3	0	19
Volume Right	0	6	10
cSH	1422	1700	721
Volume to Capacity	0.00	0.09	0.04
Queue Length 95th (ft)	0	0	3
Control Delay (s)	0.2	0.0	10.2
Lane LOS	A		B
Approach Delay (s)	0.2	0.0	10.2
Approach LOS			B

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	21.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
7: Leadbetter Rd & Benton St

8/18/2010



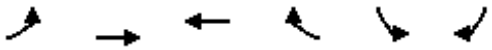
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	10	179	178	18	11	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	188	187	19	12	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	206				406	197
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	206				406	197
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	99
cM capacity (veh/h)	1365				598	845

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	199	206	18
Volume Left	11	0	12
Volume Right	0	19	6
cSH	1365	1700	667
Volume to Capacity	0.01	0.12	0.03
Queue Length 95th (ft)	1	0	2
Control Delay (s)	0.5	0.0	10.5
Lane LOS	A		B
Approach Delay (s)	0.5	0.0	10.5
Approach LOS			B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	27.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
8: Leadbetter Rd & Division St

8/18/2010



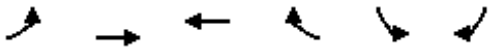
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	174	128	9	27	14
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	193	142	10	30	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	152				352	147
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	152				352	147
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				95	98
cM capacity (veh/h)	1429				645	900

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	199	152	46
Volume Left	6	0	30
Volume Right	0	10	16
cSH	1429	1700	714
Volume to Capacity	0.00	0.09	0.06
Queue Length 95th (ft)	0	0	5
Control Delay (s)	0.2	0.0	10.4
Lane LOS	A		B
Approach Delay (s)	0.2	0.0	10.4
Approach LOS			B

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	23.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
8: Leadbetter Rd & Division St

8/18/2010



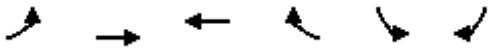
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	15	175	187	29	17	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	16	184	197	31	18	9
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	227				428	212
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	227				428	212
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				97	99
cM capacity (veh/h)	1341				579	829

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	200	227	27
Volume Left	16	0	18
Volume Right	0	31	9
cSH	1341	1700	646
Volume to Capacity	0.01	0.13	0.04
Queue Length 95th (ft)	1	0	3
Control Delay (s)	0.7	0.0	10.8
Lane LOS	A		B
Approach Delay (s)	0.7	0.0	10.8
Approach LOS			B

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	31.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Leadbetter Rd & NE Adams St

8/18/2010



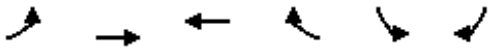
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	196	121	14	41	16
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	218	134	16	46	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	150				371	142
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	150				371	142
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				93	98
cM capacity (veh/h)	1431				629	906

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	223	150	63
Volume Left	6	0	46
Volume Right	0	16	18
cSH	1431	1700	688
Volume to Capacity	0.00	0.09	0.09
Queue Length 95th (ft)	0	0	8
Control Delay (s)	0.2	0.0	10.8
Lane LOS	A		B
Approach Delay (s)	0.2	0.0	10.8
Approach LOS			B

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	24.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Leadbetter Rd & NE Adams St

8/18/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	17	175	205	44	26	11
Sign Control		Free	Free		Stop	
Grade		0%	0%		-12%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	18	184	216	46	27	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	262				459	239
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	262				459	239
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				95	99
cM capacity (veh/h)	1302				554	801

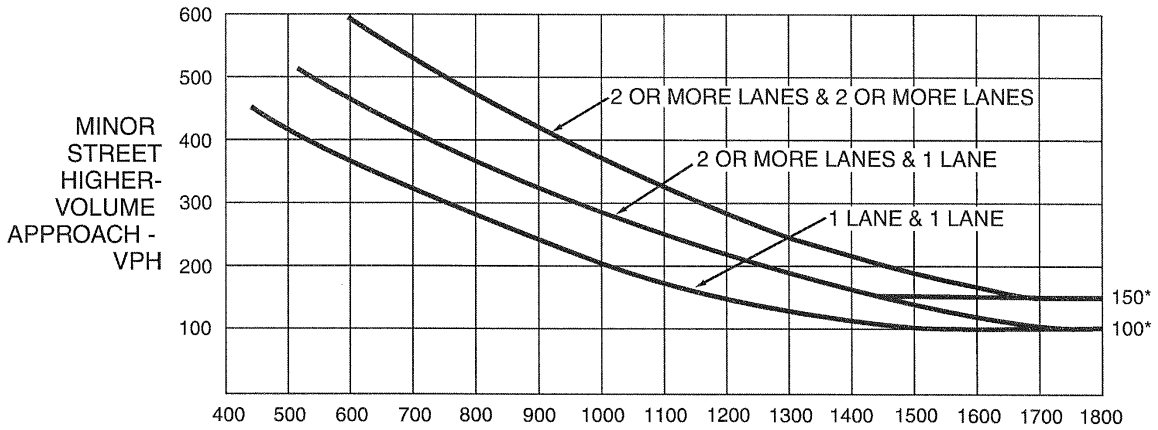
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	202	262	39
Volume Left	18	0	27
Volume Right	0	46	12
cSH	1302	1700	610
Volume to Capacity	0.01	0.15	0.06
Queue Length 95th (ft)	1	0	5
Control Delay (s)	0.8	0.0	11.3
Lane LOS	A		B
Approach Delay (s)	0.8	0.0	11.3
Approach LOS			B

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	33.3%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX H

Warrant Analysis

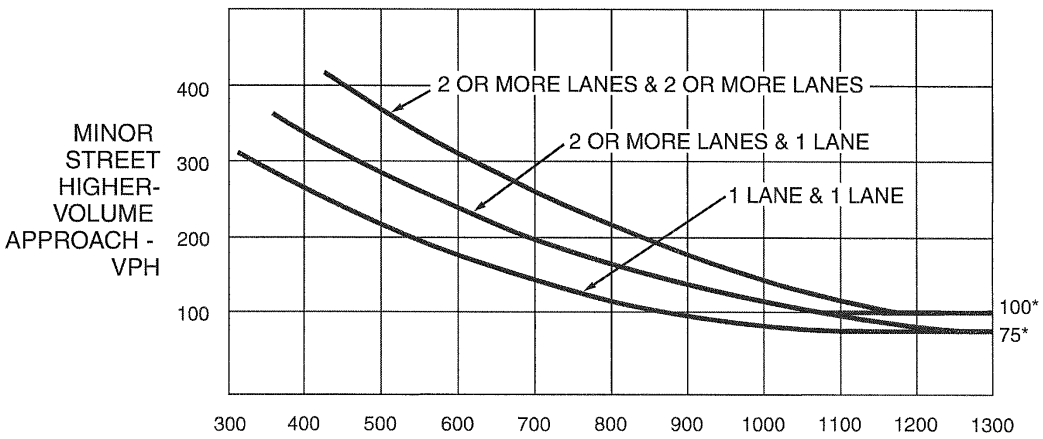
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

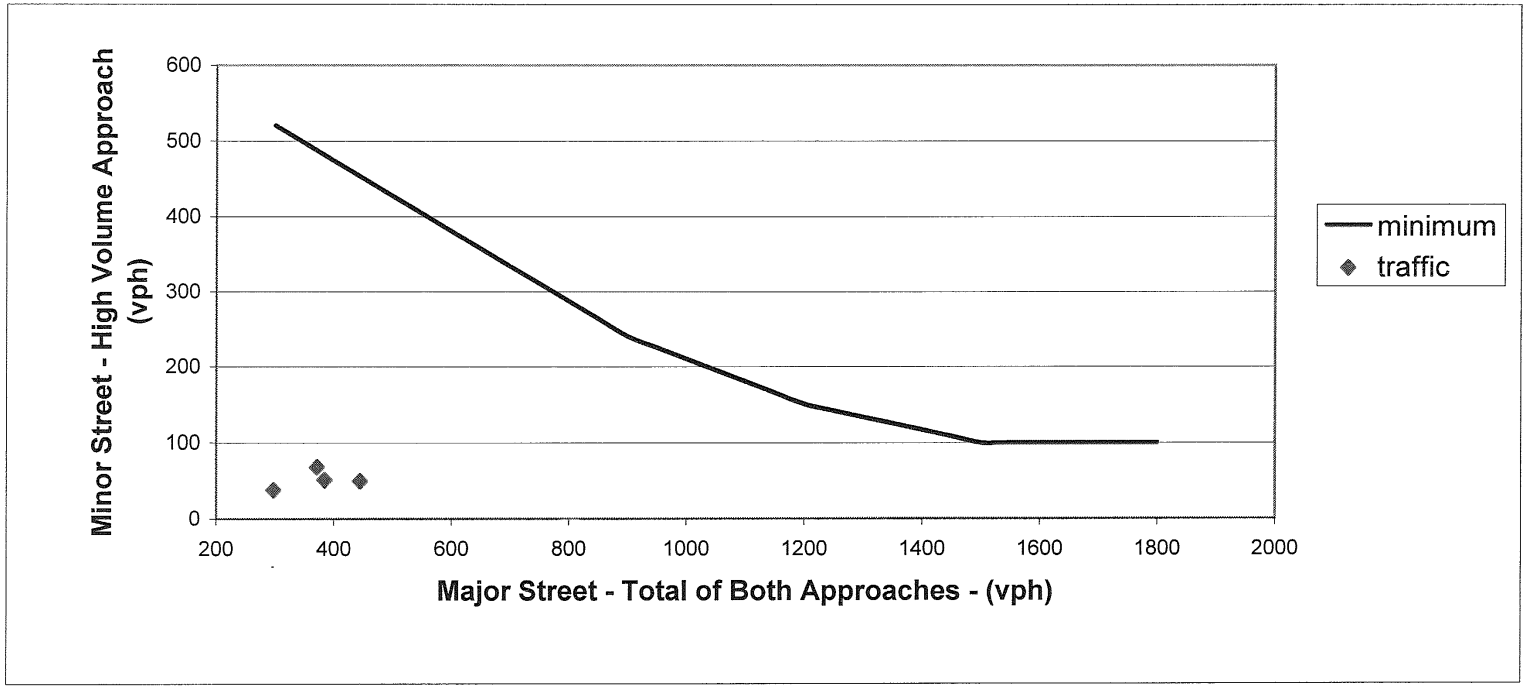
Everett Street / Leadbetter Road - 2010 Existing Scenario

Warrant 3, Peak Hour

Major Street:	**Everett St (SR 500)**
Minor Street:	**Leadbetter Road**
Mile Post:	**17.26**
Warrant Called:	**NO**
Condition:	

Time	Major Street (2X - vph)	Minor Street (1X - vph)	100% Factor (1X - vph)	70% Factor (1X - vph)	Meets Criteria
7:00	371	68	497		
17:00	384	51	497		
16:00	444	50	473		
8:00	297	38	#N/A		#N/A
23:00	0	0	#N/A		#N/A

*Needs to meet Criteria a Minimum of 1 time.
**Criteria Minor St. VPH > Factor VPH or Condition A on Delay.
***If Minor St. VPH > Factor VPH, but criteria is blank, Minor St. VPH is just below the Factor VPH.



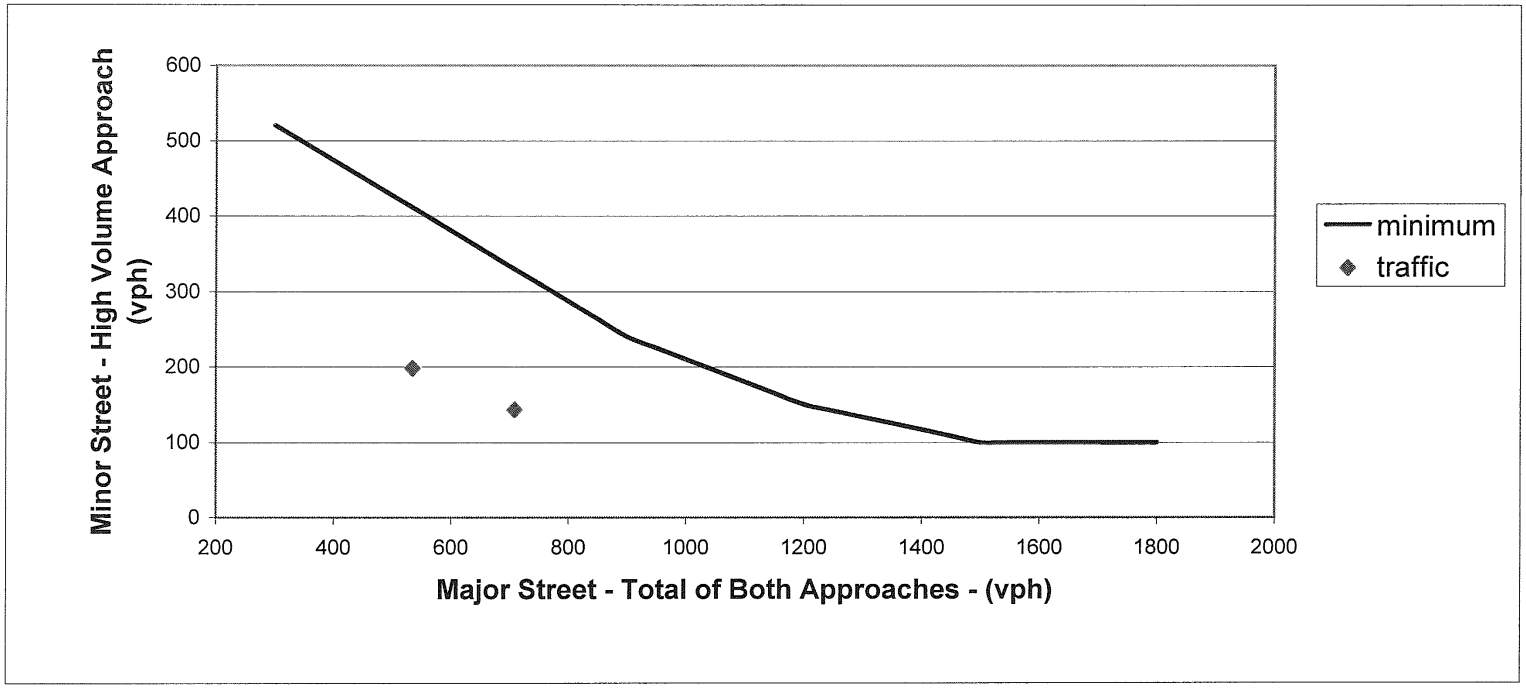
Everett Street / Leadbetter Road - 2018 Post-Development Scenario

Warrant 3, Peak Hour

Major Street:	**Everett St (SR 500)**
Minor Street:	**Leadbetter Road**
Mile Post:	**17.26**
Warrant Called:	**NO**
Condition:	

Time	Major Street (2X - vph)	Minor Street (1X - vph)	100% Factor (1X - vph)	70% Factor (1X - vph)	Meets Criteria
7:00	534	198	427		
16:00	708	143	333		
23:00	0	0	#N/A		#N/A
22:00	0	0	#N/A		#N/A
21:00	0	0	#N/A		#N/A

*Needs to meet Criteria a Minimum of 1 time.
**Criteria Minor St. VPH > Factor VPH or Condition A on Delay.
***If Minor St. VPH > Factor VPH, but criteria is blank, Minor St. VPH is just below the Factor VPH.



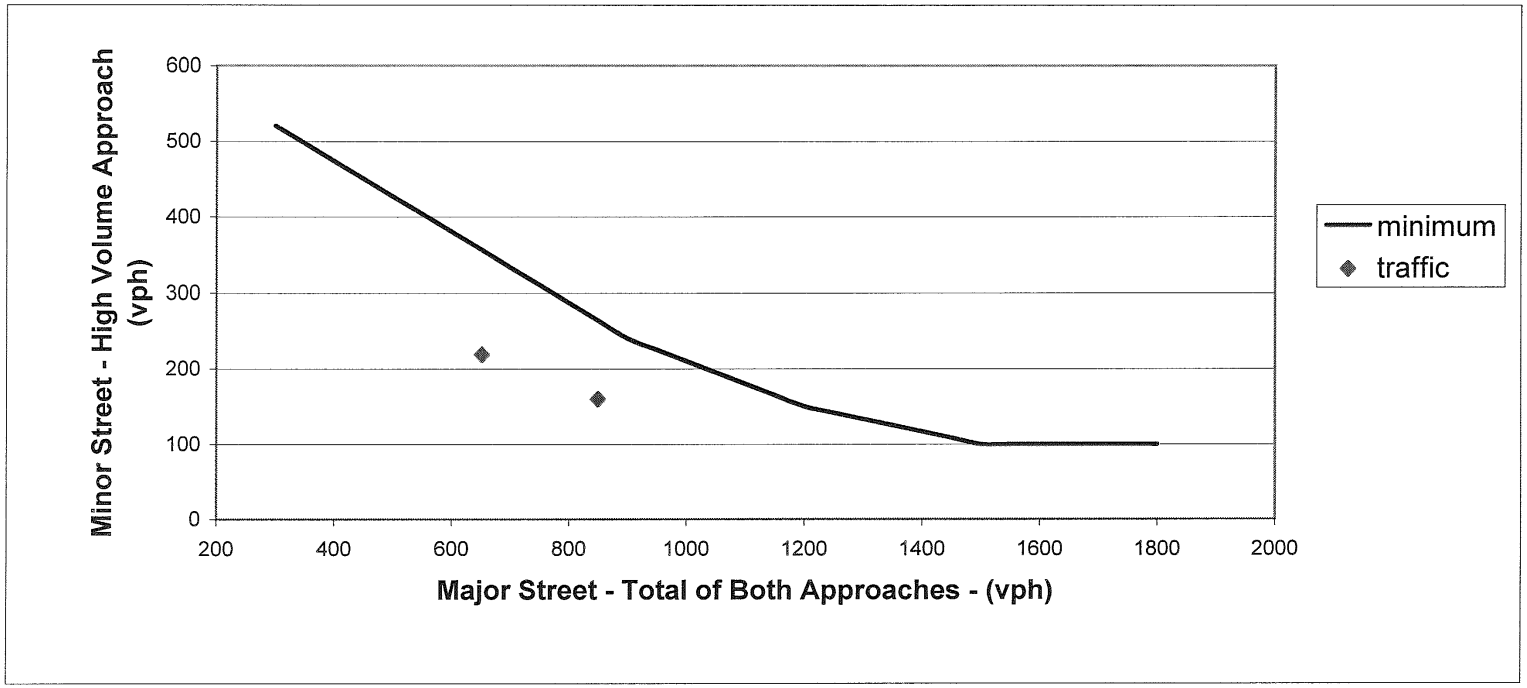
Everett Street / Leadbetter Road - 2030 Future Year Scenario

Warrant 3, Peak Hour

Major Street:	**Everett St (SR 500)**
Minor Street:	**Leadbetter Road**
Mile Post:	**17.26**
Warrant Called:	**NO**
Condition:	

Time	Major Street (2X - vph)	Minor Street (1X - vph)	100% Factor (1X - vph)	70% Factor (1X - vph)	Meets Criteria
7:00	651	219	357		
16:00	849	160	287		
23:00	0	0	#N/A		#N/A
22:00	0	0	#N/A		#N/A
21:00	0	0	#N/A		#N/A

*Needs to meet Criteria a Minimum of 1 time.
**Criteria Minor St. VPH > Factor VPH or Condition A on Delay.
***If Minor St. VPH > Factor VPH, but criteria is blank, Minor St. VPH is just below the Factor VPH.



APPENDIX I

Scoping

David Holt

From: Curleigh Carothers [jcarothers@ci.camas.wa.us]
Sent: Friday, July 16, 2010 11:14 AM
To: Brent Ahrend
Cc: Wes Heigh; David Holt; Todd Johnson; carl@lawsoninvestment.com
Subject: RE: CJ Dens TIA Scope

Brent,
If there is not a great delay in the timing of the application submittal, your proposal appears to be fine based on the information provided in your email.

"Curleigh"
James E. Carothers, P.E.
Engineering Manager/City Engineer
City of Camas
616 NE 4th Avenue
PO Box 1055
Camas, WA 98607
360-817-7230
360-834-1535 FAX
jcarothers@ci.camas.wa.us

>>> "Brent Ahrend" <BAhrend@grpmack.com> 7/15/2010 3:59 PM >>>
Curleigh,

During our review of the in-process projects provided to us by Wes Heigh, we found that the recent proposal to expand Camas High School analyzed two intersections in common with our analysis scope:

- NE Everett Street (SR 500) / NE 43rd Avenue
- NE Everett Street (SR 500) / NE Lake Road

The analysis of these intersections was based on turning movement counts collected in January 2010, and the study was completed in February. As it was provided to us as an in-process project, we understand the CHS project to be approved, adding capacity for 330 more students at the existing campus on SE 15th Street (NE 43rd Avenue) for a buildout year of 2015.

Because the counts were collected within the last 12 months and the analysis was recently completed, we propose to use the CHS study data as the basis for analyzing these two intersections. This will reduce our need for data collection and additional analysis. The volume calculations would be adjusted to these formulae:

- 2010 Existing scenario = CHS study 2010 Existing scenario
- 2018 Pre-Development scenario = [CHS study 2015 Total scenario volumes] + [2% annual growth for 3 years]
- 2018 Post-Development scenario = [2018 Pre-Development] + [CJ Dens Subdivision Site Trips]
- 2030 Future Year scenario = [2018 Post-Development] + [2% annual growth for 12 years]

For all other study area intersections the previously proposed conditions (2% annual growth for 8 years, plus inclusion of all provided in-process trips, to yield 2018 buildout year conditions) would still be applied without change.

Please confirm that this approach is an acceptable alternative to that proposed and agreed upon in our prior correspondence. Thank you for your time and consideration.

From: Curleigh Carothers [mailto:jcarothers@ci.camas.wa.us]
Sent: Friday, May 14, 2010 4:17 PM
To: Brent Ahrend; David Holt

Cc: Wes Heigh; Todd Johnson; carl@lawsoninvestment.com
Subject: Re: CJ Dens TIA Scope

Brent,
Thanks for the clarification. I have verified that the PM peak number for 302 vehicles is "spot on."

David,
To answer your question on timing...I plan of going over the study with Wes next week. We will supply comments once we have had time to review and discuss. Thank you.

Curleigh

>>> <bahrend@grpmack.com> 5/14/2010 1:43 PM >>>
We used the equation instead of the average. ITE guidelines suggest use of the equation.

Brent

Sent from my Verizon Wireless BlackBerry

From: "Curleigh Carothers" <jcarothers@ci.camas.wa.us>
Date: Fri, 14 May 2010 12:26:36 -0700
To: Brent Ahrend<BAhrend@grpmack.com>
Cc: Wes Heigh<wheigh@ci.camas.wa.us>; David Holt<DHolt@grpmack.com>; Todd Johnson<TJohnson@grpmack.com>; <carl@lawsoninvestment.com>
Subject: CJ Dens TIA Scope

Brent,
I have just scanned the document so far. I noticed, however, that the PM peak hour total seems low for 302 SF detached. Can you please check this number? I come up with 305 to 308 (for 1.01 to 1.02 trips per SFD).

Thank you.

"Curleigh"
James E. Carothers, P.E.
Engineering Manager/City Engineer
City of Camas
616 NE 4th Avenue
PO Box 1055
Camas, WA 98607
360-817-7230
360-834-1535 FAX
jcarothers@ci.camas.wa.us

>>> "Brent Ahrend" <BAhrend@grpmack.com> 5/13/2010 3:15 PM >>>
Curleigh,

Please see the attached TIA scoping letter.

Contact David Holt or me if you have any questions.

Thanks,

Brent Ahrend, PE

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Please consider the environment before printing this email. Thank you.

This email is confidential, may be legally privileged, and is intended solely for the addressee. If you are not the intended recipient, access is prohibited. As email can be altered, its integrity is not guaranteed.

David Holt

From: Curleigh Carothers [jcarothers@ci.camas.wa.us]
Sent: Friday, May 21, 2010 11:34 AM
To: Brent Ahrend; David Holt
Cc: Phil Bourquin; Wes Heigh; Todd Johnson; carl@lawsoninvestment.com
Subject: RE: CJ Dens TIA Scope

Brent,
My thoughts on your proposed scope are as follows:

Apparently, you and I interpret the Camas TIS Guidelines a bit differently. Since a TIF study has not been conducted for the north urban growth area, off-site impacts for this subdivision have not been conducted. The amount of traffic that is being added to the city's system may have an impact on number and length of "gaps" on some of the streets that you have proposed to leave out of your study.

Your Traffic Study Scope reads, *"The Guidelines indicate a TIS should analyze impacted intersections of streets that are both classified as a Collector or higher classification...Several intersections proposed for this study do not meet the Collector/Collector criterion..."* and you suggest paring down the list of intersections based on your interpretation.

The Camas TIS guidelines actually state, *"The preparer of the transportation impact study shall contact the Public Works Director to discuss study area limits (including the number of intersections to be analyzed and key project issues) for their specific project prior to beginning the study."* You have done this task.

The sentence that I believe that you are referring to out of the guidelines is, *"Intersections of arterials or collectors should be considered in determining study intersections..."* I do not find reference in the guidelines that determine that collectors, arterials, or state routes that intersect with non-collectors, non-arterials, or non-state routes should not be considered. You may have a solid argument on some of the lesser traveled side streets (e.g. NE 35th), but some of the intersections that you have eliminated from the list have school traffic or are neighborhood routes or "cut-through" streets (NE 22nd, NE 19th, Lacamas Lane, Leadbetter Drive (construction to be completed this year.))

You have proposed to eliminate at least one state-county intersection from your list of intersections. I has suggested that you might want to include the County and the State in the discussion for intersections to be analyzed. I do not know if you have made contact with them, but the City will, at some point in time, provide the study to these agencies for their comments.

As I have stated before, when a north urban growth area or citywide TIF study is conducted, you will likely be instructed that changes to the study will be required.

Ultimately, your study is for your client to provide adequate information to present for staff comments and to ultimately provide a solid application to take through the public process. I am merely trying to do the best at guiding you upon your request.

"Curleigh"
James E. Carothers, P.E.
Engineering Manager/City Engineer
City of Camas
616 NE 4th Avenue
PO Box 1055
Camas, WA 98607
360-817-7230
360-834-1535 FAX
jcarothers@ci.camas.wa.us

>>> "Brent Ahrend" <BAhrend@grpmack.com> 5/20/2010 1:00 PM >>>
Curleigh,

I am following up on my voice mail message regarding the traffic study scope. I am happy to answer any questions you may have or am available to discuss the scope with you and Wes.

Thanks,

Brent

From: Curleigh Carothers [mailto:jcarothers@ci.camas.wa.us]
Sent: Friday, May 14, 2010 4:17 PM
To: Brent Ahrend; David Holt
Cc: Wes Heigh; Todd Johnson; carl@lawsoninvestment.com
Subject: Re: CJ Dens TIA Scope

Brent,
Thanks for the clarification. I have verified that the PM peak number for 302 vehicles is "spot on."

David,
To answer your question on timing...I plan of going over the study with Wes next week. We will supply comments once we have had time to review and discuss. Thank you.

Curleigh

>>> <bahrend@grpmack.com> 5/14/2010 1:43 PM >>>
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Brent

Sent from my Verizon Wireless BlackBerry

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Date: Fri, 14 May 2010 12:26:36 -0700
To: Brent Ahrend<BAhrend@grpmack.com>
Cc: Wes Heigh<wheigh@ci.camas.wa.us>; David Holt<DHolt@grpmack.com>; Todd Johnson<TJohnson@grpmack.com>; <carl@lawsoninvestment.com>
Subject: CJ Dens TIA Scope

Brent,
I have just scanned the document so far. I noticed, however, that the PM peak hour total seems low for 302 SF detached. Can you please check this number? I come up with 305 to 308 (for 1.01 to 1.02 trips per SFD).

Thank you.

"Curleigh"
James E. Carothers, P.E.
Engineering Manager/City Engineer
City of Camas
616 NE 4th Avenue
PO Box 1055
Camas, WA 98607
360-817-7230
360-834-1535 FAX
jcarothers@ci.camas.wa.us

>>> "Brent Ahrend" <BAhrend@grpmack.com> 5/13/2010 3:15 PM >>>
Curleigh,

Please see the attached TIA scoping letter.

Contact David Holt or me if you have any questions.

Thanks,

Brent Ahrend, PE

GROUP MACKENZIE
CELEBRATING 50 YEARS

Heritage Building | 601 Main Street, Suite 101 | Vancouver, WA 98660
T: 360.695.7879 | F: 360.693.6637 | www.groupmackenzie.com | vCard
PORTLAND, OREGON | SEATTLE, WASHINGTON | VANCOUVER, WASHINGTON

Please consider the environment before printing this email. Thank you.

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GROUP MACKENZIE
CELEBRATING 50 YEARS

May 12, 2010

City of Camas
Attention: James "Curleigh" Carothers
616 NE 4th Avenue
PO Box 1055
Camas, WA 98607

Re: **CJ Dens Camas Subdivision**
Transportation Impact Study – Scope Definition
Project Number 2050186.01

Dear Mr. Carothers:

Group Mackenzie has prepared this letter to confirm the Transportation Impact Study (TIS) area limits for the above project as required by the City's *Transportation Impact Study and Neighborhood Traffic Management Guidelines* (*Guidelines*, dated 10/28/02, and revised 9/18/07). This letter responds to your April 9, 2010 e-mail, which discussed preliminary scope considerations. This letter also presents the anticipated trip generation and describes the proposed study scope.

Our client, CJ Dens Land Company, proposes to develop a 302-lot single-family residential subdivision within Camas city limits with accesses onto Leadbetter Road. The subdivision is anticipated to include development of all required public infrastructure, including streets, sidewalks, and utilities. Four parcels together comprise the currently undeveloped 82.5-acre site bounded by Leadbetter Road to the south and west, by undeveloped light industrial/business park properties to the north, and by partially-developed residential properties to the east. The site is zoned Residential-7,500 (R-7.5), in which the proposed single-family residential subdivision is an allowed use. A pre-application conference was held with city staff on March 18, 2010.

TRIP GENERATION

Trip generation estimates will be prepared using trip rates in the Institute of Transportation Engineers' (ITE) *Trip Generation*, 8th Edition. Trip generation is anticipated to be as follows:

TABLE 1 – SITE TRIP GENERATION

Land Use (ITE Code)	Variable	Variable Value	ADT	AM Peak Hour		PM Peak Hour	
				Enter	Exit	Enter	Exit
Single-Family Detached Housing (210)	Dwelling Units	302	2,874	55	166	179	105

Heritage Building | 601 Main Street, Suite 101 | Vancouver, WA 98660
Tel: 360.695.7879 Web: www.grpmack.com Fax: 360.693.6637

Group Mackenzie, Incorporated
Architecture
Interiors
Structural Engineering
Civil Engineering
Land Use Planning
Transportation Planning
Landscape Architecture

Locations:
Portland, Oregon
Seattle, Washington
Vancouver, Washington

With more than 200 daily trips, the project meets the City's requirement for preparing a TIS.

TRIP DISTRIBUTION

Distribution of site trips will be based on existing EMME/2 model data provided by the Southwest Washington Regional Transportation Council (RTC). Specifically, the trip assignment patterns from the model's Transportation Analysis Zone (TAZ) 483 are used. TAZ 483 includes all four subject parcels comprising the subdivision site.

From the site accesses on Leadbetter Road, it is estimated 35% of trips will travel to and from the north/west and 65% to and from the south/east. Approximately 10% of the site trips will travel along NE 43rd Avenue, primarily to and from the schools, and 40% of the site trips will travel along Everett Street farther south, between the subdivision and downtown Camas. The attached figure presents the proposed trip distribution.

TRAFFIC STUDY SCOPE

The *Guidelines* indicate a TIS should analyze impacted intersections of streets that are both classified as a Collector or higher classification. Applying this logic to the list of study intersections proposed in your April 9, 2010 e-mail, the following intersections meet this criterion. The intersections are shown in table format along with the number of site trips anticipated to travel through each intersection during the PM peak hour.

TABLE 2 – STUDY AREA PUBLIC STREET INTERSECTIONS AND PM PEAK HOUR SITE TRIPS

Street 1	Street 2	Approximate Added PM Peak Hour Site Trips
NE Goodwin Road	NE Ingle Road	85
NE 28th Street	NE 232nd Avenue	99
NE Everett Street (SR 500)	SE Leadbetter Road	185
NE Everett Street (SR 500)	NE 43rd Avenue	170
NE Everett Street (SR 500)	NE Lake Road	142
NW Sierra Street	NW Lake Road	28*
NW Leadbetter Drive	NW Lake Road	14*

* These intersections are proposed to be excluded from the TIS analysis. See note below.

Several intersections proposed for study in your April 9, 2010 e-mail do not meet the Collector/Collector criterion, and only through trips related to the subdivision site are anticipated to travel through them. Therefore we propose to exclude from the TIS the following intersections:

- NE 232nd Avenue/NE 9th Street
- NE Everett Street (SR 500)/NE 3rd Street
- NE Everett Street (SR 500)/NE 38th Avenue
- NE Everett Street (SR 500)/NE 35th Avenue
- NE Everett Street (SR 500)/NE 22nd Avenue
- NE Everett Street (SR 500)/NE 19th Avenue
- NE Everett Street (SR 500)/NE 15th Avenue
- NE Everett Street (SR 500)/NE 14th Avenue
- NW Lake Road/NW Lacamas Lane

We request these intersections not be included in the study area as they do not meet the standard of being a collector classification, nor are site trips likely to be added on the intersecting local streets.

Because the anticipated number of site trips at the NW Sierra Street/NW Lake Road and NW Leadbetter Drive/NW Lake Road intersections is small, we also propose to exclude these intersections from the TIS analysis. Only 10% of site trips are anticipated to travel this section of NW Lake Road.

In addition to the intersections identified in Table 2 above, analysis will be provided at the four locations where site trips will access Leadbetter Road, including the NE Adams Street/SE Leadbetter Road intersection identified in the April 9, 2010 e-mail and constructed with the Deerhaven Subdivision. The attached preliminary site plan depicts the approximate locations of the proposed access points.

In summary, the following intersections are proposed to be included in the analysis:

- NE Ingle Road/NE Goodwin Road
- NE 28th Street/NE 232nd Avenue
- NE Everett Street (SR 500)/NE Leadbetter Road
- NE Everett Street (SR 500)/NE 43rd Avenue
- NE Everett Street (SR 500)/NE Lake Road
- NE Leadbetter Road/NE Adams Street
- Site Accesses on Leadbetter Road (3)

ANALYSIS PERIODS

In conformance with the *Guidelines*, the study will analyze traffic operations during weekday AM and PM peak hour periods at intersections identified above for the following scenarios:

- 2010 Existing
- 2018 Pre-Development
- 2018 Post-Development (with project trips)
- 2030 Future Year

The analysis years are proposed to include build-out of the subdivision in 2018, which reflects an anticipated project approval in 2011 and a maximum seven-year phased development.

Existing vehicle turning movement counts will be collected at the intersections identified above for inclusion in the study area to form the basis of the operations analysis.

Roadway 24-hour volume and speed surveys will be conducted at two points along Leadbetter Road. One point will be near the proposed west public street access from the subdivision onto Leadbetter; the other point will be approximately halfway between the two new proposed east public street access points onto Leadbetter. These surveys will allow us to provide estimates of daily traffic volumes (ADT) and 85th percentile speeds in the TIS, as required in the *Guidelines*.

The TIS will conform to City standards and will include sight distance review, crash history assessment, pedestrian and bicycle facilities review, transit service review, turn lane warrant analysis, and signal warrant analysis.

PLANNED IMPROVEMENTS

The subject site is within an area recently annexed by the City of Camas, and the City has yet to adopt a new Transportation Impact Fee (TIF) Study or a Capital Facilities Plan (CFP) for the area. As such, no public transportation improvements are identified for the study area at this time.

Although a future east-west arterial roadway has been identified north of the site in the City's Transportation Comprehensive Plan, as an arterial replacement for the existing Leadbetter Road alignment, the timing for construction of such a new roadway is uncertain. For this reason, our analysis will assume Leadbetter Road remains in its current location and provides access to the site. At the time the new arterial roadway is constructed, site access would then be provided to the north and Leadbetter would be closed. Analysis of this condition would be prepared by the City in conjunction with the TIF/CFP update.

BACKGROUND GROWTH

We propose a background growth rate of 2% per year. A review of RTC model data in the site vicinity indicates growth rates from 2000 to 2009 varying between 1.5% and 8%; much of the significant growth since 2000 has been related to the new Camas High School campus on NE 43rd Avenue. Actual roadway volumes have decreased in the last two years and do not provide a reliable basis for estimating future growth. Thus an annual growth rate of 2% seems a logical value.

IN-PROCESS PROJECTS

City staff provided trip assignment information for several in-process projects in the area including the following. We will include trips from these projects in the future volumes for the study area intersections.

- Deerhaven
- The Hills at Round Lake
- Millshore Downs
- Camas High School Expansion
- Lacamas Pointe
- North Hills
- Vintage View/The Village at Round Lake
- Lakeridge North
- Two Creeks at Camas Meadows
- LaCamas Meadows PRD
- Hidden Meadows Subdivision

CONCLUSION

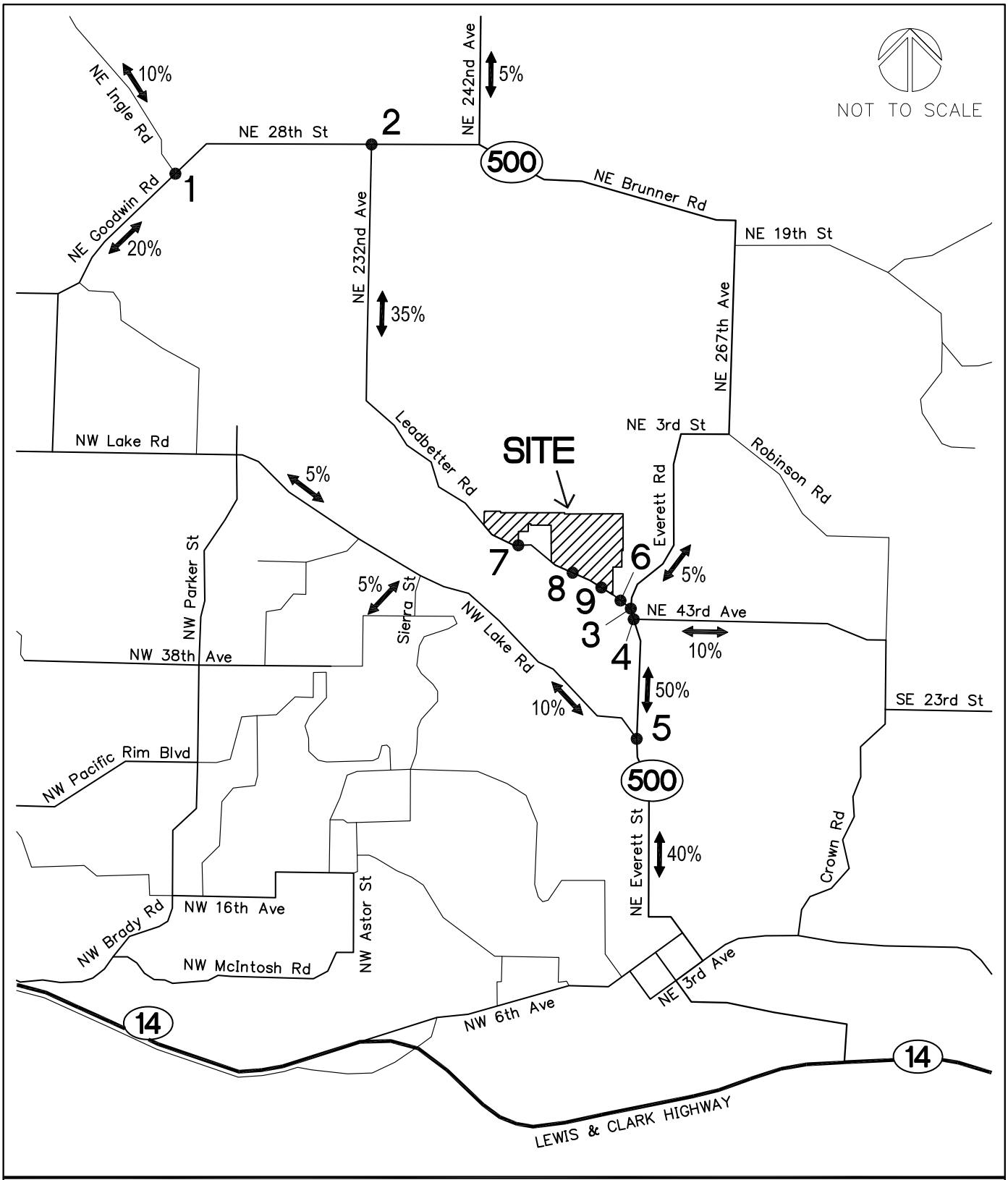
Please provide written confirmation of the traffic study scope and assumptions. Please contact David Holt or me if you need any additional information or have any questions.

Sincerely,

Brent Ahrend, P.E.
Senior Associate

Enclosures: Proposed Trip Distribution, Proposed Site Plan

c: Carl Lawson – CJ Dens Land Company
David Holt, Todd Johnson – Group Mackenzie



GROUP MACKENZIE

Portland OR 503.224.9560 Vancouver WA 360.695.7879 Seattle WA 206.749.9993

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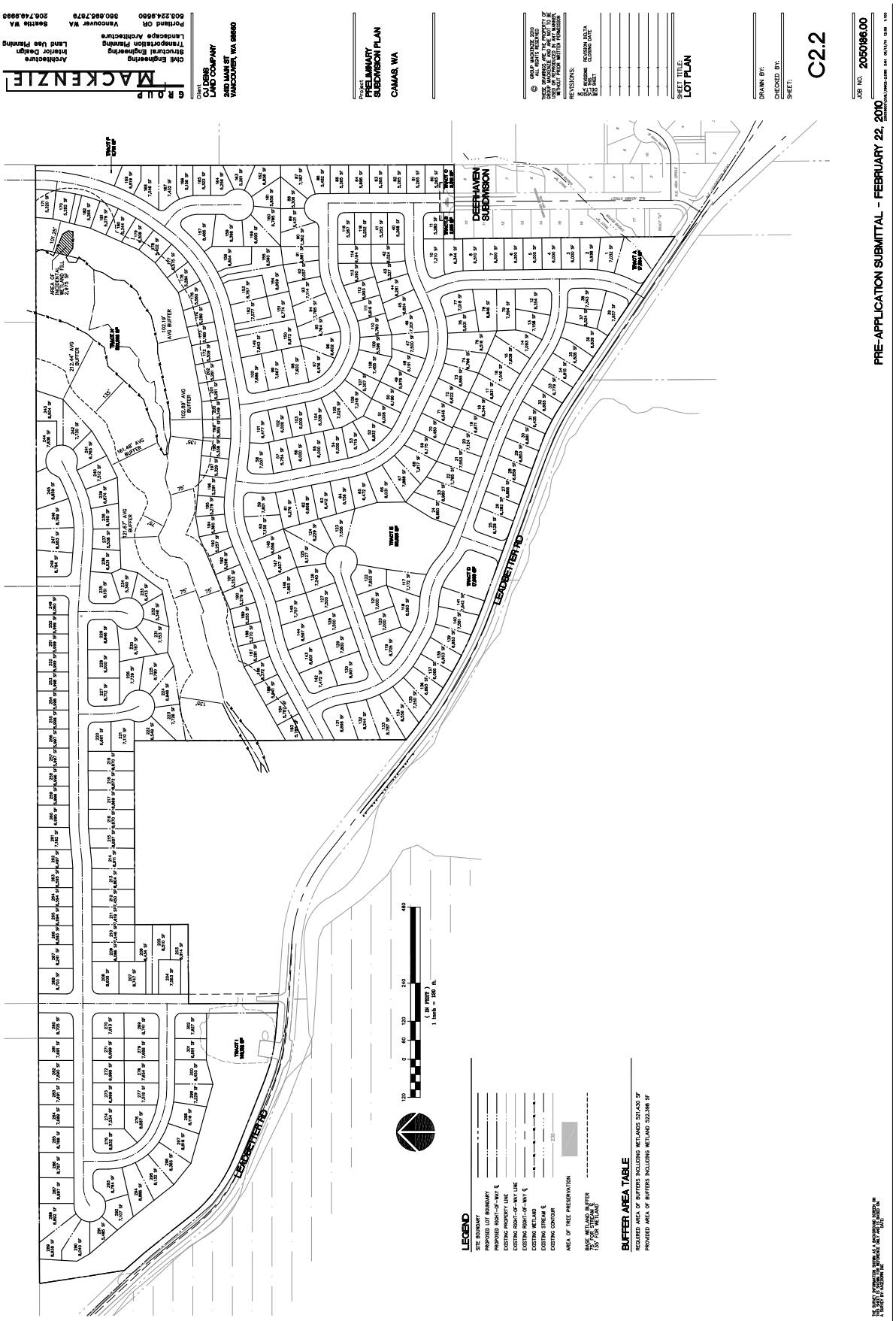
DATE: 05.13.10
DRAWN BY: DAH
CHECKED BY: BTA
JOB NO: 2050186.01

SITE TRIP DISTRIBUTION AND STUDY AREA INTERSECTIONS

CJ DENS RESIDENTIAL SUBDIVISION
CAMAS, WASHINGTON

FIGURE
A


MACKENZIE
Civil Engineering
Structural Engineering
Transportation Planning
Landscape Architecture
Architecture
Interior Design
Land Use Planning
Portland OR 503.224.9560
Vancouver WA 360.695.7879
Seattle WA 206.749.9993
Client:
CJ DEBS
LAND COMPANY
2ND MAIN ST
VANCOUVER, WA 98660
Project:
PRELIMINARY
SUBDIVISION PLAN
CAMAS, WA
SHEET TITLE:
LOT PLAN
C2.2
JOB NO. 2050186.00
PRE-APPLICATION SUBMITTAL - FEBRUARY 22, 2010
DEERHAVEN SUBDIVISION
LEADBETTER RD
LEGEND
SITE BOUNDARY
PROPOSED LOT BOUNDARY
PROPOSED RIGHT-OF-WAY ℄
EXISTING PROPERTY LINE
EXISTING RIGHT-OF-WAY LINE
EXISTING WETLAND
EXISTING STREAM ℄
EXISTING CONTOUR
AREA OF TREE PRESERVATION
BASIC WETLAND BUFFER
150' FOR WETLAND
BUFFER AREA TABLE
REQUIRED AREA OF BUFFERS INCLUDING WETLANDS 521,430 SF
PROVIDED AREA OF BUFFERS INCLUDING WETLAND 522,398 SF
(IN FEET)
1 inch = 120 ft.

ARCHAEOLOGICAL PREDETERMINATION

(Exempt from Public Disclosure RCW 42.56.300)

4232555 EAS
RecFee - $42.00 Pages: 11 - MICHAEL HIGGINS
Clark County, WA 10/09/2006 10:25

Michael P. Higgins
1112 Daniels St Ste 200
P.O. Box 54
Vancouver, WA 98666

Real Estate Excise Tax
Ch. 11 Rev. Laws 1951
$ 89.00 has been paid
Recp.# 599649 Date 10-9-06
Sec. 61, see Affd. No.
Doug Lasher
Clark County Treasurer
By RV
Deputy

Grantor: CJ Dens Land Co.
Grantee: Corey D. Harris and Michael A. Fortin
Legal Description: Section 34 and 35, T2N, R3E (complete legals on pages 7-9)
Assessor's Tax Parcel ID #178236-000

AGREEMENT FOR TEMPORARY INGRESS AND EGRESS EASEMENT

THIS TEMPORARY EASEMENT AGREEMENT ("Agreement") made and entered this 29 day of September, 2006, by and between CJ DENS LAND CO. LIMITED PARTNERSHIP, a Nevada limited partnership, hereinafter referred to as "CJ DENS" and/or "Grantor", and COREY D. HARRIS, a married man as his separate property, and MICHAEL A. FORTIN, a married man as his separate property, as tenants in common, hereinafter referred to as "HARRIS/FORTIN" and/or "Grantee".

RECITALS

WHEREAS, CJ DENS is the owner of certain real estate situated within Clark County, State of Washington, and legally described within Exhibit "A" which is attached hereto and by this reference is made a part hereof and hereinafter referred to as "CJ DENS Property"; and

WHEREAS, HARRIS/FORTIN are the owners of certain real estate situated immediately to the south and east of and adjoining the CJ DENS Property situated within Clark County, State

of Washington, and legally described within Exhibit "B" which is attached hereto and by this reference is made part hereof and hereinafter referred to as "HARRIS/FORTIN Property" ; and

WHEREAS, for valuable consideration, CJ DENS has agreed to grant a temporary easement for ingress and egress across a portion of the CJ DENS Property in accordance with the terms and provisions of this Agreement;

NOW THEREFORE, in and for the consideration of the mutual covenants and promises of the parties hereto, the parties hereto covenant and agree as follows:

1. Temporary Easement for Ingress and Egress. For valuable consideration, receipt of which is hereby acknowledged, Grantor CJ DENS hereby grants and conveys to Grantee HARRIS/FORTIN, their heirs, personal representatives, successors, and assigns, for the benefit of the Dominant Estate defined below, a temporary and non-exclusive easement (hereinafter referred to as the "Temporary Easement") for ingress and egress over, across and upon the surface of the following described real estate of the Grantor situated within Clark County, Washington, legally described within Exhibit "C" attached hereto and by this reference made a part hereof (hereinafter referred to as the "Servient Estate"). The Temporary Easement shall be used solely for the purpose of an emergency turnaround for Grantee's above described real property (hereinafter referred to as the "Dominant Estate") as required by Clark County as noted below.

Grantor CJ DENS further grants as part of the Temporary Easement the right for Grantee HARRIS/FORTIN, their heirs, personal representatives, successors, and assigns, to construct and make all improvements necessary and appropriate, but only on the Servient Estate, to provide an emergency turnaround as required by the City of Camas as a condition for final plat approval of the Deerhaven subdivision with the costs to construct and make such improvements, and

Clark Auditor Mon Oct 09 10:26:46 PDT 2006 4232555 Page 2

thereafter maintain such improvements, to be solely borne by HARRIS/FORTIN, their heirs, personal representatives, successors and assigns, until such temporary easement is terminated as provided for herein. Upon completion of the construction of the turnaround, Grantee shall immediately restore Grantor's surrounding property to its condition prior to such construction. A copy of the map plan showing the dimensions of the proposed turnaround is attached hereto Exhibit "D" and by this reference is made a part hereof.

This Temporary Easement is subject, however, to all exceptions, reservations, restrictions, estates, leases, limitations and encumbrances, whether of record or not, currently existing or to be created, which affect the Servient Estate. Grantee, in its use of the Temporary Easement, shall comply with all reasonable security and safety regulations imposed by Grantor and its successors and assigns in ownership of the Servient Estate.

Grantee, on behalf of itself, its successors and assigns, shall indemnify, hold harmless and defend Grantor, its successors and assigns, and its officers, directors, employees, agents and assigns, from and against any and all losses, expenses, claims, demands, suits and causes of action and damages, including, but not limited to court costs, attorney's fees or expert and witness fees (i) resulting from or in any manner connected with the exercise by Grantee, its, employees, invitees, contractors, agents or representatives, of the rights under the Temporary Easement, (ii) resulting from or in any manner connected with the use by any third party of the Temporary Easement located on Grantor's Property who may be injured or suffer property damage, (iii) arising from any default or breach by Grantee or its successors and assigns of covenants or any other term or condition contained herein, and/or (iv) arising under any applicable laws, ordinances, orders, rules, regulations and requirements of all federal, state and local government, including but not limited to those relating to the environment. Grantee's

indemnity contained herein shall survive the termination of the Temporary Easement granted herein.

Grantee agrees to pay to Grantor during the entire term of this temporary easement the incremental increase in insurance premiums for Grantor to maintain commercial comprehensive general liability insurance covering personal injury, bodily injury and property damage, as well as automobile liability insurance, with combined limits of not less than $2,000,000 per occurrence. Grantee shall promptly make payment to Grantor within five (5) business days of receipt of such amounts due from Grantor for such incremental premium increases.

Grantee's exercise of its rights under the Temporary Easement shall not unreasonably interfere with Grantor's access to and use of the Servient Estate. Grantor, its successors and assigns shall have the right at any time to use the Servient Estate for any purpose whatsoever except that Grantor agrees that it shall not use the Servient Estate for any purpose which is inconsistent with the rights and privileges granted to the Grantee herein.

Grantor is under no obligation whatsoever to maintain, in any particular condition, the Temporary Easement or any property subject to the Temporary Easement. Grantee and its successors and assigns shall be solely responsible for any required repairs and maintenance on the Temporary Easement, except for gross negligence or willful misconduct of Grantor.

This easement for ingress and egress "touches and concerns" that portion of the CJ DENS Property identified above as the Servient Estate and the HARRIS/FORTIN Property, and shall apply to and run with the land for the benefit of the present and future owners of the HARRIS/FORTIN Property but only for the life of the Temporary Easement, or any portion thereof, and is appurtenant to the HARRIS/FORTIN Property, or any portion thereof.

2. Termination/Release of Temporary Easement for Ingress and Egress. The parties to this Agreement, for themselves, their heirs, personal representatives, successors, and assigns, agree that the Temporary Easement provided for herein shall be terminated once the easement area (Servient Estate) is dedicated to Clark County, the City of Camas, or other responsible municipality, as a portion of a public road, or the responsible municipality no longer requires the emergency turnaround to be maintained, or upon Grantor's development of its Property necessitating the termination of the turnaround (and replacement with an alternative exit of Grantee's property), in which circumstance HARRIS/FORTIN, their heirs, personal representatives, successors, or assigns, upon notice from City of Camas (or other responsible municipality) shall promptly prepare and have recorded with the Clark County Auditor an instrument terminating and releasing the temporary easement provided for herein.

3. Attorney Fees and Venue. The parties hereto agree that in the event that this Agreement is breached by either party, and a dispute arises that requires a legal action to resolve,

[THE BALANCE OF THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK].

the prevailing shall be entitled to recover their reasonable attorney fees and legal costs incurred. Venue for any such legal action shall be Clark County, State of Washington.

IN WITNESS WHEREOF, the parties have executed this Agreement for Temporary Ingress and Egress Easement, in Vancouver, Washington, to be effective on the day and year first above written.

CJ DENS LAND CO, LIMITED PARTNERSHIP, a
Nevada limited partnership

By: Carl C Jr

Its: member

MICHAEL A. FORTIN

COREY D. HARRIS

STATE OF WASHINGTON)
:ss.
County of Clark)

On this 2nd day of October, 2006, before me, the undersigned, a Notary Public in and for the State of Washington, duly commissioned and sworn, personally appeared Carl Lawson, to me known to be the General Partner of CJ DENS LAND CO, LIMITED PARTNERSHIP, the limited partnership that executed the foregoing instrument, and acknowledged such instrument to be the free and voluntary act and deed of such limited partnership, for the uses and purposes therein mentioned, and on oath stated that he was authorized to execute such instrument on behalf of such entity.

Witness my hand and official seal hereto affixed the day and year first above written.

DEBORAH L. MEYER
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXPIRES
APRIL 15, 2009

Deborah Meyer
NOTARY PUBLIC
Residing at Clark County, Wa.
My Appointment Expires: 4-15-2009

STATE OF WASHINGTON)
:ss.
County of Clark)

I certify that I know or have satisfactory evidence that COREY D. HARRIS is the person who appeared before me, and said person acknowledged that he signed this instrument and acknowledged it to be his free and voluntary act for the uses and purposes mentioned in the instrument.

DATED: September 28, 2006.

TRENA C. GRASSER NOTARY PUBLIC STATE OF WASHINGTON COMMISSION EXPIRES 1-9-08

NOTARY PUBLIC
Residing at Kelso
My Appointment Expires: 1/9/08

STATE OF WASHINGTON)
:ss.
County of Clark)

I certify that I know or have satisfactory evidence that MICHAEL A. FORTIN is the person who appeared before me, and said person acknowledged that he signed this instrument and acknowledged it to be his free and voluntary act for the uses and purposes mentioned in the instrument.

DATED: September 25, 2006.

TRENA C. GRASSER NOTARY PUBLIC STATE OF WASHINGTON COMMISSION EXPIRES 1-9-08

NOTARY PUBLIC
Residing at Kelso
My Appointment Expires: 1/9/2008

EXHIBIT "A"

A portion of the West half of the West half of Section 35, Township 2 North, Range 3 East, Willamette Meridian, Clark County, Washington, described as follows:

BEGINNING at a concrete monument with brass cap marking the Northeast corner of Section 34, as shown in Book 39 of Surveys at page 173b, Clark County Auditor's Records; thence South 00°15'46" East, 1319.52 feet to a 3/4 inch iron pipe at the Southeast corner of the Northeast quarter of the Northeast quarter of Section 34; thence North 89°50'42" East, along the South line of the Northwest quarter of the Northwest quarter of Section 35, for a distance of 777.92 feet to the TRUE POINT OF BEGINNING; thence South 00°13'50" West, 1838.61 feet to the centerline of S.E. Leadbetter Road; thence, Southeasterly along the centerline of S.E. Leadbetter Road, South 55°57'00" East, 360.00 feet; thence along the arc of a 954.92 foot radius curve to the right, through a central angle of 1°16'14", for an arc distance of 21.18 feet to the Southeast corner of the "Ast tract" as described under Clark County Auditor's File No. E45408; thence, leaving said road centerline, North 00°36'11: West, 732.57 feet to a 3/4 inch iron pipe at the Northwest corner of the "Ast tract" at a point on the South line of the Southwest quarter of the Northwest quarter of Section 35; thence North 89°51'44" East, along the South line of the Southwest quarter of the Northwest quarter of Section 35, for a distance of 233.68 feet to a 1-1/4 inch iron bar at the Southeast corner of the Southwest quarter of the Northwest quarter of Section 35; thence North 00°07'57" West, 1320.61 feet to a 1/2 inch iron rod at the Southeast corner of the Northwest quarter of the Northwest quarter of Section 35; thence South 89°50'42" West, 548.00 feet to the TRUE POINT OF BEGINNING.

EXCEPT any portion lying within SE Leadbetter Road.

EXHIBIT "B"

A parcel of land in the Northwest quarter of the Southwest quarter of Section 35, Township 2 North, Range 3 East of the Willamette Meridian, Clark County, Washington, more particularly described as follows:

BEGINNING at a 1 inch pipe which point is also the quarter section corner between Sections 34 and 35 of Township 2 North, Range 3 East of the Willamette Meridian; thence following the South boundary of Northwest quarter of said Section 35, South 89°32' East, a distance of 1321.80 feet to a 1 inch iron pipe set at the Northwest corner of a tract of land described in deed recorded in Book 147, page 628, records of said county, which point is the Point of Beginning of the tract to be conveyed herein; thence from said beginning point South 0°16' West along the West boundary line of said tract of land described in deed recorded in Book 147, page 628, records of said county, a distance of 959.80 feet to the center of the County Road as now laid out and constructed over and across the Northwest quarter of the Southwest quarter of Section 35, Township 2 North, Range 3 East of the Willamette Meridian; thence following the centerline of said County Road North 32°50' West 59.80 feet; thence North 43°50' West 205 feet; thence North 57°00' West 65 feet to the Northwest corner of a tract of land commonly known as the C. W. Flanner property; thence North 728.40 feet to a 1 inch pipe set on the South line of the Northwest quarter of said Section 35; thence South 89°32' East 233.40 feet to the Point of Beginning.

EXCEPT that portion within SE Leadbetter Road.

EXCEPT that portion thereof conveyed to the State of Washington for purpose of Secondary State Highway No. 8-A by deed recorded under Auditor's File No. G 210157.

SUBJECT TO:

1. Taxes and assessments as they become due and payable.

   Notice of Moratorium on Non-Forestry Use of Land recorded October 7, 1998, under Auditor's File No. 3014431.

   Easement, including the terms, covenants and provisions thereof, as granted by instrument;

Recorded:	JULY 18, 1950
Auditor's File No.:	G 81789
Records of:	Clark County, Washington
To:	PUBLIC UTILITY DISTRICT NO. 1 OF CLARK COUNTY
Purpose:	transmission of electric currency
Affects:	blanket in nature

   Easement, including its terms, covenants and provisions as disclosed by instrument;

Recorded:	AUGUST 22, 1989
Auditor's File No.:	8908220175
In favor of:	CITY OF CAMAS
For:	constructing a STEP sanitary sewer collection system
Affects:	blanket in nature

EXHIBIT "C"

An easement for ingress and egress over, under and across that portion of the Southwest quarter of the Northwest quarter of Section 35, Township 2 North, Range 3 East, Willamette Meridian, Clark County, Washington, described as follows:

BEGINNING AT a concrete monument with brass cap at the Southwest corner of the Northwest quarter of said Section 35;

THENCE North 89° 51' 38" East; 1087.37 feet to a 3/4 inch iron pipe at the Northwest corner of the "Ast tract" as described under Clark County Auditor's File No. E45408 and shown on that survey recorded in Book 39 of Surveys, Page 173.

THENCE North 89° 51' 44" East, to a 1-1/4 inch iron bar at the Northeast corner of said "Ast tract" and the most Easterly Southeast corner of the "North LaCamas Corporation tract" as described under Auditor's File No. 8810190090 as shown on said record of survey;

THENCE South 89° 51' 44" West, along the North line of said "Ast tract", 56.14 feet to the TRUE POINT OF BEGINNING of this easement description;

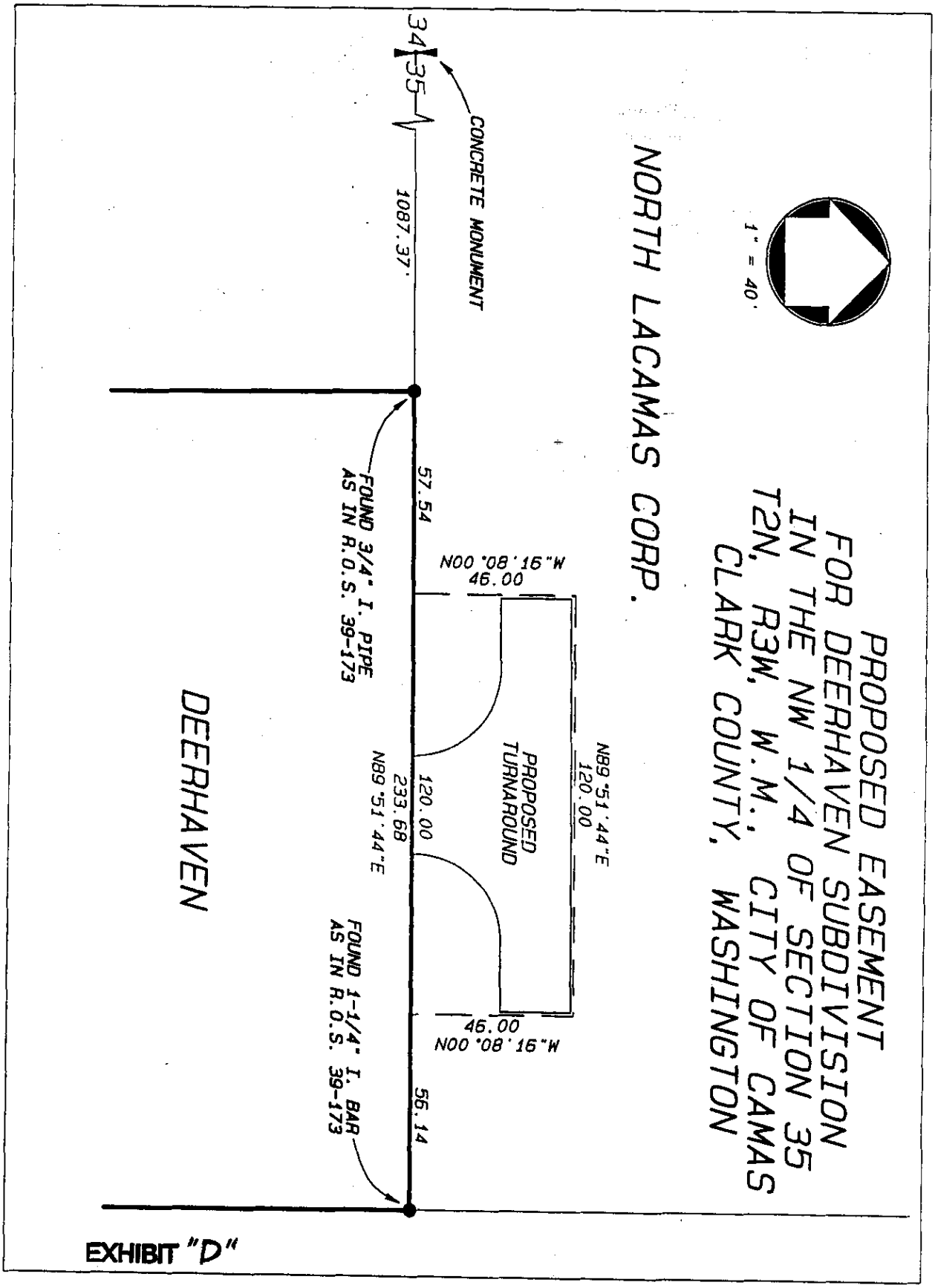
THENCE, continuing South 89° 51' 44" West, along said North line 120.00 feet;

THENCE North 0° 08' 16" West perpendicular to said North line 46.00 feet;

THENCE North 89° 51' 44" East parallel to said North line 120.00 feet;

South 0° 08' 16" East, 46.00 feet to the TRUE POINT OF BEGINNING.

EXHIBIT "C"


PROPOSED EASEMENT
FOR DEERHAVEN SUBDIVISION
IN THE NW 1/4 OF SECTION 35
T2N, R3W, W.M., CITY OF CAMAS
CLARK COUNTY, WASHINGTON
NORTH LACAMAS CORP.
1" = 40'
35
CONCRETE MONUMENT
1087.37'
57.54
FOUND 3/4" I. PIPE
AS IN R.O.S. 39-173
N00°08'16"W
46.00
PROPOSED
TURNAROUND
N89°51'44"E
120.00
120.00
233.68
N89°51'44"E
46.00
N00°08'16"W
56.14
FOUND 1-1/4" I. BAR
AS IN R.O.S. 39-173
DEERHAVEN
EXHIBIT "D"

5719904 BLA
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P.O. Box 694
Vancouver, WA 98666

DECLARATION OF BOUNDARY LINE ADJUSTMENT AGREEMENT

Grantor	:	CJ Dens Lacamas I, LLC
Grantee	:	CJ Dens Lacamas I, LLC
Abbreviated Legal	:	#29, #30 SEC 34 T2N R3EWM; #80, #144 SEC 35 T2N R3EWM
Tax Parcel No.	:	177905-000; 177906-000; 178172-000; 178236-000
Other Reference Nos.	:	NA

1. Effective Date. February 13, 2020.

2. Recitals.

A. CJ Dens Lacamas I, LLC (Owner) is the owner of the four legal parcels of real property legally described in **Exhibit A**, attached to this document and incorporated by reference (Original Parcels).

B. Owner desires to adjust the boundaries of the four legal lots into new parcel configurations (Adjusted Parcels).

C. Prior to the boundary adjustment, there are four legal lots and subsequent to the adjustment, there will be four legal lots, and no property will be conveyed until after this Declaration is recorded. This Declaration will not be effective until recorded.

Owner declares as follows:

3. Current Boundaries. Owner acknowledges that the legal descriptions attached as **Exhibit A** contain the record boundaries of its four legal lots. The City of Camas, Washington has confirmed that each of these lots are legal lots of record and approved a boundary line adjustment in a land use decision issued on March 26, 2020, under City File No. BLA20-03.

4. Proposed Adjusted Boundaries. Owner intends by this Agreement to change the existing legal boundaries of the Original Parcels so that the boundaries of the Original Parcels will be adjusted as follows:

4.1 The boundaries of the Original Parcels are modified and legally described in **Exhibit B**, and illustrated in **Exhibit C**.

5. Intention.

5.1 Owner, in adopting the new boundaries and legal descriptions for the Original Parcels, does fully represent and agree that it is its intention to confirm, modify and accept the real property descriptions as modified in this document.

5.2 Owner, as among itself, its assigns, heirs, representatives and successors, accepts the legal descriptions in **Exhibit B**, and illustrated in **Exhibit C** as modifying the legal descriptions in **Exhibit A**, and so establishing in **Exhibit B** the true legal descriptions of the Adjusted Parcels, and will execute this instrument to embody its intention regarding the new location of the boundary lines and the new legal descriptions for its four parcels.

5.3 Owner declares that an access and utility easement exists on, over and under Adjusted Tax Lot 30 for the benefit of Adjusted Tax Lot 80 legally described in **Exhibit D**.

5.4 Owner will execute any necessary additional documents or deeds in order to fulfill the intentions of this document.

6. Compliance. This Boundary Line Adjustment is made in compliance with Section 58.17.040(6) RCW and Section 17.07.040.A. of the Camas Municipal Code because this document does not create any additional lot, tract, parcel, site or division nor is it considered a plat alteration.

7. Headings. The headings appearing in this document are for convenience of reference only and in no way define, limit, or circumscribe the scope and intent of this document or any provision herein.

Signature on following page

CJ Dens Lacamas I, LLC
Carl Lawson, managing Member

Date: 4/3/20

State of Washington)
) ss.
County of Clark)

I certify that I know or have satisfactory evidence Carl Lawson is the person who appeared before me, and said person acknowledged that s/he signed this instrument, on oath stated that s/he was authorized to execute the instrument as the manager of CJ Dens Lacamas I, LLC, and acknowledged it to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated: February 13, 2020.

Notary Public
State of Washington
IMELDA M MANALO
Commission Expires 8-1-2020

Notary Public for Vancouver, WA

Imelda Manalo
Name of Notary

My appointment expires: 8-1-2020

EXHIBIT A

LEGAL DESCRIPTIONS OF ORIGINAL PARCELS
See following pages

PARCEL 1

A PORTION OF THE EAST HALF OF SECTION 34, TOWNSHIP 2 NORTH, RANGE 3 EAST, WILLAMETTE MERIDIAN, CLARK COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS:

BEGINNING AT A CONCRETE MONUMENT WITH BRASS CAP MARKING THE NORTHEAST CORNER OF SECTION 34, AS SHOWN IN BOOK 39 OF SURVEYS AT PAGE 173B, CLARK COUNTY AUDITOR'S RECORDS; THENCE SOUTH 00°15'48" EAST, 1319.52 FEET TO A 3/4 INCH IRON PIPE AT THE SOUTHEAST CORNER OF THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER OF SECTION 34; THENCE SOUTH 89°45'43" WEST, 175.00 FEET TO THE TRUE POINT OF BEGINNING; THENCE CONTINUING SOUTH 89°45'43" WEST, 1146.36 FEET TO A 3/4 INCH IRON PIPE AT THE SOUTHEAST CORNER OF THE LAUGHLIN TRACT AS DESCRIBED IN BOOK Z OF DEEDS AT PAGE 524, RECORDS OF CLARK COUNTY AUDITOR; THENCE SOUTH 89°46'35" WEST, ALONG THE SOUTH LINE OF THE LAUGHLIN TRACT, FOR A DISTANCE OF 885.01 FEET TO A HALF INCH IRON ROD (SURVEY 39-173B) AT THE NORTHEAST CORNER OF PARCEL I OF THE MILLS TRACT AS DESCRIBED UNDER CLARK COUNTY AUDITOR'S FILE NO. 8206200027; THENCE SOUTH 08°47'06" EAST, 270.56 FEET TO A HALF INCH IRON ROD (SURVEY 39-173B) AT THE SOUTHEAST CORNER OF THE MILLS TRACT, AND ON THE NORTHERLY RIGHT-OF-WAY LINE OF SE LEADBETTER ROAD; THENCE NORTHWESTERLY, ALONG THE NORTHERLY RIGHT-OF-WAY LINE OF SE LEADBETTER ROAD, ALONG THE ARC OF A 2895.59 FOOT RADIUS CURVE TO THE LEFT, (THE RADIUS POINT OF WHICH BEARS SOUTH 48°14'55" WEST) THROUGH A CENTRAL ANGLE OF 02°22'55", FOR AN ARC DISTANCE OF 120.38 FEET; THENCE NORTH 44°08'00" WEST, 248.81 FEET TO THE SOUTH LINE OF THE ABOVE MENTIONED LAUGHLIN TRACT; THENCE SOUTH 89°46'35" WEST, ALONG THE SOUTH LINE OF THE LAUGHLIN TRACT, FOR A DISTANCE OF 41.84 FEET TO THE CENTERLINE OF SE LEADBETTER ROAD; THENCE SOUTHEASTERLY ALONG THE CENTERLINE OF SE LEADBETTER ROAD, SOUTH 44°08'00" EAST, 277.49 FEET; THENCE ALONG THE ARC OF A 2895.59 FOOT RADIUS CURVE TO THE RIGHT, THROUGH A CENTRAL ANGLE OF 05°50'00" FOR AN ARC DISTANCE OF 294.75 FEET; THENCE SOUTH 38°18'00" EAST 94.05 FEET; THENCE ALONG THE ARC OF A 477.51 FOOT RADIUS CURVE TO THE LEFT, THROUGH A CENTRAL ANGLE OF 29°58'00", FOR AN ARC DISTANCE OF 249.75 FEET; THENCE SOUTH 68°16'00" EAST, 259.91 FEET; THENCE ALONG THE ARC OF A 572.75 FOOT RADIUS CURVE TO THE LEFT, THROUGH A CENTRAL ANGLE OF 17°40'00", FOR AN ARC DISTANCE OF 176.69 FEET; THENCE SOUTH 85°56'00" EAST, 260.46 FEET; THENCE ALONG THE ARC OF A 477.48 FOOT RADIUS CURVE TO THE RIGHT, THROUGH A CENTRAL ANGLE OF 34°20'00", FOR AN ARC DISTANCE OF 286.12 FEET; THENCE SOUTH 51°36'00" EAST, 476.62 FEET; THENCE LEAVING THE CENTERLINE OF SE LEADBETTER ROAD, NORTH 00°15'25" WEST, 38.43 FEET TO A HALF INCH IRON ROD (SURVEY 39-173B), AT THE SOUTHEAST CORNER OF THE WILDLIFE LEAGUE TRACT AS DESCRIBED UNDER CLARK COUNTY AUDITOR'S FILE NO. 8812270186, ON THE NORTHERLY RIGHT-OF-WAY LINE OF SE LEADBETTER ROAD; THENCE NORTHWESTERLY ALONG THE NORTHERLY RIGHT-OF-WAY LINE OF SE LEADBETTER ROAD NORTH 51°36'00" WEST, 452.92 FEET; THENCE ALONG THE ARC OF A 507.48 FOOT RADIUS CURVE TO THE LEFT THROUGH A CENTRAL ANGLE OF 34°25'00", FOR AN ARC DISTANCE OF 304.10 FEET; THENCE NORTH 85°56'00" WEST, 197.52 FEET TO A HALF INCH IRON ROD (SURVEY 39-173B) AT THE SOUTHWEST CORNER OF THE WILDLIFE LEAGUE TRACT; THENCE, LEAVING THE NORTHERLY RIGHT-OF-WAY LINE OF SE LEADBETTER ROAD, NORTH 00°17'47" WEST, 282.50 FEET TO A HALF INCH IRON ROD (SURVEY 39-173B) AT THE NORTH-WEST CORNER OF THE WILDLIFE LEAGUE TRACT; THENCE NORTH 89°45'43" EAST, ALONG THE NORTH LINE OF THE WILDLIFE LEAGUE TRACT, FOR A DISTANCE OF 250.00 FEET TO A HALF INCH IRON ROD SET IN BOOK 44 OF SURVEYS, PAGE 122, AT THE SOUTHWEST CORNER OF ANOTHER WILDLIFE LEAGUE TRACT AS DESCRIBED UNDER CLARK COUNTY AUDITOR'S FILE NO. 5704190180; THENCE NORTH 00°15'25" WEST 168.00 FEET TO A HALF INCH IRON ROD (SURVEY 44-122) AT THE NORTHWEST CORNER OF THE LATTER WILDLIFE LEAGUE TRACT; THENCE NORTH 89°45'43" EAST, 579.53 FEET TO A HALF INCH IRON ROD (SURVEY 44-122) AT THE NORTHEAST CORNER OF THE LATTER WILDLIFE LEAGUE TRACT; THENCE CONTINUING NORTH 89°45'43" EAST, 316.00 FEET; THENCE NORTH 00°09'19" WEST, 305.35 FEET TO THE TRUE POINT OF BEGINNING.

EXCEPT ANY PORTION LYING SOUTH OF THE NORTH LINE OF SE LEADBETTER ROAD.

TOGETHER WITH AN EASEMENT FOR ROAD AND UTILITY PURPOSES OVER, ALONG AND ACROSS THE WEST 30 FEET OF THE FOLLOWING DESCRIBED TRACT:

BEGINNING AT A POINT WHICH IS NORTH 89°58'30" WEST, 1322.5 FEET AND SOUTH 0°01'30" EAST, 2093.3 FEET FROM CORNER COMMON TO SECTIONS 26, 27, 34, 35, ALL IN SECTION 34, TOWNSHIP 2 NORTH, RANGE 3 EAST WILLAMETTE MERIDIAN; THENCE NORTH 0°01'30" WEST, 382.50 FEET; THENCE NORTH 89°58'30" EAST 529.5 FEET; THENCE SOUTH 288.4 FEET, THENCE EAST 50 FEET; THENCE SOUTH 200.0 FEET; THENCE WEST 50 FEET; THENCE SOUTH 224.92 FEET TO NORTH BOUNDARY LINE OF COUNTY ROAD; THENCE ALONG THE NORTH BOUNDARY LINE OF RIGHT-OF-WAY OF SAID COUNTY ROAD TO POINT OF BEGINNING.

PARCEL 2

A PORTION OF THE WEST HALF OF THE WEST HALF OF SECTION 35, TOWNSHIP 2 NORTH, RANGE 3 EAST, WILLAMETTE MERIDIAN, CLARK COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS:

BEGINNING AT A CONCRETE MONUMENT WITH BRASS CAP MARKING THE NORTHEAST CORNER OF SECTION 34, AS SHOWN IN BOOK 38 OF SURVEYS AT PAGE 173B, CLARK COUNTY AUDITOR'S RECORDS; THENCE SOUTH 00°15'46" EAST, 1319.52 FEET TO A 3/4 INCH IRON PIPE AT THE SOUTHEAST CORNER OF THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER OF SECTION 34; THENCE NORTH 89°50'42" EAST, ALONG THE SOUTH LINE OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 35, FOR A DISTANCE OF 230.92 FEET TO THE TRUE POINT OF BEGINNING THENCE SOUTH 00°12'28" WEST, 1548.45 FEET TO THE CENTERLINE OF SE LEADBETTER ROAD, THENCE, SOUTHEASTERLY ALONG THE CENTERLINE OF SE LEADBETTER ROAD, SOUTH 70°12'02" EAST, 305.00 FEET; THENCE ALONG THE ARC OF A 572.80 FOOT RADIUS CURVE TO THE RIGHT, THROUGH A CENTRAL ANGLE OF 14°15'00", FOR AN ARC DISTANCE OF 142.48 FEET; THENCE SOUTH 55°57' EAST, 278.64 FEET; THENCE, LEAVING SAID ROAD CENTERLINE, NORTH 00°13'50" WEST, 1838.61 FEET TO THE SOUTH LINE OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 35; THENCE SOUTH 89°50'42" WEST, 547.00 FEET TO THE TRUE POINT OF BEGINNING.

EXCEPT ANY PORTION LYING WITHIN SE LEADBETTER ROAD.

PARCEL 3

A PORTION OF THE WEST HALF OF THE WEST HALF OF SECTION 35, TOWNSHIP 2 NORTH, RANGE 3 EAST, WILLAMETTE MERIDIAN, CLARK COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS:

BEGINNING AT A CONCRETE MONUMENT WITH BRASS CAP MARKING THE NORTHEAST CORNER OF SECTION 34, AS SHOWN IN BOOK 38 OF SURVEYS AT PAGE 173B, CLARK COUNTY AUDITOR'S RECORDS; THENCE SOUTH 00°15'46" EAST, 1319.52 FEET TO A 3/4 INCH IRON PIPE AT THE SOUTHEAST CORNER OF THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER OF SECTION 34; THENCE NORTH 89°50'42" EAST, ALONG THE SOUTH LINE OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 35, FOR A DISTANCE OF 777.92 FEET TO THE TRUE POINT OF BEGINNING, THENCE SOUTH 00°13'50" WEST, 1838.61 FEET TO THE CENTERLINE OF SE LEADBETTER ROAD; THENCE, SOUTHEASTERLY ALONG THE CENTERLINE OF SE LEADBETTER ROAD, SOUTH 55°57'00" EAST, 360.00 FEET; THENCE ALONG THE ARC OF A 954.92 FOOT RADIUS CURVE TO THE RIGHT, THROUGH A CENTRAL ANGLE OF 1°16'14", FOR AN ARC DISTANCE OF 21.16 FEET TO THE SOUTHEAST CORNER OF THE "AST TRACT" AS DESCRIBED UNDER CLARK COUNTY AUDITOR'S FILE NO. G45406, THENCE, LEAVING SAID ROAD CENTERLINE, NORTH 00°36'11" WEST, 732.57 FEET TO A 3/4 INCH IRON PIPE AT THE NORTHWEST CORNER OF THE "AST TRACT" AT A POINT ON THE SOUTH LINE OF THE SOUTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 35; THENCE NORTH 89°51'44" EAST, ALONG THE SOUTH LINE OF THE SOUTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 35, FOR A DISTANCE OF 233.68 FEET TO A 1-1/4 INCH IRON BAR AT THE SOUTHEAST CORNER OF THE SOUTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 35; THENCE NORTH 00°07'57" WEST, 1320.61 FEET TO A HALF INCH IRON ROD AT THE SOUTHEAST CORNER OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 35; THENCE SOUTH 89°50'42" WEST, 546.00 FEET TO THE TRUE POINT OF BEGINNING.

EXCEPT ANY PORTION LYING WITHIN SE LEADBETTER ROAD

PARCEL A

A PORTION OF THE EAST HALF OF SECTION 34 AND THE WEST HALF OF THE WEST HALF OF SECTION 35, ALL IN TOWNSHIP 2 NORTH, RANGE 3 EAST, WILLAMETTE MERIDIAN, CLARK COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS:

BEGINNING AT A CONCRETE MONUMENT WITH BRASS CAP MARKING THE NORTHEAST CORNER OF SECTION 34, AS SHOWN IN BOOK 39 OF SURVEYS AT PAGE 1738, CLARK COUNTY AUDITOR'S RECORDS; THENCE SOUTH 89°15'48" EAST, 1319.52 FEET TO A 3/4 INCH IRON PIPE AT THE SOUTHEAST CORNER OF THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER OF SECTION 34, AND THE TRUE POINT OF BEGINNING; THENCE SOUTH 89°45'43" WEST, 175.00 FEET; THENCE SOUTH 00°09'10" EAST, 305.36 FEET; THENCE SOUTH 89°45'43" WEST, 316.00 FEET TO A HALF INCH IRON ROD SET IN BOOK 44 OF SURVEYS, PAGE 102, CLARK COUNTY AUDITOR'S RECORDS AT THE NORTHEAST CORNER OF THE WILDLIFE LEAGUE TRACT AS DESCRIBED UNDER CLARK COUNTY AUDITOR'S FILE NO. 9704180160; THENCE SOUTH 00°19'25" EAST, ALONG THE EAST LINE OF THE WILDLIFE LEAGUE TRACT AND ALONG THE EAST LINE OF ANOTHER WILDLIFE LEAGUE TRACT AS DESCRIBED UNDER CLARK COUNTY AUDITOR'S FILE NO. 8812270196, FOR A DISTANCE OF 696.14 FEET TO THE CENTERLINE OF SE LEADBETTER ROAD; THENCE SOUTHEASTERLY ALONG THE CENTERLINE OF SE LEADBETTER ROAD, SOUTH 51°38'20" EAST, 13.51 FEET; THENCE ALONG THE ARC OF A 1432.62 FOOT RADIUS CURVE TO THE LEFT, THROUGH A CENTRAL ANGLE OF 16°36'00", FOR AN ARC DISTANCE OF 485.07 FEET; THENCE SOUTH 70°12'20" EAST, 328.64 FEET; THENCE, LEAVING SAID ROAD CENTERLINE, NORTH 00°12'28" WEST, 1548.45 FEET TO THE SOUTH LINE OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 35; THENCE SOUTH 89°50'42" WEST, 230.92 FEET TO THE TRUE POINT OF BEGINNING.

EXCEPT ANY PORTION LYING WITHIN SE LEADBETTER ROAD.

Tax Account No(s) 177905-000, 177906-000, 178172-000, 178236-000

EXHIBIT B

LEGAL DESCRIPTIONS OF ADJUSTED PARCELS
See following pages

ADJUSTED TAX LOT 29

Being a portion of the Southwest quarter of the Northeast quarter and the Southeast quarter of the Northeast quarter of Section 34 and the Southwest quarter of the Northwest quarter of Section 35, Township 2 North, Range 3 East of the Willamette Meridian, City of Camas, Clark County, Washington described as follows:

COMMENCING at a concrete monument with brass cap marking the Northeast corner of Section 34 as shown in Book 39 of Surveys, Page 173, Clark County Auditor's records;

Thence South 00°15'46" East, along the East line of the Northeast quarter of Section 34 for a distance of 1319.52 feet to a 3/4" iron pipe at the Southeast corner of the Northeast quarter of the Northeast quarter of Section 34 and the **POINT OF BEGINNING;**

Thence South 89°45'43" West, along the South line of the Northeast quarter of the Northeast quarter of Section 34, for a distance of 1321.38 feet to a 3/4" iron pipe at the Southeast corner of the Laughlin Tract as described in Book Z of Deeds, Page 524, Clark County Auditor's records;

Thence South 89°46'35" West, along the South line of the Laughlin Tract, for a distance of 880.01 feet to a 1/2" iron rebar (Survey Book 39, Page 173) at the Northeast corner of Parcel 1 of the Mills Tract as described under Clark County Auditor's File Number 8208200027;

Thence South 08°47'06" East, for a distance of 270.55 feet to a 1/2" iron rebar (Survey Book 39, Page 173) at the Southeast corner of the Mills Tract, being on the Northerly right-of-way line of SE Leadbetter Road;

Thence along the Northerly right-of-way line of Leadbetter Road the following described courses;

Thence along the arc of a 2895.59 foot radius curve to the right through a central angle of 03°27'05", for an arc distance of 174.42 feet, the chord of which bears South 40°01'32" East, 174.40 feet;

Thence South 38°18'00" East, for a distance of 94.05 feet;

Thence along the arc of a 447.51 foot radius curve to the left, through a central angle of 29°58'00", for an arc distance of 234.06 feet, the chord of which bears South 53°17'00" East, 231.40 feet;

Thence South 68°16 00" East, for a distance of 259.91 feet;

Thence along the arc of a 542.70 foot radius curve to the left, through a central angle of 17°40'00", for an arc distance of 167.34 feet, the chord of which bears South 77°06'00" East, 166.67 feet;

Thence South 85°56'00" East, for a distance of 82.96 feet to a 1/2" iron rebar (Survey Book 39, Page 173), marking the Southwest corner of the City of Camas tract as described under Clark County Auditor's File Number 5571688;

Thence North 00°17'47" West, leaving said North right-of-way line along the most Westerly line of the City of Camas Tract, for a distance of 282.50 feet to a 1/2" iron rebar (Survey Book 39, Page 173), marking the most Westerly Northwest corner of said City of Camas tract;

Thence North 89°45'43" East, along the most Southerly North line of said City of Camas tract, for a distance of 250.00 feet to a 1/2" iron rebar (Survey Book 39, Page 173), marking an internal corner thereof;

Thence North 00°15'25" West, along the most Easterly West line of said City of Camas tract, for a distance of 168.00 feet to a 1/2" iron rebar as shown in Book 41 of Surveys, Page 122, Clark County Auditor's Records, marking the most Northerly Northwest corner thereof;

Thence North 89°45'43" East, along the North line of said City of Camas tract, for a distance of 579.50 feet to a 1/2" iron rebar (Survey Book 41, Page 122), marking the Northeast corner thereof;

Thence South 00°15'25" East, along the East line of said City of Camas tract, for a distance of 364.60 feet;

Thence North 60°00'00" East, leaving said East line for a distance of 182.00 feet;

Thence North 75°00'00" East, for a distance of 420.00 feet;

Thence North 28°00'00" East, for a distance of 90.00 feet;

Thence North 80°00'00" East, for a distance of 43.00 feet;

Thence South 65°00'00" East, for a distance of 95.00 feet;

Thence North 84°00'00" East, for a distance of 320.00 feet;

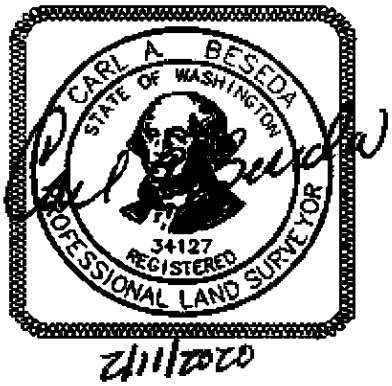
Thence North 61°00'00" East, for a distance of 310.00 feet;

Thence North 29°00'00" East, for a distance of 279.41 feet to the South line of the Northwest quarter of the Northwest quarter of Section 35 (Survey Book 39, Page 173);

Thence South 89°50'42" West, along said South line for a distance of 970.30 feet to the **POINT OF BEGINNING;**

Contains approximately 32.69 acres.

Together with and subject to easements and restrictions of record.



ADJUSTED TAX LOT 30

Being a portion of the Southeast quarter of the Northeast quarter and the Northeast quarter of the Southeast quarter of Section 34 and the Southwest quarter of the Northwest quarter and the Northeast quarter of the Southwest quarter of Section 35, Township 2 North, Range 3 East of the Willamette Meridian, City of Camas, Clark County, Washington described as follows:

COMMENCING at a concrete monument with brass cap marking the Northeast corner of Section 34 as shown in Book 39 of Surveys, Page 173, Clark County Auditor's records;

Thence South 00°15'46" East, along the East line of the Northeast quarter of Section 34, for a distance of 1319.52 feet to a 3/4" iron pipe at the Southeast corner of the Northeast quarter of the Northeast quarter of Section 34;

Thence North 89°50'42" East, along the North line of the Southwest quarter of the Northwest quarter of Section 35, for a distance of 970.30 feet;

Thence continuing North 89°50'42" East, along said North line for a distance of 353.62 feet to a 1/2" iron rebar with yellow plastic cap inscribed "Minister 12563", marking the Northeast corner of the Southwest quarter of the Northwest quarter of Section 35 as shown (Survey 39-173);

Thence South 00°07'57" East, along the East line of the Southwest quarter of the Northwest quarter of Section 35, for a distance of 796.83 feet;

Thence continuing South 00°07'57" East, along said East line for a distance of 523.79 feet to the Northeast corner of Deerhaven, recorded in Book 311 of Plats, Page 573, Clark County Auditor's Records;

Thence South 89°51'44" West, along the North line of Deerhaven (Plats 311- 573) for a distance of 233.68 feet to the Northwest corner thereof;

Thence South 00°36'11" East, along the West line of Deerhaven for a distance of 103.60 feet to the **POINT OF BEGINNING**;

Thence South 55°50'51" West, leaving said West line for a distance of 183.58 feet;

Thence North 81°30'58" West, for a distance of 116.25 feet;

Thence North 13°49'07" East, for a distance of 90.86 feet;

Thence North 54°21'17" East, for a distance of 153.08 feet;

Thence along the arc of a 20.00 foot radius curve to the left, through a central angle of 54°29'14", for an arc distance of 19.02 feet, the chord of which bears North 27°06'40" East, 18.31 feet.

Thence North 00°07'57" West, for a distance of 115.32 feet;

Thence South 89°52'03" West, for a distance of 61.63 feet;

Thence along the arc of a 678.00 foot radius curve to the right through a central angle of 02°44'21", for an arc distance of 32.42 feet, the chord of which bears North 88°45'47" West, 32.41 feet;

Thence South 02°36'24" West, for a distance of 100.89 feet;

Thence South 76°16'02" West, for a distance of 71.76 feet;

Thence North 76°42'57" West, for a distance of 433.46 feet;

Thence North 32°54'03" West, for a distance of 175.17 feet;

Thence North 03°42'19" West, for a distance of 65.37 feet;

Thence North 23°59'56" West, for a distance of 56.24 feet;

Thence North 78°24'19" East, for a distance of 62.08 feet;

Thence South 89°46'33" East, for a distance of 44.61 feet;

Thence South 86°43'31" East, for a distance of 72.00 feet;

Thence South 03°16'29" West, for a distance of 16.99 feet;

Thence South 86°43'31" East, for a distance of 66.08 feet;

Thence North 13°17'03" East, for a distance of 162.00 feet;

Thence North 76°42'57" West, for a distance of 79.90 feet;

Thence North 86°43'31" West, for a distance of 254.58 feet;

Thence North 11°48'58" West, for a distance of 116.80 feet;

Thence North 08°22'20" West, for a distance of 26.00 feet, hereon referred to as described **POINT A**;

Thence continuing North 08°22'20" West, for a distance of 26.00 feet;

Thence along the arc of a 326.00 foot radius curve to the left, through a central angle of 02°04'23" for an arc distance of 11.79 feet, the chord of which bears South 80°35'29" West, 11.79 feet;

Thence North 10°26'42" West, for a distance of 71.15 feet;

Thence North 62°47'15" West, for a distance of 30.13 feet;

Thence South 68°20'28" West, for a distance of 118.87 feet;

Thence North 62°52'10" West, for a distance of 34.30 feet;

Thence South 69°40'14" West, for a distance of 72.81 feet;

Thence South 88°06'20" West, for a distance of 31.62 feet;

Thence South 69°40'14" West, for a distance of 300.00 feet;

Thence South 51°14'08" West, for a distance of 63.25 feet;

Thence South 65°31'05" West, for a distance of 55.71 feet to the East line of the City of Camas tract as described under Clark County Auditor's File Number 5571688, said point to bear South 00°15'25" East, along said East line, 446.51 feet from the Northeast corner of said City of Camas tract;

Thence South 00°15'25" East, along the East line of said City of Camas tract for a distance of 417.21 feet to a 1/2" iron rebar (Survey 39-173), marking the Southeast corner thereof being on the Northerly right-of-way line of SE Leadbetter Road;

Thence following the North right-of-way line of SE Leadbetter Road the following described courses;

Thence South 51°36'00" East, for a distance of 37.51 feet;

Thence along the arc of a 1402.62 foot radius curve to the left through a central angle of 18°36'00" for an arc distance of 455.33 feet, the chord of which bears South 60°54'00" East, 453.34 feet;

Thence South 70°12'00" East, for a distance of 13.56 feet to the Southwest corner of another City of Camas tract as described under Clark County Auditor's File Number 5609467;

Thence North 18°04'52" East, along the West line of said latter City of Camas tract (Auditor's File Number 5609467) for a distance of 74.00 feet to the Northwest corner thereof;

Thence South 70°12'53" East, along the North line of said City of Camas tract, for a distance of 139.09 feet to the Northeast corner thereof;

Thence South 19°48'37" West, along the East line of said City of Camas tract, for a distance of 54.00 feet to an angle point of said East line;

Thence South 64°48'17" West, continuing along said East line for a distance of 28.29 feet to the Southeast corner of said City of Camas tract being on the Northerly right-of-way line of SE Leadbetter Road;

Thence South 70°12'00" East, along said Northerly right-of-way for a distance of 401.43 feet;

Thence continuing along said Northerly right-of-way along the arc of a 602.80 foot radius curve to the right through a central angle of 14°15'00" for an arc distance of 149.92 feet, the chord of which bears South 63°04'30" East, 149.54 feet;

Thence South 55°57'00" East, continuing along said Northerly right-of-way, for a distance of 636.64 feet;

Thence continuing along said right-of-way along the arc of a 984.92 foot radius curve to the right, through a central angle of 00°00'55" for an arc distance of 0.26 feet, the chord of which bears North 55°55'15" West, 0.26 feet to a 1/2" iron rebar as shown (Survey 39- 173), being on the Southerly extension of the West line of Deerhaven (Plats 311-573);

Thence North 00°36'11" West, along said Southerly extension and the West line of Deerhaven, for a distance of 592.20 feet to the **POINT OF BEGINNING**;

Contains approximately 22.34 acres.

Also together with and subject to a 30.00 foot wide easement for ingress-egress and utilities, described as follows:

Being a portion of the Southeast quarter of the Northeast quarter of Section 34, Township 2 North, Range 3 East and the Southwest quarter of the Northwest quarter and the Northwest quarter of the Southwest quarter of Section 35, Township 2 North, Range 3 East of the Willamette Meridian, City of Camas, Clark County, Washington, the centerline from which is described as follows:

BEGINNING at above described **POINT A**;

Thence along the arc of a 300.00 foot radius curve to the left through a central angle of 11°57'26" for an arc distance of 62.61 feet, the chord of which bears South 75°38'57" West, 62.49 feet;

Thence South 69°40'14" West, for a distance of 474.54 feet;

Thence South 27°49'37" East, for a distance of 92.86 feet;

Thence along the arc of a 450.00 foot radius curve to the left, through a central angle of 23°54'30" for an arc distance of 187.77 feet, the chord of which bears South 39°46'52" East, 186.42 feet;

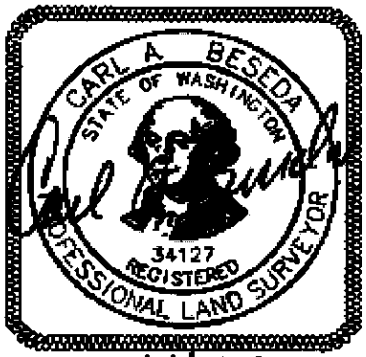
Thence South 51°44'07" East, for a distance of 790.79 feet;

Thence along the arc of a 70.00 foot radius curve to the right through a central angle of 58°43'36" for an arc distance of 71.75 feet, the chord of which bears South 22°22'19" East, 68.65 feet;

Thence South 06°59'30" West, for a distance of 17.55 feet to the Northerly right-of-way line of SE Leadbetter Road and the **TERMINUS** of the described centerline;

Said side lines of which are to be shortened or extended to intersect North 08°22'20" West and South 08°22'20" East, from the **POINT OF BEGINNING** and to the Northerly right-of-way line of SE Leadbetter Road from the **TERMINUS** of the described centerline.

Together with and subject to easements and restrictions of record.



2/11/2020

ADJUSTED TAX LOT 80

Being a portion of the Southeast quarter of the Northeast quarter of Section 34 and the Southwest quarter of the Northwest quarter of Section 35, Township 2 North, Range 3 East of the Willamette Meridian, City of Camas, Clark County, Washington described as follows:

COMMENCING at a concrete monument with brass cap marking the Northeast corner of Section 34 as shown in Book 39 of Surveys, Page 173, Clark County Auditor's records;

Thence South 00°15'46" East, along the East line of the Northeast quarter of Section 34, for a distance of 1319.52 feet to a 3/4" iron pipe at the Southeast corner of the Northeast quarter of the Northeast quarter of Section 34;

Thence North 89°50'42" East, along the North line of the Southwest quarter of the Northwest quarter of Section 35, for a distance of 970.30 feet to the **POINT OF BEGINNING;**

Thence continuing North 89°50'42" East, along said North line for a distance of 353.62 feet to a 1/2" iron rebar with yellow plastic cap inscribed Minister 12563, marking the Northeast corner of the Southwest quarter of the Northwest quarter of Section 35 as shown (Survey 39-173);

Thence South 00°07'57" East, along the East line of the Southwest quarter of the Northwest quarter of Section 35, for a distance of 796.83 feet;

Thence South 89°52'03" West, leaving said East line for a distance of 360.00 feet;

Thence North 88°59'44" West, for a distance of 56.96 feet;

Thence North 29°27'15" West, for a distance of 41.75 feet;

Thence South 89°33'35" West, for a distance of 87.48 feet;

Thence South 76°12'31" West, for a distance of 233.11 feet;

Thence North 76°42'57" West, for a distance of 106.27 feet;

Thence North 86°43'31" West, for a distance of 254.58 feet;

Thence North 11°48'58" West, for a distance of 116.80 feet;

Thence North 08°22'20" West, for a distance of 26.00 feet, hereon referred to as described **POINT A**;

Thence continuing North 08°22'20" West, for a distance of 26.00 feet;

Thence along the arc of a 326.00 foot radius curve to the left, through a central angle of 02°04'23", for an arc distance of 11.79 feet, the chord of which bears South 80°35'29" West, 11.79 feet;

Thence North 10°26'42" West, for a distance of 71.15 feet;

Thence North 62°47'15" West, for a distance of 30.13 feet;

Thence South 68°20'28" West, for a distance of 118.87 feet;

Thence North 62°52'10" West, for a distance of 34.30 feet;

Thence South 69°40'14" West, for a distance of 72.81 feet;

Thence South 88°06'20" West, for a distance of 31.62 feet;

Thence South 69°40'14" West, for a distance of 300.00 feet;

Thence South 51°14'08" West, for a distance of 63.25 feet;

Thence South 65°31'05" West, for a distance of 55.71 feet to the East line of the City of Camas tract as described under Clark County Auditor's File 5571688, said point bears South 00°15'25" East, along said East line, 440.51 feet, from the Northeast corner of said City of Camas tract;

Thence North 00°15'25" West, along said East line for a distance of 75.91 feet;

Thence North 60°00'00" East, leaving said East line of said City of Camas tract, for a distance of 182.00 feet;

Thence North 75°00'00" East, for a distance of 420.00 feet;

Thence North 28°00'00" East, for a distance of 90.00 feet;

Thence North 80°00'00" East, for a distance of 43.00 feet;

Thence South 65°00'00" East, for a distance of 95.00 feet;

Thence North 84°00'00" East, for a distance of 320.00 feet;

Thence North 61°00'00" East, for a distance of 310.00 feet;

Thence North 29°00'00" East, for a distance of 279.41 feet to the **POINT OF BEGINNING**.

Contains approximately 15.94 acres.

Together with a 30.00 foot wide easement for ingress-egress and utilities, described as follows:

Being a portion of the Southeast quarter of the Northeast quarter of Section 34, Township 2 North, Range 3 East and the Southwest quarter of the Northwest quarter and the Northwest quarter of the Southwest quarter of Section 35, Township 2 North, Range 3 East of the Willamette Meridian, City of Camas, Clark County, Washington, the centerline from which is described as follows:

BEGINNING at above described **POINT A**;

Thence along the arc of a 300.00 foot radius curve to the left through a central angle of 11°57'26" for an arc distance of 62.61 feet, the chord of which bears South 75°38'57" West, 62.49 feet;

Thence South 69°40'14" West, for a distance of 474.54 feet;

Thence South 27°49'37" East, for a distance of 92.86 feet;

Thence along the arc of a 450.00 foot radius curve to the left, through a central angle of 23°54'30" for an arc distance of 187.77 feet, the chord of which bears South 39°46'52" East, 186.42 feet;

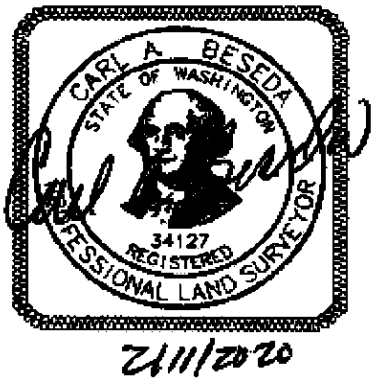
Thence South 51°44'07" East, for a distance of 790.79 feet;

Thence along the arc of a 70.00 foot radius curve to the right through a central angle of 58°43'36" for an arc distance of 71.75 feet, the chord of which bears South 22°22'19" East, 68.65 feet;

Thence South 06°59'30" West, for a distance of 17.55 feet to the Northerly right-of-way line of SE Leadbetter Road and the **TERMINUS** of the described centerline;

Said side lines of which are to be shortened or extended to intersect North 08°22'20" West and South 08°22'20" East, from the **POINT OF BEGINNING** and to the Northerly right-of-way line of SE Leadbetter Road from the **TERMINUS** of the described centerline.

Together with and subject to easements and restrictions of record.



2/11/2020

ADJUSTED TAX LOT 144

Being a portion of the Southwest quarter of the Northwest quarter and the Northeast quarter of the Southwest quarter of Section 35, Township 2 North, Range 3 East of the Willamette Meridian, City of Camas, Clark County, Washington described as follows:

COMMENCING at a concrete monument with brass cap marking the Northeast corner of Section 34 as shown in Book 39 of Surveys, Page 173, Clark County Auditor's records;

Thence South 00°15'46" East, along the East line of the Northeast quarter of Section 34 for a distance of 1319.52 feet to a 3/4" iron pipe at the Southeast corner of the Northeast quarter of the Northeast quarter of Section 34;

Thence North 89°50'42" East, along the North line of the Southwest quarter of the Northwest quarter of Section 35, for a distance of 970.30 feet;

Thence continuing North 89°50'42" East, along said North line for a distance of 353.62 feet to a 1/2" iron rebar with yellow plastic cap inscribed Minister 12563 marking the Northeast corner of the Southwest quarter of the Northwest quarter of Section 35 as shown (Survey Book 39, Page 173);

Thence South 00°07'57" East, along the East line of the Southwest quarter of the Northwest quarter of Section 35, for a distance of 796.83 feet to the **POINT OF BEGINNING;**

Thence continuing South 00°07'57" East, along said East line for a distance of 523.79 feet to the Northeast corner of Deerhaven, recorded in Book 311 of Plats, Page 573, Clark County Auditor's Records;

Thence South 89°51'44" West, along the North line of Deerhaven (Plats Book 311, Page 573) for a distance of 233.68 feet to the Northwest corner thereof;

Thence South 00°36'11" East, along the West line of Deerhaven for a distance of 103.60 feet;

Thence South 55°50'51" West, leaving said West line for a distance of 183.58 feet;

Thence North 81°30'58" West, for a distance of 116.25 feet;

Thence North 13°49'07" East, for a distance of 90.86 feet;

Thence North 54°21'17" East, for a distance of 153.08 feet;

Thence along the arc of a 20.00 foot radius curve to the left, through a central angle of 54°29'14" for an arc distance of 19.02 feet, the chord of which bears North 27°06'40" East, 18.31 feet;

Thence North 00°07'57" West, for a distance of 115.32 feet;

Thence South 89°52'03" West, for a distance of 61.63 feet;

Thence along the arc of a 678.00 foot radius curve to the right through a central angle of 02°44'21" for an arc distance of 32.42 feet, the chord of which bears North 88°45'47" West, 32.41 feet;

Thence South 02°36'24" West, for a distance of 100.89 feet;

Thence South 76°16'02" West, for a distance of 71.76 feet;

Thence North 76°42'57" West, for a distance of 433.46 feet;

Thence North 32°54'03" West, for a distance of 175.17 feet;

Thence North 03°42'19" West, for a distance of 65.37 feet;

Thence North 23°59'56" West, for a distance of 56.24 feet;

Thence North 78°24'19" East, for a distance of 62.08 feet;

Thence South 89°46'33" East, for a distance of 44.61 feet;

Thence South 86°43'31" East, for a distance of 72.00 feet;

Thence South 03°16'29" West, for a distance of 16.99 feet;

Thence South 86°43'31" East, for a distance of 66.08 feet;

Thence North 13°17'03" East, for a distance of 162.00 feet;

Thence South 76°42'57" East, for a distance of 26.37 feet;

Thence North 76°12'31" East, for a distance of 233.11 feet;

Thence North 89°33'35" East, for a distance of 87.48 feet;

Thence South 29°27'15" East, for a distance of 41.75 feet;

Thence South 88°59'44" East, for a distance of 56.96 feet;

Thence North 89°52'03" East, for a distance of 360.00 feet to the **POINT OF BEGINNING.**

Contains approximately 11.34 acres.

Together with and subject to easements and restrictions of record.

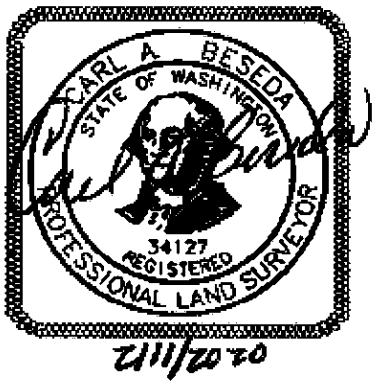
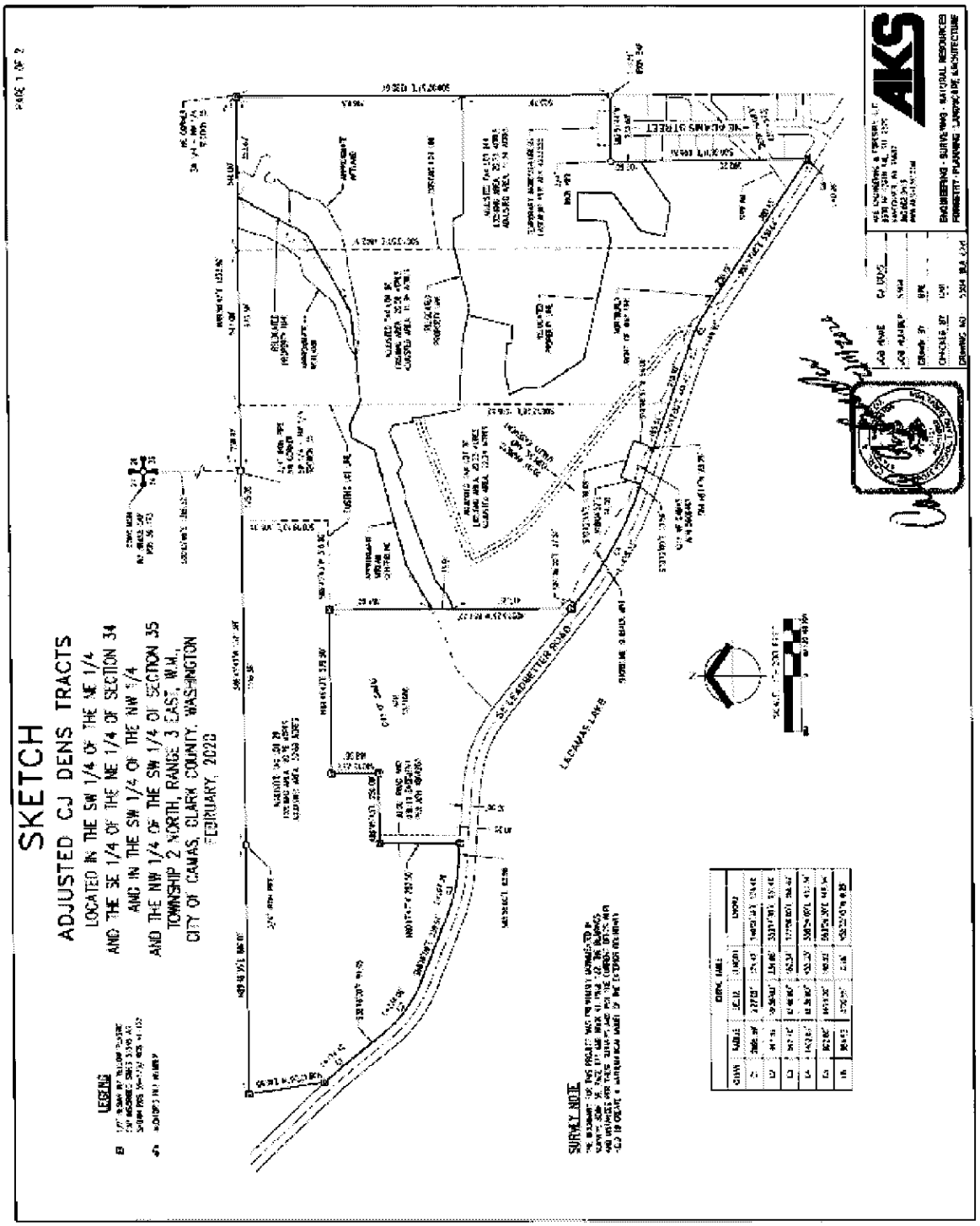
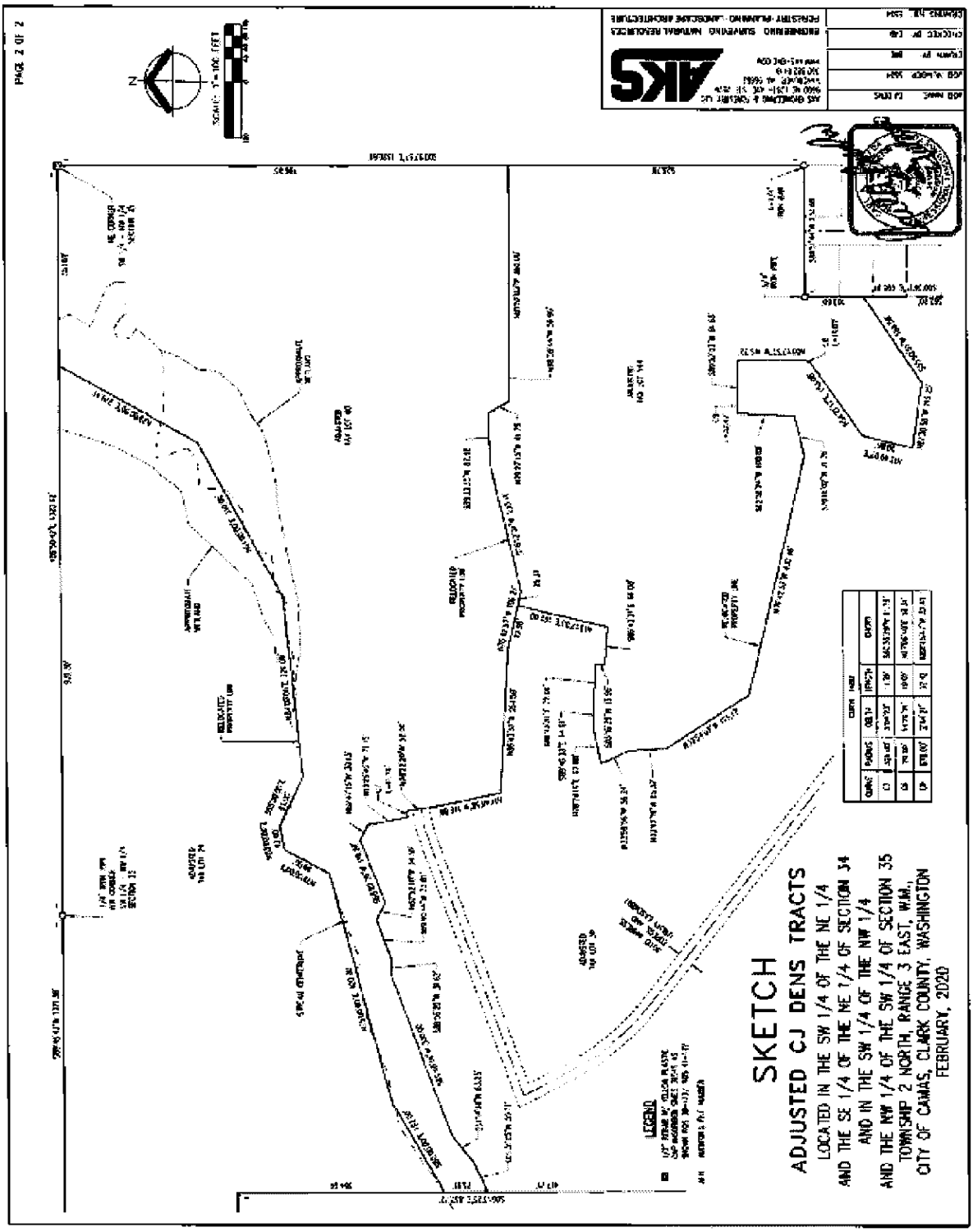


EXHIBIT C

ILLUSTRATION OF ADJUSTED PARCELS
See following pages


SKETCH
ADJUSTED CJ DENS TRACTS
LOCATED IN THE SW 1/4 OF THE NE 1/4
AND THE SE 1/4 OF THE NE 1/4 OF SECTION 34
AND IN THE SW 1/4 OF THE NW 1/4
AND THE NW 1/4 OF THE SW 1/4 OF SECTION 35
TOWNSHIP 2 NORTH, RANGE 3 EAST, W.M.,
CITY OF CAMAS, CLARK COUNTY, WASHINGTON
FEBRUARY, 2020
LEGEND
SURVEY NOTE
LACAMAS LAKE
SE LEADBETTER ROAD
SE ADAMS STREET
AKS
ENGINEERING · SURVEYING · NATURAL RESOURCES
FORESTRY · PLANNING · LANDSCAPE ARCHITECTURE


SKETCH
ADJUSTED CJ DENS TRACTS
LOCATED IN THE SW 1/4 OF THE NE 1/4
AND THE SE 1/4 OF THE NE 1/4 OF SECTION 34
AND IN THE SW 1/4 OF THE NW 1/4
AND THE NW 1/4 OF THE SW 1/4 OF SECTION 35
TOWNSHIP 2 NORTH, RANGE 3 EAST, W.M.,
CITY OF CAMAS, CLARK COUNTY, WASHINGTON
FEBRUARY, 2020
LEGEND

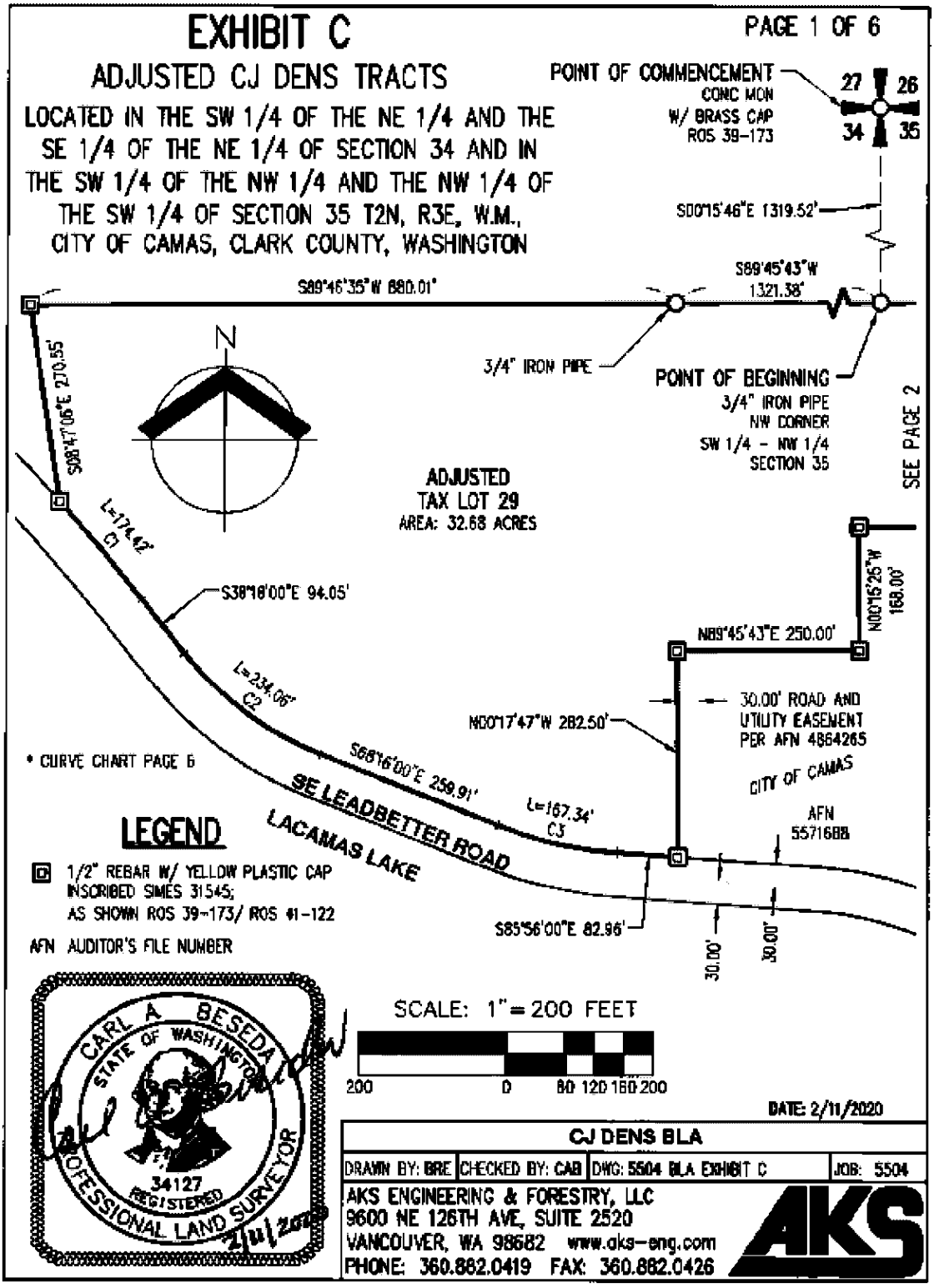


EXHIBIT C
PAGE 1 OF 6
ADJUSTED CJ DENS TRACTS
LOCATED IN THE SW 1/4 OF THE NE 1/4 AND THE SE 1/4 OF THE NE 1/4 OF SECTION 34 AND IN THE SW 1/4 OF THE NW 1/4 AND THE NW 1/4 OF THE SW 1/4 OF SECTION 35 T2N, R3E, W.M., CITY OF CAMAS, CLARK COUNTY, WASHINGTON
POINT OF COMMENCEMENT
CONC MON
W/ BRASS CAP
ROS 39-173
27
26
34
35
S00°15'46"E 1319.52'
S89°45'43"W
1321.38'
S89°46'35"W 680.01'
3/4" IRON PIPE
POINT OF BEGINNING
3/4" IRON PIPE
NW CORNER
SW 1/4 - NW 1/4
SECTION 35
SEE PAGE 2
N
S08°47'06"E 270.55'
ADJUSTED
TAX LOT 29
AREA: 32.68 ACRES
L=174.42'
C1
S38°16'00"E 94.05'
N00°15'26"W
168.00'
N89°45'43"E 250.00'
L=234.06'
C2
N00°17'47"W 282.50'
30.00' ROAD AND
UTILITY EASEMENT
PER AFN 4864265
* CURVE CHART PAGE 6
S68°16'00"E 259.91'
L=167.34'
C3
CITY OF CAMAS
AFN
5571688
SE LEADBETTER ROAD
LACAMAS LAKE
LEGEND
1/2" REBAR W/ YELLOW PLASTIC CAP
INSCRIBED SIMES 31545;
AS SHOWN ROS 39-173/ ROS 61-122
AFN AUDITOR'S FILE NUMBER
S85°56'00"E 82.96'
30.00'
30.00'
CARL A. BESEDA
STATE OF WASHINGTON
34127
REGISTERED
PROFESSIONAL LAND SURVEYOR
2/11/2020
SCALE: 1" = 200 FEET
200
0
80 120 160 200
DATE: 2/11/2020
CJ DENS BLA
DRAWN BY: BRE
CHECKED BY: CAB
DWG: 5504 BLA EXHIBIT C
JOB: 5504
AKS ENGINEERING & FORESTRY, LLC
9600 NE 126TH AVE, SUITE 2520
VANCOUVER, WA 98682 www.aks-eng.com
PHONE: 360.882.0419 FAX: 360.882.0426
AKS

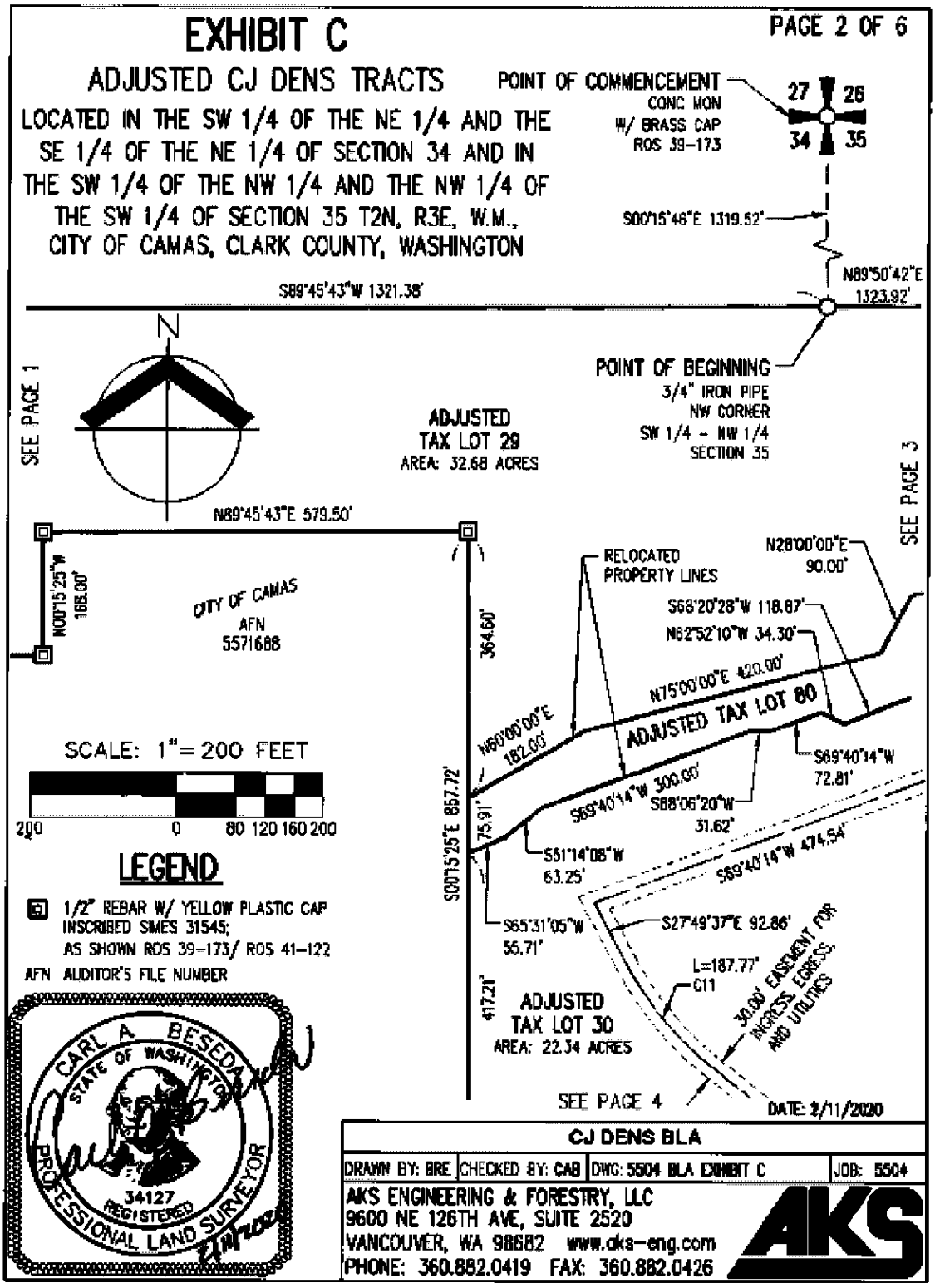
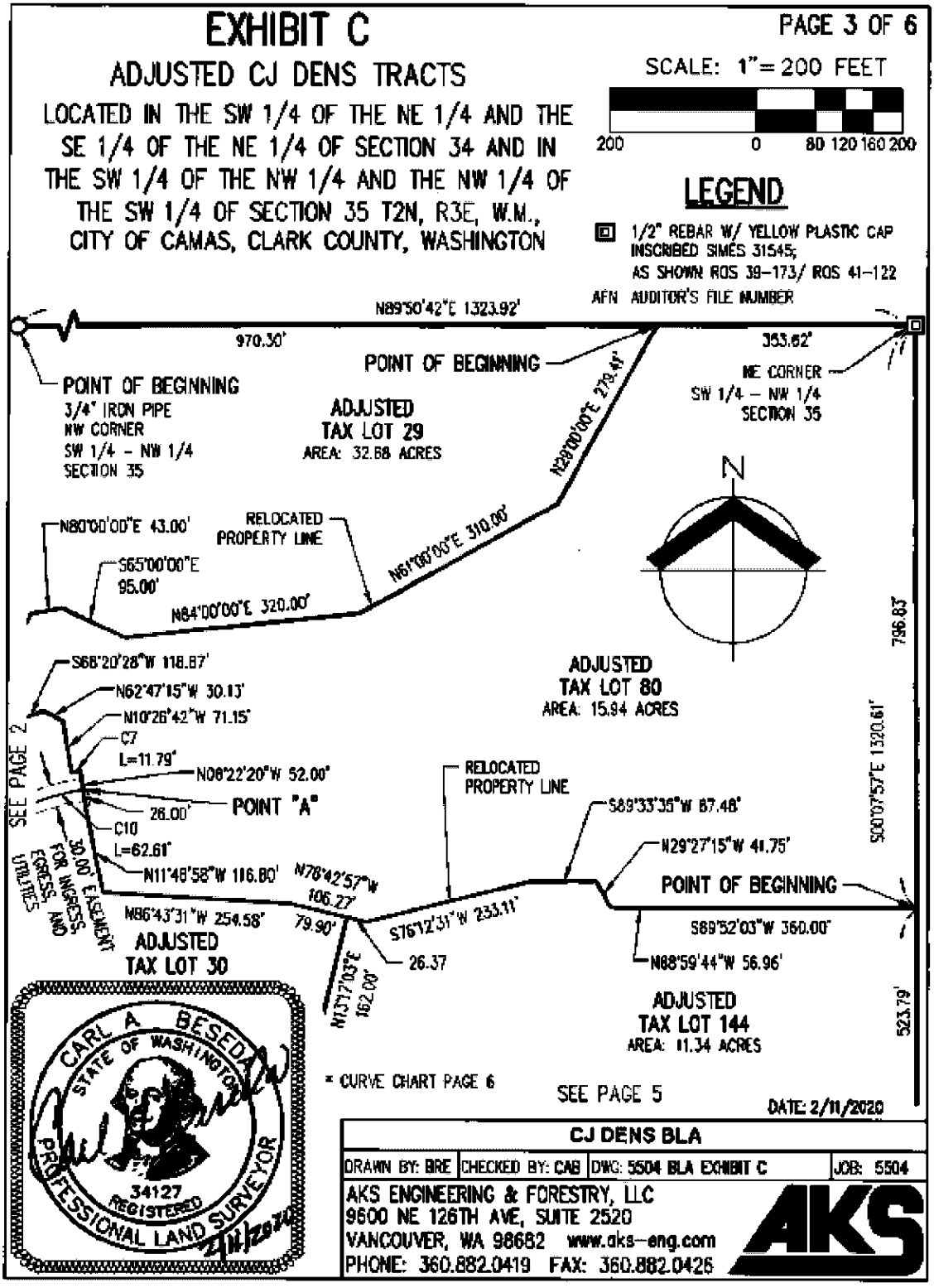


EXHIBIT C
PAGE 2 OF 6
ADJUSTED CJ DENS TRACTS
LOCATED IN THE SW 1/4 OF THE NE 1/4 AND THE SE 1/4 OF THE NE 1/4 OF SECTION 34 AND IN THE SW 1/4 OF THE NW 1/4 AND THE NW 1/4 OF THE SW 1/4 OF SECTION 35 T2N, R3E, W.M., CITY OF CAMAS, CLARK COUNTY, WASHINGTON
POINT OF COMMENCEMENT
CONC MON W/ BRASS CAP ROS 39-173
27 26 34 35
S00°15'46"E 1319.52'
N89°50'42"E 1323.92'
S89°45'43"W 1321.38'
POINT OF BEGINNING
3/4" IRON PIPE NW CORNER SW 1/4 - NW 1/4 SECTION 35
N
SEE PAGE 1
ADJUSTED TAX LOT 29
AREA: 32.68 ACRES
N89°45'43"E 579.50'
N00°15'25"W 168.80'
CITY OF CAMAS AFN 5571688
364.60'
S00°15'25"E 857.72'
SEE PAGE 3
RELOCATED PROPERTY LINES
N28°00'00"E 90.00'
S68°20'28"W 118.87'
N62°52'10"W 34.30'
N75°00'00"E 420.00'
ADJUSTED TAX LOT 80
N60°00'00"E 182.00'
S69°40'14"W 72.81'
S69°40'14"W 300.00'
S88°06'20"W 31.62'
75.91'
S51°14'08"W 63.25'
S69°40'14"W 474.54'
S65°31'05"W 55.71'
S27°49'37"E 92.86'
L=187.77'
C11
30.00' EASEMENT FOR INGRESS, EGRESS, AND UTILITIES
417.21'
ADJUSTED TAX LOT 30
AREA: 22.34 ACRES
SEE PAGE 4
DATE: 2/11/2020
SCALE: 1"=200 FEET
200 0 80 120 160 200
LEGEND
1/2" REBAR W/ YELLOW PLASTIC CAP INSCRIBED SIMES 31545; AS SHOWN ROS 39-173/ ROS 41-122
AFN AUDITOR'S FILE NUMBER
CARL A. BESEDA
STATE OF WASHINGTON
34127
REGISTERED
PROFESSIONAL LAND SURVEYOR
CJ DENS BLA
DRAWN BY: BRE CHECKED BY: CAB DWG: 5504 BLA EXHIBIT C JOB: 5504
AKS ENGINEERING & FORESTRY, LLC
9600 NE 126TH AVE, SUITE 2520
VANCOUVER, WA 98682 www.aks-eng.com
PHONE: 360.882.0419 FAX: 360.882.0426
AKS



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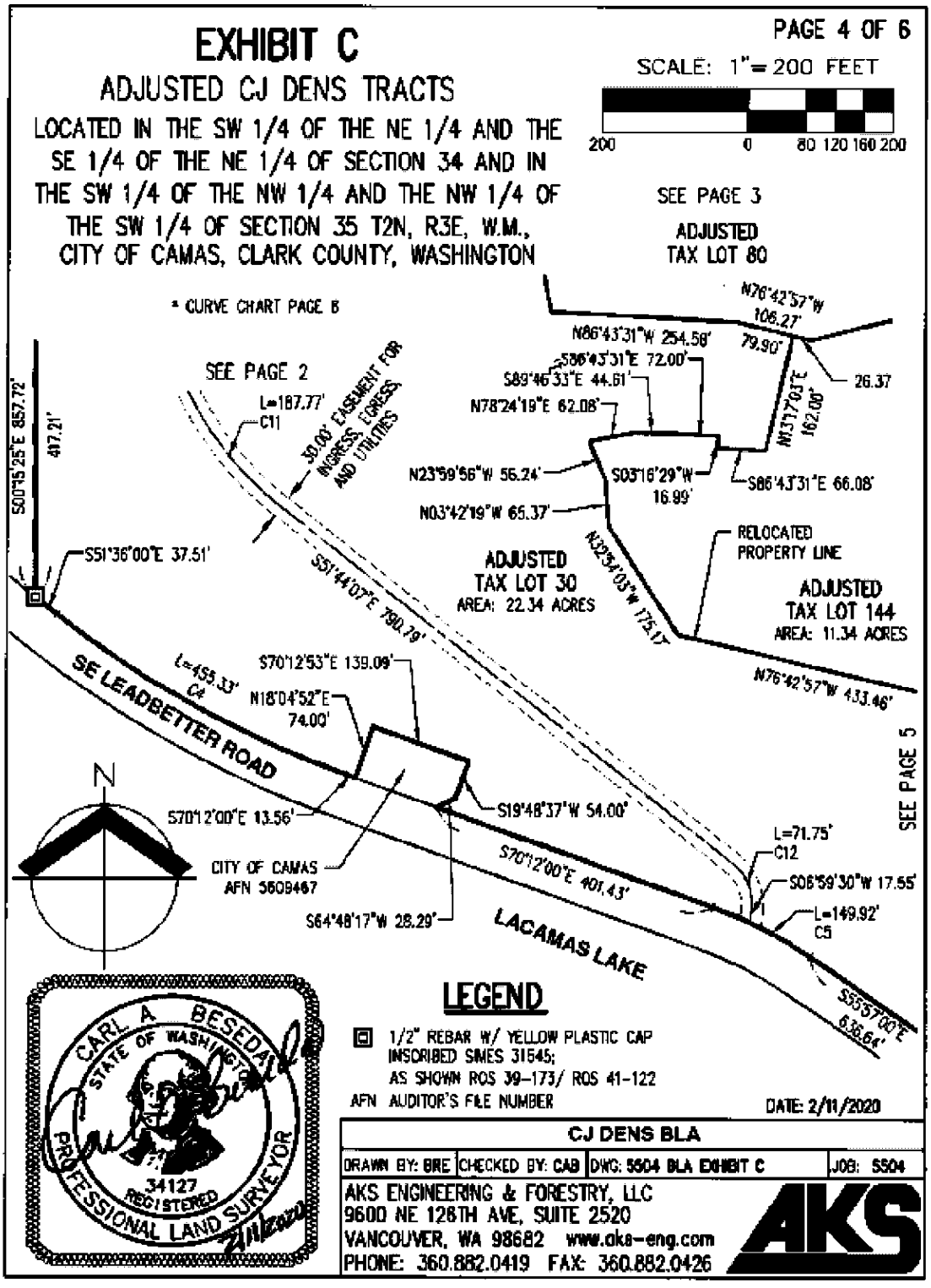
EXHIBIT C
PAGE 4 OF 6
ADJUSTED CJ DENS TRACTS
LOCATED IN THE SW 1/4 OF THE NE 1/4 AND THE SE 1/4 OF THE NE 1/4 OF SECTION 34 AND IN THE SW 1/4 OF THE NW 1/4 AND THE NW 1/4 OF THE SW 1/4 OF SECTION 35 T2N, R3E, W.M., CITY OF CAMAS, CLARK COUNTY, WASHINGTON
SCALE: 1"= 200 FEET
200 0 80 120 160 200
SEE PAGE 3
ADJUSTED TAX LOT 80
* CURVE CHART PAGE 6
SEE PAGE 2
S00°15'25"E 857.72'
497.21'
L=187.77'
C11
30.00' EASEMENT FOR INGRESS, EGRESS AND UTILITIES
S51°36'00"E 37.51'
S51°44'07"E 790.79'
N76°42'57"W 106.27'
79.90'
N86°43'31"W 254.58'
S86°43'31"E 72.00'
S89°46'33"E 44.61'
N78°24'19"E 62.08'
N31°17'03"E 162.00'
26.37
N23°59'56"W 56.24'
S03°16'29"W 16.99'
S86°43'31"E 66.08'
N03°42'19"W 65.37'
N29°54'03"W 175.17'
RELOCATED PROPERTY LINE
ADJUSTED TAX LOT 30
AREA: 22.34 ACRES
ADJUSTED TAX LOT 144
AREA: 11.34 ACRES
N76°42'57"W 433.46'
SE LEADBETTER ROAD
L=455.33'
C4
S70°12'53"E 139.09'
N18°04'52"E 74.00'
S19°48'37"W 54.00'
S70°12'00"E 13.56'
CITY OF CAMAS AFN 5609467
S64°48'17"W 28.29'
S70°12'00"E 401.43'
L=71.75'
C12
S08°59'30"W 17.55'
L=149.92'
C5
LACAMAS LAKE
S55°57'00"E 636.64'
SEE PAGE 5
N
CARL A. BESEDA
STATE OF WASHINGTON
34127
REGISTERED
PROFESSIONAL LAND SURVEYOR
LEGEND
1/2" REBAR W/ YELLOW PLASTIC CAP INSCRIBED SMES 31545; AS SHOWN ROS 39-173/ ROS 41-122
AFN AUDITOR'S FILE NUMBER
DATE: 2/11/2020
CJ DENS BLA
DRAWN BY: BRE CHECKED BY: CAB DWG: 5504 BLA EXHIBIT C JOB: 5504
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PHONE: 360.882.0419 FAX: 360.882.0426
AKS

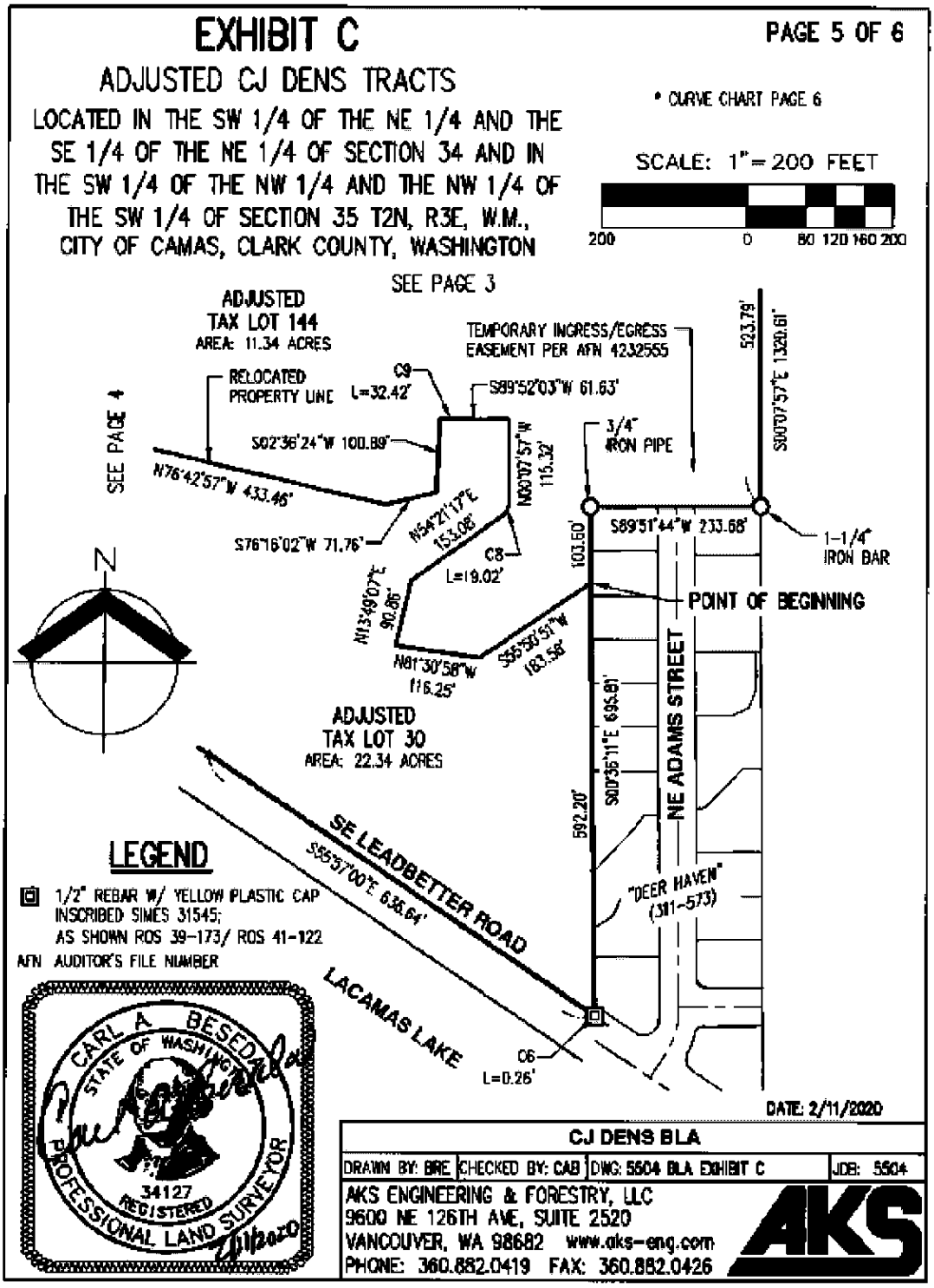


EXHIBIT C
PAGE 5 OF 6
ADJUSTED CJ DENS TRACTS
LOCATED IN THE SW 1/4 OF THE NE 1/4 AND THE SE 1/4 OF THE NE 1/4 OF SECTION 34 AND IN THE SW 1/4 OF THE NW 1/4 AND THE NW 1/4 OF THE SW 1/4 OF SECTION 35 T2N, R3E, W.M., CITY OF CAMAS, CLARK COUNTY, WASHINGTON
* CURVE CHART PAGE 6
SCALE: 1"=200 FEET
200 0 80 120 160 200
SEE PAGE 3
ADJUSTED TAX LOT 144
AREA: 11.34 ACRES
TEMPORARY INGRESS/EGRESS EASEMENT PER AFN 4232555
RELOCATED PROPERTY LINE
C9 L=32.42'
S89°52'03"W 61.63'
3/4" IRON PIPE
S00°07'57"E 1320.61'
523.79'
SEE PAGE 4
S02°36'24"W 100.89'
N76°42'57"W 433.46'
N00°07'57"W 115.32'
S76°16'02"W 71.76'
N54°27'17"E 153.08'
C8 L=19.02'
S89°51'44"W 233.68'
1-1/4" IRON BAR
103.50'
POINT OF BEGINNING
N13°49'07"E 90.86'
N81°30'58"W 116.25'
S35°30'57"W 183.58'
N
ADJUSTED TAX LOT 30
AREA: 22.34 ACRES
NE ADAMS STREET
S00°36'11"E 695.81'
592.20'
SE LEADBETTER ROAD
S55°57'00"E 636.64'
"DEER HAVEN" (381-573)
LACAMAS LAKE
C6 L=0.26'
LEGEND
1/2" REBAR W/ YELLOW PLASTIC CAP INSCRIBED SIMES 31545; AS SHOWN ROS 39-173/ ROS 41-122
AFN AUDITOR'S FILE NUMBER
CARL A. BESEDA
STATE OF WASHINGTON
34127
REGISTERED PROFESSIONAL LAND SURVEYOR
DATE: 2/11/2020
CJ DENS BLA
DRAWN BY: BRE CHECKED BY: CAB DWG: 5504 BLA EXHIBIT C JOB: 5504
AKS ENGINEERING & FORESTRY, LLC
9600 NE 126TH AVE, SUITE 2520
VANCOUVER, WA 98682 www.aks-eng.com
PHONE: 360.882.0419 FAX: 360.882.0426
AKS

EXHIBIT C

PAGE 6 OF 6

ADJUSTED CJ DENS TRACTS

LOCATED IN THE SW 1/4 OF THE NE 1/4 AND THE SE 1/4 OF THE NE 1/4 OF SECTION 34 AND IN THE SW 1/4 OF THE NW 1/4 AND THE NW 1/4 OF THE SW 1/4 OF SECTION 35 T2N, R3E, W.M., CITY OF CAMAS, CLARK COUNTY, WASHINGTON

CURVE TABLE				
CURVE	RADIUS	DELTA	LENGTH	CHORD
C1	2895.59'	3°27'05"	174.42'	S40°01'32"E 174.40'
C2	447.51'	29°58'00"	234.06'	S53°17'00"E 231.40'
C3	542.70'	17°40'00"	167.34'	S77°06'00"E 166.67'
C4	1402.62'	18°36'00"	455.33'	S60°54'00"E 453.34'
C5	602.80'	14°15'00"	149.92'	N63°04'30"W 149.54'
C6	984.92'	0°00'55"	0.26'	N55°55'15"W 0.26'
C7	326.00'	2°04'23"	11.79'	S80°35'29"W 11.79'
C8	20.00'	54°29'14"	19.02'	N27°06'40"E 18.31'
C9	676.00'	2°44'21"	32.42'	N88°45'47"W 32.41'
C10	300.00'	11°57'26"	62.61'	S75°38'57"W 62.49'
C11	450.00'	23°54'30"	187.77'	S39°46'52"E 186.42'
C12	70.00'	58°43'36"	71.75'	S22°22'19"E 68.65'

SURVEY NOTE

THE BOUNDARY FOR THIS PROJECT WAS PREVIOUSLY MONUMENTED IN SURVEYS BOOK 39, PAGE 173 AND BOOK 41, PAGE 122. THE BEARINGS AND DISTANCES PER THESE SURVEYS AND PER THE CURRENT DEEDS WERE HELD TO CREATE A MATHEMATICAL MODEL OF THE EXTERIOR BOUNDARY.

DATE: 2/11/2020

CARL A. BESEDA STATE OF WASHINGTON 34127 REGISTERED PROFESSIONAL LAND SURVEYOR 2/11/2020

CJ DENS BLA			
DRAWN BY: BRE	CHECKED BY: CAB	DWG: 5504 BLA EXHIBIT C	JOB: 5504

AKS ENGINEERING & FORESTRY, LLC
9600 NE 126TH AVE, SUITE 2520
VANCOUVER, WA 98682 www.aks-eng.com
PHONE: 360.882.0419 FAX: 360.882.0426

AKS

EXHIBIT D

LEGAL DESCRIPTION OF EASEMENT

30.00 FOOT EASEMENT FOR INGRESS-EGRESS AND UTILITIES

Being a portion of the Southeast quarter of the Northeast quarter of Section 34, Township 2 North, Range 3 East and the Southwest quarter of the Northwest quarter and the Northwest quarter of the Southwest quarter of Section 35, Township 2 North, Range 3 East of the Willamette Meridian, City of Camas, Clark County, Washington, the centerline from which is described as follows:

BEGINNING at above described **POINT A;**

Thence along the arc of a 300.00 foot radius curve to the left through a central angle of 11°57'26" for an arc distance of 62.61 feet, the chord of which bears South 75°38'57" West, 62.49 feet;

Thence South 69°40'14" West, for a distance of 474.54 feet;

Thence South 27°49'37" East, for a distance of 92.86 feet;

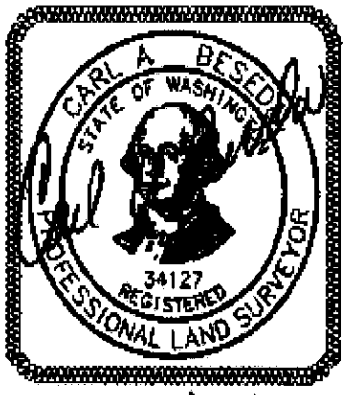
Thence along the arc of a 450.00 foot radius curve to the left, through a central angle of 23°54'30" for an arc distance of 187.77 feet, the chord of which bears South 39°46'52" East, 186.42 feet;

Thence South 51°44'07" East, for a distance of 790.79 feet;

Thence along the arc of a 70.00 foot radius curve to the right through a central angle of 58°43'36" for an arc distance of 71.75 feet, the chord of which bears South 22°22'19" East, 68.65 feet;

Thence South 06°59'30" West, for a distance of 17.55 feet to the Northerly right-of-way line of SE Leadbetter Road and the **TERMINUS** of the described centerline;

Said side lines of which are to be shortened or extended to intersect North 08°22'20" West and South 08°22'20" East, from the **POINT OF BEGINNING** and to the Northerly right-of-way line of SE Leadbetter Road from the **TERMINUS** of the described centerline.



2/11/2020

AKS 30 FT EASEMENT FOR INGRESS-EGRESS & UTILITIES (AKS Job #7879) February 11, 2020
Legal Description Page 1 of 1

COMMUNITY DEVELOPMENT DEPARTMENT
616 NE 4th Avenue
Camas, WA 98607
www.ci.camas.wa.us

December 21, 2020

CJ Dens Lacamas II LLC
Carl Lawson
PO Box 2239
Kalama, WA 98625
(sent via email carl@lawsoninvestments.com)

RE: CJ Dens Lacamas II LLC (SUB20-02) application completeness review

Dear Mr. Lawson,

Thank you for your application submittal for the CJ Dens Subdivision. There are a few items that need to be addressed with your application submittal. The purpose of this letter is to inform you that the above application submitted on November 25, 2020 has been deemed incomplete in accordance with Camas Municipal Code (CMC) Section 18.55.130. You have 180 days from the date of application to submit the missing information pursuant to CMC 18.55.130.C. If the below requested information is submitted, staff will again verify whether the application is complete.

Items necessary for completeness:

1. The mailing labels appear to be of the residence addresses, not the property owners. Please submit the mailing address labels of the property owners within 300-feet per 18.55.110.C.
2. The following needs to be shown on the preliminary plat plan pursuant to CMC 17.11.030.B.6:
   b. Owners of adjacent land and the names of any adjacent subdivision;
   m. Location of any critical areas and critical area buffers *(the location of the geologically hazardous areas was not shown on the preliminary plat*);
   o. Location of existing fire hydrants within 500-feet of proposal;
3. Provide documentation from DAHP as to whether an updated archaeological predetermination is required. If not required, then email a copy of the archaeological predetermination that was previously prepared for (SUB10-3) including the proof of mailing or emailing the archaeological predetermination to the tribes.

Other items to be addressed, but not necessary for application completeness:

4. Within 14 days of the application being deemed complete, a sign shall be posted including the information outlined in the Shoreline Master Program Appendix B Section VII.A. Please email to the City for content approval prior to posting the sign.

If you have any questions, please contact me at lhollenbeck@cityofcamas.us or 360-314-7537 (work cell).

Respectfully,

Lauren Hollenbeck

Lauren Hollenbeck
Senior Planner

Cc: Anita Ashton, Engineering Project Manager
Robert Maul, Planning Manager

COMMUNITY DEVELOPMENT DEPARTMENT
616 NE 4th Avenue
Camas, WA 98607
www.ci.camas.wa.us

January 15, 2021

Carl Lawson
CJ Dens Lacamas II LLC
PO Box 2239
Kamala, WA 98625
(sent via email carl@lawsoninvestments.com)

RE: CJ Dens Lacamas II LLC (SUB20-02) application completeness review

Dear Mr. Lawson,

The purpose of this letter is to inform you that the above application submitted on November 25, 2020 and resubmitted January 8, 2021 has been deemed complete in accordance with Camas Municipal Code (CMC) Section 18.55.130. Staff will begin reviewing the application and contact you if we have comments and/or questions.

If you have any questions, please contact me at lhollenbeck@cityofcamas.us.

Respectfully,

Lauren Hollenbeck
Senior Planner

Cc: Anita Ashton, Engineering Project Manager
Robert Maul, Planning Manager

NOTICE OF APPLICATION FOR CJ DENS SUBDIVISION

(File no. SUB20-02)

Shoreline Substantial Development Permit, Shoreline Conditional Use Permit and Shoreline Variance (SHOR20-01); Critical Areas Review (CA20-08); Archaeological Review (ARCH20-08); Temporary Use Permit (TUP20-05)

NOTICE IS HEREBY GIVEN that an application for "CJ Dens" a 152-lot single-family residential subdivision requesting preliminary plat approval was received on November 25, 2020 and was deemed technically complete on January 15, 2021. A portion of the project is located within the shoreline designation of "Urban Conservancy". A public hearing is required for the development proposal and will be scheduled at a later date. A separate public notice for the public hearing will be mailed to all property owners within 300-feet of the subject development and published in the Post Record.

Location: The 49.62-acre site is zoned single-family residential (R-7.5) in the City of Camas. The site is located at 715 SE Leadbetter Road. The site is located west of N Adams Street and north of SE Leadbetter Road in the NE ¼ of Section 34 and the NW ¼ of Section 35, Township 2 North, Range 3 East, Camas, WA, Parcel Numbers: 177906-000, 178172-000 and 178236-000.

Application Materials: The application included the following: project narrative, shoreline narrative, amended SEPA checklist, preliminary plat plans, tree report, traffic study, archaeological predetermination*, preliminary stormwater report and critical area reports including mitigation plans. Application materials are available for review from the Community Development Department during regular business hours Monday – Friday 8am-5pm.

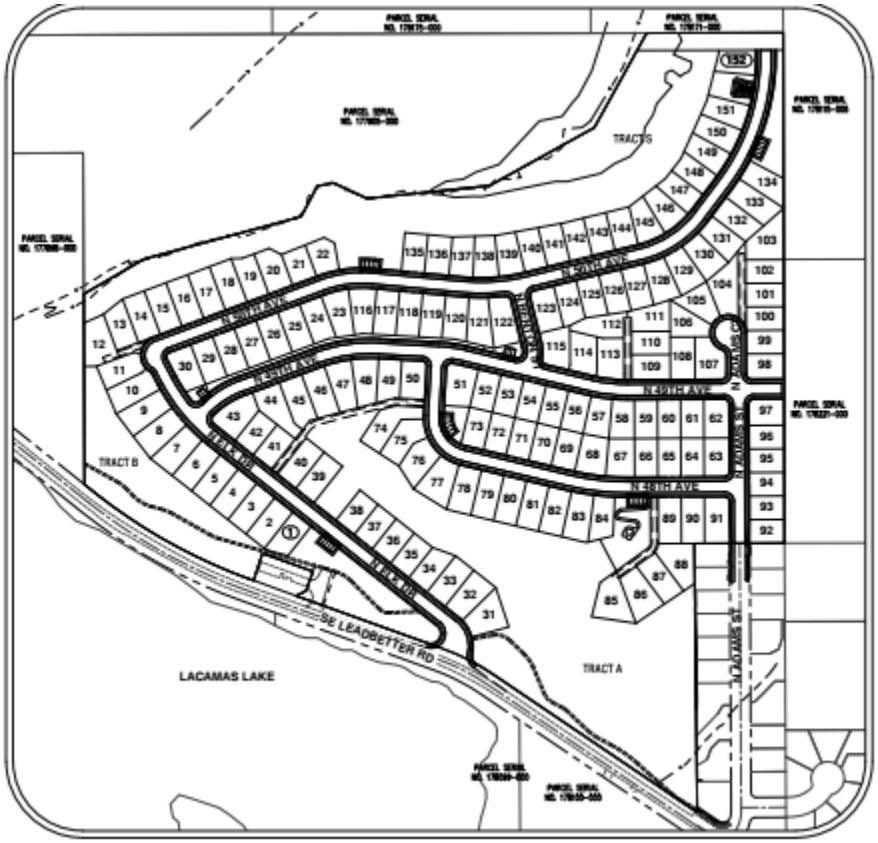
Comment Deadline: Written comments must be received in the next 30 days, by **February 28, 2021,** before 5:00 p.m. Mailed comments may be directed to the Community Development Department, c/o Lauren Hollenbeck, 616 NE Fourth Avenue, Camas, WA 98607, or email your comments to *communitydevelopment@cityofcamas.us*.

For questions related to this application, please contact Lauren Hollenbeck, Senior Planner, at (360) 817-7253 or lhollenbeck@cityofcamas.us.

*consistent with RCW 42.56.300, Archaeological information is exempt from public disclosure.

VICINITY MAP

CONCEPTUAL SITE PLAN



SITE MAP
1"=150'

COMMUNITY DEVELOPMENT DEPARTMENT
616 NE 4th Avenue
Camas, WA 98607
www.ci.camas.wa.us

March 9, 2021

Carl Lawson
CJ Dens Lacamas II LLC
PO Box 2239
Kalama, WA 98625
Sent via email carl@lawsoninvestments.com

RE: CJ Dens subdivision review comments (SUB20-02)

Dear Mr. Lawson,

The below comments are based on the City's review of the application materials submitted November 25, 2020, and revised application materials submitted January 8, 2021 for the CJ Dens subdivision:

Trees:

1. Hazard trees were identified as noted on page 11 of the applicant's staff report yet not identified on the tree survey. The tree survey must include a hazardous tree evaluation per CMC 18.13.045.B.2.e. Numerical value based on the following:1) failure potential, 2) size of part most likely to fail, 3) distance to target (i.e. residence).
2. Several trees were identified for removal within open space and buffer tracts. Why do the trees within those tracts that are not proposed for development need to be removed (i.e. Tract A)? What is the quality of habitat for the trees proposed for removal in those areas?
3. Show building envelopes in relation to the trees. Is there a potential for tree to be preserved within the rear yard setbacks in lots (for instance, lots 92-101)?
4. How many "dead" trees are proposed for removal?

Critical Areas:

5. A preliminary mitigation plan is required per CMC 16.53.050.E.1, including the applicable contents listed in 2 (a) and (b) (i-xi).
6. The tree survey denotes tree removal within the wetland buffer. Per CMC 16.51.125, a 2 to1 replacement ratio for tree removal in wetland buffers is required including a replanting plan for the replacement trees. The mitigation for tree removal in the wetland buffer is not counted towards the tree unit count required in CMC 18.13.051.A.
7. See enclosed Geotechnical review comments from 3rd party reviewer, Earth Engineers, dated March 9, 2021.

Trail:

8. T-3 Regional Trail requires a 12-ft wide pave trail per the City's Parks Recreation and Open Space (PROS) plan. However, staff finds a 6-ft. wide paved trail, consistent with the local trail requirements in the PROS plan, is acceptable to help reduce tree removal and grading impacts. Keep in mind the Parks Department will have the final input on trail requirements.

Negotiated Flexibility:

9. Lots 31 thru 33 shall require larger front yard setback due to driveway access.
10. Staff finds the proposed negotiated flexibility acceptable with the following conditions:
    a. Provide a robust replanting plan in Tract A (this includes a mitigation ratio of 2:1 for the trees

removed for the trail),

b. Provide an active tot lot amenity to be centrally located within the plat and
c. Garages shall be setback a minimum 5-feet from the front wall of the house per code. The garage setback from the right-of-way will be a minimum of 20-feet.

Landscaping:

11. Final landscape plan shall show the driveway approaches to ensure street tree compliance.
12. 10-ft. L2 landscape buffer should surround stormwater facility at the property lines and include a paved access driveway.

Engineering:

13. A pedestrian connection is required from Tract L to N 50th Avenue consistent with CMC 17.19.040.B.10.b.ii.
14. Provide grading profiles and cross sections for retaining walls.
15. Dead-end turnarounds required on private roads located in Tract K (Lots 85-89), Tract L (Lots 98-103), and Tract M (Lots 109-112). For Tract M, the applicant is encouraged to work with staff on other mitigation measures.
16. Dead-end turnaround required at the end of N 50th Avenue at Lot 152.
17. Private access roads, to three or four dwelling units, with a minimum of 12-foot paved and 20-foot clear may require additional mitigation due to potential difficulties for fire and EMS vehicles.
18. The curb radii at the intersection of all private and public roads, to be 25-foot on both sides of the road.
19. A dedicated location for address monuments at the intersection of public and private roads is to be shown on the plans.
20. All road sections shall be per the City's Design Standards Manual, use the signed and approved Street details, including for the applicable private road section.
21. All mechanical stormwater treatment vaults to be located in their own tract, which will be owned and maintained by homeowners/Homeowners Association.
22. Address site distances at for trail crossing and driveways proposed for lots 31 thru 33 on N Elk Drive.

Stormwater:

23. Treatment for phosphorous is required prior to discharge into Lacamas Lake but is not addressed in preliminary TIR. Required to be addressed in final TIR.
24. Use of mechanical treatment catch basins, located within the City's ROW, is not approved. All treatment vaults are to be located on private tracts.
25. Collection of rear yard stormwater runoff and discharged/dispersed onto adjacent property is not approved. Per CMC 14.02.010.B.2 and CMC 17.19.040.C.3 and C.3.e stormwater is not to impact the neighboring properties. Specifically, the stormwater discharge from Lots 92-103 as stated on the preliminary stormwater plan.
26. Justification of the existing culvert crossings, that discharge to Lacamas Lake, located on NE Leadbetter to handle the existing runoff verses the increased runoff from CJ Dens.

Please note, additional comments may be provided during further review of your application.

Respectfully,

Lauren Hollenbeck

Lauren Hollenbeck
Senior Planner

April 07, 2021

Lauren Hollenbeck
City of Camas Community Development
616 NE 4th Avenue
Camas, WA 98607

RE: CJ Dens Subdivision Review Comments Response (SUB20-02)

Dear Lauren:

This letter is written as a response to the comments received on March 9, 2021 for the CJ Dens Subdivision (SUB20-02). I have included with comment, with AKS's response below.

Trees:

1. Hazard trees were identified as noted on page 11 of the applicant's staff report yet not identified on the tree survey. The tree survey must include a hazardous tree evaluation per CMC 18.13.045.B.2.e. Numerical value based on the following:1) failure potential, 2) size of part most likely to fail, 3) distance to target (i.e. residence).

Response: **The Narrative will be updated to describe the existing trees more accurately. The Tree Report will be updated to correct the errors identified by staff and provide clarity on tree health and safety. The Tree Report will also address root protection zones.**

This will be a condition of approval if updated documentation is not provided before public hearing.

2. Several trees were identified for removal within open space and buffer tracts. Why do the trees within those tracts that are not proposed for development need to be removed (i.e. Tract A)? What is the quality of habitat for the trees proposed for removal in those areas?

Response: **Trees within the wetland buffer will remain and be evaluated as needed during construction to ensure no trees become candidates for removal. The Tree Report will be updated to provide clarity on tree health and safety and retain trees that do not pose an immediate threat to the site or future development. The Arborist will note that the City has requested retention of trees originally proposed for removal and these trees will also be evaluated during and after construct to ensure safety for the site.**

This will be a condition of approval if updated documentation is not provided before public hearing.

3. Show building envelopes in relation to the trees. Is there a potential for tree to be preserved within the rear yard setbacks in lots (for instance, lots 92-101)?

Response: **Building setbacks will be shown on the tree plan. The Tree Report will be updated to provide additional clarity for tree removal related to site grading. As shown, the plan does exceed the tree unit requirements of the City.**

This will be a condition of approval if updated documentation is not provided before public hearing.

4. How many "dead" trees are proposed for removal?

Response: **Dead trees to be removed are shown in the tables on sheet P5.3-P5.5. There is a total of 71 dead trees currently proposed for removal. Dead tress within the open space tract will be retained unless it is determined they are hazards during construction. The Arborist will note that the City has requested retention of trees originally proposed for**

removal and these trees will also be evaluated during and after construct to ensure safety for the site.
No further comment.

Critical Areas:

5. A preliminary mitigation plan is required per CMC 16.53.050.E.1, including the applicable contents listed in 2 (a) and (b) (i-xi).

Response: **The preliminary mitigation plan and updated critical areas report will be provided.**
This will be a condition of approval if updated documentation is not provided before public hearing.

6. The tree survey denotes tree removal within the wetland buffer. Per CMC 16.51.125, a 2 to 1 replacement ratio for tree removal in wetland buffers is required including a replanting plan for the replacement trees. The mitigation for tree removal in the wetland buffer is not counted towards the tree unit count required in CMC 18.13.051.A.

Response: **The Plans and Tree Report will be modified to retain all trees within the wetland buffer.**
This will be a condition of approval if updated documentation is not provided before public hearing.

7. See enclosed Geotechnical review comments from 3rd party reviewer, Earth Engineers, dated March 9, 2021.

Response: **There are no issues with the geotechnical review.**
No further comment.

Trail:

8. T-3 Regional Trail requires a 12-ft wide pave trail per the City's Parks Recreation and Open Space (PROS) plan. However, staff finds a 6-ft. wide paved trail, consistent with the local trail requirements in the PROS plan, is acceptable to help reduce tree removal and grading impacts. Keep in mind the Parks Department will have the final input on trail requirements.

Response: **Plans will be updated to a 6-foot gravel trail. With portions widened to 8-foot and turnaround at the west end as requested by the Parks Department.**
No further comment. Parks Dept. will review final design.

Negotiated Flexibility:

9. Lots 31 thru 33 shall require larger front yard setback due to driveway access.

Response: **Per the Pre-Application meeting notes, SE Leadbetter Road is classified as a 2-lane local road. SE Leadbetter Road is also not identified as an arterial or collector in the City of Camas Comprehensive plan. Sight distance will be reviewed for the driveways.**
This will be a condition of approval prior to Final Engineering plan approval.

10. Staff finds the proposed negotiated flexibility acceptable with the following conditions:
    a. Provide a robust replanting plan in Tract A (this includes a mitigation ratio of 2:1 for the trees removed for the trail),

Response: **The applicant proposes to plant additional plantings in strategic locations adjacent to the rights-of-way, while letting the central portion of the open spaces follow a natural process for regrowth. A seed mix containing native shrubs will also be used to seed areas within the open space tracts where grading for the development occurs. The seed mix will help with the natural re-establishment of the entire open space. The steep slopes will also make installation and maintenance of large amounts of planting in the open space difficult. The tree mitigation calculation for trees removed for the trail will be shown on the plans.**
This will be a condition of approval if updated documentation is not provided before public hearing.

b. Provide an active tot lot amenity to be centrally located within the plat and

Response: **The Plans will be updated to show play amenities in Tract I, incorporated into the open space and trail leading to the overlook. The amenities will be designed to be integrated into the environment as opposed to being a standard tot lot style playground.**

This will be a condition of approval if updated documentation is not provided before public hearing.

c. Garages shall be setback a minimum 5-feet from the front wall of the house per code. The garage setback from the right-of-way will be a minimum of 20-feet.

Response: **The Applicant would like to us the modified lot standards listed below:**

Front Yard Setback:	**10 Feet**
Garage Setback:	**18 Feet (Minimum 5 feet from the front wall of the house)**
Rear Yard Setback:	**15 Feet**
Maximum Building Lot Coverage:	**50%**

As discussed above, additional plantings will be provided for the large open space tracts and play amenities will be provided in Tract I to offset for these modifications. The Applicant requests the 10-yard front setback to allow for as much rear yard space while providing a home where the garage is setback a minimum 5 feet from the front wall of the home. The 18-foot garage setback will also allow for better rear yards and siting of the home for lot grading and is similar to setbacks for garages in surrounding jurisdictions.

Garage setback need to be 20-feet to accommodate vehicle overhang onto sidewalk and will be a condition of approval.

Landscaping:

11. Final landscape plan shall show the driveway approaches to ensure street tree compliance.

Response: **Proposed Condition: Final landscape plan to show driveway approaches to ensure street compliance prior to final construction approval.**

This can be a condition of approval.

12. 10-ft. L2 landscape buffer should surround stormwater facility at the property lines and include a paved access driveway.

Response: **The Plans have been updated to identify the location of the L2 buffer. Plantings will be provided with the final landscape plan.**

This can be a condition of approval.

Engineering:

13. A pedestrian connection is required from Tract L to N 50th Avenue consistent with CMC 17.19.040.B.10.b.ii.

Response: **The Plans will be updated to show Lot 103 as a flag lot access from N 50th Avenue and Tract L will end at the south side of Lot 102. Therefore, the distance from N 49th Avenue to the end of Tract L is less than 300 feet and no pedestrian access is required. An exhibit is also included with this document to show the modifications.**

Refer to attached Fire Marshall review notes.

14. Provide grading profiles and cross sections for retaining walls.

Response: **The proposed wall locations are shown on the preliminary plans and the proposed walls will not exceed the maximum allowed height of 6 feet. Wall types, cross sections, and other necessary engineering information will be provided during final engineering review.**

This will be a condition of approval prior to Final Engineering plan approval.

15. Dead-end turnarounds required on private roads located in Tract K (Lots 85-89), Tract L (Lots 98-103), and Tract M (Lots 109-112). For Tract M, the applicant is encouraged to work with staff on other mitigation measures.

Response: **The plans will be updated to show a turnaround for Tract K. Lot 103 will become a flag lot accessing from N 50th Avenue and Tract L will end at the south side of Lot 102. Therefore, Tract L is less than 150 feet. Tract M has been shortened to less than 150 feet, with access still provided to all lots on the tract. Exhibits were provided to the City showing the updates are included with this letter. All houses in the development are sprinklered and all homes can be reached by a 150-foot hose run from the end of each tract.**

Refer to attached Fire Marshall review notes.

16. Dead-end turnaround required at the end of N 50th Avenue at Lot 152.

Response: **The Plans will be updated to show a hammerhead turnaround at the terminus of Lot 152 in Tract T.**

This will be a condition of approval prior to Final Engineering plan approval.

17. Private access roads, to three or four dwelling units, with a minimum of 12-foot paved and 20-foot clear may require additional mitigation due to potential difficulties for fire and EMS vehicles.

Response: A **turnaround will be provided for Tract K, and Tract L and M will be shortened to less than 150 feet. All houses in the development are sprinklered and all homes can be reached by a 150-foot hose run from the end of each tract.**

Refer to attached Fire Marshall review notes.

18. The curb radii at the intersection of all private and public roads, to be 25-foot on both sides of the road.

Response: **Engineering staff is discussing the requirement with the Fire Marshal to determine the need for radii.**

Refer to attached Fire Marshall review notes.

19. A dedicated location for address monuments at the intersection of public and private roads is to be shown on the plans.

Response: **The Plans will be updated to show the proposed location for address monuments. The final design of the monuments will be determined during final engineering.**

Agreed

20. All road sections shall be per the City's Design Standards Manual, use the signed and approved Street details, including for the applicable private road section.

Response: **The Plans will be updated to show road sections per the City's Design Standards Manual.**

Agreed

21. All mechanical stormwater treatment vaults to be located in their own tract, which will be owned and maintained by homeowners/Homeowners Association.

Response: **The Applicant is willing to provide a maintenance agreement and note on the final plat requiring the HOA to maintain the mechanical treatment portion of the catch basins.**

Staff is not in support of treatment vaults located in City ROW

22. Address site distances at for trail crossing and driveways proposed for lots 31 thru 33 on N Elk Drive.

Response: **Per the Pre-Application meeting notes, SE Leadbetter Road is classified as a 2-lane local road. SE Leadbetter Road is also not identified as an arterial or collector in the City of Camas Comprehensive plan. The trail crossing will be at the intersection of Elk Drive SE Leadbetter Road. Sight distance will be reviewed for the trail crossing and driveways.**

Refer to attached trail crossing/sight distance Engineering notes.

Stormwater:

23. Treatment for phosphorous is required prior to discharge into Lacamas Lake but is not addressed in preliminary TIR. Required to be addressed in final TIR.

Response: **This was addressed in Section F of the Preliminary TIR on page 4, phosphorus treatment will be provided per Chapter 5 of the CSDSM.**

Proposed Condition: Phosphorous treatment is required for discharge into Lacamas Lake and shall be address in the final Stormwater TIR.

This will be a condition of approval.

24. Use of mechanical treatment catch basins, located within the City's ROW, is not approved. All treatment vaults are to be located on private tracts.

Response: **See response to issue 21.**

Staff is not in support of treatment vaults located in City ROW

25. Collection of rear yard stormwater runoff and discharged/dispersed onto adjacent property is not approved. Per CMC 14.02.010.B.2 and CMC 17.19.040.C.3 and C.3.e stormwater is not to impact the neighboring properties. Specifically, the stormwater discharge from Lots 92-103 as stated on the preliminary stormwater plan.

Response: **As shown on the Pre-Developed Basin Map in the Preliminary Stormwater report, Basin 3S is within a separate Threshold Discharge Area (TDA) and has its own point of compliance that flows across the eastern boundary of the project. The Post-Developed Basin 3S is smaller and will contain only rear yard runoff. Per requirements outlined in the Washington Department of Ecology's Western Washington Stormwater Manual, Basin 3S of this project is required to meet minimum requirement 4 (Preservation of Natural Drainage Systems and Outfalls) to maintain drainage flows to the east and minimum requirement 7 (Flow Control). Properties to the east of the project site should not be negatively impacted from rear yard stormwater runoff. This will be further analyzed and described in the Final Stormwater TIR.**

Proposed Condition: Show in the final Stormwater TIR that stormwater runoff will not impact neighboring properties.

This will be conditioned in both the final TIR and proposed design to address on the final Engineering plans. Not to impact adjacent parcels per CMC 14.02.010.B.2 & 17.19.040. C.3 & C.3.e.

26. Justification of the existing culvert crossings, that discharge to Lacamas Lake, located on NE Leadbetter to handle the existing runoff verses the increased runoff from CJ Dens.

Response: **The culverts will be upsized with the development to account for increased flows.**

Proposed Condition: Existing culverts crossing NE Leadbetter Road shall be upsized as necessary to meet the requirements for the proposed stormwater management. Justification of culvert sizing shall be shown in the final Stormwater TIR.

This will be a condition of approval.

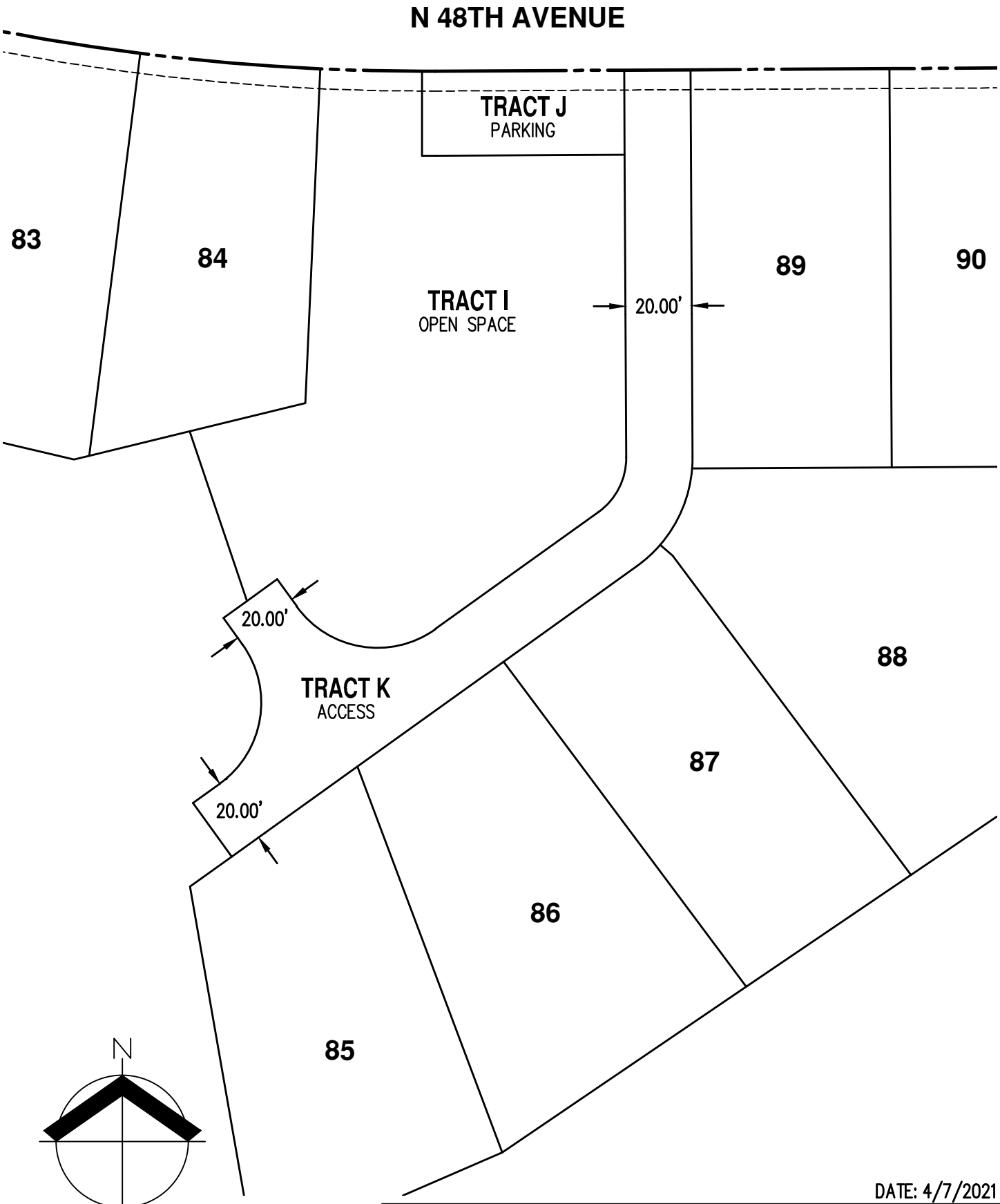
Sincerely,

AKS ENGINEERING & FORESTRY, LLC

Michael Andreotti, RLA, Land Use Planner
9600 NE 126th Avenue, Suite 2520
Vancouver, WA 98682
(360) 882-0419 | andreottim@aks-eng.com

Attachments:

Exhibits A-C Tract Adjustment Exhibits
Exhibit D Trail Exhibit
Exhibit E Sight Distance Exhibit



SCALE: 1"= 40 FEET

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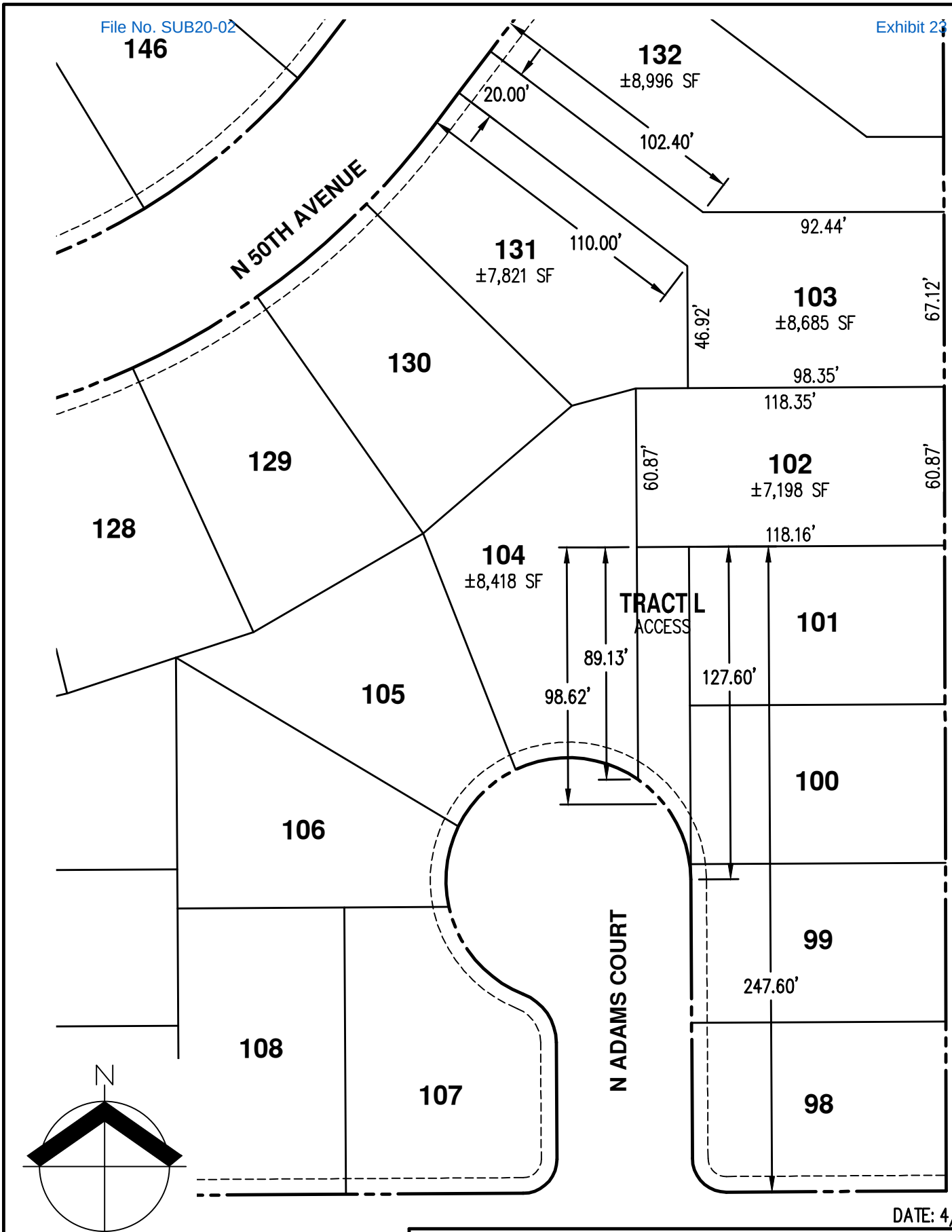
ORIGINAL PAGE SIZE: 8.5" x 11"

DATE: 4/7/2021

TRACT K ADJUSTMENT EXHIBIT	EXHIBIT A
AKS ENGINEERING & FORESTRY, LLC 9600 NE 126TH AVE, STE 2520 VANCOUVER, WA 98682 360.882.0419 WWW.AKS-ENG.COM	DRWN: MPA CHKD: JMM AK 1033

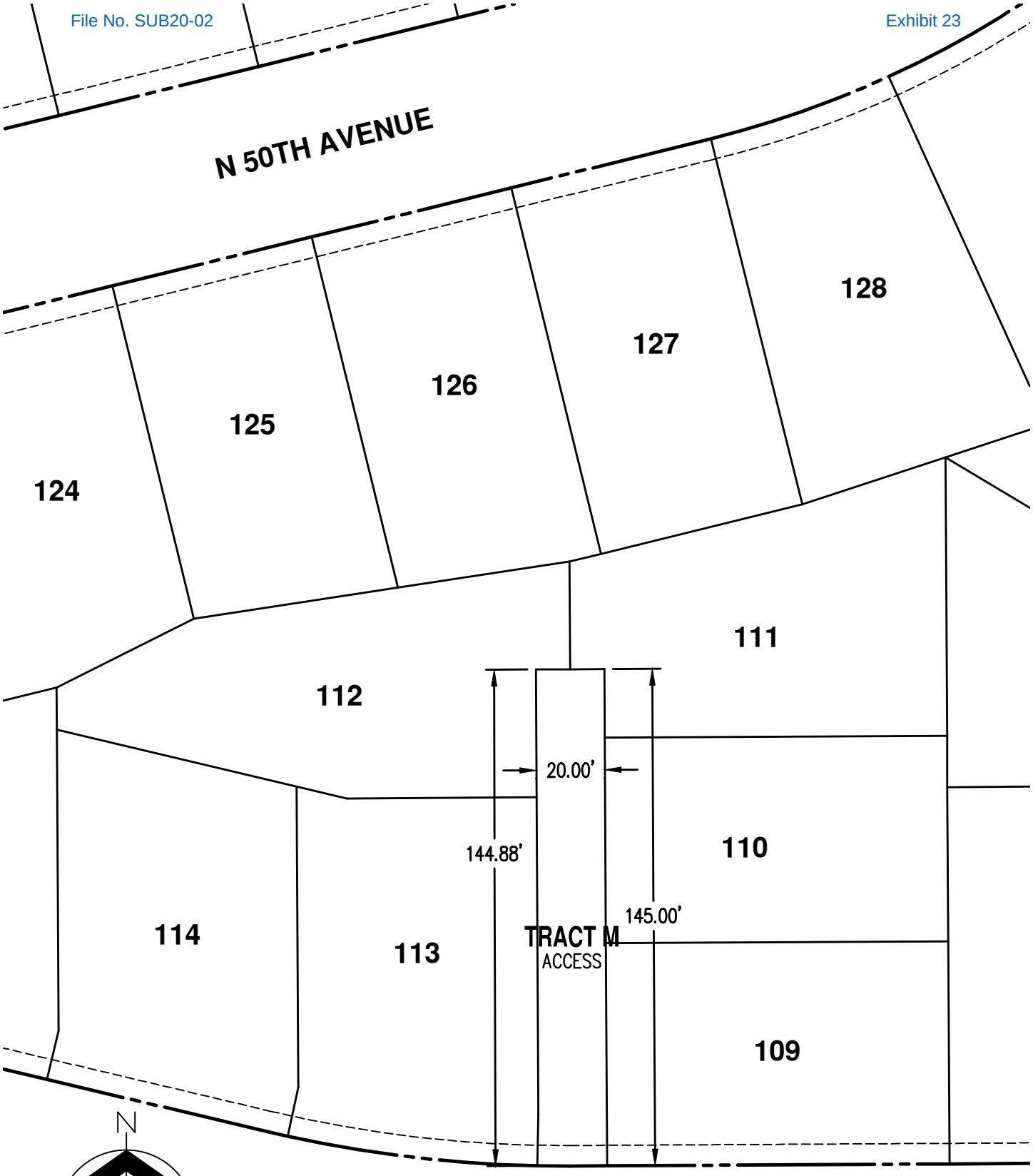
DWG: 5504 20210401 ACCESS TRACT UPDATE | LAYOUT1



DATE: 4/7/2021

TRACT L ADJUSTMENT EXHIBIT	EXHIBIT B
AKS ENGINEERING & FORESTRY, LLC 9600 NE 126TH AVE, STE 2520 VANCOUVER, WA 98682 360.882.0419 WWW.AKS-ENG.COM	DRWN: MPA CHKD: JMM AK 1034

DWG: 5504 20210401 ACCESS TRACT UPDATE | LAYOUT2



DATE: 4/7/2021

SCALE: 1"= 40 FEET

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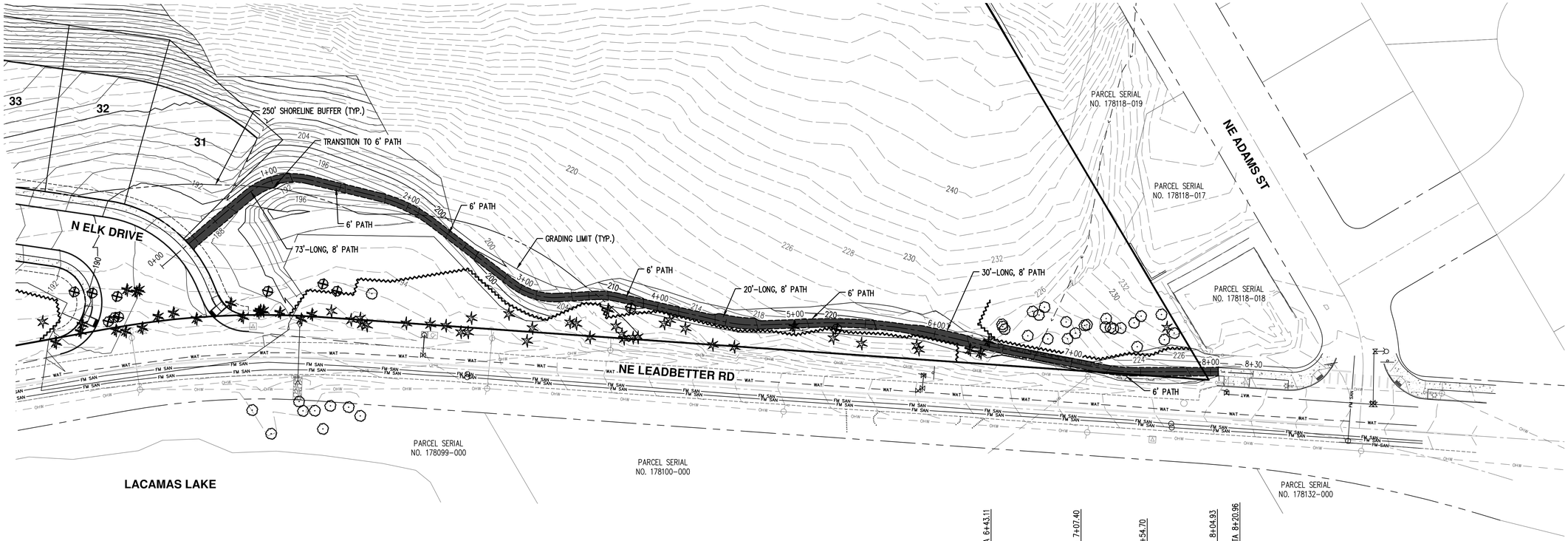
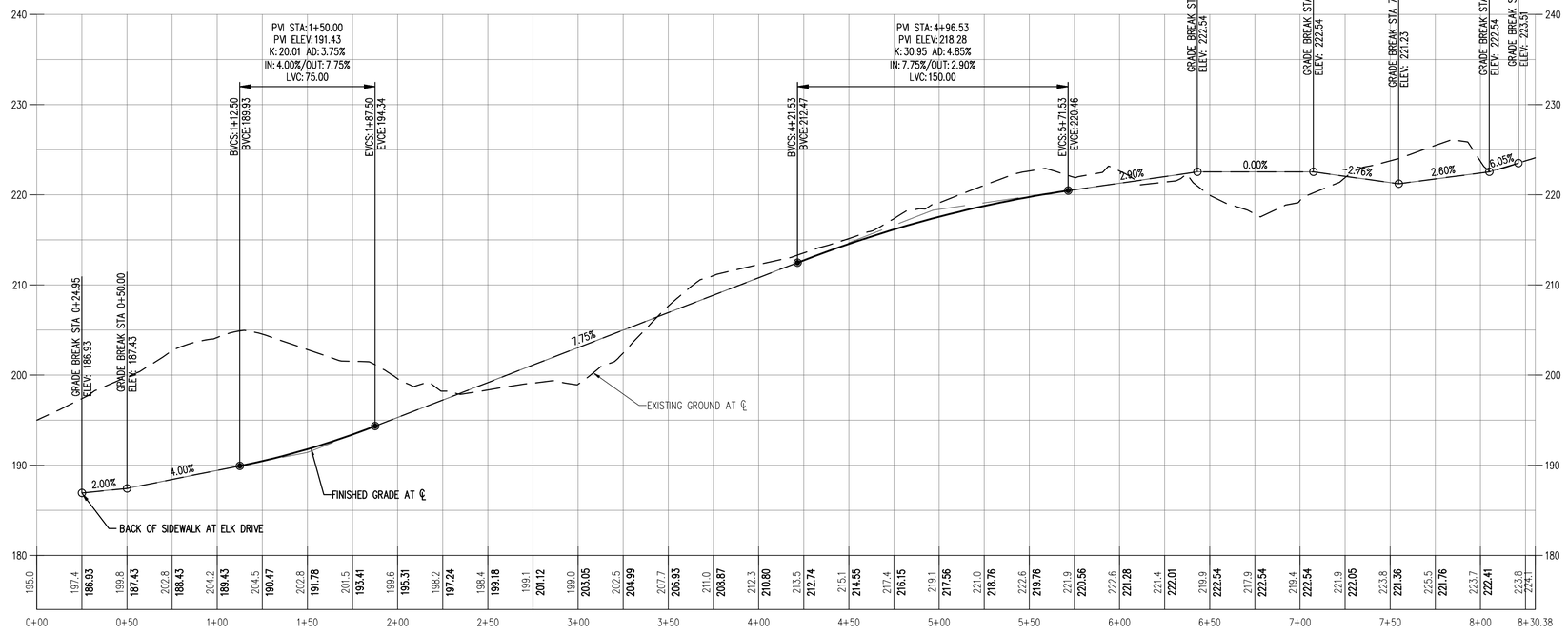
ORIGINAL PAGE SIZE: 8.5" x 11"

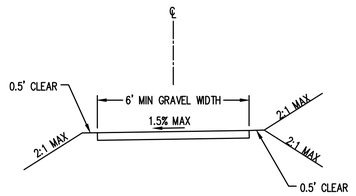
TRACT M ADJUSTMENT EXHIBIT	EXHIBIT C
AKS ENGINEERING & FORESTRY, LLC 9600 NE 126TH AVE, STE 2520 VANCOUVER, WA 98682 360.882.0419 WWW.AKS-ENG.COM	DRWN: MPA CHKD: JMM AK 5504

1035

DWG: 5504 20210401 ACCESS TRACT UPDATE | LAYOUT3







TRAIL TYPICAL CROSS SECTION
NTS

TRAIL 1.1
Hor. Scale: 1"= 40'
Vert. Scale: 1"= 8'
STATIONING IS BASED ON TRAIL
CENTERLINE UNLESS OTHERWISE NOTED

AKS ENGINEERING & FORESTRY, LLC
9600 NE 126TH AVE, STE 2520
VANCOUVER, WA 98682
360.882.0419
WWW.AKS-ENG.COM

ENGINEERING · SURVEYING · NATURAL RESOURCES
FORESTRY · PLANNING · LANDSCAPE ARCHITECTURE

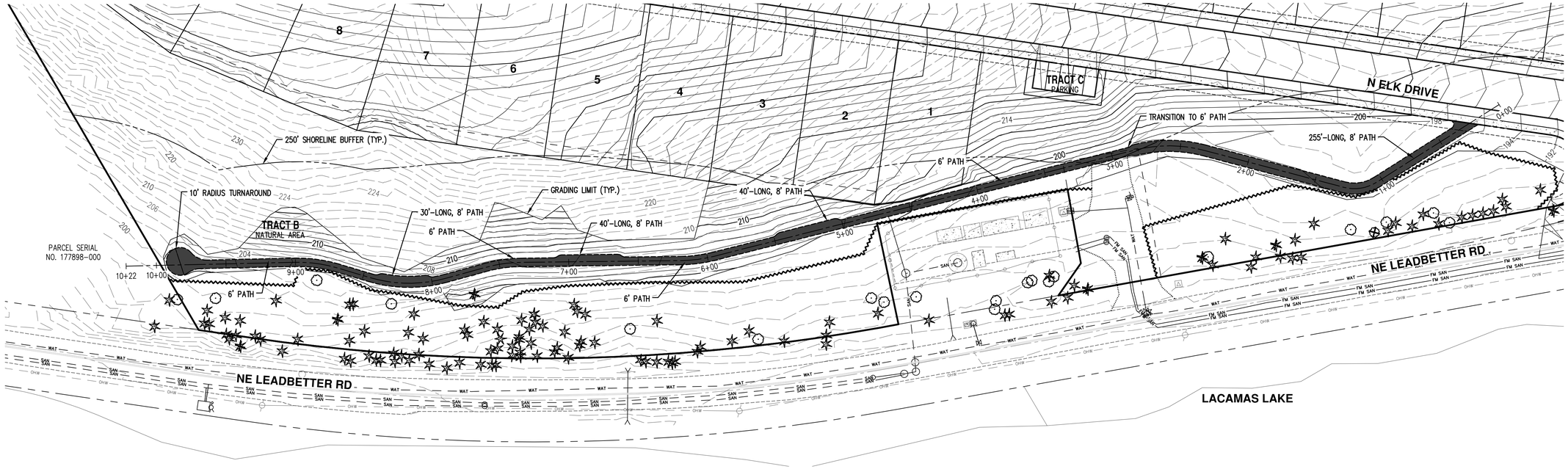
EXHIBIT D - T-3 TRAIL LOCATION
CJ DENS
CAMAS, WASHINGTON

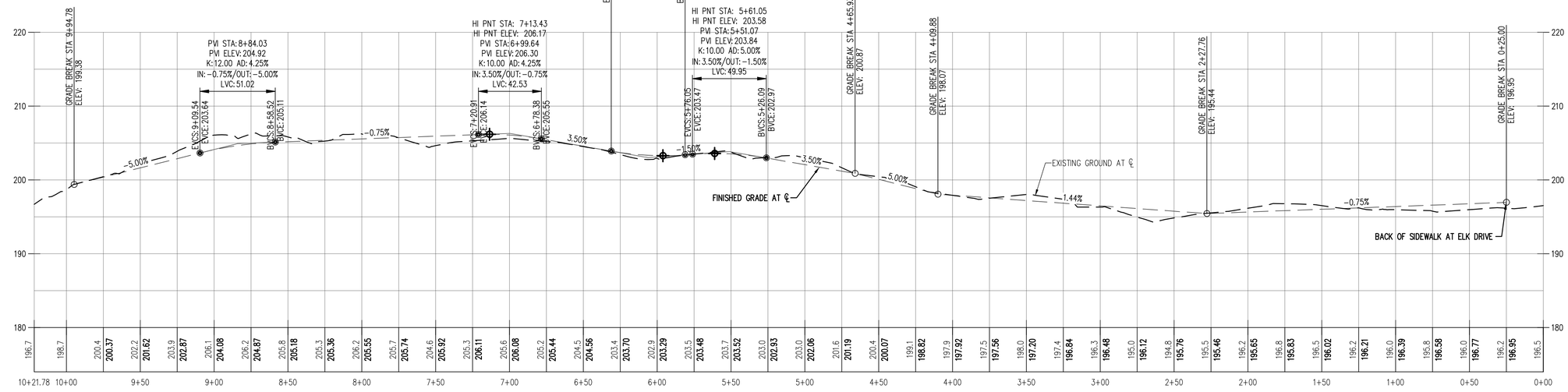
JOB NUMBER:	5504
DATE:	4/7/2021
DESIGNED BY:	CJS
DRAWN BY:	CJS
CHECKED BY:	JMM

D-01

1036

AKS DRAWING FILE: 5504 20210407 TRAIL LOCATION EXD.DWG | LAYOUT: D-01





TRAIL 1.2
Hor. Scale: 1"= 40'
Vert. Scale: 1"= 8'
STATIONING IS BASED ON TRAIL
CENTERLINE UNLESS OTHERWISE NOTED

AKS ENGINEERING & FORESTRY, LLC
9600 NE 126TH AVE, STE 2520
VANCOUVER, WA 98682
360.882.0419
WWW.AKS-ENG.COM

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FORESTRY · PLANNING · LANDSCAPE ARCHITECTURE

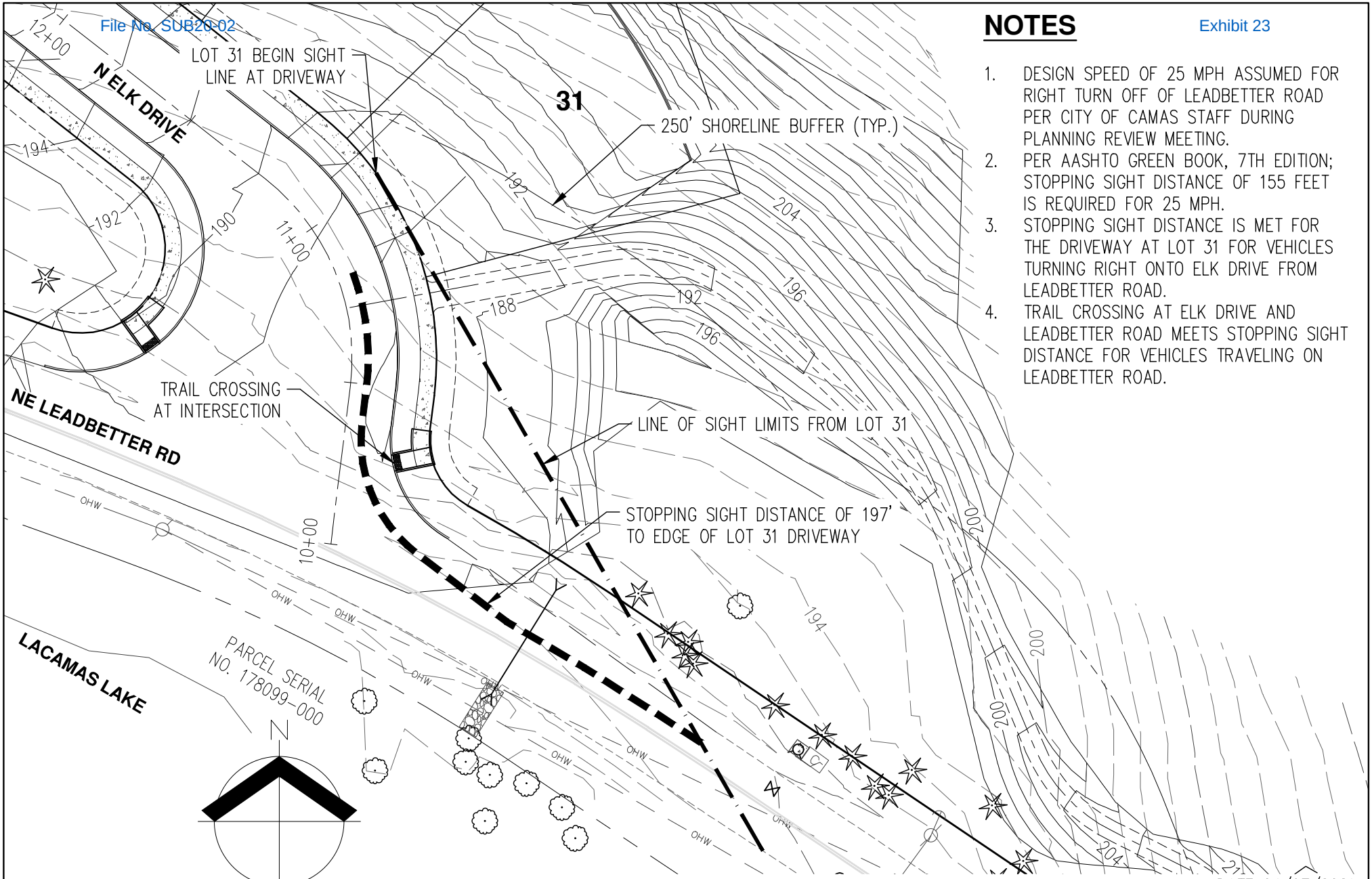
EXHIBIT D - T-3 TRAIL LOCATION
CJ DENS
CAMAS, WASHINGTON

JOB NUMBER:	5504
DATE:	4/7/2021
DESIGNED BY:	CJS
DRAWN BY:	CJS
CHECKED BY:	JMM

D-02

1037

AKS DRAWING FILE: 5504 20210407 TRAIL LOCATION EXD.DWG | LAYOUT: D-02



NOTES

1. DESIGN SPEED OF 25 MPH ASSUMED FOR RIGHT TURN OFF OF LEADBETTER ROAD PER CITY OF CAMAS STAFF DURING PLANNING REVIEW MEETING.
2. PER AASHTO GREEN BOOK, 7TH EDITION; STOPPING SIGHT DISTANCE OF 155 FEET IS REQUIRED FOR 25 MPH.
3. STOPPING SIGHT DISTANCE IS MET FOR THE DRIVEWAY AT LOT 31 FOR VEHICLES TURNING RIGHT ONTO ELK DRIVE FROM LEADBETTER ROAD.
4. TRAIL CROSSING AT ELK DRIVE AND LEADBETTER ROAD MEETS STOPPING SIGHT DISTANCE FOR VEHICLES TRAVELING ON LEADBETTER ROAD.

DATE: 04/07/2021

STOPPING SIGHT DISTANCE AT LOT 31 EXHIBIT

EXHIBIT **E**

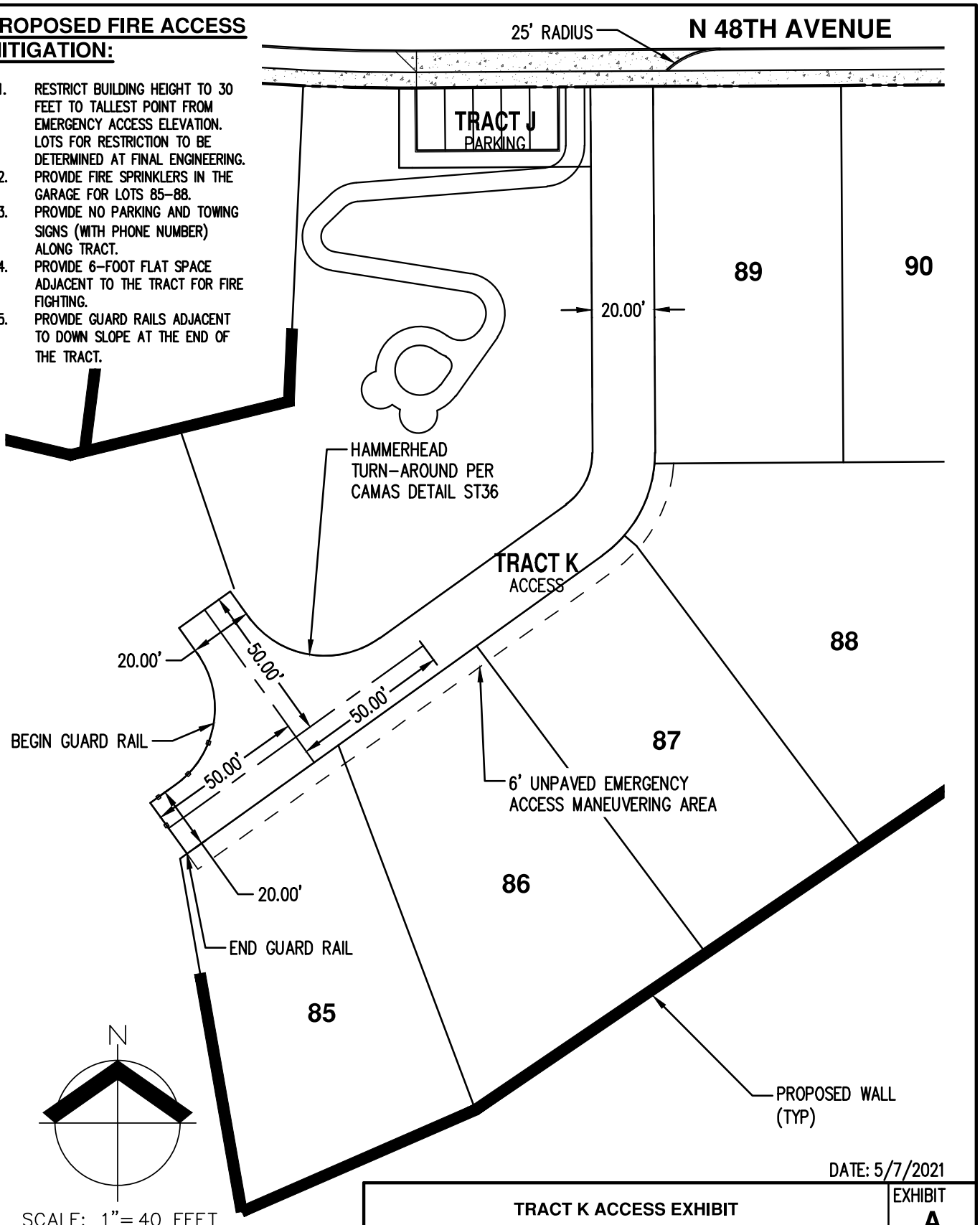
AKS ENGINEERING & FORESTRY, LLC
9600 NE 126TH AVE, STE 2520
VANCOUVER, WA 98682
360.882.0419 WWW.AKS-ENG.COM

DRWN: CJS
CHKD: JMM
AK 1038

DWG: 5504 20210405 TRAIL SIGHT DIST EX | EX A

PROPOSED FIRE ACCESS MITIGATION:

1. RESTRICT BUILDING HEIGHT TO 30 FEET TO TALLEST POINT FROM EMERGENCY ACCESS ELEVATION. LOTS FOR RESTRICTION TO BE DETERMINED AT FINAL ENGINEERING.
2. PROVIDE FIRE SPRINKLERS IN THE GARAGE FOR LOTS 85–88.
3. PROVIDE NO PARKING AND TOWING SIGNS (WITH PHONE NUMBER) ALONG TRACT.
4. PROVIDE 6–FOOT FLAT SPACE ADJACENT TO THE TRACT FOR FIRE FIGHTING.
5. PROVIDE GUARD RAILS ADJACENT TO DOWN SLOPE AT THE END OF THE TRACT.



SCALE: 1"= 40 FEET

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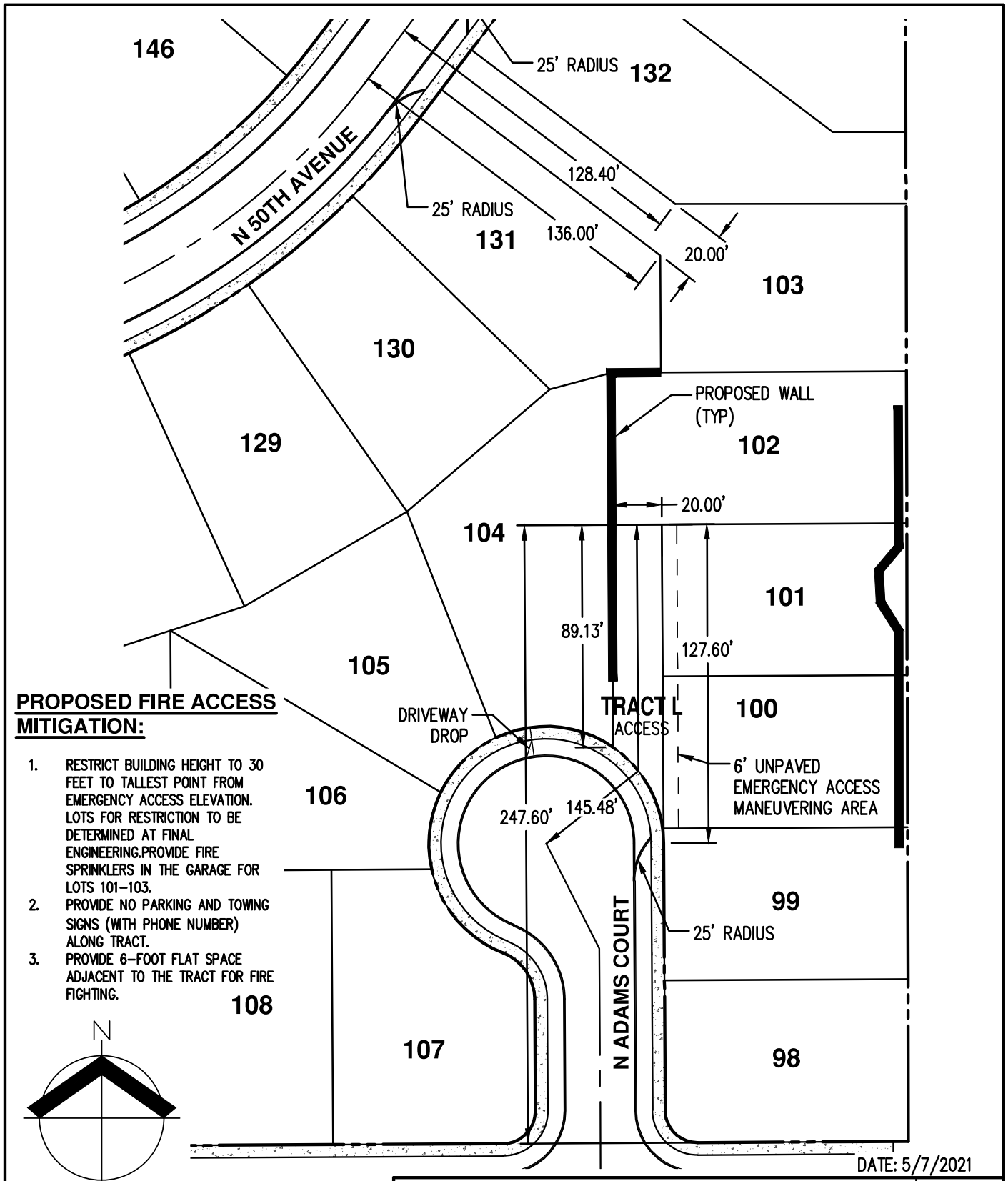
ORIGINAL PAGE SIZE: 8.5" x 11"

DATE: 5/7/2021

TRACT K ACCESS EXHIBIT	EXHIBIT A
AKS ENGINEERING & FORESTRY, LLC 9600 NE 126TH AVE, STE 2520 VANCOUVER, WA 98682 360.882.0419 WWW.AKS–ENG.COM	DRWN: MPA CHKD: JMM AKS JOB: 5504

DWG: 5504 20210506 ACCESS TRACT UPDATE–GN | LAYOUT1



PROPOSED FIRE ACCESS MITIGATION:

1. RESTRICT BUILDING HEIGHT TO 30 FEET TO TALLEST POINT FROM EMERGENCY ACCESS ELEVATION. LOTS FOR RESTRICTION TO BE DETERMINED AT FINAL ENGINEERING.PROVIDE FIRE SPRINKLERS IN THE GARAGE FOR LOTS 101–103.
2. PROVIDE NO PARKING AND TOWING SIGNS (WITH PHONE NUMBER) ALONG TRACT.
3. PROVIDE 6–FOOT FLAT SPACE ADJACENT TO THE TRACT FOR FIRE FIGHTING.

DATE: 5/7/2021

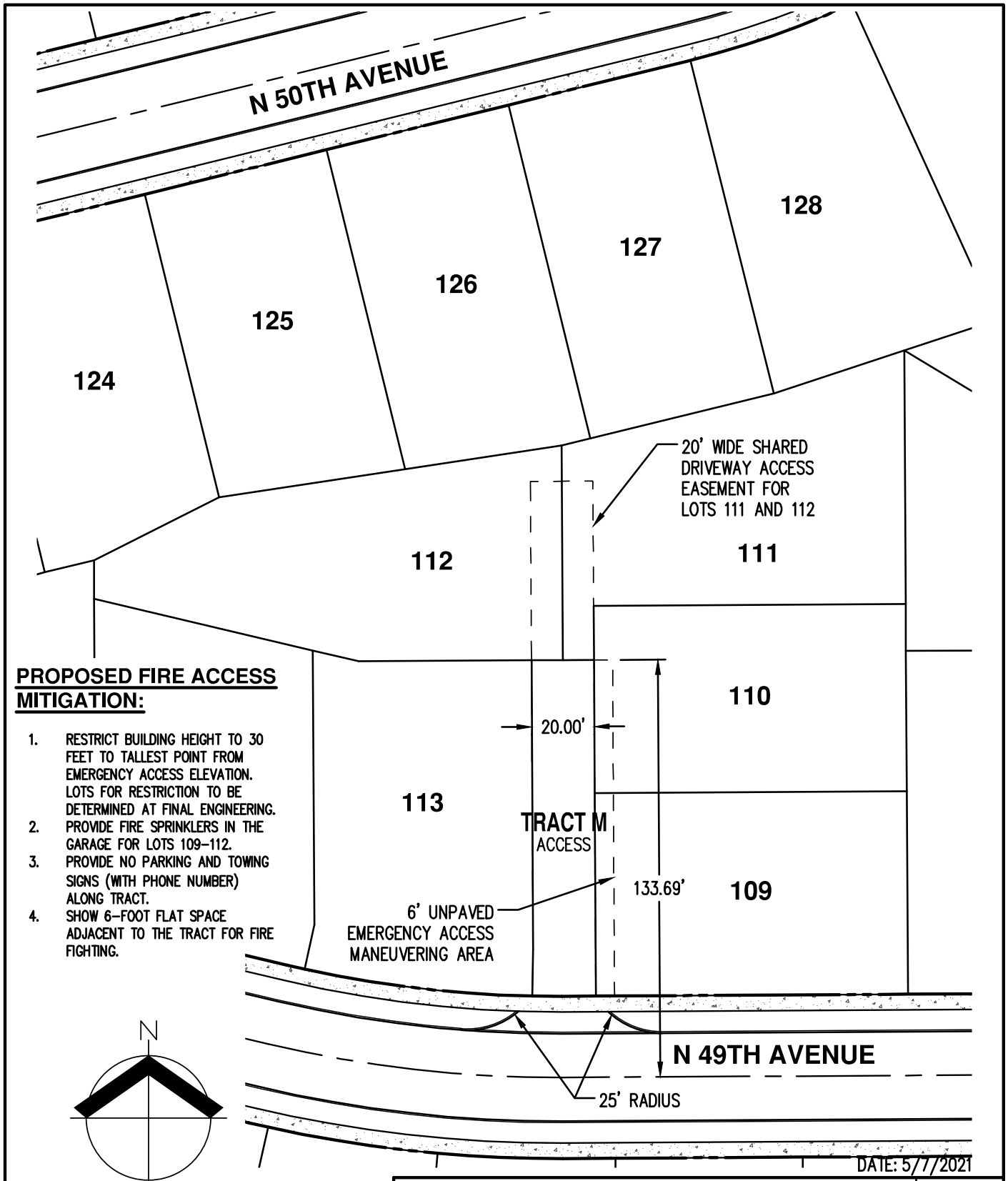
TRACT L ACCESS EXHIBIT

EXHIBIT B

AKS ENGINEERING & FORESTRY, LLC
9600 NE 126TH AVE, STE 2520
VANCOUVER, WA 98682
360.882.0419 WWW.AKS-ENG.COM

DRWN: MPA
CHKD: JMM
AKS JOB: 5504

DWG: 5504 20210506 ACCESS TRACT UPDATE-GN | LAYOUT2



PROPOSED FIRE ACCESS MITIGATION:

1. RESTRICT BUILDING HEIGHT TO 30 FEET TO TALLEST POINT FROM EMERGENCY ACCESS ELEVATION. LOTS FOR RESTRICTION TO BE DETERMINED AT FINAL ENGINEERING.
2. PROVIDE FIRE SPRINKLERS IN THE GARAGE FOR LOTS 109–112.
3. PROVIDE NO PARKING AND TOWING SIGNS (WITH PHONE NUMBER) ALONG TRACT.
4. SHOW 6–FOOT FLAT SPACE ADJACENT TO THE TRACT FOR FIRE FIGHTING.

SCALE: 1"= 40 FEET

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ORIGINAL PAGE SIZE: 8.5" x 11"

DATE: 5/7/2021

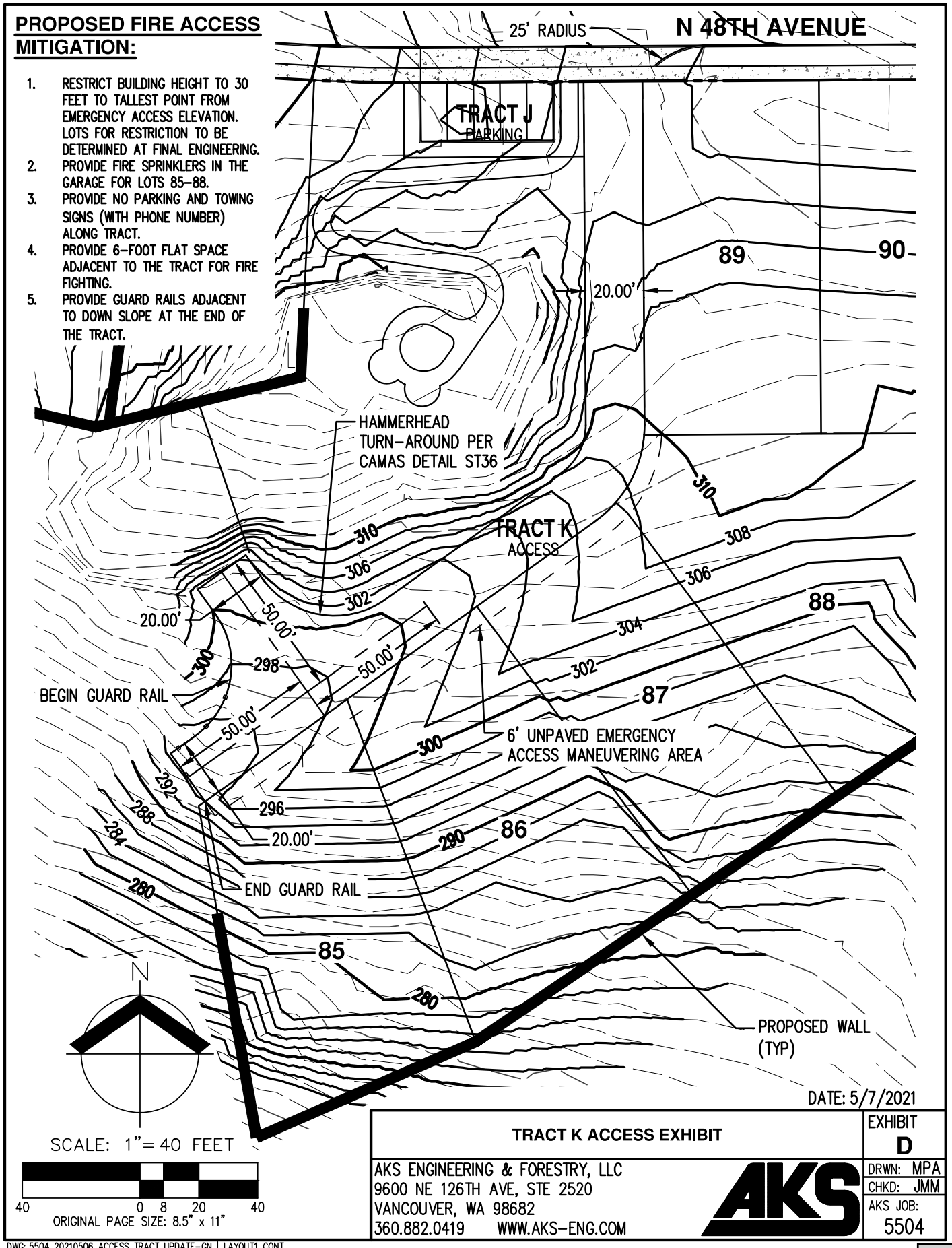
TRACT M ACCESS EXHIBIT

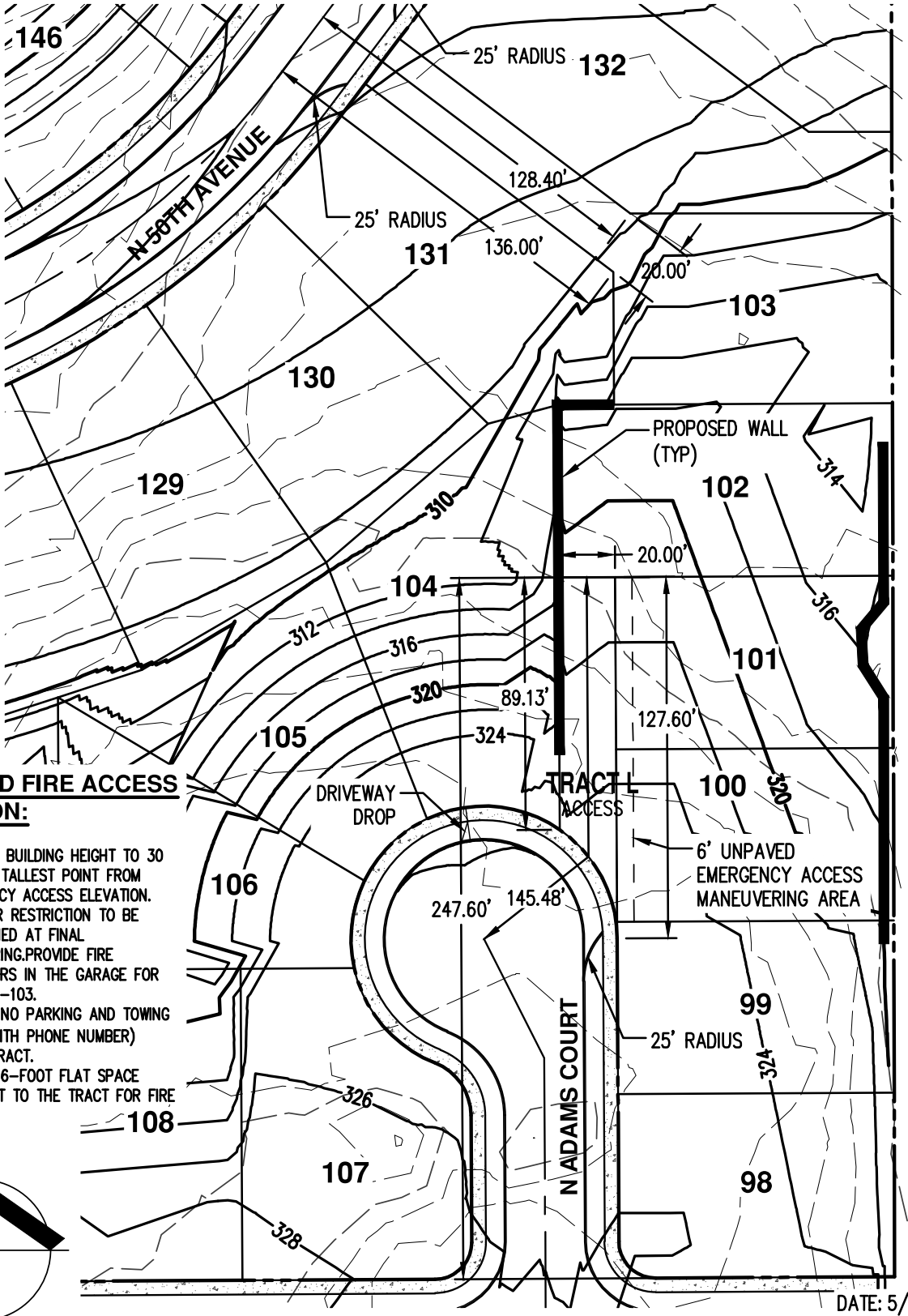
EXHIBIT C

AKS ENGINEERING & FORESTRY, LLC
9600 NE 126TH AVE, STE 2520
VANCOUVER, WA 98682
360.882.0419 WWW.AKS-ENG.COM

DRWN: MPA
CHKD: JMM
AKS JOB: 5504

DWG: 5504 20210506 ACCESS TRACT UPDATE-GN | LAYOUT3


PROPOSED FIRE ACCESS MITIGATION:
1. RESTRICT BUILDING HEIGHT TO 30 FEET TO TALLEST POINT FROM EMERGENCY ACCESS ELEVATION. LOTS FOR RESTRICTION TO BE DETERMINED AT FINAL ENGINEERING.
2. PROVIDE FIRE SPRINKLERS IN THE GARAGE FOR LOTS 85–88.
3. PROVIDE NO PARKING AND TOWING SIGNS (WITH PHONE NUMBER) ALONG TRACT.
4. PROVIDE 6–FOOT FLAT SPACE ADJACENT TO THE TRACT FOR FIRE FIGHTING.
5. PROVIDE GUARD RAILS ADJACENT TO DOWN SLOPE AT THE END OF THE TRACT.
25' RADIUS
N 48TH AVENUE
TRACT J
PARKING
20.00'
89
90
HAMMERHEAD TURN–AROUND PER CAMAS DETAIL ST36
310
TRACT K
ACCESS
308
306
304
302
88
87
50.00'
298
300
BEGIN GUARD RAIL
6' UNPAVED EMERGENCY ACCESS MANEUVERING AREA
292
288
284
280
296
290
86
END GUARD RAIL
85
PROPOSED WALL (TYP)
N
SCALE: 1"=40 FEET
40 0 8 20 40
ORIGINAL PAGE SIZE: 8.5" x 11"
DATE: 5/7/2021
TRACT K ACCESS EXHIBIT
EXHIBIT D
AKS ENGINEERING & FORESTRY, LLC
9600 NE 126TH AVE, STE 2520
VANCOUVER, WA 98682
360.882.0419 WWW.AKS–ENG.COM
DRWN: MPA
CHKD: JMM
AKS JOB: 5504
DWG: 5504 20210506 ACCESS TRACT UPDATE–GN | LAYOUT1 CONT



PROPOSED FIRE ACCESS MITIGATION:

1. RESTRICT BUILDING HEIGHT TO 30 FEET TO TALLEST POINT FROM EMERGENCY ACCESS ELEVATION. LOTS FOR RESTRICTION TO BE DETERMINED AT FINAL ENGINEERING.PROVIDE FIRE SPRINKLERS IN THE GARAGE FOR LOTS 101–103.
2. PROVIDE NO PARKING AND TOWING SIGNS (WITH PHONE NUMBER) ALONG TRACT.
3. PROVIDE 6–FOOT FLAT SPACE ADJACENT TO THE TRACT FOR FIRE FIGHTING.

DATE: 5/7/2021

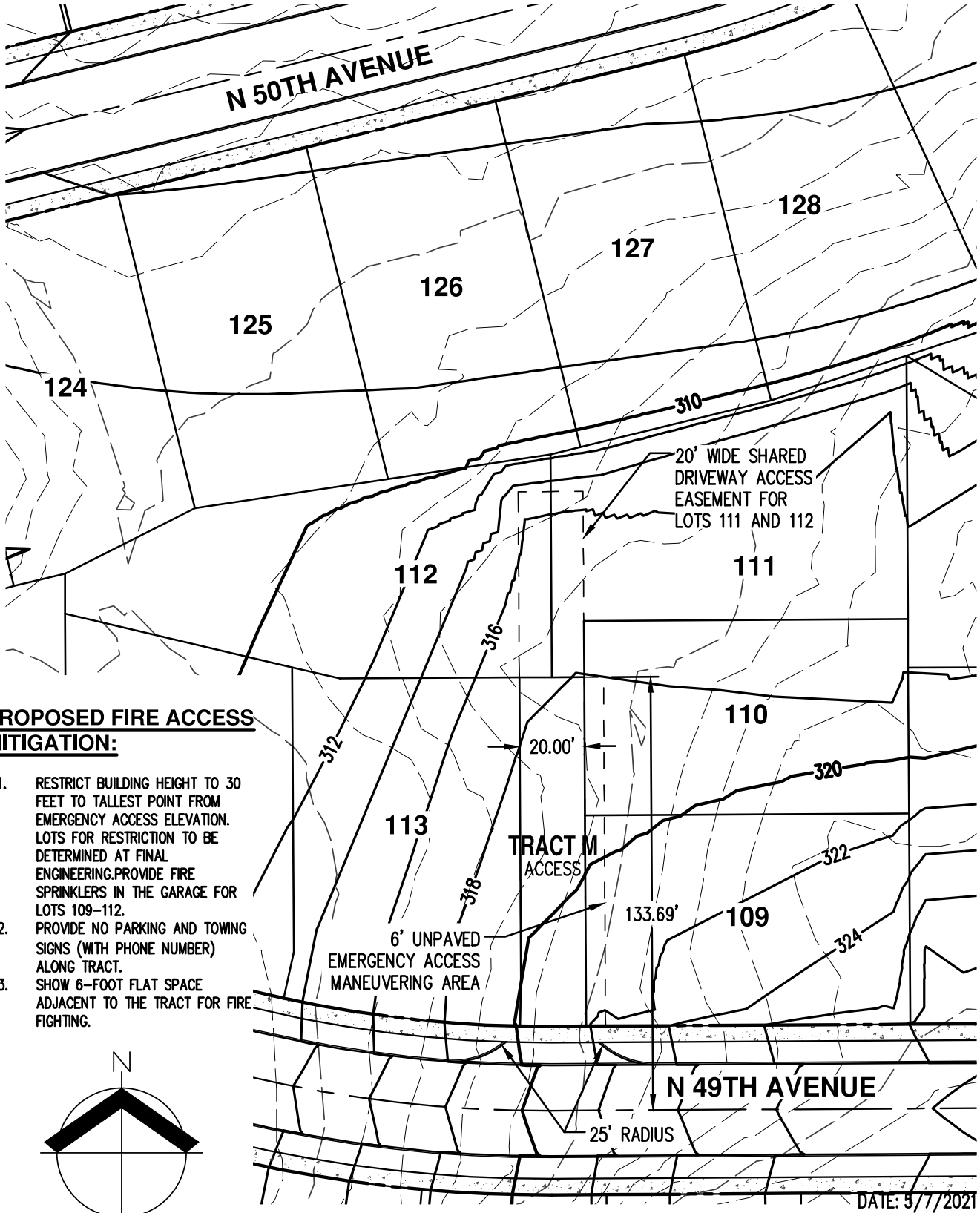
TRACT L ACCESS EXHIBIT

EXHIBIT **E**

AKS ENGINEERING & FORESTRY, LLC
9600 NE 126TH AVE, STE 2520
VANCOUVER, WA 98682
360.882.0419 WWW.AKS-ENG.COM

DRWN: MPA
CHKD: JMM
AKS JOB: 5504

DWG: 5504 20210506 ACCESS TRACT UPDATE-GN | LAYOUT2 CONT



PROPOSED FIRE ACCESS MITIGATION:

1. RESTRICT BUILDING HEIGHT TO 30 FEET TO TALLEST POINT FROM EMERGENCY ACCESS ELEVATION. LOTS FOR RESTRICTION TO BE DETERMINED AT FINAL ENGINEERING.PROVIDE FIRE SPRINKLERS IN THE GARAGE FOR LOTS 109–112.
2. PROVIDE NO PARKING AND TOWING SIGNS (WITH PHONE NUMBER) ALONG TRACT.
3. SHOW 6–FOOT FLAT SPACE ADJACENT TO THE TRACT FOR FIRE FIGHTING.

N

SCALE: 1"= 40 FEET

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ORIGINAL PAGE SIZE: 8.5" x 11"

DATE: 5/7/2021

TRACT M ACCESS EXHIBIT	EXHIBIT F
AKS ENGINEERING & FORESTRY, LLC 9600 NE 126TH AVE, STE 2520 VANCOUVER, WA 98682 360.882.0419 WWW.AKS-ENG.COM	DRWN: MPA CHKD: JMM AKS JOB: 5504

DWG: 5504 20210506 ACCESS TRACT UPDATE-GN | LAYOUT3 CONT

Lauren Hollenbeck

From: Anita Ashton
Sent: Monday, March 1, 2021 10:53 AM
To: Lauren Hollenbeck; Michael Kallas
Cc: Curleigh (Jim) Carothers
Subject: RE: DHV - Comment re proposed "CJ Dens" project site located at 715 SE Leadbetter Road, Camas WA 98607

Morning Michael,

I received your email to Lauren. Thank you for your comments and concerns from the Deerhaven residents. Staff is just starting the review the application and beginning to work on the staff report.

As we proceed with our review, we'll have additional answers to your concerns and comments.

If you have additional questions, please send me an email. Please make sure to include Lauren Hollenbeck on any emails.

Thanks, A
Anita Ashton
Face coverings are required for pickup and delivery. Thanks!
Project Manager
Community Development Engineering
Office: 360-817-7231
Email: aashton@cityofcamas.us

From: Lauren Hollenbeck <LHollenbeck@cityofcamas.us>
Sent: Thursday, February 25, 2021 10:01 AM
To: Michael Kallas <mkallas@iwmhoa.com>
Cc: Anita Ashton <AAshton@cityofcamas.us>
Subject: RE: DHV - Comment re proposed "CJ Dens" project site located at 715 SE Leadbetter Road, Camas WA 98607

Hi Michael,
I have copied your traffic questions/concerns to the Project Engineer, Anita Ashton, for a response. Do not hesitate to reach out should you have further questions.
Respectfully,

Lauren Hollenbeck
Senior Planner
Community Development
616 NE 4th Ave. Camas, WA 98607
360-817-1568 ext. 4253 (office)
360-314-7537 (cell)
lhollenbeck@cityofcamas.us

From: Michael Kallas <mkallas@iwmhoa.com>
Sent: Thursday, February 25, 2021 9:21 AM
To: Community Development Email <communitydevelopment@cityofcamas.us>
Cc: Nancy Lambert <nlambert@iwmhoa.com>
Subject: DHV - Comment re proposed "CJ Dens" project site located at 715 SE Leadbetter Road, Camas WA 98607

WARNING: This message originated outside the City of Camas Mail system. DO NOT CLICK on links or open attachments unless you recognize the sender and are expecting the content. If you are unsure, click the Phish Alert button to redirect the email for ITD review.

Dear Ms. Hollenbeck,

I am writing regarding the attached notice and invitation for comment with respect to the proposed "CJ Dens" project site located at 715 SE Leadbetter Road, Camas WA 98607. We manage the Deerhaven Homeowner's Association located to the southeast of the proposed project. The Association is comprised of homes located in 45th Circle and along N. Adams Street north of SE Leabetter Road.

The Association is concerned about safety issues as the project moves forward and after it is completed. Specifically, Adams Street, which currently dead ends at the north end, will likely experience a significant increase in heavy truck volumes during construction, and in traffic volumes in general once the project is completed, and the Association is concerned that vehicle speeds will increase as well, especially as cars and trucks come downhill from the north. There will be additional vehicular traffic once the connection is completed. The posted speed will be 25 mph.

The Association would like to know whether speed bumps on Adams Street are part of the project design? While the addition of such a feature is not always ideal for those who must traverse them daily, they would likely help increase the safety for children that reside and play in the neighborhood. Also, can you please tell us what kind of signage is being contemplated along Adams Street and what speed is being contemplated for that street? At this time, the required signage are street names and speed limit signs. The posted speed will be 25 mph.

Thank you in advance for considering the Association's concerns and answering our questions about the project design.

Michael A. Kallas
Community Manager and Director of Association Management, CCM

Invest West Management
Celebrating 40 Years!

12503 SE Mill Plain Blvd, Ste. 260 | Vancouver, WA 98684
(360) 567-4347 | Fax: (360) 254-9573

How did we do?

Click to rate your experience with Invest West Management

COMMUNITY DEVELOPMENT DEPARTMENT
616 NE 4th Avenue
Camas, WA 98607
www.ci.camas.wa.us

Date Published: May 6, 2021

To Whom It May Concern:

Please find enclosed a Mitigated Determination of Non-Significance (MDNS) for the **CJ Dens Subdivision (SEPA20-17)** that was issued pursuant to the State Environmental Policy Act (SEPA) Rules, Chapter 197-11, Washington Administrative Code. The enclosed review comments reflect evaluation of the environmental checklist by the lead agency as required by WAC 197-11-330(1)(a)(i).

The following materials were submitted with the initial application:

- Application form and fees
- Applicant's Narrative
- SEPA Checklist
- Site and development plans
- Archaeological Predetermination*
- Critical Areas Report and Mitigation Plan
- Tree Report
- Traffic Study
- Geotechnical Report
- Stormwater TIR
- Shoreline Permit
- Recorded Easements

All application materials are available for review upon request from the Community Development Department. *Archaeological information is exempt from public disclosure, consistent with RCW 42.56.300.

Written comments may be submitted on this determination within fourteen (14) days of its issuance, after which the MDNS will be reconsidered in light of the comments received.

Please address all correspondence to:

City of Camas, SEPA Official
Community Development Department
616 NE Fourth Avenue
Camas, Washington 98607
communitydevelopment@cityofcamas.us

Distribution:

Applicant
Bureau of Indian Affairs
C-Tran
Camas School District
Camas City Administrator, Jamal Fox
Camas Building Official, Bob Cunningham
Camas Community Development Director, Phil Bourquin
Camas Engineering Department Managers and Staff
Camas Fire Department, Randy Miller
Camas Finance Director, Cathy Huber Nickerson
Camas Mayor and City Council Members
Camas Parks and Recreation, Trang Lam
Camas Planning Manager and Staff
Camas Police Chief, Mitch Lackey
Camas Public Works Director, Steve Wall
Camas Public Library, Connie Urquhart
Camas-Washougal Post Record
Chinook Indian Nation
Cultural Resource Program, Cowlitz Indian Tribe
Cultural Resource Program, Yakama Indian Nation
Clark County Department of Environmental Services
Clark County Department of Transportation
Clark County Natural Resources Council
Clark Public Utilities
Department of Ecology
Department of Fish and Wildlife, Region 5
Department of Natural Resources, SEPA Center
Southwest Clean Air Agency
US Army Corps of Engineers
Vancouver- Clark Parks & Recreation
Washington Office of Archaeology & Historic Preservation
Washington State Department of Transportation
Washington State Parks and Recreation Commission, Environmental Program
Property Owners within 300 feet *(mailed the SEPA Determination & map)*
Hearings Examiner, Joe Turner

State Environmental Policy Act
Mitigated Determination of Non-Significance

CASE NO: SEPA 20-17 CJ Dens Subdivision

APPLICANT: Michael Andreotti
AKS Engineering & Forestry, LLC
9600 NE 126th Avenue, Suite 2520
Vancouver, WA 98682

REQUEST: To develop approximately 49.62-acres with 152 residential lots that contain critical areas

---

Location: 715 SE Leadbetter Road

Legal Description: The property is located in the NE ¼ of Section 34 and NW ¼ of Section 35, Township 2 North, Range 3 East, of the Willamette Meridian; and described as parcels 177906-000, 178172-000 and 178236-000

SEPA Determination: Mitigated Determination of Non-Significance (MDNS)

Comment Deadline: **May 20, 2021, at 5:00 p.m.**

As lead agency under the State Environmental Policy Act (SEPA) Rules [Chapter 197-11, Washington Administrative Code (WAC)], the City of Camas must determine if there are possible significant adverse environmental impacts associated with this proposal. The options include the following:

- DS = Determination of Significance (The impacts cannot be mitigated through conditions of approval and, therefore, requiring the preparation of an Environmental Impact Statement (EIS).
- MDNS = Mitigated Determination of Non-Significance (The impacts can be addressed through conditions of approval), or;
- DNS = Determination of Non-Significance (The impacts can be addressed by applying the Camas Municipal Code).

Published in the Post Record on May 6, 2021 Legal publication No.548070
Posted on the City website

Determination:

Mitigated Determination of Non-Significance (MDNS). The City of Camas, as lead agency for review of this proposal, has determined that this proposal does not have a probable significant adverse impact on the environment. An Environmental Impact Statement (EIS) is not required under RCW 43.21C.030(2)(e). This decision was made after review of a completed environmental checklist, and other information on file with the City of Camas.

Date of Publication & Comment Period:

Publication date of this MDNS is **May 6, 2021** and is issued under WAC 197-11-350. The lead agency will not act on this proposal until the close of the 14-day comment period, which ends on **May 20, 2021**. Comments may be sent by email to communitydevelopment@cityofcamas.us or regular mail to:

City of Camas SEPA Official
Community Development Department
616 NE Fourth Avenue
Camas, Washington 98607

Responsible Official: Robert Maul (360) 817-1568

Robert Maul, Planning Manager and Responsible Official

May 20, 2021
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SEPA Mitigation Measures for CJ Dens Subdivision (SEPA20-17)

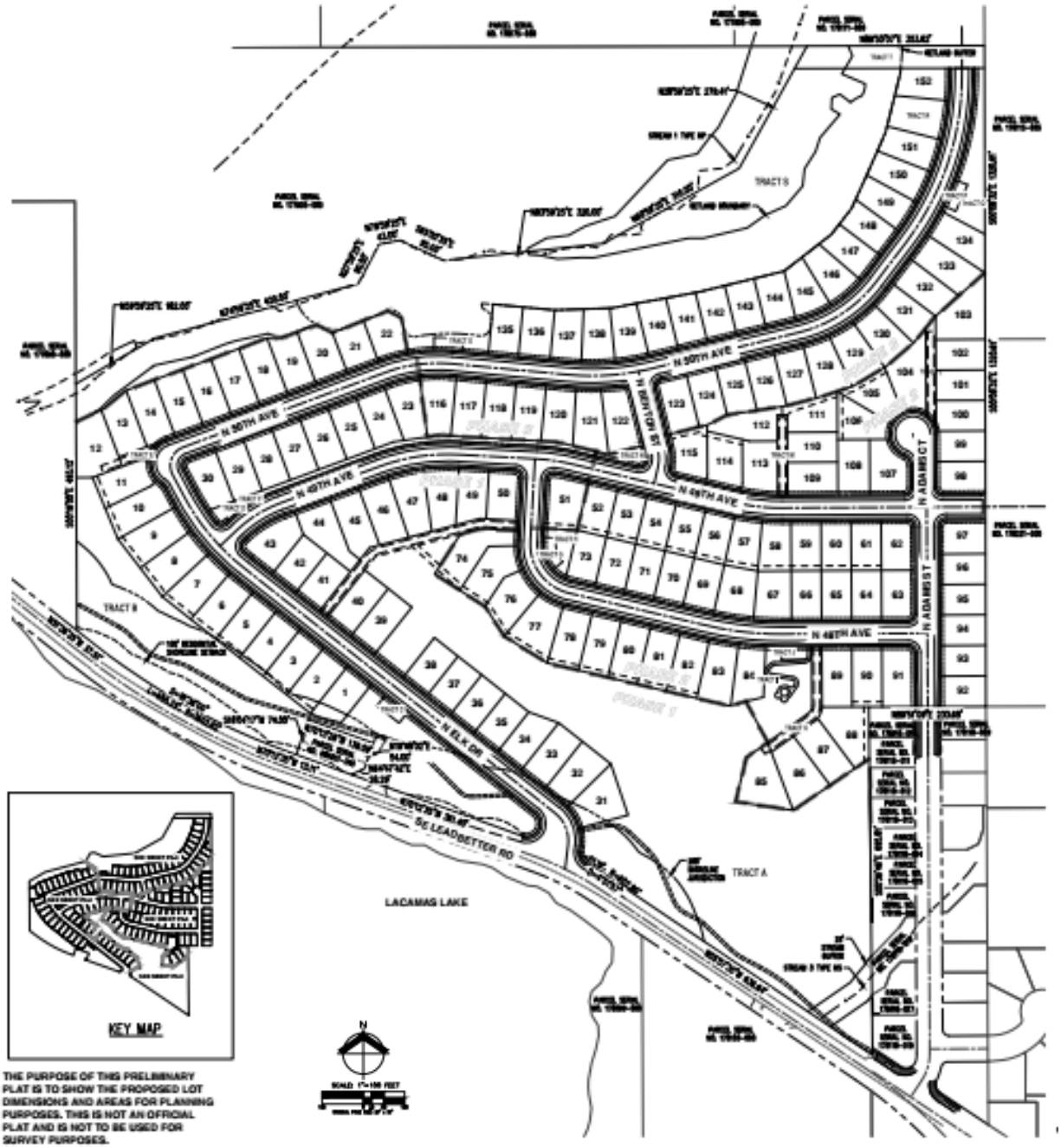
The City of Camas has identified impacts by the proposed project that requires mitigation. In addition to the requirement that the development must comply with all City of Camas zoning and development regulations, the following condition of approvals apply:

B) ENVIRONMENTAL ELEMENTS

1) Earth
   a. The applicant shall follow a phased construction schedule, beginning with Phase 1 and followed sequentially with Phases 2 and 3, where Final Acceptance will be issued by Community Development Engineering at the end of each phase and prior to the next phase, or unless authorized by the Community Development Director;
   b. Final engineering plans for Phase 1 shall be submitted as a standalone set of engineering plans, with a standalone set submitted for each subsequent phase.
   c. A 'temporary' hammerhead shall be constructed at the end of each phase and shall remain in-place until construction of each subsequent phase;
   d. Blasting and clearing & grading shall be restricted per the phasing plan; and
   e. Early grading permits shall not be issued.

14) Transportation
   a. A hammerhead shall be installed at the end of N 50th Avenue (Lot 151) until such time as the future public road is constructed;
   b. The known locations for traffic calming measures, both onsite & offsite, shall be shown on the final engineering plans. These locations are as follows: intersection of N 48th Avenue & N Adams Street and N Adams Street @ the creek crossing in the Deerhaven subdivision. Additional onsite traffic calming measures may be required. Applicant shall discuss with staff prior to final engineering plan approval.
   c. Infrastructure construction traffic shall be prohibited from using access thru the Deerhaven subdivision (aka N Adams Street).

CJ Dens Subdivision (SUB20-01)



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SEPA ENVIRONMENTAL CHECKLIST

UPDATED 2016

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

***Instructions for applicants*:**

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision- making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals:

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

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A. Background

1. Name of proposed project, if applicable:
CJ Dens

2. Name of applicant:
CJ Dens Lacamas II LLC

3. Address and phone number of applicant and contact person:

Applicant:
CJ Dens Lacamas II LLC
Carl Lawson
PO Box 2239
Kalama, WA 98625
(360) 606-6217
carl@lawsoninvestments.com

Contact:
AKS Engineering & Forestry
Michael Andreotti
9600 NE 126th Avenue, Suite 2520
Vancouver, WA 98682
(360) 882-0419
andreottim@aks-eng.com

4. Date checklist prepared:
November 20, 2020
All items in bold are amendments from the original checklist.

5. Agency requesting checklist:
City of Camas, Washington

6. Proposed timing or schedule (including phasing, if applicable):
The proposed project is anticipated to begin once all permits are obtained in summer of 2021. The development will be constructed in three phases.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.
No.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.
- *Geotechnical Report, prepared by GeoDesign, Inc. on November 22, 2005*
- *Wetland Delineation and Assessment, prepared by The Resource Company, Inc. on December 8, 2005*
- *Wetland Buffer and Mitigation Plan prepared by Ecological Land Services, August 2010*
- *Letter prepared by Ecological Land Services on August 19, 2010, regarding: Leadbetter Road Property Wetland Delineation in Camas, Washington*
- *Sensitive Areas Assessment Report, prepared by The Resource Company, Inc. on December 15, 2005*
- *Archaeological Assessment Prepared by AINW, July 2010*
- *Shoreline Substantial Development Permit*
- *Final Engineering Grading and Stormwater/Erosion Control Approval*
- ***Geotechnical Memo, prepared by Hart Crowser on November 23, 2020.***
- ***Critical Areas Report & Buffer Modification Plan prepared by Ecological Land Services on November 18, 2020***

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- ***Trip Update Letter prepared by Mackenzie on October 21, 2020***

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.
None known.

10. List any government approvals or permits that will be needed for your proposal, if known.
City of Camas Preliminary Subdivision (Type III) Approval

City of Camas Shoreline Substantial Development Permit

City of Camas Critical Areas Permit

City of Camas grading, vegetation clearing, tree preservation and view corridors.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)
~~*The applicant is proposing a preliminary subdivision of approximately 85.43 acres (according to the Clark County assessment data) into 293 lots for future residential use and several tracts for a variety of uses such as open space*~~
The applicant is proposing a preliminary subdivision of approximately 49.62 acres into 152 lots for future residential use and several tracts for critical and natural area protection, open space, and parking.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.
The site is located in the City of Camas, northeast of Lacamas Lake, and is further described as tax lots ~~29,~~ 30, 80, and 144 in Sections 34 and 35, Township 2 North, Range 3 East of the Willamette Meridian, Camas Washington

B. Environmental Elements

1. Earth

a. General description of the site:

(circle one): Flat, rolling, **hilly, steep slopes**, mountainous, other __

b. What is the steepest slope on the site (approximate percent slope)?
There are some rock outcroppings that are greater than 80% slope, see Figure 5 in the Geotechnical Report prepared by GeoDesign, Inc., on November 22, 2005.

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c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.
According to Clark County GIS and the Clark County Soil Survey (USDA 1974), noted in the Wetland Delineation and Assessment prepared by The Resource Company on December 8, 2005, and detailed in the November 22, 2005 GeoDesign report, the soils on the site are:

HcB	*Hesson clay loam, 0 to 8 percent slopes*
LlB	*Lauren very gravelly loam, 0 to 8 percent slopes*
OlD	*Olympic clay loam, 8 to 20 percent slopes*
OlF	*Olympic clay loam, 30 to 60 percent slopes*
OmE	*Olympic stony clay loam, 3 to 30 percent slopes*
ThA	*Tisch silt loam, 0 to 3 percent slopes*
VaB	*Vader silt loam, 3 to 8 percent slopes*
VaC	*Vader silt loam, 8 to 15 percent slopes*

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.
Yes, as per the geotechnical report prepared by GeoDesign Inc., on November 22, 2005, unstable soils exist on site. The proposed subdivision will be designed in accordance with the geotechnical recommendations in the GeoDesign report.
Additional geotechnical studies have been completed by Hart Crowser and are included with the application. The Geotechnical Engineer will be on site during site grading to observe soil and rock conditions and provide recommendations.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.
Specific grading plans will be generated with a subsequent final plat application. Generally, the subdivision will require grading and filling for roads, utilities, and leveling of lots for future residential development.
Estimated grading quantities are: Cut 150,000 cubic yards; Fill 75,000 cubic yard. Fill areas will utilize on-site materials and import materials from approved off-site sources, if necessary.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.
Erosion is possible, but the chances of a significant erosion hazard will be minimized by the implementation of an approved erosion control plan utilizing best management practices for erosion control, which will be implemented prior to commencing construction activities.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Impervious surfaces created by the development will included roads, sidewalks, houses, and driveways. The total impervious surface for the site will be ±20.90 acres, or 42% of the site.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:
An approved erosion control plan will be implemented prior to site construction activities.

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2. Air

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

Development would include activities which would include dust and emissions generated from heavy equipment and construction activities over the short-term during construction activities, and long-term air emissions associated with this proposal, including exhaust from automobiles and other usual emissions from residential uses.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

None known.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

No special measures are anticipated for this proposal.

3.Water

a. Surface Water:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

There is an unnamed Type ~~3 perennial~~ **Np** *stream that flows southwest through the central portion of the property before exiting the site through a culvert underneath Leadbetter Road and emptying into Lacamas Lake. The Wetland Delineation and Assessment prepared by The Resource Company in December 2005, consistent with the Washington Department of Natural Resources (DNR) mapping, states this stream is non-fish bearing. Ecological Land Services in August 2010 believes the stream has the potential to be fish bearing and recommends further evaluation if the base buffer is reduced below 75 feet. The buffer for a non-fish bearing perennial stream is 50 feet while the buffer for a non-anadromous fish bearing perennial stream is 75 feet. The development has applied the 75-foot buffer along the Type 3 stream. There is also an unnamed Type Ns (seasonal, non-fish bearing) stream that flows onsite from the east in the southeastern corner of the property noted in the additional analysis prepared by Ecological Land Services.*

There is a Category III wetland (Wetland A) located in the north portion of the site, over a portion of the Type Np stream. The site is also adjacent to Lacamas Lake, which is located on the south side of SE Leadbetter Road.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

~~*Yes, the southwestern boundary of the western most parcel (177905-000) is within the 200 foot shorelines buffer. However, this portion of the project site has been designated as an area of tree preservation and an open space tract, and for existing parking associated with the WDFW boat launch to continue. Details are shown on the attached plans.*~~

Yes, work will occur within 200 feet of all described waters. Residential lot construction, some roadway construction, construction of a multi-use trail, and site grading will occur within 200 feet of Lacamas Lake. A Shoreline Substantial Development Permit has been prepared relating to this work. The multi-use trail (a port of the T-3 trail identified in the City of Camas

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Parks, Recreation, and Open Space Plan) will be constructed over the Type Ns stream in the southeast corner of the site, using a bridge to cross the stream. Residential lot construction and site grading will occur within 200 feet of the Type Np stream and Wetland A.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.
None

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.
On site stormwater will be diverted to a stormwater treatment system designed in accordance with applicable City of Camas stormwater standards before being discharged to Lacamas Lake **and Wetland A.**

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.
County GIS and FEMA maps indicate the flood plain for Lacamas Lake graphically on portions of this site; however, based on the elevation of the top of the overflow structure in Round Lake, the flood elevation is 185.6 feet which is lower than the lowest elevation on the site.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.
No.

b. Ground Water:

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.
~~*Stormwater infiltration is not likely at this location in any significant quantity, see attached stormwater plan and report for more details.*~~
No.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.
No waste discharge is proposed.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

During construction activities, runoff will be directed to erosion control measures to control site erosion until soils can be stabilized. Post development runoff from the paved roads, driveways, and roof hardscape areas ~~will be treated with bio-filtration swales or mechanical devices using best management practices consistent with the City of Camas drainage requirements. Treated stormwater will be routed through a standard pipe system with eventual discharge to Lacamas Lake.~~ See attached stormwater plan and report for compliance with current standards.

Stormwater runoff generated by the proposed development will be collected on site. All pollution generating runoff will be treated by mechanical filters within the catch basins located in the streets. The majority of the treated stormwater will be conveyed and discharged to Lacamas Lake at existing discharge points. A small portion of the treated stormwater will be conveyed to a stormwater pond in Tract R for detention, prior to being released to Wetland A at rates permitted by Camas Municipal Code (CMC).

2) Could waste materials enter ground or surface waters? If so, generally describe.

It is possible that waste materials could enter ground or surface waters in the case of an accidental spill during construction activities or on streets.

No waste materials are proposed to enter ground or surface water as part of this application.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

No. On-site stormwater was previously dispersed within the vegetation and infiltrated on site, drained to the existing wetlands and streams, or surface flowed to ditched along the north side of SE Leadbetter Road, and eventually discharged to Lacamas Lake. Off-site stormwater also flows through the Type Np stream, and this flow will be maintained after development. Stormwater runoff generated by the proposed development will be collected on site. All pollution generating runoff will be treated by mechanical filters within the catch basins located in the streets. The majority of the treated stormwater will be conveyed and discharged to Lacamas Lake at existing discharge points. A small portion of the treated stormwater will be conveyed to a stormwater pond in Tract R for detention, prior to being released to Wetland A at rates permitted by CMC.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

~~A stormwater management system will be installed and all surface and runoff water will be conveyed to a facility within the proposed development for treatment prior to being discharged off site.~~

Stormwater runoff generated by the proposed development will be collected on site. All pollution generating runoff will be treated by mechanical filters within the catch basins located in the streets. The majority of the treated stormwater will be conveyed and discharged to Lacamas Lake at existing discharge points. A small portion of the treated stormwater will be conveyed to a stormwater pond in Tract R for detention, prior to being released to Wetland A at rates permitted by CMC.

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4. Plants

a. Check or circle types of vegetation found on the site:

——— *deciduous trees: alder, maple, aspen,* **other: ash**

——— *evergreen trees: fir, cedar, pine, other*

——— *shrubs*

——— *grass*

——— *pasture*

——— *crop or grain*

——— *wet soil plants: cattail, buttercup,* **bullrush**, *skunk cabbage,* **other: reed canary grass**

——— *water plants: water lily, eelgrass, milfoil, other*

——— *other types of vegetation: Blackberries, Misc. ground cover*

b. What kind and amount of vegetation will be removed or altered?

~~*Vegetation will be removed as necessary for construction of the proposed residences and infrastructure, including roads, utilities, and stormwater facilities.*~~

The applicant proposes clearing only as much of the site as necessary for site grading, road construction, and stormwater construction. As many healthy site trees as possible will be saved. Clearing will include trees, shrubs, and all other plant material in work areas.

c. List threatened and endangered species known to be on or near the site.

No threatened or endangered plant species are known to exist on or near the site. See Wetland and Sensitive Areas assessments prepared by The Resource Company, Inc.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Tree protection corridors have been established to promote soil stabilization, enhance view corridors, and preserve existing vegetation. Stream and wetland buffers will also add to the preservation of vegetation on the site. Future development of this site will include site landscaping consistent with typical residential uses.

e. List all noxious weeds and invasive species known to be on or near the site.

Himalayan blackberry.

5. Animals

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site.

Examples include:

birds: **hawk,** heron, eagle, **songbirds, other:** mammals: **deer**, bear, elk, **beaver, other**:
fish: **bass,** salmon, **trout**, herring, shellfish, other ___

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b. List any threatened and endangered species known to be on or near the site.
None known. As stated in the Sensitive Areas Assessment Report prepared by The Resource Company, Inc., on December 15, 2005, the Washington Department of Fish and Wildlife priority habitat maps indicate that there are no mapped priority habitats or priority species polygons on the site.

c. Is the site part of a migration route? If so, explain.
The site is within the Pacific Flyway, a bird migration route that covers most of the Pacific West Coast from Mexico to Alaska.

d. Proposed measures to preserve or enhance wildlife, if any:
None proposed.

e. List any invasive animal species known to be on or near the site.
None known.

6. Energy and Natural Resources

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.
~~*Electricity, natural gas, solar energy, and oil will all be used to meet the energy needs of the proposed residential subdivision.*~~
Electricity and/or natural gas will be used to meet the energy needs of the development.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.
No.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:
All proposed buildings will be built to current energy standards as applicable in the adopted codes.

7. Environmental Health

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.
~~*None known.*~~
Blasting of bedrock will take place during site grading. The blasting will follow all local, state, and federal regulations. Other environmental hazards are limited to standard risks associated with construction and occupancy of the development.

1) Describe any known or possible contamination at the site from present or past uses.
None known.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.
None known

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3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.
Blasting materials for bedrock blasting during site grading. Other typical construction materials such as: gas; diesel, oil, etc.

4) Describe special emergency services that might be required.
Emergency services will be required to serve future development. These services include police, fire, and medical services common to residential development.
Special emergency services could be required if an accident related to the blasting were to occur. No other special emergency services are anticipated.

5) Proposed measures to reduce or control environmental health hazards, if any:
The applicant will comply with all applicable local, state, and federal regulations related to use and storage of blasting materials for grading purposes, along with following all other best management practices for construction.

b. Noise
1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?
Traffic noise on Leadbetter Road is adjacent to the south property boundary.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indi- cate what hours noise would come from the site.
Construction noise will be on a short-term basis, during daylight hours and consistent with local and state noise regulations. Long-term noise impacts will likely be limited to noise generated from typical residential development such as vehicle traffic.
In the short term, noise from construction equipment will occur during daylight hours. Intermittent blasting will take place during site grading of bedrock. A mobile rock crusher will also be temporarily in use on site during construction. In the long term, typical neighborhood vehicular noise will occur.

3) Proposed measures to reduce or control noise impacts, if any:
~~*Noises anticipated for residential development are minimal, therefore, none are proposed.*~~
Require all construction equipment to have muffled exhaust. Follow all required mitigation practices during blasting of bedrock. Restrict construction to hours allowed by the City of Camas (CMC 9.32.050(A)).

8. Land and Shoreline Use

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

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~~*The site is currently vacant land. Properties to the south are Lacamas Lake and parks property, and property to the north is primarily vacant land. Properties to the east and west are low-density residential uses with a medium density residential subdivision (Deerhaven) to the east. The gun club is also adjacent to the property. Farming practices have occurred on the property to the north and east.*~~
Properties to the north and northeast are vacant. The property to the east is in use as a large-lot residential, and the properties to the southeast are in use as single-family residential. One property to the south across SE Leadbetter Road is in use as large-lot residential, with the remaining parcels south of the site covered by Lacamas Lake. The property to the west is in use as large-lot residential and the Camas Washougal-Wildlife League clubhouse.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?
The site was logged in 2015 under a Class IVG forest practices permit (FPA/N #2930674).

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:
No.

c. Describe any structures on the site.
None.

d. Will any structures be demolished? If so, what?
No.

e. What is the current zoning classification of the site?
~~*Medium Density Residential (MDR) with an underlying zoning designation of*~~ *Residential 7,500 (R-7.5).*

f. What is the current comprehensive plan designation of the site?
Single Family Medium (SFM)

g. If applicable, what is the current shoreline master program designation of the site?
~~*Currently, the City's shoreline management plans do not include this area, but the current Clark County Shoreline Management Plan designates the shoreline as a conservancy zone.*~~
Urban Conservancy

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.
As detailed in the December 8, 2005, Wetland Delineation and Assessment and the December 15, 2005, Sensitive Areas Assessment Report prepared by The Resource Company, Inc., and the August 2010 Wetland Buffer and Mitigation Plan prepared by Ecological Land Services, there is a Category II palustrine emergent wetland in the northeast portion of the site, a Type 3 perennial stream that flows through the central portion of the site, and a Type Ns stream in the southeast corner of the site. Steep slopes and areas of high potential erosion hazard exist

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on the site as detailed in the November 22, 2005 Geotechnical Report prepared by GeoDesign, Inc. Shorelines designation as discussed above.

Additional Geotech studies and a Critical Areas Report & Buffer Modification plan have been prepared by Hart Crowser and ELS, respectively, and are included with the application

i. Approximately how many people would reside or work in the completed project?
~~*Currently, 293 residential lots are proposed. Assuming 2.5 residents per average household, approximately 733 people would reside in the proposed subdivision at full buildout.*~~
152 lots residential lots are proposed with this application Assuming 2.67 people per residence, approximately 406 people will reside in the completed project.

j. Approximately how many people would the completed project displace?
None.

k. Proposed measures to avoid or reduce displacement impacts, if any:
None needed.

L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:
The proposal complies with all applicable land use requirements and is consistent with current zoning and comprehensive plan designations.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:
Proposed measures include approval through the City of Camas Subdivision review process.

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.
~~*293 middle income housing units would be provided.*~~
152 middle income housing units will be provided.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.
None.

c. Proposed measures to reduce or control housing impacts, if any:
~~*293 single family housing units will be supplied on this site to help meet the goals in Chapter 5 of the comprehensive plan for the growing housing needs in the area. It will also provide an extension of utilities through the property to reach areas the City has planned for industrial and commercial jobs based economic development.*~~
No impacts are proposed, so no measures are proposed.

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10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?
Residential structures are limited to 35 feet (3 stories and a basement) in the R-7.5 zone. No structure proposed will exceed the maximum height allowed in this zone.

b. What views in the immediate vicinity would be altered or obstructed?
Views of the project site from the south side of Lacamas Lake will be altered, however, the proposed tree protection areas will aid in reducing the severity of this alteration to the southwest facing hillside. The southwest facing slope of the site does allow for views of the Lake and the proposed lot layout has taken view corridors into consideration.

c. Proposed measures to reduce or control aesthetic impacts, if any:
~~*Established tree preservation areas in the previously approved Development Agreement as well as standards for protecting views.*~~
Three large natural area tracts will be provided to protect existing mature trees will help reduce the aesthetic impact of the development. Planting of additional trees in the natural area tracts and street tree will also help reduce the impact.

11. Light and Glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?
Light and glare typical of residential uses will occur from window lighting, automobile lights, and street lighting. These impacts would occur mainly during hours of darkness.

b. Could light or glare from the finished project be a safety hazard or interfere with views?
No.

c. What existing off-site sources of light or glare may affect your proposal?
None known.

d. Proposed measures to reduce or control light and glare impacts, if any:
~~*Street*~~ *lighting will be directed and shielded to minimize impacts*

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?
Lacamas Lake, Round Lake, and Lacamas Lake Park are all in the vicinity of this site and provide for a variety of recreational opportunities such as boating, fishing, and hiking. An associated boat launch is located south of the site between Lacamas Lake and Leadbetter Road.
There is a segment of the T-3 Camas Neighborhood Loop Trail located to the east of the development that the applicant proposes to extend.

b. Would the proposed project displace any existing recreational uses? If so, describe
The proposed project will not displace any existing recreational uses.

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c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:
The applicant is proposing to construct a trail segment of the T-3 trail along the southern boundary paralleling SE Leadbetter Road that will connect the development to the existing and future City of Camas trail system. The applicant is also proposing open space tracts throughout the site, which provide passive recreation including an overlook.

13. Historic and cultural preservation

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers ? If so, specifically describe.
Property is in an area of high archaeological probability. ~~*An archaeological study is included in this application.*~~
An archaeological predetermination was completed with the originally approved application (City of Camas project number SUB:10-03). The predetermination determined there were no sites eligible for listing in the national, state, or local preservation registers.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.
No landmarks, features, or other evidence of historic use or occupation were found.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.
An Archaeological Predetermination Survey completed by AINW in July 2010. The survey included review of previous records for the area, a surface survey with a series of east to west pedestrian transects, and the digging of seven test pits.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.
No loss, change, or disturbance is proposed to any resource. The project will follow requirements from DAHP and the City of Camas.

14.Transportation

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.
~~*For the initial development, the site will be served by Leadbetter Road and NE Adams Street. These accesses will be utilized until development of the adjacent parcels to the north and the new arterial roadway is constructed. Once the arterial to the north is constructed, the City of Camas plans to convert Leadbetter Road into a waterfront trail.*~~

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The site will gain access form SE Leadbetter Road through the extension of N Adams Street into the side, and the construction of N Elk Drive. A future arterial along the north site boundary will also provide access after it is constructed.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?
No. The nearest stop is Mill Plain at SE 1st approximately five miles west of the site.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?
There will be 4 private parking spaces on each lot and 30 public parking spaces located in tracts throughout the site.

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).
Yes, new roads and streets are proposed to serve the proposed subdivision. See preliminary plan for details on internal streets.

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.
The site is approximately .75 mile south of Grove Airfield and is in within the immediate vicinity of Lacamas Lake.

f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?
~~Approximately 2,857 daily trips (220 AM peak hour and 282 PM peak hour) would be generated by the proposed subdivision.~~
A Trip Update Letter prepared on October 21, 2020 by Mackenzie, which states the propose development will generate 1,528 average daily trips with 113 a.m. peak hour trips and 152 p.m. peak hour trips.

g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.
None known

h. Proposed measures to reduce or control transportation impacts, if any:
See the Transportation Impact Analysis prepared by Group Mackenzie in August 2010, for a description of impacts.
Additional traffic was prepared by Mackenzie. The Trip Update Letter prepared on October 21, 2020 is included with this application.

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15. Public Services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.

Yes, an additional 152 dwelling units will cause an incremental increase in the need for all public services.

b. Proposed measures to reduce or control direct impacts on public services, if any.

The appropriate impact fees will be paid.

16. Utilities

a. Circle utilities currently available at the site:

electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other _____

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Water and Sewer Service:	*City of Camas*
Electricity:	*Clark Public Utilities*
Refuse Service:	*City of Camas*
Natural Gas:	*Northwest Natural*
Phone and Data Service:	~~*Verizon*~~ **Comcast**

City of Camas WASHINGTON
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C. Signature

Under the penalty of perjury, the above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: _____ Name of signee Michael Andreotti

Position and Agency/Organization Land Use Planner Date Submitted: 11/23/2020

Notice of Public Hearing

CJ Dens Subdivision

File No. SUB20-02

A public hearing for the "CJ Dens Subdivision" will be held remotely via Zoom on **Tuesday, May 25, 2021, at 5:00 p.m**. The CJ Dens Subdivision was submitted by AKS Engineering, for the owner, CJ Dens Lacamas II LLC, on November 25, 2020 and was deemed technically complete on January 15, 2021. The applicant requests approval of a 152-lot residential subdivision. The proposed project is located at 715 SE Leadbetter Road on 49.62-acres [*Tax Parcels: 177906-000, 178172-000 & 178236-000]*. The project area is zoned single-family residential (R-7.5).

Questions/Comments: The public hearing will follow the quasi-judicial process described within Camas Municipal Code §18.55.180. Public comments and questions are encouraged, and there are several opportunities available to interested citizens Comments related to this development may be submitted as follows: (1) In person by testifying at the public hearing held remotely via Zoom; (2) by regular mail to Planning Division staff, Lauren Hollenbeck, Senior Planner, at the Camas City Hall, 616 NE 4th Avenue, Camas, WA 98607; (3) by phone (360) 817-7253 or by email to: communitydevelopment@cityofcamas.us.

It is preferable that written comments be received at least five (5) working days prior to the public hearing, to be available with the online agenda and materials. After the agenda has been posted online, all other written comments must be received no later than noon (12:00pm) the day of the hearing to be included in deliberations. During the hearing, oral comments may also be submitted as well as written comments via email to communitydevelopment@cityofcamas.us.

Application Materials: The CJ Dens preliminary plat (subdivision) application included the following: Project Narratives; Preliminary Plans; Pre-Application meeting notes; SEPA checklist, Preliminary Stormwater Report; Traffic Study; Environmental Reports; and Archaeological Predetermination* and other required submittal documents. These documents are available upon request to the City by phone (360) 817-7253 or by email communitydevelopment@cityofcamas.us.

Participate: The public hearing will be held remotely via Zoom. All citizens are entitled to have equal access to the services, benefits and programs of the City of Camas. Please contact the City Clerk at (360) 817-1591 for special accommodations if needed. The City will provide translators for non-English speaking persons who request assistance at least three working days prior to a public meeting or hearing.

More Information: The public hearing agenda and supporting documents will be available for review on the City's website at the Public Meeting Portal "Agenda, Minutes & Videos" link within the drop-down menu that is labeled "Community" or follow this link: www.cityofcamas.us/meetings

*Consistent with RCW 42.56.300, Archaeological information is exempt from public disclosure.

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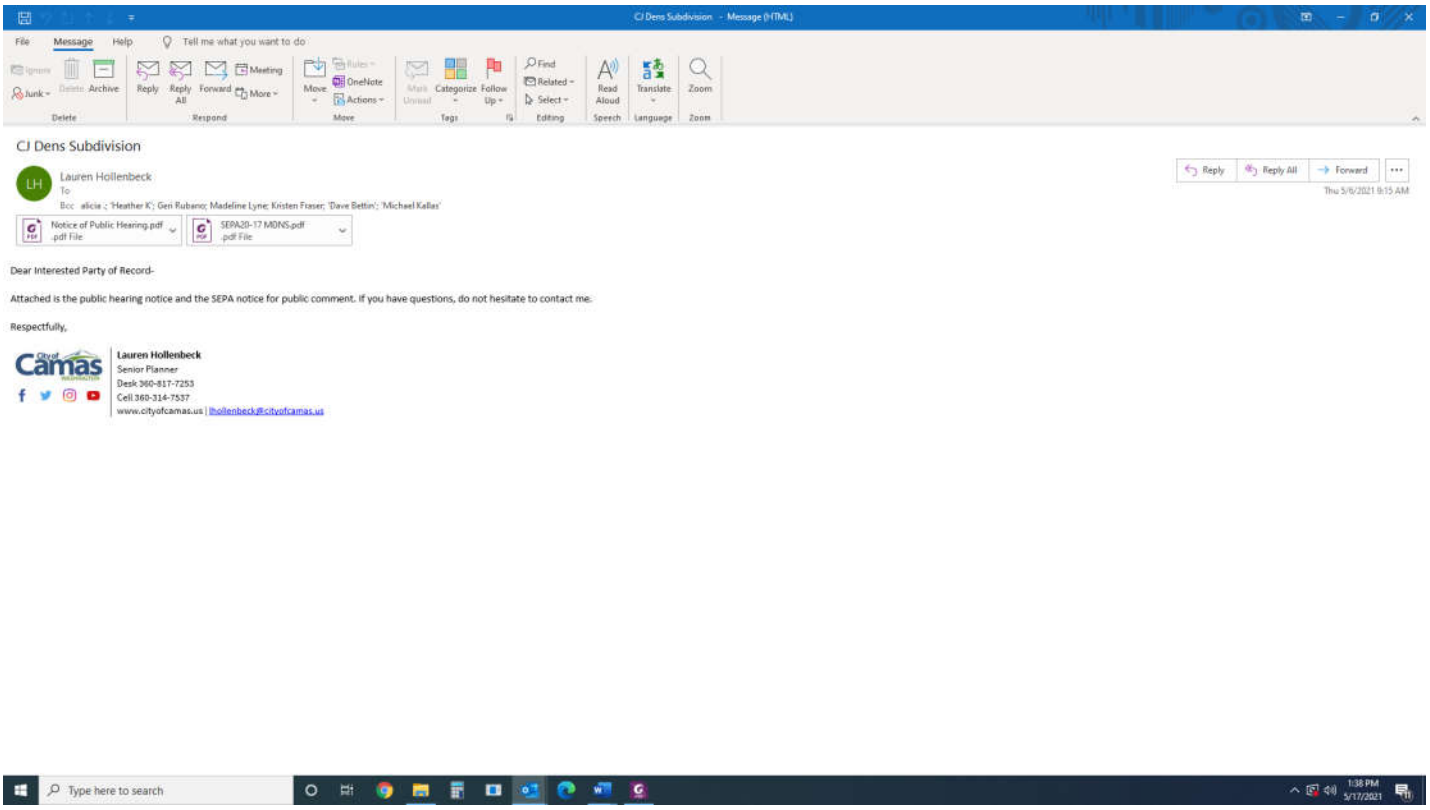
PROPOSED DEVEL
CJ Dens
49.62 ACRES
152 single family lots
NOTICE: CJ Dens Lacamas II, LLC submitted a land use development application seeking permit approval of a Type III Subdivision application; including a Shoreline Substantial Development Permit, Shoreline Conditional Use Permit, Shoreline Variance, and other permits. The application was submitted on November 25, 2020 and was determined Technically Complete on January 15, 2021. The application includes development of 152 single-family lots and construction of a portion of the T-3 trail from the City of Camas PROS Plan.
APPLICATION MATERIALS: The following documents were included with the application. General application form, Archaeological predetermination (not for public disclosure), amended State Environmental Policy Act (SEPA) Checklist, Preliminary Critical Areas Report, Tree Report, Geotechnical Report, and preliminary Stormwater Technical Information Report (TIR). Application materials are available for review at the Community Development Department (616 NE 4th Avenue).
COMMENT DEADLINE: Written comments must be received in the next 30 days, by February 28, 2021. Mail comments to the Community Development Department, 616 NE 4th Avenue, Camas, WA 98607, or email comments to communitydevelopment@cityofcamas.us.
FOR MORE INFORMATION: Lauren Hollenbeck, City of Camas (360) 817-7253
PUBLIC HEARING REQUIRED:
Dat Tuesday, May 25, 2021, at 5:00pm (via phone/web)
For participation info: communitydevelopment@cityofcamas.us or (360)-817-1568
PERMITS: Type III Subdivision; SEPA; Critical Areas; Shoreline Substantial Development Permit



CJ Dens Subdivision - Message (HTML)

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CJ Dens Subdivision

LH Lauren Hollenbeck

To

Bcc alicia ; 'Heather K'; Geri Rubano; Madeline Lyne; Kristen Fraser; 'Dave Bettin'; 'Michael Kallas'

Reply Reply All Forward

Thu 5/6/2021 9:15 AM

Notice of Public Hearing.pdf .pdf File

SEPA20-17 MDNS.pdf .pdf File

Dear Interested Party of Record-

Attached is the public hearing notice and the SEPA notice for public comment. If you have questions, do not hesitate to contact me.

Respectfully,

City of Camas WASHINGTON

Lauren Hollenbeck
Senior Planner
Desk 360-817-7253
Cell 360-314-7537
www.cityofcamas.us | lhollenbeck@cityofcamas.us

Type here to search 1:38 PM 5/17/2021

SWCAA
Southwest Clean Air Agency
11815 NE 99th Street, Suite 1294
Vancouver, WA 98682
(360) 574-3058
www.swcleanair.org

May 17, 2021

City of Camas, SEPA Official
Community Development Department
616 NE Fourth Avenue
Camas WA 98607

RE: CJ Dens Subdivision; SEPA20-17; SEPA 202102284

SEPA Official:

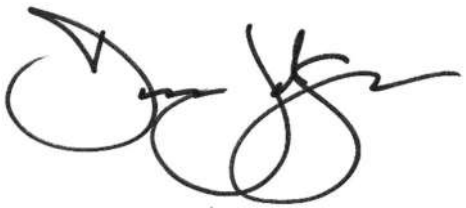
The Southwest Clean Air Agency (SWCAA) has learned that your agency has issued/will issue a SEPA Determination for the above project. Please be advised that SWCAA administers/enforces a number of regulations that may apply to the proposed project. The applicability of these regulations depends on the exact nature of the project in question. The following section provides a brief summary of the requirements for the general types of activity that may be affected by this project.

Construction Dust [SWCAA 400 - General Regulations for Air Pollution Sources]:

- Construction and earthmoving activities have the potential to generate excessive dust emissions if reasonable control measures are not implemented. SWCAA Regulation 400-040(2) requires that "no person shall cause or permit the emission of particulate matter from any stationary source to be deposited beyond the property under direct control of the owner or operator of the stationary source in sufficient quantity to interfere unreasonably with the use and enjoyment of the property upon which the material is deposited". Furthermore, SWCAA Regulation 400-040(8)(a) requires that "the owner or operator of any source of fugitive dust shall take reasonable precautions to prevent fugitive dust from becoming airborne and shall maintain and operate the source to minimize emissions".
- Common control measures to mitigate the emission of dust from construction and earthmoving activities include: application of water before and during earthmoving operations, application of water to disturbed surface areas (including access roads and staging areas) after earthmoving operations, application of chemical dust control products and/or surfactants, limiting access to open/disturbed areas, reducing equipment/vehicle speeds, establishing vegetative cover on inactive areas and ceasing operations altogether during high wind events.
- Violations of SWCAA Regulation 400-040 may result in civil penalties being assessed against the project operator and/or property owner.

The proponent of this project may contact SWCAA at 360-574-3058 for more information regarding the agency's requirements. Notification forms, permit applications, air quality regulations and other information are available on the internet at **http://www.swcleanair.org**.

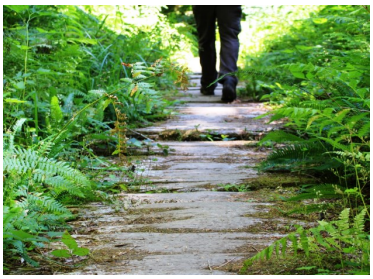
Sincerely,



Duane Van Johnson
Air Quality Specialist II

MITIGATION PLAN

May 19, 2021



Leadbetter Road Subdivision
Stream Crossing
Camas, Washington

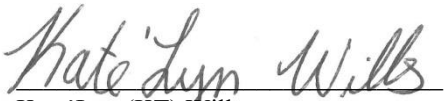
Prepared for

Toll Bros., Inc.
8815 122nd Ave. NE
Kirkland, WA 98033
425.825.1955

Prepared by
Ecological Land Services
1157 3rd Avenue, Suite 220A • Longview, WA 98632
(360) 578-1371 • Project Number 3397.01

SIGNATURE PAGE

The information in this report was compiled and prepared under the supervision and direction of the undersigned.



Kate'Lyn (KT) Wills
Biologist/Environmental Scientist V

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Figure 2 Existing Conditions
Figure 3 Proposed Conditions
Figure 4 Culvert Cross Section A
Figure 5 Culvert Cross Section B

INTRODUCTION

Ecological Land Services, Inc. (ELS) has completed this mitigation plan on behalf of the applicant, Toll Bros., Inc. for the development of a walking trail and stream crossing. The site consists of a portion of Clark County Tax Parcel 177906000 located at 715 SE Leadbetter Road in Camas, Washington, within a portion of Section 35, Township 2 North, and Range 3 East of the Willamette Meridian (Figure 1). A critical areas report and wetland buffer modification plan was completed in November 2020 for CJ Dens Land Company, the property owner, as a part of a larger subdivision (Leadbetter Subdivision) project which also included Clark County Tax Parcels 177905000, 178172000, and 178236000. The Leadbetter Subdivision project proposal is currently under review by the City of Camas (City).

PROJECT DESCRIPTION

Landscape Position

The Washington State Department of Ecology's Water Quality Atlas maps the project area within lower portion of Watershed Resource Inventory Area (WRIA) 28 Salmon – Washougal and is within the 12-digit Hydrologic Unit Code (HUC): 170800010605, within the Lacamas Creek-subwatershed. The subject stream flows directly into Lacamas Lake just south of the project area.

Site Description

The adjacent property to the east consists of the residential Deerhaven Subdivision. SE Leadbetter Road forms the southern property boundary with Lacamas Lake just to the south. The remaining adjacent properties to the north and west consist of the parcels listed in the Introduction that are included in the larger subdivision project. The project area consists of the southeastern most portion of parcel 177906000, the roadside ditch along the northern edge of SE Leadbetter Road, and the area in the immediate vicinity of an existing culvert under SE Leadbetter Road (Figure 2). The topography of the project area generally slopes from the southeast to the northwest. A small seasonal stream (Type Ns) that originates offsite to the northeast, flows southwest through the southeastern portion of the project area and into the roadside ditch along the northern edge of SE Leadbetter Road where it flows northwest for approximately 500 feet before turning south and flowing through an existing 18-inch diameter cement culvert under SE Leadbetter Road and into Lacamas Lake (Figure 2). The riparian buffer in the southeastern portion of the project area was dominated by big leaf maple (*Acer macrophyllum*), salmonberry (*Rubus spectabilis*), western brackenfern (*Pteridium aquilinum*), western swordfern (*Polystichum munitum*), reed canarygrass (*Phalaris arundinacea*), English holly (*Ilex aquifolium*), trailing blackberry (*Rubus ursinus*), and Himalayan blackberry (*Rubus armeniacus*).

Project Description

The applicant is proposing to construct a six-foot wide gravel walking path that will connect from the future Leadbetter Subdivision to the existing Deerhaven subdivision to the east. The walking path will cross the small unnamed Type Ns stream in the southeastern portion of the project area (Figure 3). The stream crossing will consist of the installation of a 30-inch diameter plastic culvert that is approximately 25 feet long. The culvert will be bedded and backfilled with typical stream grave. Fill slope armoring of quarry spalls or rip rap will be placed at the inlet and outlet. The trail surface will consist of 5/8-inch minus crushed rock (Figure 4). Additionally, the existing 18-inch diameter cement culvert that conveys the stream under SE Leadbetter Road from the roadside ditch

to Lacamas Lake will be replaced with an upsized culvert based on final hydraulic analysis. Size and material of the culvert will be determined during final engineering design by AKS Engineering. No native trees within the stream buffer will be removed to accommodate project needs. Further impacts will be avoided and minimized by the use of best management practices (BMPs) like applying native grass seed to disturbed areas not being graveled when construction is complete and locating staging areas within uplands outside of critical areas or buffers. No equipment refueling will take place within 150 feet of the stream or Lacamas Lake. Construction is anticipated to start upon receipt of permits and during the summer when the stream is dry. Construction of the walking path and stream crossing will impact approximately 0.007 acres (310 sq. ft.) of stream channel and stream buffer. Mitigation for impacts will be satisfied by enhancing the remaining stream buffer onsite (0.14 ac./6,203 sq. ft.) via invasive species control and by planting native trees and shrubs. Additionally, the enhancement area will be protected in perpetuity by recording a deed restriction with the County as well as protected via riparian buffer signs meeting municipal code requirements posted on both sides of the walking path within the stream buffer stream crossing. Besides City permitting, a Hydraulic Permit Approval (HPA) will be sought for both culverts.

Existing Critical Areas

Unnamed Stream

A small seasonal stream (Type Ns) that originates offsite to the northeast, flows through the southeastern portion project area and into a roadside ditch along the north side of SE Leadbetter Road where it flows northwest for approximately 500 feet before turning south and flowing through an existing 18-inch cement culvert under SE Leadbetter Road and into Lacamas Lake (Figure 2). According to CCO *16.61.040(D)*, Type Ns streams have a 25-foot buffer. This stream was labeled "Stream 3" in the Critical Areas Report & Buffer Modification Plan for Leadbetter Road (ELS 2020).

Lacamas Lake

Lacamas Lake is located just south of SE Leadbetter Road. Lacamas Lake is a Type S Water of the State and according to CCO *16.61.040(D)* the standard riparian habitat buffer width is 150 feet however, the buffer is entirely functionally isolated from the site by SE Leadbetter Road. As a Type S Water, Lacamas Lake and is subject to the regulations of the *Camas Shoreline Master Program* (SMP 2015).

AVOIDANCE AND MINIMIZATION OF IMPACTS

The preferred mitigation sequencing of first avoidance, then minimization, and finally compensation for unavoidable impacts was taken into consideration during the project design process however, completely avoiding impacts to the unnamed stream was not possible as the walking path is required by the City as a portion of the Leadbetter Subdivision proposal. The stream bisects the only location possible for the walking path to connect to the Deerhaven Subdivision. The concept of adding a sidewalk along SE Leadbetter Road was considered to avoid all stream impacts but ultimately was not feasible due to right-of-way (ROW) restrictions. Impacts were minimized by sizing the walking path as small as practicable for the amount of expected foot-traffic, six feet wide. No native trees within the stream buffer will be removed to accommodate project needs. Further impacts will be avoided and minimized by the use of best management practices (BMPs) like applying native grass seed to disturbed areas not being graveled when

construction is complete and locating staging areas within uplands outside of critical areas or buffers. No equipment refueling will take place within 150 feet of the stream or Lacamas Lake. Construction is anticipated to start upon receipt of permits and during the summer when the stream is dry. Construction of the walking path and stream crossing will impact approximately 0.007 acres (310 sq. ft.) of stream channel and stream buffer. Mitigation for impacts will be satisfied by enhancing the remaining stream buffer onsite (0.14 ac./6,203 sq. ft.) via invasive species control and by planting native trees and shrubs. Additionally, the enhancement area will be protected in perpetuity by recording a deed restriction with the County as well as protected via riparian buffer signs meeting municipal code requirements posted on both sides of the walking path within the stream buffer stream crossing. Conditions in local and state permits will be followed.

MITIGATION PLAN

Construction of the walking path and stream crossing will impact approximately 0.007 acres (310 sq. ft.) of stream channel and stream buffer. Mitigation for impacts will be satisfied by enhancing the remaining stream buffer onsite (0.14 ac./6,203 sq. ft.) via invasive species control and by planting native trees and shrubs to provide greater protection of the stream onsite. This added mitigation will also adequately compensate for any nominal impacts accrued during the replacement of the culvert under SE Leadbetter Road. Actual planting locations will be determined in the field, with consideration to the listed spacing and density to produce the most natural appearance as possible. The enhancement plantings will provide screening, forage, and refuge opportunities, as well as creating a densely vegetated natural barrier between any future development and the stream. Additionally, the enhancement area will be protected in perpetuity by recording a deed restriction with the County as well as protected via riparian buffer signs meeting municipal code requirements posted on both sides of the stream crossing. Table 1 below summarizes the proposed impacts due to the walking path and stream crossing and the proposed compensatory mitigation.

Table 1. Summary of Impacts and Mitigation.

Critical Area	Impact Type	Impact Area	Mitigation Ratio	Proposed Mitigation Area	Mitigation Activities
Type Ns Stream and Buffer	Permanent/ Walking Path	0.007 acres (310 sq. ft.)	1:20	0.14 ac./ 6,203 sq. ft.)	• Removal of invasive species • Planting native trees and shrubs • Protection via deed restriction and signage

The goal of the enhanced buffer is to provide an overall higher ecological lift than the existing conditions allow by improving habitat quality and diversity resulting in no net loss of ecological function. To accomplish this goal, the following objectives and performance standards are appropriate to ensure the success of the buffer enhancement area.

Objectives and Performance Standards

Vegetation

Objective 1. *Enhance approximately 0.14 acres of buffer by removing of invasive species including, but not limited to, reed canarygrass, English holly, evergreen blackberry (Rubus laciniatus) and Himalayan blackberry.*

Performance Standard 1a: Remove existing invasive species in buffer enhancement area. Document the removal of invasive plants within the enhancement areas in the as-built report.
Performance Standard 1b: In all monitoring years, invasive plant species will not exceed 10 percent aerial cover within the buffer enhancement areas.

Objective 2. *Enhance approximately 0.14 acres of the existing buffer plant community by planting native trees and shrubs within the buffer.*

Performance Standard 2a: Native trees and shrubs will be installed at spacing intervals of 10-foot and 6-foot centers, respectively. Document amount and types of species installed in the as-built report.
Performance Standard 2b: In Year 1, planted species will achieve 100 percent survival. If dead plants are replaced, this performance standard will be met. Document percent survival in the monitoring report.
Performance Standard 2c: In Year 2, planted species will achieve 85 percent survival. If dead plants are replaced, this performance standard will be met. Document percent survival in the monitoring report.
Performance Standard 2d: In Year 3, planted species will achieve 70 percent survival. If dead plants are replaced, this performance standard will be met. Document percent survival in the monitoring report.

Protection

Objective 3. *Provide long-term protection for the enhancement area.*

Performance Standard 3a: Record a deed restriction with Clark County protecting the enhancement area in perpetuity. This performance standard will be met when the deed restriction is recorded at the County and a copy is provided in the as-built report.
Performance Standard 3b: Riparian buffer signs meeting municipal code requirements will be posted on both sides of the walking path within the stream buffer and will remain in legible condition. They will be replaced if they become missing or illegible. This performance standard will be met when signs are reported to be in place and legible in the final monitoring report.

Planting Plan

Site Preparations

1. Stake or flag the enhancement area boundaries.
2. Install silt fencing at the edge of disturbance.
3. Investigate for and remove invasive species by spraying or by hand.
4. Install native plantings according to plant specifications.
5. Install mulch.
6. Install signage.
7. Remove silt fencing once bare area has been stabilized.

Planting Implementation

1. Plant the specified trees and shrubs in the fall (October-November) or early spring (Feb-March) at the intervals listed in Table 2. Space the plants somewhat irregularly and in groups to create heterogeneity in the density and appearance of the enhancement areas. Plant the 1-gallon potted stock with a tree shovel or comparable tool.
2. Removed the plant from the pot and work the roots free from majority of potted soil.
3. Place the potted plant species in the planting holes so that their roots can extend down entirely and do not bend upward or circle inside the hole (no "J" or "U" roots).
4. Position the root crowns so that they are at or slightly above the level of the surrounding soil.
5. Compact the soil around the planted species to eliminate air spaces.
6. Irrigate all newly installed plants as site and weather conditions warrant.

Gallon Stock

1. 1-gallon potted species will be purchased from a native plant nursery.
2. 1-gallon potted plants will be a minimum size of 18- to 36-inches tall.
3. 1-gallon potted stock will be kept cool and moist prior to being planted.
4. 1-gallon potted stock will have well-developed roots and sturdy stems, with an appropriate root-to-shoot ratio.
5. Unplanted potted stock will be properly stored at the end of each day.
6. The planter will be responsible for inspecting potted plant stock prior to and during planting, culling unacceptable plant materials.

Bare-Root Stock

1. Bare-root species will be purchased from a native plant nursery.
2. Plants will be protected until installation by being refrigerated, covered with damp burlap, and placed in moist sand, peat, or other method of keeping the roots cool and moist.
3. Plants will have well-developed roots and sturdy stems, with an appropriate root-to-shoot ratio.
4. No damaged or desiccated roots or diseased plants will be accepted. In particular, bare-root trees must not have damaged or "J-rooted" taproots.
5. All bare-root stock must be kept cool and moist prior to installation.
6. Unused bare-root stock must be properly stored at the end of each planting day to prevent the roots from desiccating.
7. The planter will be responsible for inspecting the bare root stock prior to and during planting; unacceptable plant materials will not be planted.

The following table summarizes the plant species, spacing, and quantities for the buffer enhancement area (Table 2).

Table 2. Plant Specifications.

Common Name	Scientific Name	Indicator Status	Spacing (on-center)	Stock	Quantity
Trees					
Red alder	*Alnus rubra*	FAC	10 feet	Gallon	8
Big leaf maple	*Acer macrophyllum*	FACU	10 feet	Gallon	8

Common Name	Scientific Name	Indicator Status	Spacing (on-center)	Stock	Quantity
				Total	**16**
Shrubs					
Nootka rose	*Rosa nutkana*	FAC	6 feet	Gallon or Bare-root	21
Snowberry	*Symphoricarpos albus*	FACU	6 feet	Gallon or Bare-root	21
				Total	**42**

Monitoring, Maintenance, and Contingency Measures

Monitoring and maintenance of the enhancement area will occur for a 3-year period with annual monitoring and reporting occurring in all years. Monitoring will be conducted by the applicant unless otherwise assigned. Each year live plants will be counted to determine the survival rate of installed species. Plant counts and pictures will be included in the monitoring letter. Invasive species will also be assessed to ensure they do not cover mor than 10 percent of the enhancement area. Additionally, at least three photo stations will be identified to photo-document vegetation establishment. Photo station location and the direction in which the picture is taken will also be recorded on the as-built.

The goal of monitoring will be to determine if the previously stated performance standards are met. Monitoring reports will be submitted to the City of Camas by December 31st of each monitoring year. At minimum, the following items will be included in the report:

- Location map and as-built drawing, including any changes.
- Historic description of project, including dates of plant installation, current year of monitoring, and remedial actions taken (if any).
- Description of monitoring methods.
- Documentation of vegetative performance standards and overall development of plant communities.
- Assessment of non-native, invasive plant species and recommendations for management.
- Photographs from established photopoints.
- Observations of wildlife, including, amphibians, invertebrates, reptiles, birds, and mammals. If photographs are taken, they will be included.
- Summary of maintenance and contingency measures completed for the past year and proposed for the next year.

Vegetation

Monitoring will occur annually during the growing season, preferably during the same two-week period to better compare data. The following information will be gathered within the established monitoring plots:

- Percent survival of woody species in Years 1, 2, and 3
- Percent cover of non-native, invasive species in all monitoring years
- General health of plants in the monitoring plot, noting specific problems and potential causes.
- Photographic documentation of vegetative changes over time from established photopoints

Overall vegetative conditions outside monitoring plots will also be observed and discussed in the monitoring reports.

Maintenance
Maintenance will occur during the growing season and will include the following:

- Irrigating planting areas every other week or as needed in the dry season for the first three years. Taper watering in Years 2 and 3, watering approximately every 3 to 4 weeks in the dry season, or as needed.
- Remove competing herbaceous species at least three times yearly within a 3-foot radius of planted trees and shrubs and re-apply mulch as needed.
- Weed-eat, spray, or mow invasive species as needed during the growing season.
- Replace dead or failed plants as described for the original installation to meet the minimum performance standards.

Contingency Plan
If the performance criteria are not met, steps will be taken to correct the situation in a timely manner. The following steps will be implemented when an area is identified as failing or potentially failing:

- Identify the cause(s) of the failure or potential failure.
- Identify the extent of the failure or potential failure.
- Implement corrective actions such as irrigating, fertilizing, and replanting.
- Document the activities and include this data in the monitoring reports.
- If a routine corrective action will not correct the problem, immediately consult with the appropriate agencies.
- Evaluate recommendations from resource agency staff and implement recommendations in a timely manner.

Funding for corrective actions will be the responsibility of the applicant.

LIMITATIONS

ELS bases this report's determinations on standard scientific methodology and best professional judgment. In our opinion, local, state, and federal regulatory agencies should agree with our determinations. However, the information contained in this report should be considered preliminary and used at your own risk until it has been approved in writing by the appropriate regulatory agencies. ELS is not responsible for the impacts of any changes in environmental standards, practices, or regulations after the date of this report.

REFERENCES

ELS, Inc. 2020. *Critical Areas Report & Buffer Modification Plan for Leadbetter Road*, November 18, 2020.

City of Camas. 2017. Camas Municipal Code, *Title 16 – Environment, Critical Areas.* https://library.municode.com/wa/camas/codes/code_of_ordinances?nodeId=TIT16EN_CRAR. Accessed May 2021.

City of Camas. 2021. *Camas Shoreline Master Program.* Adopted by Ordinance No. 21-003, February 16, 2021.

FIGURES

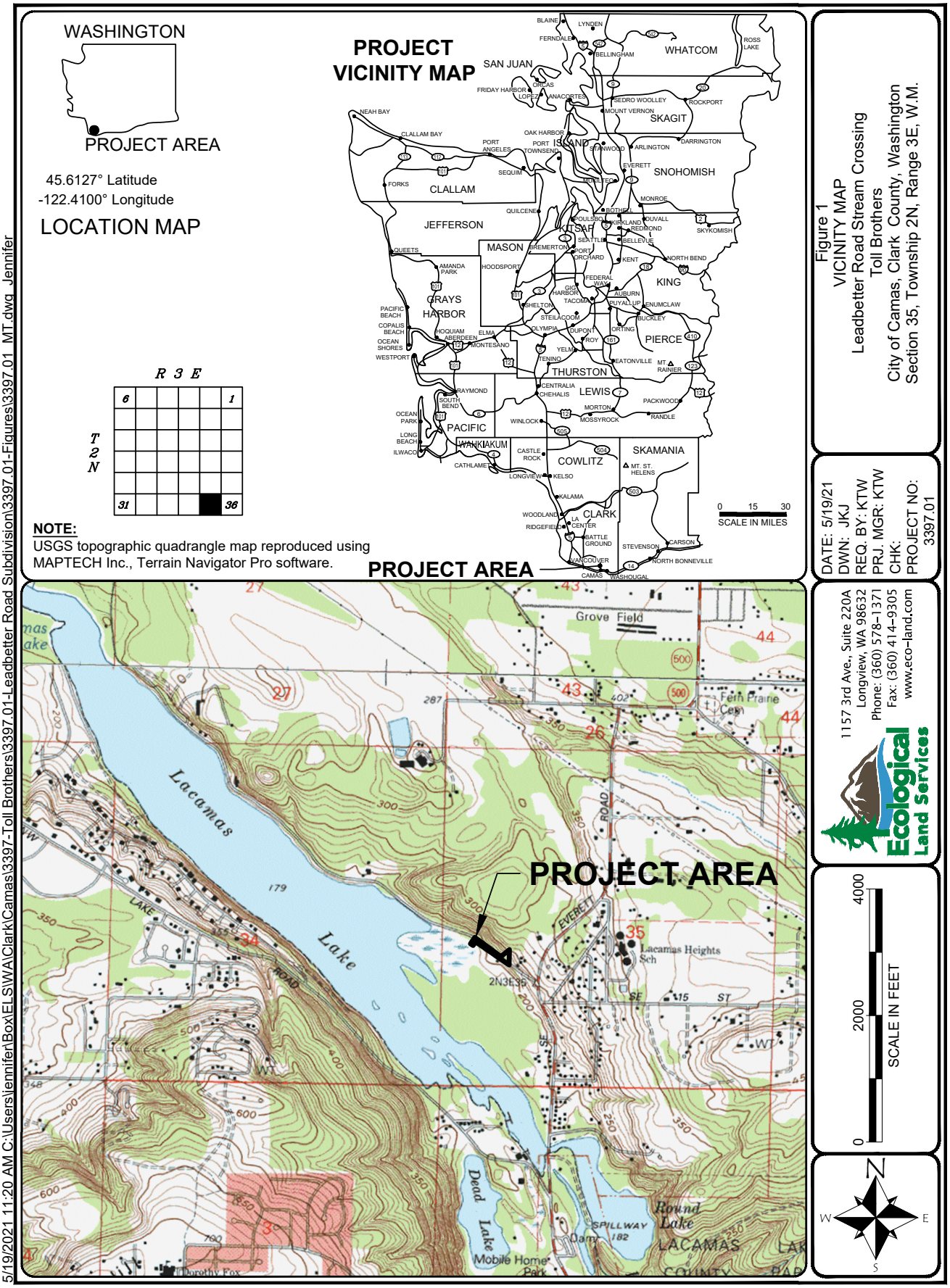

Figure 1
VICINITY MAP
Leadbetter Road Stream Crossing
Toll Brothers
City of Camas, Clark County, Washington
Section 35, Township 2N, Range 3E, W.M.

DATE: 5/19/21
DWN: JKJ
REQ. BY: KTW
PRJ. MGR: KTW
CHK:
PROJECT NO: 3397.01

1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305
www.eco-land.com
Ecological Land Services

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NOTES:
1. Aerial photograph (9/24/2018) provided by Google Earth™.
2. Onsite stream centerlines from topographic survey by Group Mackenzie (2010).
3. Roadside ditch location determined by field observation and aerial photo analysis..
4. Parcel boundaries from Clark County GIS Department (2020).

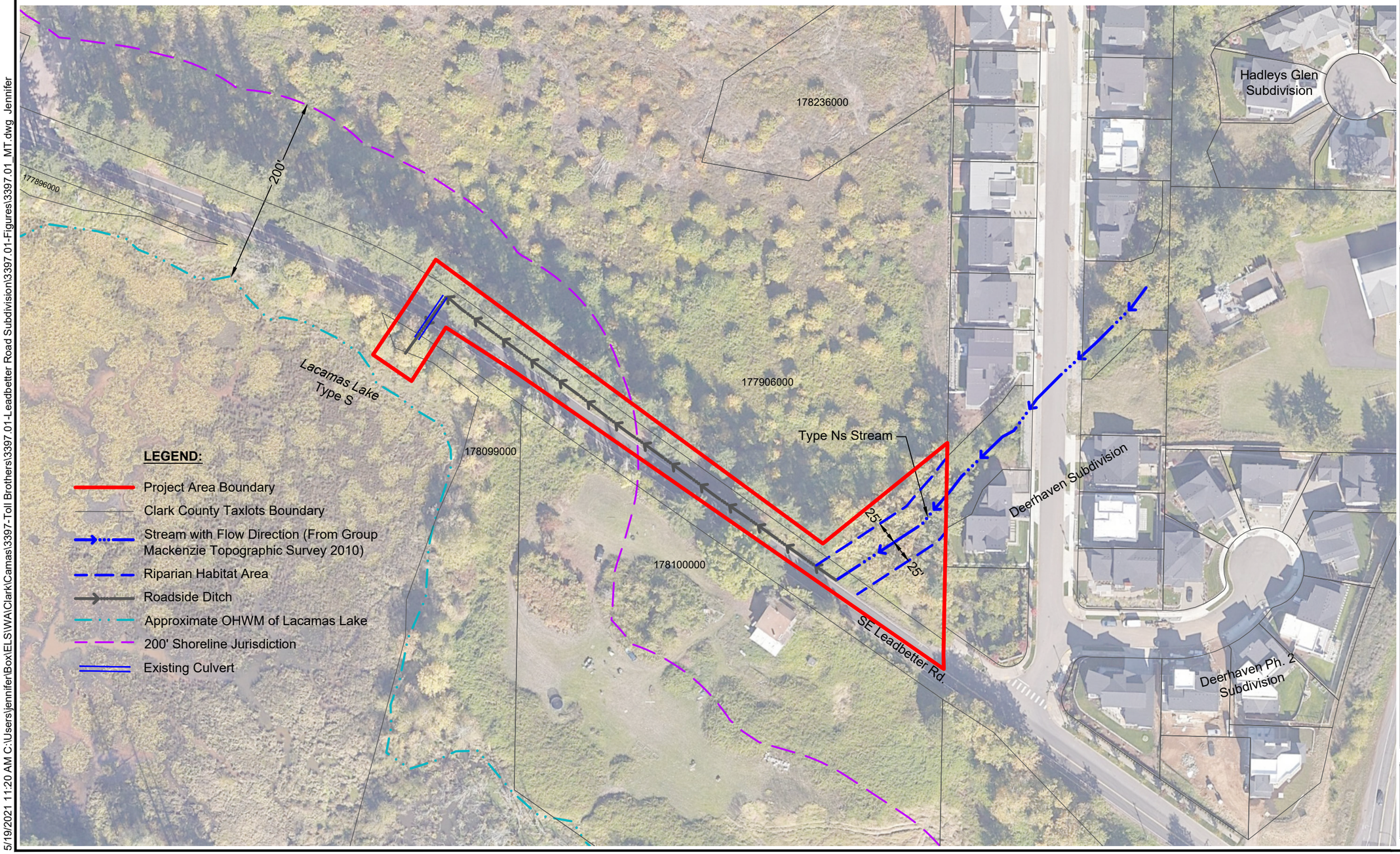

Figure 2
EXISTING CONDITIONS
Leadbetter Road Stream Crossing
Toll Brothers
City of Camas, Clark County, Washington
Section 35, Township 2N, Range 3E, W.M.

DATE: 5/19/21
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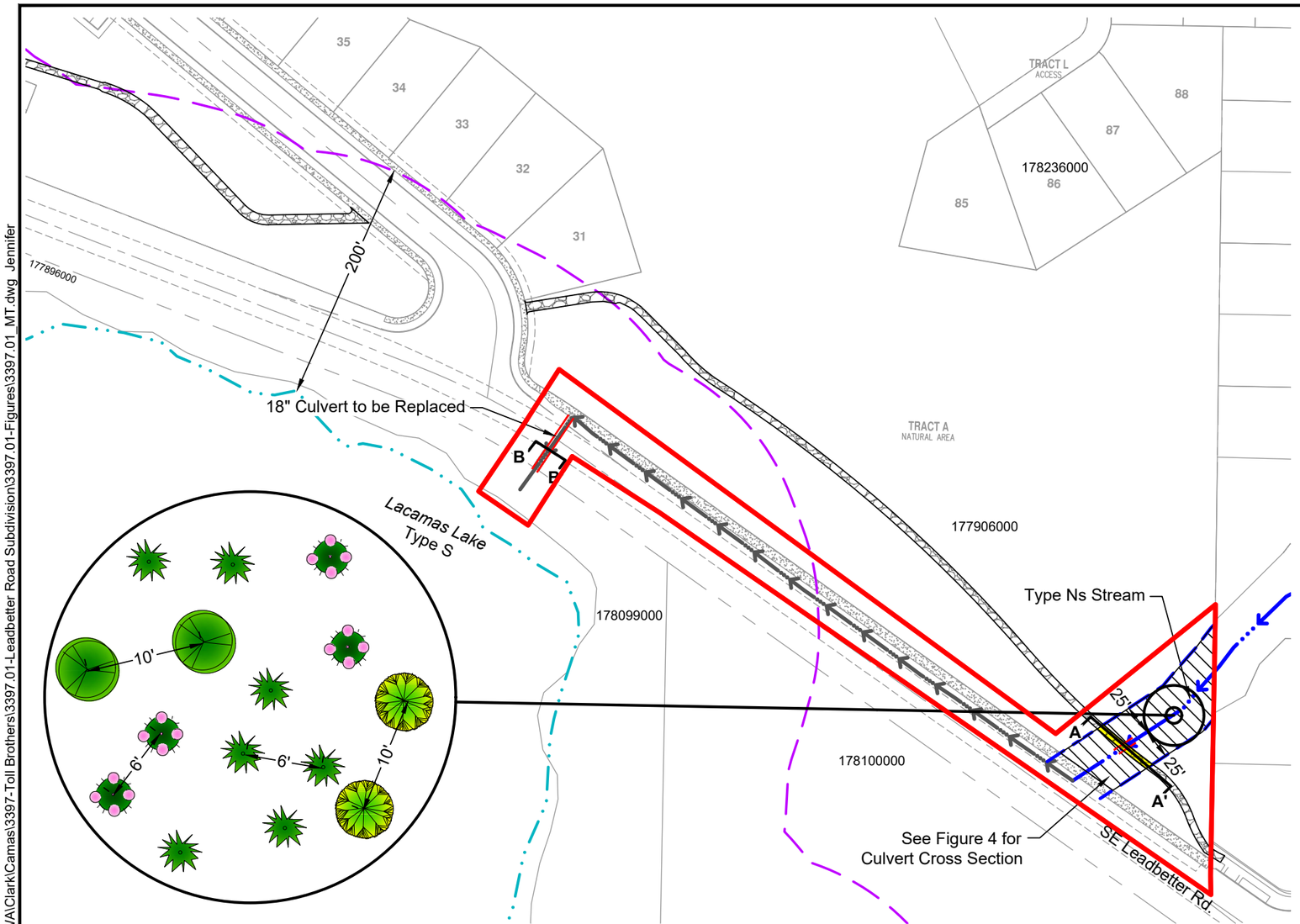

LEGEND:

- Project Area Boundary
- Clark County Taxlots Boundary
- Stream with Flow Direction (From Group Mackenzie Topographic Survey 2010)
- Riparian Habitat Area
- Roadside Ditch
- Approximate OHWM of Lacamas Lake
- 200' Shoreline Jurisdiction
- Proposed Gravel Path (6' Wide)
- Proposed Culvert
- Impact Area - 0.007 ac. (315 sf.)
- RHA Enhancement Area - 0.149 ac. (6,503 sf.)

Figure 3
PROPOSED CONDITIONS
Leadbetter Road Stream Crossing
Toll Brothers
City of Camas, Clark County, Washington
Section 35, Township 2N, Range 3E, W.M.

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Common Name	Scientific Name	Indicator Status	Spacing (on-center)	Stock	Quantity
Trees					
Red alder	*Alnus rubra*	FAC	10 feet	Gallon	8
Big leaf maple	*Acer macrophyllum*	FACU	10 feet	Gallon	8
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Nootka rose	*Rosa nutkana*	FAC	6 feet	Gallon or Bare-root	21
Snowberry	*Symphoricarpos albus*	FACU	6 feet	Gallon or Bare-root	21
				Total	**42**

NOTES:
1. Onsite stream centerlines from topographic survey by Group Mackenzie (2010).
2. Roadside ditch location determined by field observation and aerial photo analysis..
3. Parcel boundaries from Clark County GIS Department (2020).
4. Site plan by AKS Engineering.

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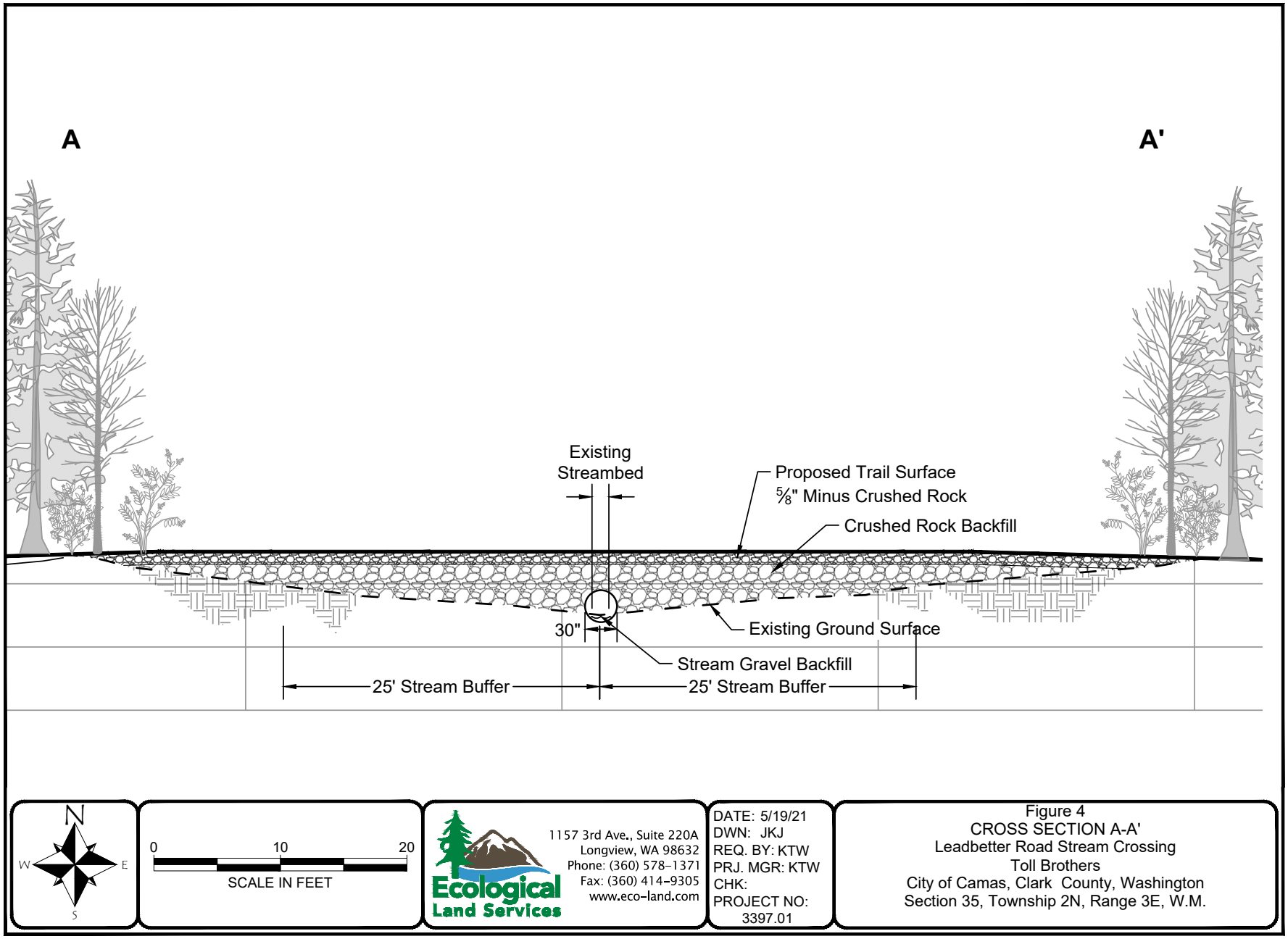

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Figure 4
CROSS SECTION A-A'
Leadbetter Road Stream Crossing
Toll Brothers
City of Camas, Clark County, Washington
Section 35, Township 2N, Range 3E, W.M.

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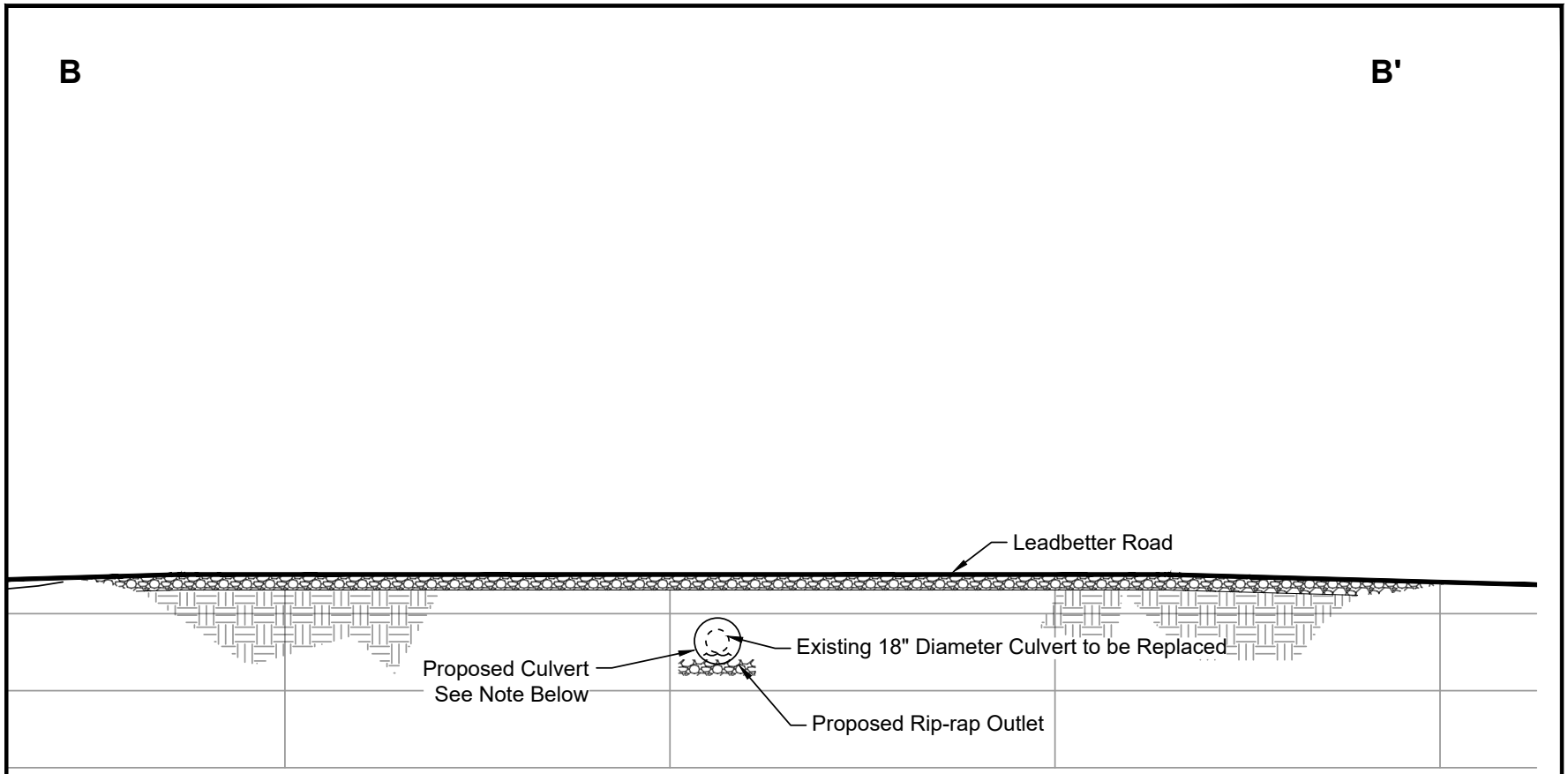

NOTE: The existing 18-inch diameter cement culvert that conveys the stream under SE Leadbetter Road from the roadside ditch to Lacamas Lake will be replaced with an upsized culvert based on final hydraulic analysis. Size and material of the culvert will be determined during final engineering design by AKS Engineering.

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Figure 5
CROSS SECTION B-B'
Leadbetter Road Stream Crossing
Toll Brothers
City of Camas, Clark County, Washington
Section 35, Township 2N, Range 3E, W.M.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

May 20, 2021

Lauren Hollenbeck, Senior Planner
City of Camas
Community Development Department
616 Northeast Fourth Avenue
Camas, WA 98607

Dear Lauren Hollenbeck:

Thank you for the opportunity to comment on the mitigated determination of nonsignificance for the CJ Dens Project (SUB20-17) located at 715 Southeast Leadbetter Road as proposed by Michael Andreott. The Department of Ecology (Ecology) reviewed the environmental checklist and has the following comment(s):

SHORELANDS & ENVIRONMENTAL ASSISTANCE:
Miranda Adams, Wetlands/Shorelands Specialist
(360) 690-7164 | miranda.adams@ecy.wa.gov

The site plan is very difficult, if not impossible, to read so it's not clear whether impacts to critical areas have been avoided and minimized to the extent practicable. It's also unclear where the on-site wetlands are exactly. The local jurisdiction should supply the critical areas report as part of the SEPA submittal package so that regulatory agencies can review and comment more meaningfully. Ecology would like to verify the wetland rating to ensure that the correct buffer width has been applied.

SOLID WASTE MANAGEMENT: Derek Rockett (360) 407-6287

All grading and filling of land must utilize only clean fill. All other materials may be considered solid waste and permit approval may be required from the local jurisdictional health department prior to filling. All removed debris resulting from this project must be disposed of at an approved site. Contact the local jurisdictional health department for proper management of these materials.

TOXICS CLEANUP: Craig Rankine (360) 690-4795

There are known contaminated site(s) within approximately half-a-mile of the proposed SEPA action. The site(s) include, but may not be limited to following, see Ecology Facility Site ID No's, site name and project manager:

- 4884 Wildlife League Property (no project manager assigned, contact Craig Rankine [360] 690-4795 for information)

If environmental contamination is discovered at the site of the proposed action, it must be reported to Ecology's Southwest Regional Office by contacting the Environmental Report Tracking System Coordinator at (360) 407-6300. For assistance regarding cleanup information on sites listed above contact the Ecology project manager. The applicant should make sure only clean soil is used as fill. Provisions and equipment should be on hand to contain and cleanup a release of oil or fuel from heavy equipment operation.

WATER QUALITY/WATERSHED RESOURCES UNIT:
Greg Benge (360) 690-4787

Erosion control measures must be in place prior to any clearing, grading, or construction. These control measures must be effective to prevent stormwater runoff from carrying soil and other pollutants into surface water or stormdrains that lead to waters of the state. Sand, silt, clay particles, and soil will damage aquatic habitat and are considered to be pollutants.

Any discharge of sediment-laden runoff or other pollutants to waters of the state is in violation of Chapter 90.48 RCW, Water Pollution Control, and WAC 173-201A, Water Quality Standards for Surface Waters of the State of Washington, and is subject to enforcement action.

Section A #10 of the SEPA checklist does not reflect the need for coverage under the Construction Stormwater General Permit (CSWGP), which will likely be required for the proposed project. If site disturbance is over an acre or the project reasonably expects to cause a violation of any water quality standards, and stormwater discharges to surface Waters of the State, a CSWGP is required. The presence of streams and wetlands within the construction boundary presents an increased likelihood that construction stormwater will enter Waters of the State.

Construction Stormwater General Permit:
The following construction activities require coverage under the Construction Stormwater General Permit:

1. Clearing, grading and/or excavation that results in the disturbance of one or more acres **and** discharges stormwater to surface waters of the State; and
2. Clearing, grading and/or excavation on sites smaller than one acre that are part of a larger common plan of development or sale, if the common plan of development or sale will ultimately disturb one acre or more **and** discharge stormwater to surface waters of the State.
    a) This includes forest practices (including, but not limited to, class IV conversions) that are part of a construction activity that will result in the disturbance of one or more acres, **and** discharge to surface waters of the State; and
3. Any size construction activity discharging stormwater to waters of the State that Ecology:
    a) Determines to be a significant contributor of pollutants to waters of the State of Washington.
    b) Reasonably expects to cause a violation of any water quality standard.

If there are known soil/ground water contaminants present on-site, additional information (including, but not limited to: temporary erosion and sediment control plans; stormwater pollution prevention plan; list of known contaminants with concentrations and depths found;

a site map depicting the sample location(s); and additional studies/reports regarding contaminant(s)) will be required to be submitted. For additional information on contaminated construction sites, please contact Carol Serdar at Carol.Serdar@ecy.wa.gov, or by phone at (360) 742-9751.

Additionally, sites that discharge to segments of waterbodies listed as impaired by the State of Washington under Section 303(d) of the Clean Water Act for turbidity, fine sediment, high pH, or phosphorous, or to waterbodies covered by a TMDL may need to meet additional sampling and record keeping requirements. See condition S8 of the Construction Stormwater General Permit for a description of these requirements. To see if your site discharges to a TMDL or 303(d)-listed waterbody, use Ecology's Water Quality Atlas at: https://fortress.wa.gov/ecy/waterqualityatlas/StartPage.aspx.

The applicant may apply online or obtain an application from Ecology's website at: http://www.ecy.wa.gov/programs/wq/stormwater/construction/ - Application. Construction site operators must apply for a permit at least 60 days prior to discharging stormwater from construction activities and must submit it on or before the date of the first public notice.

Ecology's comments are based upon information provided by the lead agency. As such, they may not constitute an exhaustive list of the various authorizations that must be obtained or legal requirements that must be fulfilled in order to carry out the proposed action.

If you have any questions or would like to respond to these comments, please contact the appropriate reviewing staff listed above.

Department of Ecology
Southwest Regional Office

(GMP:202102284)

cc: Miranda Adams, SEA
Derek Rockett, SWM
Craig Rankine, TCP
Greg Benge, WQ

CJ Dens Subdivision (SUB20-02)
Index of Exhibits

Updated on May 20, 2021

Exhibit No.	Title/Description	Document Date
1	Application form	11/25/20
2	Pre-application conference notes	2/20/20
3	Applicant's Narrative	11/25/20
4	Applicant's Supplemental Narrative	5/7/21
5	Applicant's Shoreline Narrative	11/25/20
6	Shoreline Mitigation Memo	5/7/21
7	Preliminary Plat plans	11/25/20
8	Revised Preliminary Plat plans	5/7/21
9	Critical Areas Report	11/18/20
10	Geotechnical Analysis	11/23/20
11	2015 Geotechnical Analysis	12/7/15
12	EEI Geotech Review	3/9/21
13	Tree Report	5/2021
14	Preliminary Stormwater TIR	11/2020
15	Traffic Analysis	10/21/20
16	2010 Traffic Report	8/18/15
17	Archaeological Predetermination - ***Exempt from public disclosure (RCW 42.56.300)***	1/27/21
18	Recorded Easements	11/25/20
19	Application Review Letter	12/21/20
20	Technically Complete Letter	1/15/21
21	Notice of Application	1/28/21
22	City Review Letter	3/9/21
23	Combined Applicant and City Response Letter	4/7/21and 4/16/21
24	Applicant's Access Tract Exhibits	4/7/21
25	Michael Kallas Public Comment and City Response	2/25/21 and 3/1/21
26	SEPA MDNS	5/6/21
27	Notice of Public Hearing	5/6/21
28	Mailing Labels	5/6/21
29	Posted Development sign	5/6/21
30	Interested Parties of Record email	5/6/21
31	SWCAA SEPA review comment	5/17/21
32	Mitigation Plan 051921	5/19/21
33	Ecology SEPA review comment	5/20/21