Department of State Lands
775 Summer Street, Suite 100
Salem, OR 97301-1279
☎ 503-986-5200

NOTICE: This Permit Must Be On Work Site

Permit No.:	**60102-RF**
Permit Type:	**Removal/Fill**
Waterway:	**Wetlands/Waterways**
County:	**Clackamas/Washington**
Expiration Date:	**May 7, 2019**

TUALTIN VALLEY WATER DISTRICT

IS AUTHORIZED IN ACCORDANCE WITH ORS 196.800 TO 196.990 TO PERFORM THE OPERATIONS DESCRIBED IN THE ATTACHED COPY OF THE APPLICATION, SUBJECT TO THE SPECIAL CONDITIONS LISTED ON ATTACHMENT A AND TO THE FOLLOWING GENERAL CONDITIONS:

1. This permit does not authorize trespass on the lands of others. The permit holder must obtain all necessary access permits or rights-of-way before entering lands owned by another.
2. This permit does not authorize any work that is not in compliance with local zoning or other local, state, or federal regulation pertaining to the operations authorized by this permit. The permit holder is responsible for obtaining the necessary approvals and permits before proceeding under this permit.
3. All work done under this permit must comply with Oregon Administrative Rules, Chapter 340; Standards of Quality for Public Waters of Oregon. Specific water quality provisions for this project are set forth on Attachment A.
4. Violations of the terms and conditions of this permit are subject to administrative and/or legal action, which may result in revocation of the permit or damages. The permit holder is responsible for the activities of all contractors or other operators involved in work done at the site or under this permit.
5. Employees of the Department of State Lands (DSL) and all duly authorized representatives of the Director must be permitted access to the project area at all reasonable times for the purpose of inspecting work performed under this permit.
6. Any permit holder who objects to the conditions of this permit may request a hearing from the Director, in writing, within twenty-one (21) calendar days of the date this permit was issued.
7. In issuing this permit, DSL makes no representation regarding the quality or adequacy of the permitted project design, materials, construction, or maintenance, except to approve the project's design and materials, as set forth in the permit application, as satisfying the resource protection, scenic, safety, recreation, and public access requirements of ORS Chapters 196, 390, and related administrative rules.
8. Permittee must defend and hold harmless the State of Oregon, and its officers, agents and employees from any claim, suit, or action for property damage or personal injury or death arising out of the design, material, construction, or maintenance of the permitted improvements.
9. Authorization from the U.S. Army Corps of Engineers may also be required.

OPERATORS COPY

NOTICE: If removal is from state-owned submerged and submersible land, the permittee must comply with leasing and royalty provisions of ORS 274.530. If the project involves creation of new lands by filling on state-owned submerged or submersible lands, you must comply with ORS 274.905 to 274.940 if you want a transfer of title; public rights to such filled lands are not extinguished by issuance of this permit. This permit does not relieve the permittee of an obligation to secure appropriate leases from DSL, to conduct activities on state-owned submerged or submersible lands. Failure to comply with these requirements may result in civil or criminal liability. For more information about these requirements, please contact Department of State Lands, 503-986-5200.

Kirk Jarvie, Southern Region Manager
Aquatic Resource Management
Oregon Department of State Lands

Authorized Signature

May 7, 2018
Date Issued

ATTACHMENT A

Permit Holder: Tualatin Valley Water District

Project Name: Willamette Water Supply System

Special Conditions for Removal/Fill Permit No. 60102-RF

READ AND BECOME FAMILIAR WITH CONDITIONS OF YOUR PERMIT.

The project site may be inspected by the Department of State Lands (DSL) as part of our monitoring program. A copy of this permit must be available at the work site whenever authorized operations are being conducted.

1. **Responsible Party:** By signature on the application, Mark Knudson is acting as the representative of Tualatin Valley Water District. By proceeding under this permit, Tualatin Valley Water District agrees to comply with and fulfill all terms and conditions of this permit, unless the permit is officially transferred to another party as approved by DSL.

2. **Authorization to Conduct Removal and/or Fill:** This permit authorizes removal and fill of material in multiple locations within Clackamas and Washington Counties, as described in the attached permit application, map and drawings (See Attachment B for project locations), with a final date of February 27, 2018 and summarized as follows:

Summary of Authorized Wetland Impacts

Wetland #	Permanent			Temporary		
	Sq. Ft.	Removal (cy)	Fill (cy)	Sq. Ft.	Removal (cy)	Fill (cy)
Wetland A	2,700	800	1,700	---	---	---
Wetland B	4,800	533	2,667	---	---	---
Wetland C	10,000	1,100	5,500	4,200	156	156
Wetland D	10,000	---	1,900	---	---	---
Wetland E	3,400	378	756	---	---	---
Wetland F	6,600	733	2,933	---	---	---
Wetland M1-1	---	---	---	1,577	279	253
124th-B	---	---	---	7,151	1,863	1,569
W-M4-1	---	---	---	6,743	1,024	546
W2-4	---	---	---	35,536	3,862	3,422
W-M5-10	---	---	---	5,686	381	320
QEA-A	---	---	---	1,662	135	189
AKS	---	---	---	242	82	84
W-M5-9	20	26	22	3,096	387	332
W2-7	20	26	22	16,566	1,601	1,534
W-M5-8	---	---	---	1,500	129	177
W-M5-3	---	---	---	56,246	4,551	3,764
W-M5-2	---	---	---	3,786	140	140
W-M5-1	---	---	---	6,019	223	223
W-W1-2	---	---	---	3,854	143	143
W-W1-5	20	26	22	13,098	1,350	1,200

Wetland #	Permanent			Temporary		
	Sq. Ft.	Removal (cy)	Fill (cy)	Sq. Ft.	Removal (cy)	Fill (cy)
PHS-C1	---	---	---	555	59	52
W-W2-1	---	---	---	13,112	1,757	2,138
CORN PASS C, E	---	---	---	14,794	548	548
E-01	---	---	---	1,228	45	45
Total:	**37,560**	**3,622**	**15,522**	**196,651**	**18,716**	**16,835**

Summary of Authorized Waterway Impacts

Waterway Name	Permanent			Temporary		
	Sq. Ft.	Removal (cy)	Fill (cy)	Sq. Ft.	Removal (cy)	Fill (cy)
Willamette River	13	23	23	436	16	16
Coffee Lake Creek M1-1	---	---	---	956	157	147
S2-2	---	---	---	1,924	251	28
S2-4	---	---	---	408	167	166
S2-5	---	---	---	525	212	178
S2-6	---	---	---	54	194	161
S2-7	---	---	---	1,990	225	188
S-M5-1	---	---	---	260	30	26
S-M5-3	---	---	---	410	36	26
S-W1-2	---	---	---	511	45	43
S-W2-1	---	---	---	2,645	452	536
S-W2-2	---	---	---	2,094	230	230
Total:	**13**	**23**	**23**	**12,213**	**2,015**	**1,748**

3. **Work Period in Jurisdictional Areas:** Fill or removal activities below the ordinary high water elevation of Willamette River, Willamette River Tributaries and Tualatin River Tributaries must be conducted between July 15 and September 30, unless otherwise coordinated with Oregon Department of Fish and Wildlife and approved in writing by DSL. If fish eggs are observed within the project area, work must cease and DSL contacted immediately.

4. **Changes to the Project or Inconsistent Requirements from Other Permits:** It is the permittee's responsibility to ensure that all state, federal and local permits are consistent and compatible with the final approved project plans and the project as executed. Any changes made in project design, implementation or operating conditions to comply with conditions imposed by other permits resulting in removal-fill activity must be approved by DSL prior to implementation.

5. **DSL May Halt or Modify:** DSL retains the authority to temporarily halt or modify the project or require rectification in case of unforeseen adverse effects to aquatic resources or permit non-compliance.

6. **DSL May Modify Conditions Upon Permit Renewal:** DSL retains the authority to modify conditions upon renewal, as appropriate, pursuant to the applicable rules in effect at the time of the request for renewal or to protect waters of this state.

Pre-Construction

7. **Local Government Approval Required Before Beginning Work:** Prior to the start of construction, the permittee must obtain Engineering Approval at time of construction from the City of Tualatin; Conditional Use Permit and Development Permit from the City of Wilsonville; Public Transportation Facility approval, Tree Plan 2 and Site Development Permits from the City of Beaverton; and, Special Use and Development Review permits from Washington County.

8. **DSL Proprietary Authorization Required Before Beginning Work:** Prior to the start of work within state-owned submerged and submersible lands (Willamette River), the permittee must obtain the following proprietary authorization(s): modification of existing easement for water intake if work will occur outside the area authorized under the existing easement. If the City of Wilsonville will no longer own and maintain the intake structure, an assignment of the easement will be required to transfer the easement rights to the new governing body.

9. **Stormwater Management Approval Required Before Beginning Work:** Prior to the start of construction, the permittee must obtain a National Pollution Discharge Elimination System (NPDES) permit from the Oregon Department of Environmental Quality (DEQ), if one is required by DEQ.

10. **Authorization to Use Property for Linear Projects**: For linear facility projects, the removal-fill activity cannot occur until the person obtains:

    a. The landowner's consent;
    b. A right, title or interest with respect to the property, that is sufficient to undertake the removal or fill activity; or
    c. A court order or judgment authorizing the use of the property

11. **Pre-construction Resource Area Fencing or Flagging:** Prior to any site grading, the boundaries of the avoided wetlands, waterways, and riparian areas adjacent to the project site must be surrounded by noticeable construction fencing or flagging. The marked areas must be maintained during construction of the project and be removed immediately upon project completion.

General Construction Conditions

12. **Water Quality Certification:** The Department of Environmental Quality (DEQ) may evaluate this project for a Clean Water Act Section 401 Water Quality Certification (WQC). If the evaluation results in issuance of a Section 401 WQC, that turbidity condition will govern any allowable turbidity exceedance and monitoring requirements.

13. **Erosion Control Methods:** The following erosion control measures (and others as appropriate) must be installed prior to construction and maintained during and after construction as appropriate, to prevent erosion and minimize movement of soil into waters of this state.

    a. All exposed soils must be stabilized during and after construction to prevent erosion and sedimentation.
    b. Filter bags, sediment fences, sediment traps or catch basins, leave strips or berms, or other measures must be used to prevent movement of soil into waterways and wetlands.

c. To prevent erosion, use of compost berms, impervious materials or other equally effective methods, must be used to protect soil stockpiled during rain events or when the stockpile site is not moved or reshaped for more than 48 hours.
d. Unless part of the authorized permanent fill, all construction access points through, and staging areas in, riparian and wetland areas must use removable pads or mats to prevent soil compaction. However, in some wetland areas under dry summer conditions, this requirement may be waived upon approval by DSL. At project completion, disturbed areas with soil exposed by construction activities must be stabilized by mulching and native vegetative plantings/seeding. Sterile grass may be used instead of native vegetation for temporary sediment control. If soils are to remain exposed more than seven days after completion of the work, they must be covered with erosion control pads, mats or similar erosion control devices until vegetative stabilization is installed.
e. Where vegetation is used for erosion control on slopes steeper than 2:1, a tackified seed mulch must be used so the seed does not wash away before germination and rooting.
f. Dredged or other excavated material must be placed on upland areas having stable slopes and must be prevented from eroding back into waterways and wetlands.
g. Erosion control measures must be inspected and maintained as necessary to ensure their continued effectiveness until soils become stabilized.
h. All erosion control structures must be removed when the project is complete and soils are stabilized and vegetated.

14. **Hazardous, Toxic, and Waste Material Handling:** Petroleum products, chemicals, fresh cement, sandblasted material and chipped paint, wood treated with leachable preservatives or other deleterious waste materials must not be allowed to enter waters of this state. Machinery refueling is to occur at least 150 feet from waters of this state and confined in a designated area to prevent spillage into waters of this state. Barges must have containment system to effectively prevent petroleum products or other deleterious material from entering waters of this state. Project-related spills into waters of this state or onto land with a potential to enter waters of this state must be reported to the Oregon Emergency Response System (OERS) at 1-800-452-0311.

15. **Archaeological Resources:** If any archaeological resources, artifacts or human remains are encountered during construction, all construction activity must immediately cease. The State Historic Preservation Office must be contacted at 503-986-0674. You may be contacted by a Tribal representative if it is determined by an affected Tribe that the project could affect Tribal cultural or archeological resources.

16. **Construction Corridor:** There must be no removal of vegetation or heavy equipment operating or traversing outside the designated construction corridor or footprint. Unless fish passage is required, the following construction corridor locations shall not exceed the maximum width at top of bank:

WWSP Work Package	Crossing	Maximum Width
PLM_1.0	Coffee Lake Creek	60 Feet
PLM_4.0	Chicken Creek	50 Feet
PLM_5.0	Drainage North of SW Beef Bend Rd #1	30 Feet
	Scholls Ferry Creek Crossings	75 Feet
	Wetland near intersection of Tile Flat and Grabhorn Rds	50 Feet
	McKernan Creek at Grabhorn Rd	60 Feet
	Unnamed Seasonal Drainage at Tanabe Property	50 Feet

WWSP Work Package	Crossing	Maximum Width
PLW_1.0	Unnamed Seasonal Drainage north of Rosedale Rd	50 Feet
	Unnamed Tributary to Butternut Creek	50 Feet
PLW_2.0	Beaverton Creek at Cornelius Pass Rd	60 Feet
	Rock Creek at Cornelius Pass Rd	50 Feet

17. **Hazards to Recreation, Navigation or Fishing:** The activity must be timed so as not to unreasonably interfere with or create a hazard to recreational or commercial navigation or fishing.

18. **Operation of Equipment in the Water:** Heavy equipment may be positioned below ordinary high water if the area is isolated from the waterway and aquatic organism salvage is completed. All machinery operated below ordinary high water (OHW) elevation must use vegetable-based hydraulic fluids, be steam cleaned and inspected for leaks prior to each use, and be diapered to prevent leakage of fuels, oils, or other fluids below OHW elevation. Any equipment found to be leaking fluids must be immediately removed from and kept out of OHW until repaired. Equipment staging, cleaning, maintenance, refueling, and fuel storage must be at least 150 feet from OHW and wetlands to prevent contaminates from entering waters of the state.

19. **Work Area Isolation:** Open trench construction at the following stream crossings must have work area isolation that will allow fish passage. The contractor cannot block fish movement, both up and downstream in the following streams for a period not to exceed 10 days. The streams include Coffee Lake Creek; Rock Creek; Chicken Creek; Unnamed Creek at Scholls Ferry Road (near Lolich's Farm); Beaverton Creek and associated tributary streams. ODFW must be notified if the contractor requires more than 10 days at any one specific location to complete the work. All work area must be isolated from the water during construction in accordance with the work area isolation plan in the application. All structures and materials used to isolate the work area must be removed immediately following construction and water flow returned to pre-construction conditions.

20. **Fish Salvage Required:** Fish must be salvaged from the isolation area. Permits from NOAA Fisheries and Oregon Department of Fish and Wildlife, Fish Research are required to salvage fish. Fish salvage permit information may be obtained by contacting ODFW Fish Research at 503-947-6254 or Fish.Research@state.or.us.

21. **Wildlife CHTR Permit Required:** To facilitate avoidance and minimization of direct mortality of non-game protected wildlife species, a Wildlife Capture, Holding, Transportation and Relocation (CHTR) permit is required prior to beginning construction. CHTR permit information may be obtained by contacting Susan Barnes, Regional Conservation Biologist for ODFW at 971-673-6010 or susan.p.barnes@state.or.us.

22. **Fish Passage Required:** The project must meet Oregon Department of Fish and Wildlife requirements for fish passage. ODFW must be contacted prior to construction regarding isolation and fish removal techniques where open-trench methods are used on Coffee Lake Creek, Chicken Creek and Beaverton Creek.

23. **Fish Screening Required:** The Water Supply Intake located on the mainstem Willamette River shall meet state screening criteria. Permittee shall contact ODFW Screening and Passage Program for review and approval of all designs prior to construction.

24. **Raising or Redirecting Water:** The project must not cause water to rise or be redirected and result in damage to structures or property on the project site as well as adjacent, nearby, upstream, and downstream of the project site.

25. **Trenching in Wetlands:** During trenching or excavation, the top layer of soil must be separated from the rest of the excavated material and put back on top when the trench or pit is back-filled. If the native underlying soils are not used as bedding material and a coarser, non-native soil or other material is used, preventative measures such as clay or concrete plugs must be used so that underground hydraulic piping does not dewater the site and adjacent wetlands.

Pilings

26. **Piling Placement and/or Removal Location:** Piling must be placed and/or removed from locations depicted in the application, (RWF 1.0 Figure 2).

27. **Method of Piling Placement:** Pilings must be placed by means of vibratory hammer and then set with an impact hammer with the minimum number of strikes to set piling. Sound attenuation methods shall be used.

28. **Method of Piling Removal:** Removal of pile must be conducted by means of vibratory removal and/or cutting at the mudline.

29. **Barge Grounding Prohibited:** For barge-mounted equipment, the barge must not at any time be grounded on the bed or banks of the waterway.

30. **Waste Pilings Disposal:** Old piling and other waste material must be disposed of in a disposal facility approved for this purpose. There must be no temporary storage of piling or other waste material below top of bank or in any wetland, Federal Emergency Management Administration designated floodway, or an area historically subject to landslides.

Rectification of Temporary Impacts to Wetlands and Riparian Areas

31. **Temporary Ground Disturbances:** All temporarily disturbed areas must be returned to original ground contours at project completion.

32. **Site Rectification Required for Temporary Wetland and Riparian Impacts:** Site rectification for temporary impacts to 4.51 acres of wetland and 0.27 acre of riparian areas must be conducted according to the rehabilitation plan in the application, Attachment F. Failure to rectify the site may result in additional compensatory mitigation. To mitigate for the temporal loss of 0.47 acres for more than 24 months of impact to Palustrine Forested Wetland, the Permittee has purchased 0.47 mitigation bank credits from the W & B Butler Wetland Mitigation Bank.

33. **Pre-construction Elevations Must Be Restored Within the Same Construction Season:** Construction activities within areas identified as temporary impact must not exceed two construction seasons and rectification of temporary impacts must be completed within 24 months of the initiation of impacts. However, if the temporary impact only requires one construction season, re-establishment of pre-construction contours must be completed within that same construction season, before the onset of fall rains.

34. **Woody Vegetation Planting Required:** Planting of native woody vegetation must be completed before the next growing season after re-establishment of the pre-construction contours.

Monitoring and Reporting Requirements for Temporary Impact Areas

35. **Post-Construction Report Required:** A post-construction report demonstrating as-built conditions for impacted regulated aquatic resource areas and discussing any variation from the approved plan must be provided to DSL within 90 days of site grading. The post-construction report must include:

    a. A scaled drawing, accurate to 1-foot elevation, clearly showing the following:
        1. Finished contours of the site.
        2. Current tax lot and right-of-way boundaries.
        3. Photo point locations.
    b. Photos from fixed photo points. This should clearly show the site conditions, and any signage, and fencing required.
    c. A narrative that describes any deviation from the approved mitigation plan.

36. **Annual Monitoring Reports Required:** Monitoring is required until DSL has officially released the temporary impact sites from further monitoring. The permittee must monitor the sites to determine whether the sites are meeting performance standards for a minimum period of 3 growing seasons after completion of all the initial plantings. Annual monitoring reports are required and are due by November 1. Failure to submit the required monitoring report by the due date may result in an extension of the monitoring period and/or enforcement action.

37. **Extension of the Monitoring Period:** The monitoring period may be extended, at the discretion of DSL, for failure of the sites to meet performance standards for the final two consecutive years without corrective or remedial actions (such as irrigation, significant weed/invasive plants treatment or replanting) or when needed to evaluate corrective or remedial actions.

38. **Contents of the Annual Monitoring Report:** The annual monitoring report must include the following information:

    a. Completed Monitoring Report Cover Sheet, which includes permit number, permit holder name, monitoring date, report year, performance standards, and a determination of whether each site is meeting performance standards.
    b. Site location maps that clearly shows the boundaries of each temporary wetland and riparian impact area.
    c. Site Plans that clearly shows at least the following.
        1. The area seeded, with the square foot area listed.
        2. The area planted with trees and shrubs, with the square foot area listed.
        3. Current tax lot and right-of-way boundaries.
        4. Permanent monitoring plot locations that correspond to the data collected and fixed photo-points. These points should be overlaid on the as-built map.
        5. PEM, PSS, PFO, and riparian areas clearly identified separately and the area (square foot or acreage) of each noted.

d. A brief narrative that describes maintenance activities and recommendations to meet success criteria. This includes when irrigation occurred and when the above ground portion of the irrigation system was or will be removed from the site.
e. Data collected to support the conclusions related to the status of the site relative to the performance standards listed in this permit (include summary/analysis in the report and raw data in the appendix). Data should be submitted using the DSL Mitigation Monitoring Vegetation Spreadsheet or presented in a similar format as described in DSL's Routine Monitoring Guidance for Vegetation.
f. Photos from fixed photo points (include in the appendix).
g. Other information necessary or required to document compliance with the performance standards listed in this permit.

39. **Corrective Action May Be Required:** DSL retains the authority require corrective action in the event the performance standards are not accomplished at any time within the monitoring period.

Performance Standards

To be deemed successful, the rehabilitation of temporary impacts areas must meet the following performance standards, as determined by DSL:

40. **Establishment of Permanent Monitoring Locations Required:** Permanent plot locations must be established during the first annual monitoring in sufficient number and locations to be representative of the site. The permanent plot locations must be clearly marked on the ground.

Shrub-dominated and Forested Wetlands

41. **Native Species Cover:** The cover of native species, as defined in the USDA Plants Database, in the herbaceous stratum is at least 60%.

42. **Invasive Species Cover:** The cover of invasive species is no more than 10%. A plant species should automatically be labeled as invasive if it appears on the current Oregon Department of Agriculture noxious weed list, plus known problem species including *Phalaris arundinacea, Mentha pulegium, Holcus lanatus, Anthoxanthum odoratum,* and the last crop plant if it is non-native. Non-native plants should be labeled as such if they are listed as non-native on the USDA Plants Database. Beginning in Year 2 of monitoring, DSL will consider a non-native plant species invasive if it comprises more than 15% cover in 10% or more of the sample plots in any habitat class and increases in cover or frequency from the previous monitoring period. Plants that meet this definition will be considered invasive for all successive years of monitoring. After the site has matured to the stage when desirable canopy species reach 50% cover, the cover of invasive understory species may increase but may not exceed 30%.

43. **Bare Substrate Cover:** Bare substrate represents no more than 20% cover.

44. **Woody Vegetation:** The density of woody vegetation is at least 1,600 live native plants (shrubs) and/or stems (trees) per acre OR the cover of native woody vegetation on the site is at least 50%. Native species volunteering on the site may be included, dead plants do not count, and the standard must be achieved for 2 years without irrigation.

45. **Species Diversity:** By Year 3 and thereafter, there are at least 6 different native species. To qualify, a species must have at least 5% average cover in the habitat class and occur in at least 10% of the plots sampled.

46. **Moisture Prevalence Index:** Prevalence Index total for all strata is <3.0.

Riparian Areas

47. **Native Species Cover:** The cover of native species, as defined in the USDA Plants Database, in the herbaceous stratum is at least 60%.

48. **Invasive Species Cover:** The cover of invasive species is no more than 10%. A plant species should automatically be labeled as invasive if it appears on the current Oregon Department of Agriculture noxious weed list, plus known problem species including *Phalaris arundinacea, Mentha pulegium, Holcus lanatus, Anthoxanthum odoratum,* and the last crop plant if it is non-native. Non-native plants should be labeled as such if they are listed as non-native on the USDA Plants Database. Beginning in Year 2 of monitoring, DSL will consider a non-native plant species invasive if it comprises more than 15% cover in 10% or more of the sample plots in any habitat class and increases in cover or frequency from the previous monitoring period. Plants that meet this definition should be considered invasive for all successive years of monitoring. After the site has matured to the stage when desirable canopy species reach 50% cover, the cover of invasive understory species may increase but may not exceed 30%.

49. **Woody Vegetation:** The density of woody vegetation is at least 1,600 live native plants (shrubs) and/or stems (trees) per acre OR the cover of native woody vegetation on the site is at least 50%. Native species volunteering on the site may be included, dead plants do not count, and the standard must be achieved for 2 years without irrigation.

Compensatory Mitigation

50. **Mitigation Bank Credit Purchase:** Mitigation for the unavoidable loss of 0.86 acres of Palustrine Forested Slope wetland and for temporal losses due to temporary loss of Palustrine Forested Slope functions (0.47 acres) has been accomplished via purchase of 1.33 credits from the W & B Butler Wetland Mitigation Bank, per the proof of purchase.

Monitoring and Reporting Schedule

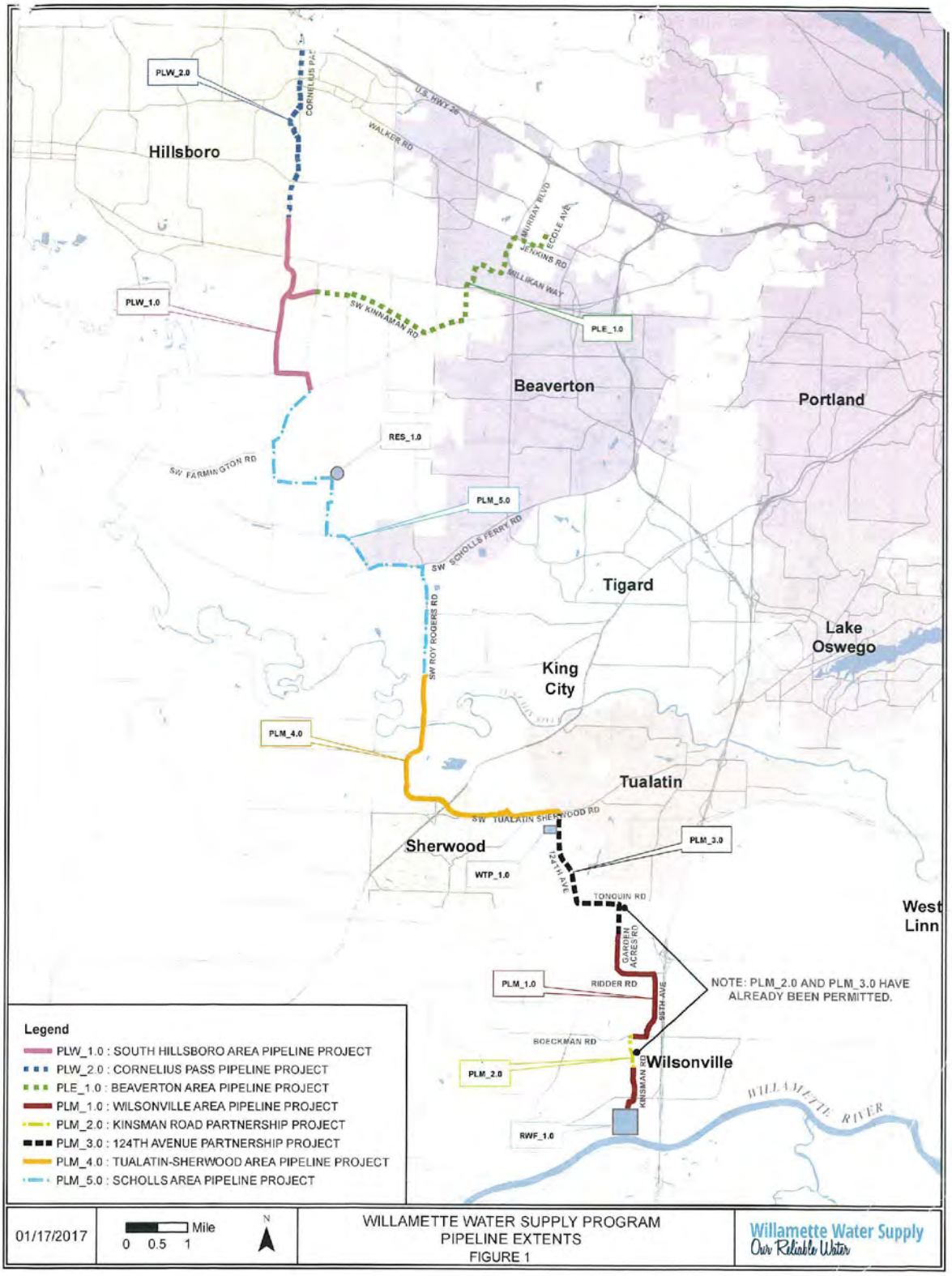
Report	Requirements	Schedule
Post-Construction	Post-construction report	90 days after completion of site grading
First Annual Report	Establishment of permanent monitoring locations Vegetation performance standards	After one growing season of all proposed plantings
Second Annual Report	Vegetation performance standards	After two growing seasons
Third (or final report if the monitoring period has been extended)	Vegetation performance standards	After three growing seasons.

ATTACHMENT B

Permit Holder: Tualatin Valley Water District

Project Name: Willamette Water Supply System

Maps and Drawings for Removal/Fill Permit No. 60102-RF



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FEB 27 2018

DEPARTMENT OF STATE LANDS

Date Stamp

Joint Permit Application

This is a joint application, and must be sent to both agencies, who administer separate permit programs. Alternative forms of permit applications may be acceptable; contact the Corps and DSL for more information.

U.S. Army Corps of Engineers Portland District	Oregon Department of State Lands
Corps Action ID Number	DSL Number 60102 Revised

(1) APPLICANT AND LANDOWNER CONTACT INFORMATION

	Applicant #1	Applicant #2	Authorized Agent (if applicable) ☑ Consultant ☐ Contractor
Contact Name	Mark Knudson Chief Exec. Officer	Kevin Hanway Water Department Director	Ethan Rosenthal
Business Name	Tualatin Valley Water District	City of Hillsboro	David Evans and Assoc., Inc.
Mailing Address 1	1850 SW 170th Ave.	150 E. Main Street	2100 SW River Parkway
Mailing Address 2			
City, State, Zip	Beaverton, OR 97003	Hillsboro, OR 97123-4028	Portland, OR 97201
Business Phone	503-941-4570	503-941-4570	503-499-0572
Cell Phone			
Fax			
Email	Mark.Knudson@tvwd.org	Kevin.Hanway@hillsboro-oregon.gov	ejro@deainc.com

(2) PROJECT INFORMATION

A. Provide the project location.

Project Name Willamette Water Supply System	Tax Lot # See Attachment A	Latitude & Longitude* See Attachment A
Project Address / Location Not applicable	City (nearest) Wilsonville, Sherwood, Beaverton, Tigard, Tualatin, and Hillsboro	County Clackamas and Washington

Township	Range	Section	Quarter/Quarter
See Attachment A	See Attachment A	See Attachment A	See Attachment A

Brief Directions to the Site
See Attachment A

B. What types of waterbodies or wetlands are present in your project area? (Check all that apply.)

☑ River / Stream ☑ Non-Tidal Wetland ☐ Lake / Reservoir / Pond
☐ Estuary or Tidal Wetland ☐ Other ☐ Pacific Ocean

Waterbody or Wetland Name**	River Mile	6th Field HUC Name	6th Field HUC (12 digits)
See attached	See attached	See attached	See attached

C. Indicate the project category. (Check all that apply.)

☐ Commercial Development ☐ Industrial Development ☐ Residential Development
☑ Institutional Development ☐ Agricultural ☐ Recreational
☐ Transportation ☐ Restoration ☐ Bank Stabilization

(2) PROJECT INFORMATION

☐ Dredging	☑ Utility lines	☐ Survey or Sampling
☑ In- or Over-Water Structure	☐ Maintenance	☐ Other:

* In decimal format (e.g., 44.9399, -123.0283)
** If there is no official name for the wetland or waterway, create a unique name (such as "Wetland 1" or "Tributary A").

(3) PROJECT PURPOSE AND NEED

Provide a statement of the purpose and need for the overall project.

Population size and municipal water needs in Washington County are expected to double in the next 50 years, with new source supplies needed as early as 2026. The Tualatin Valley Water District (TVWD) and the City of Hillsboro (Hillsboro), collectively referred to as the Project Participants, have identified the Willamette Water Supply System (WWSS or Project—see Note below) as the best option for future delivery of drinking water to their service areas in Washington County. There are four primary components of the WWSS: the Raw Water Facilities (RWF), the WWSS Water Treatment Plant (WTP), the Reservoir Facilities, and the Transmission Pipelines, described below. The RWF will be built in partnership with the Project Participants and the cities of Wilsonville, Sherwood, Tigard, and Beaverton, collectively referred to as the Partners. Those communities will design, permit, and construct any related water infrastructure facilities separately from the WWSS or will have to buy capacity from the WWSS at a later date. The Willamette River at Wilsonville will be the water supply source for the WWSS. Developing this additional water supply through a partnership supports the region's plans for responsible growth within the urban growth boundary (UGB).

The purpose of the proposed WWSS is to provide a long-term, resilient water supply to serve the projected water supply needs of the Project Participants. To ensure that the Project purpose is fulfilled, the water supply must meet the following needs:

- Meet projected future water demands supporting the region's plans for responsible growth within the UGB
- Reliably deliver a long-term water supply, including in times of droughts, earthquakes, or other disasters
- Supply finished water to TVWD and Hillsboro customers
- Offer a cost-effective water supply source in service by July 2026
- Support ownership and control of the water supply via a partnership between TVWD and Hillsboro

(**Note**: In some supporting documentation and attachments to this application, the Project is referred to as the Willamette Water Supply Program or Program instead of the Willamette Water Supply System.)

(4) DESCRIPTION OF RESOURCES IN PROJECT AREA

A. Describe the existing physical and biological characteristics of each wetland or waterway. Reference the wetland and waters delineation report if one is available. Include the list of items provided in the instructions.

A description of jurisdictional wetlands and waterways within the project area is provided in the table in Attachment A named *"Attachment A.2: JPA Section (4.A) WWSP Jurisdictional Wetland and Waterway Crossings."* A wetland functional assessment is provided in Attachment B (permanently impacted wetlands and high quality wetlands that will be avoided). The project area was documented in several wetland delineation reports. Wetland delineation concurrence letters received to date are provided in Attachment C. All wetland delineation reports have been submitted to the U.S. Army Corps of Engineers (USACE) and Oregon Department of State Lands (DSL) under a separate transmittal.

B. Describe the existing navigation, fishing and recreational use of the waterway or wetland.

The Project crosses several small drainages not typically used for navigation, fishing, or recreational uses. The only two waterways in the project area with such uses are the Willamette River at the RWF (intake) and the Tualatin River along the proposed pipeline alignment. Both rivers in the general vicinity of the proposed Project elements provide boating, fishing, and recreational uses. Because the Tualatin River is relatively narrow, boating usage tends to be human-powered vessels such as canoes and kayaks, though there is the potential for small motorized watercraft. The Willamette River is much larger and, therefore, a wider array of watercraft can be found.

(5) PROJECT SPECIFIC CRITERIA AND ALTERNATIVES ANALYSIS

Describe project-specific criteria necessary to achieve the project purpose. Describe alternative sites and project designs that were considered to avoid or minimize impacts to the waterway or wetland.

A detailed alternatives analysis has been conducted for the Project that considers alternative water supply sources, alternative pipeline alignments and routing from the RWF, alternative WWSS WTP sites, and alternative Reservoir Facilities sites. This analysis is provided as Attachment D.

(6) PROJECT DESCRIPTION

A. Briefly summarize the overall project including work in areas both in and outside of waters or wetlands.

The Project is located in Clackamas and Washington counties (see figures provided in Attachment E). There are four primary components of the WWSS, as follows:

- The **Raw Water Facilities** (RWF) refer to the proposed modifications to the existing Willamette River intake (including replacement of the existing fish screens with larger capacity screens), seismic stability improvements, raw water pump station upgrades, new electrical and hydraulic surge control facilities for the pump station, stormwater management facilities, and associated raw water pipelines that will convey water from the Willamette River through the upgraded raw water pump station. The RWF are located immediately adjacent to the Willamette River near the Willamette River Water Treatment Plant (WRWTP). Two raw water pipelines will exit the raw water pump station to convey water to two water treatment plants (the existing WRWTP and the proposed WWSS WTP, described below). Owners of the RWF will include TVWD and the cities of Wilsonville, Sherwood, Hillsboro, Beaverton, and Tigard, with the exception of the raw water pipeline serving the WWSS WTP, which will be owned by TVWD and Hillsboro. The existing water rights associated with the RWF (Permits S-46319, S-49240, S-54940, S-45565 (relocation pending)) authorize the use of up to 332.7 cubic feet per second (cfs) (179 million gallons per day (mgd)) for municipal purposes. A table presenting these water rights is in Appendix C. The proposed withdrawal capacity of the RWF is 150 mgd (232.1 cfs).

- The **WWSS Water Treatment Plant (WWSS WTP)** refers to the proposed water treatment plant, including a finished water pump station, that will be located in unincorporated Washington County near the city of Sherwood. The WWSS WTP will receive water from the raw water pipeline, perform treatment to meet or exceed drinking water standards, and then pump that treated water into the finished water pipeline. This facility will serve TVWD and Hillsboro, with phased construction to expand the capacity to 120 mgd.

- The **Reservoir Facilities** site will contain two aboveground water storage tanks proposed to be located in the Cooper Mountain area of Washington County. The storage tanks will receive and store finished water that has been treated at the WWSS WTP. Water will be gravity fed from the storage tanks into the northern sections of the water pipeline. The Reservoir Facilities will serve TVWD and Hillsboro. The combined storage capacity of the two water storage tanks totals 30 million gallons (mg).

- **Transmission Pipelines** will connect the RWF, WWSS WTP, and Reservoir Facilities, and ultimately tie in to the Project Participants' existing water distribution systems. The Transmission Pipelines will convey raw water from the RWF to the WWSS WTP, and finished water from the WWSS WTP to the Reservoir Facilities and the existing water distribution system tie-ins. These pipelines will serve TVWD and Hillsboro, and will also tie in to the City of Beaverton's and Joint Water Commission's (JWC) transmission systems to allow for emergency access between the systems. The capacity within individual pipeline sections will vary by location, but the overall system will provide approximately 105.7 mgd of water transmission capacity.

(6) PROJECT DESCRIPTION

To facilitate completion by July 2026, the Project Participants divided the Project into work packages, each of which is assigned a simple naming convention code, as shown in Table 1.

Table 1. Project Components

Project Component	Code	Common Name	Approximate Component Size
Raw Water Facilities	RWF_1.0	Raw Water Facilities	12 acres
WWSS WTP	WTP_1.0	Willamette Water Supply System WTP	20 acres
Reservoir Facilities	RES_1.0	South Beaverton Area Water Storage	10 acres
Transmission Pipelines	PLM_1.0	Wilsonville Area Pipeline Project	3.0 miles
	PLM_2.0	Kinsman Road Partnership Project	0.5 mile
	PLM_3.0	124th Avenue Partnership Project	2.7 miles
	PLM_4.0	Tualatin-Sherwood Area Pipeline Project	4.8 miles
	PLM_5.0	Scholls Area Pipeline Project	7.7 miles
	PLW_1.0	South Hillsboro Area Pipeline Project	3.9 miles
	PLW_2.0	Cornelius Pass Pipeline Project	3.4 miles
	PLE_1.0	Beaverton Area Pipeline Project	5.5 miles

ADDITIONAL ENVIRONMENTAL BENEFITS PROJECTS

In addition to the water supply system infrastructure, two voluntary habitat restoration projects (additional environmental benefits) will be supported as part of the overall WWSS. These projects will be in addition to any compensatory mitigation required by federal, state, and local regulations for the WWSS. At a program level, the benefits of these two projects are to: (1) demonstrate the Project's commitment to environmental stewardship within the watersheds and communities in which it operates, and (2) promote lasting partnerships with area stakeholders. The WWSS will support these environmental benefits projects by acting as a funding partner. Each project will be responsible for obtaining its own permits, and therefore the permits that authorize the WWSS will not authorize these projects. Descriptions of the two habitat restoration projects are provided below (figures are provided in Attachment E).

Chicken Creek Restoration Project

The Chicken Creek restoration project is located within the Tualatin River National Wildlife Refuge (the Refuge). The Project would provide funds to support this project, which currently includes the following partners: Refuge, Clean Water Services (CWS), and Ducks Unlimited.

Chicken Creek is located on the Atfalat'l Unit of the Refuge's larger Sherwood Management Unit and historically meandered through a floodplain mosaic of wet and dry prairie, riparian forest, and wetlands to its connection with the Tualatin River. In the early part of the 20th century, the creek was channelized to the western part of the property to facilitate farming and now exists in a linear, deeply incised ditch. Once the creek was channelized, the mosaic of habitat was converted to agricultural lands that supported feed crops and a dairy farm. Agriculture operations occurred for almost 100 years until, in 1996, the property was purchased by the Refuge. Early restoration efforts emphasized creating a complex of managed wetlands to provide foraging, wintering, and some breeding habitat for migratory birds. As a part of these restoration activities, a water diversion structure was placed at the head of the channelized portion of Chicken Creek to provide water for managed herbaceous wetlands; however, rather than restoring the creek's historical connection to the Tualatin River, the creek remained channelized.

The restoration project is currently in the design phase, with implementation anticipated to start in 2018. This project, which was identified during the Refuge's Comprehensive Conservation Plan process, would restore an approximately 1.5-mile reach of Chicken Creek and its associated floodplain, which would benefit listed steelhead trout, lamprey, and cutthroat trout, as well as migratory birds and other native species. Beaver activity would be promoted as part of long-term restoration efforts.

(6) PROJECT DESCRIPTION

Molalla Confluence Project

The Molalla confluence project is located within Molalla River State Park at the confluence of the Molalla, Pudding, and Willamette rivers. The confluence is roughly 3.5 miles downstream of the existing WRWTP intake and proposed RWF on the Willamette River. WWSS would provide funds to support this project, which currently includes the following partners: Oregon State Parks, Molalla River Watch, and Cascade Pacific Resource Conservation and Development. The Molalla project is in the planning and early design phase, and will be implemented over several years. Early pilot projects to control invasive knotweed in the floodplain have already begun. A map illustrating the project opportunities is provided in Attachment E.

The project area consists of a hydrologically complex area centered at Molalla River State Park, and composed of 450 acres of floodplain forest and channels within the two-year inundation zone of the Willamette River. The Molalla River supports populations of native winter steelhead (in full recovery and considered a stronghold population), spring Chinook salmon, a naturalized population of coho salmon, Pacific and Western brook lamprey, Oregon chub, and wildlife such as bald eagle, heron, pond turtle, beaver, waterfowl, migratory songbirds, elk, deer, and cougar. The confluence area is used by many of these species, as well as migrating fish populations on the mainstem Willamette River.

The project addresses several limiting factors and associated actions identified in the Upper Willamette River Recovery Plan for Chinook Salmon and Steelhead (NMFS/ODFW, 2011), including but not limited to the following activities: increasing instream habitat complexity, enhancing riparian habitat, reconnecting side channel and off-channel habitats, and protecting existing high quality aquatic and riparian habitats. Enhancing floodplain habitat and improving vegetation communities at the park is identified as a priority action for the Molalla River watershed in The Middle and Lower Molalla River Restoration Action Plan (Molalla River Watershed Council and Molalla River Improvement District, 2011).

B. Describe work within waters and wetlands.

This section provides a description of work proposed specifically within regulated waters and wetlands, at a level of detail intended for USACE and DSL permitting. Figures of proposed work within waters and wetlands are provided in Attachment E. Additional detail, such as proposed stormwater management and in-depth construction methods, is available in the Project's Biological Assessment (BA), provided as Attachment I. Project impact quantities are provided in the table in Attachment A named *"Attachment A.3 Wetland and Waterways Impact Table."*

The following discussion details the distinction between temporary and permanent impact types:

- ***Temporary Acreage and Functional Impact:*** Includes temporary ground clearing and/or earthwork where contours and plant community type can be restored similar to preconstruction conditions or better. For example, open-trench work through an emergent wetland dominated by reed canarygrass (e.g., dominated by invasive species) will be restored to at least an emergent wetland community. Replanting will be accomplished using native species, with the understanding that non-native species from the surrounding environment are likely to encroach. Site restoration will occur in accordance with the Conceptual Site Restoration Plan provided in Attachment F. No mitigation is proposed for these temporary impacts.
- ***Temporary Acreage Impacts but with a Permanent Impact to Resource Functions (noted as temporary impacts in the impacts table, but with an asterisk to signify the permanent functional loss):*** Includes temporary ground clearing and/or earthwork where plant community type cannot be restored to preconstruction conditions or better. For example, if construction removes a forested wetland community and a similar community cannot be planted directly over the pipeline, this would result in a permanent diminishment (impact) to wetland functions. However, since the area over the pipe would still be graded similar to preconstruction conditions and planted with native plantings, there would be no loss in wetland acreage from this activity, and wetland functions would still be provided but at a lower level. Site restoration will occur in accordance with the Conceptual Site Restoration Plan provided in Attachment F. Although there are no permanent impacts to wetland acreage, the affected wetland function will be mitigated through purchase of wetland mitigation bank credits. This will occur based on a ratio of one mitigation bank credit per acre of affected wetland.

Temporal losses

(6) PROJECT DESCRIPTION

- ***Permanent Impact to Resource Acreage and Functions***: Permanent impacts refer to those areas where wetland acreage would be lost in perpetuity. For example, development of the proposed WWSS WTP site will result in some unavoidable permanent loss of wetlands in order to properly grade the site and situate the various treatment facilities. The affected acreage will be mitigated through purchase of wetland mitigation bank credits. This will occur based on a ratio of one mitigation bank credit per acre of affected wetland.

RAW WATER FACILITIES (RWF)

Modifications to the RWF located on the Willamette River in Wilsonville will include modifications to the intake (including replacement of screens and associated modifications of existing piles), site seismic improvements, and modifications to the existing raw water pump station at the WRWTP, including construction of associated facilities. The RWF also include the portion of raw water transmission line located on the WRWTP property, which will cross Arrowhead Creek. Only the intake and seismic improvements will entail work in regulated waters. The Arrowhead Creek crossing will be a trenchless crossing and therefore will not impact regulated waters. Further description of regulated activities is provided below.

Raw Water Intake Modifications

No removal or fill activities are associated with these modifications other than the structural fill associated with the screen replacement and pile modifications. The existing raw water intake will be modified to increase its capacity from 70 mgd to 150 mgd. Within the river, the existing intake includes two 66-inch-diameter tee-screens with a total permitted design capacity of 70 mgd (35 mgd each screen) and with openings small enough to prevent debris and aquatic organisms from being drawn into the RWF. The existing screen system protects anadromous juvenile fish using Oregon Department of Fish and Wildlife (ODFW) and National Marine Fisheries Service (NMFS) standards to meet fish passage requirements. As part of the modifications to increase withdrawal capacity, two new 78-inch-diameter tee-screens will be bolted on in place of the existing screens. The existing screens are protected from impacts by ten piles; up to ten of these piles would need to be modified to accommodate the new, larger screens.

Replacement of the screens and modification of the screen protection H-piles will be accomplished by the contractor working from a barge. Divers will remove and replace the screens using an onboard crane, so there will be no disturbance to the riverbank. Two construction methods are under consideration to modify up to ten of the screen protection H-piles to accommodate the larger screens: (1) Divers will cut the existing H-piles and attach brackets to extend the area protected by the piles. (2) The existing H-pile will be extracted with a vibratory hammer or cut 2 feet below riverbed, if the pile cannot be completely removed. The new pile will be installed with a vibratory hammer and then set with an impact hammer. The pile may be concrete, 24 inches in diameter or smaller, steel H-pile designated HP24 or smaller, or wood that has not been treated with preservatives or pesticides. Sound attenuation methods will be used when using an impact hammer. The number of screen protection piles that will need to be modified and the construction method will be determined in final design. All construction activities in the river will be conducted during the Willamette River in-water work window of June 1 to October 31.

Raw Water Facilities Site Seismic Improvements

The majority of seismic improvement activities will occur above the Section 404 and Oregon Removal-Fill Law ordinary high water (OHW) mark (elevation 74 feet North American Vertical Datum of 1988 (NAVD88), based on field indicators); however, a very small section of pile wall and associated temporary construction footprint will occur below this elevation. Slightly more work would occur below the Section 10 OHW elevation (78.7 feet NAVD88, based on modeled elevation provided by the USACE); however, the majority of work still occurs above this elevation. See the impacts table in Attachment A.3 for detailed acreage and volume quantities for work below OHW. Further description is provided below.

The riverbank adjacent to the existing raw water intake has the potential for related slope failure during a seismic event, and for the slide mass to bury and damage the intake. Site seismic improvements will be constructed as part of the Project to address seismic and structural vulnerabilities at the raw water intake and raw water pump station. A subsurface wall of piles will be constructed on the Willamette River riverbank to protect the raw water intake

from damage that would result if it were buried during a seismic event. A second subsurface wall of piles will be constructed near the top of the slope to protect the existing raw water pump station, the structures associated with the pump station, and the WWSS pipeline exiting the pump station from damage due to slope failure during a seismic event. Construction of the seismic improvements would last approximately eight months.

Access to the construction area for seismic improvements will be via existing unpaved access roads that will be improved and extended by laying down temporary materials of crushed rock and geotextile. The construction area will accommodate access roads and work platforms for a drill rig and crane used to install the piles. The access roads will be approximately 12 feet wide and will require localized leveling of the slope. The total construction area for seismic improvements would affect approximately 0.5 acre of forested riparian area. Construction below the OHW elevation will occur during the Willamette River in-water work window.

Intake Protection. Approximately sixteen 4-foot-diameter tangent piles will be built into the bank above the intake screens to stabilize the potential failure zone. The piles will be constructed near the toe of the riverbank and will extend approximately 50 feet deep. Of the 16 piles, 1 pile is anticipated to be located below OHW elevation. The pile wall will be buried approximately 1 foot below grade, and the ground level will be restored to preconstruction elevations.

The pile wall will be constructed using a track-mounted drill rig that would be placed parallel to the wall construction. An auger will be used to drill shafts, and then a steel casing will be installed to protect the soil from caving into the shaft. Concrete will be pumped in to backfill the shaft, creating the piles. After construction, the slope will be regraded, and the hillside revegetated with appropriate riparian species and in accordance with local jurisdictional requirements.

Pump Station and Associated Structures Protection. The raw water pump station and the locations for proposed associated structures are also at risk of damage from potential for slope failure. Approximately thirty-seven 10-foot-diameter piles, each extending approximately 120 feet deep, will be constructed near the top of the slope. The piles will be located no closer than 15 feet from the intake pipe. Within 15 feet of the intake pipe, a jet grout block approximately 36 feet by 50 feet by 35 feet will be installed underground to connect two segments of the pile wall while protecting the intake pipe.

Together, the drilled shafts and jet grout block will extend approximately 450 feet along the top of the slope in two segments. This 10-foot-diameter pile wall will be constructed as described above for the 4-foot-diameter pile wall. The jet grout block will also be constructed using a track-mounted drill rig placed parallel to the wall construction. Jet grouting consists of injecting liquid concrete into the soil to create a soil/concrete mixture below the ground surface. During this process, a borehole is drilled to the desired depth, and then concrete (sometimes mixed with water and air) is pumped into the borehole. As the injection equipment rotates and is withdrawn from the borehole, a column of loosened soil stabilized with concrete is created.

Raw Water Pump Station

The pump station facilities will be constructed in upland areas, including partly within the existing WRWTP site. No work in wetlands or other waters is associated with these facilities.

WWSS WATER TREATMENT PLANT

As noted above, the proposed WWSS WTP will be located near the city of Sherwood. The initial capacity of the new water treatment plant will be 60 mgd, with planned expansions to an ultimate capacity of 120 mgd. The water treatment plant will be expanded in multiple stages, but all construction and new facilities are anticipated to fall within the original footprint (see the Project's BA in Attachment I for additional description).

The WWSS WTP will be constructed using typical construction methods for buildings, such as grading, laying spread footing foundations, and erecting building sides. Construction equipment is expected to include bulldozers, water trucks, loaders, cranes, excavators, haul trucks, soil compactors, pavers, concrete trucks, dewatering pumps, cranes and/or lifts, and light and heavy duty general construction trucks. If blasting or other specialized equipment is required to excavate rock, all of the operations, including transportation, storage, and handling of explosives and blasting materials, will comply with county, state, and federal regulations.

(6) PROJECT DESCRIPTION

Construction of the WWSS WTP is expected to take approximately three years, and will affect approximately 20 acres. Of this area, impervious surfaces will account for approximately 10 acres, and the remaining approximately 10 acres will be landscaped. Wetlands will be impacted by construction of the WWSS WTP as described below.

Wetland impact quantities are provided in Attachment A.3. Construction will result in the permanent total loss of Wetlands A, B, D, E, F, and Potential Wetland H (PW-H), which are small isolated depressional wetlands (see Attachment E, Work Package Design Drawings). Construction will result in permanent and temporary impacts to a portion of Wetland C. Wetland C is a wetland swale that drains northward to a tributary of Hedges Creek, which is a tributary to the Tualatin River. Retaining walls are proposed in order to limit the permanent impacts to Wetland C. However, providing for equipment access during construction of the retaining walls will result in temporary impacts. Temporarily disturbed areas will be restored to native conditions post-construction. Wetland G is a very large, isolated depressional wetland. This wetland will be purposefully avoided in order to maintain its habitat quality and functions.

RESERVOIR FACILITIES

No known impacts to regulated wetlands or waterways will occur at the Reservoir Facilities site and associated staging areas. A wetland delineation has not been conducted at this site due to lack of property access. However, based on review of surrounding conditions, landscape position, National Wetland Inventory, and soils maps, there is a very low likelihood of jurisdictional resources within the proposed development footprint for the Reservoir Facilities. There is likely to be a stream and potentially slope wetlands in a ravine along the east side of the property. However, the proposed development footprint only extends to the upper slopes of the ravine and, therefore, is assumed to avoid jurisdictional resources. A wetland delineation will be conducted prior to permit issuance to confirm these assumptions.

The staging areas for work on the Reservoir Facilities are anticipated to be approximately 6.9 acres, of which up to 0.3 acre is located within the Reservoir Facilities site, and the remainder is on the property to the west, across SW Grabhorn Road. The staging area west of SW Grabhorn Road was delineated for wetlands. Currently, this area consists primarily of non-native grassland, Himalayan blackberry shrub thickets, and scrub-forest habitats. A wetland and an intermittent drainage system located in the northwest corner of the property would be avoided. Both staging areas will be graded to establish final contours and revegetated with native plantings upon completion of the work.

TRANSMISSION PIPELINES

Transmission Pipelines have been sited to avoid and minimize impacts to wetlands and waterways to the greatest extent practicable. However, site constraints dictate that the pipelines leave developed road rights-of-way in certain locations along the pipeline route, which results in wetland and waterway impacts in some locations. Further detail of how resources were avoided is provided in the Alternatives Analysis (see Attachment D). Pipeline resource crossings (i.e., wetlands and waterways) will include both open-trench crossings and trenchless crossings (e.g., boring). Trenchless approaches will be used to avoid and minimize resource impacts where practicable. Depths of the pipeline at creek crossings will be set to minimize the risk of potential future scour exposing the pipe.

The WWSS includes 12 turnouts for connecting the WWSS pipelines to existing water distribution systems. Turnouts consist of a short length of pipe and a below-grade meter vault and, in some cases, a below-grade pressure-regulating or flow-control station. Any modifications to existing water distribution systems beyond the meter vault would be permitted and constructed separately, and are not considered part of the WWSS. The turnouts are not located in any resource crossings and will not be discussed further in this document.

Unavoidable Impacts to Resources from Transmission Pipelines

The Transmission Pipelines will result in some unavoidable impacts to wetlands and waters, as shown in the figures provided in Attachment E and listed in the impacts table provided in Attachment A.3 (note that Attachment A.3 addresses the removal-fill quantification requirements of Sections 6F, 6G, 6H, and 6I of this application). The vast majority of these impacts will be of a temporary nature, primarily from open-trench construction. However, some permanent impacts to wetlands and waters will occur as a result of pipe appurtenances (e.g., blowoff valves) that

need to be sited in low spots. A description of pipeline open-trench construction activities relevant to proposed resource crossings is provided below.

Transmission Pipeline Work Areas

Permanent easements along the pipeline would typically be about 50 feet wide, with an additional 25 feet of temporary (construction) easement, for a typical total work area width of 75 feet (see Transmission Pipeline Work Package Design Drawings provided in Attachment E). However, widths will vary depending upon site-specific conditions, such as avoiding existing facilities or conformance to property boundaries. The total work area is intended to provide space for equipment operation and staging areas during construction. If additional staging area is necessary during construction, the contractor would be responsible for identifying, securing, maintaining, and restoring those locations according to the project specifications. Staging areas will not be located within resource areas.

During open-trench construction, the work area would be graded to establish appropriate contours for construction, and to provide safe and efficient machinery movement and operation. Topsoil would be removed and stored on-site for use during backfill and revegetation when appropriate.

Required trench width is a function of pipeline diameter, geotechnical properties of the surrounding soils, backfill material, trench protection methods, contractor construction methods, and inspection requirements, but would typically be 8 feet to 12 feet wide. Beneath the active stream channel, the depth of earth cover over the pipe will be a minimum of twice the pipe diameter, or deep enough to avoid active scour as indicated by a subsequent site-specific analysis. Beyond the active channel, minimum cover would vary according to local conditions, but would typically not be less than 4 feet deep.

Trench Protection

Trench protection methods are determined by soil conditions and trench depth, and are designed to prevent cave-ins. Trench protection methods at resource crossings would include one or more of the following: trench boxes, soldier piles and lagging, sheet piles, or other engineered retaining structures. Trench protection components would be removed as the trench is backfilled.

Open-Trench Construction Dewatering

High groundwater is frequently encountered in open-trench construction through resource crossings, and its management is essential in order to provide safe construction conditions and quality pipeline installation. In areas of known, persistent high groundwater, pre-drainage methods can involve using well points (pre-drilled temporary wells) to lower local groundwater elevations before the trench is excavated. Well point systems are designed to meet construction safety needs as well as to protect adjacent natural resources. Where listed species are present, changes in stream flow within active channels would be monitored; sheet piles could be utilized between well points and the active channel to limit the effects of dewatering on streamflows.

A common method for controlling groundwater intrusion into the open pipeline trench is to use pumps at the bottom of the excavation area (in a sump) to draw down groundwater below the open trench bottom. Typically, the water is pumped out by solids-handling sump pumps. Sump pump systems have limited capacity and are not capable of significantly changing the water table to the extent that wetlands or streams would be affected.

Groundwater collected from well points and sump pump systems generally is pumped into a temporary retention pond or tank for treatment before being discharged to upland areas or routed to appropriate storm drains, upon meeting discharge requirements. Discharge of groundwater is coordinated with local agencies through erosion and sediment control permitting. Settlement and/or filtration of groundwater through settling tanks or other systems may be necessary before groundwater can be discharged, in order to meet Oregon Department of Environmental Quality (DEQ) Water Quality Standards (the relevant state regulation is the Beneficial Uses, Policies, and Criteria for Oregon (OAR 340-041-0036), which states that no more than a 10 percent cumulative increase in natural stream turbidities is allowed, as measured relative to a control point immediately upstream of the turbidity-causing activity). After treatment, if required, water can be discharged to a stream, river, wetland, open area, or storm drain system.

(6) PROJECT DESCRIPTION

Transmission Pipeline Work Area Isolation

Isolating work areas during open-trench construction within an active channel generally involves shifting flows from one side of a stream to the other as construction progresses, unless complete impoundment is possible and does not last more than seven days. Work areas within streams and adjacent wetland areas can be isolated, allowing the flow of upstream water to continue downstream and providing fish passage as needed. Several methods can be used to reroute or temporarily isolate streams and fish from the work area, including pipes, cofferdams, diversion ditches, silt curtains, sheet piles, sand bags, inflatable dams, or similar methods. To minimize disturbance to downstream fish populations and habitats, the discharge point from the temporary diversion is located immediately downstream of the worksite.

Trench Backfill

Backfill materials for the pipe bedding and pipe zone (the fill area adjacent to the pipe and within 1 foot above the pipe) provide necessary support to the pipeline, and are placed and compacted around the curvature of the pipe. Backfill will be composed of granular material (aggregate) or controlled low-strength material (low-strength concrete). Using aggregate backfill requires a slightly wider trench to accommodate compaction activities. No compaction is necessary for low-strength concrete.

Native soils from on-site excavation materials are typically not considered suitable for bedding and pipe zone materials, so granular aggregate materials are used. Select native soils are typically used for backfill above the pipe zone in areas not sensitive to settlement.

Aggregate backfill is typically more porous than native soils, and in places where aggregate is used for backfill, the pipe zone could act as a conduit for groundwater flow. To limit groundwater flow through the pipe zone, low-permeability concrete trench cutoff walls (constructed from low-strength concrete) would be installed in trenches that are backfilled with aggregate. Trench cutoff walls are installed at specific intervals and locations to prevent subsurface water from wetlands and waterways being channeled through the pipeline trench.

Blowoff Valve Construction and Operation

Blowoff valves, or low-point drains, provide an outlet to drain the transmission pipeline during testing, commissioning, and maintenance activities. Blowoffs are necessary at low points on the pipeline regardless of the surrounding geography or topography, but they are often needed at resource crossings because of the lower pipe elevations at these locations. Blowoff valves will not occur below OHW; however, they are located on streambanks and adjacent wetlands at some locations (see impacts table in Attachment A.3).

Blowoffs are constructed with one or more isolation valves and a vertical casing pipe that extends to the ground surface. During blowoff events, the construction or maintenance crew connects discharge piping to the vertical casing when water is under pressure. After the transmission line is depressurized, a sump pump can be lowered into the vertical casing to pump out the remaining water. Blowoffs located within urban areas direct outflow toward street storm drains whenever possible. Discharge rates will be coordinated with the jurisdictional utility agency to avoid overloading the downstream receiving systems.

If a storm or sanitary sewer system is unavailable for discharge, and it is necessary to discharge to upland areas, wetlands, or surface waters, the water will be dechlorinated and treated (settled or filtered), as needed, to meet water quality and discharge regulations. Residual chlorine that might remain in the water will be removed if necessary by adding ascorbic acid (vitamin C) or sodium bisulfate to the water (the relevant state regulation is the Beneficial Uses, Policies, and Criteria for Oregon (OAR 340-041-0036)). Discharge rates at each drain location will be controlled by throttling valves installed on the drain locations. For the Transmission Pipelines, any blowoff valves that discharge directly to a drainage will be designed to prevent soil erosion or channel erosion. Blowoff discharge rates would not exceed the bankfull discharge rate for the receiving channel, in order to prevent soil or channel erosion. Bankfull discharge will be estimated using local stream gage data, previous drainage studies, or published regional regression equations. Temporary best management practices (BMPs) might also be applied to control downstream effects during regular maintenance or emergency drainage.

(6) PROJECT DESCRIPTION

Trenchless Crossings

Trenchless crossings will not result in impacts to jurisdictional wetlands or waterways. All staging and work areas will be located out of jurisdictional resources. A brief description of such work is provided in this JPA, since the work will be located near regulated resources, including passing underneath such resources. A more detailed description of trenchless crossing methods is provided in the Project's BA (Attachment I).

Trenchless crossing methods will be used at several locations along the pipeline, as identified in the resource descriptions table (Attachment A.2) and the impacts table (Attachment A.3). Several factors are used to determine the most appropriate type of trenchless crossing method, such as the type of feature being crossed (e.g., natural resource, railroad, highway), subsurface geotechnical conditions, the pipe diameter, and the length of a given crossing.

Shallow crossings for the Project generally include crossings for some wetlands and streams, as well as railroads, major roadways, and major utilities along the pipeline alignment. Shallow crossings are generally anticipated to be less than 25 to 30 feet deep to the top of the pipe (but not less than twice the diameter of the pipeline at resource crossings), and they allow simpler shoring and dewatering designs than deep crossings. Trenchless methods appropriate for shallow resource crossings primarily include jack and bore (also called auger boring) and pipe ramming; where groundwater conditions are appropriate, a shielded tunnel boring machine can be used. Deeper crossings typically require microtunneling or horizontal directional drilling (HDD). At this time, HDD is not anticipated for use in constructing the Project; however, specific methods of construction will be determined during final design and construction bidding.

Generally, a minimum work area of approximately 60 feet by 150 feet is required at an entry shaft, whereas the space requirements for the exit shaft work area are smaller—a minimum of 50 feet by 80 feet. The minimum work area dimensions would be larger if the site had steep contours or other restrictions. If additional staging area is needed during construction, the contractor would be responsible for identifying, securing, maintaining, and restoring those locations according to the Project specifications. Additional staging areas will not be located within resource areas.

Stream/river morphology significantly impacts the layout of deep crossings. The alignments of trenchless crossings will extend beyond the limits of stream floodplains, with shafts set back from the floodplain side slopes in order to minimize slope instability and seismic risks.

During shaft construction (or staging setup for HDD), the work area will be graded to establish appropriate contours for construction, and to provide for the safe and efficient movement and operation of machinery. Jack and bore, pipe ramming, shielded tunneling, and microtunneling methods involve excavating underground from an entry shaft to a receiving shaft to avoid disturbing surface features between the two shafts (HDD does not require shafts). Entry shafts are typically 20 feet by 40 feet for jack and bore or pipe ramming, and 35 feet in diameter for shielded tunneling or microtunneling (for a 66-inch-diameter pipe). Additional area is necessary for staging in order to provide sufficient room to accommodate excavation and tunneling equipment. Exit shafts are typically 12 feet by 15 feet for jack and bore or pipe ramming, and 25 feet in diameter for shielded tunneling or microtunneling (for a 66-inch-diameter pipe).

In trenchless construction using shafts (jack and bore, pipe ramming, shielded tunneling, and microtunneling), high groundwater must be managed so that safe construction conditions and quality pipeline installation can be provided. Pre-drainage methods might involve using dewatering wells to lower local groundwater elevations before excavating shafts for trenchless construction. Dewatering wells are designed to meet construction requirements as well as protect adjacent natural resources.

A common method for managing groundwater intrusion into the shaft itself is to use pumps at the bottom of the shaft (in a sump) to remove groundwater that may leak into the shaft. Typically, the water would be pumped out by solids-handling sump pumps. Sump pump systems have limited capacity and are not capable of significantly changing the water table to the extent that wetlands or streams would be affected.

Groundwater collected from well points and sump pump systems generally is pumped into a temporary retention pond or tank for treatment before being discharged to upland areas or routed to appropriate storm drains, upon meeting discharge requirements. Discharge of groundwater is coordinated with local agencies through erosion and sediment control permitting. Settlement and/or filtration of groundwater through settling tanks and systems may be necessary before groundwater can be discharged, in order to meet DEQ Water Quality Standards (the relevant state regulation is the Beneficial Uses, Policies, and Criteria for Oregon (OAR 340-041-0036)). After treatment, if required, water may be discharged to a stream, river, wetland, open area, or storm drain system.

Once tunnel construction is complete, shaft components can be left in place permanently or, as is typically done for steel shaft components, removed. The concrete slab seal at the bottom of the shaft is punctured to prevent flotation, and the shaft is backfilled.

Post-Construction Site Restoration and Revegetation

A conceptual post-construction site restoration plan has been developed for proposed pipeline resources crossings (i.e., wetlands, creeks, and riparian areas) associated with the Project (see Attachment F). This plan is considered conceptual and is intended to provide overall site restoration guidance, specifically along proposed pipeline construction corridors. Site-specific design work for restoration at resource crossings will be required as part of final design for each Project work package, and will need to take into consideration local site conditions, engineering constraints, local regulatory requirements (e.g., CWS and local land use code requirements), and conditions associated with any Project-wide federal and state permits that have been issued.

C. Construction Methods. Describe how the removal and/or fill activities will be accomplished to minimize impacts to waters and wetlands.

Impact avoidance and minimization measures will include the following:

- Perform any in-water work (any construction activities below OHW elevation) during the following ODFW-designated and NMFS-approved windows:
  - Willamette River: June 1–October 31
  - Willamette River tributaries: July 15–October 15
  - Tualatin River tributaries: July 15–September 30
- Have a biologist qualified to conduct fish salvage on-site during work area isolation to assist in implementing conservation measures. Remove fish that are present from the isolated work area by electrofishing and/or netting. Identify any captured fish and then release them unharmed, outside of the work area.
- Install and remove work area isolation measures so that downstream water flows are maintained. Maintain and control water flow for the duration of the diversion to prevent downstream dewatering.
- Minimize alteration or disturbance of streambanks and existing riparian vegetation.
- Flag the Permitted Work Area (also referred to as the in-water work area, OHW elevation, and jurisdictional waters or wetlands) before mobilizing equipment on-site.
- Locate areas for storage of equipment and vehicles, other than track-mounted vehicles, at least 150 feet away from the Permitted Work Area, unless developed areas are available for staging, and appropriate containment measures are in place to ensure containment and isolation of equipment and vehicles from the work area.
- Locate areas for storing fuels and other potentially hazardous materials, and areas for refueling and servicing construction equipment and vehicles at least 150 feet away from the Permitted Work Area, unless developed areas are available for staging, and appropriate containment measures are in place to ensure containment and isolation of potentially hazardous materials, equipment, and vehicles from the work area.
- For track-mounted equipment, large cranes, and other equipment whose limited mobility makes it impractical to move them for refueling, take all feasible precautions to prevent and minimize the risk of fuel reaching the Permitted Work Area; implement appropriate spill prevention measures, and provide fuel containment systems designed to completely contain a potential material spill, as well as other pollution control devices

and measures adequate to provide complete containment of hazardous material; and perform refueling operations to minimize the amount of fuel remaining in vehicles stored during non-work times.

- Maintain hazardous material containment booms and spill containment booms on-site to facilitate the cleanup of hazardous material spills. Install hazardous material containment booms where there is a potential for release of petroleum or other toxicants.
- Prohibit underwater blasting.
- Implement containment measures adequate to prevent pollutants or construction materials (such as waste spoils, petroleum products, concrete cured less than 24 hours, concrete cure water, silt, and welding slag and grindings) from entering the Permitted Work Area or any regulated waters.
- If flooding of the work area is expected to occur within 24 hours, evacuate all potential pollutants, equipment, and fuel from the anticipated inundation area.
- Do not permit any equipment in the wetted channel or any wetland, unless the work to be performed using such equipment is isolated from the wetted channel or wetland.
- Do not discharge contaminated or sediment-laden water from the Project or water contained within a cofferdam directly into any waters of the state until the water is satisfactorily treated (for example, by bioswale, filter, settlement pond, pumping to vegetated upland location, bio-bag, or dirt-bag), as appropriate.
- Do not use treated timbers within the Permitted Work Area for any purpose.
- Do not apply fertilizer within 50 feet of any wetland or waterbody.
- Before operating within 150 feet of the Permitted Work Area, inspect and clean all construction equipment; check all construction equipment for fluid leaks; remove external oil, grease, dirt, and caked mud; do not discharge untreated wash and rinse water into the Permitted Work Area; and establish temporary impoundments to catch water from equipment cleansing (which may only be performed at least 150 feet from the Permitted Work Area and in a location that does not contribute untreated wastewater to any waters of the state unless otherwise noted).
- Place waste materials and spoils above bank lines and away from any wetlands. If necessary, temporarily locate waste materials and spoils, before their removal from the Project site and disposal, above bank lines and away from any wetlands. Construction spoils will be disposed of in accordance with applicable regulations.
- Minimize the operation of equipment in or on the water to the extent feasible.
- For construction access roads and work areas near waterways and wetlands, use a rock work pad or other measures to minimize soil compaction from heavy equipment. Place a geotextile fabric, chain link fence, or other equally effective material under the temporary rock to protect existing ground and assist in removal of temporary work pad fill rock. Following construction, remove all of the temporary work pad materials, and regrade and restore the area according to the revegetation plans.
- Mandate that "diapering" of vehicles and stationary equipment to catch any toxicants (for example, oils, greases, and brake fluid) be used when the vehicles have any potential to contribute toxic materials into aquatic systems.
- Implement the following BMPs for trenchless (drilling, boring, or jacking) resource crossings:
    - Design, build, and maintain facilities to collect and treat construction and drilling discharge water using the appropriate technology applicable to site conditions. Provide treatment to remove debris, nutrients, sediment, petroleum hydrocarbons, metals, and other pollutants likely to be present. Use collection and proper disposal off site as an alternative to treatment.
    - Isolate drilling operations from wetted stream to prevent drilling fluids from contacting waters of the state and U.S.
    - Prevent loss of drilling fluid to the subsurface formation. If necessary, use drill casing. If drilling fluid or waste is released to surface water, a wetland or other sensitive environment, cease drilling operations

until approval from the Owners' Representative is received to resume drilling. The Owners' Representative will notify the appropriate regulatory agencies of inadvertent release.

- Recover, recycle, or dispose of drilling fluids and waste as needed to prevent entry into flowing water.
- The contractor will submit its anticipated slurry operating pressures for review by the Owners' Representative, according to technical specifications, before construction begins.

- The contractor will implement an Erosion Control Plan to prevent the discharge of sediment to surface waters and ensure that turbidity does not exceed 10 percent above existing background conditions. An example Erosion Control Plan for a single crossing is provided in Attachment G. The Project will comply with issued National Pollutant Discharge Elimination System (NPDES) permit requirements.
  - Identify and isolate sensitive areas before construction begins. Install erosion and sediment control measures around and on the site.

- Implement the following BMPs when using a barge:
  - Before moving the barge to the project site, unless the barge is transported solely by water from within the state of Oregon, inspect the barge and ballast for invasive species to prevent bringing invasive species to the Project site. Contact the Oregon State Marine Board if invasive species are found.
  - Prohibit barge grounding. Do not at any time allow barges to be grounded on the bed or banks of the waterway.
  - Do not use impact hammers for barge support/anchor (spud) placement.
  - Install and maintain containment measures to prevent barge surface runoff from flushing oil, fuel, or other contaminants into the water.
  - Secure all equipment, as well as containers with fuel, hazardous materials, or waste, to the barge deck.
  - If a fuel container is used on the barge, provide a double-walled fuel container and place an absorbent containment boom around the container when it is on the barge.
  - Provide individual containment for each piece of equipment on the barge, including containment pans or absorbent booms to contain minor spills locally.
  - Develop a spill mitigation plan prior to the start of work.

- Implement one of the following sound attenuation methods when using an impact hammer to install the screen protection piles:
  - If the water velocity is 1.6 feet per second (fps) or less, surround the pile being driven by a confined or unconfined bubble curtain that will distribute small air bubbles around 100 percent of the pile perimeter for the full depth of the water column (see, e.g., NMFS and USFWS (2006), Wursig et al. (2002), and Longmuir and Lively (2001)).
  - If water velocity is greater than 1.6 fps, surround the pile being driven with a confined bubble curtain (e.g., surrounded by a fabric or non-metallic sleeve) that will distribute small air bubbles around 100 percent of the pile perimeter for the full depth of the water column.

(6) PROJECT DESCRIPTION

D. Describe source of fill material and disposal locations if known.

The Project will use a balanced cut/fill approach to the extent practicable. Nearly all wetland impacts will be temporary; that is, topsoil will be stockpiled and replaced after pipe installation. There will likely be excess cut because of the volume displacement of the buried pipes and specialized backfill materials, where necessary. The disposal locations for excess subsoil are currently not known, but they will be located in suitable upland locations or rock quarry sites that are being reclaimed.

E. Construction timeline.

What is the estimated project start date?	Construction bid for first work package included in this permit application = 2017
What is the estimated project completion date?	2026
Is any of the work underway or already complete? If yes, describe.	☑ Yes ☐ No

Two pipeline work packages have been permitted as part of local roadway projects for installation beneath previously proposed roadways. The first is the SW 124th Avenue Extension project, which is being carried out by Washington County (currently under construction). WWSS work package PLM_3.0 includes approximately 2.7 miles of pipeline and is being constructed concurrently with the SW 124th Avenue Extension project. The second work package is part of the Kinsman Road project, which is being carried out by the City of Wilsonville (currently under construction). WWSS work package PLM_2.0 includes approximately 0.5 mile of pipeline and is being constructed concurrently with the Kinsman Road project. These opportunity roadway projects allowed for considerable cost savings, and the pipeline construction associated with these packages has resulted in no additional resource impacts than would have resulted from the roadway projects alone. A third opportunity project, PLW_1.1, which is a small subset of the PLW_1.0 work package, is also under construction. This opportunity project does not include impacts to regulated resources and therefore did not require permits from the USACE or DSL.

F. Fill Volumes and Dimensions (if more than 4 impact sites, include a summary table as an attachment) (See Attachment A.3)

Wetland / Waterbody Name *	Fill Dimensions					Duration of Impact**	Material***
	Length (ft.)	Width (ft.)	Depth (ft.)	Area (sq. ft. or ac.)	Volume (c.y.)		
		See impacts table in Attachment A.3.					

G. Total Fill Volumes and Dimensions

Fill Impacts to Waters	Length (ft.)	Area (sq. ft. or ac.)	Volume (c.y.)
Total Fill to Wetlands	See impacts table in Attachment A.3		
Total Fill Below Ordinary High Water			
Total Fill Below Highest Measured Tide			
Total Fill Below High Tide Line			
Total Fill Below Mean High Water Tidal Elevation			

H. Removal Volumes and Dimensions (if more than 4 impact sites, include a summary table as an attachment)

Wetland / Waterbody Name*	Removal Dimensions					Duration of Impact**	Material***
	Length (ft.)	Width (ft.)	Depth (ft.)	Area (sq. ft. or ac.)	Volume (c.y.)		
		See impacts table in Attachment A.3					

(6) PROJECT DESCRIPTION

I. Total Removal Volumes and Dimensions

Removal Impacts to Waters	Length (ft.)	Area (sq. ft. or ac.)	Volume (c.y.)
Total Removal to Wetlands	See impacts table in Attachment A.3		
Total Removal Below Ordinary High Water			
Total Removal Below Highest Measured Tide			
Total Removal Below High Tide Line			
Total Removal Below Mean High Water Tidal Elevation			

* If there is no official name for the wetland or waterway, create a unique name (such as "Wetland 1" or "Tributary A").
** Indicate the days, months or years the fill or removal will remain. Enter "permanent" if applicable. For DSL, permanent removal or fill is defined as being in place for 24 months or longer.
*** Example: soil, gravel, wood, concrete, pilings, rock etc.

(7) ADDITIONAL INFORMATION

Are there any state or federally listed species on the project site?	☑ Yes	☐ No	☐ Unknown
Is the project site within designated or proposed critical habitat?	☑ Yes	☐ No	☐ Unknown
Is the project site within a national Wild and Scenic River?	☐ Yes	☑ No	☐ Unknown
Is the project site within the 100-year floodplain?	☑ Yes	☐ No	☐ Unknown

*** If yes to any of the above, explain in Block 4 and describe measures to minimize adverse effects to these resources in Block 5.**

Is the project site within the Territorial Sea Plan (TSP) Area?	☐ Yes	☑ No	☐ Unknown

*** If yes, attach TSP review as a separate document for DSL.**

Is the project site within a designated Marine Reserve?	☐ Yes	☑ No	☐ Unknown

*** If yes, certain additional DSL restrictions will apply.**

Will the overall project involve construction dewatering or ground disturbance of one acre or more?	☑ Yes	☐ No	☐ Unknown

*** If yes, you may need a 1200-C permit from the Oregon Department of Environmental Quality (DEQ).**

Is the fill or dredged material a carrier of contaminants from on-site or off-site spills?	☐ Yes	☐ No	☑ Unknown
Has the fill or dredged material been physically and/or chemically tested?	☐ Yes	☐ No	☑ Unknown

***If yes, explain in Block 4 and provide references to any physical/chemical testing report(s).**

Has a cultural resource (archaeological) survey been performed on the project area?	☑ Yes	☐ No	☐ Unknown

*** If yes, provide a copy of the survey with this application. Do not describe any resources in this document.**

Identify any other federal agency that is funding, authorizing or implementing the project.

Agency Name	Contact Name	Phone Number	Most Recent Date of Contact
National Marine Fisheries Service	Annie Birnie	503-230-5407	1/23/2017
Oregon DEQ	Amy Simpson	503-229-5051	1/18/2017

List other certificates or approvals/denials required or received from other federal, state or local agencies for work described in this application. For example, certain activities that require a USACE permit also require 401 Water Quality Certification from Oregon DEQ.

Approving Agency	Certificate/ approval / denial description	Date Applied
Oregon DEQ	401 water quality certification	Same as JPA submittal

(7) ADDITIONAL INFORMATION

Other DSL and/or Corps Actions Associated with this Site (Check all that apply.)

☐ Work proposed on or over lands owned by or leased from the Corps

☑ State owned waterway — DSL Waterway Lease # 22670-EA
Willamette River and Tualatin River

☐ Other Corps or DSL Permits — Corps # — DSL #

☐ Violation for Unauthorized Activity — Corps # — DSL #

☑ Wetland and Waters Delineation — Corps # (see below) — DSL # (see below)

Note: Wetland delineation reports have been submitted to the USACE and DSL as separate submittals from this JPA due to the size of the reports and to allow for early submittal and review of the delineation reports. The following agency tracking numbers have been assigned:

Work Package or Site Name	Submitted to DSL	DSL File #	Submitted to USACE	USACE ID	Review Status
PLM_1.0	1/19/2017	WD2017-0026	1/19/2017	(DA#) NWP-2015-41	under review 6/21/17
PLM_4.0	1/9/2017	WD2017-0006	1/9/2017	(DA#) NWP-2015-41	under review 4/17/17
PLM_5.0	1/19/2017	WD2017-0024	1/19/2017	(DA#) NWP-2015-41	under review 7/11/17
PLW_2.0	1/9/2017	WD2017-0007	1/9/2017	(DA#) NWP-2015-41	under review 4/13/17
Reservoir 2 site	1/9/2017	WD2017-0005	1/9/2017	(DA#) NWP-2015-41	DSL concurrence on 3/21/2017 USACE under review
WTP 1.0 (WWSS WTP)	1/9/2017	WD2017-0008	1/9/2017	(DA#) NWP-2015-41	DSL concurrence on 3/29/2017 USACE under review
PLE_1.0	1/19/2017	WD2017-0025	1/19/2017	(DA#) NWP-2015-41	under review 6/21/17
PLW_1.0	1/19/2017	WD2017-0027	1/19/2017	(DA#) NWP-2015-41	under review 6/21/17
RWF_1.0 (WRWTP)	6/7/2016	WD2016-0249	1/9/2017	(DA#) NWP-2015-41	DSL concurrence on 8/31/2016 USACE under review
RES_1.0	Wetland delineation not yet conducted due to lack of site access				

☑ A wetland / waters delineation has been completed (if so, provide a copy with the application)

☐ The Corps has approved the wetland / waters delineation within the last 5 years

☑ DSL has approved the wetland / waters delineation within the last 5 years

(8) IMPACTS, RESTORATION/REHABILITATION, COMPENSATORY MITIGATION

A. Describe unavoidable environmental impacts that are likely to result from the proposed project. Include permanent, temporary, direct, and indirect impacts.

Section 6(B) describes the general types of wetland and waterway impacts that will occur as part of the Project, and the impacts table provided in Attachment A.3 provides the permanent and temporary impact quantities. Most direct impacts will be of a temporary nature as a result of open trenching for pipe installation. Site restoration will occur as described below in Section 8B. Indirect impacts are anticipated to be only temporary in nature and could include temporary disturbance to fish and wildlife in the vicinity of proposed Project construction. Direct and indirect impacts to species listed under the federal Endangered Species Act (individuals and their habitats) are addressed in the BA included as Attachment I.

B. For temporary removal or fill or disturbance of vegetation in waterways, wetlands or riparian (i.e., streamside) areas, discuss how the site will be restored after construction.

A Conceptual Post-Construction Site Restoration Plan is provided in Attachment F. Areas of temporary disturbance will typically be graded similar to preconstruction contours and planted with native vegetation. Plantings will typically include native trees, shrubs, and herbaceous material. However, there are some exceptions, primarily in agricultural wetlands, as described in Attachment F.

Compensatory Mitigation

C. Proposed mitigation approach. Check all that apply:

☐ Permittee-responsible Onsite Mitigation	☐ Permittee-responsible Offsite mitigation	☑ Mitigation Bank or in-lieu fee program	☐ Payment to Provide (not approved for use with USACE permits)

D. Provide a brief description of mitigation approach and the rationale for choosing that approach. If you believe mitigation should not be required, explain why.

Mitigation for all permanent wetland impacts, as well as for wetlands that will experience a permanent loss of wetland function (i.e., forested wetlands), is proposed using an approved wetland mitigation bank. The use of a mitigation bank in the Tualatin River Basin is proposed because individual impacts will be localized but distributed over a long distance, with each individual impact being relatively small. Consolidating mitigation at an approved mitigation bank is often a desired approach for long, linear projects such as the WWSS.

A review of how the mitigation proposed for the Project meets DSL's principal objectives is provided below.

Oregon Department of State Lands Principal Objectives:

(a) Replace functions and values lost at the removal-fill site;

Very little function will be lost as a result of the Project. Most of the proposed impacts will be temporary, and in many cases along the Transmission Pipelines, disturbed area will be restored to a more native plant community. In total, 1.18 acres of wetland will experience permanent loss of acreage and associated functions. Approximately 0.47 acre of wetland will experience temporary acreage impacts, but also will experience a permanent decrease in function due to conversion from a forested wetland type to a scrub-shrub or emergent wetland type. Functions and values lost due to these impacts will be offset through the use of mitigation bank credits. The mitigation banks in the Tualatin River Basin have received extensive review by regulatory and resource agencies to determine that the mitigation sites will provide important functions and values, including the water quality and wildlife habitat functions that will be most impacted by the proposed Project.

(b) Provide local replacement for locally important functions and values, where appropriate;

This principal objective is met through the purchase of mitigation bank credits. The mitigation bank underwent extensive review by regulatory and resource agencies to determine that the mitigation site will provide locally important functions and values. Project impacts are located within the bank service areas.

(8) IMPACTS, RESTORATION/REHABILITATION, COMPENSATORY MITIGATION

(c) Enhance, restore, create or preserve wetlands or tidal areas that are self-sustaining and minimize long-term maintenance needs;

This principal objective is met through the purchase of mitigation bank credits. The mitigation bank underwent extensive review by regulatory and resource agencies to determine that the mitigation site will be self-sustaining and minimize long-term maintenance needs.

(d) Ensure the siting of CWM in ecologically suitable locations considering: local watershed needs and priorities; appropriate landscape position for the wetland types, functions and values sought; connectivity to other habitats and protected resources; and the absence of contaminants or conflicting adjacent land uses that would compromise wetland functions; and

This principal objective is met through the purchase of mitigation bank credits. The mitigation bank underwent extensive review by regulatory and resource agencies to determine that the site occurs within an ecologically suitable location.

(e) Minimize temporal loss of wetlands and tidal waters and their functions and values.

This principal objective is met through the purchase of mitigation bank credits. Functions provided at the bank are already occurring; therefore, there will be no temporal loss of wetland functions and values proposed by the Project.

Mitigation Bank / In-Lieu Fee Information:

The applicants propose to purchase credits from either the Butler Wetland Mitigation Bank or Tualatin Valley Environmental Bank. A total of 1.65 credits will be purchased to offset the permanent loss of 1.18 acres of wetlands and 0.47 acre of temporary impacts to forested wetlands. Credits shall be purchased prior to permit issuance or as a permit condition, as required by the USACE and DSL.

If you are proposing permittee-responsible mitigation, have you prepared a compensatory mitigation plan?

☐ Yes. Submit the plan with this application and complete the remainder of this section.

☐ No. A mitigation plan will need to be submitted (for DSL, this plan is required for a complete

Mitigation Location Information (Fill out only if permittee-responsible mitigation is proposed)

Mitigation Site Name/Legal Description	Mitigation Site Address	Tax Lot #
N/A	N/A	N/A
County	City	Latitude & Longitude (in DD.DDDD format)
N/A	N/A	N/A

Township	Range	Section	Quarter/Quarter
N/A	N/A	N/A	N/A

(9) ADJACENT PROPERTY OWNERS FOR PROJECT AND MITIGATION SITE

☑ **Pre-printed mailing labels of adjacent property owners attached separately.**	**Project Site Adjacent Property Owners**	**Mitigation Site Adjacent Property Owners**

A list of adjacent property owners is provided in Attachment H (DSL and USACE).

(10) CITY/COUNTY PLANNING DEPARTMENT LAND USE AFFIDAVIT (TO BE COMPLETED BY LOCAL PLANNING OFFICIAL)

I have reviewed the project described in this application and have determined that:

☐ This project is not regulated by the comprehensive plan and land use regulations.

☒ This project is consistent with the comprehensive plan and land use regulations.

☐ This project will be consistent with the comprehensive plan and land use regulations when the following local approval(s) are obtained:

- ☐ Conditional Use Approval
- ☐ Development Permit
- ☐ Other Permit (see comment section)

☐ This project is not consistent with the comprehensive plan. Consistency requires:

- ☐ Plan Amendment
- ☐ Zone Change
- ☐ Other Approval or Review (see comment section)

An application ☐ has ☐ has not been filed for local approvals checked above.

Local planning official name (print)	Title	(City)/ County (circle one)
Ruth Klein	Planner	Hillsboro

Signature	Date
Ruth Kl.	3/23/17

Comments:

(11) COASTAL ZONE CERTIFICATION

If the proposed activity described in your permit application is within the Oregon coastal zone, the following certification is required before your application can be processed. A public notice will be issued with the certification statement, which will be forwarded to the Oregon Department of Land Conservation and Development (DLCD) for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program, contact DLCD at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Name	Title
N/A	N/A

Signature	Date

(10) CITY/COUNTY PLANNING DEPARTMENT LAND USE AFFIDAVIT (TO BE COMPLETED BY LOCAL PLANNING OFFICIAL)

I have reviewed the project described in this application and have determined that:

☐ This project is not regulated by the comprehensive plan and land use regulations.

☐ This project is consistent with the comprehensive plan and land use regulations.

☒ This project will be consistent with the comprehensive plan and land use regulations when the following local approval(s) are obtained:

- ☐ Conditional Use Approval
- ☐ Development Permit
- ☒ Other Permit (see comment section)

☐ This project is not consistent with the comprehensive plan. Consistency requires:

- ☐ Plan Amendment
- ☐ Zone Change
- ☐ Other Approval or Review (see comment section)

An application ☐ has ☐ has not been filed for local approvals checked above.

Local planning official name (print)	Title	City / County (circle one)
Monica Bilodeau	Associate Planner	City Tigard

Signature	Date
Monica Bilodeau	3/21/2017

Comments:

Pipeline work is exempt in the Right-of-way and Roy Rogers is within Washington County's Jurisdiction.

(11) COASTAL ZONE CERTIFICATION

If the proposed activity described in your permit application is within the Oregon coastal zone, the following certification is required before your application can be processed. A public notice will be issued with the certification statement, which will be forwarded to the Oregon Department of Land Conservation and Development (DLCD) for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program, contact DLCD at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Name	Title
N/A	N/A
Signature	**Date**

(10) CITY/COUNTY PLANNING DEPARTMENT LAND USE AFFIDAVIT
(TO BE COMPLETED BY LOCAL PLANNING OFFICIAL)

I have reviewed the project described in this application and have determined that:

☐ This project is not regulated by the comprehensive plan and land use regulations.

☐ This project is consistent with the comprehensive plan and land use regulations.

☐ This project will be consistent with the comprehensive plan and land use regulations when the following local approval(s) are obtained:

- ☐ Conditional Use Approval
- ☐ Development Permit
- ☐ Other Permit (see comment section)

☐ This project is not consistent with the comprehensive plan. Consistency requires:

- ☐ Plan Amendment
- ☐ Zone Change
- ☐ Other Approval or Review (see comment section)

An application ☐ has ☐ has not been filed for local approvals checked above.

Local planning official name (print)	Title	City / County (circle one)
ALICE CANNON	ASSISTANT CITY MANAGER/ COMMUNITY DEVELOPMENT DIRECTOR	TUALATIN

Signature	Date
[illegible signature]	3/30/17

Comments:

LAND USE APPROVAL IS NOT REQUIRED FOR PIPES IN THE RIGHT-OF-WAY. HOWEVER, TUALATIN ENGINEERING APPROVAL IS REQUIRED AT TIME OF CONSTRUCTION.

(11) COASTAL ZONE CERTIFICATION

If the proposed activity described in your permit application is within the Oregon coastal zone, the following certification is required before your application can be processed. A public notice will be issued with the certification statement, which will be forwarded to the Oregon Department of Land Conservation and Development (DLCD) for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program, contact DLCD at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Name	Title
N/A	N/A
Signature	**Date**

(10) CITY/COUNTY PLANNING DEPARTMENT LAND USE AFFIDAVIT (TO BE COMPLETED BY LOCAL PLANNING OFFICIAL)

I have reviewed the project described in this application and have determined that:

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☐ This project is consistent with the comprehensive plan and land use regulations.

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- ☐ Development Permit
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☐ This project is not consistent with the comprehensive plan. Consistency requires:

- ☐ Plan Amendment
- ☐ Zone Change
- ☐ Other Approval or Review (see comment section)

An application ☐ has ☐ has not been filed for local approvals checked above.

Local planning official name (print)	Title	City / County (circle one)
Connie Randall	Planning Manager	Sherwood

Signature	Date
Connie Randall	3/30/17

Comments:

Pipeline work for utilities in the right-of-way is exempt from City of Sherwood land use review. Tualatin-Sherwood Road and Roy Rogers Road are within Washington County's jurisdiction.

(11) COASTAL ZONE CERTIFICATION

If the proposed activity described in your permit application is within the Oregon coastal zone, the following certification is required before your application can be processed. A public notice will be issued with the certification statement, which will be forwarded to the Oregon Department of Land Conservation and Development (DLCD) for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program, contact DLCD at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Name	Title
N/A	N/A
Signature	**Date**

(10) CITY/COUNTY PLANNING DEPARTMENT LAND USE AFFIDAVIT (TO BE COMPLETED BY LOCAL PLANNING OFFICIAL)

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- ☒ Development Permit
- ☒ Other Permit (see comment section)

☐ This project is not consistent with the comprehensive plan. Consistency requires:

- ☐ Plan Amendment
- ☐ Zone Change
- ☐ Other Approval or Review (see comment section)

An application ☐ has ☒ has not been filed for local approvals checked above.

Local planning official name (print)	Title	(City) / County (circle one)
Daniel Pauly	Senior Planner	Wilsonville

Signature	Date
	3/23/17

Comments:
- Work in Willamette River Greenway requires Conditional Use Permit
- Pipeline and associated vents, access points, etc. are exempt from Wilsonville land use permitting as "utilities"
- Buildings require development permit but are expected to be outside areas subject to JPA.

(11) COASTAL ZONE CERTIFICATION

If the proposed activity described in your permit application is within the Oregon coastal zone, the following certification is required before your application can be processed. A public notice will be issued with the certification statement, which will be forwarded to the Oregon Department of Land Conservation and Development (DLCD) for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program, contact DLCD at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Name	Title
N/A	N/A
Signature	**Date**

(10) CITY/COUNTY PLANNING DEPARTMENT LAND USE AFFIDAVIT (TO BE COMPLETED BY LOCAL PLANNING OFFICIAL)

I have reviewed the project described in this application and have determined that:

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☐ This project is consistent with the comprehensive plan and land use regulations.

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- ☒ Development Permit
- ☒ Other Permit (see comment section)

☐ This project is not consistent with the comprehensive plan. Consistency requires:

- ☐ Plan Amendment
- ☐ Zone Change
- ☐ Other Approval or Review (see comment section)

An application ☐ has ☒ has not been filed for local approvals checked above.

Local planning official name (print)	Title	City / County (circle one)
Scott Whyte	Senior Planner	Beaverton

Signature	Date
Scott Whyte	3-29-17

Comments:

Pipeline work is exempt where located within existing right-of-way. Work that involves acquisition of new right-of-way, or work that includes construction activities outside the public right-of-way or easement, including contractor staging and stockpiling of materials, may be subject to Public Transportation Facility approval (40.57.15 of the Beaverton Development Code). Other land use applications, depending on project scope, may include Tree Plan 2 (Section 40.90.15.2). Following land use approval, Site Development Permit(s) will need to be obtained from the city (administrative).

(11) COASTAL ZONE CERTIFICATION

If the proposed activity described in your permit application is within the Oregon coastal zone, the following certification is required before your application can be processed. A public notice will be issued with the certification statement, which will be forwarded to the Oregon Department of Land Conservation and Development (DLCD) for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program, contact DLCD at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Name	Title
N/A	N/A

Signature	Date

(10) CITY/COUNTY PLANNING DEPARTMENT LAND USE AFFIDAVIT (TO BE COMPLETED BY LOCAL PLANNING OFFICIAL)

I have reviewed the project described in this application and have determined that:

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☒ This project will be consistent with the comprehensive plan and land use regulations when the following local approval(s) are obtained:

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- ☒ Development Permit
- ☒ Other Permit (see comment section)

☐ This project is not consistent with the comprehensive plan. Consistency requires:

- ☐ Plan Amendment
- ☐ Zone Change
- ☐ Other Approval or Review (see comment section)

An application ☐ has ☒ has not been filed for local approvals checked above.

Local planning official name (print)	Title	City / County (circle one)
GENNY BOND	SENIOR PLANNER	WASHINGTON

Signature	Date
Amy Bond	3.17.17

Comments:

Pipeline: Special Use and Development Review permit where not exempt (exempt in right-of-way and adjacent to right-of-way in agricultural zones); Section 421 and 422 flood plain and significant natural resource requirements, tree removal, and staging addressed as part of Special Use and Development Review permit

Reservoir: Special Use and Development Review permit; Section 421 and 422 flood plain and significant natural resource requirements and staging to be addressed as part of Special Use and Development Review permit

(11) COASTAL ZONE CERTIFICATION

If the proposed activity described in your permit application is within the Oregon coastal zone, the following certification is required before your application can be processed. A public notice will be issued with the certification statement, which will be forwarded to the Oregon Department of Land Conservation and Development (DLCD) for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program, contact DLCD at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Name	Title
N/A	N/A

Signature	Date

(12) SIGNATURES

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and, to the best of my knowledge and belief, this information is true, complete and accurate. I further certify that I possess the authority to undertake the proposed activities. By signing this application I consent to allow USACE or DSL staff to enter into the above-described property to inspect the project location and to determine compliance with an authorization, if granted. I hereby authorize the person identified in the authorized agent block below to act in my behalf as my agent in the processing of this application and to furnish supplemental information in support of this permit application. I understand that the granting of other permits by local, county, state or federal agencies does not release me from the requirement of obtaining the permits requested before commencing the project. I understand that payment of the required state processing fee does not guarantee permit issuance.

To be considered complete, the fee must accompany the application to DSL. The fee is not required for submittal of an application to the USACE.

Fee Amount Enclosed	$ 1,191
Applicant Signature	
Print Name Kevin Hanway	Title Director, City of Hillsboro Water Department
Signature Kevin Hanway	Date 03/28/2017
Authorized Agent Signature	
Print Name Ethan Rosenthal	Title Ecologist
Signature	Date
Landowner Signature(s)	
Landowner of the Project Site (if different from applicant)	
Print Name	Title
Signature	Date
Landowner of the Mitigation Site (if different from applicant)	
Print Name	Title
Signature	Date
Department of State Lands, Property Manager (to be completed by DSL)	
If the project is located on state-owned submerged and submersible lands, DSL staff will obtain a signature from the Land Management Division of DSL. A signature by DSL for activities proposed on state-owned submerged/submersible lands only grants the applicant consent to apply for a removal-fill permit. A signature for activities on state-owned submerged and submersible lands grants no other authority, express or implied and a separate proprietary authorization may be required.	
Print Name	Title
Signature	Date

(12) SIGNATURES

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and, to the best of my knowledge and belief, this information is true, complete and accurate. I further certify that I possess the authority to undertake the proposed activities. By signing this application I consent to allow USACE or DSL staff to enter into the above-described property to inspect the project location and to determine compliance with an authorization, if granted. I hereby authorize the person identified in the authorized agent block below to act in my behalf as my agent in the processing of this application and to furnish supplemental information in support of this permit application. I understand that the granting of other permits by local, county, state or federal agencies does not release me from the requirement of obtaining the permits requested before commencing the project. I understand that payment of the required state processing fee does not guarantee permit issuance.
To be considered complete, the fee must accompany the application to DSL. The fee is not required for submittal of an application to the USACE.

Fee Amount Enclosed	$ 1,191

Applicant Signature

Print Name Mark Knudson	Title CEO, Tualatin Valley Water District
Signature	Date 3/28/17

Authorized Agent Signature

Print Name Ethan Rosenthal	Title Ecologist
Signature	Date

Landowner Signature(s)

Landowner of the Project Site (if different from applicant)

Print Name	Title
Signature	Date

Landowner of the Mitigation Site (if different from applicant)

Print Name	Title
Signature	Date

Department of State Lands, Property Manager (to be completed by DSL)

If the project is located on state-owned submerged and submersible lands, DSL staff will obtain a signature from the Land Management Division of DSL. A signature by DSL for activities proposed on state-owned submerged/submersible lands only grants the applicant consent to apply for a removal-fill permit. A signature for activities on state-owned submerged and submersible lands grants no other authority, express or implied and a separate proprietary authorization may be required.

Print Name	Title
Signature	Date

(13) ATTACHMENTS

- ☑ **Drawings (items in bold are required)**
  - ☑ **Location map with roads identified**
  - ☑ **U.S.G.S topographic map**
  - ☑ **Tax lot map**
  - ☑ **Site plan(s)**
  - ☑ **Cross section drawing(s)**
  - ☑ **Recent aerial photo**
  - ☐ Project photos
  - ☑ Erosion and Pollution Control Plan(s), if applicable
  - ☑ DSL/Corps Wetland Concurrence letter and map, if approved and applicable
- ☑ Pre-printed labels for adjacent property owners (Required if more than 5)
- ☑ Restoration plan or rehabilitation plan for temporary impacts
- ☐ Mitigation plan
- ☑ Wetland functional assessment and/or stream functional assessment
- ☑ Alternatives analysis
- ☑ Biological assessment (if requested by Corps project manager during pre-application coordination.)
- ☑ Stormwater management plan (may be required by the Corps or DEQ)
- ☐ Other:
  - ☐
  - ☐

Send Completed form to:

U.S. Army Corps of Engineers
ATTN: CENWP-OD-GP
PO Box 2946
Portland, OR 97208-2946
Phone: 503-808-4373

Counties:
Baker, Clackamas, Clatsop, Columbia, Gilliam, Grant, Hood River, Jefferson, Lincoln, Malheur, Marion, Morrow, Multnomah, Polk, Sherman, Tillamook, Umatilla, Union, Wallowa, Wasco, Washington, Wheeler, Yamhill

OR

U.S. Army Corps of Engineers
ATTN: CENWP-OD-GE
211 E. 7th AVE, Suite 105
Eugene, OR 97401-2722
Phone: 541-465-6868

Counties:
Benton, Coos, Crook, Curry, Deschutes, Douglas Jackson, Josephine, Harney, Klamath, Lake, Lane, Linn

Send Completed form to:

DSL - West of the Cascades:

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
Phone: 503-986-5200

OR

DSL - East of the Cascades:

Department of State Lands
1645 NE Forbes Road, Suite 112
Bend, Oregon 97701
Phone: 541-388-6112

Send all Fees to:
Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
Pay by Credit Card by Calling 503-986-5253

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Attachment A: JPA Form Information Supplements

Attachment B: Wetland Functional Assessment Memorandum

Attachment C: Wetland Delineation Concurrence Letters

Attachment D: Alternatives Analysis

Attachment E: Figures

- Vicinity (Map Keys)
- USGS Topographic Maps, Tax Maps, and Aerial Photos by Work Package
- Work Package Design Drawings
  - Raw Water Facilities
  - Reservoir Facilities
  - Willamette Water Supply System Water Treatment Plant (WWSS WTP)
  - Transmission Pipelines
- Additional Environmental Benefits Projects

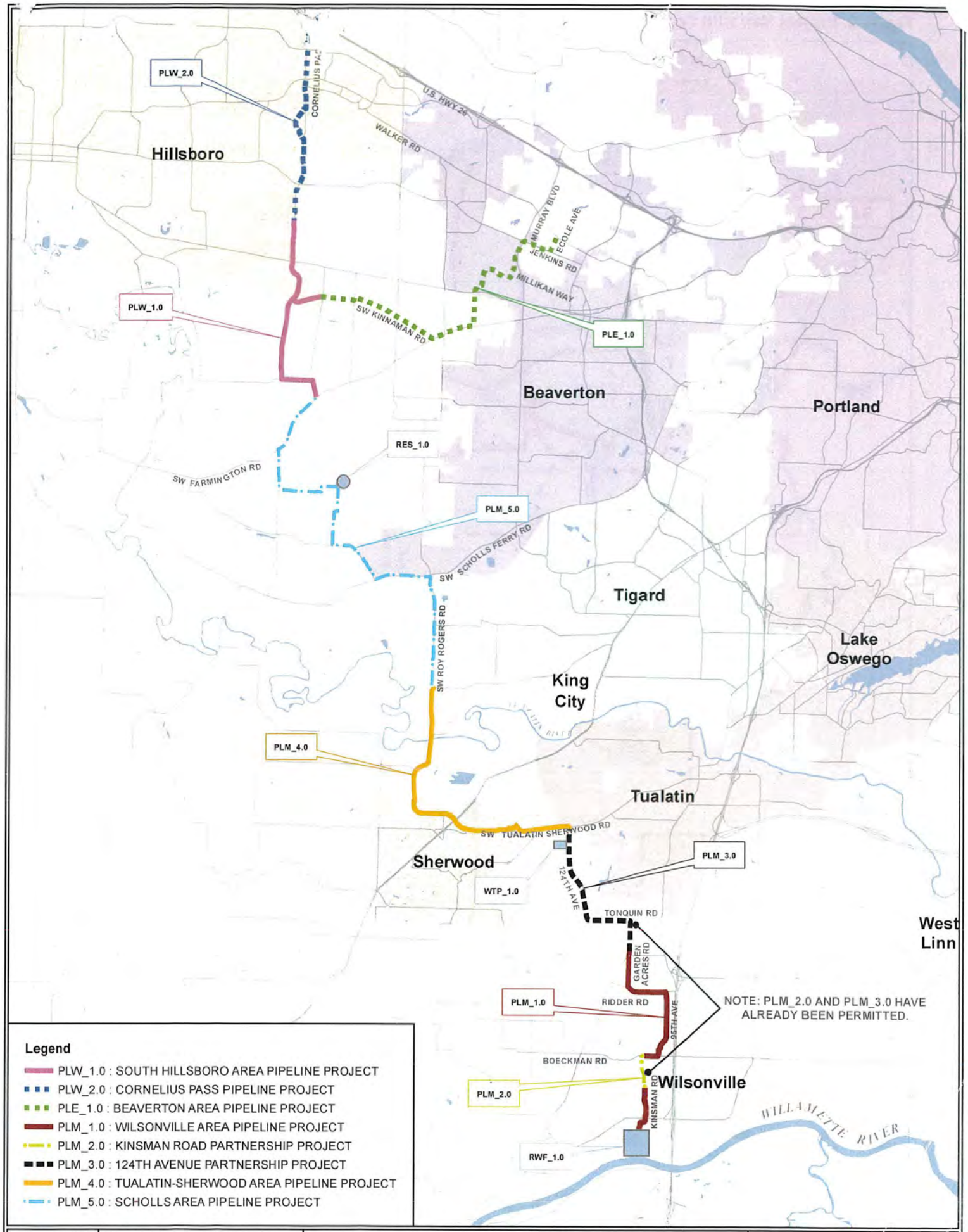
Attachment F: Conceptual Post-Construction Site Restoration Plan

Attachment G: Example Erosion and Sediment Control Plan (Chicken Creek Crossing)

Attachment H: Adjacent Property Owners/Mailing Labels

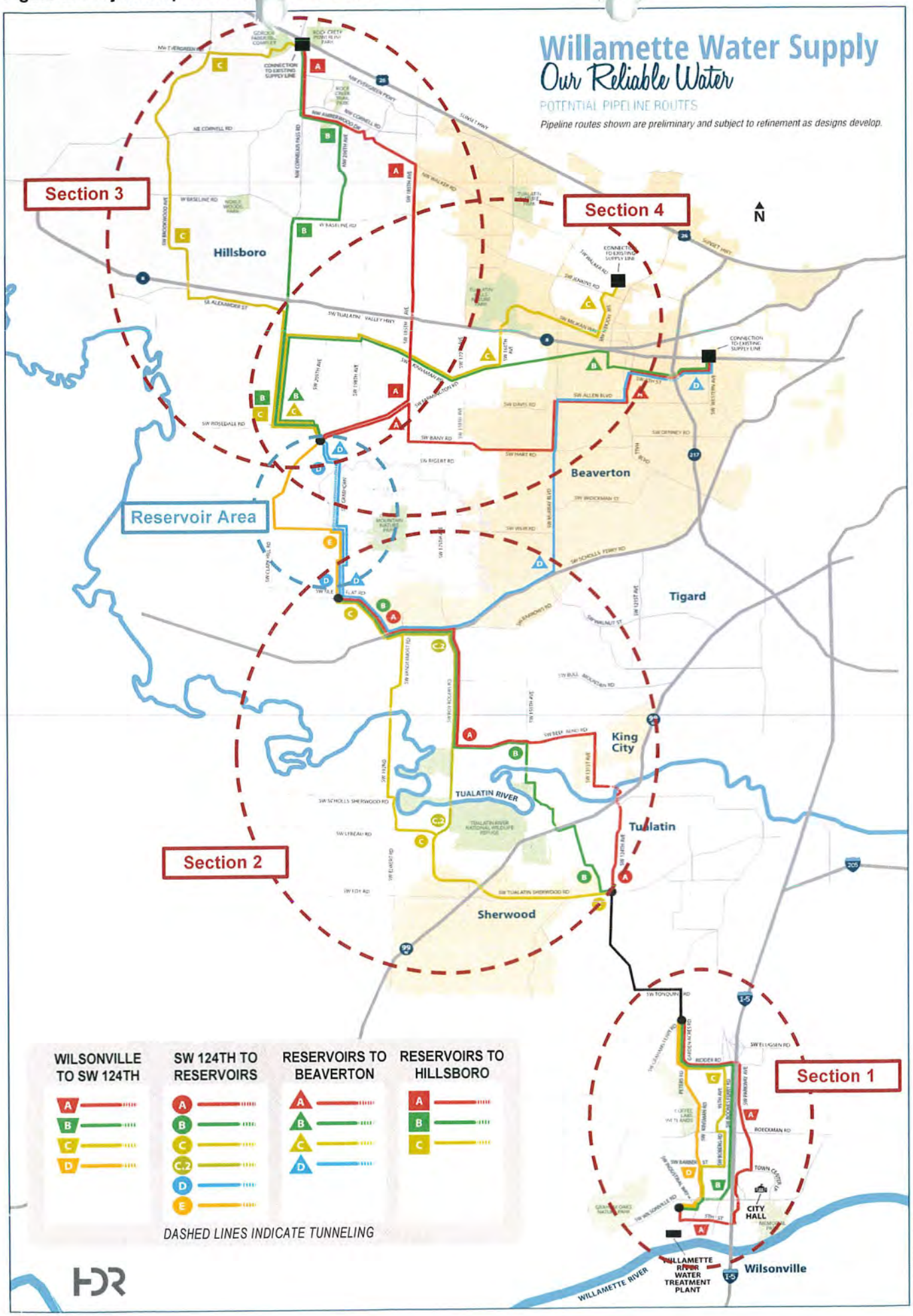
Attachment I: Biological Assessment (Provided under separate cover to USACE)

Attachment J: Cultural Resources Report/Programmatic Agreement (Provided under separate cover to USACE)



01/17/2017	Mile 0 0.5 1 N	WILLAMETTE WATER SUPPLY PROGRAM PIPELINE EXTENTS FIGURE 1	Willamette Water Supply Our Reliable Water

Figure 2. Project Map with Sections Labeled



Attachment A: JPA Form Information Supplements

Attachment A1

JPA Section (2) Project Information Supplement

TAX LOTS

Work Package	Tax lot ID's
PLM_1.0	
	31W23B00100, 31W23B00300, 31W23B00500, 31W23B00400, 31W23B00601, 31W23B00800, 31W23B00900, 31W14C00100, 31W14C00180, 31W14C00302, 31W14B00202, 31W14B00300, 31W14B00203, 31W11A00100, 31W11A00102, 31W11A00800, 31W11A01200, 31W14A02200, 31W11C00603, 31W11D00200, 31W11D00300, 31W11D00400, 31W11D00500, 31W11D00702, 31W11D00901, 3S102CD00600, 3S102C001400, 3S102DC00600, 3S103A001700, 3S103D000100, 3S103D000201, 3S103D000301, 3S103D000302, 3S103D000700, 3S102B000800, 31W14B00900
PLM_4.0	
	2S128A001200, 2S128BC00100, 2S128BC00700, 2S128BC00800, 2S128BC00900, 2S128BC01000, 2S128BD00400, 2S128BD00500, 2S128BD00600, 2S128BD00700, 2S129A000301, 2S129A000400, 2S129A000500, 2S129A001100, 2S129A001700, 2S129A002600, 2S129A002900, 2S129A003000, 2S129A003100, 2S129B000600, 2S129B000900, 2S129B000901, 2S129B001400, 2S129BC00400, 2S130AB07600, 2S130AB12600, 2S1190000201, 2S1190001000, 2S1190001004, 2S1190001008, 2S1180001404, 2S1180001405, 2S1180001501, 2S1180001502, 2S1170000400
PLM_5.0	
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Attachment A1

JPA Section (2) Project Information Supplement

Work Package	Tax lot ID's
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PLW_1.0	
	1S202CC00100, 1S202CC00100, 1S202CC00700, 1S202CC01100, 1S202CC01100, 1S202CC16800, 1S202CC16900, 1S202CC17000, 1S202CC17100, 1S202CC18500, 1S202CD07400, 1S202CD08400, 1S202CD11600, 1S2110001600, 1S211BA00200, 1S211BA01300, 1S211BA26400, 1S211BB01500, 1S211BB01600, 1S211BB01700, 1S211BB01700, 1S211BC00100, 1S211BC00101, 1S211BC00102, 1S211BC00103, 1S211BC01500, 1S211BC01600, 1S211BC01702, 1S211BC01703, 1S211BC01900, 1S2140001900, 1S2140002300, 1S2140002402, 1S2140002404, 1S2140002600, 1S2230000401, 1S2230000600, 1S2230001100, 1S2230001200, 1S2230001300, 1S2230001400, 1S2230001401, 1S2230001900, 1S2230002000, 1S2230002200, 1S2230002200, 1S2230002203, 1S2230002203, 1S2230002401, 1S2230002401, 1S2230002402, 1S2230002402, 1S2230002403, 1S223AC02400, 1S223AC02600, 1S223AC02700, 1S223AC02800, 1S223DA90000
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Attachment A1

JPA Section (2) Project Information Supplement

Work Package	Tax lot ID's
PLE_1.0	
	1S1080000104, 1S1080000107, 1S1080000107, 1S1080000113, 1S1080000290, 1S1080000501, 1S1080001800, 1S1080002500, 1S1080002500, 1S1080002800, 1S1080002800, 1S108CD00700, 1S108DB00700, 1S108DB00700, 1S108DB01000, 1S108DB01100, 1S108DB01400, 1S1090000701, 1S1090001100, 1S1090001100, 1S109BB30700, 1S1170000101, 1S1170000101, 1S117BB00201, 1S117BB00202, 1S117BB00203, 1S117BB02300, 1S117BB02400, 1S117BB03900, 1S117BC00500, 1S117BC01200, 1S117BC01300, 1S117BC02300, 1S117BC02400, 1S117BC02500, 1S117BC02600, 1S117BC02601, 1S117BC02700, 1S117BC02800, 1S117BC02900, 1S117BC02902, 1S117BC03000, 1S117BC06800, 1S117CB00303, 1S118BC01601, 1S118BC01700, 1S118CB02300, 1S118CB02400, 1S118CB14800, 1S118DA00600, 1S118DA00700, 1S118DA00800, 1S118DA03900, 1S213AB00100, 1S213AB00601, 1S213AB00602, 1S213AB00900, 1S213AB01000, 1S213AB01002, 1S213AB01201, 1S213AB01400, 1S213AB01500, 1S213AB08100, 1S213AB09500, 1S213AB12100, 1S213AB12900, 1S213AB13000, 1S213AB13500, 1S213AB13500, 1S213AB13600, 1S213AC00100, 1S213AC00200, 1S213AD02800, 1S213AD02900, 1S213AD03000, 1S213AD03100, 1S213AD03100, 1S213AD06700, 1S213AD06900, 1S213BA00301, 1S213BA00400, 1S213BA00600, 1S213BA03400, 1S213BA03401, 1S213BA03402, 1S213BA03500, 1S213BA03501, 1S213BA03601, 1S213BA03602, 1S213BA03603, 1S213BA03700, 1S213BB01600, 1S118BC01701, 1S118BC03200, 1S118BC03800, 1S118BC03900, 1S118BC04000, 1S118BC04001, 1S118BC11800, 1S118BD01300, 1S118BD01400, 1S118BD01500, 1S118BD01600, 1S118BD01700, 1S118BD01800, 1S118CA00101, 1S118CB00312, 1S118CB00313, 1S118CB02200, 1S213BB01700, 1S213BB01800, 1S213BB03000, 1S214AA00300, 1S214AA00600, 1S214AA05100, 1S214AA05200, 1S214AA05300, 1S214AA05400, 1S214AA13700, 1S214AA13800, 1S214AA13900, 1S214AA152004
Raw Water Facilities (RWF_1.0)	31W23B01900 and 01800
Reservoir Facilities (RES_1.0)	1S2360000200 (staging site 1S2360000304)
Willamette Water Supply System Water Treatment Plant (WWSS WTP)	2S128D000100

Attachment A1

JPA Section (2) Project Information Supplement

LATITUDE AND LONGITUDE (PROGRAM END POINTS AND KEY FEATURES)

Description	Latitude	Longitude
Pipeline (southern terminus) and RWF	45.2940	-122.7829
Pipeline (northern terminus)	45.5527	-122.9011
Pipeline (eastern terminus)	45.5051	-122.8157
Reservoir Facilities	45.4472	-122.8836
WWSS WTP	45.3649	-122.8087

TOWNSHIP, RANGE, SECTION

PLM_1.0	T3S R1W S2, T3S R1W S3, T3S R1W S11, T3S R1W S14, T3S R1W S22, T3S R1W S23
PLM_4.0	T2S R1W S18, T2S R1W S19, T2S R1W S20, T2S R1W S28, T2S R1W S29, T2S R1W S30
PLM_5.0	T1S R2W S23, T1S R2W S25, T1S R2W S26, T1S R2W S34, T1S R2W 35, T1S R2W S36 T2S R1W S6, T2S R1W S7, T2S R1W S18, T2S R2W S1
PLW_1.0	T1S R2W S1, T1S R2W S3, T1S R2W S14, T1S R2W S23
PLW_2.0	T1N R2W S35, T1S R2W S1, T1S R2W S2, T1S R2W S3
PLE_1.0	T1S R1W S4, T1S R1W S8, T1S R1W S17, T1S R1W S18, T1S R2W S14
Reservoir Facilities	T1S R2W S36
WWSS WTP	T2S R1W S28

BRIEF DIRECTIONS TO SITE

From Portland take I-5 south to Wilsonville (exit 283). Continue west on SW Wilsonville Road to Arrowhead Creek Lane and follow the road to the Willamette River Water Treatment Plant (WRWTP) (10350 Arrowhead Creek Lane, Wilsonville, OR 97070). This is the southern end of the Project facilities.

Program work package PLM_1.0 heads north from the WRWTP along SW Arrowhead Creek Lane, to SW Wilsonville Road, to SW Kinsman Road, where it stops at the intersection with SW Barber Street. Work package PLM_2.0, which has already been permitted and is under construction, starts at this point and ends where PLM_1.0 begins again further north at the intersection of SW Kinsman Road (under construction) and SW Boeckman Road. PLM_1.0 heads east from this intersection before turning north onto SW 95th Avenue. It follows SW 95th Avenue until turning west onto SW Ridder Road. Follow the road until turning north onto SW Garden Acres Road. PLM_1.0 ends a bit north of the end of Garden Acres Road on SW Grahams Ferry Rd, where it then becomes PLM_3.0. PLM_3.0 has already been permitted and is under construction.

The proposed Willamette Water Supply System Water Treatment Plant (WWSS WTP) is located off of SW Tualatin-Sherwood Road near the intersection with SW 124th Avenue, on a portion of currently undeveloped tax lot ID 2S128D000100.

Program work package PLM_4.0 starts at the intersection of SW Tualatin-Sherwood Road and SW 124th Avenue. The alignment follows SW Tualatin-Sherwood Road west through the city of Sherwood and continues as the road turns north and becomes SW Roy Rogers Road. PLM_4.0 continues along SW Roy Rogers Road until it ends at the intersection with SW Beef Bend Road.

PLM_5.0 begins where PLM_4.0 ends, continuing north along SW Roy Rogers Road until heading west along SW Scholls Ferry Road. It eventually turns right onto SW Tile Flat Road and then another right onto

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SW Grabhorn Road. Shortly after the intersection with SW Stonecreek Drive, PLM_5.0 heads off of SW Grabhorn Road, going over private parcels in a generally southwest direction until intersecting with SW Clark Hill Road due south of SW Koehler Road. The alignment continues to the north on SW Clark Hill Road until turning right onto SW Farmington Road. The north end of PLM_5.0 ends at SW Farmington Road and SW 209th Avenue.

The Reservoirs site is situated along the PLM_5.0 route on an undeveloped property in the southeast corner of the intersection of SW Grabhorn Road and SW Stonecreek Drive.

PLW_1.0 continues north from the north end of PLM 5.0heading along SW 209th Avenue and follows it north until turning west onto SW Rosedale Road. About 0.5 mile down SW Rosedale Road, the alignment heads northward, overland, through private parcels. PLW_1.0 ends on the south side of the intersection of SW Cornelius Pass Road and SW Tualatin Valley Highway.

PLW_2.0 continues along SW Cornelius Pass Road, heading north from the SE Frances Street intersection, and then ending near the south side of the Highway 26 interchange.

PLE_1.0 starts at SW 209th Avenue and heads east along SW Kinnamon Road until turning eastward on SW Farmington Road. The alignment then turns north onto SW 160th Avenue, crosses SW Tualatin Valley Highway, and continues north on SW Millikan Way. The route eventually heads north along an abandoned (i.e., tracks removed) section of P&W Rail right-of-way, crosses the Tri-Met light rail alignment, and then continues northward on SW Terman Road. From SW Terman Road the route continues northward onto SW Murray Boulevard until turning east onto SW Jenkins Road. From SW Jenkins Road, it turns north onto SW Ecole Avenue. PLE_1.0 terminates at the intersection of SW Ecole Avenue and SW Walker Road.

WATER BODY OR WETLANDS

See table (Attachment A.2) for JPA Section 4.A.

HYDROLOGIC UNIT CODES (6TH LEVEL –HUC12)

HUC Name	HUC12 Code
Coffee Lake Creek-Willamette River Watershed	170900070402
Saum Creek-Tualatin River Watershed	170900100504
Chicken Creek Watershed	170900100501
Rock Creek-Tualatin River Watershed	170900100503
Christensen Creek Watershed	170900100406
Davis Creek-Tualatin River Watershed	170900100404
Lower Rock Creek Watershed	170900100403
Beaverton Creek Watershed	170900100401
Upper Rock Creek Watershed	170900100402

Attachment A.2: JPA Section (4.A) WWSS Jurisdictional Wetland and Waterway Crossings (Impact acreage and volumes provided in table Attachment A.3)

Work Package	Resource Crossing	Delineation Feature ID's	Resource Description	Listed Species	Fish Habitat (per ODFW maps)	Planned Crossing Method or Activity	Impacts to Jurisdictional Resources Avoided?
RWF 1.0	Willamette River	Willamette River	Steep upland forested bluff leads down to a narrow, moderate to gradual sloping flood bench adjacent to open water/channel of Willamette River. OHW extends beyond the channel and onto the floodbench as evidenced by flood deposits, drift lines, and a break between persistent vegetation cover in the herbaceous layer. The intake is located in the river proper, with no aboveground structures.	UWR steelhead , UWR Chinook salmon critical habitat	Steelhead rearing and migration; provides habitat for non-listed species	Proposed fish screen replacement	Structural fill from the fish screen replacement only
RWF 1.0	Arrowhead Creek at Arrowhead Creek Lane	Arrowhead Creek	Perennial stream that drains to Coffee Lake Creek. Forested riparian corridor in most areas, but dominated by blackberry at proposed crossing location.	Drains to steelhead and Chinook critical habitat	No steelhead habitat; provides habitat for non-listed species	Trenchless	Impacts avoided
WTP 1.0 (WWSS WTP)	Wetland A	A	Small isolated depresssional palustrine scrub-shrub wetland, roughly half of which is surrounded by rocky slopes and rock overhangs. Dominated by native vegetation including Douglas spirea, Oregon ash, Pacific crabapple, slough sedge, swamp rose, and Pacific willow. Bordered by Oregon oak/madrone and Douglas fir habitats.	None	None	Development fill, entire wetland	Permanent impact
WTP 1.0 (WWSS WTP)	Wetland B	B	Small isolated depresssional unconsolidated bottom wetland, consists largely of unvegetated ponded water over 2 feet deep but less than 6 feet deep. Surrounded by rocky outcroppings, steep rock faces, and boulders. Where present, vegetation is dominated by reed canarygrass, colonial bentgrass, and swamp rose. Bordered by Oregon oak/madrone and Douglas fir habitats.	None	None	Development fill, entire wetland	Permanent impact
WTP 1.0 (WWSS WTP)	Wetland C	C	A palustrine forested and scrub-shrub wetland, typical of Oregon ash swale wetlands. Dominated by Oregon ash, swamp rose, Douglas spirea, and slough sedge. Drains off-site to the north and eventually to a tributary of the Tualatin River. Bordered by Oregon oak/madrone and Douglas fir habitats.	None	None	Development fill and retaining wall to limit impacts	Permanent impact; temporary impact to forested wetland to construct retaining wall will be mitigated as though permanent impact
WTP 1.0 (WWSS WTP)	Wetland D	D	Small isolated depressional wetland with shallow ponded water. Wetland a palustrine scrub-shrub wetland but also has a large palustrine unconsolidated bottom component. Vegetated area is dominated by Douglas spirea, Pacific crabapple, and swamp rose. Bordered by Oregon oak/madrone and Douglas fir habitats.	None	None	Development fill and retaining wall to limit impacts	Permanent impact; temporary impact to construct retaining wall
WTP 1.0 (WWSS WTP)	Wetland E	E	Small isolated depressional palustrine scrub-shrub wetland. Contained shallow ponded water. Vegetated area is dominated by Douglas spirea, Pacific crabapple, and Nootka rose. Bordered by Oregon oak/madrone and Douglas fir habitats.	None	None	Development fill, entire wetland	Permanent impact
WTP 1.0 (WWSS WTP)	Wetland F	F	Small isolated palustrine forested wetland, with some areas of palustrine scrub-shrub and emergent habitats. Dominated by Oregon ash, colonial bentgrass, toad rush, and Oregon ash saplings. Bordered by Oregon oak/madrone and Douglas fir habitats.	None	None	Development fill, entire wetland	Permanent impact

Attachment A.2: JPA Section (4.A) WWSS Jurisdictional Wetland and Waterway Crossings (Impact acreage and volumes provided in table Attachment A.3)

Work Package	Resource Crossing	Delineation Feature ID's	Resource Description	Listed Species	Fish Habitat (per ODFW maps)	Planned Crossing Method or Activity	Impacts to Jurisdictional Resources Avoided?
WTP 1.0 (WWSS WTP)	Wetland G	G	A large isolated depressional wetland consisting of native palustrine forested, scrub-shrub, and emergent communities along with some areas of shallow open water. Northern half of the wetland has steep rocky terrain with slopes up to 100% from between 5 and 30 feet from the wetland boundary. The remainder of the wetland had more gentle slopes. Dominant species included Pacific willow, Douglas spirea, swamp rose, and Pacific crabapple, tall mannagrass, and cattail. Bordered by Oregon oak/madrone and Douglas fir habitats.	None	None	Avoided; development placed as far away as practicable	No impact
WTP 1.0 (WWSS WTP)	Potential Wetland H	PW-H	Area not visited; additional field work needed. Based on topography and aerial photos, assumed to be an isolated depressional wetland similar to Wetland D.	None	None	Development fill and retaining wall to limit impacts	Permanent impact; temporary impact to construct retaining wall
PLM_1.0	Coffee Lake Creek at Industrial Way/Ore-Pac Avenue	S-M1-1 and W-M1-1	Creek is small and sparsely vegetated in this location. Contains fringe of riverine palustrine emergent wetland dominated by reed canarygrass.	Drains to steelhead and Chinook critical habitat	No steelhead habitat; provides habitat for non-listed species	Open trench	Temporary impacts
PLM_1.0	Tapman Creek at SW Ridder Road	S1-2	Highly degraded, ditched section of creek that is a tributary to Coffee Lake Creek. Creek is mostly piped north of Ridder Road except at small pond outlet point, surrounded by parking lot, adjacent to north side of road.	Drains to steelhead and Chinook critical habitat	No steelhead habitat; habitat for non-listed species uncertain due to poor connectivity and habitat quality	In roadway, above or below culvert	Impacts avoided
PLM_4.0	WQ facility in line with tributary to Hedges Creek at SW 124th Ave/Tualatin-Sherwood Rd intersection	124th-B	Water detention pond in-line with natural intermittent drainage feature. Outflows are piped from this feature to unknown location but are assumed to make their way to Hedges Creek.	May drain to steelhead habitat in Hedges Creek	No steelhead habitat; no habitat for non-listed species	Open trench	Temporary impacts
PLM_4.0	Rock Creek at Tualatin-Sherwood Road	S2-1	Crossing to occur over existing box culverts in roadway. Fairly degraded stream corridor on north side of proposed crossing. Stream is ditched in a ravine formed in part by adjacent development fills. Riparian corridor consists of extensive Himalayan blackberry thickets with some tree canopy. Stream has perennial flow. Flows to the Tualatin River National Wildlife Refuge. South side of crossing consists of extensive floodplain with relatively degraded habitat and permitted mitigation site.	Steelhead	Steelhead rearing; provides habitat for non-listed species	In roadway, above culvert	Impacts avoided
PLM_4.0	Chicken Creek at Roy Rogers Road	S2-2 and W-M4-1	Chicken Creek is a perennial stream. Flows to the Tualatin River National Wildlife Refuge. Slope wetland with palustrine emergent wetland dominated by invasive reed canarygrass occupies most of the floodplain on north side of creek. Narrower flood bench with forested wetland occurs on south side of creek, with forested riparian community and blackberry thickets continuing along the adjacent steep slope.	Steelhead	Steelhead rearing; provides habitat for non-listed species	Open trench	Temporary impacts (impacts to forested wetland to be mitigated as though a permanent impact)
PLM_4.0	Tualatin River at Roy Rogers Road	S2-3 and W2-3	River crossing adjacent to Tualatin River National Wildlife Refuge. The refuge consists of managed wet pasture/agricultural fields in this area. The river has a relatively narrow band of forested riparian vegetation along both banks.	Steelhead	Steelhead migration; provides habitat for non-listed species	Trenchless	Impacts avoided
PLM_4.0	Wetland North of Elsner Road	W2-4	Depressional agricultural wetland that floods in winter providing potential wintertime waterfowl habitat. Likely connects to Tualatin River off-site to the west of Roy Rogers Road during periods of river flooding, but otherwise likely no direct surface water connection.	Drains to steelhead migration habitat in Tualatin River	None	Open trench	Temporary impacts

Attachment A.2: JPA Section (4.A) WWSS Jurisdictional Wetland and Waterway Crossings (Impact acreage and volumes provided in table Attachment A.3)

Work Package	Resource Crossing	Delineation Feature ID's	Resource Description	Listed Species	Fish Habitat (per ODFW maps)	Planned Crossing Method or Activity	Impacts to Jurisdictional Resources Avoided?
PLM_5.0	Drainage North of Beef Bend Road #1	S2-4 and W-M5-10	Small intermittent drainage that runs through forested slope wetland in ravine bottom. Ravine slopes are forested.	Drains to steelhead migration habitat in Tualatin River	No steelhead habitat; habitat for non-listed species unlikely	Open trench	Temporary impacts (impacts to forested wetland to be mitigated as though a permanent impact)
PLM_5.0	Drainage North of Beef Bend Road #2	S-M5-7	Unnamed creek in steep v-shaped ravine with no floodplain in bottom at crossing location. Channel is deeply incised. Creek is perennial but with very minimal flow in summer. Ravine slopes are forested.	Drains to steelhead migration habitat in Tualatin River	No steelhead habitat; provides habitat for non-listed species	Trenchless	Impacts avoided
PLM_5.0	Ag drainage crossing at Roy Rogers Road	S-M5-6	Agricultural drainage ditch mostly on east side of Roy Rogers Road, but small section is exposed on west side before being piped further west through private property.	None	None	Open trench	Temporary impacts
PLM_5.0	Bridge North of Bull Mountain Road	S-M5-5	Unnamed perennial creek in steep v-shaped ravine with no floodplain in bottom at crossing location. Ravine slopes are forested.	Drains to steelhead migration habitat in Tualatin River	No steelhead habitat; provides habitat for non-listed species	Trenchless	Impacts avoided
PLM_5.0	Wetland at Scholls Ferry Road	M5-PW1, M5-PW2	Potential agricultural wetlands (hay field) situated in depressions along north side of Scholls Ferry Road.	None	None	Open trench	Temporary impacts
PLM_5.0	Creek Crossings at Scholls Ferry Road near Vandermost Road	S2-5 and S2-6	Confluence of two drainages. Eastern drainage is a perennial creek with forested areas on both sides of road, although only a very narrow band of trees on the north side. West drainage near Vandermost Road flows from in-line irrigation pond, then along north side of Scholls Ferry road in ditch, and then flows under road via culvert, and continues along south side of road until it joins the eastern creek. Stream corridors are fairly degraded, although habitat quality appears better on south side of road.	Drains to steelhead migration habitat in Tualatin River	No steelhead habitat; provides habitat for non-listed species	Open trench	Temporary impacts
PLM_5.0	Wetland at Tile Flat Road/Kobbe Drive	W-M5-9	Small isolated depressional wetland dominated by emergent species bordered by trees. Bordered by roads and pasture.	None	None	Open trench	Temporary impacts
PLM_5.0	Wetlands near Intersection of Tile Flat and Grabhorn Roads	W2-7	Emergent wetlands dominated by reed canarygrass bordered by upland pasture. Drains west via an eroding channel through culverts under Grabhorn Road.	None	None	Open trench	Temporary impact
PLM_5.0	McKernan Creek at Grabhorn Road	S2-7 and W-M5-8	Perennial creek parallels east side of road before crossing the road via a culvert. Forested/scrub-shrub wetlands border the creek on east side of road. Lower quality riparian corridor found on west side of road.	None	No steelhead habitat; provides habitat for non-listed species	Open trench on west side of road	Temporary impacts (impacts to forested wetland to be mitigated as though a permanent impact, forested and total wetland impact reduced by shifting to west side of road)
PLM_5.0	Unnamed Seasonal Drainage North of McKernan Creek	D2-43	Seasonal drainage at bend in Grabhorn Road on west side that connects to drainage ditch along east side of road. Drainage ditch may be historic/shifted seasonal channel. Drains to McKernan Creek.	None	None	Open trench on south/east side of road, where feature is a roadside ditch	Temporary impact
PLM_5.0	Unnamed Seasonal Drainage at Tanabe Property	S-M5-1	Poorly defined seasonal drainage. Bordered by a mix of native forest and invasive Himalayan blackberry thickets.	None	None	Open trench	Temporary impact
PLM_5.0	Wetland and small trib at Clark Hill Road	W-M5-3, S-M5-3	Pasture wetland and swale/drainage connected to high quality forested wetland with large trees. Notable beaver activity. Portions of wetland are wet year round. Very poor fish habitat farther downstream across Clark Hill Road due to ditching, lack of riparian cover, and reservoirs.	None	None	Open trench	Temporary impact (work in pasture wetland, forested wetland avoided)

Attachment A.3: JPA Section 6.F-I, WWSP Jurisdictional Wetland and Waterway Impact Quantities (non-ditch features)										
				Wetland Impacts			Waterway Impacts			
Location/Activity	Wetland Delineation Report ID	Temporary, Permanent, No Impact	Pipe Installation Method: Trenchless (T) Open Trench (O) Aerial (A)	sqft	Fill (CY)	Removal (CY)	sqft	Fill (CY)	Removal (CY)	Impact Description and Avoidance and Minimization Notes
RWF 1.0										
Intake	Willamette River	Sec. 404 -No impact, Sec. 10 see notes	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Section 404 = No impact; screen replacement activity will not disturb riverbed. Section 10 = replacement of 66" screen with new 78" screen
Arrowhead Creek crossing	Arrowhead Creek	No impact	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No impact; Trenchless alignment does not impact wetland
Tangent Pipe Wall	Willamette River	Permanent	n/a	n/a	n/a	n/a	13	23	23	Waterway impacts to the Willamette River are those below CWA Sect. 404 OHW (74 feet). Impacts below CWA Sect. 10 would include 208 sqft and 372.32 CY of removal and fill.
Tangent Pipe Wall	Willamette River	Temporary	n/a	n/a	n/a	n/a	436	16	16	Waterway impacts to the Willamette River are those below CWA Sect. 404 OHW (74 feet). Impacts below CWA Sect. 10 would include 3,485 sqft and 137 CY of removal and fill. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access.
Subtotal - Temporary				0	0	0	436	16	16	WILLR
Subtotal - Permanent				0	0	0	13	23	23	WILLR
WTP 1.0										
Filter building foundation and WTP road paving	A	Permanent	n/a	2,700	1,700	800	n/a	n/a	n/a	Site grading and building siting will cause permanent, unavoidable impacts
WTP road paving and site leveling	B	Permanent	n/a	4,800	2,667	533	n/a	n/a	n/a	WTP road paving and site leveling will cause permanent, unavoidable impacts
Retaining wall	C	Permanent	n/a	10,000	5,500	1,100	n/a	n/a	n/a	Retaining wall used to minimize disturbance to resource associated with grading.
Retaining wall	C	Temporary (*)	n/a	4,200	156	156	n/a	n/a	n/a	Temporary impacts associated with constructing retaining wall. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access. Impacts occur to 4,200 sq ft of forested wetland, which will require mitigation.
WTP road paving and site leveling	D	Permanent	n/a	10,000	1,900	-	n/a	n/a	n/a	WTP road paving and site leveling
Ozone contactor foundation and WTP road paving	E	Permanent	n/a	3,400	756	378	n/a	n/a	n/a	Site grading and building siting will cause permanent, unavoidable impacts
WTP road paving and site leveling	F	Permanent	n/a	6,600	2,933	733	n/a	n/a	n/a	WTP road paving and site leveling
Avoided by 200 ft all around	G	No impact	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Avoided by at least 200 ft all around
Subtotal - Temporary				4,200	156	156	0	0	0	
Subtotal - Permanent				37,500	15,456	3,544	0	0	0	

Attachment A.3: JPA Section 6.F-I, WWSP Jurisdictional Wetland and Waterway Impact Quantities (non-ditch features)										
				Wetland Impacts			Waterway Impacts			
Location/Activity	Wetland Delineation Report ID	Temporary, Permanent, No Impact	Pipe Installation Method: Trenchless (T) Open Trench (O) Aerial (A)	sqft	Fill (CY)	Removal (CY)	sqft	Fill (CY)	Removal (CY)	Impact Description and Avoidance and Minimization Notes
PLM 1.0 - Wilsonville Area Pipeline Project										
Coffee Lake Creek at Industrial Way	W-M1-1, S-M1-1	Temporary	O	1577	253	279	956	147	157	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access.
Tapman Creek at Ridder Road	S-M1-2	No Impact	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No impact; Alignment does not impact creek, stays within roadway.
Subtotal - Temporary				1577	253	279	956	147	157	
Subtotal - Permanent				0	0	0	0	0	0	
PLM 4.0 - Tualatin Sherwood Area Pipeline Project										
WQ facility in line with tributary to Hedges Creek at SW 124th Ave/Tualatin-Sherwood Rd intersection	124th-B	Temporary	O	7151	1569	1863	n/a	n/a	n/a	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access.
Rock Creek at Tualatin-Sherwood Road	S2-1	No Impact	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No impact; Open trench in road above existing culverts.
Chicken Creek at Roy Rogers Road	W-M4-1, S2-2	Temporary (*)	O	6743	546	1024	1924	28	251	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access. Impacts occur to 7,022 sq ft of forested wetland at this crossing, which will require mitigation.
Tualatin River at Roy Rogers Road	W2-3, W2-2, S2-3	No Impact	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No impact; Trenchless alignment does not impact wetland
Wetland north of Elsner Road	W2-4	Temporary	O	35536	3422	3862	n/a	n/a	n/a	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access.
Subtotal - Temporary				49430	5537	6749	1924	28	251	
Subtotal - Permanent				0	0	0	0	0	0	
PLM 5.0 - Scholls Area Pipeline Project										
Drainage North of Beef Bend Road #1	W-M5-10, S2-4	Temporary (*)	O	5686	320	381	408	166	167	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access. Impacts occur to 5,686 sq ft of forested wetland at this crossing, which will require mitigation.
Drainage North of Beef Bend Road #2	S-M5-7	No Impact	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No impact; Trenchless alignment does not impact wetland
Ag drainage crossing at Roy Rogers Road	S-M5-6	No Impact	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No impact; Trenchless alignment does not impact wetland
Bridge North of Bull Mountain	QEA Creek	No Impact	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No impact; Trenchless alignment does not impact wetland

Attachment A.3: JPA Section 6.F-I, WWSP Jurisdictional Wetland and Waterway Impact Quantities (non-ditch features)										
				Wetland Impacts			Waterway Impacts			
Location/Activity	Wetland Delineation Report ID	Temporary, Permanent, No Impact	Pipe Installation Method: Trenchless (T) Open Trench (O) Aerial (A)	sqft	Fill (CY)	Removal (CY)	sqft	Fill (CY)	Removal (CY)	Impact Description and Avoidance and Minimization Notes
Creek Crossings at Scholls Ferry Road near Vandermost Road	Wetland QEA-A	Temporary	O	1662	189	135	n/a	n/a	n/a	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access.
Creek Crossings at Scholls Ferry Road near Vandermost Road	S2-5	Temporary	O	n/a	n/a	n/a	525	178	212	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access.
Pond and Wetlands at Scholls Ferry Road near Vandermost Road	Wetland AKS, S2-6	Temporary	O	242	84	82	54	161	194	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access.
Wetland on Tile Flat Road	W-M5-9	Temporary	O	3096	332	387	n/a	n/a	n/a	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access.
Wetland on Tile Flat Road	W-M5-9	Permanent	O	20	22	26	n/a	n/a	n/a	Blow off = permanent impact from manhole lid
Wetland on oppose side of Tile Flat Road	W2-6	No Impact	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No impact; Alignment does not impact wetland
Wetlands near Intersection of Tile Flat and Grabhorn Roads	W2-7	Temporary	O	16566	1534	1601	n/a	n/a	n/a	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access.
Wetlands near Intersection of Tile Flat and Grabhorn Roads	W2-7	Permanent	O	20	22	26	n/a	n/a	n/a	Blow off = permenant impact from manhole lid
McKernan Creek at Grabhorn Road	W-M5-8, S2-7	Temporary (*)	O	1500	177	129	1990	188	225	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access. Impacts occur to 1500 sq ft of forested wetland at this crossing, which will require mitigation.
Unnamed seasonal drainage	S-M5-1	Temporary	O	n/a	n/a	n/a	260	26	30	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access.
Wetland and small trib at Clark Hill Road	W-M5-3, S-M5-3	Temporary	O	56246	3764	4551	410	26	36	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access. Forested wetland to the south avoided.
Ag wetland along Clark Hilll Road	W-M5-2	Temporary	O	3786	140	140	n/a	n/a	n/a	No Cut/Fill; Trench is not located in wetland. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access.
Ag wetland along Farmington Road	W-M5-1	Temporary	O	6019	223	223	n/a	n/a	n/a	No Cut/Fill; Trench is not located in wetland. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access.
Subtotal - Temporary				94803	6764	7629	3647	746	863	
Subtotal - Permanent				40	44	52	0	0	0	

6763

Attachment A.3: JPA Section 6.F-I, WWSP Jurisdictional Wetland and Waterway Impact Quantities (non-ditch features)										
				Wetland Impacts			Waterway Impacts			
Location/Activity	Wetland Delineation Report ID	Temporary, Permanent, No Impact	Pipe Installation Method: Trenchless (T) Open Trench (O) Aerial (A)	sqft	Fill (CY)	Removal (CY)	sqft	Fill (CY)	Removal (CY)	Impact Description and Avoidance and Minimization Notes
PLW 1.0 - South Hillsboro Area Pipeline Project										
Wetland on Rosedale west of SW 213th	W-W1-2	Temporary	O	3854	143	143	n/a	n/a	n/a	Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access. Trench not located in wetland.
Drainage north of Rosedale	W-W1-5, S-W1-2	Temporary	O	13098	1200	1350	511	43	45	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access.
Drainage north of Rosedale	W-W1-5, S-W1-2	Permanent	O	20	22	26	n/a	n/a	n/a	Blow off = permenant impact from manhole lid
Unnamed Tributary to Butternut Creek	PHS-C1	Temporary (*)	O	555	52	59	n/a	n/a	n/a	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access. Impacts occur to 555 sq ft of forested wetland at this crossing, which will require mitigation.
Butternut Creek	PHS-A	No impact	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No impact; Trenchless alignment does not impact wetland
Reedville Creek at Cornelius Pass Road	W-W1-4, S-W1-1	No impact	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No impact; Trenchless alignment does not impact wetland
Subtotal - Temporary				17507	1395	1551	511	43	45	
Subtotal - Permanent				20	22	26	0	0	0	
						1552				
PLW 2.0 - Cornelius Pass Pipeline Project										
Beaverton Creek at Cornelius Pass Road	W-W2-1, S-W2-1	Temporary (*)	O	13112	2138	1757	2645	536	452	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access. Impacts occur to 1,310 sq ft of forested wetland at this crossing, which will require mitigation.
Rock Creek at Cornelius Pass Road	S-W2-2	Temporary	O	n/a	n/a	n/a	2094	230	230	Temporary impact; Fill volume = Cut volume minus pipe volume. Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access.
Wetlands near Cornelius Pass Road northern terminus (east side of Cornelius Pass Road)	CornPass-C, CornPass-E	Temporary	O	14794	548	548	n/a	n/a	n/a	Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access. Trench not located in wetland.
Wetland near pipe connection near existing Cornelius Pass Road pump station	W-W2-3	No Impact	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No impact; Alignment does not impact wetland
Subtotal - Temporary				27906	2686	2305	4739	767	683	
Subtotal - Permanent				0	0	0	0	0	0	

Attachment A.3: JPA Section 6.F-I, WWSP Jurisdictional Wetland and Waterway Impact Quantities (non-ditch features)										
				Wetland Impacts			Waterway Impacts			
Location/Activity	Wetland Delineation Report ID	Temporary, Permanent, No Impact	Pipe Installation Method: Trenchless (T) Open Trench (O) Aerial (A)	sqft	Fill (CY)	Removal (CY)	sqft	Fill (CY)	Removal (CY)	Impact Description and Avoidance and Minimization Notes
PLE_1.0 Beaverton Area Pipeline Project										
Wetland on Farmington west of 165th	E-01	Temporary	O	1228	45	45	n/a	n/a	n/a	Includes 1 foot of temp. crushed rock fill and removal over geotextile fabric for equipment access. Trench not located in wetland.
Wetland at SW Millikan Way	Wetland F	No Impact	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No impact; Alignment does not impact wetland
Beaverton Creek at SW Millikan Way	W-4-1, S4-1	No Impact	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No impact; Alignment does not impact wetland
Subtotal - Temporary				1228	45	45	0	0	0	
Subtotal - Permanent				0	0	0	0	0	0	

(*) = All or a portion of temporary impact is to forested wetland. Although these areas will remain as wetland post-construction, much of the forested portion cannot be replanted with trees due to planting restrictions over and near the pipe. This results in a partial loss of wetland functions. The forested acreage of these wetlands will be mitigated as though impacts were permanent. The area of each forested wetland is provided in the notes column for wetlands with this habitat.

	Wetlands			Waterways		
	sqft	Fill (CY)	Removal (CY)	sqft	Fill (CY)	Removal (CY)
Total - All Temporary	196,651	16,837	18,716	12,213	1,748	2,015
Total --Forested Temporary Only	20,273					
Total --All Permanent	37,560	15,522	3,622	13	23	23

	Acres
Total - All Temporary	4.51
Total --Forested Temporary Only	0.47
Total --All Permanent	0.86

Acres
0.28
0.00

16835 correct

18715 correct

1745 correct

Attachment B: Wetland Functional Assessment Memorandum

DAVID EVANS AND ASSOCIATES INC

MEMORANDUM

DATE: February 21, 2017

TO: Niki Iverson
Willamette Water Supply Program (WWSP)

FROM: Ethan Rosenthal,
David Evans and Associates, Inc. (DEA)

SUBJECT: Willamette Water Supply Program-Wetland Functional Assessment

CC: Jill Chomycia, MWH

Introduction

This memorandum provides the results of wetland functional assessments conducted for the Willamette Water Supply Program (Project) permitting effort. Wetland functional assessments were conducted for wetlands located within the Project study area that will experience permanent impacts. Wetland functional assessment was also conducted in a few instances where high quality wetlands, or higher functioning portions of wetlands, were specifically avoided, in order to document avoidance rationale. Permanent impacts to wetlands, based on guidance from the U.S. Army Corps of Engineers (USACE) and Oregon Department of State Lands (DSL), include the following types of activities associated with Project development:

- Permanent loss of wetland habitats, such as construction of a portion of a new water treatment plant on top of existing wetland habitat.
- Conversion of one wetland type to another wetland type of perceived lower value. This would occur at locations where forested wetlands are converted to a non-forested condition, such as along pipeline open trench crossings of forested wetlands. Although the impacts at open cut crossings would be temporary, the agencies would view the impact as permanent if a forested condition could not be reestablished within the pipeline corridor.
- Construction impacts lasting greater than two years are viewed as permanent impacts by DSL, even if the area can be restored to wetland conditions post-construction. DSL extends this thinking to existing forested wetlands that could be replanted with trees but would not result in a forested condition (e.g., tall trees with canopy cover) within two years.

This memorandum is intended to provide the wetland functional assessment results. A discussion of project impacts, including avoidance and minimization measures, is provided in the Joint Permit Application submittal to the USACE and DSL.

Methods

The Oregon Rapid Wetland Assessment Protocol (ORWAP) (Adamus et. al. 2010) was used to assess wetland functions. This method was used because it is approved for use in Oregon by the USACE and DSL and because it covers all wetland types found within the Project study area. ORWAP version 2.0.2 was used. ORWAP version 3.1 was not available until all assessment work had already been conducted. ORWAP version 3.1 will

be required for all projects after January 1, 2017. However, DSL stated that projects using version 2.0.2 will be accepted if the assessment was conducted prior to January 1, 2017 (Peter Ryan, DSL, personal communication, November 1, 2017).

Wetland Characterization

Wetlands requiring functional assessments are described below and are organized by Project work package. These descriptions are intended to provide a general picture of the assessed wetlands as context for the more detailed assessment questions required by ORWAP. Functional scores are summarized in Table 1 (attached). ORWAP cover sheets and summary pages are included as an attachment to this memorandum.

Willamette Water Supply System Water Treatment Plant (WWSS WTP) Work Package

The WWSS WTP site contains seven wetlands that will undergo permanent impacts by the proposed project as a result of complete or partial filling. These include Wetlands A, B, C, D, E, F, and potential wetland PW-H, which was mapped as potential wetland because access to the wetland was not possible at time of delineation. The largest wetland, Wetland G, will not experience impacts and was purposely avoided during design.

The approximately 50-acre site is located east of the City of Sherwood, OR, south of SW Tualatin-Sherwood Road, and between Dahlke Lane and SW 120th Avenue. A gravel operation and a future SW 124th Avenue extension (currently under construction) lie to the east, and a farmed field lies north of the study area. The site is densely forested with undulating topography and rocky outcroppings. Upland vegetation consists primarily of Oregon oak (*Quercus garryana*), Pacific madrone (*Arbutus menziesii*), and Douglas fir (*Pseudotsuga menziesii*) trees, with extensive thickets of poison oak (*Toxicodendron diversilobum*) in the understory. A power line corridor that crosses the south part of the study area is maintained as shrub habitat.

All wetlands (A through G) would be classified as depressional wetlands according to the HGM classification system, with the exception of Wetland C, which was classified as a slope wetland by ORWAP. The wetlands receive hydrology from precipitation, runoff from surrounding slopes, and groundwater discharge. Based on the closed depression topography of PW-H, it is assumed that a wetland occurs at this location and would also be classified as depressional. Wetland C continues offsite to the north and west. Wetland C is likely jurisdictional to both DSL and USACE because of its connectivity to other waters off-site to the north. All other wetlands appear to be isolated and are thus under the jurisdiction of DSL but likely not the USACE.

The wetlands are primarily dominated by native vegetation and consist of varying quantities of forested, scrub-shrub, emergent, and shallow (<6 ft deep) open water areas. Due to their common characteristics (plant communities, size, surrounding landscape, etc.) Wetlands A, B, D, E, and PW-H were assessed together. On the other hand Wetlands C, F, and G were different enough that a separate assessment was conducted for each of these wetlands. Although Wetland G will not be impacted, an assessment was conducted for this wetland also to document the importance of avoidance.

Pipeline Main (PLM 4.0) Work Package

Chicken Creek at Roy Rogers Road (delineation feature ID's: W-M4-1)

Chicken Creek is a perennial stream that flows through the Tualatin National Wildlife Refuge (Refuge), downstream of the proposed Project, and then to the Tualatin River. Within the Project study area, emergent wetland dominated by invasive reed canarygrass (*Phalaris arundinacea*) occupies most of the floodplain on the north side of the creek (approximately 0.13 acres), with a very narrow band of forested wetland along the north creek bank. A narrow flood bench with forested wetland occurs on the south side of the creek, with forested riparian community and blackberry thickets continuing along the adjacent steep slope. Forested wetland covers approximately 0.18 acres of the study area. Vegetation in the forested wetland consists of a mix of native vegetation such as Oregon ash (*Fraxinus latifolia*) trees and vine maple (*Acer circinatum*) and non-native or nuisance vegetation such as black locust (*Robinia pseudoacacia*) and English ivy (*Hedera helix*). Wetland hydrology is primarily from hillside seepage and shallow subsurface flow; however, overtopping of Chicken Creek may happen on occasion. Native anadromous and resident fish species have access to the creek at the proposed crossing. Areas north of the creek crossing consist of rural agricultural land and the Refuge. Areas south of the crossing consist of dense suburban land development associated with the City of Sherwood.

Pipeline Main (PLM 5.0) Work Package

Drainage #1 North of Beef Bend Road (delineation feature ID: W-M5-10)

This crossing is located at a relatively deep forested ravine located along the west side of Roy Rogers Road in rural Washington County. The surrounding area consists of agricultural lands and further to the north rapidly developing land recently brought into the urban growth boundary. Native vegetation dominates the forested ravine, with the exception of extensive Himalayan blackberry (*Rubus armeniacus*) thickets along the forest edges. The ravine bottom contains a forested wetland with seasonal drainage that likely does not provide fish habitat but likely does provide habitat for native amphibians.

McKernan Creek at Grabhorn Road (delineation feature ID: W-M5-8)

McKernan Creek is a perennial stream that flows out from Cooper Mountain Nature Park roughly one mile upstream of the project crossing. Closer to and downstream of the project crossing, the creek flows through a rural agricultural setting and has been ditched and altered in many places before flowing into the Tualatin River. Several small reservoir impoundments occur between the project crossing and the Tualatin River, including Lindow Reservoir. These prevent anadromous fish species from reaching the project crossing; however, native resident fish species are likely present. Wetlands on the east side of the road near the crossing consist of forested wetland immediately adjacent to the creek and agricultural wetland further north of the creek. Wetlands at the crossing location on the west side of the road consist of a forested wetland adjacent to the creek, with the extant of wetlands on the west side of the road notably less than on the east side.

Clark Hill Road Forest and Pasture Wetlands (delineation feature ID: W-M5-3 and W-M5-3.1)

This wetland is located in rural Washington County. Agricultural production and mining operations occur within the watershed. This wetland was identified as W-M5-3, in the PLM 5.0 delineation report; however, the wetland was divided into two assessment units, based on forested and pasture habitat conditions (W-M5-3 and -3.1 respectively), for functional assessment purposes to inform the proposed pipeline crossing through this area. There is a clear break between habitat types based on the tax lot boundary that runs through the

wetland. The southern portion of the wetland consists of forested wetland dominated by native species. Several trees were greater than 30-inch diameter at breast height. The northern portion of the wetland consists of grazed pasture dominated by non-native grasses. A small creek flows through both wetland portions and beaver activity was pervasive within the forested portion. Culverts likely block fish passage to this wetland, and Jackson Reservoir, several miles downstream, prevents migration of anadromous fish species.

Pipeline West (PLW 1.0) Work Package

Unnamed Tributary to Butternut Creek (delineation feature ID: PHS-C1)

This crossing consists of a forested wetland swale that drains to Butternut Creek. No channel was mapped in this wetland by Pacific Habitat Services (DSL WD#2014-0532 approved by DSL February 23, 2015). Butternut Creek provides habitat for anadromous and resident fish species; however, such habitat is not present along wetland PHS-C1. Surrounding land use consists of managed wood lots, pasture, crops, and low level rural development.

Pipeline West (PLW 2.0) Work Package

Beaverton Creek at Cornelius Pass Road (delineation feature ID's: W-W2-1)

This crossing is situated in a moderately deep drainage within the otherwise highly developed suburban landscape of Hillsboro, Oregon. Beaverton Creek is a perennial creek mostly confined to its banks, but that may overtop during particularly heavy prolonged rain events. Ravine slopes on the south side are forested; however, in the vicinity of the proposed crossing slopes are partially altered due to a sewer line crossing. Ravine slopes on the north side of the crossing primarily consist of blackberry thickets and non-native grasses. The floodplain consists of wetland mostly dominated by non-native reed canarygrass; however, the north side contains a narrow wetland flood bench with trees. Although technically not a "forest", the treed portion of the wetland was assessed to account for permanent loss of this condition post-project (i.e., conversion from treed condition to scrub-shrub and emergent condition). Native resident and anadromous fish species have access to the creek at the proposed crossing location.

Rock Creek at Cornelius Pass Road (delineation feature ID's: W-W2-2)

This crossing is situated in a small drainage that runs through Orenco Woods Nature Park, which is located within the otherwise highly developed suburban landscape of Hillsboro, Oregon. The park contains a mix of native upland, riparian, and wetland habitats; however, much of the park consists of pasture areas currently being restored to native habitat conditions. The forested wetland (W-W2-2) is located within an old oxbow of Rock Creek. The creek is mostly confined to its banks, but will overtop during particularly heavy prolonged rain events. Native resident and anadromous fish species have access to the creek at the proposed crossing location.

Findings

Table 1 provides a summary of wetland function and value scores based on the grouped ORWAP functional categories used in wetland permitting in Oregon. ORWAP cover pages and detailed score sheets for each assessment are provided as an attachment to this memorandum. Detailed assessment worksheet forms, roughly 30 pages per assessed wetland, are available upon request.

On average, wetlands within the project study area rated as moderate for both functions and values, with some individual group function categories rating relatively high. This is not too surprising since all assessed wetlands were either forested wetlands or were adjacent to forested wetlands. ORWAP assesses conditions both within the wetland, adjacent to the wetland, and in the larger surrounding environment. Therefore, even a degraded pasture-type wetland can receive moderate scores if higher quality resources are nearby. Likewise, wetlands that might be perceived as high quality but that have disturbed conditions in surrounding areas; will have lower scores than they would have if the wetland was assessed without taking its surroundings into account.

As previously noted, this memorandum is only intended to provide the wetland functional assessment results. Discussion of project impacts, including avoidance and minimization measures, is provided in the Joint Permit Application submittal to the USACE and DSL.

References

Adamus, P., J. Morlan, and K. Verble. 2010. Manual for the Oregon Rapid Wetland Assessment Protocol (ORWAP). Version 2.0.2. Oregon Department of State Lands, Salem, OR.

Peter Ryan, DSL, personal communication, November 1, 2017

Attachments

Attachment 1: ORWAP Summary Table

Attachment 2: ORWAP Cover Pages and Summary Scores

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Attachment 1: ORWAP Summary Table

Table 1: Summary of ORWAP Group Scores

Work Package	WWSS WTP		WWSS WTP		WWSS WTP		WWSS WTP		PLM_4.0		PLM_5.0	
Crossing Name	na		na		na		na		Chicken Creek at Roy Rogers Road		Culvert North of Beef Bend Road	
Wetland ID	Wetlands A, B, D, E, and PW-H		Wetland C		Wetland F		Wetland G		W-M4-1		W-M5-10	
GROUPED FUNCTIONS	**Functions**	**Values**	**Functions**	**Values**	**Functions**	**Values**	**Functions**	**Values**	**Functions**	**Values**	**Functions**	**Values**
Hydrologic Function (WS)	2.25	3.33	2.25	3.33	3.15	3.33	3.25	3.33	3.23	2.33	3.54	6.67
Water Quality Group (WQ)	10.00	4.61	10.00	4.61	6.26	4.61	10.00	4.61	9.44	6.89	7.54	6.33
Carbon Sequestration (CS)	2.31		1.86		2.01		2.01		2.50		2.51	
Fish Support Group (FISH)	5.45	6.67	5.52	6.67	1.51	6.67	6.02	6.67	7.60	10.00	5.79	6.67
Aquatic Support Group (AQ)	8.05	7.49	7.90	7.19	6.64	7.00	7.95	7.20	7.05	7.60	8.10	7.00
Terrestrial Support Group (TERR)	7.55	7.00	6.65	7.00	7.07	7.00	7.88	7.00	5.49	7.00	4.81	7.00
Public Use & Recognition (PU)		10.00		10.00		10.00		10.00		0.48		0.00
Provisioning Services (PS)		0.00		0.00		0.00		0.00		0.00		0.00
Average	**5.94**	**5.59**	**5.70**	**5.54**	**4.44**	**5.52**	**6.18**	**5.54**	**5.88**	**4.90**	**5.38**	**4.81**

Work Package	PLM_5.0		PLM_5.0		PLM_5.0		PLW_1.0		PLW_2.0		PLW_2.0	
Crossing Name	McKernan Creek at Grabhorn Road		Clark Hill Road Forest Wetland		Clark Hill Road Pasture Wetland		Unnamed Tributary to Butternut Creek		Beaverton Creek at Cornelius Pass Road		Rock Creek at Cornelius Pass Road	
Wetland ID	W-M5-8		W-M5-3		W-M5-3.1		PHS-C1		W-W2-1		W-W2-2	
GROUPED FUNCTIONS	**Functions**	**Values**	**Functions**	**Values**	**Functions**	**Values**	**Functions**	**Values**	**Functions**	**Values**	**Functions**	**Values**
Hydrologic Function (WS)	2.88	5.42	3.42	6.94	3.92	6.94	3.63	6.88	3.92	3.83	4.10	3.83
Water Quality Group (WQ)	7.94	5.74	8.18	5.42	7.26	5.58	7.72	5.40	7.41	8.75	7.78	8.75
Carbon Sequestration (CS)	2.20		2.51		2.36		2.30		2.08		2.22	
Fish Support Group (FISH)	7.42	6.67	6.05	6.67	3.95	6.67	1.61	4.06	7.26	10.00	4.49	10.00
Aquatic Support Group (AQ)	7.10	7.42	6.16	8.00	5.97	7.00	7.88	7.11	6.92	8.00	6.84	8.00
Terrestrial Support Group (TERR)	6.25	7.00	7.81	7.43	4.16	7.00	6.17	7.22	5.34	7.00	5.75	7.00
Public Use & Recognition (PU)		0.00		0.00		1.19		0.00		1.53		2.36
Provisioning Services (PS)		0.00		0.00		0.00		0.00		0.00		0.00
Average	**5.63**	**4.61**	**5.69**	**4.92**	**4.60**	**4.91**	**4.89**	**4.38**	**5.49**	**5.59**	**5.19**	**5.71**

Attachment 2: ORWAP Cover Pages and Summary Scores

CoverPg: Basic Description of Assessment	2012
Site Name:	WWSP WTP, Wetlands A, B, D and E
Investigator Name:	Vingiello, Macklin, Rosenthal
Date of Field Assessment:	11/4/2016
County:	Washington
Nearest Town:	Sherwood
Latitude (decimal degrees):	45.364748
Longitude (decimal degrees):	-122.80832
TRS, quarter/quarter section and tax lot(s)	T2S R1W S28
Approximate size of the Assessment Area (AA, in acres)	0.49
AA as percent of entire wetland (approx.)	100
If delineated, DSL file number (WD #) if known	none
Soil Map Units within the AA (list these in approx. rank order by area, from WSS web site or published county survey; see manual)	Xerochrepts-Rock outcrop complex
Soil Map Units surrounding and contiguous to the AA (list all present in approx. rank order by area; see manual)	Saum silt loam, 7 to 12 percent slopes
	Saum silt loam, 20 to 30 percent
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery):	PEM, PSS, PFO
Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E	
Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	
HGM Class (Scores worksheet will suggest a class; see manual section 2.4.2)	Depressional
If tidal, the tidal phase during most of visit:	N/A
What percent (approx.) of the **wetland** were you able to visit?	80
What percent (approx.) of the **AA** were you able to visit?	80
Have you attended an ORWAP training session? If so, indicate approximate month & year.	Yes, more than 5 years ago
How many wetlands have you assessed previously using ORWAP (approx.)?	36
Comments about the site or this ORWAP assessment (attach extra page if desired):	

ORWAP SCORES SHEET	version 2.0.2 May 2012
Site Name:	WWSP WTP, Wetlands A, B, D and E
Investigator Name:	Vingiello, Macklin, Rosenthal
Date of Field Assessment:	11/4/2016

Specific Functions:	Relative Effectiveness of the Function	Relative Values of the Function
Water Storage & Delay (WS)	2.25	3.33
Sediment Retention & Stabilization (SR)	10.00	3.87
Phosphorus Retention (PR)	10.00	4.61
Nitrate Removal & Retention (NR)	10.00	4.36
Thermoregulation (T)	0.00	0.00
Carbon Sequestration (CS)	2.31	
Organic Matter Export (OE)	0.00	
Aquatic Invertebrate Habitat (INV)	8.05	7.49
Anadromous Fish Habitat (FA)	0.00	5.09
Non-anadromous Fish Habitat (FR)	5.45	6.67
Amphibian & Reptile Habitat (AM)	7.49	4.67
Waterbird Feeding Habitat (WBF)	5.09	4.67
Waterbird Nesting Habitat (WBN)	0.00	3.50
Songbird, Raptor, & Mammal Habitat (SBM)	5.76	4.67
Pollinator Habitat (POL)	7.55	3.06
Native Plant Diversity (PD)	6.15	7.00

GROUPED FUNCTIONS	Group Scores (functions)	Group Scores (values)	
Hydrologic Function (WS)	2.25	3.33	(identical to Water Storage and Delay function and value scores)
Water Quality Group (WQ)	10.00	4.61	(maximum of scores for SR, PR, NR, and T)
Carbon Sequestration (CS)	2.31		(identical to Carbon Sequestration score above)
Fish Support Group (FISH)	5.45	6.67	(maximum of scores for FA and FR)
Aquatic Support Group (AQ)	8.05	7.49	(maximum of scores for OE, AM, INV, WBF, and WBN)
Terrestrial Support Group (TERR)	7.55	7.00	(maximum of scores for PD, POL, and SBM)
Public Use & Recognition (PU)		10.00	(click on this cell to see this attribute defined)
Provisioning Services (PS)		0.00	(click on this cell to see this attribute defined)

OTHER ATTRIBUTES		
Wetland Ecological Condition (CQ)		7.22
Wetland Stressors (STR)		3.08
Wetland Sensitivity (SEN)		10.00

HGM Class - Relative Probabilities (select max)	
Estuarine	0.00
Riverine	0.50
Slope	3.38
Flat	5.10
Depressional	10.56
Lacustrine	0.00

CoverPg: Basic Description of Assessment	2012
Site Name:	WWSS WTP, Wetland C
Investigator Name:	Vingiello, Macklin, Rosenthal
Date of Field Assessment:	11/4/2016
County:	Washington
Nearest Town:	Sherwood
Latitude (decimal degrees):	45.365758
Longitude (decimal degrees):	122.810606
TRS, quarter/quarter section and tax lot(s)	T2S R1W S28, TL 100
Approximate size of the Assessment Area (AA, in acres)	0.3
AA as percent of entire wetland (approx.)	100
If delineated, DSL file number (WD #) if known	none
Soil Map Units within the AA (list these in approx. rank order by area, from WSS web site or published county survey; see manual)	Xerochrepts-Rock outcrop complex
Soil Map Units surrounding and contiguous to the AA (list all present in approx. rank order by area; see manual)	Quatama loam, 7 to 12 percent slopes
	Saum silt loam, 7 to 12 percent slopes
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PEM, PSS, PFO
HGM Class (Scores worksheet will suggest a class; see manual section 2.4.2)	slope
If tidal, the tidal phase during most of visit:	N/A
What percent (approx.) of the **wetland** were you able to visit?	90
What percent (approx.) of the **AA** were you able to visit?	90
Have you attended an ORWAP training session? If so, indicate approximate month & year.	yes, about 5 years ago
How many wetlands have you assessed previously using ORWAP (approx.)?	36
Comments about the site or this ORWAP assessment (attach extra page if desired):	

ORWAP SCORES SHEET	ersion 2.0.2 May 2012		
Site Name:	WWSS WTP, Wetland C		
Investigator Name:	Vingiello, Macklin, Rosenthal		
Date of Field Assessment:	11/4/2016		

Specific Functions:	Relative Effectiveness of the Function	Relative Values of the Function
Water Storage & Delay (WS)	2.25	3.33
Sediment Retention & Stabilization (SR)	10.00	3.77
Phosphorus Retention (PR)	10.00	4.61
Nitrate Removal & Retention (NR)	10.00	4.36
Thermoregulation (T)	0.00	0.00
Carbon Sequestration (CS)	1.86	
Organic Matter Export (OE)	0.00	
Aquatic Invertebrate Habitat (INV)	7.90	7.19
Anadromous Fish Habitat (FA)	0.00	4.70
Non-anadromous Fish Habitat (FR)	5.52	6.67
Amphibian & Reptile Habitat (AM)	7.19	4.67
Waterbird Feeding Habitat (WBF)	4.70	4.67
Waterbird Nesting Habitat (WBN)	0.00	3.50
Songbird, Raptor, & Mammal Habitat (SBM)	5.58	4.67
Pollinator Habitat (POL)	6.65	3.06
Native Plant Diversity (PD)	5.87	7.00

GROUPED FUNCTIONS	Group Scores (functions)	Group Scores (values)	
Hydrologic Function (WS)	2.25	3.33	(identical to Water Storage and Delay function and value scores)
Water Quality Group (WQ)	10.00	4.61	(maximum of scores for SR, PR, NR, and T)
Carbon Sequestration (CS)	1.86		(identical to Carbon Sequestration score above)
Fish Support Group (FISH)	5.52	6.67	(maximum of scores for FA and FR)
Aquatic Support Group (AQ)	7.90	7.19	(maximum of scores for OE, AM, INV, WBF, and WBN)
Terrestrial Support Group (TERR)	6.65	7.00	(maximum of scores for PD, POL, and SBM)
Public Use & Recognition (PU)		10.00	(click on this cell to see this attribute defined)
Provisioning Services (PS)		0.00	(click on this cell to see this attribute defined)

OTHER ATTRIBUTES		
Wetland Ecological Condition (CQ)		7.22
Wetland Stressors (STR)		1.06
Wetland Sensitivity (SEN)		10.00

HGM Class - Relative Probabilities (select max)	
Estuarine	0.00
Riverine	0.50
Slope	3.69
Flat	0.00
Depressional	0.00
Lacustrine	0.00

CoverPg: Basic Description of Assessment	2012
Site Name:	WWSS WTP, Wetland F
Investigator Name:	Vingiello, Macklin, Rosenthal
Date of Field Assessment:	11/4/2016
County:	Washington
Nearest Town:	Sherwood
Latitude (decimal degrees):	45.365258
Longitude (decimal degrees):	.122.806511
TRS, quarter/quarter section and tax lot(s)	T2S R1W S28, TL 100
Approximate size of the Assessment Area (AA, in acres)	0.2
AA as percent of entire wetland (approx.)	100
If delineated, DSL file number (WD #) if known	none
Soil Map Units within the AA (list these in approx. rank order by area, from WSS web site or published county survey; see manual)	Xerochrepts-Rock outcrop complex
Soil Map Units surrounding and contiguous to the AA (list all present in approx. rank order by area; see manual)	Saum silt loam, 7 to 12 percent slopes
	Saum silt loam, 20 to 30 percent slopes
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PSS, PFO
HGM Class (Scores worksheet will suggest a class; see manual section 2.4.2)	Depressional
If tidal, the tidal phase during most of visit:	N/A
What percent (approx.) of the **wetland** were you able to visit?	100
What percent (approx.) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	Yes, more than 5 years ago
How many wetlands have you assessed previously using ORWAP (approx.)?	36
Comments about the site or this ORWAP assessment (attach extra page if desired):	

ORWAP SCORES SHEET	version 2.0.2 May 2012
Site Name:	WWSS WTP, Wetland F
Investigator Name:	Vingiello, Macklin, Rosenthal
Date of Field Assessment:	11/4/2016

Specific Functions:	Relative Effectiveness of the Function	Relative Values of the Function
Water Storage & Delay (WS)	3.15	3.33
Sediment Retention & Stabilization (SR)	6.26	3.60
Phosphorus Retention (PR)	4.03	4.61
Nitrate Removal & Retention (NR)	3.27	4.36
Thermoregulation (T)	3.06	0.00
Carbon Sequestration (CS)	2.01	
Organic Matter Export (OE)	5.91	
Aquatic Invertebrate Habitat (INV)	6.43	7.00
Anadromous Fish Habitat (FA)	0.00	3.28
Non-anadromous Fish Habitat (FR)	1.51	6.67
Amphibian & Reptile Habitat (AM)	6.64	4.67
Waterbird Feeding Habitat (WBF)	3.28	4.67
Waterbird Nesting Habitat (WBN)	0.00	3.50
Songbird, Raptor, & Mammal Habitat (SBM)	5.69	4.67
Pollinator Habitat (POL)	7.07	3.06
Native Plant Diversity (PD)	5.91	7.00

GROUPED FUNCTIONS	Group Scores (functions)	Group Scores (values)	
Hydrologic Function (WS)	3.15	3.33	(identical to Water Storage and Delay function and value scores)
Water Quality Group (WQ)	6.26	4.61	(maximum of scores for SR, PR, NR, and T)
Carbon Sequestration (CS)	2.01		(identical to Carbon Sequestration score above)
Fish Support Group (FISH)	1.51	6.67	(maximum of scores for FA and FR)
Aquatic Support Group (AQ)	6.64	7.00	(maximum of scores for OE, AM, INV, WBF, and WBN)
Terrestrial Support Group (TERR)	7.07	7.00	(maximum of scores for PD, POL, and SBM)
Public Use & Recognition (PU)		10.00	(click on this cell to see this attribute defined)
Provisioning Services (PS)		0.00	(click on this cell to see this attribute defined)

OTHER ATTRIBUTES		
Wetland Ecological Condition (CQ)		7.50
Wetland Stressors (STR)		0.96
Wetland Sensitivity (SEN)		6.50

HGM Class - Relative Probabilities (select max)	
Estuarine	0.00
Riverine	0.70
Slope	3.13
Flat	6.20
Depressional	4.72
Lacustrine	0.00

CoverPg: Basic Description of Assessment	2012
Site Name:	WWSS WTP, Wetland G
Investigator Name:	Vingiello, Macklin, Rosenthal
Date of Field Assessment:	11/4/2016
County:	Washington
Nearest Town:	Sherwood
Latitude (decimal degrees):	45.363544
Longitude (decimal degrees):	-122.808707
TRS, quarter/quarter section and tax lot(s)	T2S R1W S28, TL 100
Approximate size of the Assessment Area (AA, in acres)	4.7
AA as percent of entire wetland (approx.)	100
If delineated, DSL file number (WD #) if known	none
Soil Map Units within the AA (list these in approx. rank order by area, from WSS web site or published county survey; see manual)	Xerochrepts-Rock outcrop complex
Soil Map Units surrounding and contiguous to the AA (list all present in approx. rank order by area; see manual)	Saum silt loam, 7 to 12 percent slopes
	Saum silt loam, 20 to 30 percent slopes
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PEM, PSS, PFO, PUB
HGM Class (Scores worksheet will suggest a class; see manual section 2.4.2)	Depressional
If tidal, the tidal phase during most of visit:	N/A
What percent (approx.) of the **wetland** were you able to visit?	75
What percent (approx.) of the **AA** were you able to visit?	75
Have you attended an ORWAP training session? If so, indicate approximate month & year.	Yes, greater than 5 years
How many wetlands have you assessed previously using ORWAP (approx.)?	36
Comments about the site or this ORWAP assessment (attach extra page if desired):	

ORWAP SCORES SHEET	version 2.0.2 May 2012
Site Name:	WWSS WTP, Wetland G
Investigator Name:	Vingiello, Macklin, Rosenthal
Date of Field Assessment:	11/4/2016

Specific Functions:	Relative Effectiveness of the Function	Relative Values of the Function
Water Storage & Delay (WS)	3.25	3.33
Sediment Retention & Stabilization (SR)	10.00	3.88
Phosphorus Retention (PR)	10.00	4.61
Nitrate Removal & Retention (NR)	10.00	4.36
Thermoregulation (T)	0.00	0.00
Carbon Sequestration (CS)	2.01	
Organic Matter Export (OE)	0.00	
Aquatic Invertebrate Habitat (INV)	7.95	7.20
Anadromous Fish Habitat (FA)	0.00	4.89
Non-anadromous Fish Habitat (FR)	6.02	6.67
Amphibian & Reptile Habitat (AM)	7.20	4.67
Waterbird Feeding Habitat (WBF)	4.89	4.67
Waterbird Nesting Habitat (WBN)	5.54	3.50
Songbird, Raptor, & Mammal Habitat (SBM)	5.28	4.67
Pollinator Habitat (POL)	7.88	3.06
Native Plant Diversity (PD)	6.18	7.00

GROUPED FUNCTIONS	Group Scores (functions)	Group Scores (values)	
Hydrologic Function (WS)	3.25	3.33	(identical to Water Storage and Delay function and value scores)
Water Quality Group (WQ)	10.00	4.61	(maximum of scores for SR, PR, NR, and T)
Carbon Sequestration (CS)	2.01		(identical to Carbon Sequestration score above)
Fish Support Group (FISH)	6.02	6.67	(maximum of scores for FA and FR)
Aquatic Support Group (AQ)	7.95	7.20	(maximum of scores for OE, AM, INV, WBF, and WBN)
Terrestrial Support Group (TERR)	7.88	7.00	(maximum of scores for PD, POL, and SBM)
Public Use & Recognition (PU)		10.00	(click on this cell to see this attribute defined)
Provisioning Services (PS)		0.00	(click on this cell to see this attribute defined)

OTHER ATTRIBUTES		
Wetland Ecological Condition (CQ)		7.22
Wetland Stressors (STR)		0.96
Wetland Sensitivity (SEN)		10.00

HGM Class - Relative Probabilities (select max)	
Estuarine	0.00
Riverine	0.50
Slope	2.50
Flat	4.32
Depressional	14.72
Lacustrine	0.00

CoverPg: Basic Description of Assessment	2012
Site Name:	PLM 4.0: Chicken Creek at Roy Rogers Road (W-M4-1)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	6/20/2016
County:	Washington
Nearest Town:	Sherwood
Latitude (decimal degrees):	45.3748
Longitude (decimal degrees):	-122.8563
TRS, quarter/quarter section and tax lot(s)	T2S R1W S30
Approximate size of the Assessment Area (AA, in acres)	0.32
AA as percent of entire wetland (approx.)	20%
If delineated, DSL file number (WD #) if known	none
Soil Map Units within the AA (list these in approx. rank order by area, from WSS web site or published county survey; see manual)	McBee silty clay loam
Soil Map Units surrounding and contiguous to the AA (list all present in approx. rank order by area; see manual)	Hillsboro loam, 12 to 20 percent slopes
	Xerochrepts and Haploxerolls, very steep
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PFOC, PSSC
HGM Class (Scores worksheet will suggest a class; see manual section 2.4.2)	Riverine, Slope
If tidal, the tidal phase during most of visit:	N/A
What percent (approx.) of the **wetland** were you able to visit?	20
What percent (approx.) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	Yes, greater than 5 years ago
How many wetlands have you assessed previously using ORWAP (approx.)?	30
Comments about the site or this ORWAP assessment (attach extra page if desired):	

ORWAP SCORES SHEET	ersion 2.0.2 May 2012
Site Name:	Chicken Creek at Roy Rogers Road (W-M4-1)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	6/20/2016

Specific Functions:	Relative Effectiveness of the Function	Relative Values of the Function
Water Storage & Delay (WS)	3.23	2.33
Sediment Retention & Stabilization (SR)	4.17	5.46
Phosphorus Retention (PR)	4.39	6.89
Nitrate Removal & Retention (NR)	4.69	5.44
Thermoregulation (T)	9.44	6.25
Carbon Sequestration (CS)	2.50	
Organic Matter Export (OE)	7.05	
Aquatic Invertebrate Habitat (INV)	5.68	7.60
Anadromous Fish Habitat (FA)	7.60	10.00
Non-anadromous Fish Habitat (FR)	4.93	6.67
Amphibian & Reptile Habitat (AM)	4.06	4.67
Waterbird Feeding Habitat (WBF)	5.61	4.67
Waterbird Nesting Habitat (WBN)	4.71	3.50
Songbird, Raptor, & Mammal Habitat (SBM)	5.49	4.67
Pollinator Habitat (POL)	5.28	2.50
Native Plant Diversity (PD)	4.12	7.00

GROUPED FUNCTIONS	Group Scores (functions)	Group Scores (values)	
Hydrologic Function (WS)	3.23	2.33	(identical to Water Storage and Delay function and value scores)
Water Quality Group (WQ)	9.44	6.89	(maximum of scores for SR, PR, NR, and T)
Carbon Sequestration (CS)	2.50		(identical to Carbon Sequestration score above)
Fish Support Group (FISH)	7.60	10.00	(maximum of scores for FA and FR)
Aquatic Support Group (AQ)	7.05	7.60	(maximum of scores for OE, AM, INV, WBF, and WBN)
Terrestrial Support Group (TERR)	5.49	7.00	(maximum of scores for PD, POL, and SBM)
Public Use & Recognition (PU)		0.48	(click on this cell to see this attribute defined)
Provisioning Services (PS)		0.00	(click on this cell to see this attribute defined)

OTHER ATTRIBUTES		
Wetland Ecological Condition (CQ)		6.36
Wetland Stressors (STR)		3.00
Wetland Sensitivity (SEN)		2.58

HGM Class - Relative Probabilities (select max)	
Estuarine	0.00
Riverine	2.90
Slope	10.00
Flat	0.00
Depressional	0.00
Lacustrine	0.00

CoverPg: Basic Description of Assessment	2012
Site Name:	PLM 5.0: Culvert North of Beef Bend Road (Wetland M5-10)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	6/20/2016
County:	Washington
Nearest Town:	Sherwood
Latitude (decimal degrees):	45.4065
Longitude (decimal degrees):	-122.8520
TRS, quarter/quarter section and tax lot(s)	2S 1W Sec 7
Approximate size of the Assessment Area (AA, in acres)	0.13
AA as percent of entire wetland (approx.)	50%
If delineated, DSL file number (WD #) if known	none
Soil Map Units within the AA (list these in approx. rank order by area, from WSS web site or published county survey; see manual)	Aloha silt loam
Soil Map Units surrounding and contiguous to the AA (list all present in approx. rank order by area; see manual)	Xerochrepts and Haploxerolls, very steep
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PSS, PFO
HGM Class (Scores worksheet will suggest a class; see manual section 2.4.2)	Riverine/Slope
If tidal, the tidal phase during most of visit:	N/A
What percent (approx.) of the **wetland** were you able to visit?	50
What percent (approx.) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	Yes, greater than 5 years ago
How many wetlands have you assessed previously using ORWAP (approx.)?	31
Comments about the site or this ORWAP assessment (attach extra page if desired):	

ORWAP SCORES SHEET	ersion 2.0.2 May 2012
Site Name:	Culvert North of Beef Bend Road (Wetland M5-10)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	6/20/2016

Specific Functions:	Relative Effectiveness of the Function	Relative Values of the Function
Water Storage & Delay (WS)	3.54	6.67
Sediment Retention & Stabilization (SR)	4.29	5.59
Phosphorus Retention (PR)	7.54	6.33
Nitrate Removal & Retention (NR)	3.75	3.96
Thermoregulation (T)	5.00	1.25
Carbon Sequestration (CS)	2.51	
Organic Matter Export (OE)	8.10	
Aquatic Invertebrate Habitat (INV)	6.36	7.00
Anadromous Fish Habitat (FA)	0.00	5.07
Non-anadromous Fish Habitat (FR)	5.79	6.67
Amphibian & Reptile Habitat (AM)	6.19	6.67
Waterbird Feeding Habitat (WBF)	5.07	4.67
Waterbird Nesting Habitat (WBN)	5.15	3.50
Songbird, Raptor, & Mammal Habitat (SBM)	4.11	6.67
Pollinator Habitat (POL)	3.64	3.33
Native Plant Diversity (PD)	4.81	7.00

GROUPED FUNCTIONS	Group Scores (functions)	Group Scores (values)	
Hydrologic Function (WS)	3.54	6.67	(identical to Water Storage and Delay function and value scores)
Water Quality Group (WQ)	7.54	6.33	(maximum of scores for SR, PR, NR, and T)
Carbon Sequestration (CS)	2.51		(identical to Carbon Sequestration score above)
Fish Support Group (FISH)	5.79	6.67	(maximum of scores for FA and FR)
Aquatic Support Group (AQ)	8.10	7.00	(maximum of scores for OE, AM, INV, WBF, and WBN)
Terrestrial Support Group (TERR)	4.81	7.00	(maximum of scores for PD, POL, and SBM)
Public Use & Recognition (PU)		0.00	(click on this cell to see this attribute defined)
Provisioning Services (PS)		0.00	(click on this cell to see this attribute defined)

OTHER ATTRIBUTES		
Wetland Ecological Condition (CQ)		5.20
Wetland Stressors (STR)		2.62
Wetland Sensitivity (SEN)		5.30

HGM Class - Relative Probabilities (select max)	
Estuarine	0.00
Riverine	5.90
Slope	3.44
Flat	0.00
Depressional	0.00
Lacustrine	0.00

CoverPg: Basic Description of Assessment

	2012
Site Name:	PLM 5.0: McKernan Creek at Grabhorn Road (Wetland M5-8)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	6/16/2016
Nearest Town:	Kinton
Latitude (decimal degrees):	45.4349
Longitude (decimal degrees):	-122.8860
TRS, quarter/quarter section and tax lot(s)	1S, 2W, Sec 0
Approximate size of the Assessment Area (AA, in acres)	0.25
AA as percent of entire wetland (approx.)	10%
If delineated, DSL file number (WD #) if known	none
Soil Map Units within the AA (list these in approx. rank order by area, from WSS web site or published county survey; see manual)	Wapato silty clay loam
	Woodburn silt loam, 0 to 3 percent slopes
Soil Map Units surrounding and contiguous to the AA (list all present in approx. rank order by area; see manual)	Amity silt loam
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PSS, PFO
HGM Class (Scores worksheet will suggest a class; see manual section 2.4.2)	Riverine
If tidal, the tidal phase during most of visit:	N/A
What percent (approx.) of the **wetland** were you able to visit?	10
What percent (approx.) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	Yes, more than 5 years ago
How many wetlands have you assessed previously using ORWAP (approx.)?	32

ORWAP SCORES SHEET	ersion 2.0.2 May 2012
Site Name:	McKernan Creek at Grabhorn Road (Wetland M5-8)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	6/16/2016

Specific Functions:	Relative Effectiveness of the Function	Relative Values of the Function
Water Storage & Delay (WS)	2.88	5.42
Sediment Retention & Stabilization (SR)	5.03	5.43
Phosphorus Retention (PR)	7.94	5.74
Nitrate Removal & Retention (NR)	5.61	4.99
Thermoregulation (T)	7.44	3.33
Carbon Sequestration (CS)	2.20	
Organic Matter Export (OE)	7.10	
Aquatic Invertebrate Habitat (INV)	5.45	7.42
Anadromous Fish Habitat (FA)	0.00	5.09
Non-anadromous Fish Habitat (FR)	7.42	6.67
Amphibian & Reptile Habitat (AM)	4.19	4.67
Waterbird Feeding Habitat (WBF)	5.09	4.67
Waterbird Nesting Habitat (WBN)	0.00	3.50
Songbird, Raptor, & Mammal Habitat (SBM)	5.74	4.67
Pollinator Habitat (POL)	6.25	5.83
Native Plant Diversity (PD)	6.09	7.00

GROUPED FUNCTIONS	Group Scores (functions)	Group Scores (values)	
Hydrologic Function (WS)	2.88	5.42	(identical to Water Storage and Delay function and value scores)
Water Quality Group (WQ)	7.94	5.74	(maximum of scores for SR, PR, NR, and T)
Carbon Sequestration (CS)	2.20		(identical to Carbon Sequestration score above)
Fish Support Group (FISH)	7.42	6.67	(maximum of scores for FA and FR)
Aquatic Support Group (AQ)	7.10	7.42	(maximum of scores for OE, AM, INV, WBF, and WBN)
Terrestrial Support Group (TERR)	6.25	7.00	(maximum of scores for PD, POL, and SBM)
Public Use & Recognition (PU)		0.00	(click on this cell to see this attribute defined)
Provisioning Services (PS)		0.00	(click on this cell to see this attribute defined)

OTHER ATTRIBUTES		
Wetland Ecological Condition (CQ)		5.44
Wetland Stressors (STR)		3.45
Wetland Sensitivity (SEN)		6.10

HGM Class - Relative Probabilities (select max)	
Estuarine	0.00
Riverine	5.50
Slope	1.73
Flat	0.00
Depressional	0.00
Lacustrine	0.00

CoverPg: Basic Description of Assessment	2012
Site Name:	PLM 5.0: Clark Hill Road Forest (Wetland M5-3)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	6/24/2016
County:	Washington
Nearest Town:	Jacktown
Latitude (decimal degrees):	45.4446
Longitude (decimal degrees):	-122.9031
TRS, quarter/quarter section and tax lot(s)	
Approximate size of the Assessment Area (AA, in acres)	1.40
AA as percent of entire wetland (approx.)	70%
If delineated, DSL file number (WD #) if known	WD 2009-0417
Soil Map Units within the AA (list these in approx. rank order by area, from WSS web site or published county survey; see manual)	Delena silt loam, 3 to 12 percent slopes
Soil Map Units surrounding and contiguous to the AA (list all present in approx. rank order by area; see manual)	Cornelius and Kinton silt loams, 2 to 7 percent slopes
	Cornelius and Kinton silt loams, 7 to 12 percent slopes
	Saum silt loam, 2 to 7 percent slopes
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PFO
HGM Class (Scores worksheet will suggest a class; see manual section 2.4.2)	Slope, Riverine
If tidal, the tidal phase during most of visit:	N/A
What percent (approx.) of the **wetland** were you able to visit?	10
What percent (approx.) of the **AA** were you able to visit?	30
Have you attended an ORWAP training session? If so, indicate approximate month & year.	No
How many wetlands have you assessed previously using ORWAP (approx.)?	36

ORWAP SCORES SHEET	version 2.0.2 May 2012
Site Name:	Clark Hill Road Forest (Wetland M5-3)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	6/24/2016

Specific Functions:	Relative Effectiveness of the Function	Relative Values of the Function
Water Storage & Delay (WS)	3.42	6.94
Sediment Retention & Stabilization (SR)	5.83	4.36
Phosphorus Retention (PR)	8.18	5.42
Nitrate Removal & Retention (NR)	6.31	4.87
Thermoregulation (T)	6.89	3.33
Carbon Sequestration (CS)	2.51	
Organic Matter Export (OE)	5.92	
Aquatic Invertebrate Habitat (INV)	6.16	7.00
Anadromous Fish Habitat (FA)	0.00	5.57
Non-anadromous Fish Habitat (FR)	6.05	6.67
Amphibian & Reptile Habitat (AM)	3.87	8.00
Waterbird Feeding Habitat (WBF)	5.57	4.67
Waterbird Nesting Habitat (WBN)	0.00	3.50
Songbird, Raptor, & Mammal Habitat (SBM)	6.35	4.67
Pollinator Habitat (POL)	7.81	5.83
Native Plant Diversity (PD)	7.27	7.43

GROUPED FUNCTIONS	Group Scores (functions)	Group Scores (values)	
Hydrologic Function (WS)	3.42	6.94	(identical to Water Storage and Delay function and value scores)
Water Quality Group (WQ)	8.18	5.42	(maximum of scores for SR, PR, NR, and T)
Carbon Sequestration (CS)	2.51		(identical to Carbon Sequestration score above)
Fish Support Group (FISH)	6.05	6.67	(maximum of scores for FA and FR)
Aquatic Support Group (AQ)	6.16	8.00	(maximum of scores for OE, AM, INV, WBF, and WBN)
Terrestrial Support Group (TERR)	7.81	7.43	(maximum of scores for PD, POL, and SBM)
Public Use & Recognition (PU)		0.00	(click on this cell to see this attribute defined)
Provisioning Services (PS)		0.00	(click on this cell to see this attribute defined)

OTHER ATTRIBUTES		
Wetland Ecological Condition (CQ)		5.58
Wetland Stressors (STR)		4.21
Wetland Sensitivity (SEN)		10.00

HGM Class - Relative Probabilities (select max)	
Estuarine	0.00
Riverine	6.50
Slope	4.06
Flat	0.00
Depressional	0.00
Lacustrine	0.00

CoverPg: Basic Description of Assessment	2012
Site Name:	PLM 5.0: Clark Hill Road Pasture (Wetland M5-3.1)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	11/17/2016
County:	Washington
Nearest Town:	Jacktown
Latitude (decimal degrees):	45.4451
Longitude (decimal degrees):	-122.9017
TRS, quarter/quarter section and tax lot(s)	
Approximate size of the Assessment Area (AA, in acres)	0.80
AA as percent of entire wetland (approx.)	100%
If delineated, DSL file number (WD #) if known	none
Soil Map Units within the AA (list these in approx. rank order by area, from WSS web site or published county survey; see manual)	Delena silt loam, 3 to 12 percent slopes
Soil Map Units surrounding and contiguous to the AA (list all present in approx. rank order by area; see manual)	Cornelius and Kinton silt loams, 2 to 7 percent slopes
	Cornelius and Kinton silt loams, 7 to 12 percent slopes
	Saum silt loam, 2 to 7 percent slopes
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PEM
HGM Class (Scores worksheet will suggest a class; see manual section 2.4.2)	
If tidal, the tidal phase during most of visit:	N/A
What percent (approx.) of the **wetland** were you able to visit?	100
What percent (approx.) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	Yes, more than 5 years ago
How many wetlands have you assessed previously using ORWAP (approx.)?	37

ORWAP SCORES SHEET	version 2.0.2 May 2012
Site Name:	Clark Hill Road Forest (Wetland M5-3)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	11/17/2016

Specific Functions:	Relative Effectiveness of the Function	Relative Values of the Function
Water Storage & Delay (WS)	3.92	6.94
Sediment Retention & Stabilization (SR)	5.18	4.35
Phosphorus Retention (PR)	7.26	5.58
Nitrate Removal & Retention (NR)	3.64	5.01
Thermoregulation (T)	4.11	1.67
Carbon Sequestration (CS)	2.36	
Organic Matter Export (OE)	5.97	
Aquatic Invertebrate Habitat (INV)	4.90	7.00
Anadromous Fish Habitat (FA)	0.00	4.80
Non-anadromous Fish Habitat (FR)	3.95	6.67
Amphibian & Reptile Habitat (AM)	2.84	4.67
Waterbird Feeding Habitat (WBF)	4.80	4.67
Waterbird Nesting Habitat (WBN)	0.00	3.50
Songbird, Raptor, & Mammal Habitat (SBM)	3.97	4.67
Pollinator Habitat (POL)	4.16	5.83
Native Plant Diversity (PD)	2.88	7.00

GROUPED FUNCTIONS	Group Scores (functions)	Group Scores (values)	
Hydrologic Function (WS)	3.92	6.94	(identical to Water Storage and Delay function and value scores)
Water Quality Group (WQ)	7.26	5.58	(maximum of scores for SR, PR, NR, and T)
Carbon Sequestration (CS)	2.36		(identical to Carbon Sequestration score above)
Fish Support Group (FISH)	3.95	6.67	(maximum of scores for FA and FR)
Aquatic Support Group (AQ)	5.97	7.00	(maximum of scores for OE, AM, INV, WBF, and WBN)
Terrestrial Support Group (TERR)	4.16	7.00	(maximum of scores for PD, POL, and SBM)
Public Use & Recognition (PU)		1.19	(click on this cell to see this attribute defined)
Provisioning Services (PS)		0.00	(click on this cell to see this attribute defined)

OTHER ATTRIBUTES		
Wetland Ecological Condition (CQ)		4.81
Wetland Stressors (STR)		5.83
Wetland Sensitivity (SEN)		5.70

HGM Class - Relative Probabilities (select max)	
Estuarine	0.00
Riverine	5.90
Slope	4.94
Flat	0.00
Depressional	0.00
Lacustrine	0.00

CoverPg: Basic Description of Assessment	2012
Site Name:	PLW 1.0: Unnamed Tributary to Butternut Creek (Wetland PHS-C1)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	6/21/2016
County:	Washington
Nearest Town:	Aloha
Latitude (decimal degrees):	45.4773
Longitude (decimal degrees):	-122.9049
TRS, quarter/quarter section and tax lot(s)	T1S R2W S14
Approximate size of the Assessment Area (AA, in acres)	0.10
AA as percent of entire wetland (approx.)	10%
If delineated, DSL file number (WD #) if known	none
Soil Map Units within the AA (list these in approx. rank order by area, from WSS web site or published county survey; see manual)	Huberly silt loam
Soil Map Units surrounding and contiguous to the AA (list all present in approx. rank order by area; see manual)	Aloha silt loam
	Woodburn silt loam, 0 to 3 percent
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PEM, PSS, PFO
HGM Class (Scores worksheet will suggest a class; see manual section 2.4.2)	
If tidal, the tidal phase during most of visit:	N/A
What percent (approx.) of the **wetland** were you able to visit?	10
What percent (approx.) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	Yes, more than 5 years ago
How many wetlands have you assessed previously using ORWAP (approx.)?	33
Comments about the site or this ORWAP assessment (attach extra page if desired):	

ORWAP SCORES SHEET	version 2.0.2 May 2012
Site Name:	Unnamed Tributary to Butternut Creek (Wetland PHS-C1)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	6/21/2016

Specific Functions:	Relative Effectiveness of the Function	Relative Values of the Function
Water Storage & Delay (WS)	3.63	6.88
Sediment Retention & Stabilization (SR)	4.35	4.56
Phosphorus Retention (PR)	7.72	5.40
Nitrate Removal & Retention (NR)	4.04	4.19
Thermoregulation (T)	0.83	1.67
Carbon Sequestration (CS)	2.30	
Organic Matter Export (OE)	7.88	
Aquatic Invertebrate Habitat (INV)	7.16	7.11
Anadromous Fish Habitat (FA)	0.00	4.06
Non-anadromous Fish Habitat (FR)	1.61	2.03
Amphibian & Reptile Habitat (AM)	7.11	4.67
Waterbird Feeding Habitat (WBF)	4.06	4.67
Waterbird Nesting Habitat (WBN)	0.00	3.50
Songbird, Raptor, & Mammal Habitat (SBM)	6.17	4.67
Pollinator Habitat (POL)	5.73	7.22
Native Plant Diversity (PD)	4.70	7.00

GROUPED FUNCTIONS	Group Scores (functions)	Group Scores (values)	
Hydrologic Function (WS)	3.63	6.88	(identical to Water Storage and Delay function and value scores)
Water Quality Group (WQ)	7.72	5.40	(maximum of scores for SR, PR, NR, and T)
Carbon Sequestration (CS)	2.30		(identical to Carbon Sequestration score above)
Fish Support Group (FISH)	1.61	4.06	(maximum of scores for FA and FR)
Aquatic Support Group (AQ)	7.88	7.11	(maximum of scores for OE, AM, INV, WBF, and WBN)
Terrestrial Support Group (TERR)	6.17	7.22	(maximum of scores for PD, POL, and SBM)
Public Use & Recognition (PU)		0.00	(click on this cell to see this attribute defined)
Provisioning Services (PS)		0.00	(click on this cell to see this attribute defined)

OTHER ATTRIBUTES		
Wetland Ecological Condition (CQ)		5.14
Wetland Stressors (STR)		1.75
Wetland Sensitivity (SEN)		5.70

HGM Class - Relative Probabilities (select max)	
Estuarine	0.00
Riverine	5.90
Slope	1.85
Flat	0.00
Depressional	0.00
Lacustrine	0.00

CoverPg: Basic Description of Assessment	2012
Site Name:	PLW 2.0: Beaverton Creek at Cornelius Pass Road (Wetland-W2-1)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	6/23/2016
County:	Washington
Nearest Town:	Beaverton
Latitude (decimal degrees):	45.520147
Longitude (decimal degrees):	-122.900252
TRS, quarter/quarter section and tax lot(s)	T1N R2W S37
Approximate size of the Assessment Area (AA, in acres)	0.20
AA as percent of entire wetland (approx.)	50%
If delineated, DSL file number (WD #) if known	none
Soil Map Units within the AA (list these in approx. rank order by area, from WSS web site or published county survey; see manual)	Wapato silty clay loam
Soil Map Units surrounding and contiguous to the AA (list all present in approx. rank order by area; see manual)	Quatama loam, 3 to 7 percent slopes
	Quatama loam, 7 to 12 percent slopes
	Quatama loam, 12 to 20 percent slopes
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery):	PFOC, PSSC
	(along north bank of creek)
Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E	(south bank is PEM only and not assessed)
Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	
HGM Class (Scores worksheet will suggest a class; see manual section 2.4.2)	Riverine, Slope
If tidal, the tidal phase during most of visit:	N/A
What percent (approx.) of the **wetland** were you able to visit?	50
What percent (approx.) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	Yes, more than 5 years ago
How many wetlands have you assessed previously using ORWAP (approx.)?	34
Comments about the site or this ORWAP assessment (attach extra page if desired):	

ORWAP SCORES SHEET	version 2.0.2 May 2012
Site Name:	Beaverton Creek at Cornelius Pass Road (Wetland-W2-1)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	6/23/2016

Specific Functions:	Relative Effectiveness of the Function	Relative Values of the Function
Water Storage & Delay (WS)	3.92	3.83
Sediment Retention & Stabilization (SR)	4.57	5.54
Phosphorus Retention (PR)	7.41	8.51
Nitrate Removal & Retention (NR)	4.43	5.72
Thermoregulation (T)	6.94	8.75
Carbon Sequestration (CS)	2.08	
Organic Matter Export (OE)	6.92	
Aquatic Invertebrate Habitat (INV)	4.77	7.26
Anadromous Fish Habitat (FA)	7.26	10.00
Non-anadromous Fish Habitat (FR)	4.83	6.67
Amphibian & Reptile Habitat (AM)	2.83	8.00
Waterbird Feeding Habitat (WBF)	3.94	4.67
Waterbird Nesting Habitat (WBN)	0.00	3.50
Songbird, Raptor, & Mammal Habitat (SBM)	4.14	4.67
Pollinator Habitat (POL)	5.34	5.00
Native Plant Diversity (PD)	3.80	7.00

GROUPED FUNCTIONS	Group Scores (functions)	Group Scores (values)	
Hydrologic Function (WS)	3.92	3.83	(identical to Water Storage and Delay function and value scores)
Water Quality Group (WQ)	7.41	8.75	(maximum of scores for SR, PR, NR, and T)
Carbon Sequestration (CS)	2.08		(identical to Carbon Sequestration score above)
Fish Support Group (FISH)	7.26	10.00	(maximum of scores for FA and FR)
Aquatic Support Group (AQ)	6.92	8.00	(maximum of scores for OE, AM, INV, WBF, and WBN)
Terrestrial Support Group (TERR)	5.34	7.00	(maximum of scores for PD, POL, and SBM)
Public Use & Recognition (PU)		1.53	(click on this cell to see this attribute defined)
Provisioning Services (PS)		0.00	(click on this cell to see this attribute defined)

OTHER ATTRIBUTES		
Wetland Ecological Condition (CQ)		4.57
Wetland Stressors (STR)		5.68
Wetland Sensitivity (SEN)		6.10

HGM Class - Relative Probabilities (select max)	
Estuarine	0.00
Riverine	2.90
Slope	1.31
Flat	0.00
Depressional	0.00
Lacustrine	0.00

CoverPg: Basic Description of Assessment	2012
Site Name:	PLW 2.0: Rock Creek at Cornelious Pass Road (Wetland-W2-2)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	6/23/2016
County:	Washington
Nearest Town:	Beaverton
Latitude (decimal degrees):	45.526062
Longitude (decimal degrees):	-122.900898
TRS, quarter/quarter section and tax lot(s)	T1N R2W S35
Approximate size of the Assessment Area (AA, in acres)	0.01
AA as percent of entire wetland (approx.)	10%
If delineated, DSL file number (WD #) if known	none
Soil Map Units within the AA (list these in approx. rank order by area, from WSS web site or published county survey; see manual)	Wapato silty clay loam
Soil Map Units surrounding and contiguous to the AA (list all present in approx. rank order by area; see manual)	Quatama loam, 3 to 7 percent slopes
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PFOC
HGM Class (Scores worksheet will suggest a class; see manual section 2.4.2)	Riverine, Slope
If tidal, the tidal phase during most of visit:	N/A
What percent (approx.) of the **wetland** were you able to visit?	10
What percent (approx.) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	Yes, more than 5 years ago
How many wetlands have you assessed previously using ORWAP (approx.)?	35
Comments about the site or this ORWAP assessment (attach extra page if desired):	

ORWAP SCORES SHEET	version 2.0.2 May 2012
Site Name:	Rock Creek at Cornelious PassRoad (Wetland-W2-2)
Investigator Name:	Rickus, Rosenthal
Date of Field Assessment:	6/23/2016

Specific Functions:	Relative Effectiveness of the Function	Relative Values of the Function
Water Storage & Delay (WS)	4.10	3.83
Sediment Retention & Stabilization (SR)	4.99	5.40
Phosphorus Retention (PR)	7.55	8.26
Nitrate Removal & Retention (NR)	4.48	5.72
Thermoregulation (T)	7.78	8.75
Carbon Sequestration (CS)	2.22	
Organic Matter Export (OE)	6.84	
Aquatic Invertebrate Habitat (INV)	5.31	7.00
Anadromous Fish Habitat (FA)	0.00	10.00
Non-anadromous Fish Habitat (FR)	4.49	6.67
Amphibian & Reptile Habitat (AM)	2.98	8.00
Waterbird Feeding Habitat (WBF)	3.97	4.67
Waterbird Nesting Habitat (WBN)	0.00	3.50
Songbird, Raptor, & Mammal Habitat (SBM)	4.31	4.67
Pollinator Habitat (POL)	5.75	5.00
Native Plant Diversity (PD)	4.34	7.00

GROUPED FUNCTIONS	Group Scores (functions)	Group Scores (values)	
Hydrologic Function (WS)	4.10	3.83	(identical to Water Storage and Delay function and value scores)
Water Quality Group (WQ)	7.78	8.75	(maximum of scores for SR, PR, NR, and T)
Carbon Sequestration (CS)	2.22		(identical to Carbon Sequestration score above)
Fish Support Group (FISH)	4.49	10.00	(maximum of scores for FA and FR)
Aquatic Support Group (AQ)	6.84	8.00	(maximum of scores for OE, AM, INV, WBF, and WBN)
Terrestrial Support Group (TERR)	5.75	7.00	(maximum of scores for PD, POL, and SBM)
Public Use & Recognition (PU)		2.36	(click on this cell to see this attribute defined)
Provisioning Services (PS)		0.00	(click on this cell to see this attribute defined)

OTHER ATTRIBUTES		
Wetland Ecological Condition (CQ)		4.85
Wetland Stressors (STR)		5.69
Wetland Sensitivity (SEN)		6.10

HGM Class - Relative Probabilities (select max)	
Estuarine	0.00
Riverine	2.90
Slope	1.31
Flat	0.00
Depressional	0.00
Lacustrine	0.00

Attachment C: Wetland Delineation Concurrence Letters

This attachment contains concurrence letters for wetland delineations conducted specifically for the Willamette Water Supply Program (Program). Where the WWSP has relied on recent delineations performed by others (i.e. adjacent property owners/developers that have conducted their own delineations), the associated concurrence letters are included in the appendices of Program prepared delineation reports. Program delineation reports that have not yet received concurrence are not included in this attachment but will be submitted to the agencies as a separate submittal.

Oregon
Kate Brown, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregon.gov/dsl

State Land Board

Kate Brown
Governor

Jeanne P. Atkins
Secretary of State

Ted Wheeler
State Treasurer

August 31, 2016

City of Hillsboro Water Department
Attn: Niki Iverson, Water Resource Manager
150 E. Main Street
Hillsboro, OR 97123-4028

Re: WD #2016-0249 Wetland Delineation Report for Proposed Improvements for the Willamette River Water Treatment Plant Clackamas County; T 1S R 1W S 23B Tax Lots 1800 and 1900

Dear Ms. Iverson:

The Department of State Lands has reviewed the wetland delineation report prepared by David Evans and Associates, Inc. for the site referenced above. Based upon the information presented in the report and additional information submitted upon request, we concur with the wetland and waterway boundaries as mapped in Figure 6, Sheets 1 and 2 of the report. Within the study area, three wetlands (totaling approximately 0.16 acres), and portions of three waterways, the Willamette River, Arrowhead Creek, and an unnamed tributary to the Willamette were identified.

The wetlands and the waterways are all subject to the permit requirements of the state Removal-Fill Law. Under current regulations, a state permit is required for cumulative fill or annual excavation of 50 cubic yards or more in wetlands or below the ordinary high water line (OHWL) of a waterway (or the 2 year recurrence interval flood elevation if OHWL cannot be determined). However, the Willamette River is an essential salmonid stream; therefore, fill or removal of any amount of material below its OHWL and within any hydrologically-connected wetlands may require a state permit. In addition, the Willamette is also a state-owned waterway; any activity encroaching within the submerged and submersible land may require a lease, registration, or easement to occupy state-owned land. Please contact Justin Russel at (503) 986-5219 for more information.

This concurrence is for purposes of the state Removal-Fill Law only. Federal or local permit requirements may apply as well. The Army Corps of Engineers will review the report and make a determination of jurisdiction for purposes of the Clean Water Act at the time that a permit application is submitted. We recommend that you attach a copy of

this concurrence letter to both copies of any subsequent joint permit application to speed application review.

Please be advised that state law establishes a preference for avoidance of wetland impacts. Because measures to avoid and minimize wetland impacts may include reconfiguring parcel layout and size or development design, we recommend that you work with Department staff on appropriate site design before completing the city or county land use approval process.

This concurrence is based on information provided to the agency. The jurisdictional determination is valid for five years from the date of this letter unless new information necessitates a revision. Circumstances under which the Department may change a determination are found in OAR 141-090-0045 (available on our web site or upon request). In addition, laws enacted by the legislature and/or rules adopted by the Department may result in a change in jurisdiction; individuals and applicants are subject to the regulations that are in effect at the time of the removal-fill activity or complete permit application. The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within six months of the date of this letter.

Thank you for having the site evaluated. Please phone me at 503-986-5232 if you have any questions.

Sincerely,

Peter Ryan, PWS
Jurisdiction Coordinator

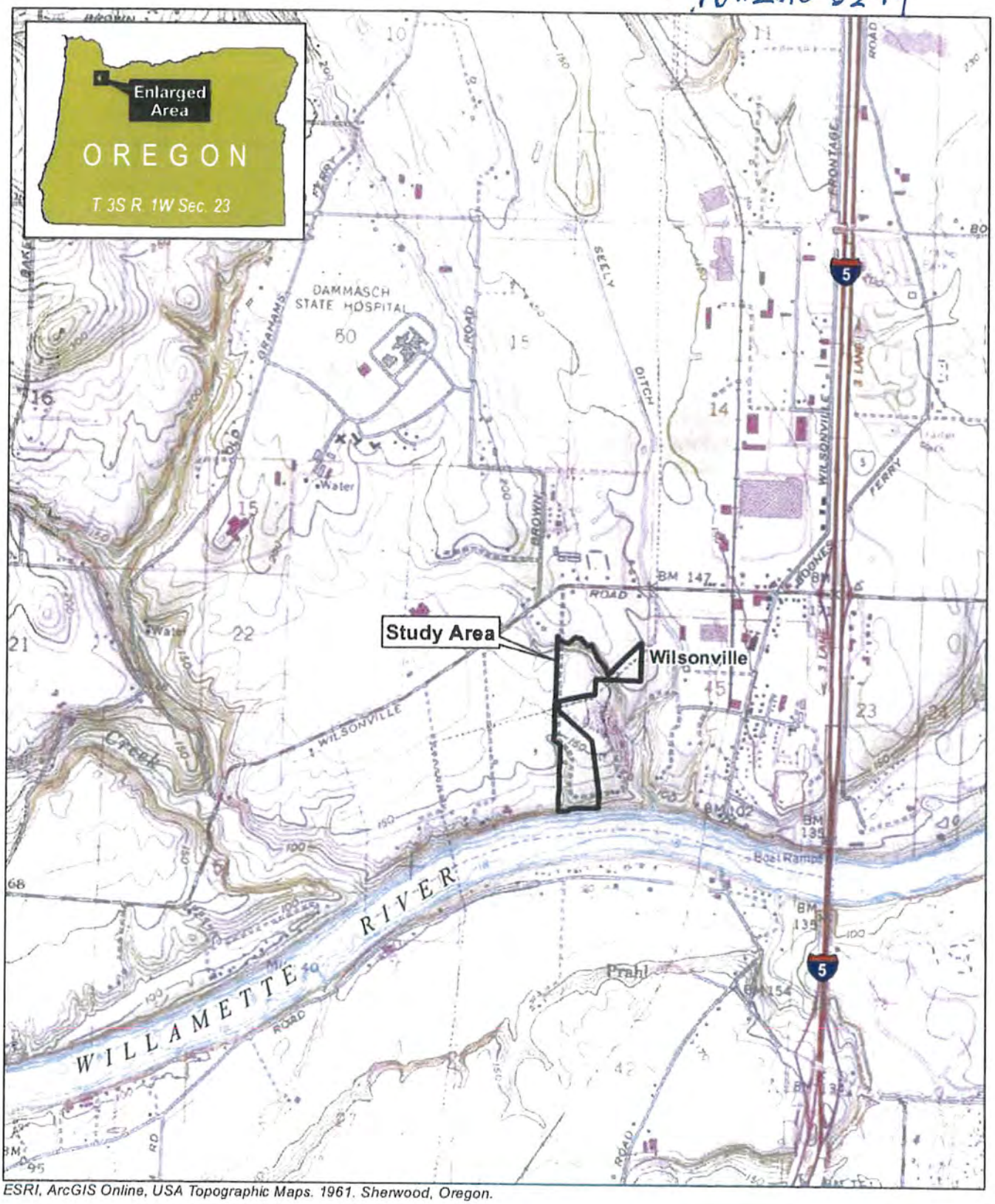
Approved by

Lori Warner-Dickason
Northern Field Operations Manager

Enclosures

ec: Ethan Rosenthal, David Evans and Associates, Inc.
City of Wilsonville Planning Department (Maps enclosed for updating LWI)
Dominic Yballe, Corps of Engineers
Anita Huffman, DSL

ID#2016-0249



ESRI, ArcGIS Online, USA Topographic Maps. 1961. Sherwood, Oregon.

Figure 1
Vicinity

N 0 2,000 4,000 Feet

This map was prepared for assessment purpose only.

N.W. 1/4 SEC. 23 T3S R1W W.M.
CLACKAMAS COUNTY

3 1W 23B
WILSONVILLE

D.L.C.
ROBERT V. SHORT NO 46
THOMAS BAILEY NO 45

SEE MAP 3 1W 14C 1" = 200'

SEE MAP 3 1W 14

3-27UR

WILSONVILLE ROAD

MKT. RD. NO. 6

KINSMAN RD.

P. P. PARCEL

PARCEL 2
2012 - 057

PARCEL 2
3-23
PARTITION PLAT 1990-92

PARCEL 1 (3.03Ac.)

D.L.C. NO. 45

NW COR

SEE MAP 31W 22A
3-23

SEE MAP 3 1W 22AA

3-23

B.P.A. LINE

3-33UR

TRACT A to Public

B.P.A. LINE EASEMENT

VANCOUVER EUGENE LINE

ELECTRIC

SEE MAP 3 1W 23AB

CANCELLED 701A1

30500

1/4 COR

OREGON CITY

SEMAWA

2000 A1
2000 A2
2000 A3

2001
6.24Ac

EAST LINE D.L.C. NO. 46

WEST LINE D.L.C. NO 45

SEE MAP 3 1W 23BD

SEE MAP 3 1W 22

1/4 COR

31000

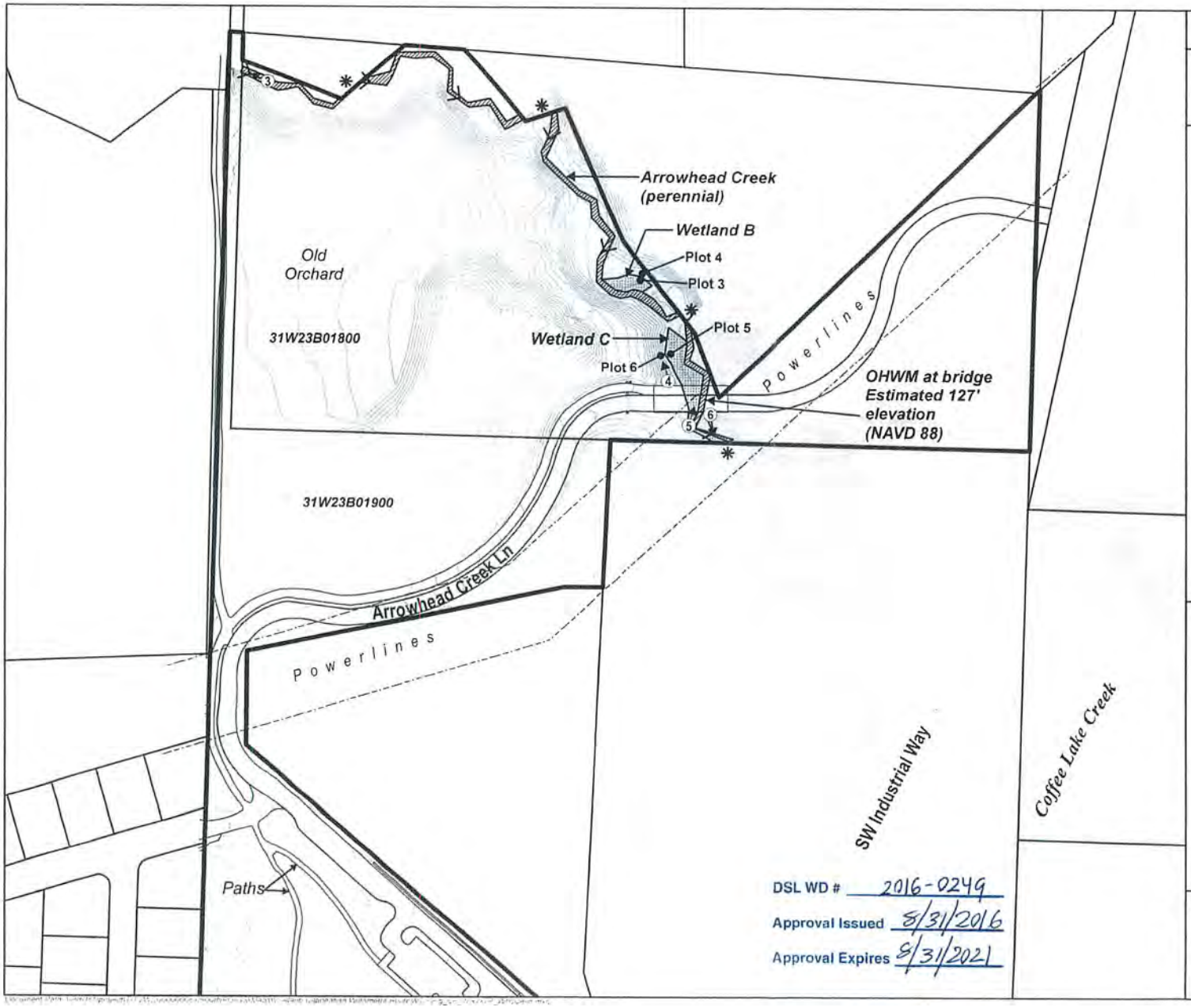
SEE MAP 3 1W 23CA

SEE MAP 3 1W 23

S E COR D.L.C. 46

WD2016-0249

3 1W 23B
WILSONVILLE
BOOK 26



DSL WD # 2016-0249
Approval Issued 8/31/2016
Approval Expires 8/31/2021

Willamette River Water Treatment Plant

Figure 6, Sheet 1
Wetland Delineation

Legend
- Study Area
- Ordinary High Water Mark (OHWM)
- Wetland
- Intermittent Stream
- Culvert Outfall
- Data Plot
- Wetland/Water Resource extends outside of Study Area
- Photo Points (directional)
- 10 ft Contour
- Taxlot

Accuracy Statement:
All features were flagged in the field and mapped by a professional survey crew with typical horizontal accuracy of one foot or better.

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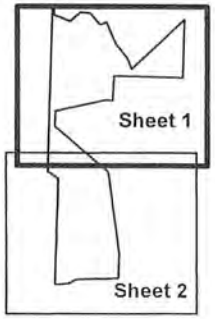

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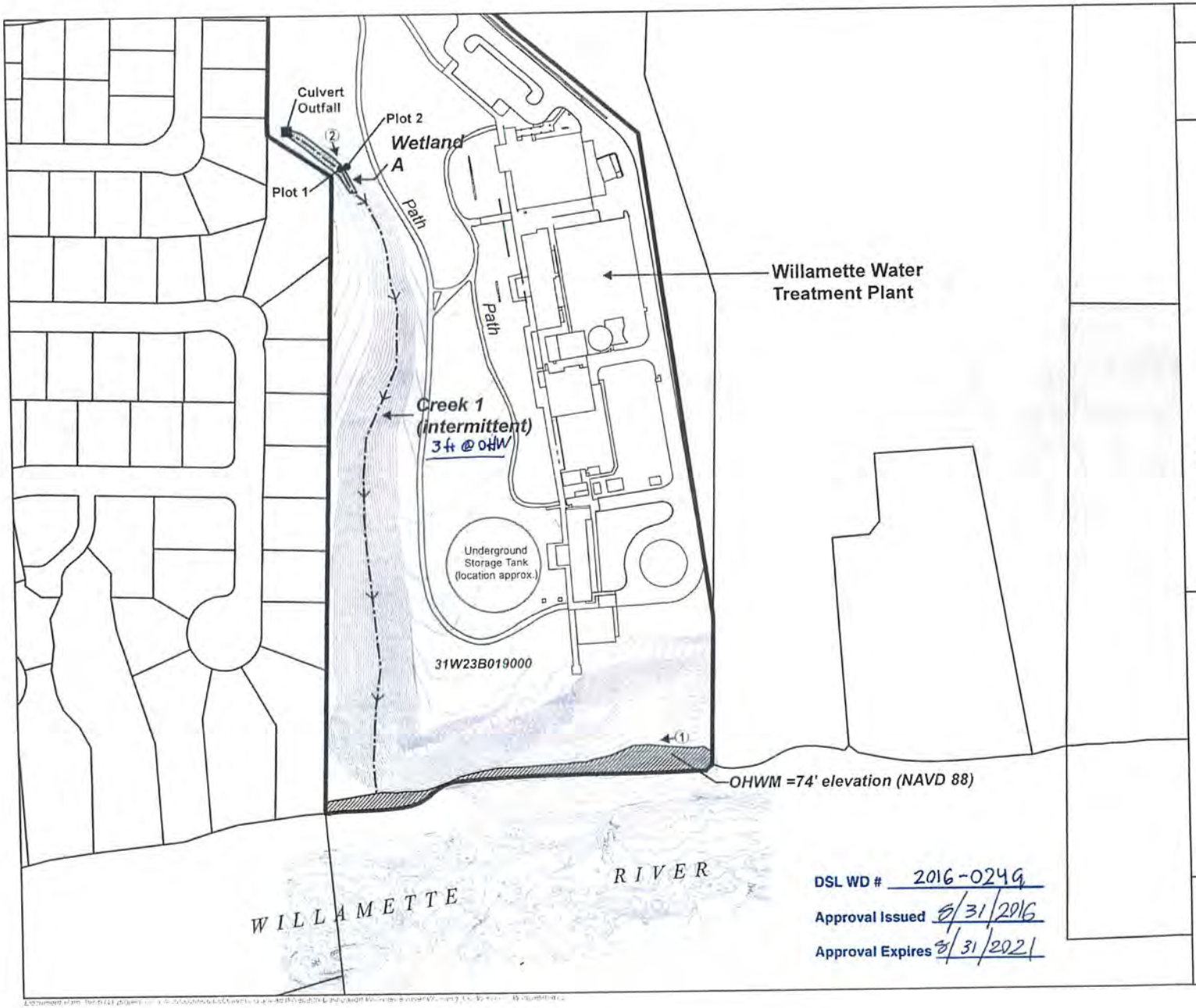
Compass Land Surveyors, June 2015.



Willamette River Water Treatment Plant

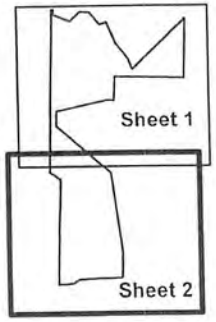
Figure 6, Sheet 2
Wetland Delineation

Legend

- Study Area
- Ordinary High Water Mark (OHWM)
- Wetland
- Intermittent Stream
- Culvert Outfall
- Data Plot
- Wetland/Water Resource extends outside of Study Area
- Photo Points (directional)
- 10 ft Contour
- Taxlot

Accuraccy Statement:
All features were flagged in the field and mapped by a professional survey crew with typical horizontal accuracy of one foot or better.

N 0 150 300 Feet



ESRI, ArcGIS Online, World Imagery. Microsoft. 2010. Portland, Oregon.

Compass Land Surveyors. June 2015.

DSL WD # 2016-0249

Approval Issued 8/31/2016

Approval Expires 8/31/2021

Oregon
Kate Brown, Governor

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State Land Board

Kate Brown
Governor

Dennis Richardson
Secretary of State

Tobias Read
State Treasurer

March 29, 2017

City of Hillsboro Water Department
Attn: Niki Iverson
150 E. Main Street
Hillsboro, OR 97123-4028

Re: WD # 2017-0008 Wetland Delineation Report for the Proposed Water Treatment Plant for the Willamette Water Supply Program Project
Washington County; T2S R1W Sec. 28D, Portion of Tax Lot 100

Dear Ms. Iverson:

The Department of State Lands has reviewed the wetland delineation report prepared by David Evans and Associates, Inc. for the site referenced above. Please note that the study area includes only a portion of the tax lot described above (see the attached map). Based upon the information presented in the report, we concur with the wetland boundaries as mapped in Figure 6 of the report. Within the study area, seven delineated wetlands and one potential wetland (Wetland PW_H) were identified, totaling approximately 6.0 acres.

The wetlands are subject to the permit requirements of the state Removal-Fill Law. Under current regulations, a state permit is required for cumulative fill or annual excavation of 50 cubic yards or more in wetlands. In addition, due to access issues Wetland PW-H was mapped using offsite wetland determination methods including interpretation of Lidar generated contour topography. Because offsite determination methods are not suitable for removal-fill permitting, it will be necessary to use onsite methods and delineate this area prior to project construction. If subsequent onsite wetland delineation work changes the areas of wetland and wetland impact appreciably, the Department may require an addendum wetland report and a revised permit application.

This concurrence is for purposes of the state Removal-Fill Law only. Federal or local permit requirements may apply as well. The Army Corps of Engineers will review the report and make a determination of jurisdiction for purposes of the Clean Water Act at the time that a permit application is submitted. We recommend that you attach a copy of this concurrence letter to both copies of any subsequent joint permit application to speed application review.

Please be advised that state law establishes a preference for avoidance of wetland impacts. Because measures to avoid and minimize wetland impacts may include reconfiguring parcel layout and size or development design, we recommend that you

work with Department staff on appropriate site design before completing the city or county land use approval process.

This concurrence is based on information provided to the agency. The jurisdictional determination is valid for five years from the date of this letter unless new information necessitates a revision. Circumstances under which the Department may change a determination are found in OAR 141-090-0045 (available on our web site or upon request). In addition, laws enacted by the legislature and/or rules adopted by the Department may result in a change in jurisdiction; individuals and applicants are subject to the regulations that are in effect at the time of the removal-fill activity or complete permit application. The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within six months of the date of this letter.

Thank you for having the site evaluated. Please phone me at 503-986-5232 if you have any questions.

Sincerely,

Peter Ryan, PWS
Jurisdiction Coordinator

Approved by

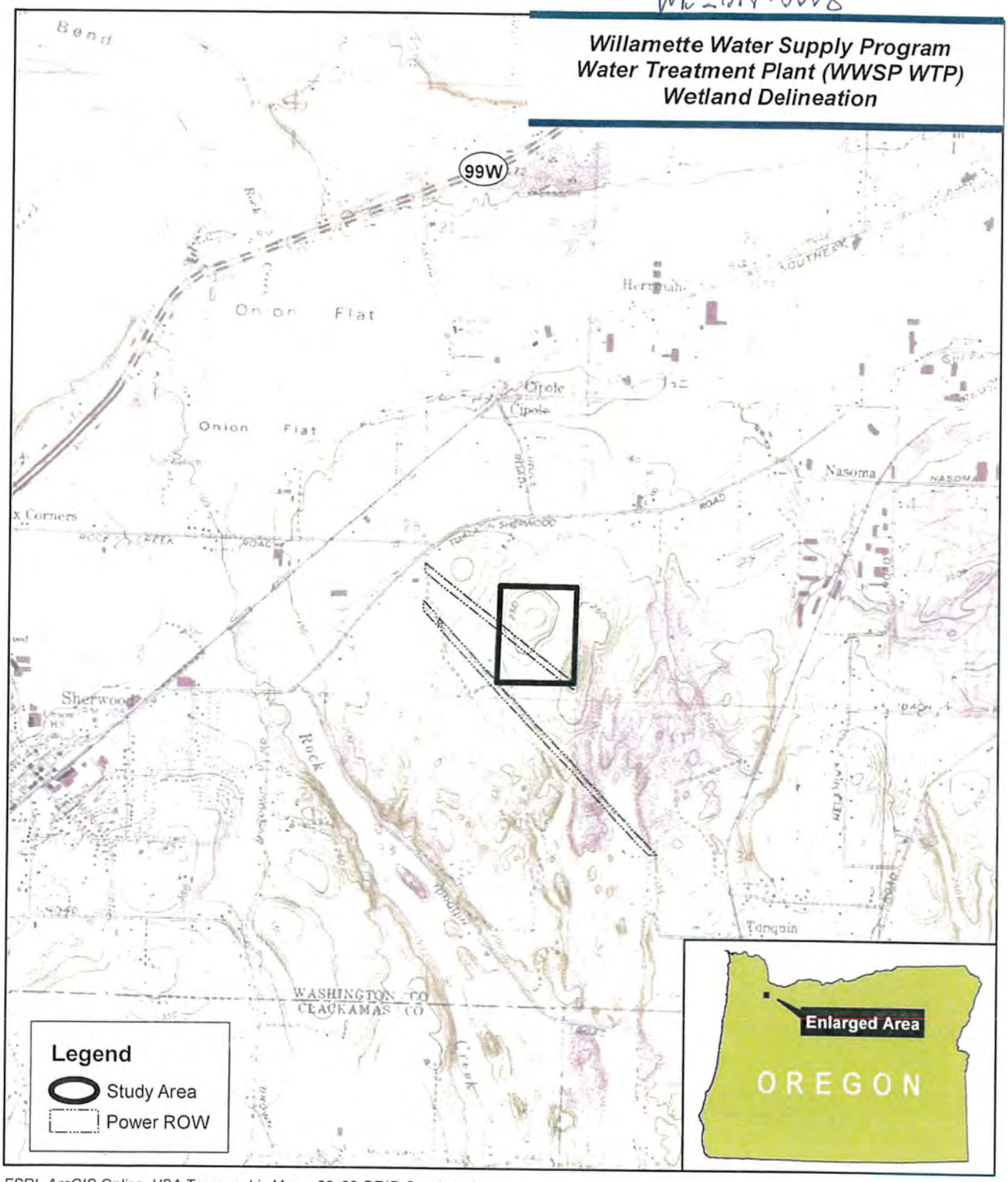
Kathy Verble, CPSS
Aquatic Resource Specialist

Enclosures

ec: John Macklin, David Evans and Associates, Inc.
Washington County Planning Department
Jaimee Davis, Corps of Engineers
Amber Wierck, Clean Water Services
Anita Huffman, DSL

WL-017-0008

Willamette Water Supply Program
Water Treatment Plant (WWSP WTP)
Wetland Delineation



ESRI, ArcGIS Online, USA Topographic Maps. 30x60 GRID Quadrangles

Figure 1
Vicinity Map

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SE 1/4 SECTION 28 T2S R1W W.M.

WASHINGTON COUNTY OREGON

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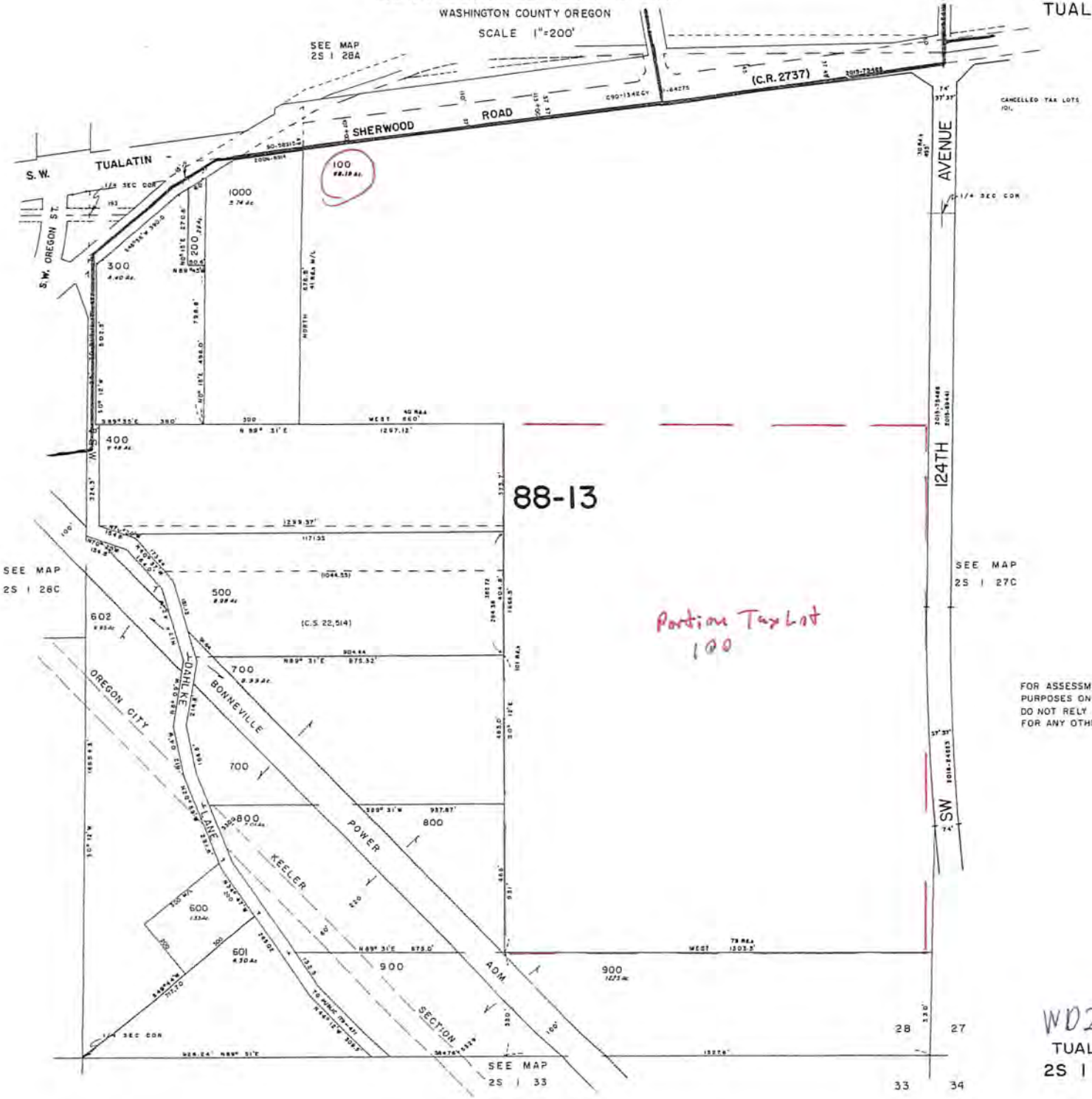

WD2017-0008

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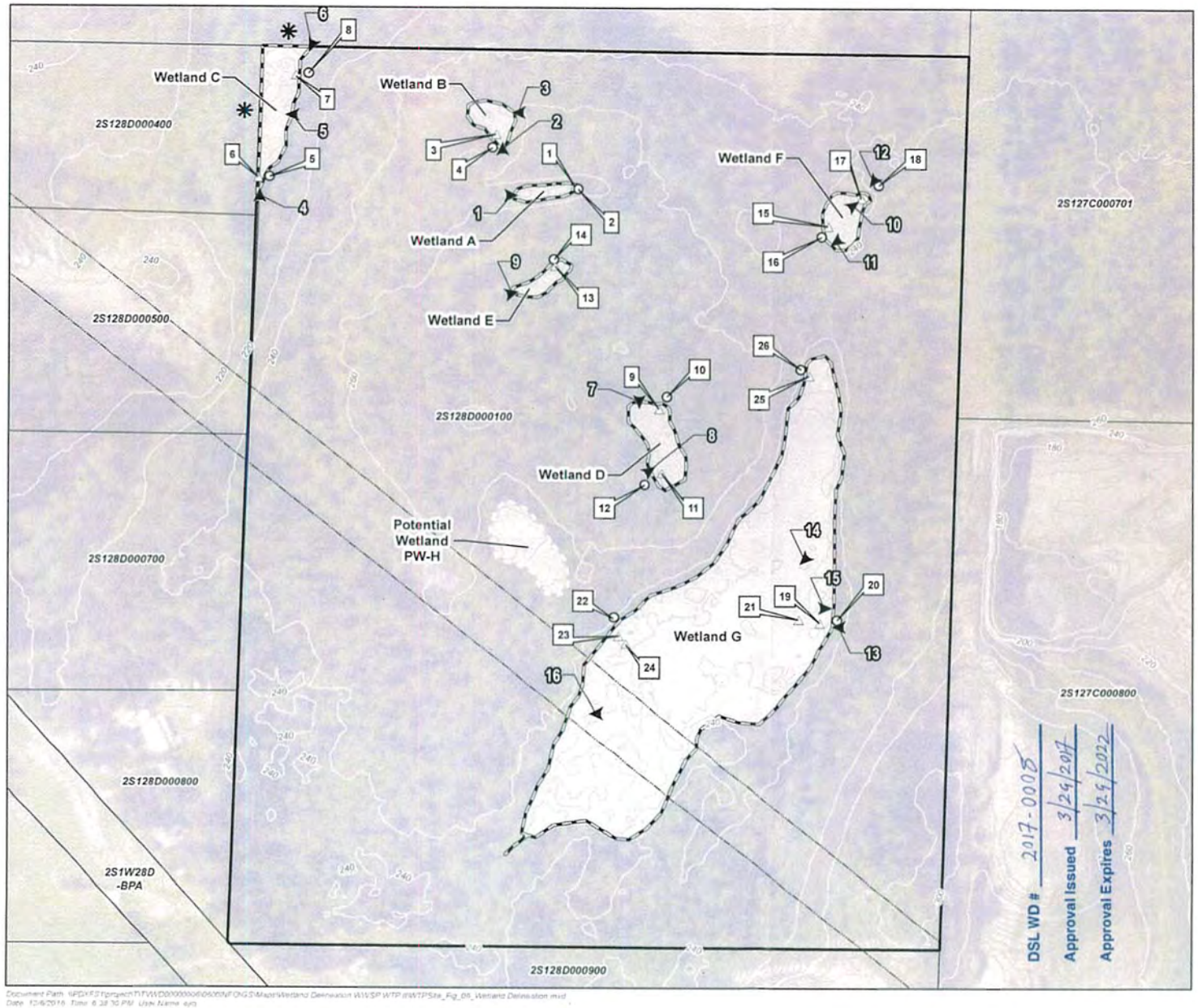

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Willamette Water Supply Program
Water Treatment Plant (WWSP WTP)
Wetland Delineation

Figure 6
Delineated Wetlands

Delineated Features
- Wetland
- Potential Wetland
- Wetland Area
- Study Area
- Photo location and direction
- Wetland extends beyond study area
- Upland Data Plot
- Wetland Data Plot
- Power ROW
- Taxlot
- Contour (20 ft intervals)
- Contour (2 ft intervals)

On-site features (wetlands, ditches, streams, culverts, and data plots) were mapped with a Trimble Pathfinder GEO XH receiver with typical accuracy of 3 feet or better. Off-site boundaries are approximate and were mapped based on field review from adjacent public right of way and aerial photo interpretation. An asterisk was included where jurisdictional features, with the exclusion of upland ditches, extend off site. Only taxlots which intersect the study area are labeled. Imagery: USDA NAIP 2016.

N

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Feet

Oregon
Kate Brown, Governor

Department of State Lands
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Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregon.gov/dsl

State Land Board

Kate Brown
Governor

Dennis Richardson
Secretary of State

Tobias Read
State Treasurer

March 21, 2017

City of Hillsboro Water Department
Attn: Niki Iverson, Water Resource Manager
150 E Main Street
Hillsboro, OR 97123-4028

Re: WD #2017-0005 Wetland Delineation Report for the Proposed Willamette Water Supply System Reservoir Site, Washington County; T 1S R 2W S 36 TL 304

Dear Ms. Iverson:

The Department of State Lands has reviewed the wetland delineation report prepared by David Evans and Associates for the site referenced above. Based upon the information presented in the report and additional information submitted upon request, we concur with the wetland and waterway boundaries as mapped in Figure 6 of the report. Within the study area, one wetland (totaling approximately 0.22 acres) and two headwater tributaries to McKernan Creek (both labeled S-M5-1 on Figure 6) were identified.

The wetland and tributaries are subject to the permit requirements of the state Removal-Fill Law. Under current regulations, a state permit is required for cumulative fill or annual excavation of 50 cubic yards or more in wetlands or below the ordinary high water line (OHWL) of a waterway (or the 2 year recurrence interval flood elevation if OHWL cannot be determined).

This concurrence is for purposes of the state Removal-Fill Law only. Federal or local permit requirements may apply as well. The Army Corps of Engineers will review the report and make a determination of jurisdiction for purposes of the Clean Water Act at the time that a permit application is submitted. We recommend that you attach a copy of this concurrence letter to both copies of any subsequent joint permit application to speed application review.

Please be advised that state law establishes a preference for avoidance of wetland impacts. Because measures to avoid and minimize wetland impacts may include reconfiguring parcel layout and size or development design, we recommend that you work with Department staff on appropriate site design before completing the city or county land use approval process.

This concurrence is based on information provided to the agency. The jurisdictional determination is valid for five years from the date of this letter unless new information necessitates a revision. Circumstances under which the Department may change a determination are found in OAR 141-090-0045 (available on our web site or upon request). In addition, laws enacted by the legislature and/or rules adopted by the Department may result in a change in jurisdiction; individuals and applicants are subject to the regulations that are in effect at the time of the removal-fill activity or complete permit application. The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within six months of the date of this letter.

Thank you for having the site evaluated. Please phone me at 503-986-5232 if you have any questions.

Sincerely,

Peter Ryan, PWS
Jurisdiction Coordinator

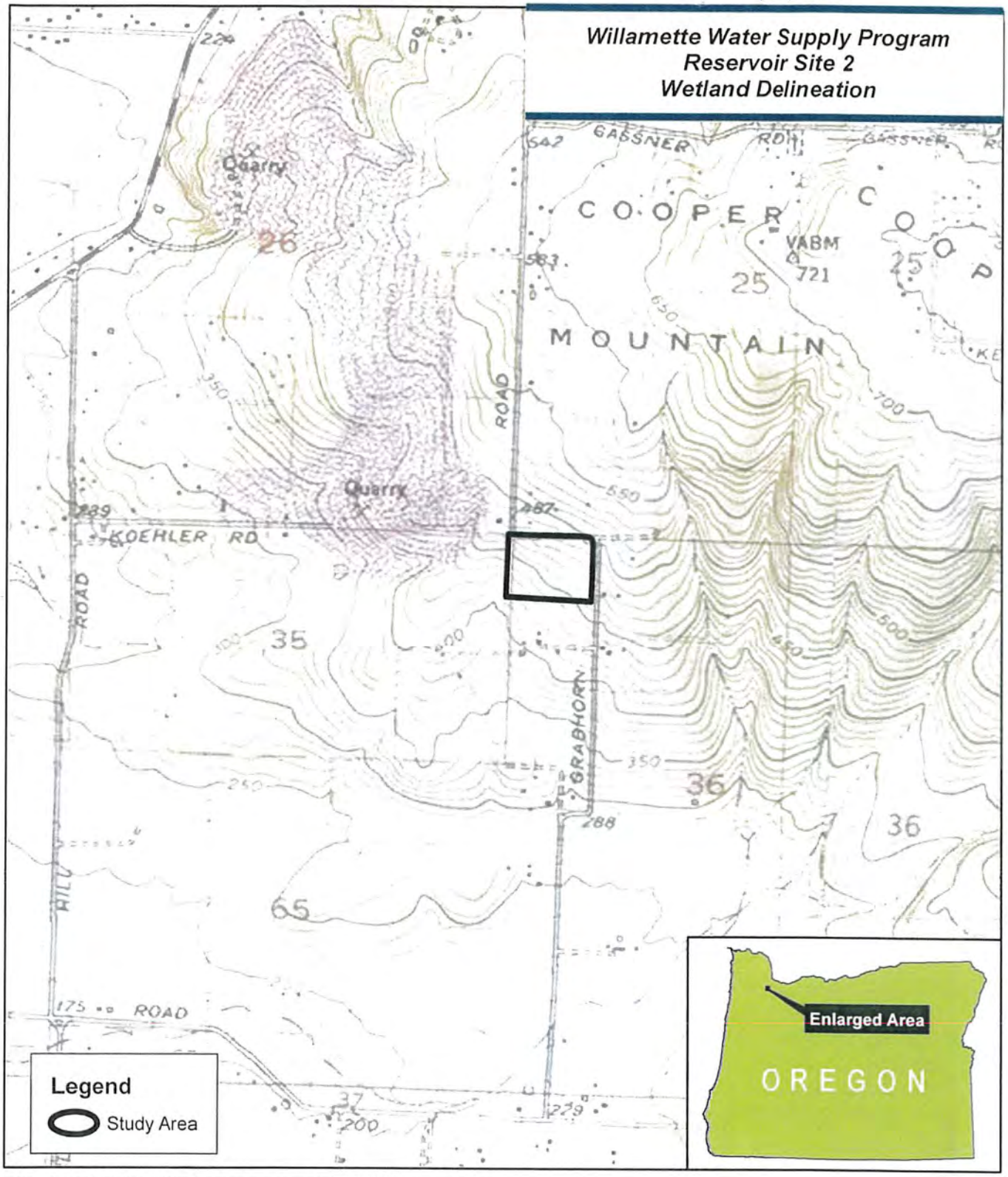
Approved by

Kathy Verble, CPSS
Aquatic Resource Specialist

Enclosures

ec: Phil Rickus, David Evans and Associates
Washington County Planning Department
Jaimee Davis, Corps of Engineers
Anita Huffman, DSL
Amber Wierck, Clean Water Services

W0207-0005



ESRI, ArcGIS Online, USA Topographic Maps. 30x60 GRID Quadrangles

Figure 1
Vicinity Map

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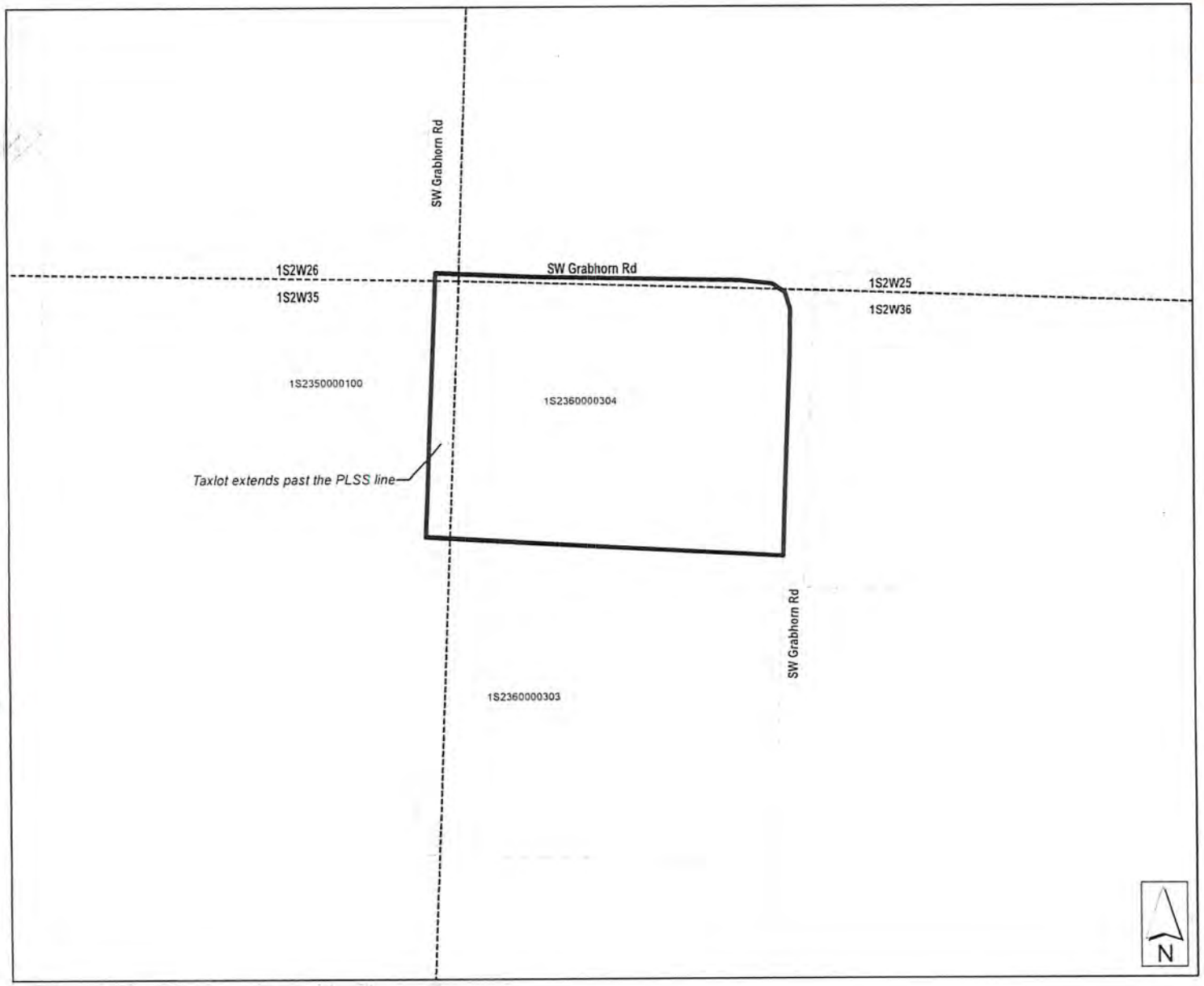
WD2017-0005

Willamette Water Supply Program
Reservoir Site 2
Wetland Delineation

Figure 2
Tax Lots



Legend

- Study Area
- Area delineated by others
- No access as of 10/24/2016
- PLSS

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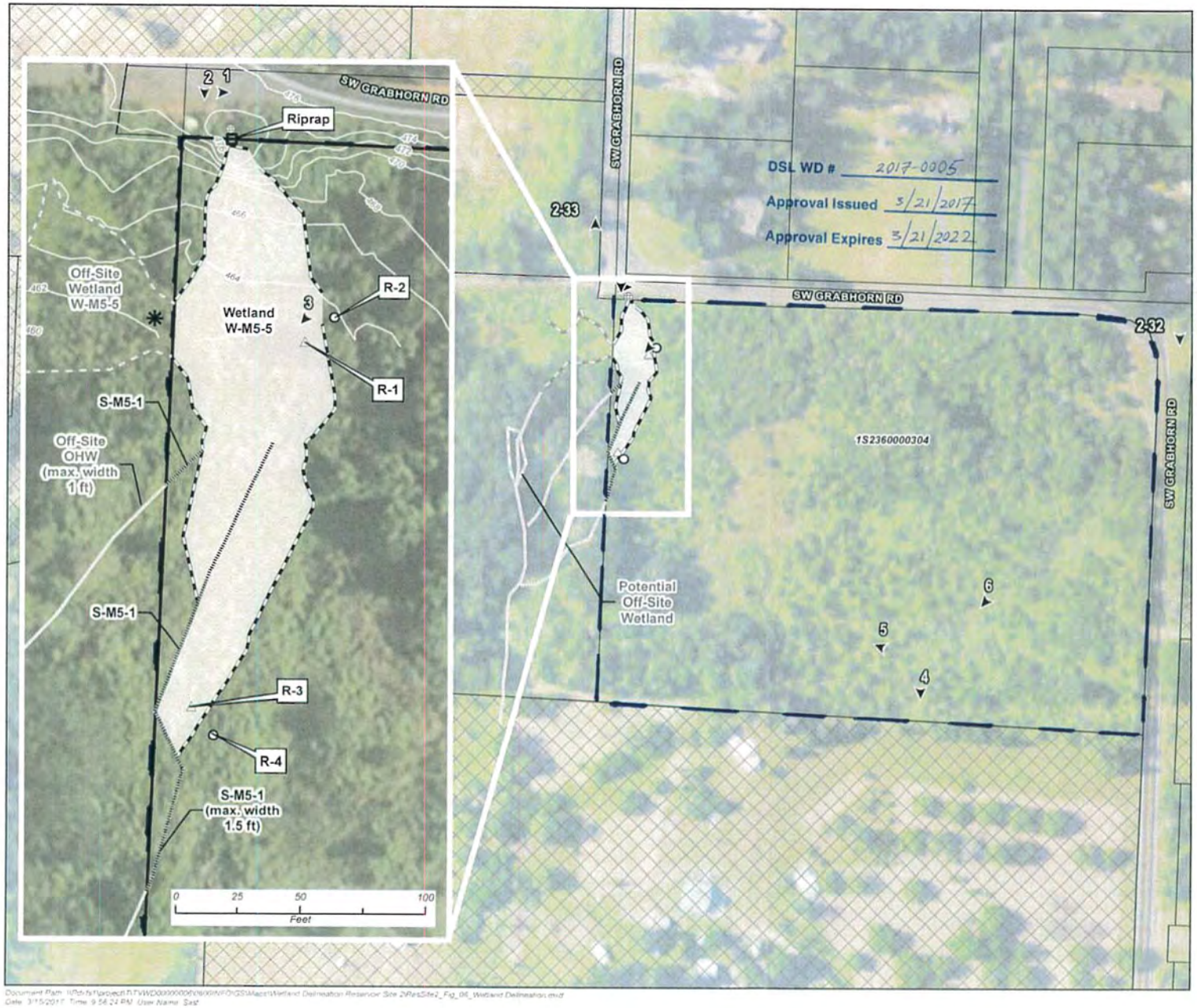
Metro RLIS Data. 2016.



Willamette Water Supply Program
Reservoir Site 2
Wetland Delineation

Figure 6
Delineated Wetlands

Delineated Features
- Wetland
- Off-Site Wetland
- Off-Site Potential Wetland
- Ordinary High Water (OHW)
- Off-Site Ordinary High Water (OHW)
- Wetland Area
- Culvert
- Study Area
- Photo location and direction
- Upland Data Plot
- Wetland Data Plot
- Wetland exten beyond study a
- No access as of 10/24/2016
- Taxlot
- Contour (2 ft intervals)

On-site features (wetlands, ditches, streams, culverts, and data plots) were mapped with a Trimble Pathfinder GEO XH receiver with typical accuracy of 3 feet or better. Off-site boundaries are approximate and were mapped based on field review from adjacent public right of way and aerial photo interpretation. An asterisk was included where jurisdictional features, with the exclusion of upland ditches, extend off site. Only taxlots which intersect the study area are labeled. Imagery: USDA NAIP 2016; inset maps show Bing Maps Aerial imagery.

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Date: 3/15/2017 Time: 9:58:24 PM User Name: Sest

Attachment D: Alternatives Analysis

Willamette Water Supply
Our Reliable Water

WILLAMETTE WATER SUPPLY SYSTEM

Alternatives Analysis

Prepared for:

Tualatin Valley Water District

Hillsboro OREGON

Prepared by:

DAVID EVANS AND ASSOCIATES INC

David Evans and Associates, Inc.
2100 SW River Parkway
Portland, Oregon 97201

April 2017

EXECUTIVE SUMMARY

The Tualatin Valley Water District (TVWD) and the City of Hillsboro (Hillsboro), collectively referred to as the Willamette Water Supply Program (WWSP or Program), have identified the Willamette Water Supply System (WWSS or Project) as the best option for future delivery of drinking water to their respective service areas in Washington County. Given projected population growth and the resultant expected doubling of water demands in Washington County over the next 50 years (Metro, 2015), increased capacity is needed to meet the needs of the region while also providing increased resiliency and redundancy of the water supply system. The purpose of the WWSP, in short, is to provide a long-term, resilient water supply option to serve the projected water supply needs of TVWD and Hillsboro customers.

TVWD and Hillsboro independently evaluated potential water supply sources and identified four primary water supply alternatives: the Tualatin Basin Water Supply Project, the mid-Willamette River at Wilsonville, a Portland supply, and a Northern Groundwater Supply. TVWD and Hillsboro each independently selected the Willamette River at Wilsonville supply alternative and formed the WWSP to partner in the development of the supply. Once a supply source alternative was selected, the Program conducted additional alternatives evaluations to determine the preferred locations of the relevant Project components—the Transmission Pipelines route, the WWSS Water Treatment Plant (WTP) site, and the Reservoir Facilities.

This Alternatives Analysis document details the alternatives evaluations conducted to determine the proposed Project, including the range of alternatives considered when selecting the Program's water supply source and the locations of relevant Project components. In addition, this Alternatives Analysis demonstrates how environmental impacts have been avoided and/or minimized to the maximum extent practicable.

After a thorough evaluation of alternatives, the Program selected a preferred Transmission Pipelines route that travels through Clackamas and Washington counties from the mid-Willamette River at Wilsonville to the Project's eastern and western extension points in Hillsboro and Beaverton. The preferred WWSS WTP site is located in the Sherwood area, along the pipeline route, and the preferred Reservoir Facilities site is located in the South Cooper Mountain area, also along the pipeline route.

This document was prepared with the intent to fulfill the requirement of the U.S. Army Corps of Engineers (USACE) to evaluate Project alternatives under the National Environmental Policy Act and the Clean Water Act Section 404(b)(1) Guidelines, and is consistent with the USACE's April 2016 Alternatives Analysis Framework guidance document. This Alternatives Analysis is intended to support the USACE in its determination of the proposed Project's Least Environmentally Damaging Practicable Alternative (LEDPA).

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1 INTRODUCTION

Population size and municipal water needs in Washington County are expected to double in the next 50 years, with new source supplies needed as early as 2026. The Tualatin Valley Water District (TVWD) and the City of Hillsboro (Hillsboro), collectively referred to as the Willamette Water Supply Program (WWSP or Program), have identified the Willamette Water Supply System (WWSS or Project) as the best option for future delivery of drinking water to their respective service areas in Washington County. In 2013, in response to a projected future water supply shortfall in their service areas and from identified vulnerabilities of their current water systems to seismic events and other natural disasters, TVWD and Hillsboro entered into an intergovernmental agreement (IGA) pursuant to Oregon Revised Statutes (ORS) Chapter 190, forming a partnership to identify additional water supply options and finance and build the necessary infrastructure to deliver sufficient water supplies to meet future demand projections. The WWSP is a result of this partnership.

After an extensive evaluation of potential supply source alternatives, TVWD and Hillsboro each selected the mid-Willamette River at Wilsonville as the water supply source for the WWSS. Evaluations of proposed Project component alternatives, including alternatives for a transmission pipeline route and water treatment plant and reservoir facilities, were also conducted. The evaluations conducted for the Program are outlined in the following sections.

This Alternatives Analysis document presents the purpose and need for the Project and summarizes the results of alternatives evaluations conducted for the Program to support the U.S. Army Corps of Engineers') (USACE's) determination of the Least Environmentally Damaging Practicable Alternative (LEDPA) for each of the Project's various components. It also demonstrates how environmental impacts have been avoided and/or minimized to the maximum extent practicable. The Alternatives Analysis demonstrates the range of alternatives, including all reasonable source options, pipeline route alternatives, water treatment plant site alternatives, and reservoir facilities alternatives that were evaluated, and meet the purpose and need of the proposed Project. All reasonable alternatives have been considered to ensure that the proposed Project is well conceived and has been thoroughly evaluated. Reasonable alternatives include those that are technically and economically practical or feasible, and meet the purpose and need of the proposed Project. This document was prepared with the intent to fulfill the requirement of the USACE to evaluate Project alternatives under the National Environmental Policy Act (NEPA) and the Clean Water Act (CWA) Section 404(b)(1) Guidelines, and is consistent with the USACE's April 2016 Alternatives Analysis Framework guidance document.

1.1 PROJECT PURPOSE AND NEED

Population size and municipal water needs in Washington County are expected to double in the next 50 years, with new source supplies needed as early as 2026. Although effective water conservation programs and newer low-water-use appliances have decreased water use by Washington County homes and businesses by 15 to 20 percent compared to a decade ago, conservation alone is not enough to meet projected future demands. Without development of a new water supply source, Hillsboro and TVWD will not have the necessary water supplies to respond to increased water demand in their service areas resulting from projected population growth and development in the region as identified by Metro, the regional growth management agency. For example, population growth in the seven-county metropolitan area is expected to increase by approximately 470,000 to 725,000 individuals by 2035. The seven-county metropolitan area includes Clackamas, Clark, Columbia, Multnomah, Skamania, Washington, and Yamhill counties. Within the urban growth boundary (UGB), population growth is estimated to add 300,000 to 485,000 people from 2015 to 2035 (Metro, 2015).

As a result of this anticipated regional growth, water demand for TVWD and Hillsboro customers is expected to exceed currently available water supplies as early as 2026. Therefore, TVWD and Hillsboro are in need of a new, long-term water supply to supplement existing supplies to meet future demands. In 2026, Hillsboro is expected to have a supply of 41.75 million gallons per day (mgd); however, long-term demands are projected to reach 77.99 mgd in 2085 (GSI, 2017). Similarly, TVWD will have a supply of 22.5 mgd in 2026, with long-term demands projected to reach 73.5 mgd in 2064 (GSI, 2014b).

In addition to meeting increased demands, a new water source is also needed to increase the resiliency and redundancy of the region's water supply system in the face of earthquakes, droughts, and other potential threats to the system. For example, current regional water supply infrastructure is not projected to withstand subduction zone earthquakes, and significant upgrades to existing infrastructure cannot occur until a new supply is online. With the addition of a new water supply source, the region can rely on a number of sources to meet the needs of the communities. If one source is limited or unavailable, another source can be relied upon.

The purpose of the WWSP is to provide a long-term, resilient water supply option to serve the projected water supply needs of TVWD and Hillsboro residents and businesses.

To ensure that the Program's purpose is achieved, the chosen water supply option must:

- Meet projected future water supply demands, supporting the region's plans for responsible growth within the UGB
- Reliably deliver a long-term water supply, including in times of droughts, earthquakes, or other disasters
- Supply finished water to TVWD and Hillsboro customers
- Offer a cost-effective water supply source in service by July 2026
- Support ownership and control of the water supply via a partnership between TVWD and Hillsboro

1.2 PROJECT LOCATION

The Project is located in Clackamas and Washington counties. The southern end of the Project is located at the Willamette River in Wilsonville, and extends to the city of Hillsboro and to TVWD's service area (near the city of Beaverton) at the northern- and eastern-most extensions (see Appendix B, Figure 1). There are four primary components of the WWSS, as described below:

- The **Raw Water Facilities (RWF)** are located immediately adjacent to the Willamette River, at the site of the existing Willamette River Water Treatment Plant (WRWTP) and intake. The existing intake was constructed with the intent of being a regional water source, and is owned by TVWD and the cities of Hillsboro, Wilsonville, Sherwood, Tigard, and Beaverton. The existing WRWTP is owned by TVWD and the City of Wilsonville. The WRWTP is a separate facility and is not part of the WWSS. The RWF encompasses the proposed modifications to the existing intake, which will include a fish screen replacement and replacement of in-water protection piles, as well as seismic stability improvements, raw water pump station upgrades, new electrical and hydraulic surge control facilities for the pump station, and associated raw water pipelines that will convey water from the Willamette River through the raw water pump station. Two raw water pipelines will exit the raw water pump station to convey water to two water treatment plants (the WRWTP and a new WWSS water treatment plant (WWSS WTP)). Owners of the RWF will include TVWD and the cities of Hillsboro, Wilsonville, Sherwood, Beaverton, and Tigard, with the exception of the raw water pipeline serving the WWSS WTP, which will be owned by TVWD and Hillsboro. The proposed withdrawal capacity of the RWF is 150 mgd (232.1 cubic feet per second (cfs)).
- The **WWSS Water Treatment Plant (WWSS WTP)** refers to the proposed construction of a new water treatment plant, including a finished water pump station, that will be located in unincorporated Washington County, near the city of Sherwood. The WWSS WTP will receive water from the raw water pipeline, perform treatment to meet or exceed drinking water standards, and then pump treated water into the finished water pipeline. This facility will serve TVWD and Hillsboro at an initial capacity of 60 mgd, with phased construction anticipated to expand the capacity to 120 mgd.
- The **Reservoir Facilities** will contain two aboveground or partially buried water storage tanks proposed to be located in the Cooper Mountain area of Washington County. The storage tanks will receive and store finished water from the WWSS WTP. Water will be gravity fed from the storage tanks into the northern section of the water pipeline. The Reservoir Facilities will serve TVWD and Hillsboro, with the combined storage capacity of the two water storage tanks totaling 30 mgd.
- **Transmission Pipelines** will connect the RWF, WWSS WTP, and Reservoir Facilities, and ultimately tie in to TVWD's and Hillsboro's existing water distribution systems. The Transmission Pipelines will convey raw water from the RWF to the WWSS WTP, and finished water from the WWSS WTP to the Reservoir Facilities and existing water distribution system tie-ins. These pipelines will serve TVWD and Hillsboro, and will also tie in to the City of Beaverton's and Joint Water Commission's (JWC's) systems to allow for emergency access

between the systems. The capacity within individual pipeline sections will vary by location, but the overall system will provide approximately 105.7 mgd of water transmission capacity.

To facilitate completion of the Project by July 2026, the Project is divided into work packages that will be constructed separately and on varying schedules between the start of the Project and July 2026.

1.3 PROJECT HISTORY

The Willamette River has been studied for several decades as a potential regional water supply source for the Portland metropolitan area. The Regional Water Provider's Consortium identified the Willamette River as a potential regional source beginning in the 1990s, and the City of Wilsonville and TVWD initially invested in the existing intake and WRWTP in the late 1990s and early 2000s. Currently, the WRWTP and associated facilities provide a total of 15 mgd of drinking water for the cities of Wilsonville and Sherwood, and have been federally authorized to withdraw up to 70 mgd. These facilities were built to accommodate regional water supply deliveries, as well as future treatment plant expansion by other parties, and, as such, the intake and other facilities were originally sized to accommodate withdrawals of up to 150 mgd.

In 2006, TVWD completed a water supply analysis evaluating several supply source options, ultimately deciding in 2007 to participate in the Tualatin Basin Water Supply Project (TBWSP). Hillsboro, as part of the JWC, undertook a separate evaluation of water supply options and completed the Tualatin Basin Water Supply Feasibility Study in 2004 (MWH, 2004), also selecting the TBWSP as its future supply source. Once the TBWSP was selected by the participating Washington County water agencies, further analyses were conducted, which concluded that a significant raise of Scoggins Dam, a major facet of the TBWSP, would not meet the water demand schedules of many of the participating water agencies. In addition, significant risks to the project due to seismic concerns and the presence of endangered species in the proposed inundation zone were identified.

In 2009, Hillsboro initiated a Long-Term Water Supply Feasibility Study (HDR, 2012). Several regional partners participated in the study as part of the Technical Advisory Committee, including TVWD. Through its partnership on the Long-Term Water Supply Feasibility Study, TVWD began evaluating water supply alternatives in 2012. The results of TVWD's and Hillsboro's water supply studies led the two agencies to form the WWSP, as described in detail in the following sections.

2 WATER SUPPLY

Hillsboro and TVWD conducted the water supply planning process to determine projected future water demand and to identify the available water rights, water conservation measures, and supply options to meet increases in demand in their respective service areas.

2.1 WATER SUPPLIES

Hillsboro currently obtains all of its water supply from the JWC, which is composed of TVWD and the cities of Hillsboro, Forest Grove, and Beaverton. The JWC manages many of the surface water rights held by its member agencies to create a shared source of supply. The JWC obtains its water supply from two primary surface water sources—the Tualatin River and its tributaries, and the Middle Fork of the North Fork Trask River. During the non-peak season, water is stored in Barney Reservoir and

Scoggins Reservoir. During the peak season, stored water from Scoggins and Barney reservoirs is released into the Tualatin River via Scoggins Creek and by pipeline, respectively, to supplement the water supply that can be diverted from the Tualatin River at the JWC's Springhill Pumping Plant.

The JWC's Springhill plant produces 75 mgd of water, of which Hillsboro owns 33.75 mgd of capacity. The JWC is currently in the process of designing and constructing a 10 mgd-capacity water treatment plant expansion. The expansion is anticipated to be completed in 2019 and will result in an increase in capacity to 41.75 mgd for Hillsboro. The JWC Springhill plant expansion and potential for lease agreement with other JWC members will allow Hillsboro to meet demands until 2026. **Table** 1 lists the municipal water rights held by members of the JWC (GSI, 2017).

Table 1. Municipal Water Rights Held by the Joint Water Commission and its Member Agencies

Water Source	Application/ Permit	Certificate/ Transfer	Priority Date	Entity Name on Water Right	Authorized Rate/Volume
Sain Creek	S-2016/ S-1136	81026	1/22/1912	City of Hillsboro	3.00 cfs* (cubic feet per second)
Sain Creek	S-4250/ S-2443	81027	5/1/1915	City of Hillsboro	2.00 cfs
Gales Creek	S-2225/ S-17549	T-11677	2/14/1947	City of Forest Grove	4.46 cfs
Tualatin River	S-13681/ S-10408	67891	8/15/1930	City of Hillsboro	9.00 cfs
Tualatin River	S-51643/ S-46423	85913	2/6/1974	City of Hillsboro	43.00 cfs
Tualatin River	S-60357/ S-45455	85914	7/15/1980	City of Beaverton	25.00 cfs
Tualatin River	S-54203/ S-40615	85916	4/28/1976	City of Forest Grove	33.00 cfs
Scoggins Creek	S-69637/ S-54737	--	6/9/1988	Joint Water Commission	75.00 cfs
Middle Fork of North Fork Trask River (Barney Reservoir)	R-32420/ R-4890	81024	6/26/1958 12/10/1965	City of Hillsboro	12,600 AF (acre-feet)** 7,400 AF
Middle Fork of North Fork Trask River and Barney Reservoir	S-32421/ S-32139	81020	6/26/1958	City of Hillsboro	38.70 cfs
Barney Reservoir	S-48359/ S-37837	81022	6/24/1971	City of Forest Grove	500 AF
Scoggins Creek	R-38449/ R-5777	81149	2/20/1963	Bureau of Reclamation	60,000 AF (13,500 AF for municipal use by JWC member agencies)
Scoggins Reservoir/Henry Hagg Lake	S-38447/ S-35792	87304	2/20/1963	Bureau of Reclamation	13,000 AF/70.00 cfs

Water Source	Application/ Permit	Certificate/ Transfer	Priority Date	Entity Name on Water Right	Authorized Rate/Volume
Scoggins Reservoir/Henry Hagg Lake	S-38447/ S-35792	T-11872	2/20/1963	Bureau of Reclamation	500 AF
Sain Creek, Tualatin River, Scoggins Creek, and the Bull Run River; tributaries of Scoggins Creek, the Willamette River, the Tualatin River, and the Sandy River	--	ASR LL-019	--	Joint Water Commission	Storage of 2.1 billion gallons

**1 mgd ≈ 1.55 cfs ** 1 mgd ≈ 3.07 AF/day*

Source: GSI, 2017

In addition to the Springhill Pumping Plant, which is managed by the JWC, Hillsboro owns a slow sand filtration plant on the upper Tualatin River that serves a portion of its residents and has a capacity of approximately 3 mgd (CH2MHill and GSI, 2010). In 2016, Hillsboro purchased a 56 cfs portion of Permit S-45565 from the City of Salem, which authorizes use of water from the Willamette River for municipal water supply. Hillsboro is in the process of adding the RWF as the point of diversion for the 56 cfs portion of Permit S-45565 through the Oregon Water Resources Department (OWRD) permit amendment process (GSI, 2014a). Additionally, an approved Water Management and Conservation Plan (WMCP) will be required to allow Hillsboro to obtain access to water under the permit.

TVWD currently obtains its water from two primary sources: through a wholesale water supply lease agreement with the City of Portland and from the JWC's shared water supply through an IGA with the JWC. TVWD receives water from the City of Portland's Bull Run watershed, which is piped to a storage reservoir on Powell Butte and then conveyed to TVWD's supply system through the Washington County Supply Line, of which the TVWD owns a capacity share of 42.3 mgd (Water Sources TVWD, 2015).

As a member of the JWC, TVWD obtains water supply from the Tualatin River, including stored water from Barney Reservoir. Water from the Tualatin River is diverted at the Springhill Pumping Plant. Of the 75 mgd of water produced at the plant, TVWD owns 12.5 mgd of capacity. The JWC Springhill plant expansion, which will be completed in 2019, will result in an increase in capacity to 14.5 mgd for TVWD. The JWC Springhill plant expansion and potential for lease agreement with other JWC members will allow TVWD to meet demands until 2026.

In addition to these two primary sources, TVWD is a member of the Willamette River Water Coalition (WRWC), which holds a water use permit for up to 202 cfs (which is approximately 130 mgd) from the Willamette River for municipal and industrial uses. TVWD, Hillsboro, the City of Wilsonville, and the other participating members of the WRWC (the cities of Tigard, Tualatin, and Sherwood) plan to build out 150 mgd of capacity. Use of the additional water supply will be authorized by the 56 cfs portion of Permit S-45565 and the WRWC permits (Appendix A, Table 1) (HDR, 2015).

TVWD also owns three certificated groundwater rights authorizing the use of 1.10 cfs, 2.20 cfs, and 0.58 cfs (approximately 0.7 mgd, 1.42 mgd, 0.37 mgd), respectively, from native groundwater wells (CH2MHill and GSI, 2010), and holds a limited license (with the City of Beaverton) for two Aquifer Storage and Recovery (ASR) wells. TVWD's ASR wells are capable of storing approximately 350 million gallons (mg) of treated water that is used as a seasonal supply to augment other water sources and meet peak summer water demands (Water Sources TVWD, 2015). TVWD plans to develop its ASR system to supply up to 4.5 mgd of water to TVWD customers beginning in 2024 (GSI, 2014b).

2.2 WATER DEMAND

Water demand for Hillsboro residents and the customers served by TVWD is expected to exceed currently available water supplies as early as 2026. Consequently, Hillsboro and TVWD are in need of a new, long-term water supply capable of supplementing their existing water supplies to meet future demands. As part of the water supply planning process, TVWD and Hillsboro independently analyzed recent water demands and developed water demand projections for their anticipated water service areas. Factors considered when developing the demand projections included projected population growth, projected land-use development, water use per equivalent dwelling unit, and conservation measures.

In 2013, TVWD's peak-day demand was 35.57 mgd (GSI, 2014b) and Hillsboro's peak-day demand was 28.54 mgd (GSI, 2017), resulting in a combined peak-day demand of 64.11 mgd. TVWD's peak-day demand is projected to increase to 73.5 mgd in 2064 (GSI, 2014b), at which point TVWD would reach build-out. Hillsboro's peak-day demand is projected to increase to 67.99 mgd in 2060 (GSI, 2017) and to reach 77.99 mgd in 2085.

As described in its Final Draft WMCP (GSI, 2017), Hillsboro projects that by 2026 it will have a reliable supply of 41.75 mgd from its JWC supply sources. However, this 2026 supply of 41.75 mgd is short of Hillsboro's projected demands for that year and well short of its projected long-term demands of 77.99 mgd in 2085. Similarly, as described in TVWD's approved WMCP (GSI, 2014b), TVWD projects that by 2026 its reliable supply from the JWC, ASR, and a renegotiated City of Portland water supply agreement will total approximately 22.5 mgd. This supply is short of TVWD's projected demands for 2026 and well short of its 2064 projected demand of 73.5 mgd. Development of the mid-Willamette River at Wilsonville as a new water supply source will allow TVWD and Hillsboro to access additional water supply to meet projected future demands.

2.3 WATER CONSERVATION

Water conservation efforts for TVWD and Hillsboro are outlined in detail in the JWC's WMCP and in their individual WMCPs. Much of their conservation, education, and outreach efforts are coordinated through the JWC's Events and Education Committee (EEC) and the Regional Water Providers Consortium (RWPC). The JWC's EEC oversees public participation, joint public messaging, and outreach efforts with key objectives, including increasing name recognition and educating Washington County customers about water conservation, backflow prevention, and the Tualatin River Basin water supply. The EEC accomplishes its objectives primarily through outreach on its website, public relations and public events including fairs and workshops, and paid media efforts (CH2MHill and GSI, 2010).

Both TVWD and Hillsboro are also members of the RWPC. The conservation objectives of the RWPC include:

- Implementing regional programs and events focused on reducing peak summer water use
- Promoting the consortium's conservation website
- Integrating consistent conservation messages into the daily lives of customers
- Implementing effective program monitoring and reporting techniques
- Inviting stakeholder participation in conservation program development
- Facilitating the joint efforts of the region's water conservation professionals
- Fostering public awareness of the RWPC's collaborative efforts

To accomplish these objectives, the RWPC conducts media campaigns and outreach events, develops outreach materials and school programs, maintains and promotes the RWPC website and MyH2O Water Savings Calculator, publishes a quarterly newsletter and weekly watering number, conducts property manager workshops, and collaborates with member agencies to pool resources and reach a broader audience.

The JWC WMCP also outlines a set of conservation recommendations, which Hillsboro and TVWD have implemented in their jurisdictions. Hillsboro coordinates the collection of data from all JWC members in order to conduct an annual water audit that is submitted to the OWRD.

Both Hillsboro and TVWD have implemented rebate programs to encourage the use of water-efficient appliances and offer rebates for high efficiency toilets, water-efficient washing machines, and weather-based irrigation controls. TVWD has also implemented a landscaping rebate program that covers lawn aeration, hose bib timers, rain sensors, pressure regulators, and weather-based irrigation controls.

To promote residential evapotranspiration reduction programs, both Hillsboro and TVWD publish links to RWPC's weekly watering number and provide conservation education materials on their websites. TVWD also conducts workshops and presentations to educate the public about evapotranspiration and efficient landscaping practices.

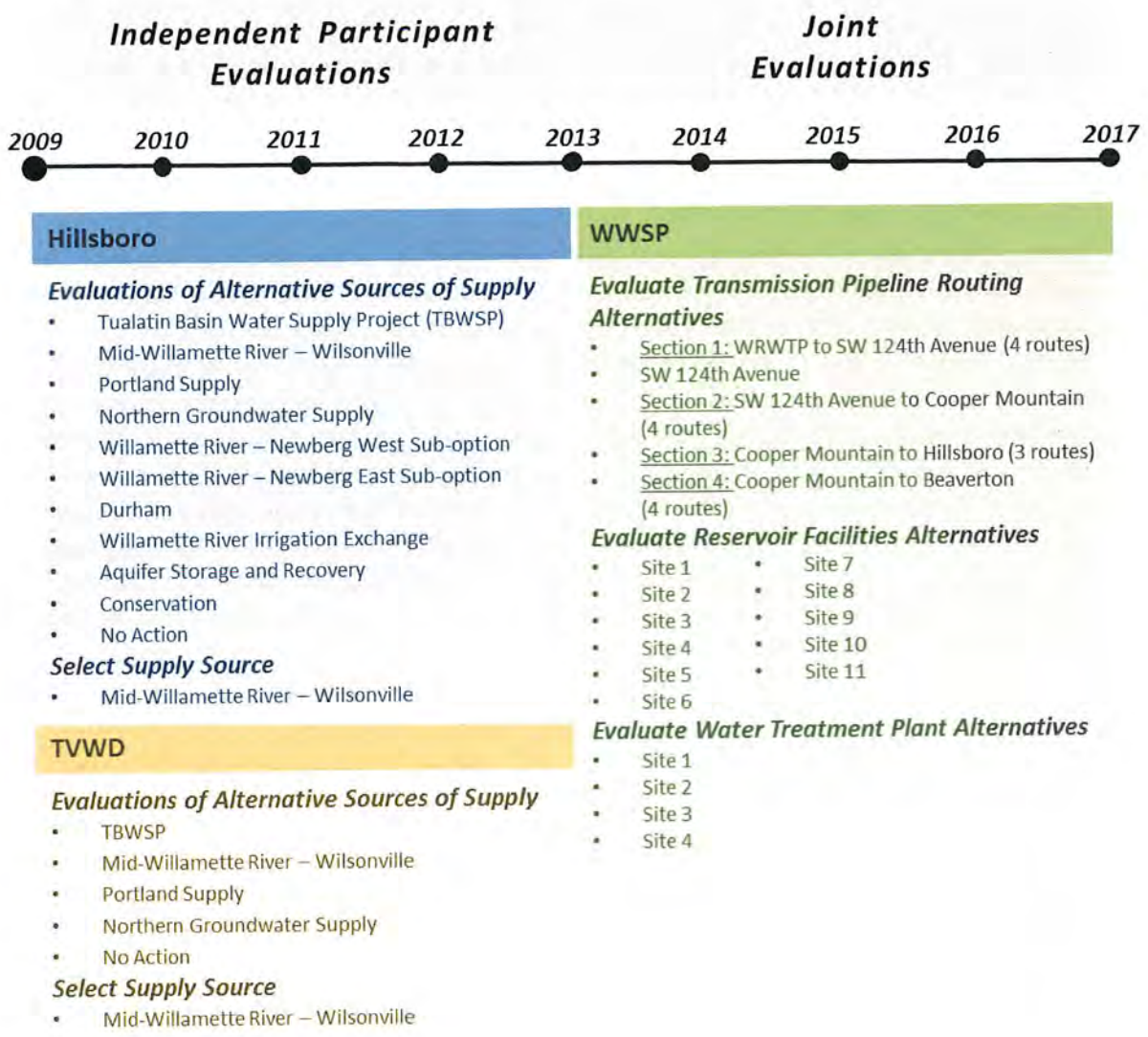
In addition to the conservation efforts described above, Oregon Administrative Rule (OAR) 690-086-0150(4) requires all municipal water suppliers to implement certain conservation measures, as described in detail in the JWC's WMCP. Hillsboro's implementation of these measures to-date includes: annual water audits to identify unaccounted-for water; metering, including the installation of an automated meter reading (AMR) system and meter testing and maintenance; reorganization of Hillsboro's rate system to a tiered rate structure to encourage conservation; leak surveys, line maintenance, and the replacement of older steel pipelines to increase leak detection and reduce water loss from leaks; and providing public education and technical and financial assistance to customers to implement water conservation measures.

TVWD meets municipal water supplier conservation required by OAR 690-086-0150(4) by implementing similar measures such as: annual water audits; metering, including the installation of an AMR system and meter testing and maintenance; implementation of a tiered rate structure to incentivize conservation by customers; leak detection surveys and water main repair and replacement; public education; and providing technical and financial assistance to customers to implement water conservation measures (CH2MHill and GSI, 2010).

3 ALTERNATIVES ANALYSIS

The Program conducted an alternatives evaluation for selection of the preferred long-term water supply source alternative and each of the four Project components to determine the LEDPA for each component. As previously described, there are four primary components of the WWSS, including the RWF, a new WWSS WTP, the Reservoir Facilities (two aboveground water storage tanks), and the Transmission Pipelines connecting the supply source to TVWD's and Hillsboro's existing water transmission systems. The following sections describe the alternatives evaluations for the relevant Project components in detail. The Program did not conduct a detailed criteria evaluation of potential alternatives for the RWF, as the intake is an existing regional water supply source in which TVWD was an initial investor, and for which the remaining portions of the RWF are locationally dependent. Figure 1, below, presents the timeline for the evaluations conducted by TVWD and Hillsboro individually, and together as part of the WWSP. These evaluations are described in more detail in the sections that follow.

Figure 1. TVWD and Hillsboro Alternatives Evaluation Timeline



3.1 WATER SUPPLY CRITERIA EVALUATION

In their evaluation of alternatives, TVWD and Hillsboro sought to select a water supply that fulfills the Program's purpose of providing a long-term, resilient water supply option to serve the projected future water supply needs of their residential and commercial customers. In 2009, Hillsboro initiated a Long-Term Water Supply Feasibility Study, for which TVWD was a partner and technical advisor, after uncertainties arose regarding the feasibility of and costs associated with the TBWSP (Hillsboro's previously identified long-term water supply alternative). Hillsboro and TVWD determined that a significant raise of Scoggins Dam might not meet the demand schedule; costs were increasing significantly due to seismic concerns; and endangered species were identified in the inundation zone. The results of the feasibility study were used by both Hillsboro and TVWD to assess additional long-term water supply options for each agency.

The supply alternatives considered and the evaluation criteria used by TVWD and Hillsboro to select the supply option that best achieves the purpose of the Program are described in the following subsections.

3.1.1 City of Hillsboro Criteria

The Hillsboro Utilities Commission developed criteria to evaluate alternative sources of supply to meet long-term demands and to provide a resilient water supply system to withstand an earthquake or other natural disaster.

To identify the appropriate criteria, Hillsboro first built a list of potential criteria based on the topics and results of the Long-Term Water Supply Feasibility Study and the results of public engagement efforts. The initial criteria were then refined to develop a discrete list that encompassed all of the critical issues. Finally, the list of criteria was mapped to the technical work generated from the Long-Term Water Supply Feasibility Study and accepted by the Hillsboro Utilities Commission in 2012 (HDR, 2012). The list of criteria that were used to evaluate water supply alternatives is provided below in Table 2.

Table 2. City of Hillsboro Long-Term Water Supply Alternatives Criteria

Criterion	Criterion Description
Cost	Overall cost of the alternative, including cost to build and operate the supply
Reliability	Ability of the alternative to consistently deliver needed water, including consideration of events with the potential for causing water supply shortages, such as droughts or earthquakes
Redundancy	Ability of the alternative to provide an additional, independent water supply
Ownership	Ability to control decisions regarding supply improvements, operations, and costs
Operational Complexity	Potential level of difficulty in running a water supply and treatment system that maintains Hillsboro's current high level of service quality
Implementation Risk	Risk that implementation of the alternative would not be completed on time, or at all, due to unforeseen circumstances, political roadblocks or level of complexity
Source Water Quality	Fewer potential sources of contamination located upstream of alternative
Treated Water Quality	Ability of treated water to meet a standard of quality comparable to treated water currently received by Hillsboro
Environmental Impacts	Environmental impacts due to construction and/or operation of the supply alternative
Responsiveness to Demand Growth	Ability to supply full projected growth in demand and to phase improvements in response to slower or faster growth

Once the criteria were finalized, each of the water supply alternatives was evaluated according to each criterion on a three-tier scale (with the exception of cost, which was evaluated based on the actual cost to implement each supply alternative), as follows:

"+" – The alternative is beneficial, relative to the other alternatives, with respect to the evaluation criterion.

"0" – The alternative is neutral (neither beneficial nor detrimental), relative to the other alternatives, with respect to the evaluation criterion.

"-" – The alternative is detrimental, relative to the other alternatives, with respect to the evaluation criterion.

The use of this three-tier scale allowed Hillsboro to evaluate the advantages and disadvantages of the supply alternatives relative to each other (HDR, 2012).

3.1.2 Tualatin Valley Water District Criteria

Similar to the evaluation process conducted by Hillsboro, TVWD began evaluating potential water supply alternatives in 2012 after the TBWSP was determined to be infeasible. TVWD developed a list of criteria to evaluate potential supply options based on the results of the Long-Term Water Supply Feasibility Study and public outreach efforts. The proposed criteria were then approved by TVWD's Board of Commissioners. The criteria used to evaluate TVWD's water supply options are listed below in Table 3.

Table 3. TVWD Long-Term Water Supply Alternatives Criteria

Criterion	Criterion Description
Demand Uncertainty	Ability of the supply source to provide additional capacity if demands are greater than projected and accommodate demands less than forecast through phasing and/or scaling of improvements
Source Reliability	Ability of the source to deliver required capacity at all times, including consideration of available water resources, existing water rights, natural variation, seismic vulnerability, and possible effects of climate change
Source Redundancy	Ability to meet the goal of having all areas served by at least two sources of supply
Implementation Risk	Risks of implementation delays and/or cost increases due to unplanned factors such as permitting risk, schedule delays, complexity of required partnering agreements, and/or complexity
Public Acceptance	Public perception of each of the sources of supply, including requirements of industrial and commercial customers as well as the general public
Community Impacts	Impacts on the community due to large infrastructure construction projects for the source
Metzger Fluoridation	Ability to continue non-fluoridated supply to Metzger
Finished Water Quality	Ability of the source to meet or exceed existing and anticipated regulatory requirements and aesthetic standards
Sustainability	Anticipated sustainability of source based on energy requirements, infrastructure requirements, and environmental impacts
Governance	Ability of the TVWD to establish and preserve policies for initial construction and ongoing maintenance of capital assets

TVWD applied the same three-tier scale as Hillsboro to evaluate the supply alternatives, assigning alternatives a "+," "-," or "0," relative to each other, for each criterion (HDR, 2013b).

3.1.3 Water Supply Alternatives Considered

3.1.3.1 Hillsboro

Based on the results of the Long-Term Water Supply Feasibility Study, Hillsboro identified four potential long-term water supply alternatives:

- Tualatin Basin Water Supply Project (TBWSP)
- Willamette River – Wilsonville
- Portland Supply
- Northern Groundwater Supply

During the feasibility study, a number of other supply alternatives were initially considered but screened out as major alternatives:

- Willamette River – Newberg
  - Willamette River – Newberg West Sub-Option
  - Willamette River – Newberg East Sub-Option
- Durham
- Willamette River Irrigation Exchange
- Aquifer Storage and Recovery (ASR)
- Conservation

With the exception of conservation, the water supply alternatives evaluated by Hillsboro are major construction projects that would likely have impacts on environmental, cultural, and socioeconomic resources in the region. The ASR and Conservation water supply alternatives are considered long-term augmentation and emergency water supply strategies, but were ruled out as viable long-term water supplies by themselves, because they are not capable of meeting estimated future regional water demands. The Durham and Willamette River Irrigation Exchange alternatives were also screened out. It was determined that securing water rights on the Tualatin River for the Durham alternative would be too difficult, if not impossible. For the Willamette River Irrigation Exchange alternative, it was determined that the legal and regulatory mechanisms to transfer water rights did not exist for the transfer of water between two entities—in this case, between the Tualatin Valley Irrigation District and the TBWSP. Finally, the Willamette River at Newberg alternatives were screened out because they were substantially similar to the Wilsonville alternative, but had additional negative aspects, including requiring the construction of a new intake and routing of pipelines through rural areas, and would be more expensive to develop.

A "No Action" alternative was also considered and eliminated. Without developing a new, long-term water supply source, Hillsboro cannot meet projected future water demands for its service area. As a public entity, Hillsboro has a mandate to serve and respond to the water supply needs of its residents.

The remaining four water supply alternatives were retained for further analysis and evaluated against the alternatives criteria.

1. **Tualatin Basin Water Supply Project:**

The TBWSP alternative would involve reconstructing Scoggins Dam at Hagg Lake, improving the seismic resistance capability of the dam, and raising the reservoir pool by 40 feet to increase water storage at the lake. This option would also require the construction of a new water treatment plant parallel to the existing plant, a new raw water pipeline for filling and draining the reservoir, a new raw water pump station to independently supply the JWC treatment plant and reservoir fill demands, a finished water pipeline system, and finished water storage tanks.

2. **Willamette River at Wilsonville:**

The Willamette River at Wilsonville alternative would supply customers with surface water taken from the Willamette River. Surface water would be treated at the existing WRWTP in Wilsonville, which would be expanded to accommodate for increased water withdrawals. Water would be pumped through a new water transmission pipeline system to the Hillsboro supply systems.

3. **Portland Supply:**

The Portland Supply alternative would involve purchasing finished water from the Portland Water Bureau, which would be conveyed from Powell Butte Reservoir through an expanded transmission pipeline system to the Hillsboro supply systems. A new water treatment plant would be constructed to remove chloramines and turbidity from the water before it would enter Hillsboro's water distribution networks.

4. **Northern Groundwater Supply:**

The Northern Groundwater Supply alternative would collect groundwater from wells constructed east of Scappoose, which would be treated in a new water treatment plant near Scappoose and pumped through a new transmission pipeline system over NW Cornelius Pass Road and into the Hillsboro supply systems.

Evaluation

Based on the results of the criteria evaluation, the Willamette River at Wilsonville (Mid-Willamette) alternative was the highest-rated alternative, relative to the other supply alternatives. The Mid-Willamette alternative was given positive (+) or neutral (0) scores for each of the criteria evaluated and also had the lowest total cost of implementation. Because this alternative best meets the Program's need and purpose, the Hillsboro Utilities Commission in 2012 selected the Mid-Willamette alternative as the preferred supply alternative.

Detailed criteria evaluations of each supply alternative considered by Hillsboro are provided in Appendix A, Table 2 (HDR, 2012).

3.1.3.2 Tualatin Valley Water District

TVWD conducted a similar criteria evaluation to Hillsboro, initially identifying the same four potential long-term supply alternatives as Hillsboro had identified during its final analysis (HDR, 2013c). As with Hillsboro, the water supply alternatives evaluated by TVWD are major construction projects that would likely have impacts on environmental, cultural, and socioeconomic resources in the region. For the same reasons as in Hillsboro's criteria evaluation, a "No Action" alternative was

removed from consideration because, as a regional water provider, TVWD is obliged to meet the water needs of its customers.

1. Tualatin Basin Water Supply Project:

The TBWSP alternative would involve reconstructing Scoggins Dam at Hagg Lake, improving the seismic resistance capability of the dam, and raising the reservoir pool by 40 feet to increase water storage at the lake. This option would also require the construction of a new water treatment plant parallel to the existing plant, a new raw water pipeline for filling and draining the reservoir, a new raw water pump station to independently supply the JWC treatment plant and reservoir fill demands, a finished water pipeline system, and finished water storage tanks.

2. Willamette River at Wilsonville:

The Willamette River at Wilsonville alternative would involve further development of the Willamette River surface water supply at Wilsonville. The WRWTP would be expanded, and a new transmission pipeline system would be constructed to deliver treated water from the treatment plant to the TVWD supply systems.

3. Portland Supply:

The Portland Supply alternative would expand TVWD's existing Portland supply system through which TVWD currently purchases wholesale water. A new Washington County Supply Line (WCSL) would parallel the existing WCSL and deliver water from the Portland's Powell Butte Reservoir to a new terminal storage reservoir located on Cooper Mountain. A new booster pump station would also be constructed.

4. Northern Groundwater Supply:

The Northern Groundwater Supply alternative would utilize groundwater resources in the Scappoose area, and include the development of a new wellfield and associated collector wells. A new wellfield pipeline, water treatment plant, pump station, and transmission pipeline system would be constructed to treat and deliver water to the existing JWC supply system.

Evaluation

The four supply alternatives identified by TVWD were evaluated relative to each other using TVWD's Board-approved criteria. Based on the results of the criteria evaluation, the Willamette River at Wilsonville (Mid-Willamette) alternative was the highest-rated alternative, relative to the other supply alternatives. The Mid-Willamette alternative was given positive (+) or neutral (0) scores for each of the criteria evaluated and also had the lowest total cost of implementation. Because this alternative best meets the Program's need and purpose, the TVWD Board in 2013 selected the Mid-Willamette alternative as the preferred supply alternative (HDR, 2013a).

Detailed criteria evaluations of each alternative considered by TVWD are provided in Appendix A, Table 3 (HDR, 2013a).

Once Hillsboro and TVWD had both selected the Mid-Willamette alternative as the preferred supply alternative, the two agencies formed the WWSP in 2013 to partner in the development of the supply source.

3.2 PREFERRED PIPELINE ROUTE

Following the selection of the Mid-Willamette alternative as the preferred supply source, the Program evaluated a number of pipeline routes to determine the route that best met the purpose of the Program while avoiding and minimizing, to the maximum extent practicable, impacts to the environment and the surrounding community. During the Project's preliminary design phase, the list of candidate routes was initially identified using aerial photography and mapping, and was further refined following site reconnaissance and agency coordination meetings during the routing analysis.

3.2.1 Pipeline Criteria Evaluation

Potential pipeline routes were eliminated from consideration based on significant obstacles to implementation. Obstacles may have been technical in nature or due to the high likelihood of social or environmental impacts, all of which would result in significant implementation risk.

A total of 117 route alternatives were evaluated as part of the pipeline criteria evaluation. The route alternatives were divided into five geographical sections, and once the route alternatives with significant implementation risks were eliminated from consideration, a short list of three to four route options in each section were evaluated according to the criteria shown in Table 4 using the same three-tier scale as the water supply alternatives evaluation (HDR, 2016b).

Table 4: Transmission Pipeline Route Evaluation Criteria

Category	Description
Comparative costs	The estimated difference in cost between alternatives, based on the lowest cost alternative (the base cost)
Social/community	A combination of congestion and community impacts, impacts to critical facilities (e.g., fire stations, hospitals) or community facilities (e.g., schools, churches, recreation centers), known opportunities to provide community enhancements, and areas deemed "no-cut" by the community due to sensitivity of the resource or recent construction
Opportunities/benefits	Known proposed road projects, available property along alignment, proposed developments that may provide new roads for pipeline alignments, or other project benefits that the alignment may have for the community
Environmental / permitting / cultural resources	Impacts to wetlands or waterways, amount of impact to Endangered Species Act (ESA)-listed or sensitive species, wildlife refuge impacts, likelihood of uncovering cultural resources, other agency ROW* (Oregon Department of Transportation (ODOT), Bonneville Power Administration, railroad), and availability of discharge locations for pipeline appurtenances
System compatibility	Adjacency to reservoir site, access and proximity to connection points (turnouts), and compatibility with system hydraulics (particularly excess length of pipe or localized high points)
System resiliency	Geologically active areas (seismic risk), high consequence foreign utilities (large/high pressure natural gas or petroleum mains, and water transmission mains), and accessibility of the pipe and appurtenances after a seismic event
Constructability	Available ROW, adequate construction access, likelihood of geotechnical challenges, large utility conflicts, known future utilities, and availability of detours and ROW width for traffic control

Category	Description
Operations & maintenance	Access to pipeline and appurtenances, and known future ROW changes that would limit access
Agricultural impacts	Avoid and minimize impacts to adjacent lands designated as Exclusive Farm Use (EFU), Exclusive Forest and Conservation (EFC) or Agricultural and Forestry District (AF-20), which implement Oregon Revised Statutes to protect agricultural and forest lands

**ROW = right-of-way*

3.2.2 Pipeline Route Alternatives Considered

The short list of routes for each pipeline section was evaluated based on the alternatives criteria to determine the preferred route. Detailed criteria evaluations for each section are provided in Appendix A, Tables 4 through 8. The routes evaluated for each section and the recommended preferred route are shown in Appendix B, Figures 2 and 3 (HDR, 2016b) and described, by section, in the following discussion.

Section 1 – WRWTP to SW 124th Avenue

Section 1 was divided into two subsections—WRWTP to SW Boeckman Road and SW Boeckman Road to SW 124th Avenue—each of which contained four route options (1A–1D) that were evaluated according to the alternatives criteria (Appendix B, Figure 2).

For the subsection from the WRWTP to SW Boeckman Road, route option 1D was selected as the recommended preferred route, because it provides the opportunity to partner with planned road projects on SW Kinsman Road, which will minimize environmental and community impacts, and has a comparatively lower cost than other options considered.

For the subsection from SW Boeckman Road to SW 124th Avenue, route option 1C was selected as the recommended preferred route, because it provides better system resiliency, presents fewer operations and maintenance restrictions than the other route options, and has the lowest cost of the route options (HDR, 2016b).

SW 124th Avenue Extension

The route spanning SW 124th Avenue, from Grahams Ferry Road to Tualatin-Sherwood Road, was selected as the preferred route through this area of Wilsonville and Washington County because of a new road construction partnering opportunity that arose with the county (Appendix B, Figure 2). The county's construction of the 124th Avenue extension will provide access to future commercial and industrial land planned for by the cities of Tualatin and Sherwood in what is currently unincorporated county land between the two cities. The 124th Avenue route alternative was evaluated against the other alternatives through this portion of the route and was determined to be the most favorable alternative of the group. It is significantly shorter than the other alternatives, resulting in fewer construction impacts. In addition, construction along the 124th Avenue alignment does not cross any sensitive natural resources; will be completed under greenfield conditions (i.e., no development), as opposed to construction in existing roadways and neighborhoods; and, finally, sharing the cost of the construction with Washington County would result in the 124th Avenue route alternative being the lowest cost alternative (Hillsboro, 2013a, 2013b) (HDR, 2016b).

Section 2 – SW 124th Avenue to Cooper Mountain

Section 2 extends from the northern end of SW 124th Avenue to the Cooper Mountain area, where the Reservoir Facilities storage tanks will be sited (Appendix B, Figure 2). This section crosses the Tualatin River and the Tualatin River National Wildlife Refuge (TRNWR), which present both coordination challenges in acquiring property easements, as well as geotechnical and siting challenges. As a result, both of these features greatly influenced route selection in this section.

Section 2 is considered to be integral to the successful implementation of the final route for the Transmission Pipelines. Thus, two options (2B and 2C2) were retained following the initial preliminary design criteria evaluation until further information could be gathered and discussions with property owners could take place to clarify. Option 2B has the lowest cost of the Section 2 route options; however, route option 2C2 presents a potential opportunity to partner with road projects on SW Tualatin-Sherwood Road. Following the conclusion of the preliminary design phase, the Program hired a design firm to further evaluate route options 2B and 2C2. Route 2C2 was ultimately selected as the preferred route in Section 2 because of opportunities to partner with Washington County on roadway projects along the route, and because this route minimizes environmental impacts to the TRNWR and impacts to private properties (HDR, 2016b).

Section 3 – Cooper Mountain to Hillsboro

Section 3 extends from the Cooper Mountain area, where the Reservoir Facilities will be sited (refer to Section 3.4), to the westside final delivery point, where the pipeline ties in to Hillsboro's existing delivery system at the junction of Highway 26 and NW Cornelius Pass Road (Appendix B, Figure 2).

Option 3B was initially selected as the recommended preferred route through Section 3 during the preliminary design phase, because it offers greater system compatibility than the other route options and has the lowest cost (HDR, 2016b). Following further conversations with Hillsboro, the Program hired a design firm to further evaluate a portion of option 3B. The original 3B route from Baseline Road to Amberwood Drive along 206th Avenue was evaluated in comparison to an alternate route along Cornelius Pass Road between Baseline Road and Amberwood Drive that had previously been eliminated due to constructability concerns. Specifically, the crossing of Beaverton Creek along Cornelius Pass Road had previously been identified as a challenging crossing given a number of site constraints. Upon further evaluation of these two options, the Program selected the Cornelius Pass Road option, because it was determined that the challenges with the Beaverton Creek crossing could be overcome, the route is shorter, and the option has fewer natural resource crossings and fewer community impacts than the 206th Avenue route (Brown and Caldwell, 2016) (Appendix B, Figure 4).

Section 4 – Cooper Mountain to Beaverton

Section 4 extends from the Cooper Mountain area, where the Reservoir Facilities will be sited (refer to Section 3.4), to SW Walker Road in Beaverton (Appendix B, Figure 2). To take advantage of opportunities to partner on the construction of NW Cornelius Pass Road in the South Hillsboro Community Planning Area, the water supply lines to Hillsboro and Beaverton do not split until NW Cornelius Pass Road approaches TV Highway, near Kinnaman Road.

Option 4C was selected as the recommended preferred route because it minimizes impacts to the community, presents fewer construction challenges, and has the lowest cost of the Section 4 options. (HDR, 2016b). After selection of option 4C, additional information became available in regard to development plans near the Project's proposed tie-in to TVWD's existing supply system on SW Walker Road. It was determined that development in the immediate vicinity of SW Walker Road would prevent the Program from constructing the option 4C route. An additional nine route alternatives were subsequently identified for the portion of Section 4 from SW 153rd Drive to SW Millikan Way and SW Walker Road, while option 4C was retained for the remainder of Section 4 west of SW 153rd Drive. Ultimately, the Program selected route D3 from its follow-up alternatives evaluation as the preferred route from SW 153rd Drive to SW Walker Road. Route D3 extends from SW 153rd Drive along Millikan Way, Murray Road, Jenkins Road, and Ecole Street before tying in to TVWD's existing supply system on SW Walker Road (Appendix B, Figure 5). Route D3 was selected as the preferred route alternative because it is one of the shorter route alternatives, avoids a known contaminated site in the vicinity, and crosses fewer natural resources than other alternatives (WWSP, 2016b).

3.3 RAW WATER FACILITIES

As mentioned previously in Section 3, a detailed evaluation of potential alternatives was not conducted for the RWF. The intake is an existing regional water supply source in which TVWD was an initial investor, and for which the remaining portions of the RWF are locationally dependent. The existing intake has the capacity to service the water supply needs of the WWSS, as well as the needs of other regional partners. The construction of a new intake and associated facilities at a separate location would be more impactful on potential environmental, cultural, and socioeconomic resources than utilizing the existing intake. The construction of the RWF is locationally dependent and must be sited at or adjacent to the water withdrawal source. Since the existing intake is located at the site of the WRWTP, construction of associated facilities for the WWSS RWF is also proposed at the WRWTP site.

3.4 WATER TREATMENT PLANT

When the mid-Willamette River at Wilsonville was selected as the water supply source for the WWSP, TVWD and Hillsboro anticipated expanding the existing WRWTP to serve the water treatment needs of the Program. As planning and design progressed, the Program identified a number of constraints with expanding the WRWTP to serve the WWSS and recognized the need to consider other sites within Washington County (WWSP, 2017), including the need for:

- A less confined site for treatment plant components and future expansions
- Improved water treatment efficiency
- Additional seismic stability/resiliency
- Limited construction and operations impacts on adjacent neighbors
- Easier maintenance of potable water quality due to a shorter length of finished water pipeline

As part of an existing master planning process with the City of Wilsonville for the WRWTP, and based on additional evaluation of site constraints by TVWD and Hillsboro, the Program determined that the site of the existing WRWTP could not accommodate the treatment needs of the WWSS. The size of the available parcel was the primary reason that the WWSS WTP cannot be sited at the WRWTP site. In addition, there were seismic stability concerns at the WRWTP, as well as concerns related to operation and maintenance of a finished water pipeline approximately 30 miles in length

(WWSP, 2017). While some of the essential components of the RWF that are tied to the withdrawal of water from the existing intake, such as the expansion of the pump station and construction of electrical facilities, will remain, by necessity, at the site of the existing WRWTP, the new WWSS WTP requires siting elsewhere. In 2016, the Program conducted a high-level screening of potential sites near or adjacent to the preferred pipeline route. This high-level screening was based on the following key parameters (WWSP, 2017):

- Parcel size of at least 10 acres, which is the minimum area required for critical WTP infrastructure (other supporting infrastructure can be located on adjoining properties, if available and necessary)
- Property owner(s) have expressed an interest in selling, either to the general public or directly to the WWSP or other public agencies
- Site must be located immediately adjacent to, or in close proximity to, the pipeline route and existing or future roads in order to facilitate connection of the WTP to the transmission pipeline and to allow access for construction of the plant

The high-level screening identified three potential sites, in addition to the site at the existing WRWTP, that met the above key parameters. The WRWTP was retained as a potential site for the purpose of an alternatives evaluation. The four sites are described below:

- **Site 1** is located at the existing WRWTP site and referred to as the Upper Site. Site 1 is approximately 12 acres in size and located along Arrowhead Creek Lane in Wilsonville, immediately north of the existing WRWTP. TVWD and the City of Wilsonville jointly own this property (Appendix B, Figure 1).
- **Site 2** is located on SW Tonquin Road near Sherwood, 0.3 mile from the future SW 124th Avenue and the pipeline route. Site 2 is approximately 20 acres in size, and the property owner has expressed interest in selling the property (Appendix B, Figure 5).
- **Site 3** is located adjacent to the future SW 124th Avenue and the pipeline route. The site is approximately 32 acres in size, and consists of two whole parcels and a portion of a third. The owner of the two whole parcels has expressed interest in selling the properties. The owner of the third parcel has listed the property for sale (Appendix B, Figure 6).
- **Site 4** is located adjacent to the future SW 124th Avenue and the pipeline route. The site is approximately 40 acres in size and comprises a portion of a larger, approximately 90-acre parcel. The owner of the 90-acre parcel has listed the property for sale (Appendix B, Figure 7).

The WWSP developed criteria to evaluate the Sites 1 through 4 with the input of engineering, construction, natural resource, land use, and other specialists. The criteria used to evaluate the four WTP site alternatives are described in Table 5, below. To further inform the evaluation, site explorations were conducted at the potential sites, including site visits, when rights of entry could be obtained; geotechnical investigations; and desktop analyses of natural resources, cultural resources, land use, and hazardous materials (WWSP, 2017).

Table 5. WWSS WTP Alternatives Criteria

Criterion	Criterion Description
System Compatibility	Site area and dimensions
Social/Community Effects	Potential visual and local character effects on neighbors and nearby community Potential encumbrances and conditions, constraints or restrictions on parcel Potential effects on neighbors and nearby community during WTP construction and operation
Opportunities/Benefits	Available property (ability to acquire property for permanent use as WTP) Opportunity for community benefits
Environmental/Permitting/Land Use	Potential effects on future and surrounding uses (current land use zoning) Potential effects on riparian habitat, upland/wildlife habitat, wetlands, cultural resources, or rare, threatened or endangered species
Access and Constructability	Accessibility and constructability for transmission pipeline to and from WTP Available space for construction access and staging Presence of geologic or other hazards Available access roads
Operations and Maintenance	Flexibility to expand WTP features on-site or to acquire adjacent parcels Ability to drain WTP facilities

As with the previous criteria evaluations, the Program applied a three-tier scale to evaluate the WWSS WTP siting alternatives, assigning alternatives a "+," "-," or "0," relative to each other, for each criterion. The results of the criteria evaluation identified Site 4 as the preferred site alternative for the WWSS WTP. While no site met or exceeded all criteria, the disadvantages associated with Site 4 were not considered substantial enough to offset the advantages. Site 4 provides adequate space to construct the WWSS WTP, and does not present the seismic and geotechnical concerns that exist at several of the other potential sites. The site is located in an area planned for industrial development, and constructing and operating a WTP there would not have substantial impacts on adjacent properties or the surrounding community. While the site will have permanent impacts to wetlands and high-quality upland habitat, property acquisition by the Program will allow for the preservation of a large kolk wetland and approximately 20 acres of upland habitat that would otherwise likely be developed in the future as part of the Tonquin Employment Area Implementation Plan (WWSP, 2017). The results of the criteria evaluation are provided in Appendix A, Table 9.

3.5 RESERVOIR FACILITIES

Reservoir storage is required for the WWSS for operational and emergency purposes. To meet the storage requirements for the WWSS, a total storage volume of 30 mg is needed at the Reservoir Facilities. During the preliminary design phase of the Project, evaluations were conducted to determine: (1) the hydraulic pressures required to provide a targeted level of service (LOS) to the existing TVWD and Hillsboro distribution systems under gravity flow, (2) the associated range of acceptable pipeline diameters, and (3) the associated range of acceptable reservoir elevations, among other factors, that would meet LOS requirements. As a result of these initial evaluations, the

Program identified a preferred reservoir elevation range of 470 to 550 feet in order to provide adequate hydraulic pressures, under gravity flow, without the need for excessive pumping in order to transport water from the WWSS WTP to the Reservoir Facilities. Using this elevation range as a preliminary criterion, the Program conducted a search for potential sites in the Cooper Mountain area that were large enough to construct 30 mg of storage (WWSP, 2016a).

Eleven potential reservoir sites in the Cooper Mountain area were initially identified that met the elevation range requirements and were large enough to accommodate 30 mg of storage. These 11 sites were further evaluated based on the criteria developed specific to the needs of the Reservoir Facilities (Appendix A, Table 10), and are summarized below in Table 6.

Table 6. Reservoir Facilities Alternatives Criteria

Criterion	Criterion Description
System Compatibility	Ground elevation, and parcel area and dimensions
Social/Community Effects	Potential visual and local character impacts to neighbors and nearby community Potential encumbrances and conditions, constraints or restrictions on parcel Potential impacts to neighbors during construction of reservoir Potential downstream consequence of reservoir or pipeline failure
Opportunities/Benefits	Available property (ability to acquire property for permanent use for reservoir) Opportunity for community benefits
Environmental/Permitting/Land Use	Potential impacts to future uses/agricultural production Potential impacts to riparian and upland/wildlife habitat and wetlands
Access and Constructability	Accessibility and constructability for transmission pipeline to and from reservoir Available space/properties for temporary or permanent easement for construction access and staging Historical landslide or known landslide hazards or other geologic hazards
Operations and Maintenance	Flexibility to build more than one tank on the site or to acquire adjacent parcels Ability to drain reservoir or pipe

As with the previous criteria evaluations, the Program applied a three-tier scale to evaluate the WWSS Reservoir Facilities alternatives, assigning alternatives a "+," "-," or "0," relative to each other, for each criterion. The general area of the Reservoir Facilities alternatives is shown in Appendix B, Figure 8. Due to the sensitive nature of a number of these properties, the exact locations of the sites are not shown. Based on the results of the criteria evaluation, which are outlined in Appendix A, Table 11, three sites were retained for further evaluation at the conclusion of the preliminary design phase (HDR, 2016a):

- **Site 2** is located on the south and west side of the intersection of SW Grabhorn Road and SW Stone Creek Drive. The site is approximately 11 acres in size and has ground elevations ranging from approximately 420 to 500 feet.

- **Site 3** is located at 10150 SW Grabhorn Road, on the south and east side of the intersection of SW Grabhorn Road and SW Stone Creek Drive. The site is approximately 10 acres in size, with ground elevations ranging from approximately 490 to 530 feet.
- **Site 11** consists of two adjacent parcels located at 8820 and 8840 SW Grabhorn Road, on the east side of SW Grabhorn Road, north of SW Nancy Lane. The site is approximately 8 acres in size, with ground elevations ranging from approximately 580 to 630 feet. While the elevation ranges at this site are higher than preferred, the site was retained for further analysis given the size of the site, which could accommodate 30 mg of storage, and because the selection of Site 11 would require less pipeline tunneling along SW Grabhorn Road than previously considered options, and could potentially reduce the diameters of the gravity-fed sections of the pipeline due to the higher elevation.

In addition to the criteria evaluation, Sites 2, 3, and 11 underwent further evaluations following the preliminary design phase. Desktop analyses were conducted that evaluated the natural resources, cultural resources, land use, and hazardous materials considerations at the sites, and surveys and geotechnical investigations were conducted on those sites where rights of entry could be obtained. The Program also initiated discussions with property owners to determine their willingness to sell.

Based on the results of the criteria evaluation and the additional evaluations conducted, Site 3 was selected as the preferred site for the Reservoir Facilities. While Sites 2 and 3 are similar, the elevations at Site 3 are better suited to meet the desired LOS and best fulfill the Project's purpose and need. The elevations at Site 3, which range from 490 to 530 feet, are within the range necessary to provide the desired pressure and flow at each point of connection between the WWSS Transmission Pipelines and TVWD's and Hillsboro's existing distribution systems. In addition to best meeting LOS requirements, Site 3 is also preferred because natural resources are not anticipated to be impacted; in addition, the site is ideally located adjacent to the pipeline route and provides easy access for construction and operation (WWSP, 2016a).

4 PROPOSED PROJECT

The Project, as proposed, will withdraw water from the mid-Willamette River at Wilsonville to serve the future water needs of residential and commercial customers in the Hillsboro and TVWD service areas. Water will be withdrawn from an existing, regionally owned intake in Wilsonville. The RWF will be constructed at the site of the existing WRWTP, immediately adjacent to the intake. Raw water will be conveyed through the Transmission Pipelines from the RWF to the WWSS WTP, which will be constructed in the Sherwood area in what is currently unincorporated Washington County. Water will be treated at the WWSS WTP and then conveyed via a finished water Transmission Pipelines to the Reservoir Facilities in the South Cooper Mountain area. The Reservoir Facilities will store water in two storage tanks totaling 30 mg in capacity, which will be used for operational, distribution system, and emergency storage. From the Reservoir Facilities, water will be gravity fed through the finished water Transmission Pipelines to the western and eastern points of connection, where they will tie in to Hillsboro's and TVWD's existing distribution systems.

5 CONCLUSION

The development of the WWSS will greatly enhance the ability of Hillsboro and TVWD to meet projected regional growth and increased future water demands. After a thorough evaluation and analysis of all the potential water supply sources in the region, TVWD and Hillsboro selected the Willamette River at Wilsonville as the alternative that best meets the Program's objectives of providing a reliable, resilient, long-term source of water that supports the region's plans for responsible growth within the UGB.

The proposed Project, as described in this Alternatives Analysis, is the product of many years of careful planning and analysis. The Project, as proposed, will fulfill the purpose and need for the action, providing a long-term, resilient water supply to serve the projected water needs of TVWD and Hillsboro residents and businesses. Rigorous alternatives evaluations have been completed for the Project, which has sought to avoid and/or minimize potential impacts on environmental and cultural resources to the maximum extent practicable. The result of these evaluations is a Project that best meets the water supply needs of TVWD and Hillsboro, while balancing potential impacts to the environment, the surrounding community, and rate payers.

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7 APPENDICES

APPENDIX A: TABLES

Table 1. Willamette River WTP Intake Peak Day Demands by Year-- 2026 to 2085 (HDR, 2015; GSI, 2017)

Year	TVWD	Hillsboro	Beaverton	Wilsonville	Sherwood	Tigard	Tualatin*	Total
2026	48.0	7.0	8.0	11.7	4.9	N/A	N/A	79.6
2027	48.5	8.5	8.0	11.9	5.0	N/A	N/A	81.9
2028	48.9	10.0	8.0	12.1	5.1	N/A	N/A	84.1
2029	49.4	11.4	8.0	12.3	5.2	N/A	N/A	86.3
2030	49.8	11.6	8.0	12.5	5.3	N/A	3.0	90.2
2031	50.2	12.4	8.0	12.9	5.4	N/A	3.0	91.9
2032	50.5	13.1	8.0	13.2	5.5	N/A	3.0	93.3
2033	50.9	13.9	8.0	13.6	5.6	N/A	3.0	95.0
2034	51.8	14.6	8.0	14.0	5.7	N/A	3.0	97.1
2035	52.2	15.4	8.0	14.4	5.8	N/A	5.0	100.8
2036	52.7	15.9	8.0	14.7	6.0	N/A	5.0	102.3
2037	53.1	16.5	8.0	15.0	6.1	N/A	5.0	103.7
2038	53.6	17.0	8.0	15.3	6.2	N/A	5.0	105.1
2039	54.1	17.6	8.0	15.7	6.3	N/A	5.0	106.7
2040	54.4	18.1	8.0	16.0	6.4	N/A	5.0	107.9
2041	54.8	18.7	8.0	16.4	6.6	10.0	5.0	119.5
2042	55.2	19.3	8.0	16.7	6.7	10.0	5.0	120.9
2043	55.5	19.8	8.0	17.1	6.8	10.0	5.0	122.2
2044	55.9	20.4	8.0	17.4	7.0	10.0	5.0	123.7
2045	56.3	20.9	8.0	17.8	7.1	10.0	5.0	125.1
2046	56.6	21.4	8.0	18.2	7.2	10.0	5.0	126.4
2047	57.0	21.9	8.0	18.6	7.4	10.0	5.0	127.9
2048	57.4	22.4	8.0	19.0	7.5	10.0	5.0	129.3
2049	57.7	22.9	8.0	19.4	7.7	10.0	5.0	130.7
2050	58.1	23.4	8.0	19.8	7.8	10.0	5.0	132.1
2051	58.5	23.67	8.0	20.2	8.0	10.0	5.0	133.4
2052	58.8	23.96	8.0	20.6	8.2	10.0	5.0	134.6
2053	59.2	24.24	8.0	21.0	8.4	10.0	5.0	135.8
2054	59.6	24.53	8.0	21.4	8.5	10.0	5.0	137.0
2055	59.9	24.81	8.0	21.9	8.7	10.0	5.0	138.3
2056	60.2	25.00	8.0	22.4	8.8	10.0	5.0	139.4
2057	60.5	25.00	8.0	22.9	9.0	10.0	5.0	140.4
2058	60.8	25.00	8.0	23.5	9.2	10.0	5.0	141.5
2059	61.1	25.00	8.0	24.0	9.4	10.0	5.0	142.5
2060	61.5	26.24	8.0	24.1	9.6	10.0	5.0	144.4
2061	61.7	26.64	8.0	24.6	9.7	10.0	5.0	145.6
2062	62.0	27.04	8.0	25.1	9.9	10.0	5.0	147.0
2063	62.3	27.44	8.0	25.5	10.0	10.0	5.0	148.2
2064	62.5	27.84	8.0	26.0	10.0	10.0	5.0	149.3
2065	62.5	28.24	8.0	26.5	10.0	10.0	5.0	150.2

Table 1. Willamette River WTP Intake Peak Day Demands by Year-- 2026 to 2085 (HDR, 2015; GSI, 2017)

Year	TVWD	Hillsboro	Beaverton	Wilsonville	Sherwood	Tigard	Tualatin*	Total
2066	62.5	28.64	8.0	27.0	10.0	10.0	5.0	151.1
2067	62.5	29.04	8.0	27.5	10.0	10.0	5.0	152.0
2068	62.5	29.44	8.0	28.0	10.0	10.0	5.0	152.9
2069	62.5	29.84	8.0	28.5	10.0	10.0	5.0	153.8
2070	62.5	30.24	8.0	29.1	10.0	10.0	5.0	154.8
2071	62.5	30.64	8.0	29.2	10.0	10.0	5.0	155.3
2072	62.5	31.04	8.0	29.4	10.0	10.0	5.0	155.9
2073	62.5	31.44	8.0	29.6	10.0	10.0	5.0	156.5
2074	62.5	31.84	8.0	29.8	10.0	10.0	5.0	157.1
2075	62.5	32.24	8.0	30.0	10.0	10.0	5.0	157.7
2076	62.5	32.64	8.0	30.0	10.0	10.0	5.0	158.1
2077	62.5	33.04	8.0	30.0	10.0	10.0	5.0	158.5
2078	62.5	33.44	8.0	30.0	10.0	10.0	5.0	158.9
2079	62.5	33.84	8.0	30.0	10.0	10.0	5.0	159.3
2080	62.5	34.24	8.0	30.0	10.0	10.0	5.0	159.7
2081	62.5	34.64	8.0	30.0	10.0	10.0	5.0	160.1
2082	62.5	35.04	8.0	30.0	10.0	10.0	5.0	160.5
2083	62.5	35.44	8.0	30.0	10.0	10.0	5.0	160.9
2084	62.5	35.84	8.0	30.0	10.0	10.0	5.0	161.3
2085	62.5	36.24	8.0	30.0	10.0	10.0	5.0	161.7

** Submitted as "For Planning Purposes Only"*

Table 2: Hillsboro Water Supply Criteria Evaluation (HDR, 2012)

Criteria	Mid-Willamette	Southern Willamette	Tualatin Basin Water Supply Project	Portland Supply	Northern Groundwater
Hillsboro's Cost Share (assumes partner(s) will share project costs)	Medium-low cost share	Medium-low cost share	Lowest Hillsboro cost share	Highest Hillsboro cost share	Medium-high Hillsboro cost share
Reliability	+ Limited susceptibility to drought and climate change, new construction to current seismic standards	+ Limited susceptibility to drought and climate change, new construction to current seismic standards	- Susceptible to drought and climate change, need for pump-back due to insufficient flows	0 Limited susceptibility to drought and climate change, infrastructure not constructed to current standards	+ Limited susceptibility to drought and climate change, new construction to current seismic standards
Redundancy	+ Provides independent, redundant supply to the City of Hillsboro	+ Provides independent, redundant supply to the City of Hillsboro	- Does not provide redundant supply to the City of Hillsboro	+ Provides independent, redundant supply to the City of Hillsboro	+ Provides independent, redundant supply to the City of Hillsboro
Ownership	+ Hillsboro-owned supply, limited local partners, high degree of control	+ Hillsboro-owned supply, limited local partners, high degree of control	0 Bureau of Reclamation management of dam facilities with limited local control (without title transfer)	- Wholesale purchase of water without ownership	+ Hillsboro-owned supply, limited local partners, high degree of control
Operational Complexity	+ Complexity similar to existing JWC supply	+ Complexity similar to existing JWC supply	- Operation of pump-back would increase complexity of operations	0 Increased complexity due to need to manage peaking factor to Portland contract	+ Complexity similar to existing JWC supply
Implementation Risk	+ Existing intake, existing treatment plant site, pipelines through rural areas	- New intake facility, pipelines through rural areas, option not being considered by TVWD	- Numerous potential roadblocks, congressional funding approval required, significant permitting issues	0 Existing impoundment and intake, pipeline traversing heavily urbanized corridor	0 New well facilities, pipelines through rural areas
Source Water Quality	0 Potential contamination from upstream urban and agricultural influences	0 Potential contamination from upstream urban and agricultural influences	+ Limited potential contamination from upstream agriculture	+ Protected watershed, groundwater with little potential contamination	- Potential contamination from upstream sources, including superfund site; lack of water quality data
Treated Water Quality	0 With planned level of treatment, equivalent to current JWC source	0 With planned level of treatment, equivalent to current JWC source	0 Expansion of current JWC source of supply	0 With planned level of treatment, equivalent to current JWC source	0 With planned level of treatment, equivalent to current JWC source
Environmental Impacts	0 Impacts mainly during construction, potential mitigation for impacts to aquatic ESA species, moderate power usage	0 Impacts mainly during construction, potential mitigation for impacts to aquatic ESA species, moderate power usage	- Permanent flooding due to impoundment, potential mitigation for impacts both aquatic and terrestrial ESA species including loss of habitat	+ Impacts mainly during construction, existing habitat conservation plan to mitigate impacts to aquatic ESA species, lowest power usage	0 Impacts mainly during construction, potential mitigation for impacts to aquatic ESA species, higher power usage
Responsiveness to Demand Growth	0 Further expansion possible, small proportion of investment can be phased	0 Further expansion possible, small proportion of investment can be phased	- No ability to further expand supply, small proportion of investment can be phased	+ Further expansion possible, major improvements delayed compared to other options, minimum purchase requirement	0 Further expansion possible, moderate proportion of investment can be phased
Total Project Cost	Lowest Overall Cost Option	Medium-Low Overall Cost Option	Medium Overall Cost Option	Medium-High Overall Cost Option	Highest Overall Cost Option

Note: Cost information in original source document (HDR, 2012) is presented and evaluated based on the actual cost to implement each supply alternative. Because cost information in various sources was developed at different times, it reflects differing dollar bases, levels of design, and delivery assumptions. Therefore, cost information presented in this document has been simplified to a relative cost ranking.

Table 3. Summary of Final Evaluation Ratings of TVWD Water Supply Alternatives (HDR, 2013a)

Criterion		TBWSP	Mid-Willamette	Portland Supply	Northern Groundwater Supply
1	Demand Uncertainty	-	0	+	0
2	Source Reliability	+	+	0	+
3	Source Redundancy	0	+	0	+
4	Implementation Risk	-	0	0	-
5	Public Acceptance	0	0	+	-
6	Community Impacts	0	0	0	0
7	Metzger Fluoridation	0	0	0	0
8	Finished Water Quality	+	+	0	0
9	Sustainability	-	0	+	-
10	Governance	0	+	-	+

Table 4. Transmission Pipeline Route Criteria Evaluation: Section 1 - Wilsonville WTP to Boeckman Road (HDR, 2016b)

Criteria/Route	1A East of I-5		1B Boones Ferry		1C Kinsman/95th Ave		1D Kinsman/Kinsman Ext	
Social/ Community	–	Churches along route Heavy traffic/major intersection Community disruption through congested commercial area Disruption to business traffic Low community acceptability	–	Heavy traffic on Wilsonville Road "No cut" area in Wilsonville Road	–	Fire station on route Heavy truck traffic on route	–	Fire station on route
Opportunities/Benefits	0	Opportunities to partner with road projects east of I-5	0	"No cut" area in Wilsonville Road Opportunities to partner with road and development projects	0		+	Opportunities to partner on the Kinsman Road Extension Greenfield construction for portion of route on Kinsman Road Extension
Environmental/ Permitting/ Cultural Resources/ Agricultural Impacts	0	One tunnel required under Interstate-5, ODOT coordination required Crosses BPA two times Entirely within the Urban Growth Boundary (UGB)	0	Boones Ferry Road is ODOT frontage road, coordination required Crosses BPA two times Entirely within the UGB	–	Isolated cultural resource area on route Crosses BPA two times Entirely within the UGB	–	Parallels and crosses BPA two times Entirely within the UGB
System Compatibility	0	-	0		0		0	
System Resiliency	0	-	–	Parallel to natural gas transmission line in Boones Ferry Road	0		0	
Constructability	–	One tunnel required under Interstate-5, ODOT coordination required Trenchless required to cross Coffee Lake Creek just outside WTP	–	Heavy traffic on Wilsonville Road Long trenchless run under Wilsonville Road, restricted area for pits Roadway on embankment will require deeper than standard trenching	0	Trenchless crossing of Wilsonville Road to reduce impacts to traffic Heavy truck traffic on route Existing water line in SW Kinsman Road	0	Trenchless crossing of Wilsonville Road to reduce impacts to traffic Opportunity to partner on Kinsman Road extension Existing water line in SW Kinsman Road
Operations & Maintenance	–	Access limited by freeway and busy commercial areas	0		0		0	
Total Project Cost	Highest Overall Cost Option		Medium-High Overall Cost Option		Lowest Overall Cost Option		Medium-Low Overall Cost Option	

Note: Cost information in original source document (HDR, 2016b) is presented and evaluated based on the actual cost to implement each route alternative. Because cost information in various sources was developed at different times, it reflects differing dollar bases, levels of design, and delivery assumptions. Therefore, cost information presented in this document has been simplified to a relative cost ranking.

Table 5. Transmission Pipeline Route Criteria Evaluation: Section 1 - Boeckman Rd to SW 124th Avenue (HDR, 2016b)

Criteria/Route	1A East of I-5		1B Boones Ferry		1C 95th Ave		1D Tonquin Ice Age Trail	
Social/ Community	–	Heavy traffic/major intersection Disruption to business traffic Low community acceptability	0		–	Heavy truck traffic on route	–	METRO property on route
Opportunities/Benefits	0	Opportunities to partner with road projects east of I-5	0		0		0	Opportunities to partner with trail projects
Environmental/ Permitting/ Cultural Resources/ Agricultural Impacts	–	Long trenchless crossing adjacent to Coffee Lake Creek One tunnel required under Interstate-5, ODOT coordination required Crosses BPA five times, adjacent to BPA substation on Ridder Road Entirely within the UGB	0	Boones Ferry Road is ODOT frontage road, coordination required Crosses BPA four times, adjacent to BPA substation on Ridder Road Entirely within the UGB	0	Crosses BPA four times, adjacent to BPA substation on Ridder Road Entirely within the UGB	–	Highest sensitivity environmental and cultural resources along route Parallels and crosses BPA two times Wetlands on route (2,500 feet) Adjacent to railroad north of SW Boeckman Road Entirely within the UGB
System Compatibility	0		0		0		0	
System Resiliency	0	Perpendicular crossing of natural gas transmission line in Boones Ferry Road	–	Parallel to natural gas transmission main on Boones Ferry Road	0		–	Risk of lack of access to pipe after seismic event (trenchless at Coffee Lake)
Constructability	–	One trenchless crossings of Interstate-5 Adjacent to BPA substation on Ridder Road	–	Heavy truck traffic on route Elevated roadway will require deeper than standard trenching Adjacent to BPA substation on Ridder Road	–	Heavy truck traffic on route Adjacent to BPA substation on Ridder Road	–	Opportunity to partner (Tonquin Trail) Adjacent to railroad north of SW Boeckman Road Wetlands on route (2,500 feet)
Operations & Maintenance	–	Access limited by freeway and busy commercial areas	0		0		–	Access will be limited for portion in tunnel at Coffee Lake
Total Project Cost	Medium-High Overall Cost Option		Medium-Low Overall Cost Option		Lowest Overall Cost Option		Highest Overall Cost Option	

Note: Cost information in original source document (HDR, 2016b) is presented and evaluated based on the actual cost to implement each route alternative. Because cost information in various sources was developed at different times, it reflects differing dollar bases, levels of design, and delivery assumptions. Therefore, cost information presented in this document has been simplified to a relative cost ranking.

Table 6. Transmission Pipeline Route Criteria Evaluation: Section 2 - SW 124th Ave. to Reservoir (HDR, 2016b)

Criteria/Route	2A 124th/99W/131st/ Beef Bend/Roy Rogers		2B Cipole/Kummrow/150th/ Beef Bend/Roy Rogers		2C Tualatin-Sherwood/ 192nd/Vandermost		2C2 Tualatin-Sherwood/Roy Rogers	
Social/ Community Criteria	–	Community not interested in repeat construction on existing 124th Ave. Congested area with little available ROW Impacts to already high residential traffic and congestion Construction traffic will affect TVFR fire station access	0	Route avoids community facilities but affects business along route	0	Community facilities in detour areas Heavy traffic on Tualatin-Sherwood Road Landfill is "no cut" area	0	Community facilities in detour areas Heavy traffic on Tualatin-Sherwood Road
Opportunities/Benefits	0	Lack of available ROW or apparent agreeable private land owners Affected by current and upcoming development near the Hwy 99W bridges	–	No known opportunities Approximately 25 private properties to negotiate easements	0	Opportunity to partner on Tualatin-Sherwood Road Lack of available ROW or agreeable private land owners north of Scholls Sherwood Road	+	Opportunity to partner on Tualatin-Sherwood Road
Environmental/Permitting/ Cultural Resources/ Agricultural Impacts	–	Route avoids NWR One BPA crossing on Beef Bend Road Potential for discovery of cultural resources, potentially lost village Crosses through or near EFU / AF-20	0	One BPA crossing at 99W Approximately 25 private properties to negotiate easements Potential for discovery of cultural resources Adjacent to Tualatin River NWR Crosses through or near EFU / AF-20	–	Route avoids NWR Parallel to power transmission on SW Tualatin Sherwood Road Crosses BPA 8 times Potential for discovery of cultural resources Crosses through or near EFU / AF-20	–	Private property required for construction easements Parallel to power on SW Tualatin Sherwood Road Crosses BPA 6 times Potential for discovery of cultural resources Adjacent to Tualatin River NWR Crosses through or near EFU / AF-20
System Compatibility	0		0		0		0	
System Resiliency	–	Kinder Morgan crossing on Beef Bend Parallel to natural gas on Roy Rogers (mitigatable)*	–	Perpendicular crossing of Kinder Morgan at 99W Parallel to natural gas on Roy Rogers (mitigatable)*	–	Natural gas parallel on Scholls Sherwood and 192nd Avenue	–	Parallel to natural gas on Roy Rogers (mitigatable)*
Constructability	–	Private property required for tunnel under Tualatin River Traffic control challenging Limited ROW width Limited detour options Limited construction access Geotechnical challenges expected	0	Approximately 25 private properties to negotiate easements Geotechnical challenges expected	–	Opportunity to partner Challenging creek crossing on Roy Rogers at Chicken Creek Limited detour routes Available property (significant private property to acquire) Contamination risk at landfill	0	Limited detour routes Challenging creek crossing on Roy Rogers at Chicken Creek Private property may be needed Reports of favorable property owners adjacent to Roy Rogers Geotechnical challenges expected
Operations & Maintenance	–	Access concerns for future maintenance	0		–	Access concerns for future maintenance	0	
Total Project Cost	Highest Overall Cost Option		Lowest Overall Cost Option		Medium-Low Overall Cost Option		Medium-High Overall Cost Option	

**This negative can be mitigated by obtaining easement for private property owners along the west side of Roy Rogers Road, and/or by working cooperatively with a planned development along the east side of Roy Rogers north of Beef Bend Road*

Note: Cost information in original source document (HDR, 2016b) is presented and evaluated based on the actual cost to implement each route alternative. Because cost information in various sources was developed at different times, it reflects differing dollar bases, levels of design, and delivery assumptions. Therefore, cost information presented in this document has been simplified to a relative cost ranking.

Table 7. Transmission Pipeline Route Criteria Evaluation: Section 3 - Reservoirs to Hillsboro (HDR, 2016b)

Criteria/Route	3A SW 185th Avenue		3B Cornelius Pass Road		3C Cornelius Pass Road/Brookwood Parkway	
Social/ Community Criteria	0	Schools, churches along route Heavy traffic on SW Farmington Road and limited detour routes for the surrounding residential areas Heavy traffic in SW 185th Avenue	0	Schools and churches along route will require careful traffic coordination or construction timing restrictions	–	Schools and churches along route will require careful traffic coordination or construction timing restrictions Fire station along route
Opportunities/Benefits	0	Opportunities to partner on 185th Avenue	0	Opportunity to partner on Cornelius Pass Extension	0	Opportunity to partner on Cornelius Pass Extension
Environmental/Permitting/ Cultural Resources/ Agricultural Impacts	0	Parallel to BPA lines on Walker Road Three BPA crossings Near BPA substation on Cornelius Pass Road at Highway 26	0	Potentially five BPA crossings, but there are opportunities along the route to streamline and avoid Near BPA substation on Cornelius Pass Road at Highway 26	0	Adjacent to airport north of Cornell Road One BPA crossing on Evergreen Road Near BPA substation on Cornelius Pass Road at Highway 26
System Compatibility	–		+	Easy access to Partner turnouts	–	
System Resiliency	–	Challenging access after seismic event Geologically active areas Highest liquefaction potential of these routes	0	Challenging access after seismic event Geologically active areas	0	Challenging access after seismic event Geologically active areas
Constructability	–	Wide ROW north of TV Hwy Geotechnical challenges Opportunities to partner on 185th Avenue Challenging traffic control Limited detour opportunities in high traffic areas	0	Opportunities to partner on Cornelius Pass Road Greenfield construction on Cornelius Pass Road Challenging traffic control north of TV Hwy Limited detour opportunities in high traffic areas Many public and private utilities in Evergreen Road, may require a trenchless crossing	0	Opportunities to partner on Cornelius Pass Road Greenfield construction on Cornelius Pass Road Challenging traffic control north of TV Hwy Limited detour opportunities in high traffic areas
Operations & Maintenance	0	Challenging O&M access	0	Opportunity to plan for access on Cornelius Pass Extension Existing Cornelius Pass area presents challenging O&M access	0	Opportunity to plan for access on Cornelius Pass Extension Existing Brookwood Pkwy area presents challenging O&M access
Total Project Cost	Medium Overall Cost Option		Lowest Overall Cost Option		Highest Overall Cost Option	

Note: Cost information in original source document (HDR, 2016b) is presented and evaluated based on the actual cost to implement each route alternative. Because cost information in various sources was developed at different times, it reflects differing dollar bases, levels of design, and delivery assumptions. Therefore, cost information presented in this document has been simplified to a relative cost ranking.

Table 8. Transmission Pipeline Route Criteria Evaluation: Section 4 - Reservoirs to Beaverton (HDR, 2016b)

Criteria/Route	4A Farmington / Allen / 5th		4B Kinnaman / Farmington / 5th		4C Kinnaman / Millikan / Walker		4D Scholls Ferry / Murray / Allen / 5th	
Social/ Community Criteria	–	Challenging traffic control, lack of detours for some neighborhoods Schools and churches will require careful traffic coordination or construction timing restrictions Challenging detours along route	–	Fire station along route Challenging detours Heavy traffic Challenging traffic control, lack of detours for some neighborhoods Schools and churches will require careful traffic coordination or construction timing restrictions	–	Challenging detours Challenging traffic control Schools and churches will require careful traffic coordination or construction timing restrictions Heavy traffic on Hocken Road, especially at Beaverton Creek bridge Walker Road connection point presents traffic control challenges	–	Fire station in detour area Challenging detours Heavy traffic Most community facilities are located on side streets and not directly on Scholls Ferry Road
Opportunities/Benefits	–	Opportunity to partner on SW 185th Avenue south of Farmington Road City does not support construction in Allen Blvd	0	Greenfield construction in the new Cornelius Pass Road through SHCPA, opportunity to partner with road project	0	Greenfield construction in the new Cornelius Pass Road through SHCPA, opportunity to partner with road project	–	Wide right-of-way on Scholls Ferry east of Roy Rogers Road, also Murray Blvd Recent improvements on Murray Blvd now constraints City does not support construction in Allen Blvd
Environmental/Permitting/ Cultural Resources/ Agricultural Impacts	–	ODOT permit required for work in ODOT-owned section of Farmington Road ODOT coordination required for crossing under Highway 217 BPA, Kinder Morgan and NW natural transmission main crossing on Hart Road Railroad crossing at end of route Entirely within the UGB	–	Multiple high sensitivity cultural resource areas ODOT coordination required for crossing under Highway 217 One BPA crossing Railroad crossing at end of route Entirely within the UGB	0	Multiple high sensitivity cultural resource areas Two BPA crossings on route Kinder Morgan and NW natural transmission main crossing on Millikan Road Entirely within the UGB	–	Multiple high sensitivity cultural resource areas ODOT coordination required for crossing under Highway 217 One BPA crossing near Murray Blvd Kinder Morgan and NW natural transmission main crossing near Murray Blvd Railroad crossing at end of route Entirely within the UGB
System Compatibility	+		+		+		+	
System Resiliency	0	Liquefaction risks high in project area	0	Liquefaction risks high in project area	0	Liquefaction risks high in project area	–	Liquefaction risks high in project area Natural gas transmission main along Scholls Ferry Road
Constructability Criteria	–	Construction access challenges Narrow ROW at end of route Traffic control challenges	–	Construction access challenges Narrow ROW at end of route Traffic control challenges Opportunities to partner	–	Construction access challenges Narrow ROW at end of route Concrete road on Milliken Heavy commercial and business traffic along Milliken Blvd and Hocken Rd Opportunities to partner	–	Construction access challenges Narrow ROW at end of route Traffic control challenges
Operations & Maintenance	–	Access will be challenging along entire route	–	Access will be challenging along entire route	0	Access will be challenging along Farmington Road	–	Access will be challenging along entire route
Total Project Cost	Medium-Low Overall Cost Option		Medium-High Overall Cost Option		Lowest Overall Cost Option		Highest Overall Cost Option	

Note: Cost information in original source document (HDR, 2016b) is presented and evaluated based on the actual cost to implement each route alternative. Because cost information in various sources was developed at different times, it reflects differing dollar bases, levels of design, and delivery assumptions. Therefore, cost information presented in this document has been simplified to a relative cost ranking.

Table 9. Results of Criteria Evaluation for WWSS WTP Site Alternatives (WWSP, 2017)

Criteria by Category	Site 1	Site 2	Site 3	Site 4
System Compatibility				
Site area and dimensions	Approximately 15 acres, nonrectangular; all constraints known	Approximately 20 acres, nonrectangular; all constraints known	Approximately 32 acres, nonrectangular; all constraints known	Approximately 45 acres, nonrectangular; all constraints known
	0	+	0	0
Social/Community Effects				
Potential visual and local character effects on neighbors and nearby community	Site abuts residential development; minimal ability to screen	Site abuts industrial and undeveloped area; no adverse effects to visual or local character	Site abuts industrial and undeveloped areas, multiple residences; moderate potential to minimize visual effects on adjacent residences	Site abuts industrial and undeveloped areas, one residence; adequate vegetation would remain to minimize visual effects on adjacent residence
	-	+	0	0
Potential encumbrances and conditions, constraints, or restrictions on a parcel	BPA easement transects site and is avoidable	30-foot setback from SW Tonquin Way and SW Morgan Road	Multiple encumbrances identified on the title report; PGE and BPA easements adjacent to site are avoidable	Multiple encumbrances identified on the title report; PGE easement considered in conceptual layout and future Blake Road avoidable
	-	+	0	-
Potential effects on neighbors and nearby community during WTP construction/operation	Site abuts residential development; single access point with limited effects on neighbors	Limited traffic effects on neighbors; multiple access points with limited effects on neighbors	Site abuts multiple residences; multiple access points would minimize effects on neighbors	Site abuts one residence; multiple access points would minimize effects on neighbors
	-	+	0	0
Opportunities/Benefits				
Available property (ability to acquire property for permanent use for WTP)	Partners have existing ownership of the site	General willingness to sell property; timeline for sale is not compatible with WWSP schedule	Owner engaged in negotiations for sale; multiple owners and interested parties may complicate acquisition	Owner is engaged in negotiations for sale; multiple interested parties may complicate acquisition
	+	-	-	0

Table 9. Results of Criteria Evaluation for WWSS WTP Site Alternatives (WWSP, 2017)

Criteria by Category	Site 1	Site 2	Site 3	Site 4
Available space for temporary or permanent easement for construction access and staging	Site is adjacent to road accessing Wilsonville Rd.; adequate staging area on property	Site is adjacent to SW Tonquin Way and SW Morgan Rd.; adequate staging area on property	Site is adjacent to SW Dahlke Lane, future SW 124th Ave and Blake Rd; adequate staging area on property	Site is adjacent to future SW 124th Ave and Blake Rd; adequate staging area on property
	+	+	+	+
Geologic or other hazards	Substantial geotechnical mitigation required to construct seismically stable WTP foundations; low likelihood of hazardous contamination	Substantial geotechnical mitigation required to construct seismically stable WTP foundations; high likelihood of hazardous contamination	Minimal geotechnical mitigation required to construct seismically stable WTP foundations; possible hazardous contamination requiring minimal mitigation	Minimal geotechnical mitigation required to construct seismically stable WTP foundations; possible hazardous contamination requiring minimal mitigation
	-	-	+	+
Available access roads	Multiple existing roads (Arrowhead Creek Lane and SW Industrial Way)	Multiple existing roads (SW Tonquin Way and SW Morgan Rd)	Multiple existing roads (SW Dahlke Lane and SW 124th Ave)	Existing road (SW 124th Ave) and future road (Blake Rd)
	0	0	+	0
Operations and Maintenance				
Flexibility to expand treatment plant features on the site or to acquire adjacent parcels	Adjacent property to north and/or south could allow future expansion	Extremely limited or no opportunities for future expansion	Adjacent undeveloped and industrial properties provide opportunities for future expansion	Adjacent undeveloped and industrial properties provide opportunities for future expansion
	+	-	+	+
Ability to drain treatment plant facilities	Parcel within 0.25 miles of Willamette River, would require routing drainage through park	Parcel bordered by Coffee Lake Creek, tributary to the Willamette River	Parcel is more than 0.25 miles from the nearest natural drainage	Parcel is more than 0.25 miles from the nearest natural drainage
	0	+	-	-

Table 9. Results of Criteria Evaluation for WWSS WTP Site Alternatives (WWSP, 2017)

Criteria by Category	Site 1	Site 2	Site 3	Site 4
Opportunity for community benefits	Site currently provides walking trails and other features to community; features would not be inhibited by expanded WTP	Site has potential for future community benefits compatible with WTP	Site has potential for future community benefits compatible with WTP	Site has potential for future community benefits compatible with WTP; opportunity to conserve ~20 acres of high-quality upland habitat
	0	+	+	+
Environmental/Permitting				
Potential effects on future and surrounding uses (current land use zoning)	Site zoning allows WTP outright but subject to discretionary review by City of Wilsonville	Site zoning allows WTP outright but subject to Type II special use review by Washington County	Current FD-20 zoning allows WTP but subject to Type III special use review by Washington County; future EI zoning (if annexed) allows WTP outright but subject to discretionary review by Sherwood	Current FD-20 zoning allows WTP but subject to Type III special use review by Washington County; future EI zoning (if annexed) allows WTP outright but subject to discretionary review by Sherwood
	0	0	0	0
Potential effects on riparian habitat, upland/wildlife habitat, wetlands, cultural resources, or rare, threatened, or endangered species	Riparian habitat recognized by City of Wilsonville under SROZ; WTP would avoid permanent effects on habitat areas	Site is adjacent to high-value wetland; WTP would minimize permanent impacts on wetland	Site has high-quality wetland and upland habitat; WTP would avoid most impacts on wetlands, but would affect upland habitat	Site has high-quality wetland and upland habitat; WTP would avoid most impacts on largest wetland, but would permanently impact other wetlands and upland habitat
	0	0	-	-
Access and Constructability				
Accessibility and constructability for transmission pipeline to and from WTP	Site is adjacent to road accessing Wilsonville Rd.; transmission pipeline construction may cause limited closures on access road	Site is adjacent to SW Tonquin Way and SW Morgan Rd.; would require several thousand feet of additional pipe construction. Additional pipeline would affect recent road improvements.	Site is adjacent to existing SW Dahlke Lane and future SW 124th Ave. and Blake Rd; no closures anticipated	Site is adjacent to future SW 124th Ave. and Blake Rd; no closures anticipated
	0	-	+	+

Table 10: Reservoir Evaluation Criteria (HDR, 2016a)

Criterion	Definition
	System Compatibility (Hydraulics)
Ground Elevation (preferred elevation range to meet LOS)	**Potential sites screened using *minimum* Elevation 470 ft mean sea level (MSL).** This criterion is based on the preliminary hydraulic analysis that defined the minimum elevation for the reservoir floor as 470 ft MSL, with a preferred floor of 500 ft MSL. The hydraulic analysis identified a desirable elevation range to provide the desired LOS (pressure and flows) to the water supply Partners. Parcels with elevations outside this range could also work, but would result in lower LOS or higher operational costs (pumping). ▪ (+) Parcel allows minimum footprint area at ground elevation range of 500 to 530 ft (allows overflow hydraulic grade line to be within preferred hydraulic range of 500 to 530 ft) ▪ Parcel allows minimum footprint area at ground elevation range of 470 to 500 ft (does not provide as much pressure by gravity to partner connections) or greater than 530 (requires more pumping from WTP) ▪ (-) Parcel does not allow reservoir footprint area ground elevation within 470 to 550 ft
Parcel area and dimensions (area to accommodate minimum of 30 MG with a desired target of 45 MG total volume)	**Potential sites screened using minimum area of 4 acres.** For evaluation purposes, assuming a circular tank volume of 15 million gallons (MG) with a 35-foot water depth, the outside diameter of the tank is ~270 ft (conservatively). The minimum (square) area for just the circular tank would be 1.7 acres (270 ft x 270 ft). The minimum square area for two circular 15 MG tanks assuming a minimum 50-ft buffer on each side and between tanks is 3.2 acres (370 ft x 370 ft). In addition to the tank footprint, the parcel needs space for minimum permanent buffer, temporary construction, access roads, parking, storage of emergency overflow, and appurtenant facilities. Tanks in a rectangular or other shape may be used to optimize use of individual sites. Thus, a minimum of 4 acres is used to initially identify/screen parcels. Larger parcels are given higher relative rating that provide flexibility and more easily allow space for the ancillary site requirements. The footprint of the 15-MG reservoir is preliminary and a formal site concept layout is needed to verify constructability and grading issues. Required elevation is considered to be between 470 and 550 ft MSL. ▪ (+) Parcel greater than 8 acres at required elevation. ▪ (0) Parcel is between 5 and 8 acres at required elevation ▪ (-) Parcel is less than 5 acres at required elevation
	Social/Community Impacts
Potential visual and local character impacts to neighbors and nearby community	This criterion considers long-term impacts on neighbors' views and the local character of the nearby community due to construction of the reservoir. The criterion considers if parcel is adjacent to areas where residential developments have views of the potential reservoir. This criterion also considers whether the visual impacts could be mitigated, including the ability to bury the reservoir at the parcel and still meet the minimum elevation requirements. ▪ (+) Minimal visual impacts due to greater proximity from residential development or site allows effective screening ▪ (0) Visual impacts but minimal impacted residences ▪ (-) Visual impacts with minimal ability to screen with existing or planned residential development
Potential encumbrances and conditions, constraints, or restrictions on a parcel	The Preliminary Title Report provides a list of exceptions (conditions, constraints, and restrictions) on the property that may limit the ability to develop the tank at the site. ▪ (+) No significant encumbrances are identified by the preliminary title reports ▪ (0) Encumbrances identified in the preliminary reports can be readily addressed (e.g., mitigated or avoided) ▪ (-) One or more encumbrances appear significant or pose challenges to building the tank on site; or a significant number exceptions exist that need to addressed
Potential impacts to neighbors during construction of reservoir	This criterion considers short-term impacts to neighbors during construction of the reservoir. Criterion considers the proximity of the existing development (residential and commercial) and potential impacts from noise/vibration, health and safety, light pollution, and traffic. Evaluation assumes that the same types and effort for mitigating impacts may be implemented during construction. ▪ (+) No adjacent residential/commercial development exists ▪ (0) Limited number of adjacent residential/commercial development exists ▪ (-) Parcel is adjacent to a significant number of existing residential/commercial developments
Potential downstream consequence of reservoir or pipeline failure	Existing or future development downstream from the reservoir may be at risk of damage in an emergency situation if the tank were to fail. ▪ (+) Very limited to no residential and/or commercial development exists within 1 mile downstream of parcel ▪ (0) Limited residential and/or commercial development exists within 1 mile downstream of parcel ▪ (-) Parcel is immediately upstream or adjacent to residential and/or commercial development

Table 10: Reservoir Evaluation Criteria (HDR, 2016a)

Criterion	Definition
	Opportunities/Benefits
Available property (ability to acquire property for permanent use for reservoir)	Properties that are currently for sale or where the owner is interested in or willing to sell provide benefits to both the property owner and the project owner. In some cases, Partner agencies have previously approached property owners of candidate sites to discuss acquisition of the property. This information is preliminary and circumstantial in all cases, and the Public Outreach Team has to confirm this information. This information is a preliminary indication of the willingness to sell, and the potential opportunities to provide benefit to the property owner. • (+) Indications of willingness or general interest to sell based on feedback from property owner • (0) No information available based on previous contacts • (-) Indications of lack of willingness or general interest to sell based on feedback from property owner
Opportunity for community benefits	A parcel with adequate area or features that provides opportunities to incorporate site enhancements that benefits the community (e.g., hiking trails, community center, play structures/fields, open space) may provide an advantage from a public acceptance perspective. If a parcel is currently used for recreation or provides other community benefits (e.g., open land for hiking), development for a reservoir may affect existing users and be a disadvantage from public acceptance perspective. • (+) Parcel does not currently provide recreation or other benefits to community; and parcel has significant potential space or layout to allow integrated future beneficial uses for the community • (0) Parcel is not currently used for beneficial uses by community, but has limited space or other constraints that limit future integrated beneficial uses by community OR parcel is currently used for beneficial use by community and has significant potential space or layout to allow integrated future beneficial uses for the community • (-) Parcel is currently used for recreation or other beneficial uses by community but has significant constraints (space or other features) that limit or prohibit future beneficial uses by community
	Environmental/Permitting
Potential impact to future uses/ agricultural production (current land use zoning)	Land use zoning indicates whether public facilities are allowed on the parcel, and is a surrogate for indicating potential impact of a reservoir relative to other potential uses of the parcel, specifically agricultural. INST zoning allows use for public facilities. EFU sites require a Type-2 conditional use process through Washington County and require additional alternatives analysis not required by residential-zoned sites (e.g., RR-5). R-zoned sites require a Type 3 process (with public hearing). The alternatives analysis justifying approval for a public facility would consider the quality of soils and the size of the parcel (e.g., whether it is large enough to be farmed profitably and whether the site currently in active agricultural production). Sites adjacent to the UGB provide additional justification for EFU/AF20-zoned sites to be considered for inclusion in the urban growth area during land use permitting review. • (+) INST or the parcel is residential-zoned within the UGB or City of Beaverton, and generally allows public facilities • (0) Residential-type zoning or AF-20/EFU and adjacent to UGB, allows public hearing • (-) EFU and AF20 not adjacent to UGB, requires alternatives analysis and indicates potentially more impact related to future agricultural production
Potential impacts to riparian and upland/wildlife habitat and wetlands	Impacts to significant riparian habitat, uplands/wildlife habitat, or wetlands present on the site could be mitigation through land use permitting process, but sites that minimize the potential impact to natural resources are preferred. • (+) Parcel has no identified riparian/wildlife habitat or wetlands • (0) Parcel has limited areas identified as riparian/wildlife habitat or wetlands • (-) Parcel has significant areas identified as riparian/wildlife habitat or wetlands within
	Access and Constructability
Accessibility and constructability for transmission pipeline to and from reservoir	Considers accessibility of the site related to proximity of the site to potential transmission pipeline corridor. Accessibility for transmission lines is based on existing major roads (defined to include Grabhorn Road, 175th Avenue, and Scholls Ferry Road.). All other roads in the study area are considered too narrow for transmission corridors without additional easement or right-of-way. This criterion also considers potential impacts to neighbors due to construction of the transmission pipe to and from the reservoir, including road closures or traffic impacts. • (+) Parcel is located immediately adjacent to an existing major road (i.e., Grabhorn Road, 175th Ave) and transmission pipes would cause limited to no closures and/or accessibility limitations that would impact neighbors. • (0) Parcel is located immediately adjacent to existing side street or access road and construction of the transmission pipe would cause some closures and/or accessibility limitations that would impact neighbors • (-) Parcel is not located on existing major or minor road and the construction of the transmission pipe would cause closures and/or accessibility limitations that would significantly impact neighbors
Available space/properties for temporary or permanent easement for construction access and staging	Considers accessibility during construction and space for staging area. This criterion considers the capacity and function of existing access roads to the site to carry construction vehicles, evaluating whether construction vehicles can be accommodated either by the existing roadways or with upgrades to those roadways that would not have significant impacts to neighbors. This criterion also considers whether adjacent parcels or easement are available for temporary or permanent use for construction purposes. • (+) Parcel is adjacent to road that can accommodate construction vehicles without need for upgrade; and parcel has adequate area for staging and other construction purposes • (0) Parcel is adjacent to road that requires upgrades or closure would impact access by neighbors; and adjacent parcels are available for temporary or permanent easements • (-) Parcel is adjacent to road that requires upgrades or closure would impact access by neighbors; and site does not have adequate area for staging nor adjacent parcels available for temporary or permanent easements

Table 10: Reservoir Evaluation Criteria (HDR, 2016a)

Criterion	Definition
	Access and Constructability (Continued)
Historical landslide or known landslide hazards or other geologic hazards	All sites are on Cooper Mountain, therefore the seismic stability in terms of "earthquake soft soil hazard" rating or "earthquake shaking hazard" based on DOGAMI delineation (http://www.oregongeology.org/hazvu/) is the same for all of the sites. As such, the focus was whether the parcel is located near a historical landslide area as delineated in ISM 34. The landslide area does not necessarily eliminate a parcel from further consideration, assuming that engineering and design measures can largely mitigate the landslide risks (at a cost to the project). However, if a site is selected for further geotechnical investigation, the geotechnical engineer may conclude that the site is not suitable for a reservoir based on field and subsurface findings. • (+) Parcel area boundary is further than 0.25 mile from delineated landslide area boundary • (0) Parcel area boundary is less than 0.25 mile from delineated landslide area boundary • (-) Significant parcel area within delineated landslide area
	Operation and Maintenance
Flexibility to build more than one tank on the site or to acquire adjacent parcels	Considers whether a parcel allows dual/multi-tank options rather than strictly a single tank in the area at an elevation between 470 and 550 ft. This criterion also considers whether adjacent parcels are available to expand the area available for additional tanks. • (+) Allows multiple tanks at the site totaling more than 30 MG in area within 470 to 550 ft elevation • (0) Allows at least two tanks at the site with at least 30 MG total storage in the area within 470 to 550 ft elevation and/or adjacent parcels are available to potentially expand into, which could allow 30 MG total storage • (-) Does not allow more than one tank on the site of at least 30 MG in area within 470 to 550 ft elevation and no adjacent parcels are available to expand into
Ability to drain reservoir or pipe	A natural drainage feature will be advantageous for draining the reservoir for maintenance and in emergency situations where the tank needs to be drained, and to reduce the risk of downstream damage due to tank failure. Proximity to natural drainage also allows for more convenient stormwater drainage management. • (+) Parcel is immediately adjacent to natural drainage • (0) Parcel is within 0.25 mile (and up gradient) of natural drainage • (-) Parcel is more than 0.25 mile (and up gradient) of natural drainage

Table 11: Reservoir Criteria Evaluation Results (HDR, 2016a)

Criterion	Evaluation Basis	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11*
1. Ground elevation	• (+) Parcel allows minimum footprint area at ground elevation range of 500 to 530 feet (allows overflow HGL to be within preferred hydraulic range of 500 to 530 feet) • (0) Parcel allows minimum footprint area at ground elevation range of 470 to 500 feet (does not provide as much pressure by gravity to partner connections) or greater than 530 (requires more pumping from WTP) • (-) Parcel does not allow reservoir footprint area ground elevation within 470 to 550 feet	Allows elevation of reservoir floor to be above 500	Limited area to the northeast of parcel above the 470 contour	Allows elevation of reservoir floor to be above 500	Allows elevation of reservoir floor to be above 500	Allows elevation of reservoir floor to be above 500	Allows reservoir floor to be within the 470 to 490 range	Allows reservoir floor to be within the 470 to 490 range	Allows elevation of reservoir floor to be above 500	Allows reservoir floor to be within the 470 to 490 range	Reservoir floor elevation would be in the 490 to 550 range	Site 11 ground elevation is higher than the target range.
		+	0	+	+	+	0	0	+	0	+	–
2. Parcel area and dimensions	• (+) Parcel provides space for at least two 15 MG tanks (greater than 8 acres; minimum dimensions of 370 and 740 feet on the two sides of the parcel) at required elevation. • (0) Parcel provides space for one 15 MG tank (between 5 and 8 acres; minimum dimension of 370' on each side of the parcel at required elevation). • (-) Parcel is insufficient for one 15 MG tank, but is sufficient for at least one 10 MG or two smaller tanks (less than 5 acres; dimension of less than 370 feet on the shortest side) at required elevation.	Accommodates at least two 15-MG tanks at required elevation	Accommodates only one 15 MG tank on site at required elevation	*Likely* able to accommodate two 15 MG tanks at required elevation (requires significant grading)	Accommodates at least two 15 MG tanks at required elevation	*Likely* able to accommodate one 15 MG tank (note with steep slopes and resources on site)	Accommodates one 15 MG tank on site at required elevation	Accommodates one 15 MG tank on site at required elevation	Total parcel area is less than 5 acres (~320 x 630) and fits one <15 MG tank at required elevation	Total parcel area is greater than 8 acres (~530 x 670); and fits at least one15 MG tank at required elevation (requires significant grading)	Total parcel area is greater than 8 acres; and fits one15 MG tank at required elevation (requires significant grading)	Accommodates at least two 15-MG tanks at required elevation; but at elevations higher than target range.
		+	0	+	+	0	0	0	–	0	0	0
3. Flexibility to build more than one tank on the site	• (+) Allows multiple tanks at the site totaling more than 30 MG in area within 470 to 550 feet of elevation • (0) Allows at least two tanks at the site with at least 30 MG total storage in the area within 470 to 550 feet of elevation; and/or adjacent parcels are available to potentially expand into, which could allow 30 MG total storage • (-) Does not allow more than one tank on the site of at least 30 MG in area within 470 to 550 feet of elevation and no adjacent parcels are available to expand into	Parcel can accommodate two reservoirs with 30 MG total capacity	Parcel does not allow more than one tank; adjacent Site 3 provides additional area	Parcel has possibility to locate two tanks totaling 30 MG; eastern side is more difficult for tank; adjacent Site 2 and parcels to south provides additional area	Parcel has possibility to locate multiple tanks more than 30 MG (50 MG); adjacent parcel available to the west provides additional area	Parcel does not allow more than one tank on the site; adjacent Site 4 provides additional area	Parcel does not allow more than one tank on the site; adjacent parcels to east and west provide additional area (w/ existing residences); including Site 7	Parcel does not allow more than one tank on the site; adjacent parcels to west and southwest provides additional area ; including Site 6	Parcel does not allow more than one tank on the site; adjacent parcels to west provide additional area (w/ existing residences); including Site 7	Parcel does not allow more than one tank on the site; adjacent parcels to west and southwest provides additional area	Parcel does not allow more than one tank on the site; adjacent parcels do not meet elevation criteria (470 to 550)	Parcel has possibility to locate two tanks totaling 30 MG; but elevation is higher than target and space would be relatively constrained.
		+	0	+	+	0	0	0	0	0	–	0
4. Current land use zoning	• (+) INST or the parcel is residential-zoned within the UGB or City of Beaverton • (0) Residential-type zoning or AF-20/EFU and adjacent to UGB • (-) EFU and AF20 not adjacent to UGB	INST; UNINC within UGB	AF20; Outside URA; adjacent to UGB	AF20; Within URA; adjacent to UGB	EFU; Within URA; not adjacent to UGB	EFU; Within URA; not adjacent to UGB	RR5; Within URA; near UGB	RR5; Within URA; near UGB	RR5; Within URA; adjacent to UGB	R5; Within City of Beaverton	AF5; Within URA; adjacent to UGB but close	FD-20; within UGB
		+	0	0	–	–	0	0	0	+	0	0

Table 11: Reservoir Criteria Evaluation Results (HDR, 2016a)

Criterion	Evaluation Basis	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11*
5. Willingness to sell based on previous interactions	• (+) Indications of willingness or general interest to sell based on previous contacts and feedback from property owner • (0) No information available based on previous contacts • (-) Indications of lack of willingness or general interest to sell or the likelihood of challenging negotiations based on previous contacts and feedback from property owner.	No information available based on previous contacts	No information available based on previous contacts	No information available based on previous contacts	No information available based on previous contacts	No information available based on previous contacts	No information available based on previous contacts	No information available based on previous contacts	No information available based on previous contacts	General interest and willingness to sell property; no commitment to sell to Partners (based on recent communications from TVWD)	General interest and willingness to sell property; no commitment to sell to Partners(based on recent communications from Beaverton)	General interest and willingness to sell property; no commitment to sell to Partners (based on recent communications from TVWD)
		0	+	+	0	0	0	0	0	+	+	+
6. Encumbrances and conditions/restrictions	• (+) No significant encumbrances are identified by the preliminary title reports • (0) Encumbrances identified in the preliminary reports apparently can be mitigated or avoided • (-) One or more encumbrances appear significant or to pose challenges to building the tank on site; or a significant number exceptions exist that need to addressed	• PGE power line easement • Non-access reserve strip	• Private road easement • Utilities in vacated street	• Private road easement	• Flood control/fish propagation • Mineral reservation • Road maintenance • Utility easement • Homeowner's Association regulations • View, light, air and septic system easements	• Flood control/fish propagation • Mineral reservation • Road maintenance • Utility easement • Homeowner's Association regulations	• Operating agreement for Lawrence Tree Farm	• None applicable	• Road and stormwater maintenance easement	• Water pipeline easement (COB) • Reservation of utilities in vacated street • Utilities easement (COB)	• Non-access reserve strip • Sign • monumentation • Storm drainage easement • Underground distribution line easement	• None applicable
		0	0	0	–	0	0	+	0	0	0	+
7. Accessibility and constructability for transmission line to reservoir	• (+) Parcel is located immediately adjacent to an existing major road (+) (i.e. Grabhorn Rd., 175th Ave) and transmission pipes will have limited to no closures and/or accessibility limitations that would impact neighbors. • Parcel is located immediately adjacent to existing side street or access road and the construction of the transmission pipe will have some closures and/or accessibility limitations that would impact neighbors • (-) Parcel is not located on existing major or minor road and the construction of the transmission pipe will cause closures and/or accessibility limitations that would significantly impact neighbors	Parcel is adjacent to Grabhorn Rd.; upgrades not anticipated; impacts to neighbor access limited.	Parcel is adjacent to Grabhorn Rd.; upgrades not anticipated; impacts to neighbor access limited.	Parcel is adjacent to Grabhorn Rd.; upgrades not anticipated; impacts to neighbor access limited.	Parcel accessible via Horse Tale Dr.; access by neighbors could be impacted by transmission pipe construction; alignment to reservoir would be relatively long (>3,000 ft)	Parcel accessible via Horse Tale Dr.; access by neighbors could be impacted by transmission pipe construction; alignment to reservoir would be relatively long (>4,000 ft)	Parcel accessible via Alvord Ln.; excavation for piping may cause temporary road closure affecting several (~15) homes; alignment to reservoir would be moderately long (>750 ft)	Parcel accessible via Alvord Ln.; excavation for piping may cause temporary road closure affecting several (~15) homes; alignment to reservoir would be moderately long (~2,000 ft)	Parcel accessible via High Hill Ln or Snowy Owl Ln; excavation for piping requires intense traffic control/ closure affecting numerous (~80) homes; alignment to reservoir would be long (~3,600ft)	Parcel accessible via residential roads from Scholls Ferry Rd; excavation for piping requires intense traffic control/closure affecting numerous (~100) homes; alignment to reservoir would be long (~1,500ft)	Parcel accessible via Weir Rd, connected by Murray Blvd.; upgrades not anticipated; impacts to neighbor access limited; alignment to reservoir would be long from major road	Parcel is adjacent to Grabhorn Rd.; upgrades not anticipated; nearby residential properties could be impacted by construction activities and traffic.
		+	+	+	–	–	0	0	–	–	0	0

Table 11: Reservoir Criteria Evaluation Results (HDR, 2016a)

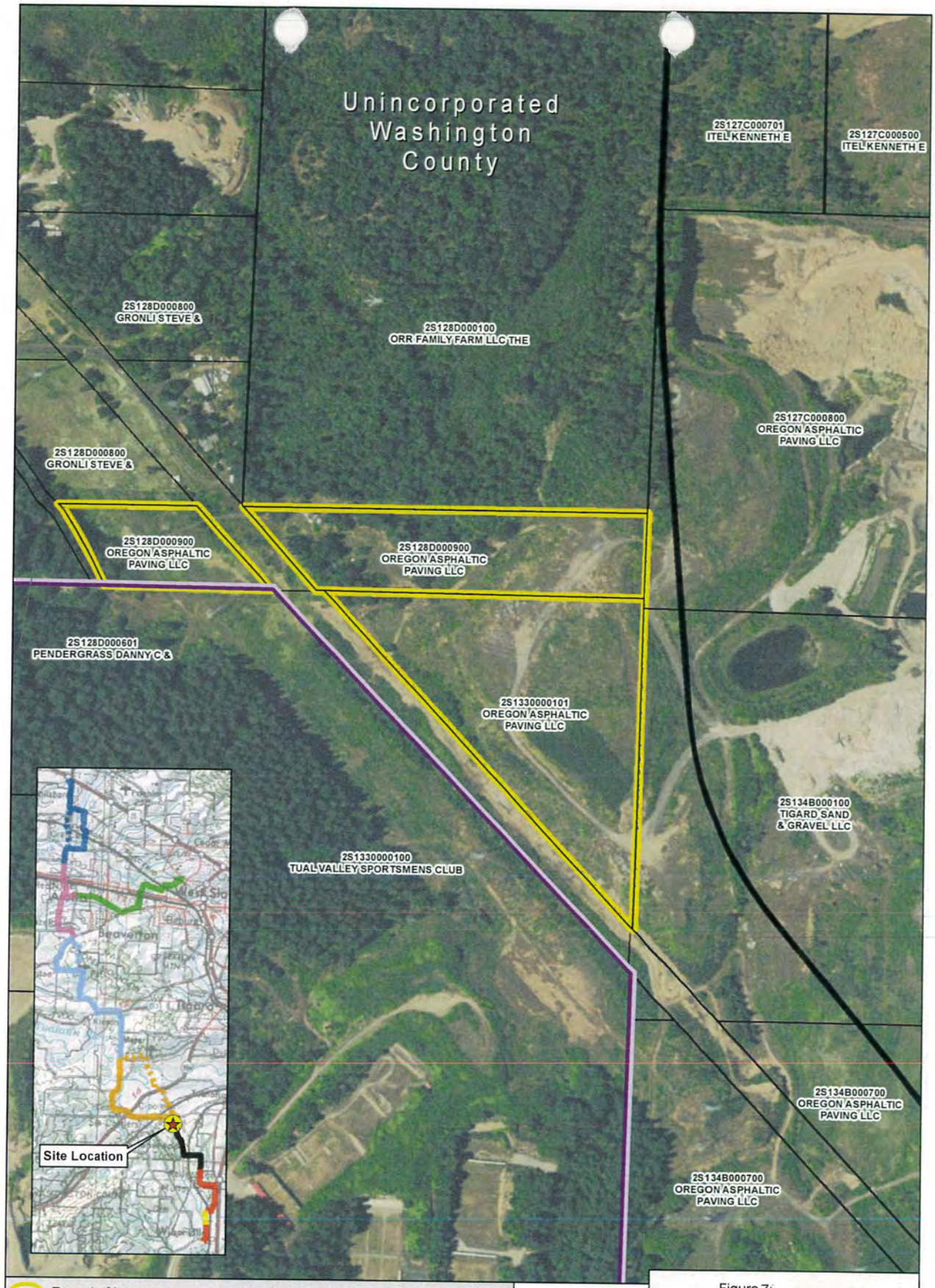
Criterion	Evaluation Basis	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11*
8. Available properties for temporary or permanent easement for construction access and staging	▪ (+) Parcel is adjacent to road that can accommodate construction vehicles without need for upgrade; and parcel has adequate area for staging and other construction purposes ▪ (0) Parcel is adjacent to road that requires upgrades or closure would impact access by neighbors; and adjacent parcels are available for temporary or permanent easements ▪ (-) Parcel is adjacent to road that requires upgrades or closure would impact access by neighbors; and site does not have adequate area for staging nor adjacent parcels available for temporary or permanent easements	Parcel is adjacent to Grabhorn Rd.; adequate staging area in south side of property	Parcel is adjacent to Grabhorn Rd.; adequate staging area in west side of property	Parcel is adjacent to Grabhorn Rd.; adequate staging area in east side of property	Parcel is adjacent to access road which likely require upgrades for construction and access for neighbors; adequate staging area is available	Parcel is adjacent to access road which likely require upgrades for construction and access for neighbors; adequate staging area is available	Parcel is adjacent to access road which likely require upgrades for construction and access for neighbors; Alvord Ln may be used as staging area, additional staging area available from adjacent properties	Access road may require significant upgrade for construction; Alvord Ln may be used as staging area; additional staging area needed and may be obtained in adjacent properties	Access road could require closure and would impact access by neighbors staging area may be available near reservoir site but not along pipe corridor	Access road could require closure and would impact access by neighbors; staging area available on reservoir site but not along pipe corridor	Parcel is adjacent to Weir Rd.; adequate staging area in north side of property	Parcel is adjacent to road that can accommodate construction vehicles without need for upgrade; parcel has limited area for staging and other construction purposes
		+	+	+	0	0	0	0	–	–	+	0
9. Ability to drain reservoir or pipe	▪ (+) Parcel is immediately adjacent to natural drainage ▪ (0) Parcel is within 0.25 mile (and upgradient) of natural drainage ▪ (-) Parcel is more than 0.25 mile (and upgradient) of natural drainage, or would have difficulties based on site constraints to comply with (chlorinated) water discharge rules	Parcel is adjacent to natural drainage	Parcel is within 0.25 mile (upgradient) from natural drainage	Parcel is adjacent to natural drainage	Parcel is adjacent to natural drainage	Parcel is adjacent to natural drainage	Parcel is greater than 0.25 mile from natural drainage	Parcel is greater than 0.25 mile from natural drainage	Parcel is greater than 0.25 mile (upgradient) from natural drainage	Parcel is within 0.25 mile (upgradient) from natural drainage	Parcel is within 0.25 mile (upgradient) from natural drainage	Parcel is within 0.25 mile (upgradient) from natural drainage
		+	0	+	+	+	–	–	–	0	0	0
10. Presence of riparian and upland/wildlife habitat and wetlands	▪ (+) Parcel has no identified riparian/wildlife habitat or wetlands ▪ (0) Parcel has limited areas identified as riparian/wildlife habitat or wetlands; or wildlife and riparian habitat has limited or no Class A or Class I ▪ (-) Parcel has significant areas identified as riparian/wildlife habitat or wetlands within with some or significant Class A or Class I areas.	Majority Class B wildlife habitat	Majority area not identified as habitat; generally unconstrained	Eastern-third of parcel Class A upland/Class II riparian habitat	Lower area within preferred elevation zone generally unconstrained	Significant Class A wildlife /Class I and II riparian habitat	Primarily Class C wildlife/Class III riparian habitat	Primarily Class B wildlife habitat and no riparian habitat	Primarily Class C wildlife/Class III riparian habitat	Majority area not identified as habitat; generally unconstrained	Majority area not identified as habitat; generally unconstrained	Majority area not identified as habitat; generally unconstrained
		–	+	0	0	–	0	0	0	+	+	+
11. Potential visual impact to residences (includes ability to screen site)	▪ (+) Minimal visual impacts due to greater proximity from residential development or allows effective screening ▪ (0) Visual impacts but minimal impacted residences ▪ (-) Visual impacts with minimal ability to screen with existing or planned residential development	Parcel across the street to residential properties; allows effective screening	Parcel across the street from existing residential properties; minimal ability to screen; limited space for tank adjacent to road.	Parcel across the street from existing residential properties; low to moderate potential for screening along road (could partially bury)	Parcel not adjacent to residential properties; not readily visible; allows effective screening	Parcel not adjacent to residential properties; not readily visible; allows effective screening	Parcel adjacent to existing residential properties; allows limited screening without additional buffer property (could partially bury)	Parcel adjacent to existing residential properties; allows limited screening without additional buffer property (could partially bury)	Parcel adjacent to existing residential properties; allows limited screening without additional buffer property; exposed face is toward residential development	Parcel adjacent to existing residential properties; allows limited screening without additional buffer property; exposed face is toward residential development	Parcel adjacent to existing residential properties; allows limited screening without additional buffer property; exposed face is toward residential development	Parcel adjacent to existing residential properties; allows limited screening without additional buffer property; exposed face is toward residential development
		0	0	0	+	+	0	0	–	–	–	–

Table 11: Reservoir Criteria Evaluation Results (HDR, 2016a)

Criterion	Evaluation Basis	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11*
12. Potential for neighbor benefits	• (+) Parcel does not currently provide recreation or other benefits to neighbors; and parcel has significant potential space or layout to allow integrated future beneficial uses for neighbors • (0) Parcel is not currently used for beneficial uses by neighbors, and does not have significant constraints that limit future integrated beneficial uses by neighbors; OR parcel is currently used for beneficial use by neighbors and has significant potential space or layout to allow integrated future beneficial uses for neighbors • (-) Parcel is currently used for recreation or other beneficial uses by neighbors but has significant constraints (space or other features) that limit or prohibit future beneficial uses by neighbors	Parcel is existing park and used for recreational space; uncertainty whether as to whether parcel could be retrofit to allow continued public use for recreation/ community space	Parcel is in a central location in the Cooper Mtn area; significant area is available to incorporate recreational and other beneficial uses along with reservoir structure that could integrate with Cooper Mtn Park and other regional parks	Parcel is in a central location in the Cooper Mtn area; significant area is available to incorporate recreational and other beneficial uses along with reservoir structure that could integrate with Cooper Mtn Park and other regional parks	Parcel is in a central location in the Cooper Mtn area; significant area is available to incorporate recreational and other beneficial uses along with reservoir structure that could integrate with Cooper Mtn Park and other regional parks	Parcel is in a central location in the Cooper Mtn area; significant area is available to incorporate recreational and other beneficial uses along with reservoir structure that could integrate with Cooper Mtn Park and other regional parks	Parcel is near Natural Area; but has limited space and layout to incorporate future co-located recreational or other beneficial uses	Parcel is near Natural Area; but has limited space and layout to incorporate future co-located recreational or other beneficial uses	Parcel is near Natural Area; but has limited space and layout to incorporate future co-located recreational or other beneficial uses	Parcel is near Natural Area; Parcel provides some opportunity to co-locate future recreational and other beneficial uses to integrate with Tenax Woods Natural area	Parcel near Natural Area and Park; Parcel provides some opportunity to co-locate future recreational and other beneficial uses to complement other nearby park areas.	Parcel near Natural Area and Park; Parcel provides some opportunity to co-locate future recreational and other beneficial uses to complement other nearby park areas.
		–	+	+	+	+	–	–	–	0	0	0
13. Downstream consequence of reservoir (or pipeline failure)	• (+) Very limited to no residential and/or commercial development exists within 1 mile of parcel • (0) Limited residential and/or commercial development exists within 1 mile of parcel • (-) Parcel is immediately upstream or adjacent to residential and/or commercial development	Very limited existing development downstream of parcel	Very limited existing development downstream of parcel	Very limited existing development downstream of parcel	Very limited existing development downstream of parcel	Very limited existing development downstream of parcel	Limited existing development downstream of parcel	Parcel is immediately upstream or adjacent to residential development	Parcel is immediately upstream or adjacent to residential development	Parcel is immediately upstream or adjacent to residential development	Parcel is immediately upstream or adjacent to residential development	Parcel is immediately upstream or adjacent to residential development
		0	+	+	+	+	0	0	–	–	–	–
14. Historical landslide/known landslide hazard	• (+) Parcel boundary further than 0.25 mile from delineated landslide area boundary • (0) Parcel boundary less than 0.25 mile of delineated landslide area boundary • (-) Significant parcel area within delineated landslide area	Further than 0.25 mile from nearest landslide area	Further than 0.25 mile from nearest landslide area	Further than 0.25 mile from nearest landslide area	Further than 0.25 mile from nearest landslide area	Further than 0.25 mile from nearest landslide area	Further than 0.25 mile from nearest landslide area	Further than 0.25 mile from nearest landslide area	Further than 0.25 mile from nearest landslide area	Further than 0.25 mile from nearest landslide area	Located within landslide area identified in ISM 34	Further than 0.25 mile from nearest landslide area
		+	+	+	+	+	+	+	+	+	–	+

** Site 11 was added as an "opportunity site" after the initial screening was conducted. Some of the criteria do not apply directly as defined. In these cases the criteria ratings were applied with some additional qualitative judgment to apply criterion as noted in the note*

APPENDIX B: FIGURES



Parcel of Interest
Metro RLIS Taxlot
Urban Growth Boundary

Alignment Segment Name
PLM 3.0 (SW 124th Avenue Extension)

Figure 7:
WTP Alternative Site 3

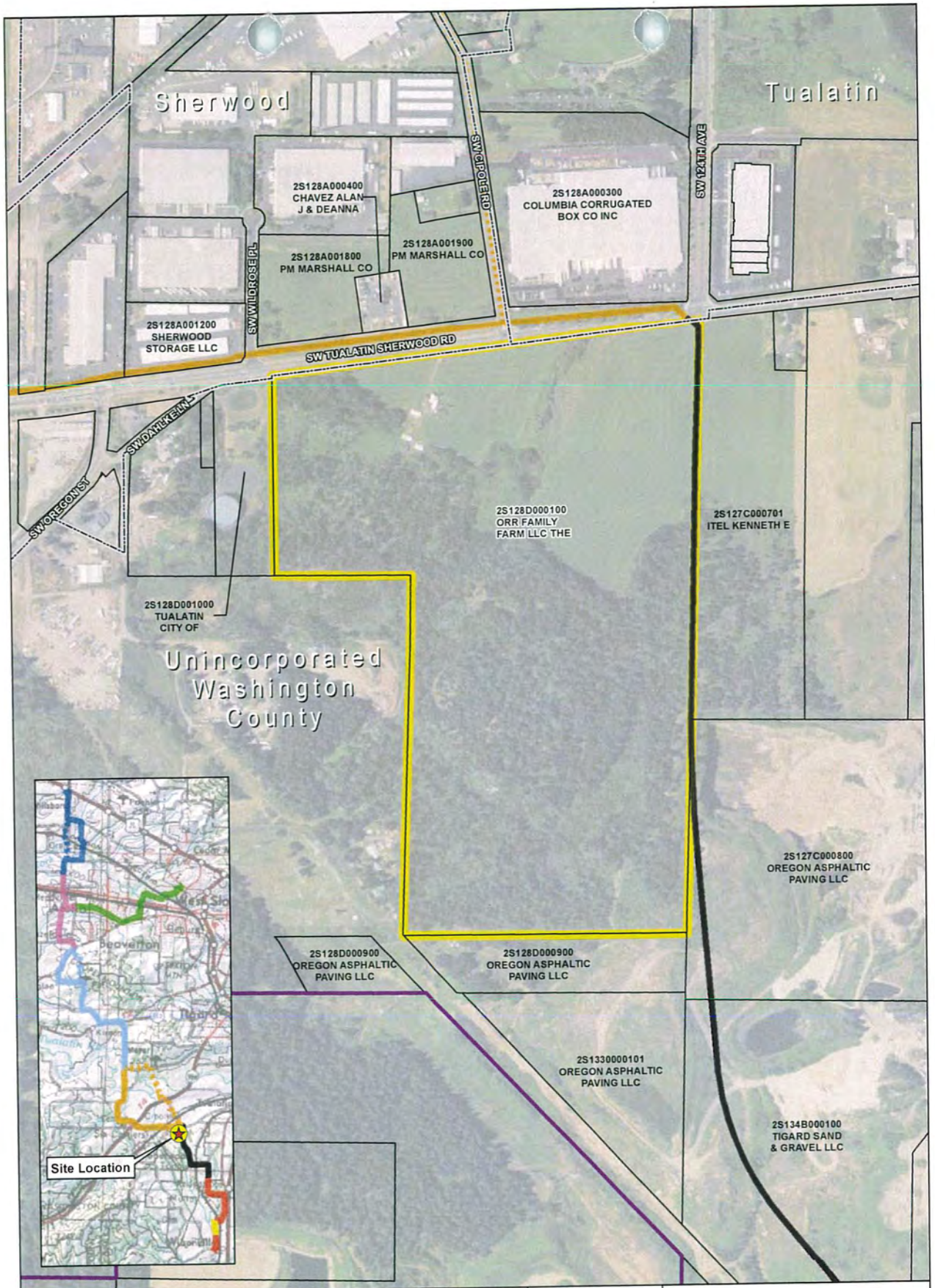
Alternative Water Treatment Plant Site Evaluation - Oregon Asphalt Paving Parcels 2S128D000900 & 2S1330000101

N

0 350 Feet

Willamette Water Supply
Our Reliable Water

Background: 2014 NAIP Imagery



Parcel of Interest
Metro RLIS Taxlot
City Boundary
Urban Growth Boundary

Alignment Segment Name
PLM 3.0 (SW 124th Avenue Extension)
PLM 4.0
Alternative Route PLM 4B

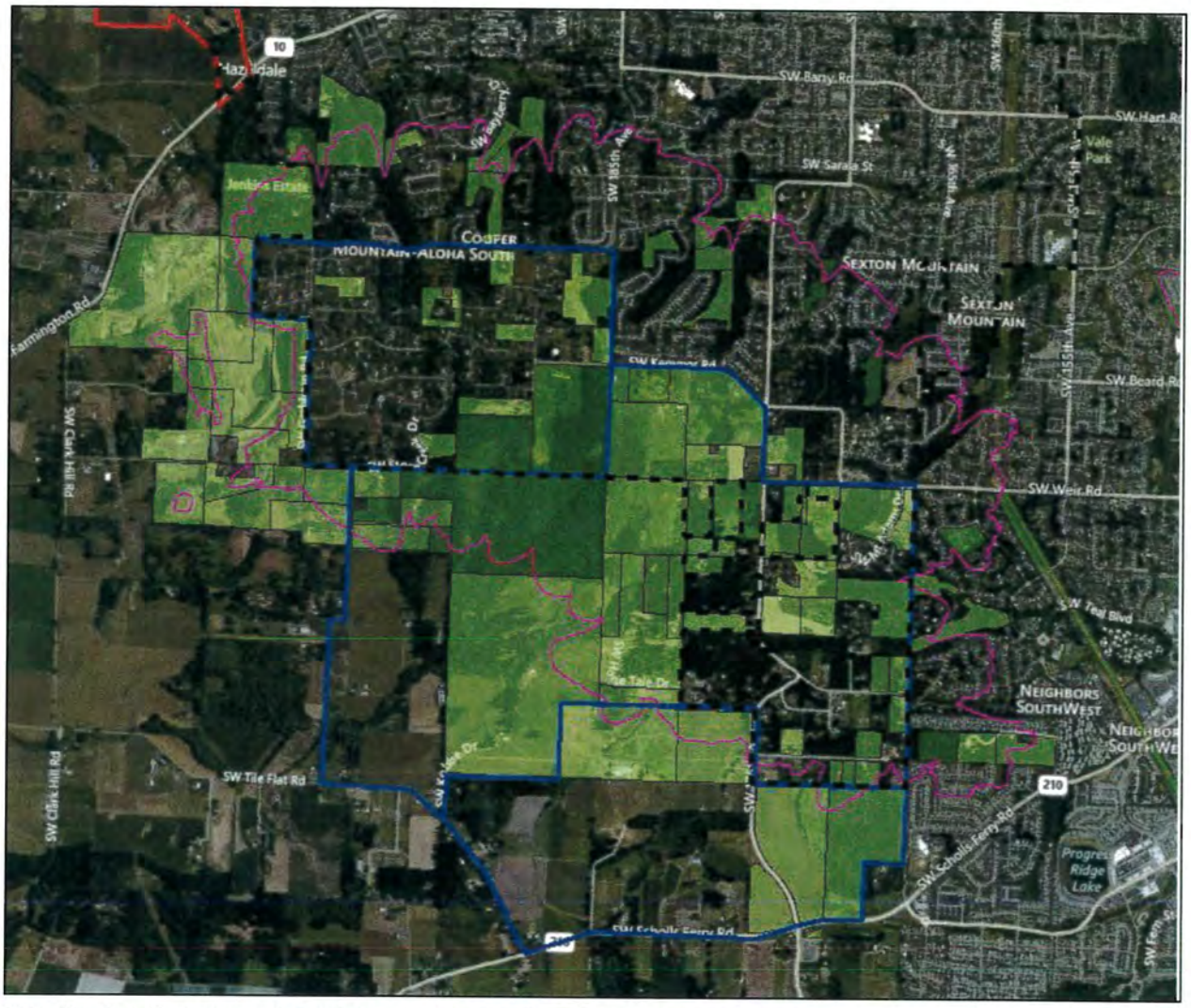
Figure 8:
WTP Alternative Site 4

Alternative Water Treatment Plant
Site Evaluation - Parcel 2S128D000100

N
0 500 Feet

Willamette Water Supply
Our Reliable Water

Figure 9. Illustration of Available Parcels on Cooper Mountain above the 430 feet Contour Interval (Parcels Greater than 200,000 square feet).



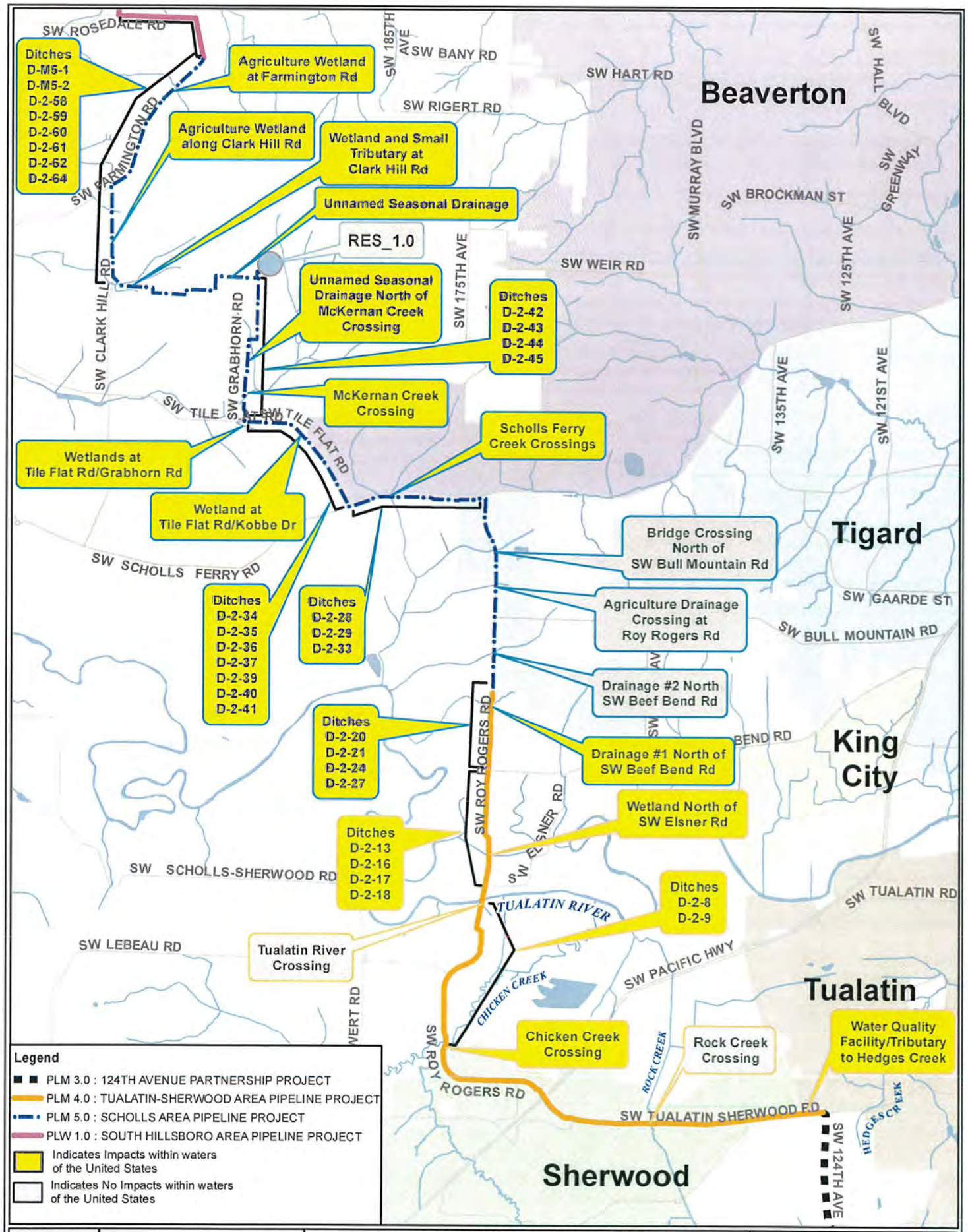
Note: Blue boundary represents South Cooper Mountain Planning Area and Urban Reserve Areas for City of Beaverton

Attachment E: Figures

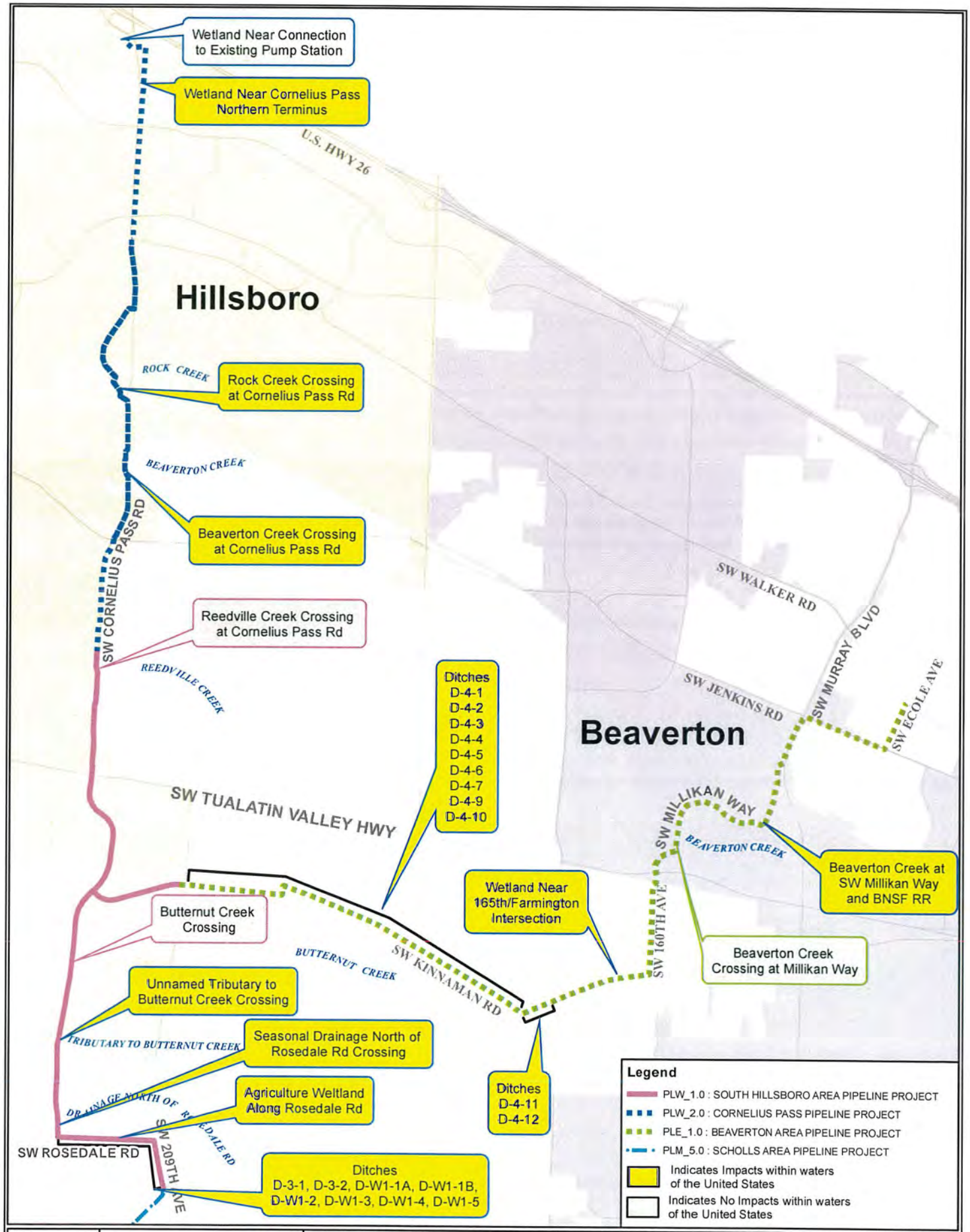
Note: Figures are from various sources, with figure or sheet numbering reflecting the original source documents. Figures have been organized as follows:

1. Vicinity Maps (Map Keys)
2. USGS Topographic Maps, Tax Lot Maps, and Aerial Photos by Work Package
3. Work Package Design Drawings
    a. Raw Water Facilities
    b. Reservoir Facilities
    c. Willamette Water Supply System Water Treatment Plant (WWSS WTP)
    d. Transmission Pipelines
        i. PLM 1.0
        ii. PLM 4.0
        iii. PLM 5.0
        iv. PLW 1.0
        v. PLW 2.0
        vi. PLE 1.0
4. Additional Environmental Benefits Projects

Vicinity-Map Keys



02/07/2018	0 1500 3000 Feet N	WILLAMETTE WATER SUPPLY PROGRAM PLM_4.0 & PLM_5.0 WORK PACKAGES KEY MAP	Willamette Water Supply Our Reliable Water



02/07/2018

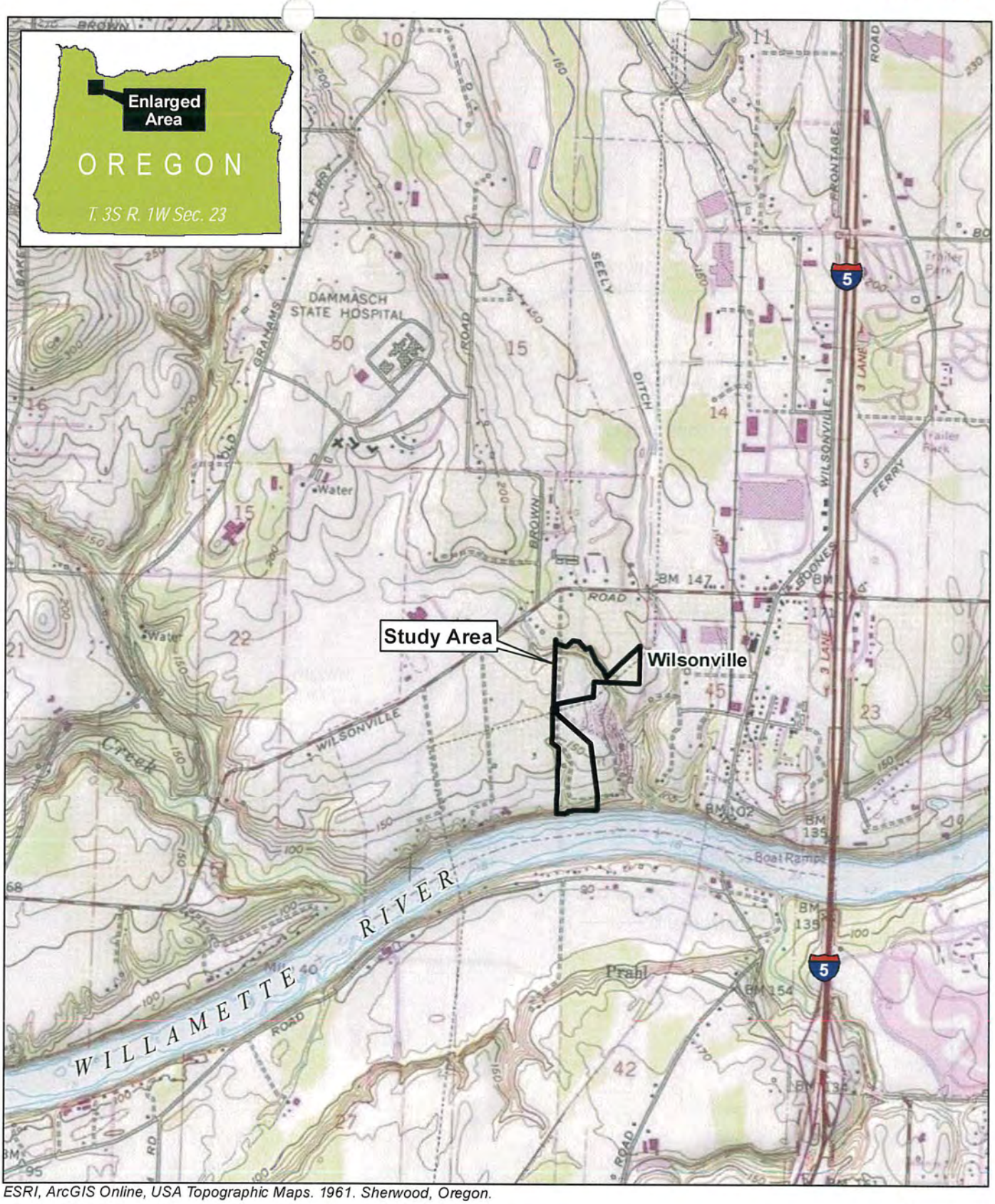
Feet
0 1000 2000

N

WILLAMETTE WATER SUPPLY PROGRAM
PLW_1.0, PLW_2.0, PLE_1.0 WORK PACKAGES
KEY MAP

Willamette Water Supply
Our Reliable Water

USGS Topographic Maps, Tax Maps, and Aerial Photos by Work Package



ESRI, ArcGIS Online, USA Topographic Maps. 1961. Sherwood, Oregon.

Figure 1
Vicinity

N 0 2,000 4,000 Feet

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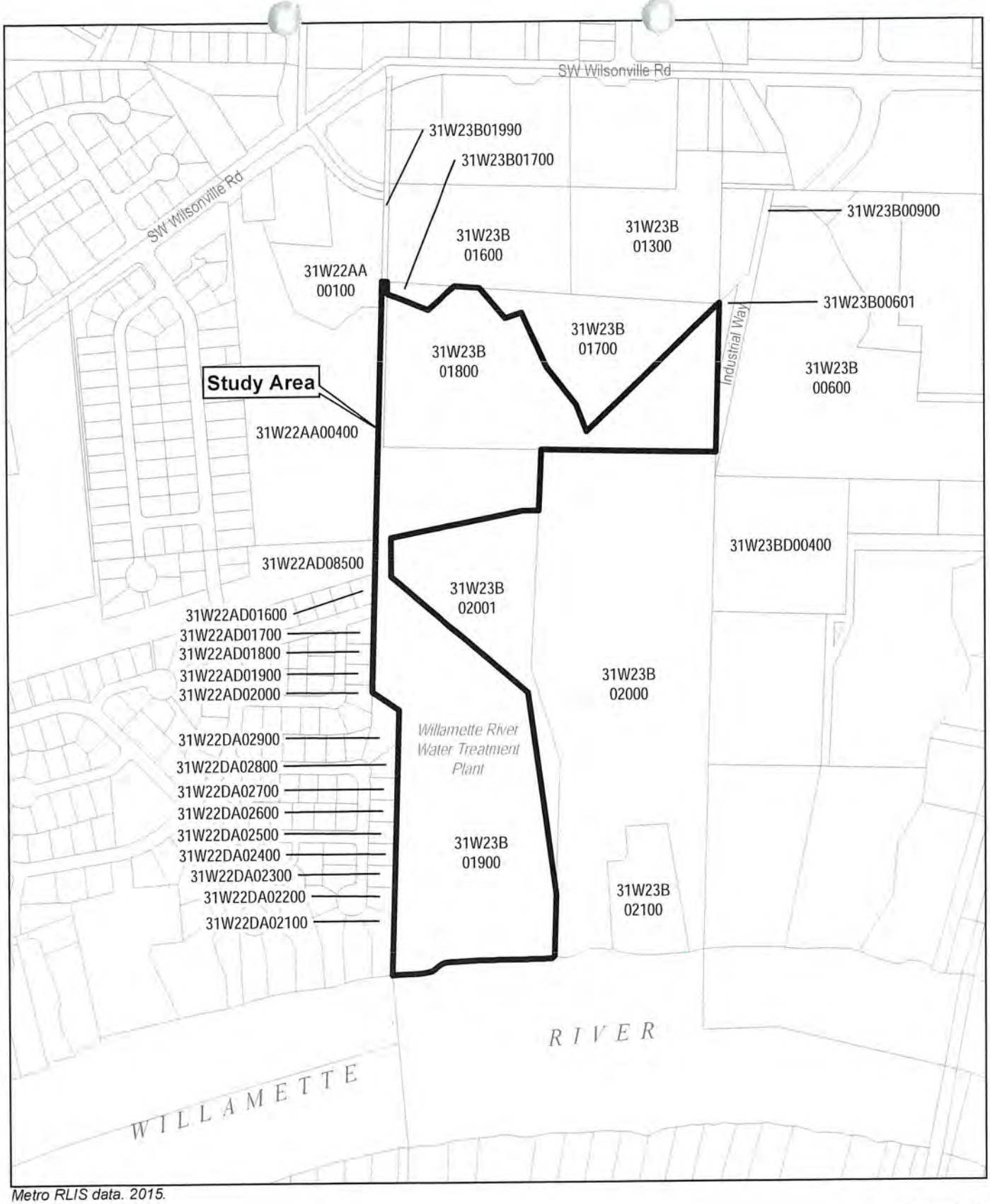


Metro RLIS data. 2015.

Figure 2
Tax Lots

N 0 500 1,000 Feet

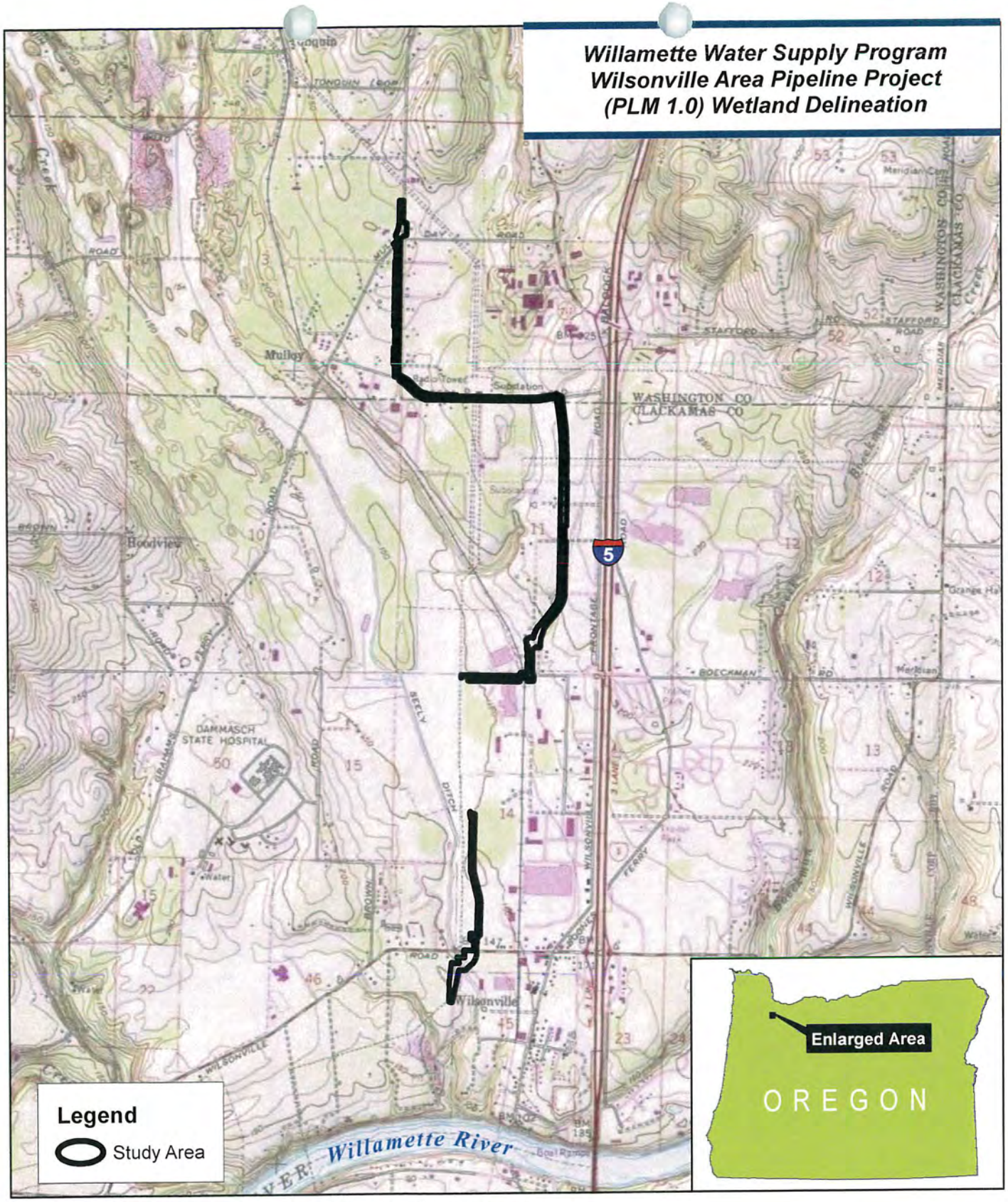
ESRI, ArcGIS Online, World Imagery. Microsoft. 2010. Portland, Oregon.

Figure 3
Aerial Photograph

N

0 500 1,000 Feet

Document Path: P:\T\TVWD00000006\0600INFO\GS\Maps\Wetland Delineation-WRWTP\Fig_05_WRWTP_Aerial.mxd



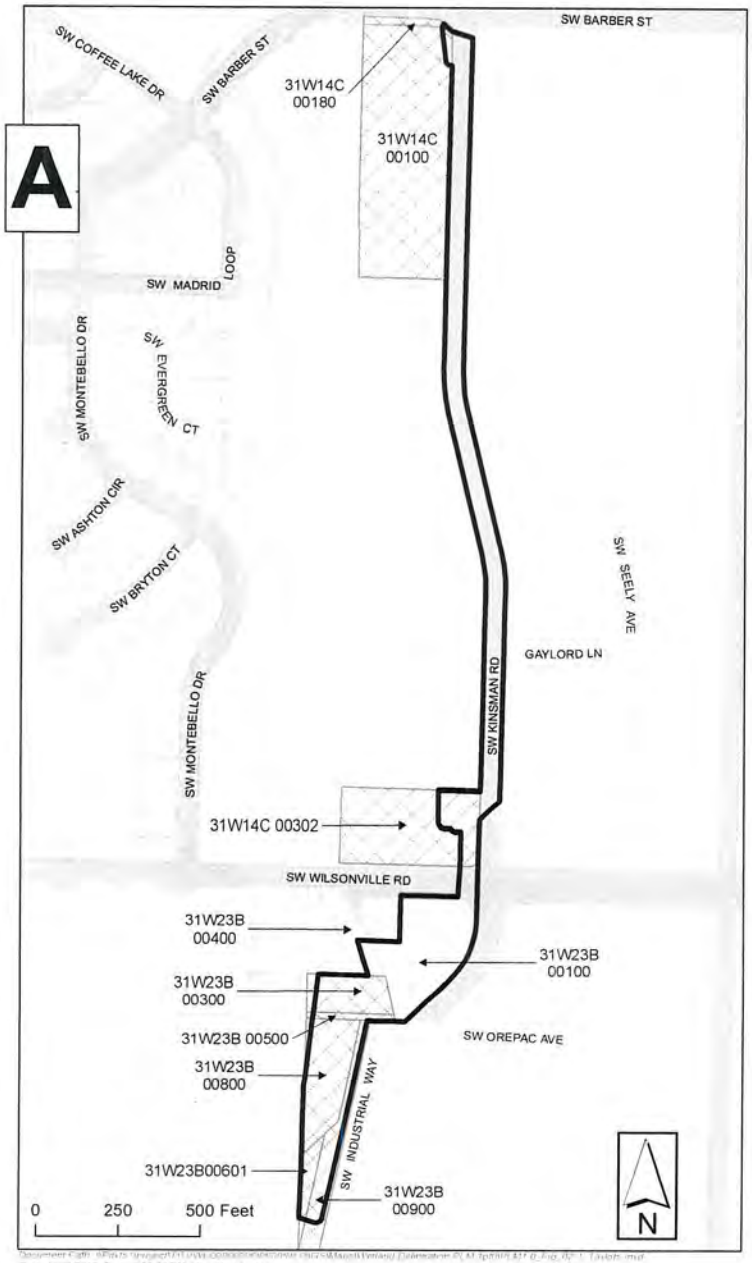
ESRI, ArcGIS Online, USA Topographic Maps. 30x60 GRID Quadrangles

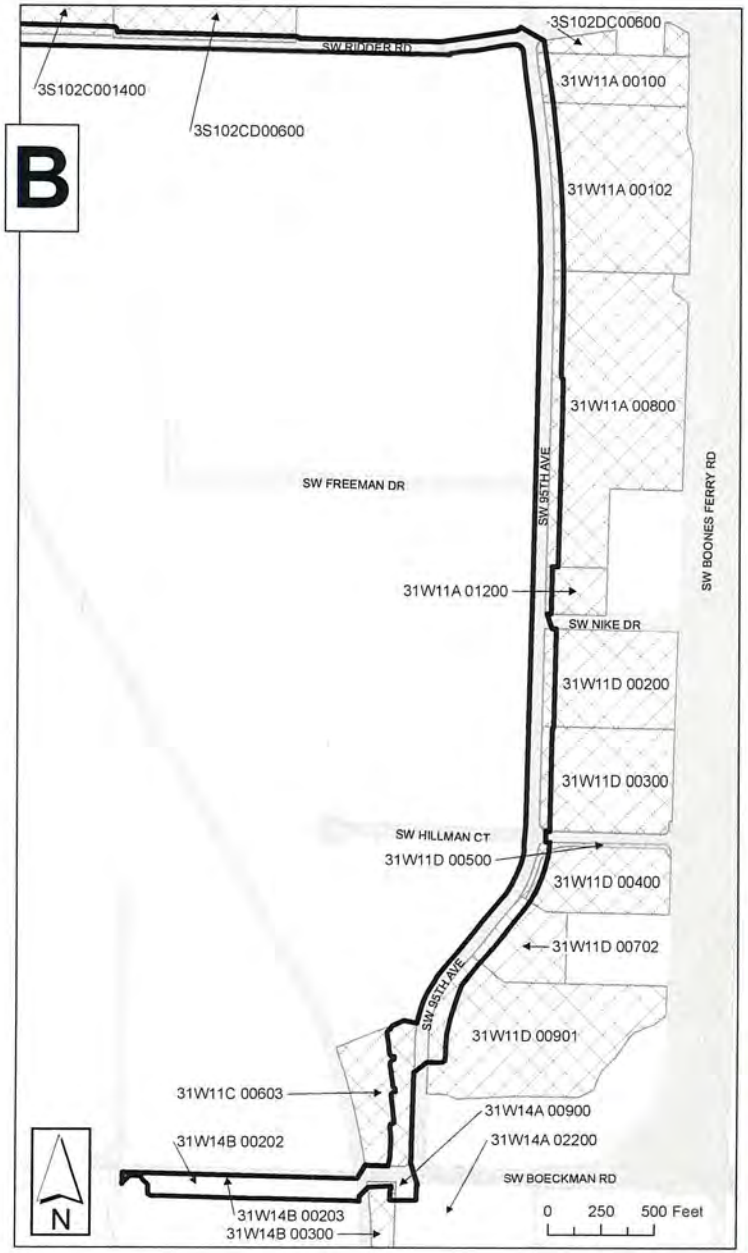
Figure 1
Vicinity Map

N 0 0.5 1 Mile

Willamette Water Supply Program
Wilsonville Area Pipeline Project
(PLM 1.0) Wetland Delineation

Figure 2, Sheet 1
Tax Lots

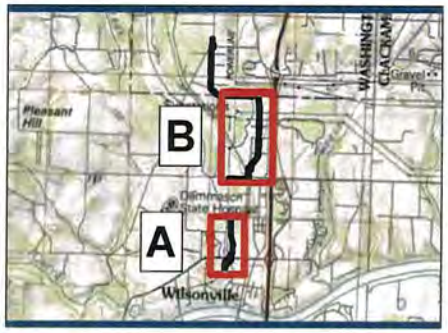




Legend

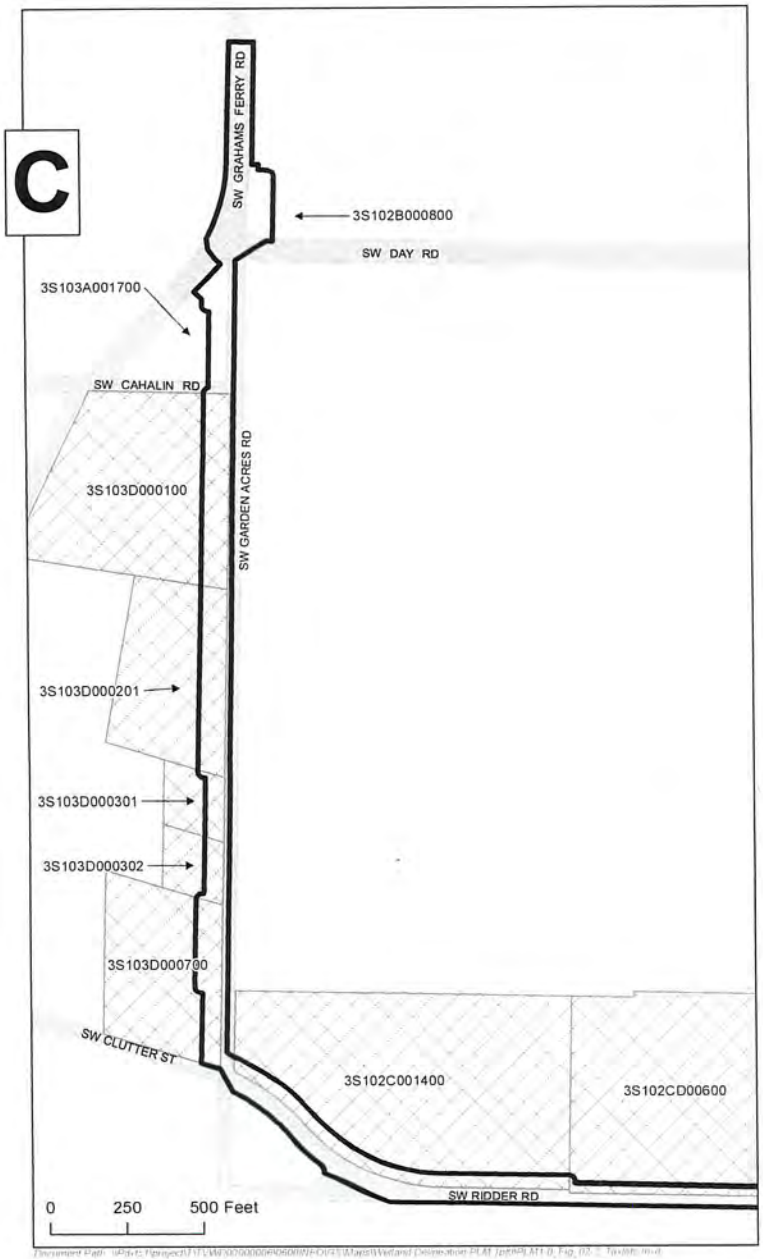
- Study Area
- Area delineated by others
- No access as of 10/24/2016

Metro RLIS Data. 2016.



Willamette Water Supply Program
Wilsonville Area Pipeline Project
(PLM 1.0) Wetland Delineation

Figure 2, Sheet 2
Tax Lots



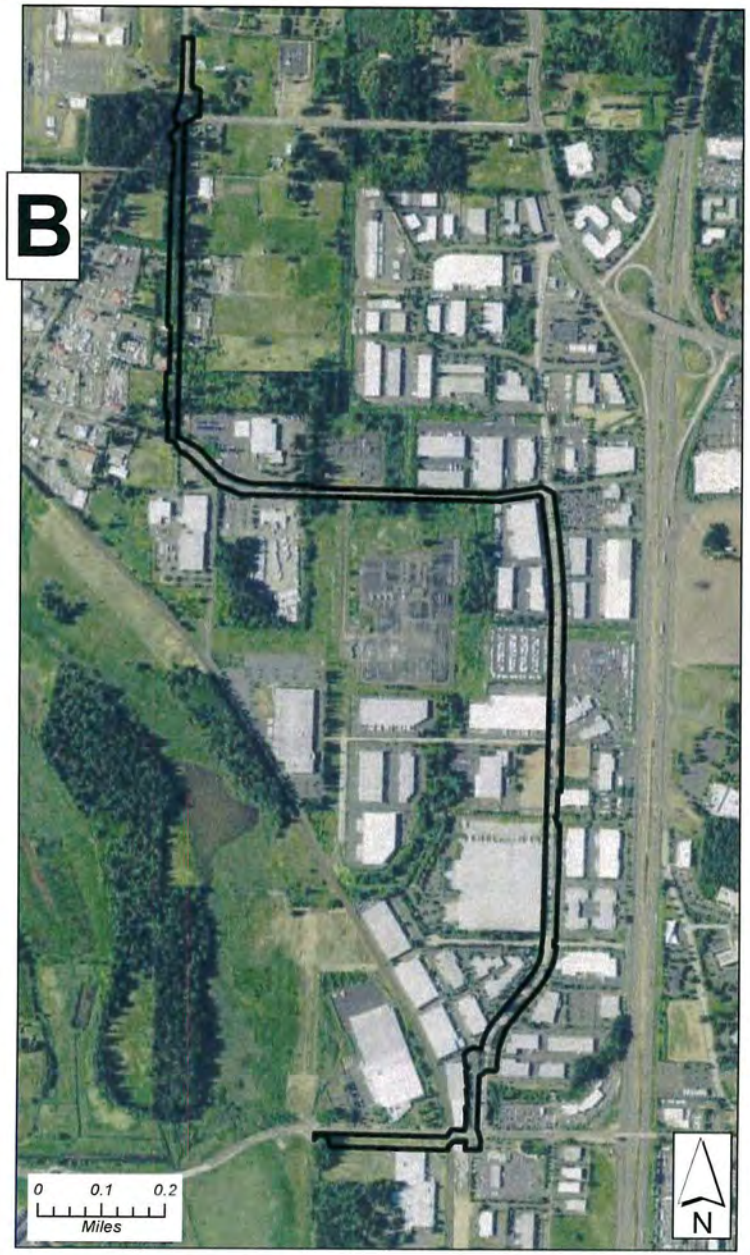
Legend

- Study Area
- Area delineated by others
- No access as of 10/24/2016

Metro RLIS Data. 2016.

Willamette Water Supply Program
Wilsonville Area Pipeline Project
(PLM 1.0) Wetland Delineation

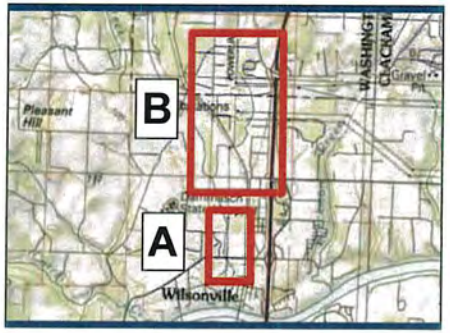
Figure 3
Aerial Photo



Legend

Study Area

USDA NAIP orthophoto, 2016.



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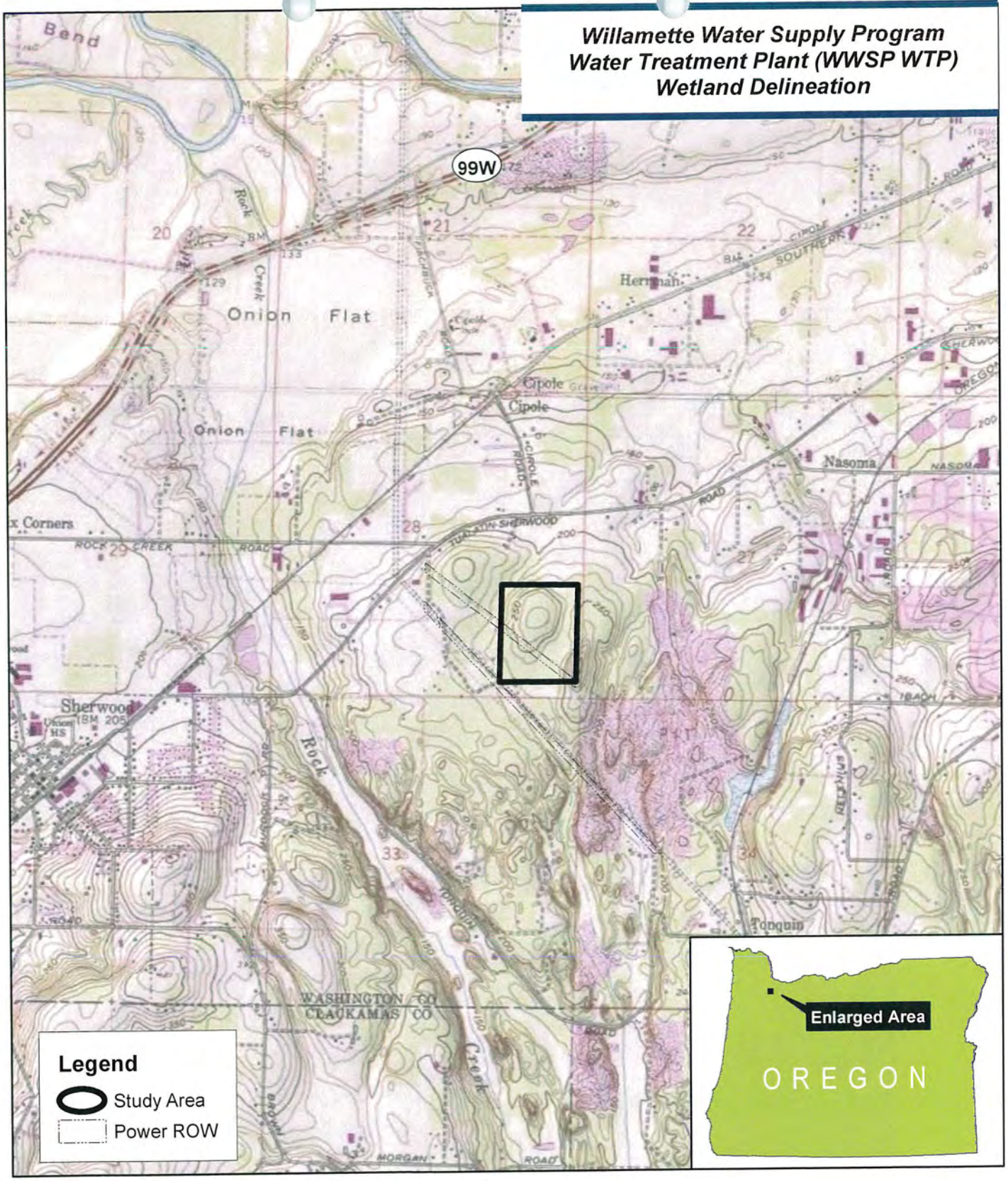


ESRI, ArcGIS Online, USA Topographic Maps. 30x60 GRID Quadrangles

Figure 1
Vicinity Map

N 0 0.25 0.5 Miles

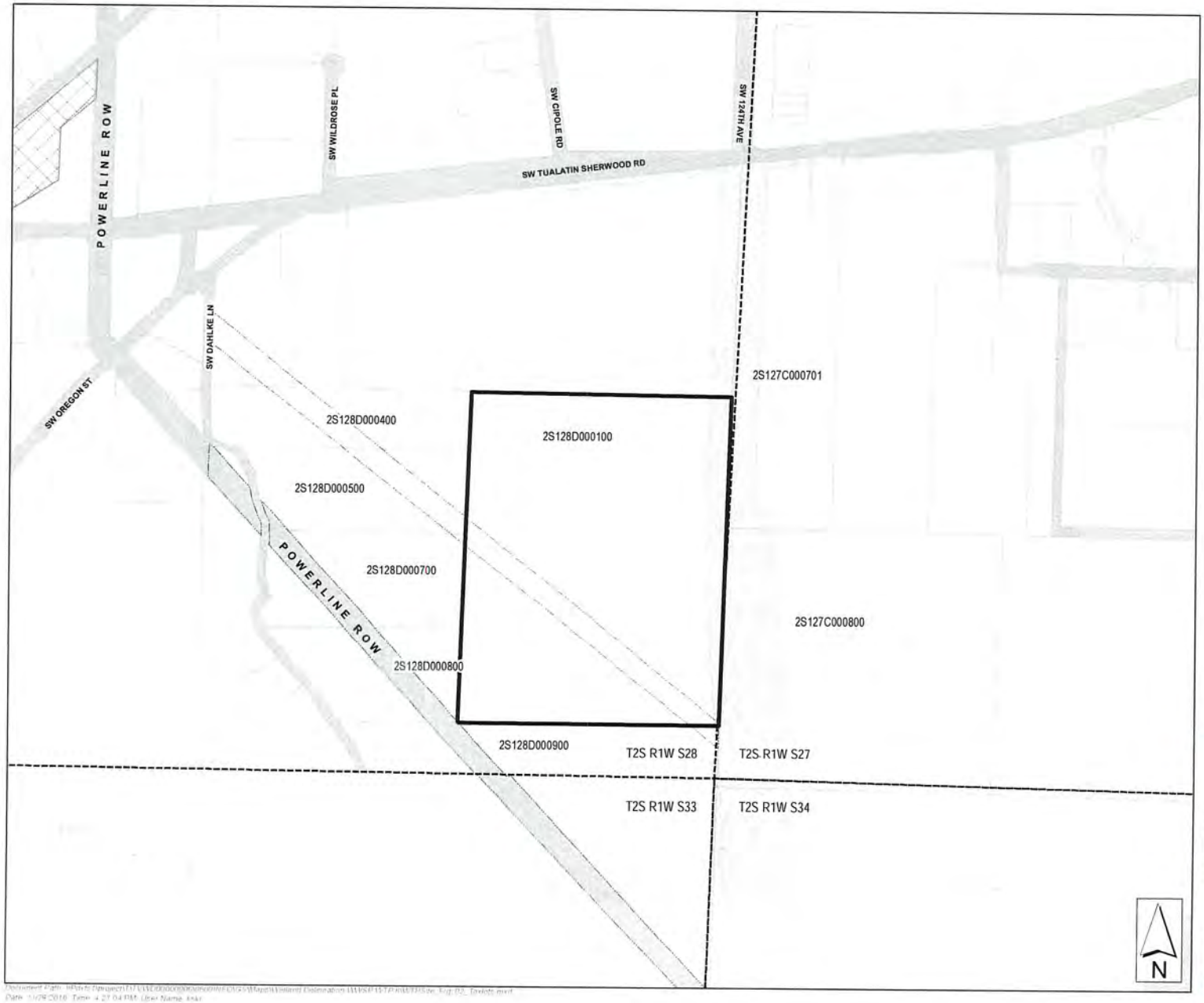
WTP 1.0

Willamette Water Supply Program
Water Treatment Plant (WWSP WTP)
Wetland Delineation

Figure 2
Tax Lots

Legend
- Study Area
- Area delineated by others
- No access as of 10/24/2016
- PLSS
- Power ROW

0 0.1
Miles



Metro RLIS Data. 2016.

Willamette Water Supply Program
Water Treatment Plant (WWSP WTP)
Wetland Delineation

Figure 3
Aerial Photo

Legend

Study Area

0 0.1
Miles

USDA NAIP orthophoto, 2016.

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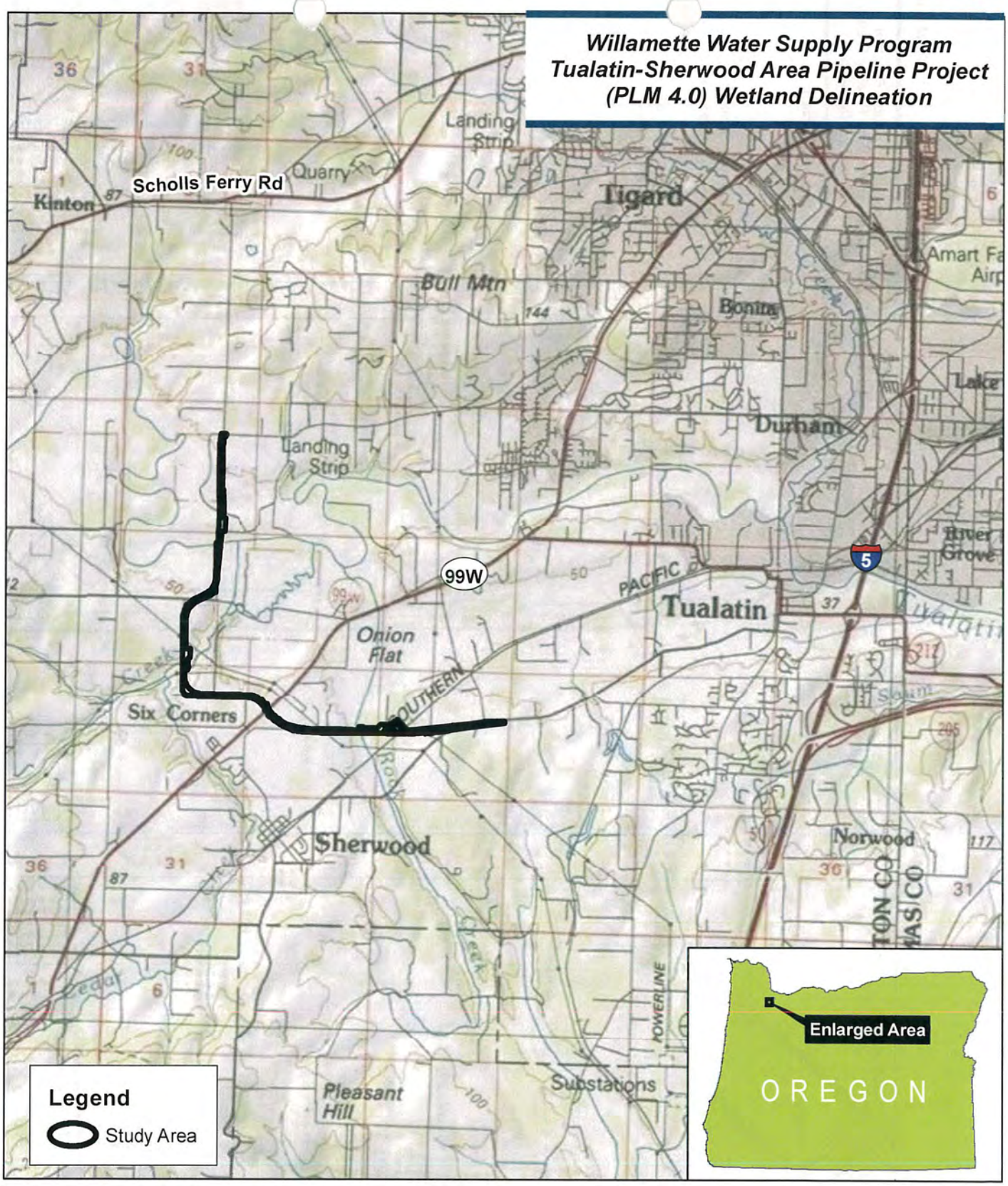


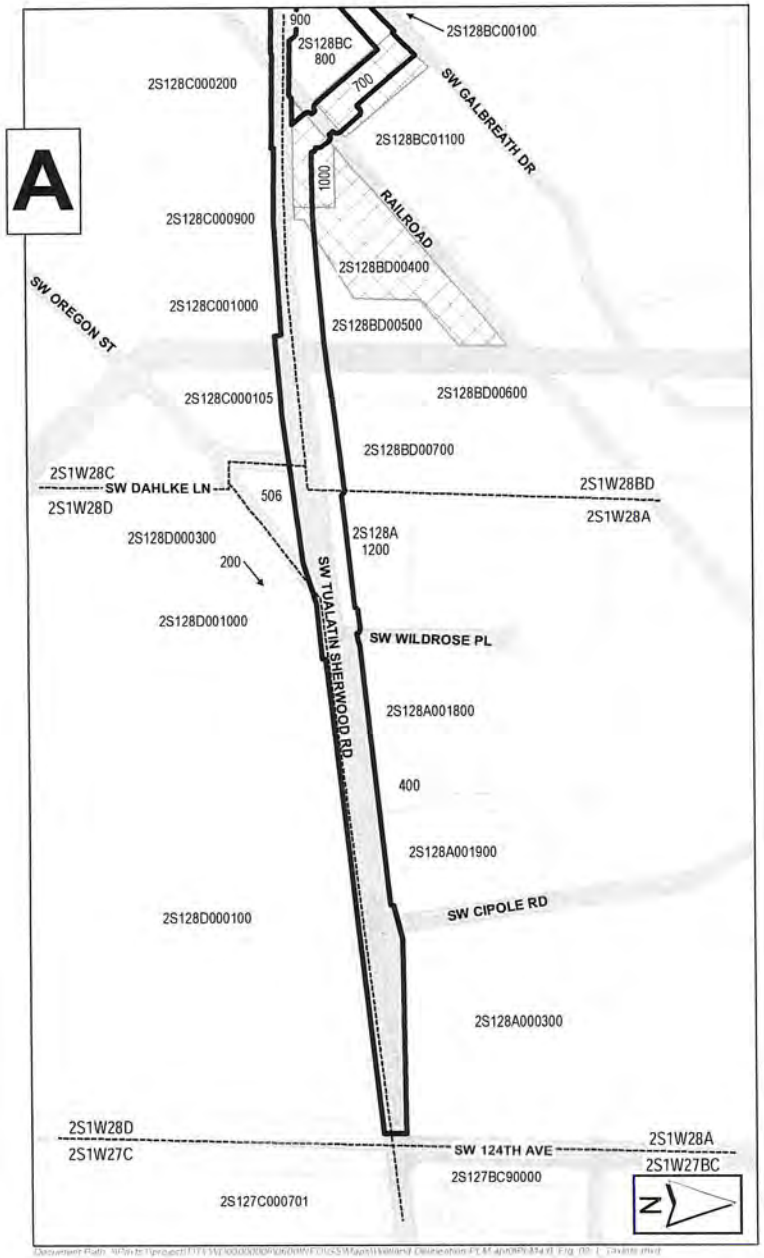
ESRI, ArcGIS Online, USA Topographic Maps. 30x60 GRID Quadrangles

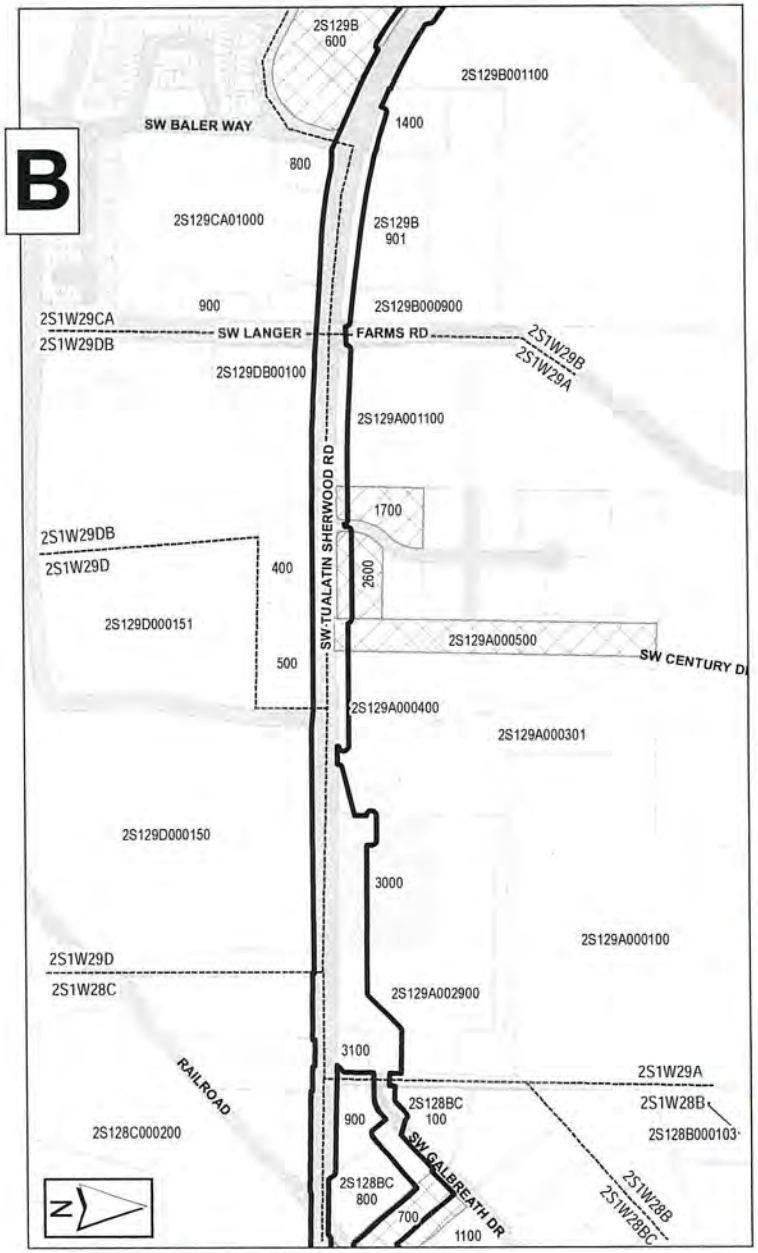
Figure 1
Vicinity Map

N 0 1 2 Miles

Willamette Water Supply Program
Tualatin-Sherwood Area Pipeline Project
(PLM 4.0) Wetland Delineation

Figure 2, Sheet 1
Tax Lots



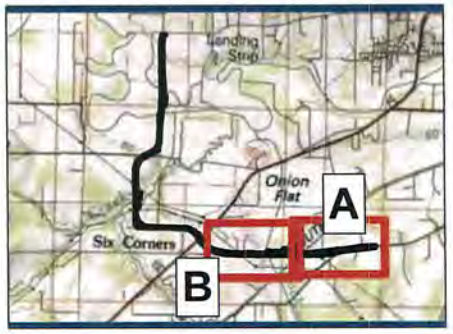


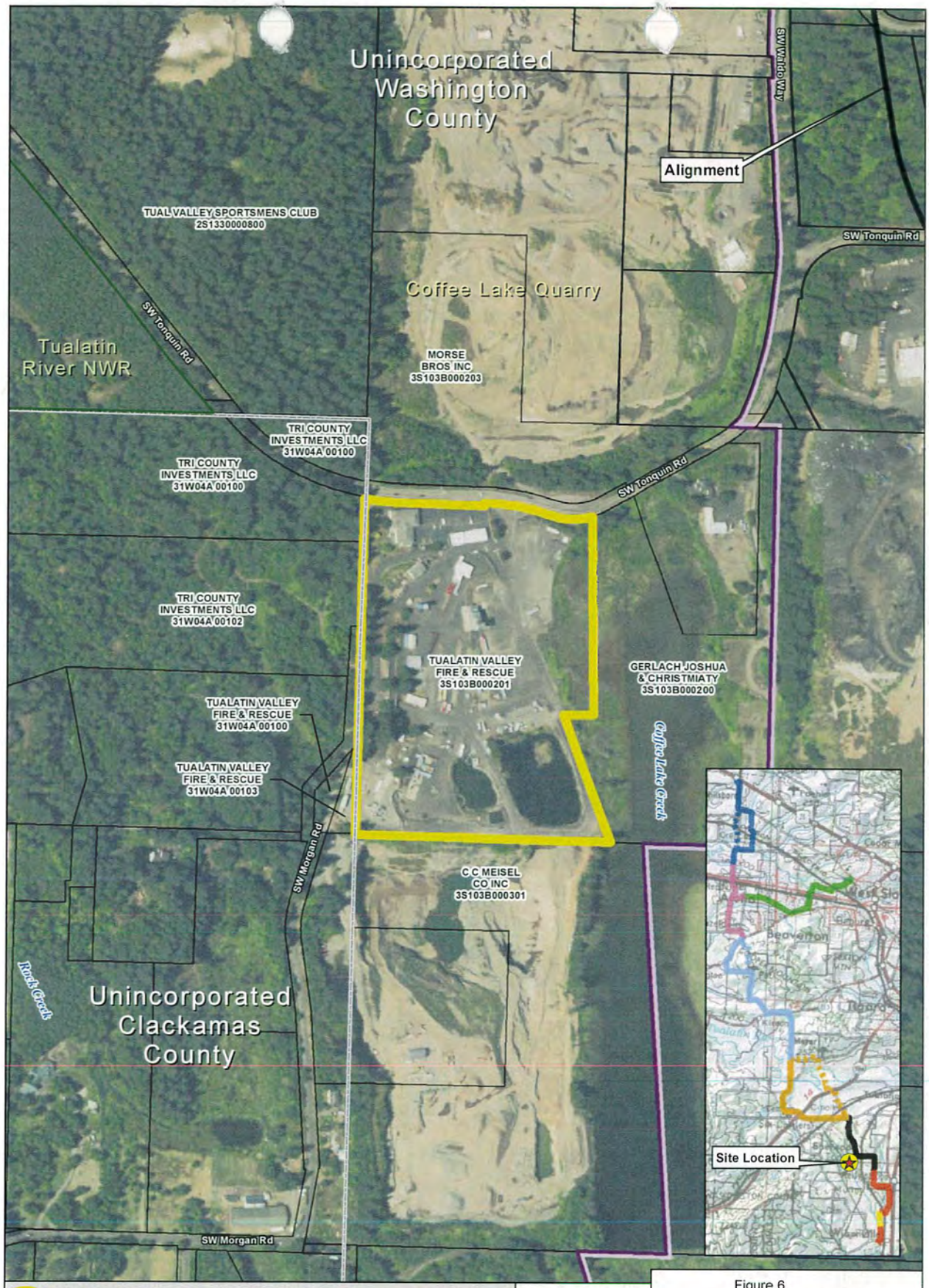
Legend

- Study Area
- Area delineated by others
- No access as of 10/24/2016

0 0.1
Miles

Metro RLIS Data. 2016.





Parcel of Interest
Metro RLIS Taxlot
Urban Growth Boundary
County Line

Alignment Segment Name
PLM 3.0 (SW 124th Avenue Extension)

Background: 2014 NAIP Imagery

Figure 6
WTP Alternative Site 2

Alternative Water Treatment Plant Site Evaluation - Tualatin Valley Fire & Rescue - Parcel 3S103B000201

N
0 350 Feet

Willamette Water Supply
Our Reliable Water

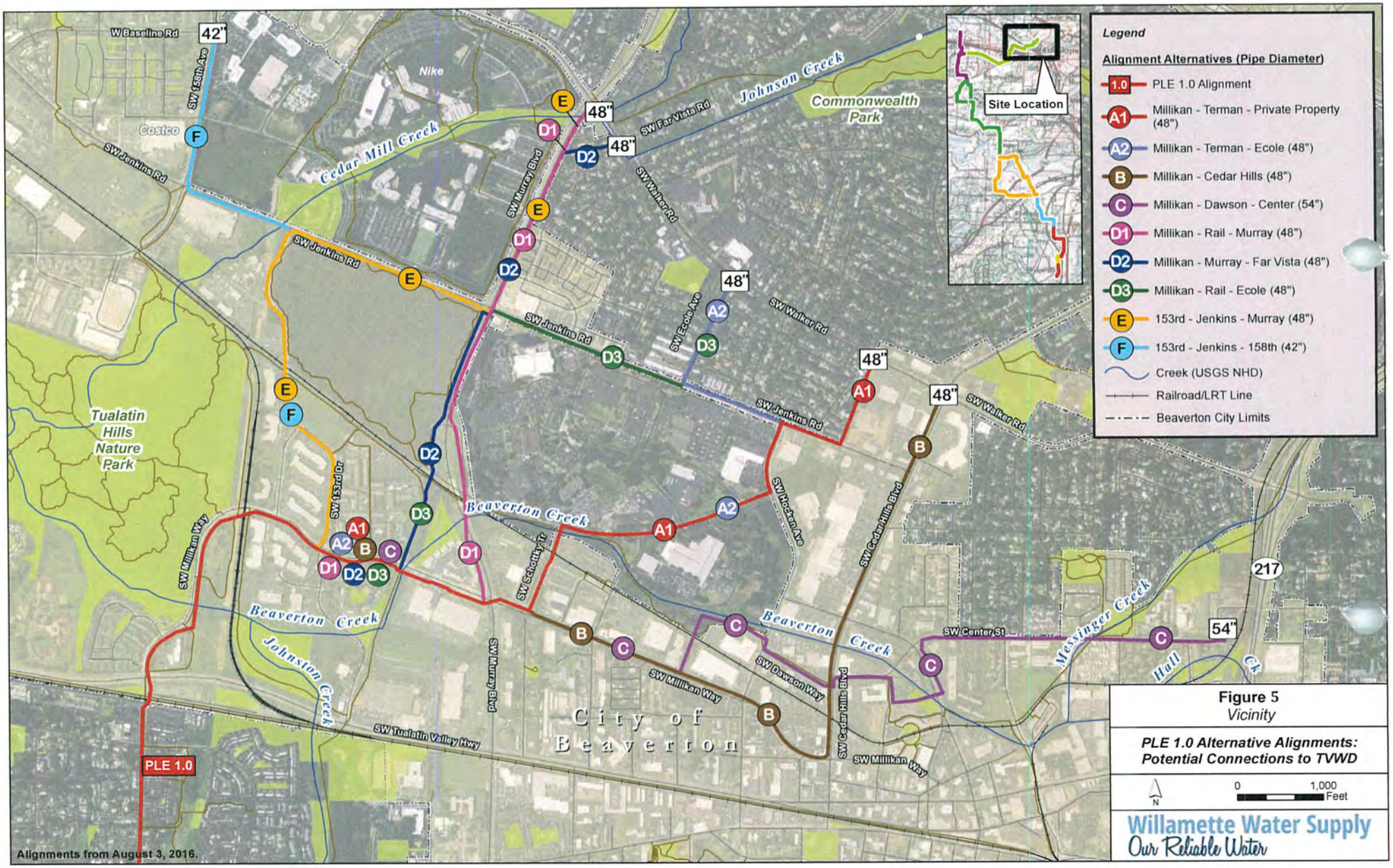


Figure 5
Vicinity

PLE 1.0 Alternative Alignments: Potential Connections to TVWD

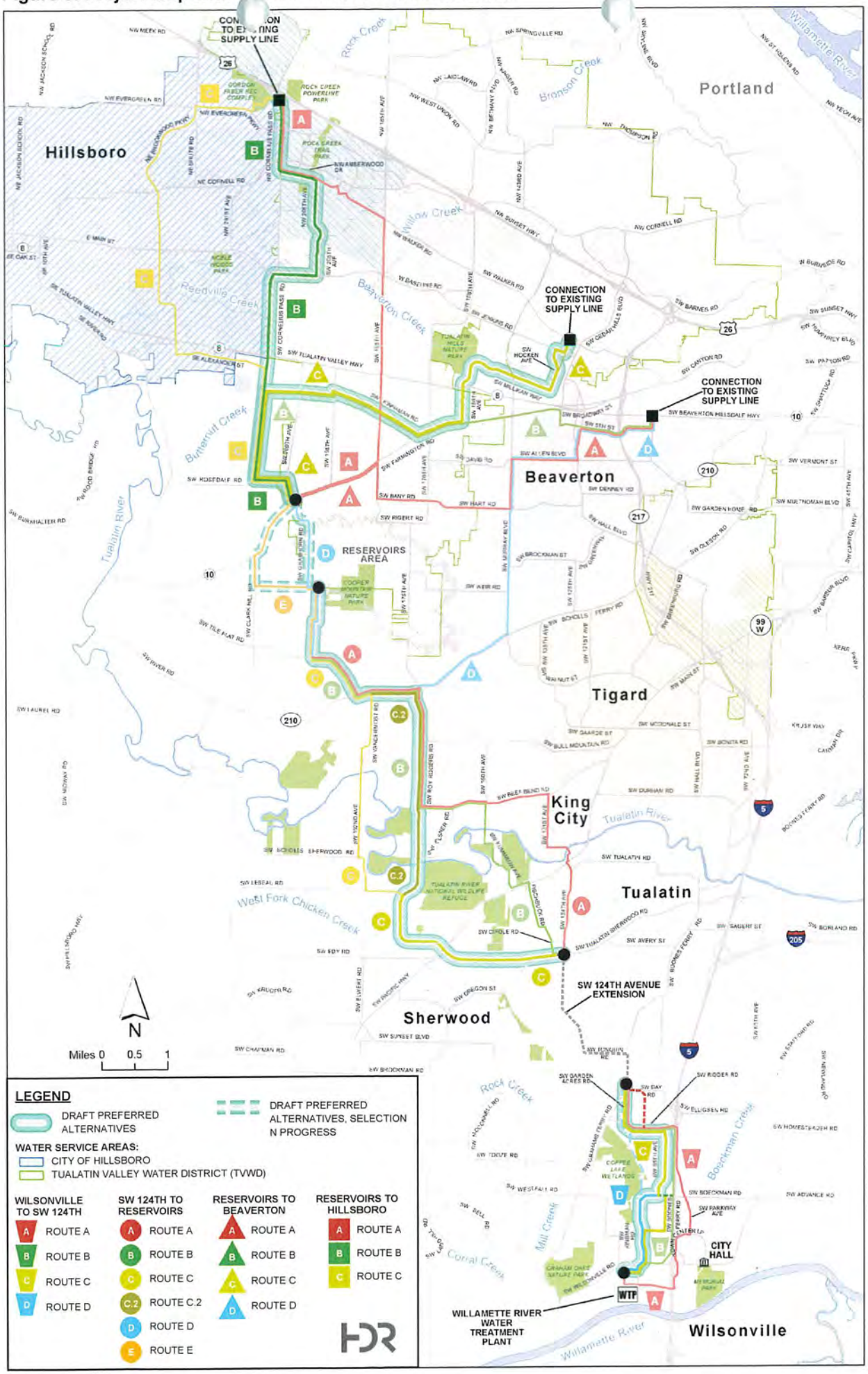
N

0 1,000 Feet

Willamette Water Supply
Our Reliable Water

Figure 4. Section 3 - Cornelius Pass Road and 206th Alternative Route Evaluation

Figure 3. Project Map with Recommended Preferred Route

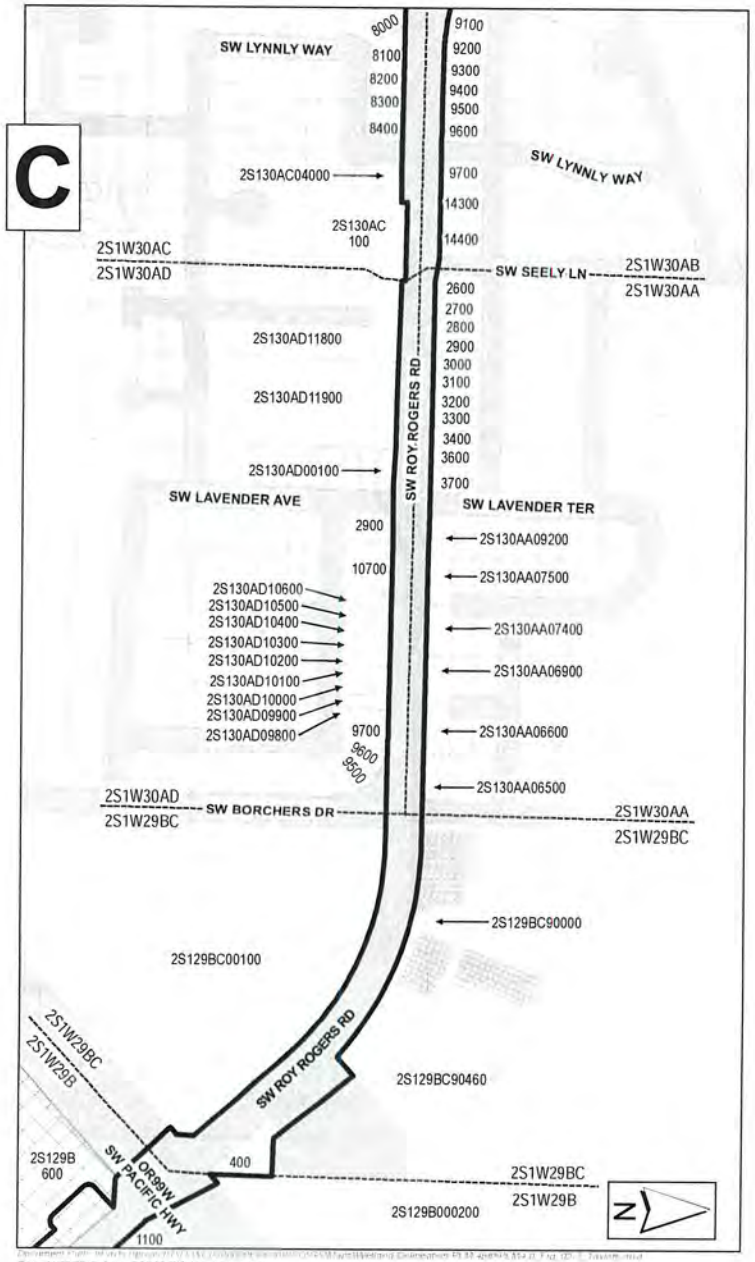


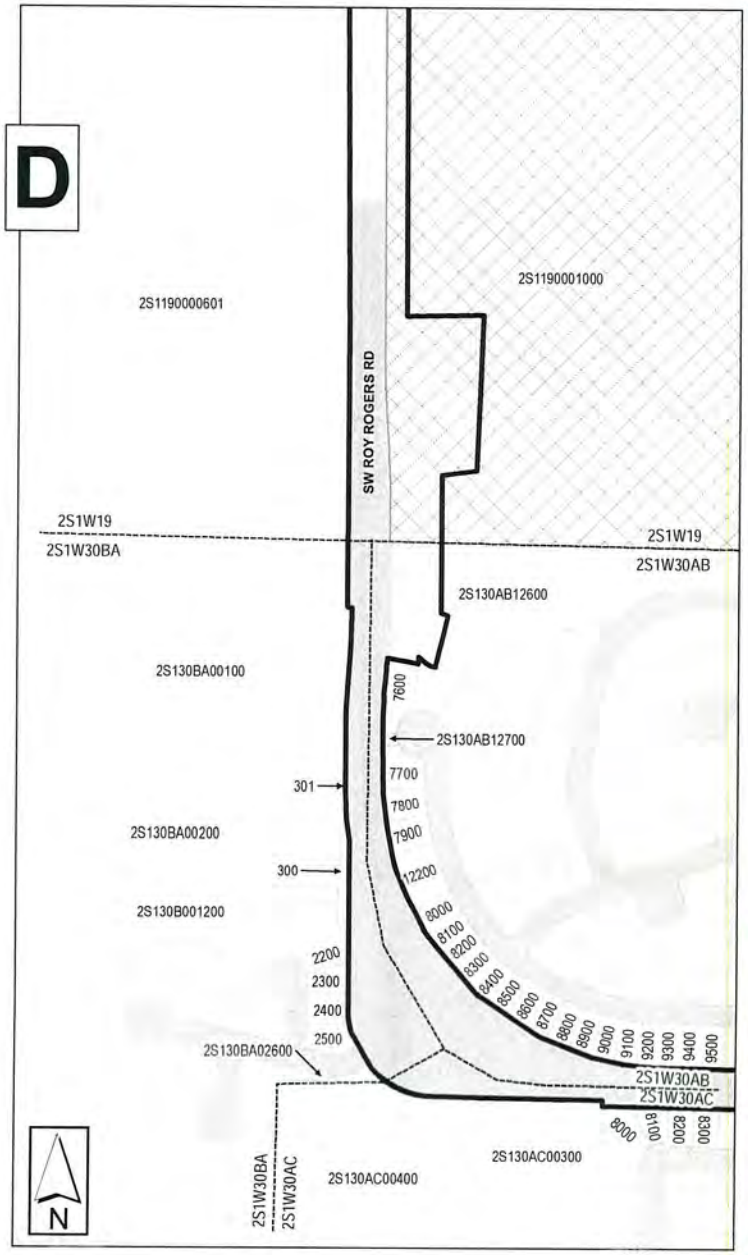
Willamette Water Supply Program
Tualatin-Sherwood Area Pipeline Project
(PLM 4.0) Wetland Delineation

Figure 2, Sheet 2
Tax Lots

Legend
- Study Area
- Area delineated by others
- No access as of 10/24/2016

0 0.1
Miles

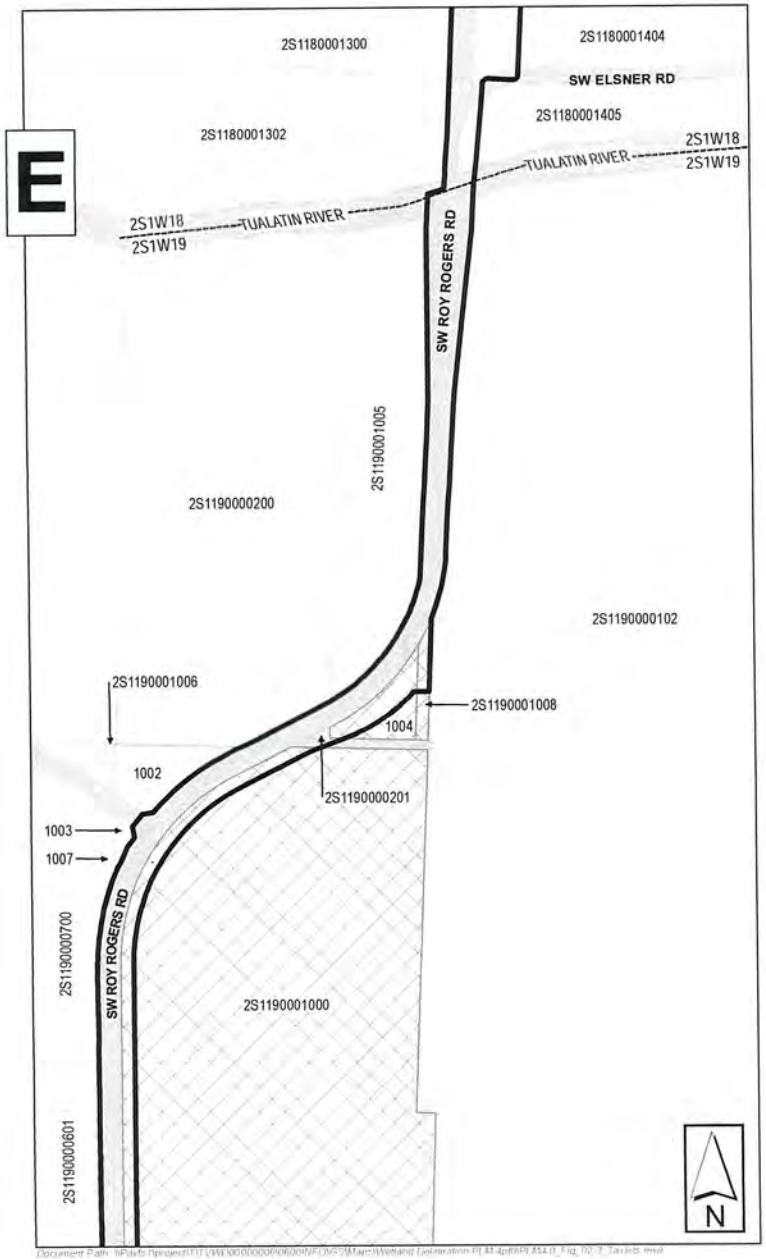


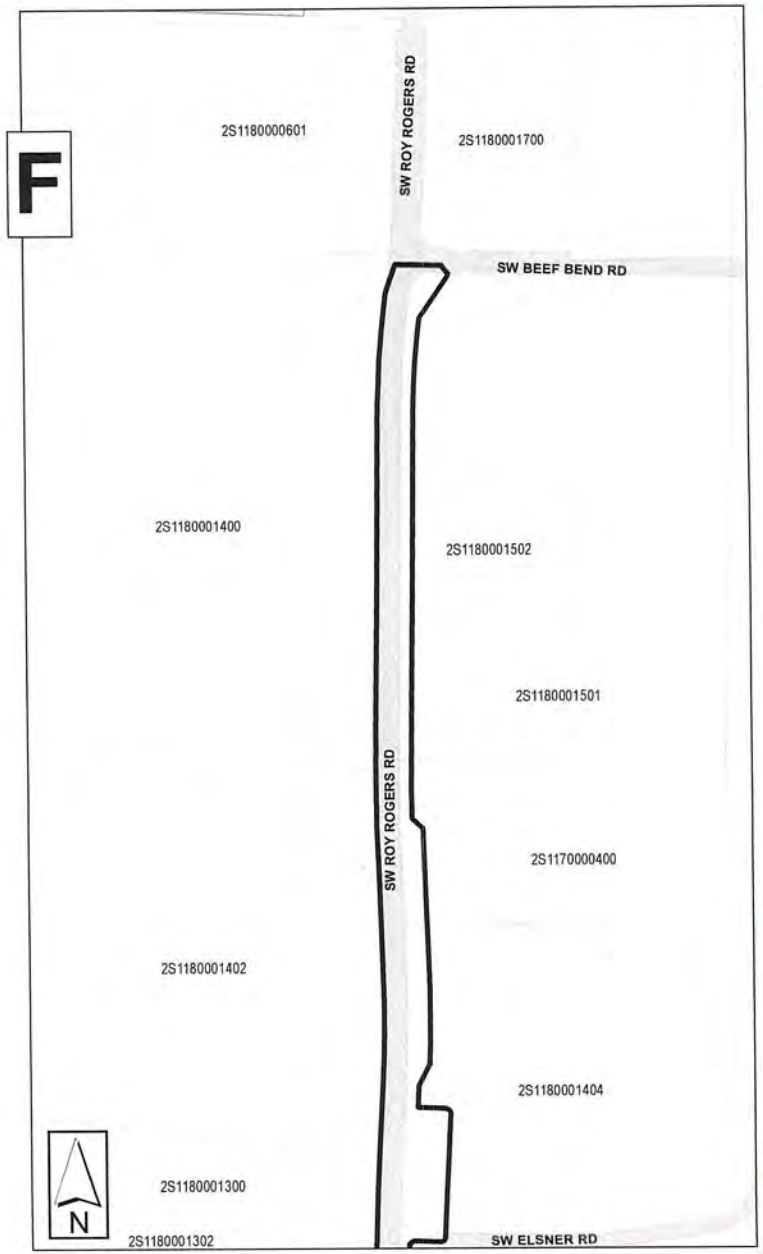


Metro RLIS Data, 2016.

Willamette Water Supply Program
Tualatin-Sherwood Area Pipeline Project
(PLM 4.0) Wetland Delineation

Figure 2, Sheet 3
Tax Lots





Legend

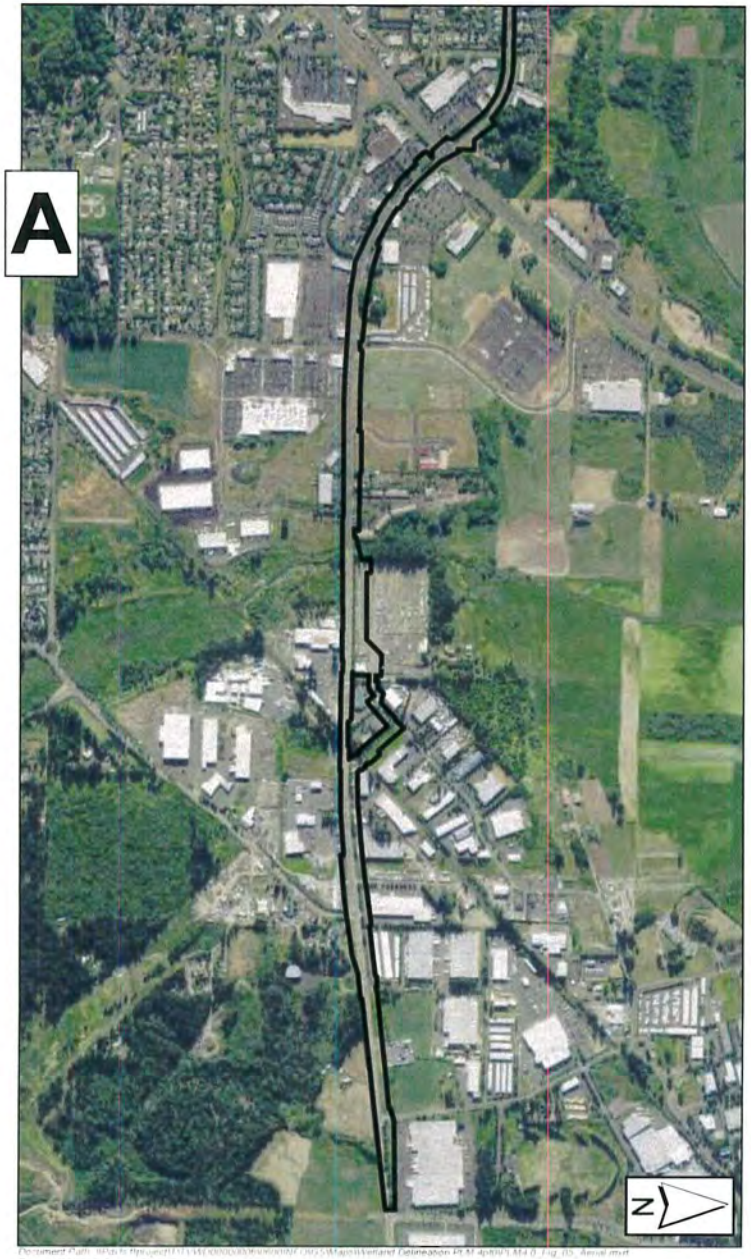
- Study Area
- Area delineated by others
- No access as of 10/24/2016

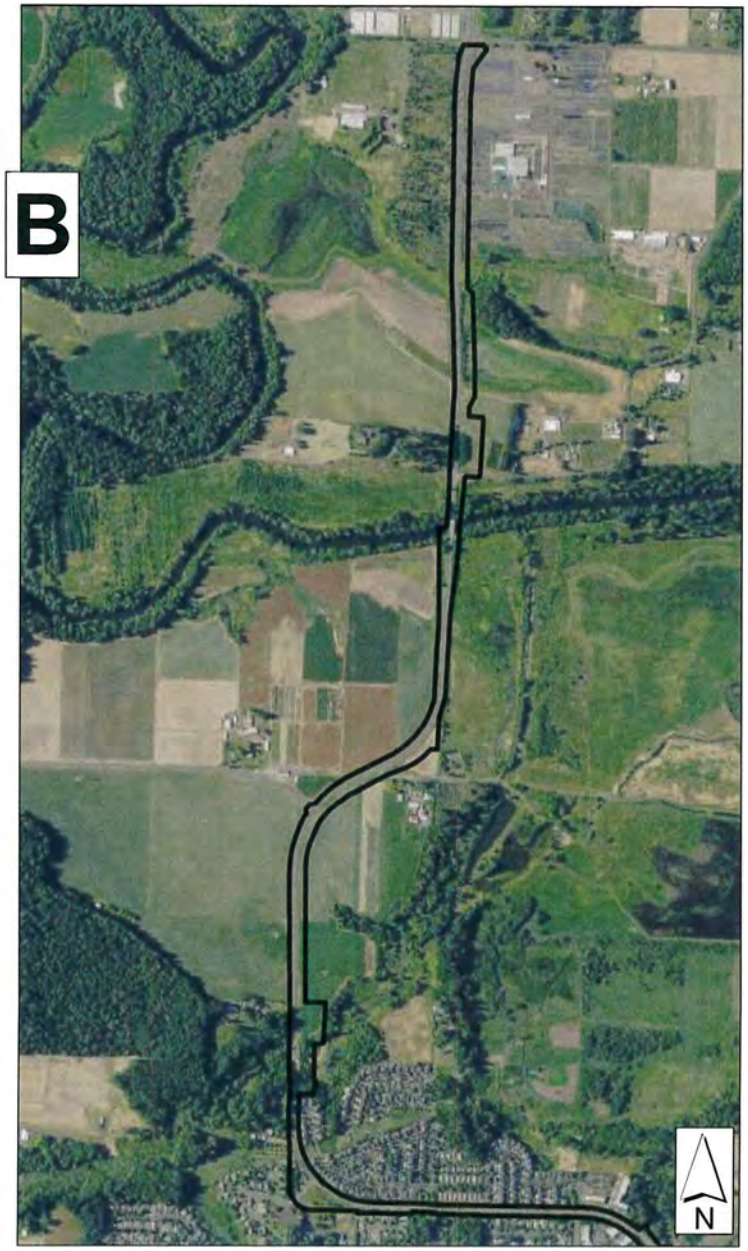
0 0.1
Miles

Metro RLIS Data, 2016.

Willamette Water Supply Program
Tualatin-Sherwood Area Pipeline Project
(PLM 4.0) Wetland Delineation

Figure 3
Aerial Photo



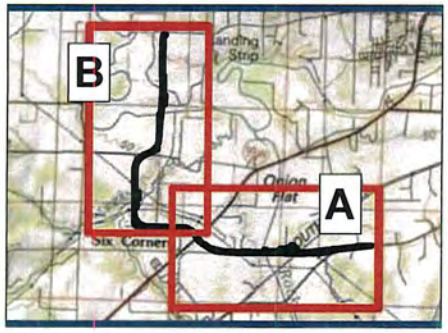


Legend

Study Area

0 0.25 0.5
Miles

USDA NAIP orthophoto, 2016



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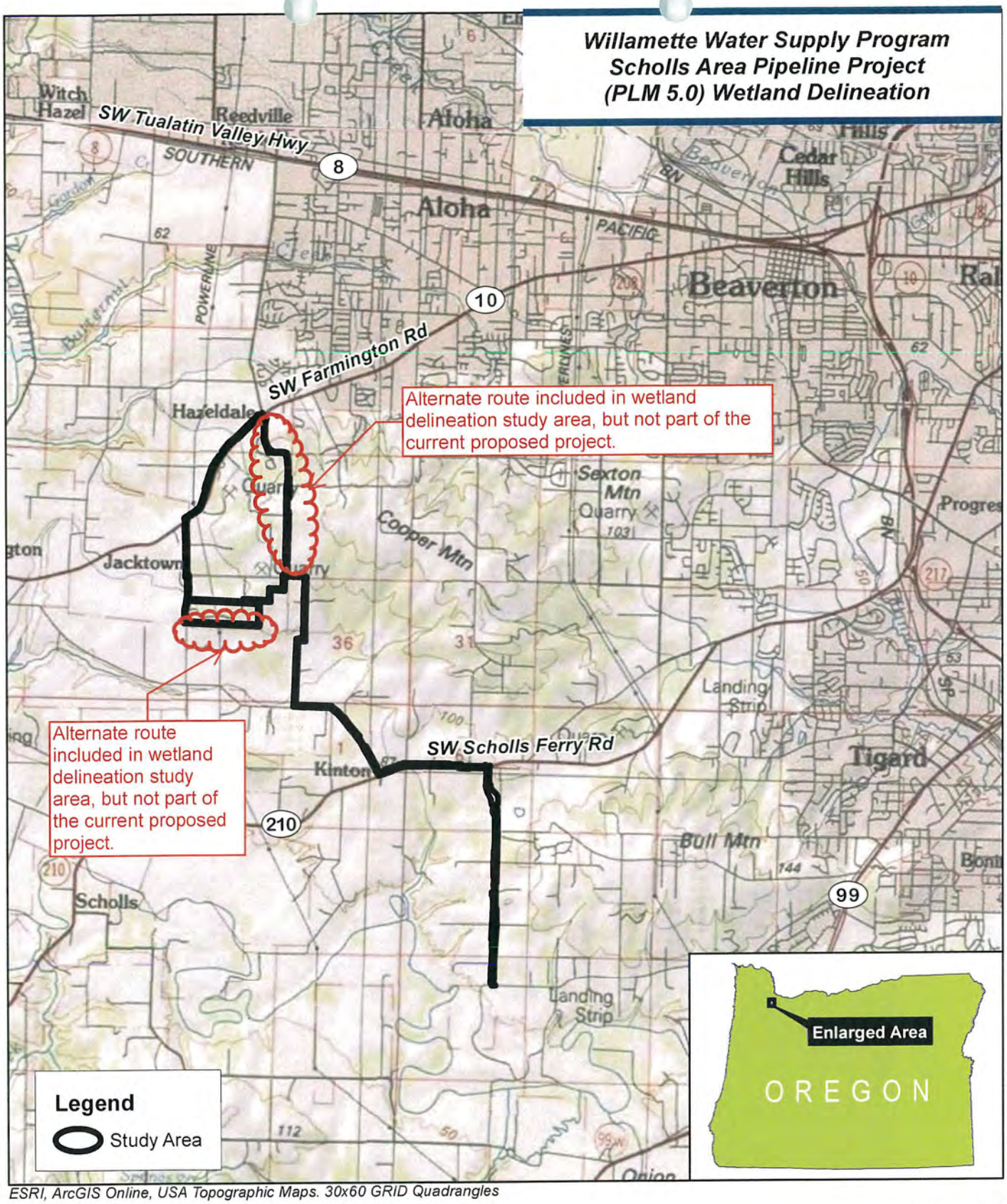


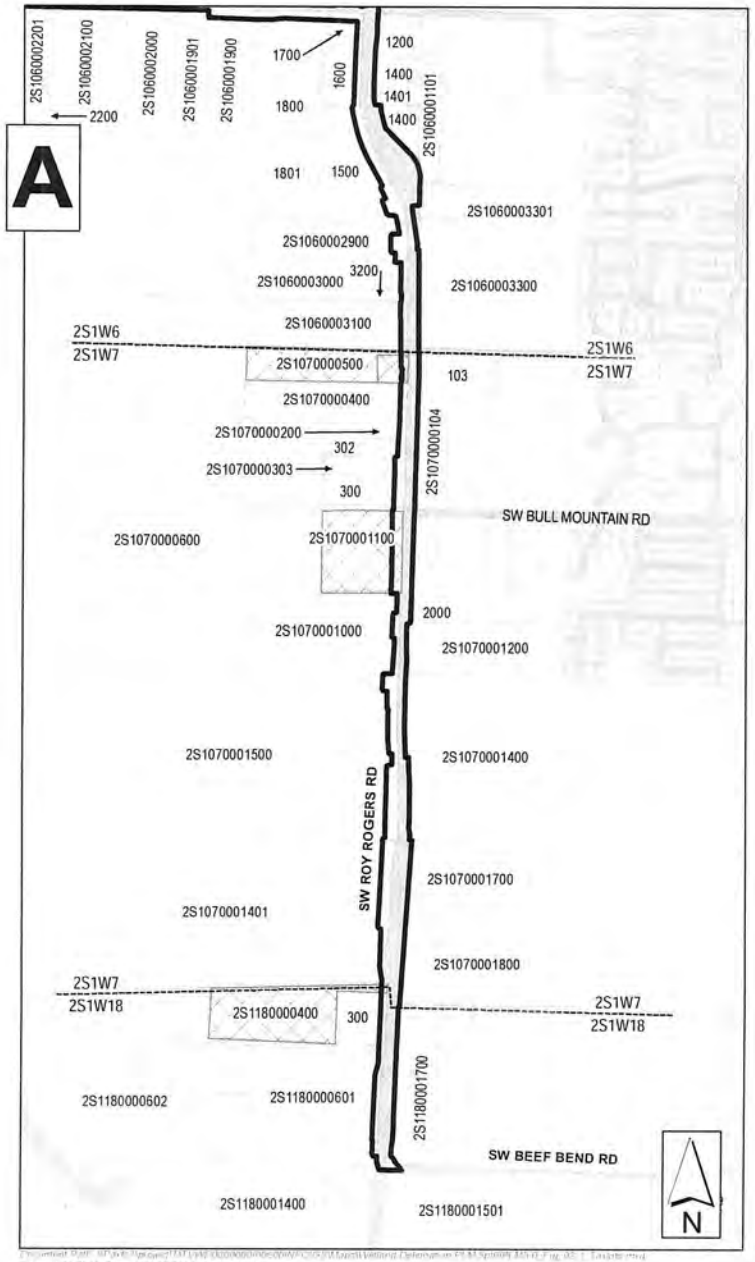
ESRI, ArcGIS Online, USA Topographic Maps. 30x60 GRID Quadrangles

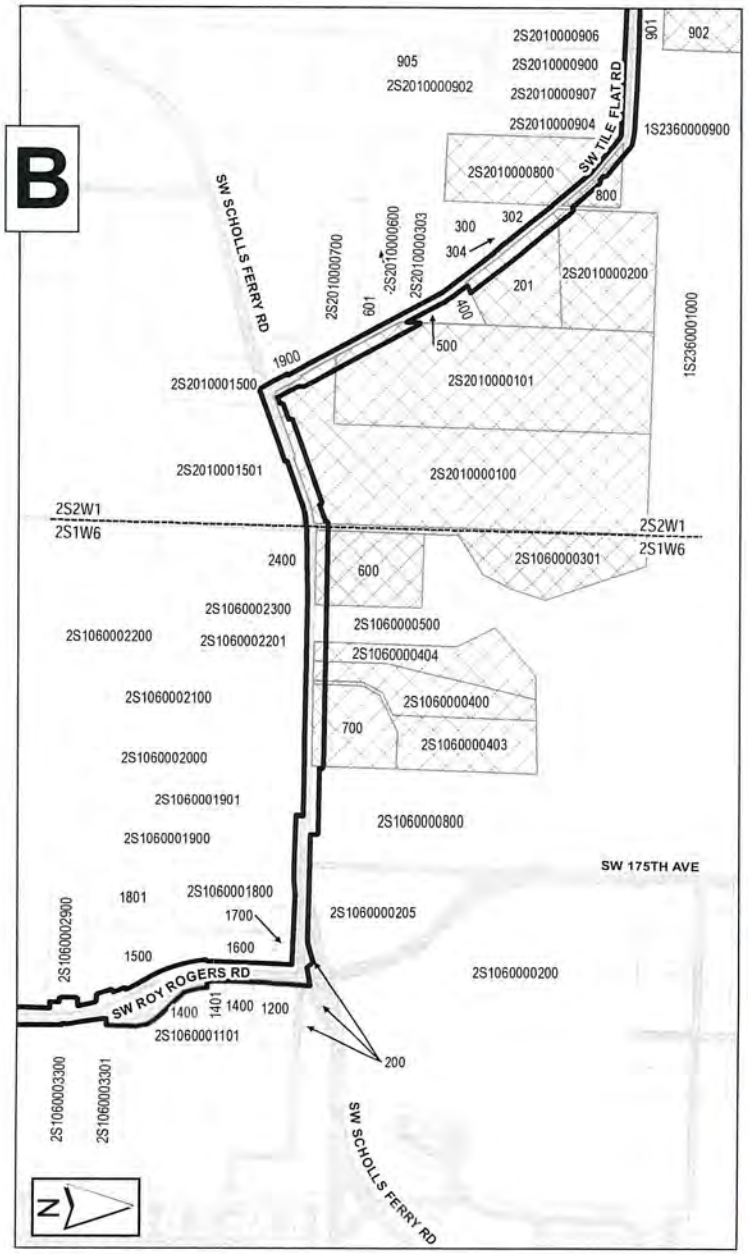
Figure 1
Vicinity Map

N 0 1 2 Miles

Willamette Water Supply Program
Scholls Area Pipeline Project
(PLM 5.0) Wetland Delineation

Figure 2, Sheet 1
Tax Lots



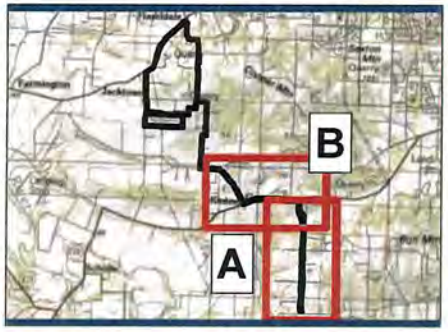


Legend

- Study Area
- Area delineated by others
- No access as of 10/24/2016

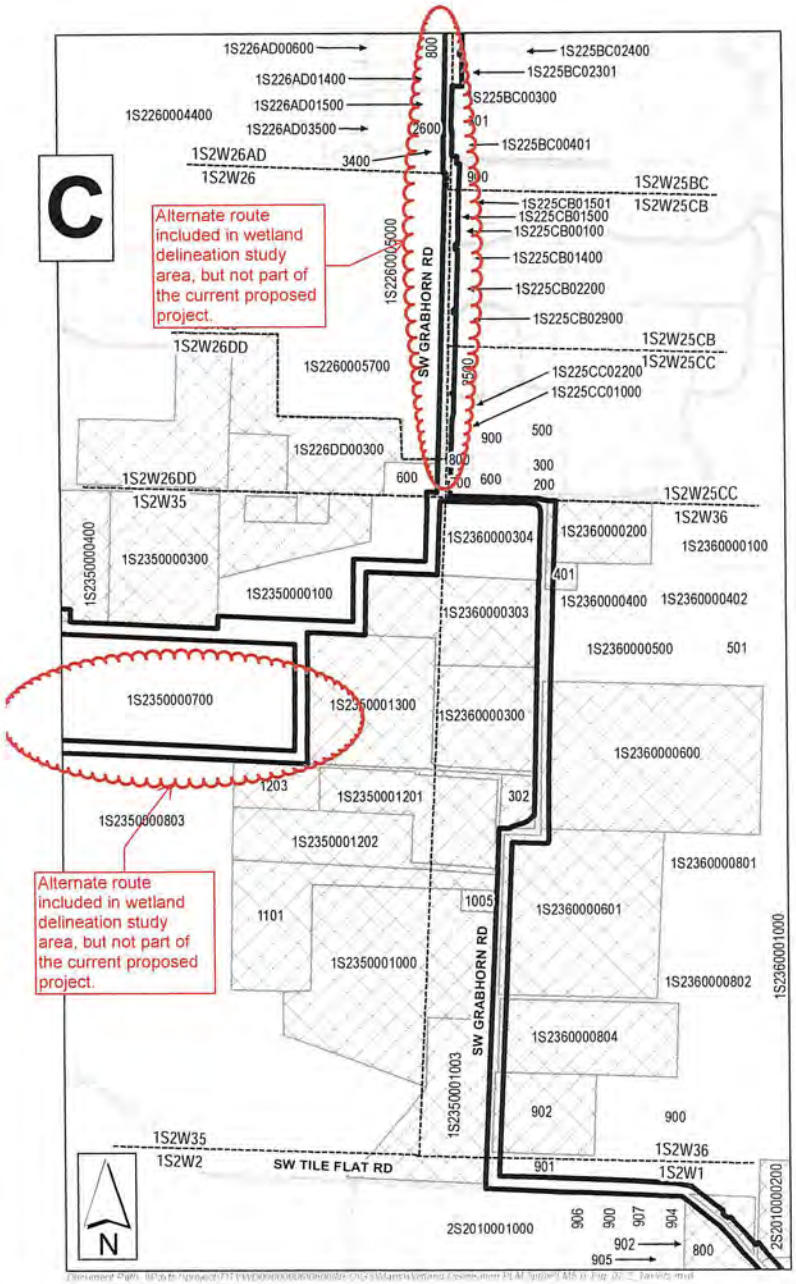
0 0.1 2
Miles

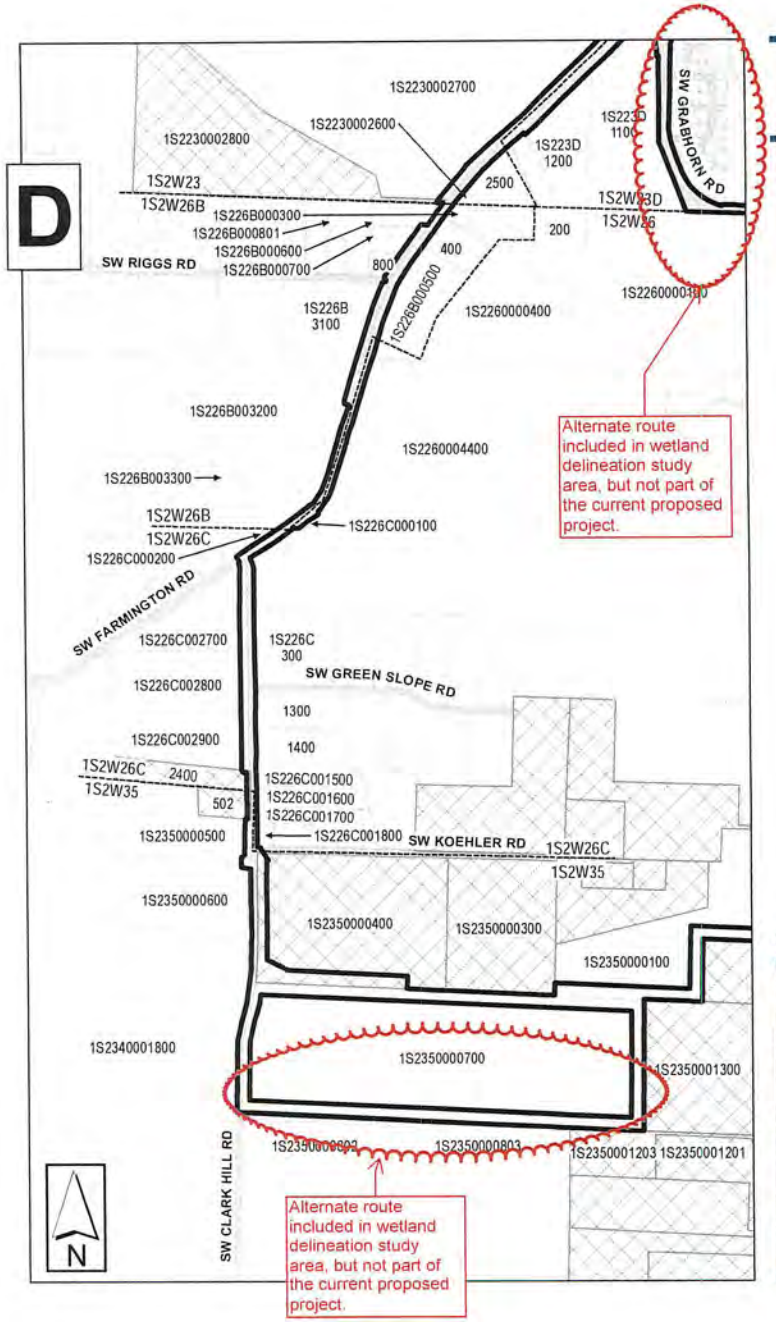
Metro RLIS Data. 2016.



Willamette Water Supply Permitting
Scholls Area Pipeline Project
(PLM 5.0) Wetland Delineation

Figure 2, Sheet 2
Tax Lots



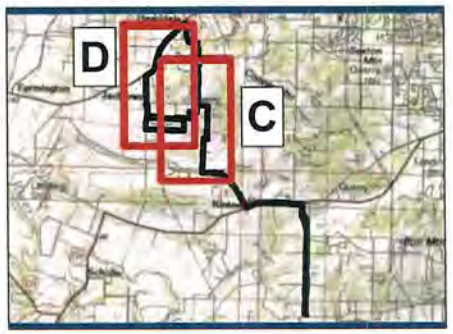


Legend

- Study Area
- Area delineated by others
- No access as of 10/24/2016

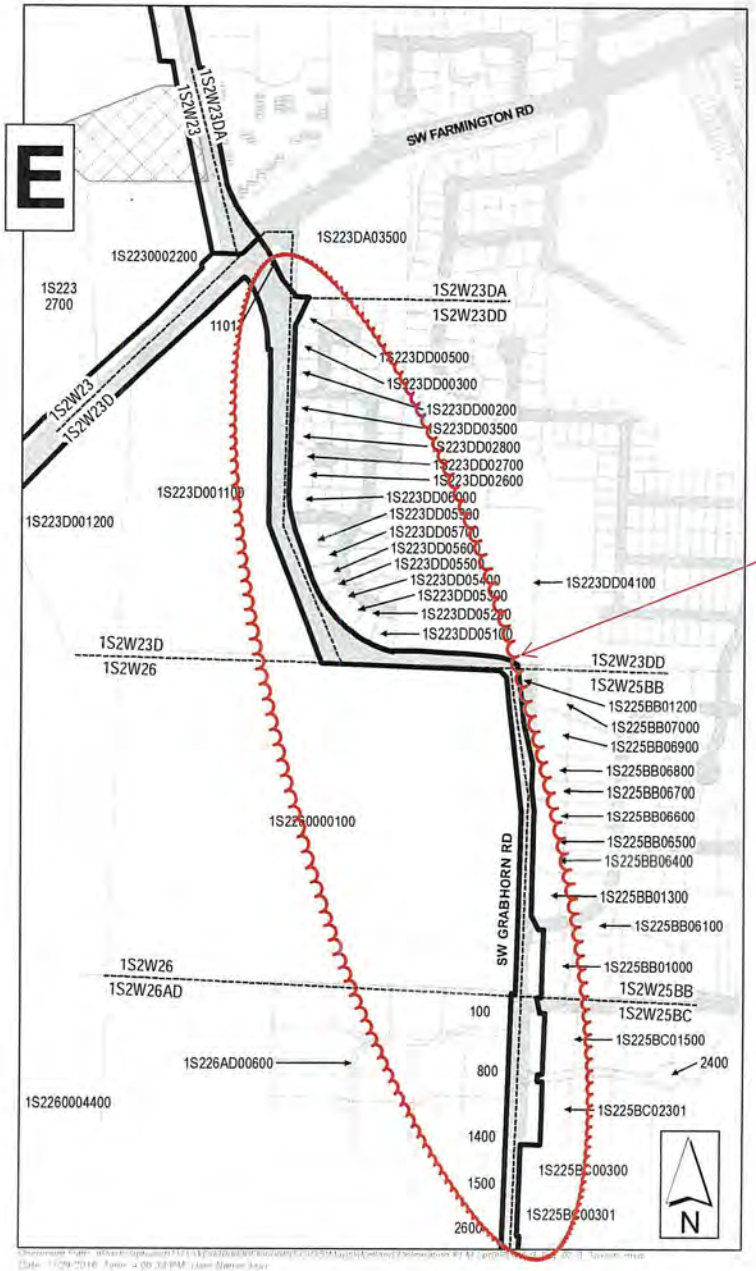
0 0.1 2
Miles

Metro RLIS Data, 2016.



Willamette Water Supply Permitting
Scholls Area Pipeline Project
(PLM 5.0) Wetland Delineation

Figure 2, Sheet 3
Tax Lots



Alternate route included in wetland delineation study area, but not part of the current proposed project.

Legend

- Study Area
- Area delineated by others
- No access as of 10/24/2016

0 Miles

Metro RLIS Data. 2016.

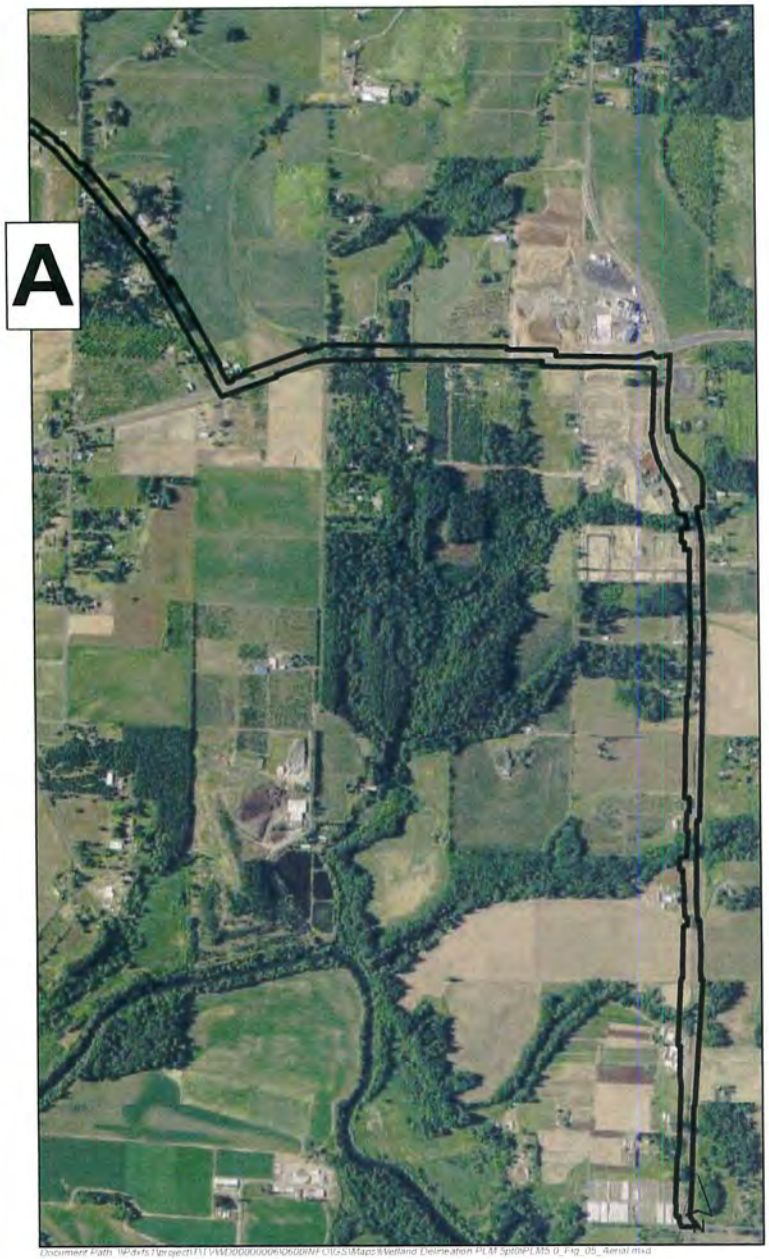
Willamette Water Supply Program
Scholls Area Pipeline Project
(PLM 5.0) Wetland Delineation

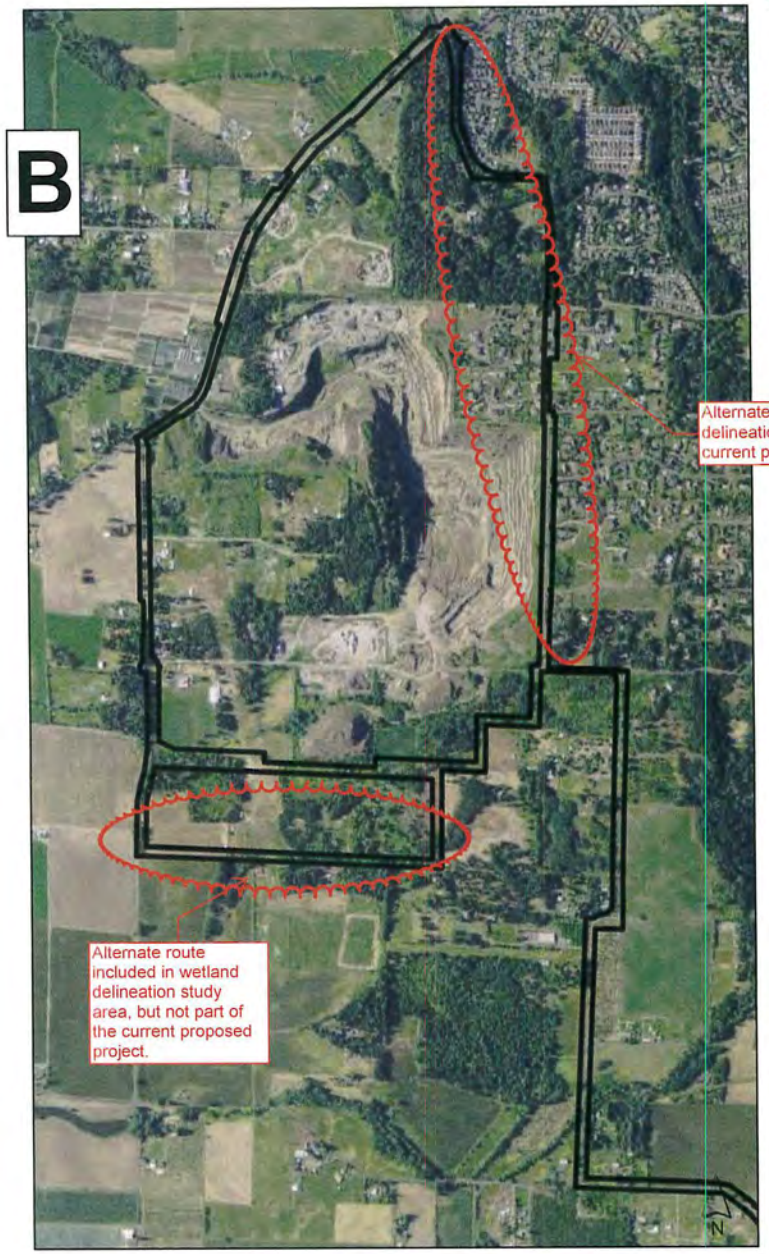
Figure 3
Aerial Photo

Legend

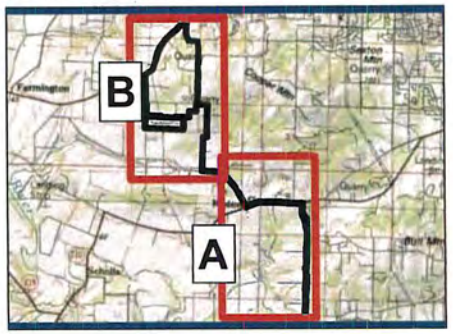
Study Area

0 0.1 0.2
Miles





USDA NAIP orthophoto, 2016.



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Willamette Water Supply Program
Reservoir Site 3
Wetland Delineation

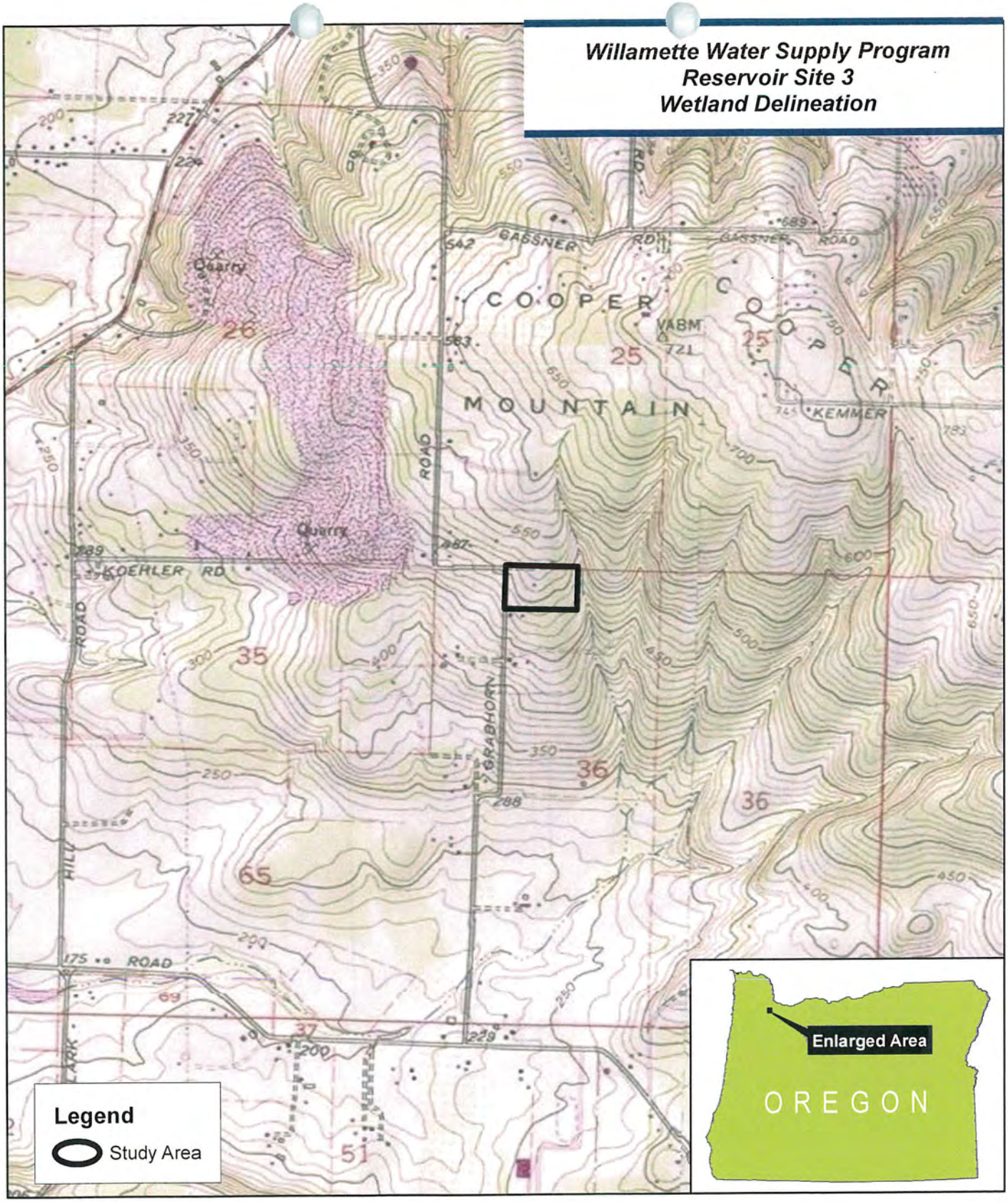
Figure 2
Tax Lots

Legend

- Study Area
- Area delineated by others
- PLSS

0 — 500
Feet

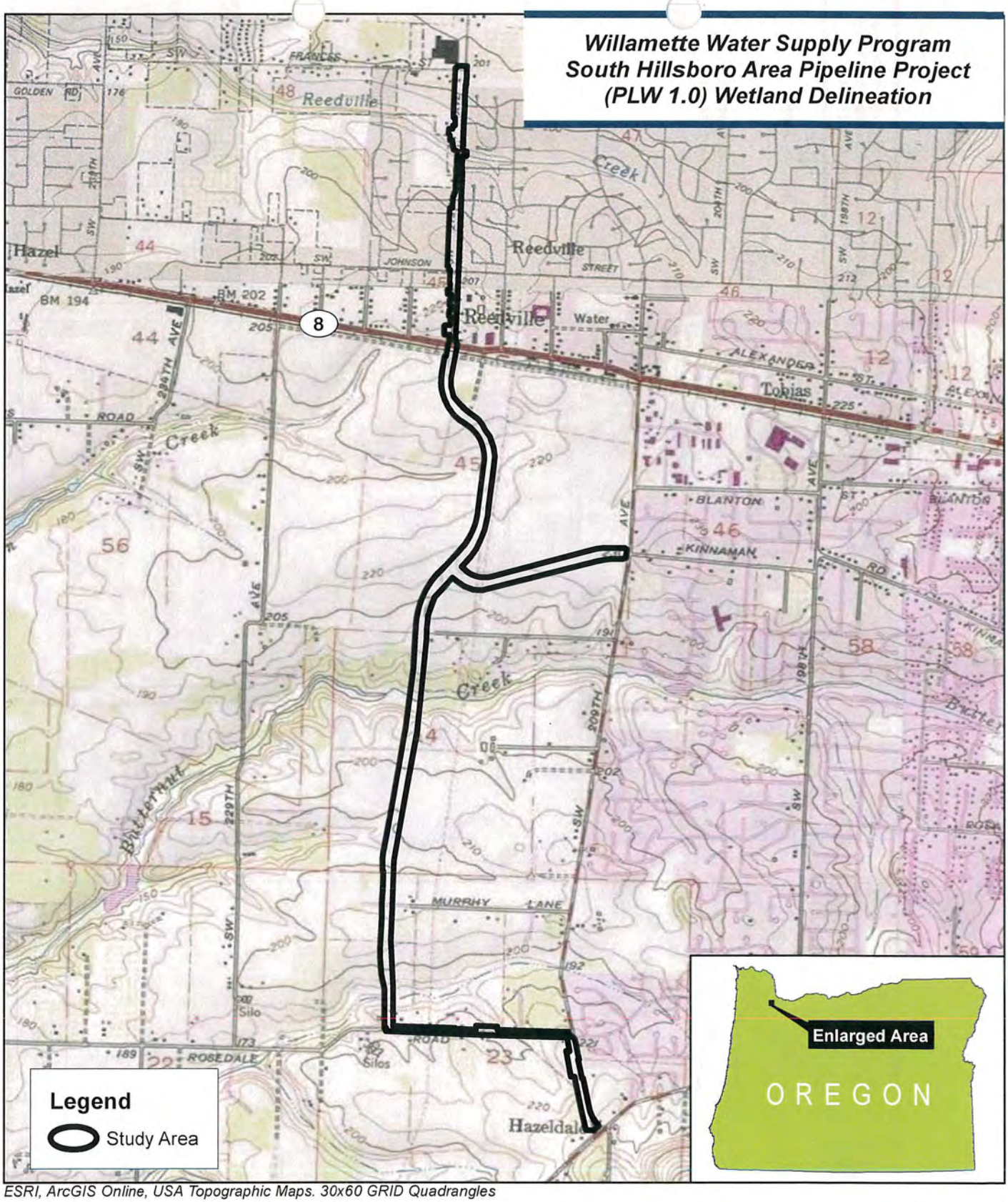
Metro RLIS Data. 2017.



ESRI, ArcGIS Online, USA Topographic Maps. 30x60 GRID Quadrangles

Figure 1
Vicinity Map

N 0 0.25 0.5 Miles



ESRI, ArcGIS Online, USA Topographic Maps. 30x60 GRID Quadrangles

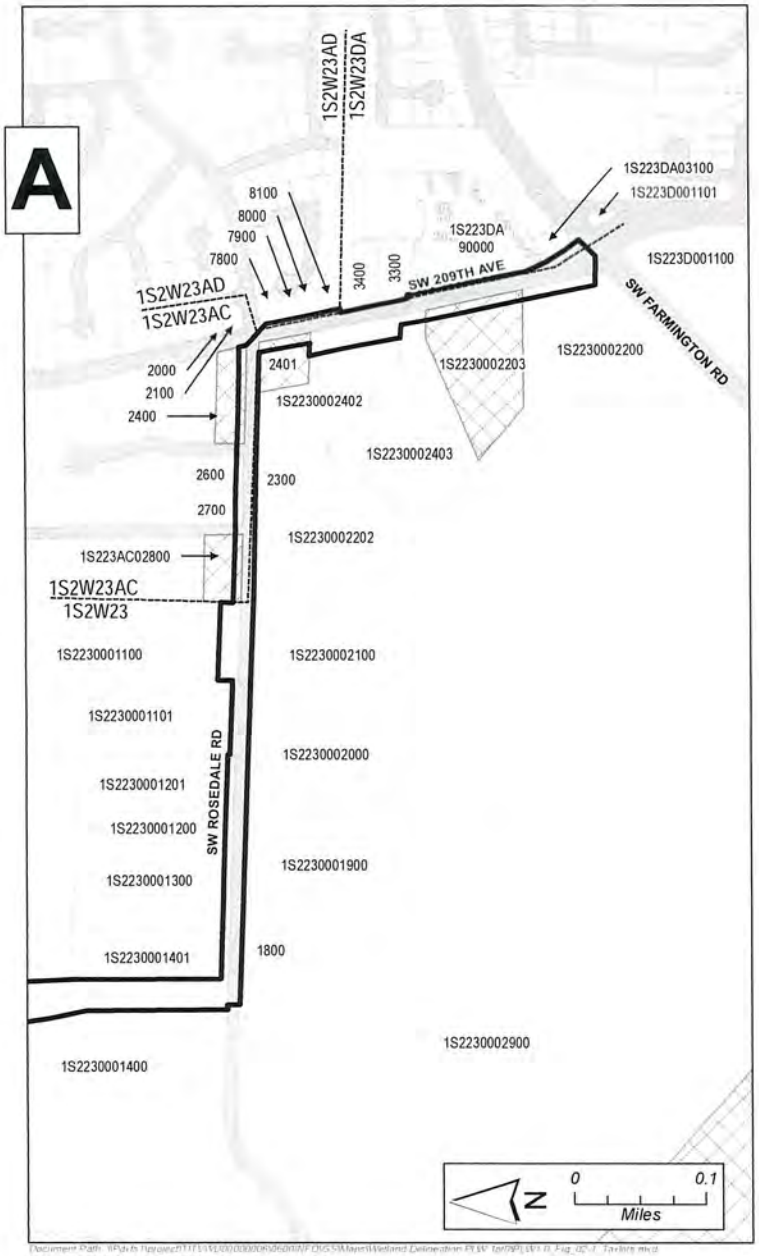
Figure 1
Vicinity Map

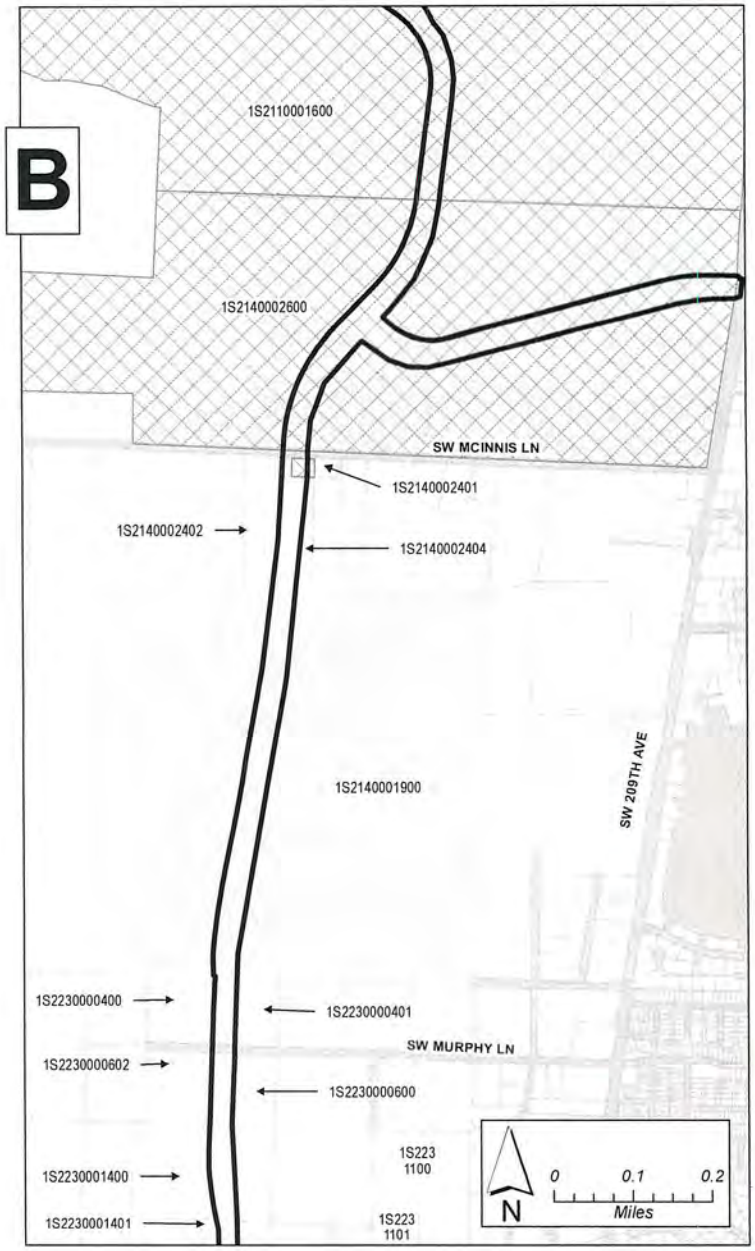
N 0 0.5 1 Mile

Willamette Water Supply Permitting
South Hillsboro Area Pipeline Project
(PLW 1.0) Wetland Delineation

Figure 2
Tax Lots, Sheet 1

Legend
- Study Area
- Area delineated by others
- No access as of 10/24/2016





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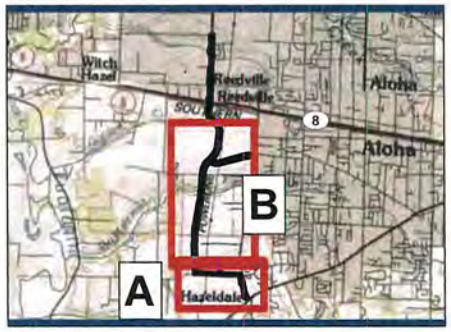


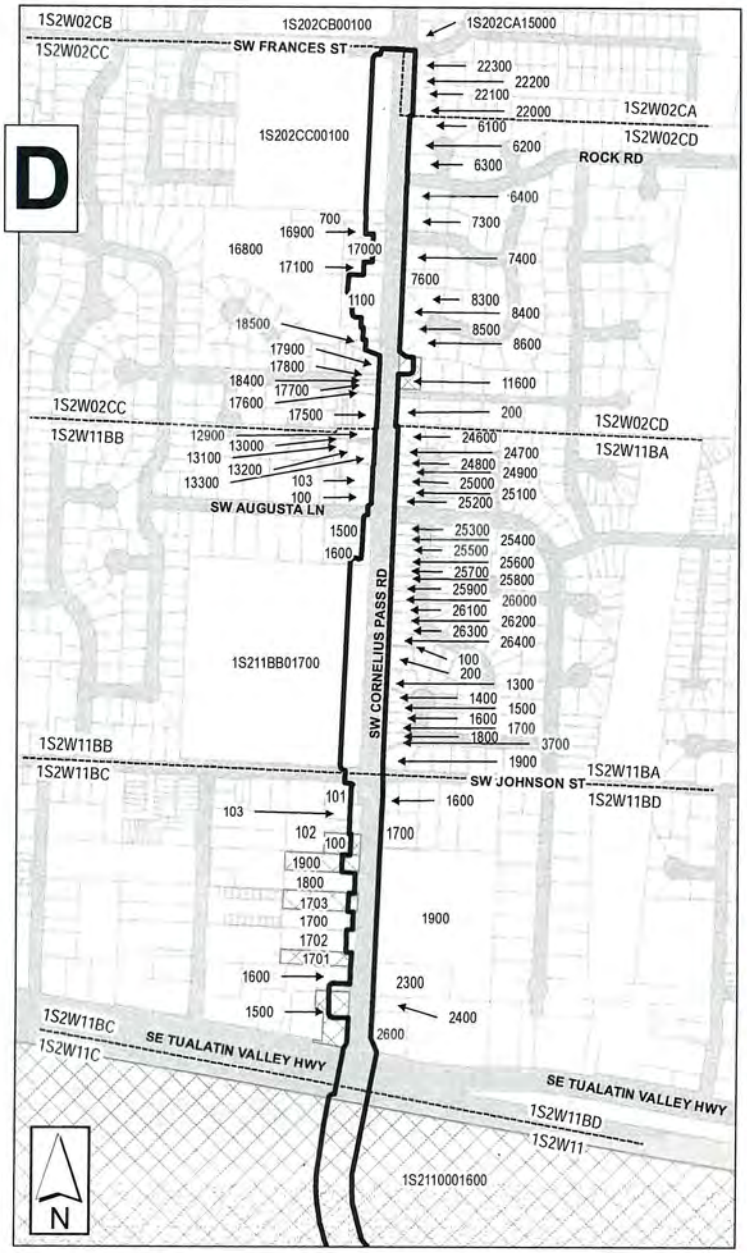
Willamette Water Supply Permitting
South Hillsboro Area Pipeline Project
(PLW 1.0) Wetland Delineation

Figure 2
Tax Lots, Sheet 2

Legend

- Study Area
- Area delineated by others
- No access as of 10/24/2016

0 Miles



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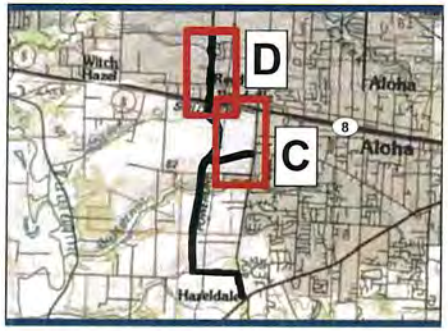

Willamette Water Supply Program
South Hillsboro Area Pipeline Project
(PLW 1.0) Wetland Delineation

Figure 3
Aerial Photo

Legend

Study Area

N

0 0.1 0.2
Miles

USDA NAIP orthophoto, 2016.

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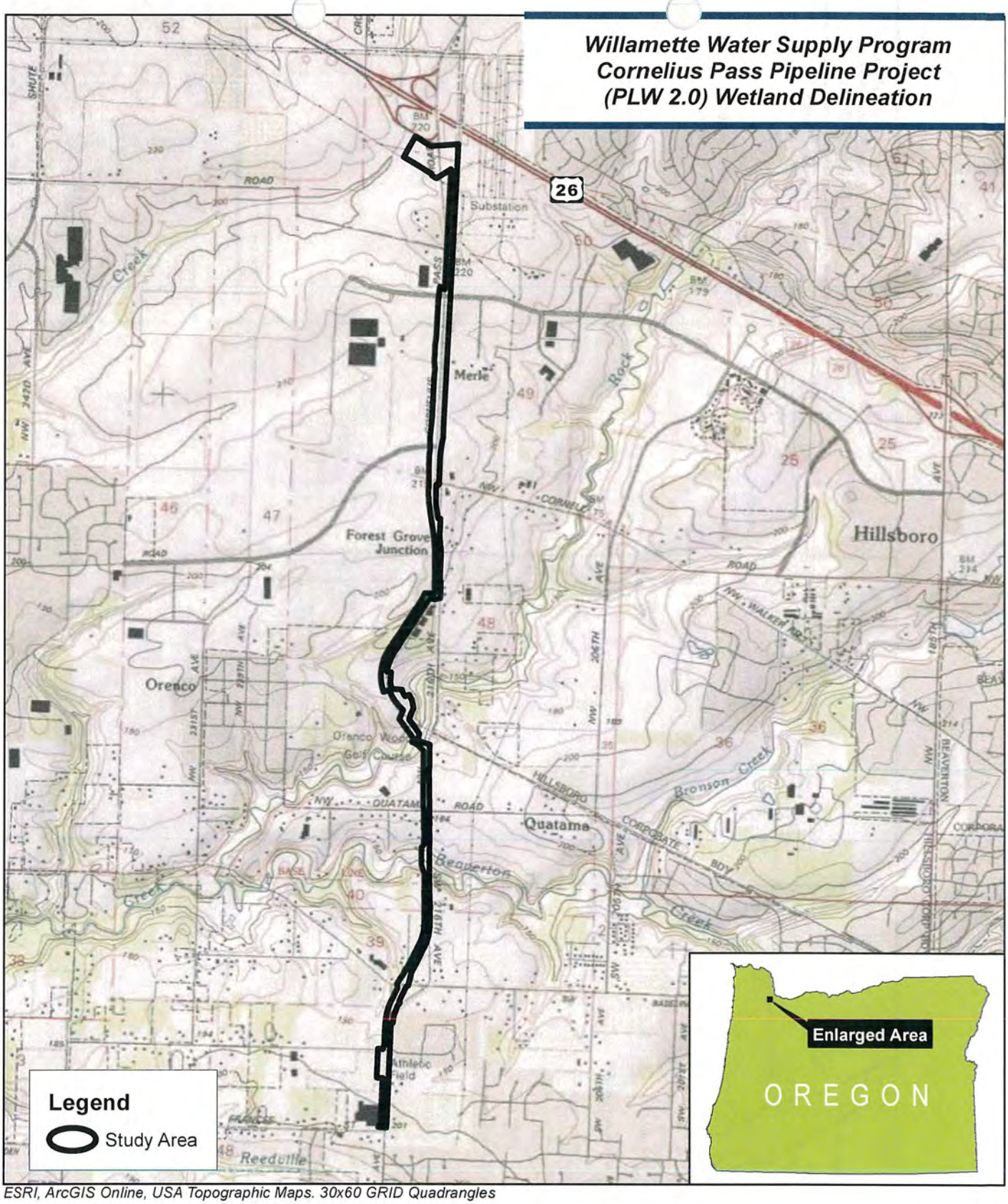


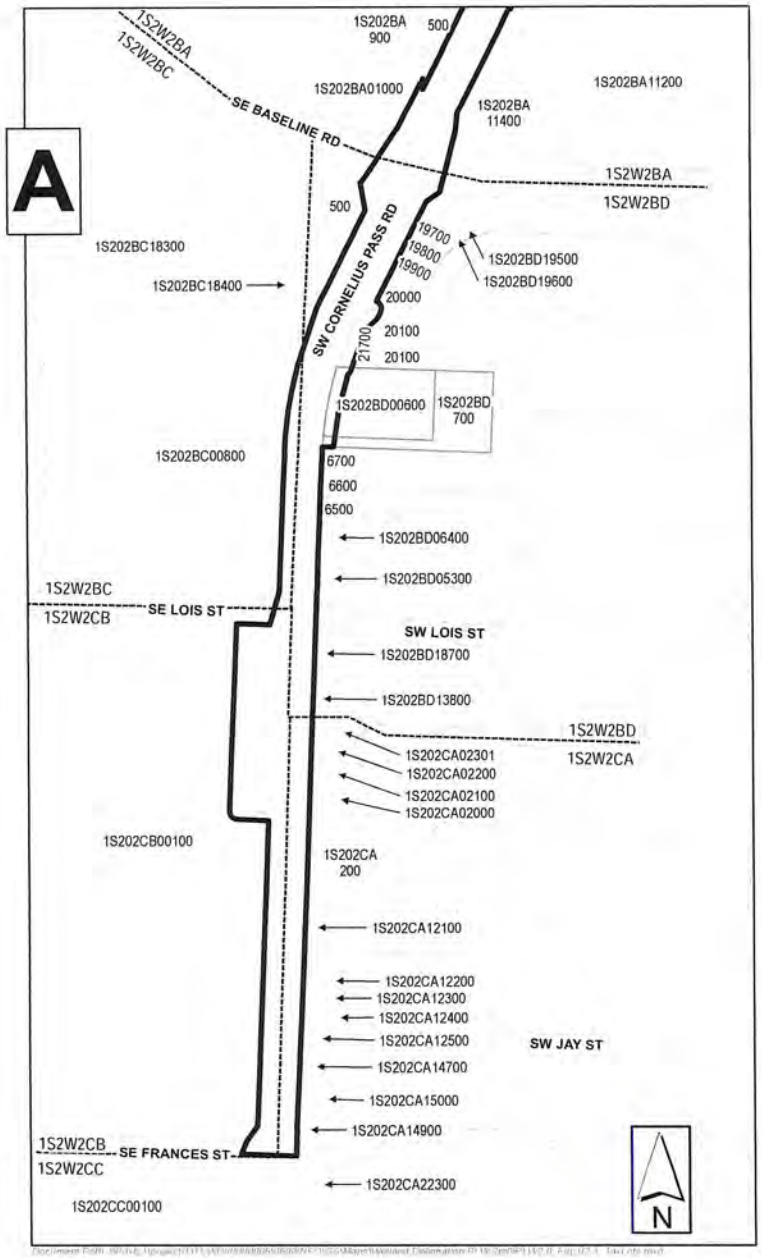
ESRI, ArcGIS Online, USA Topographic Maps. 30x60 GRID Quadrangles

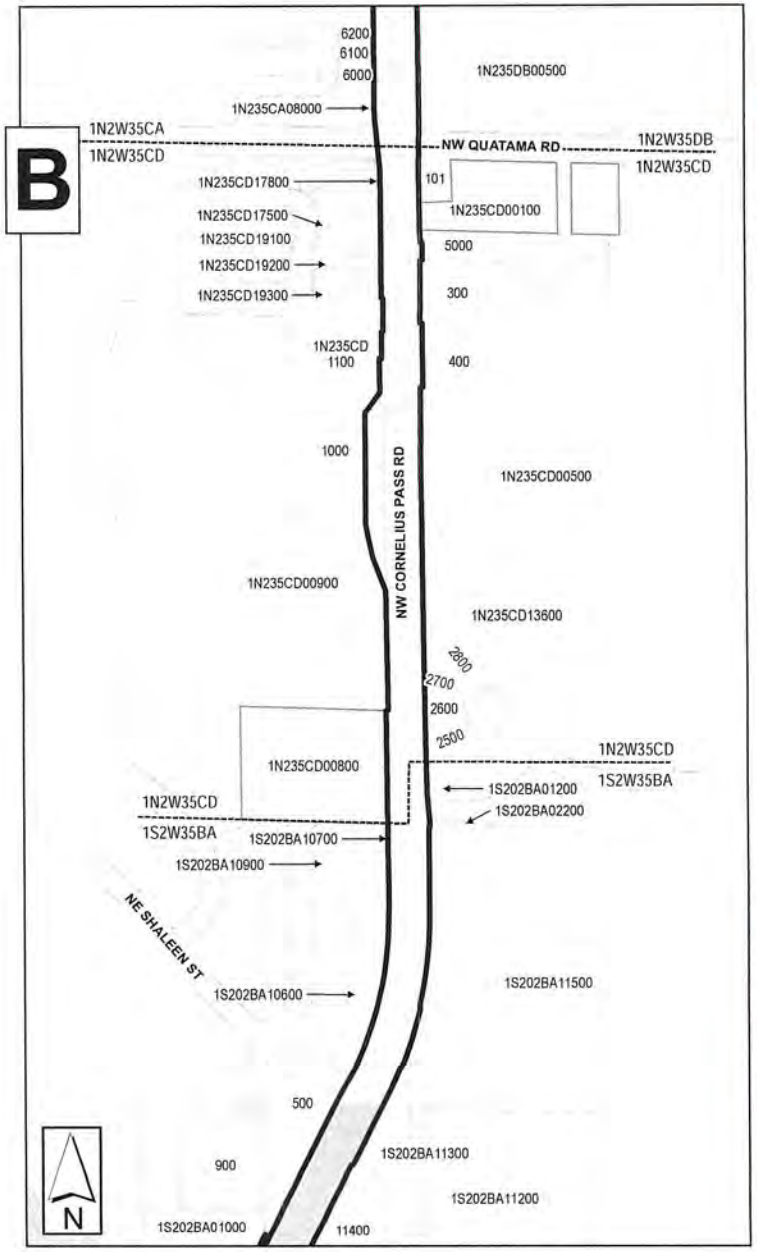
Figure 1
Vicinity Map

N 0 0.5 1 Mile

Willamette Water Supply Program
Cornelius Pass Pipeline Project
(PLW 2.0) Wetland Delineation

Figure 2, Sheet 1
Tax Lots





Legend

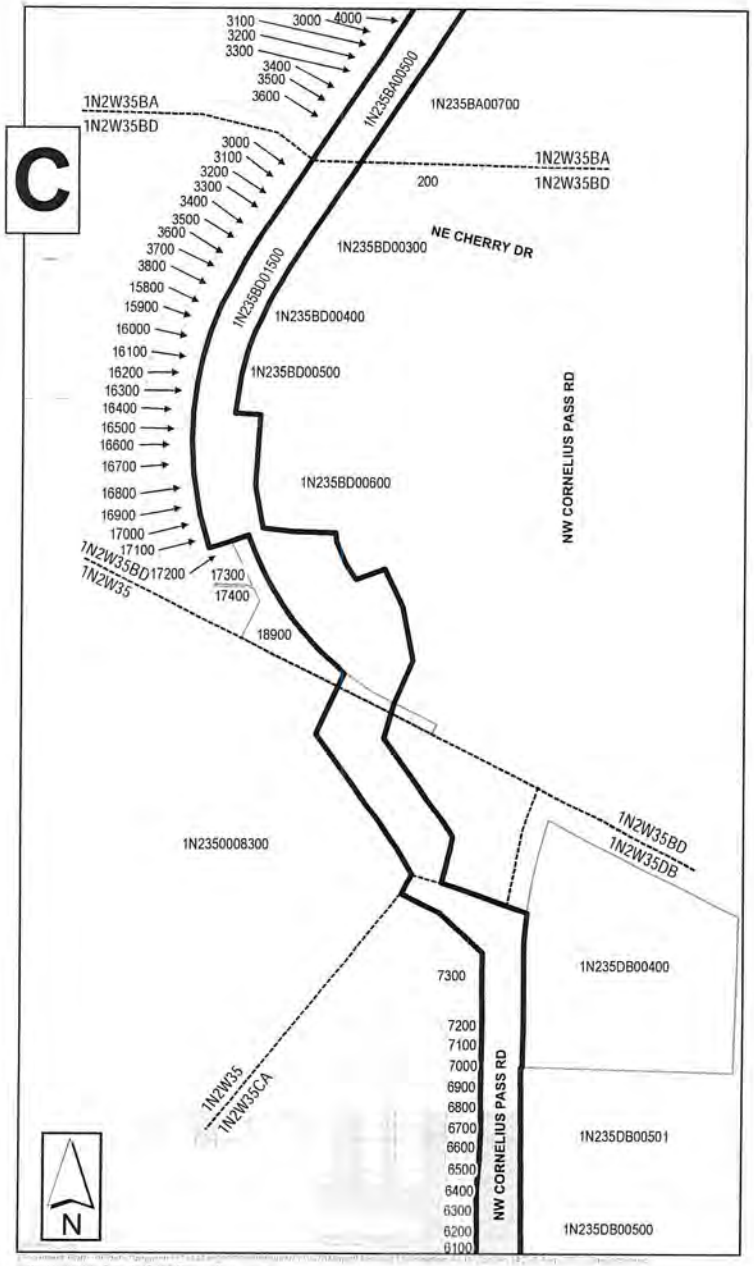
- Study Area
- No access as of 10/24/2016
- Area delineated by others

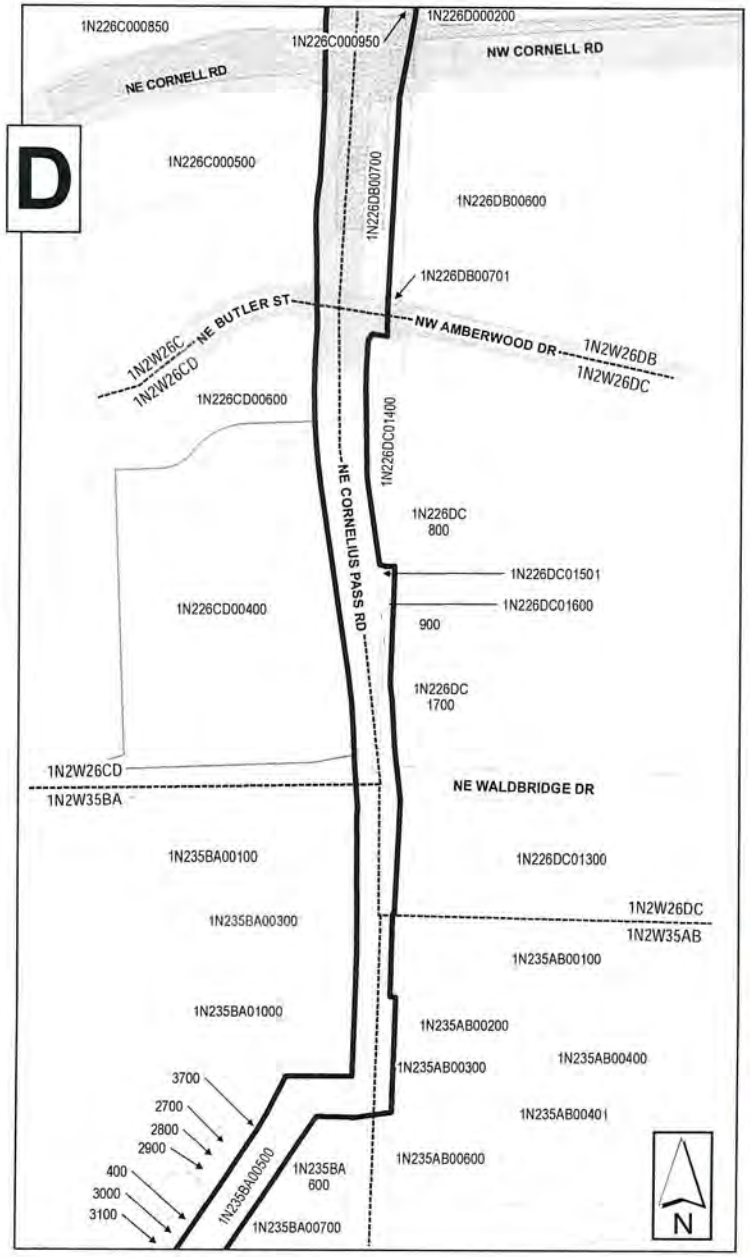
0 — 0.1
Miles

Metro RLIS Data. 2016.

Willamette Water Supply Program
Cornelius Pass Pipeline Project
(PLW 2.0) Wetland Delineation

Figure 2, Sheet 2
Tax Lots





Legend
- Study Area
- Area delineated by others
- No access as of 10/24/2016

0 0.1
Miles

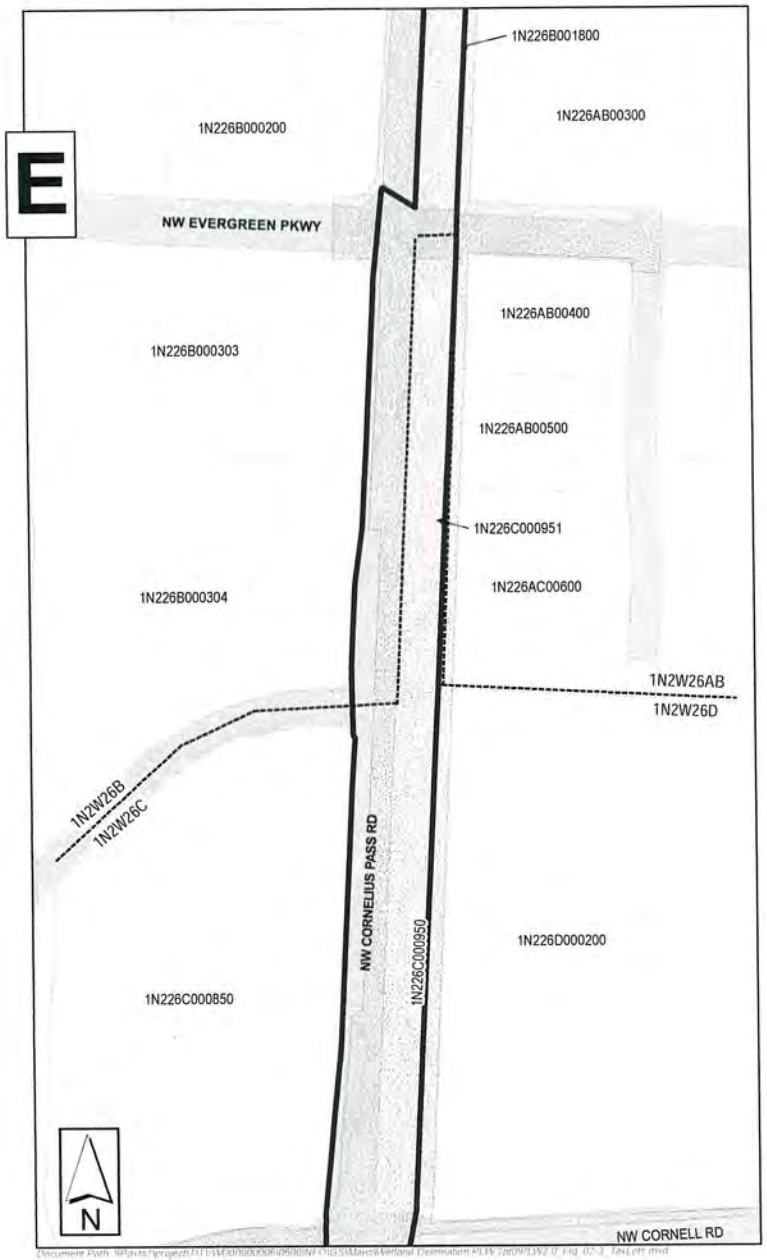
Metro RLIS Data, 2016.

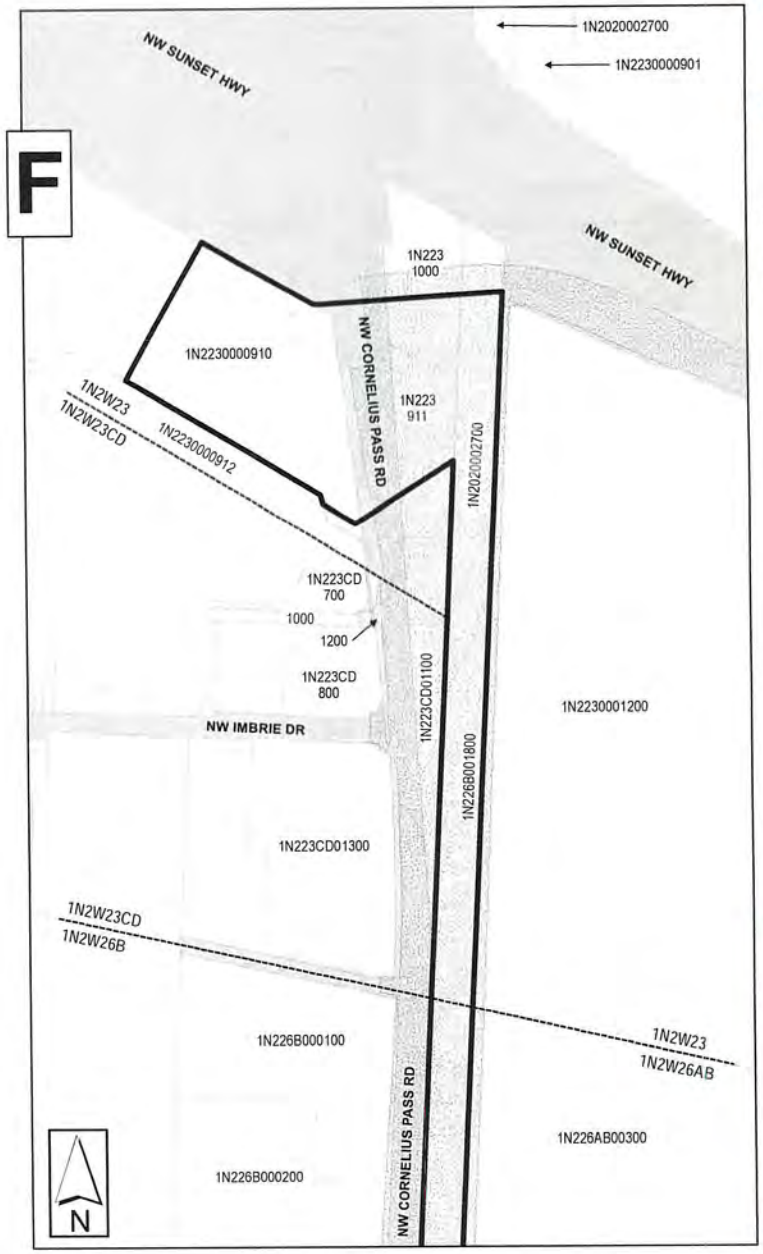
Willamette Water Supply Program
Cornelius Pass Pipeline Project
(PLW 2.0) Wetland Delineation

Figure 2, Sheet 3
Tax Lots

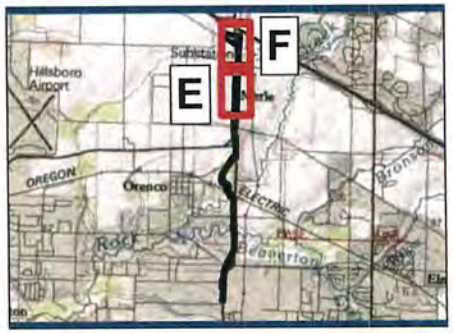
Legend
- Study Area
- Area delineated by others
- No access as of 10/24/2016

0 — 0.1
Miles





Metro RLIS Data. 2016.



Willamette Water Supply Program
Cornelius Pass Pipeline Project
(PLW 2.0) Wetland Delineation

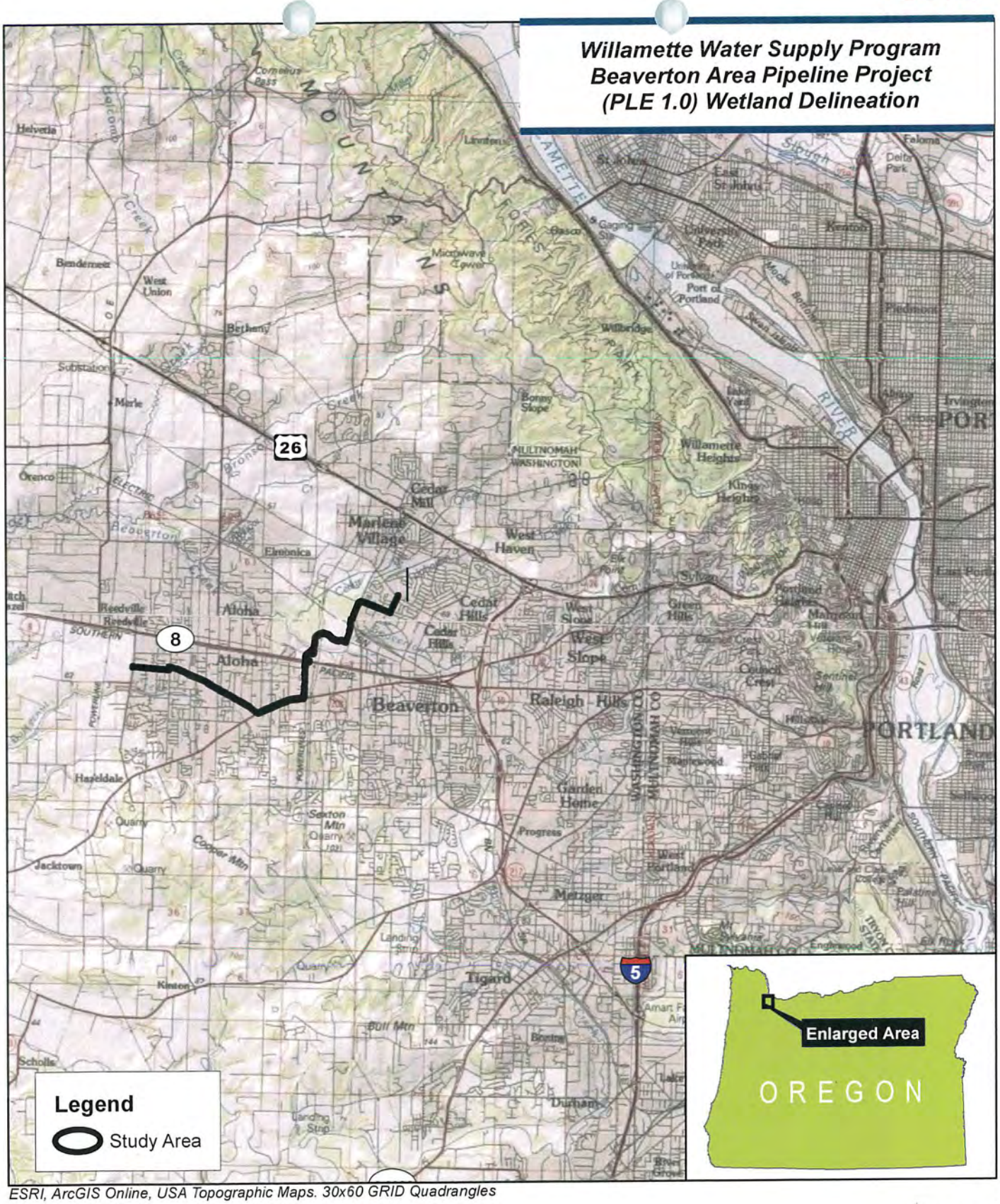
Figure 3
Aerial Photo

Legend
Study Area

N
0 0.1 0.2
Miles

USDA NAIP orthophoto, 2016.

Date 11/30/2016 Time 6:39:52 PM User Name Sajt



ESRI, ArcGIS Online, USA Topographic Maps. 30x60 GRID Quadrangles

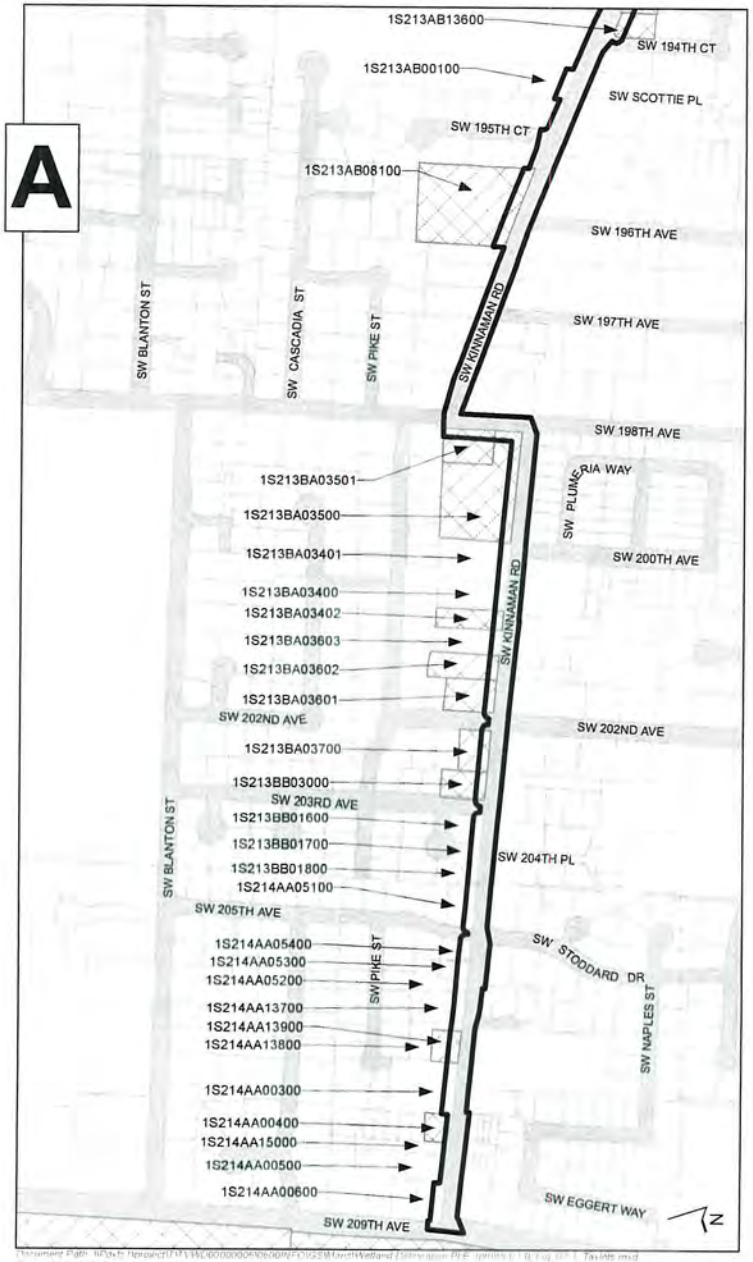
Figure 1
Vicinity Map

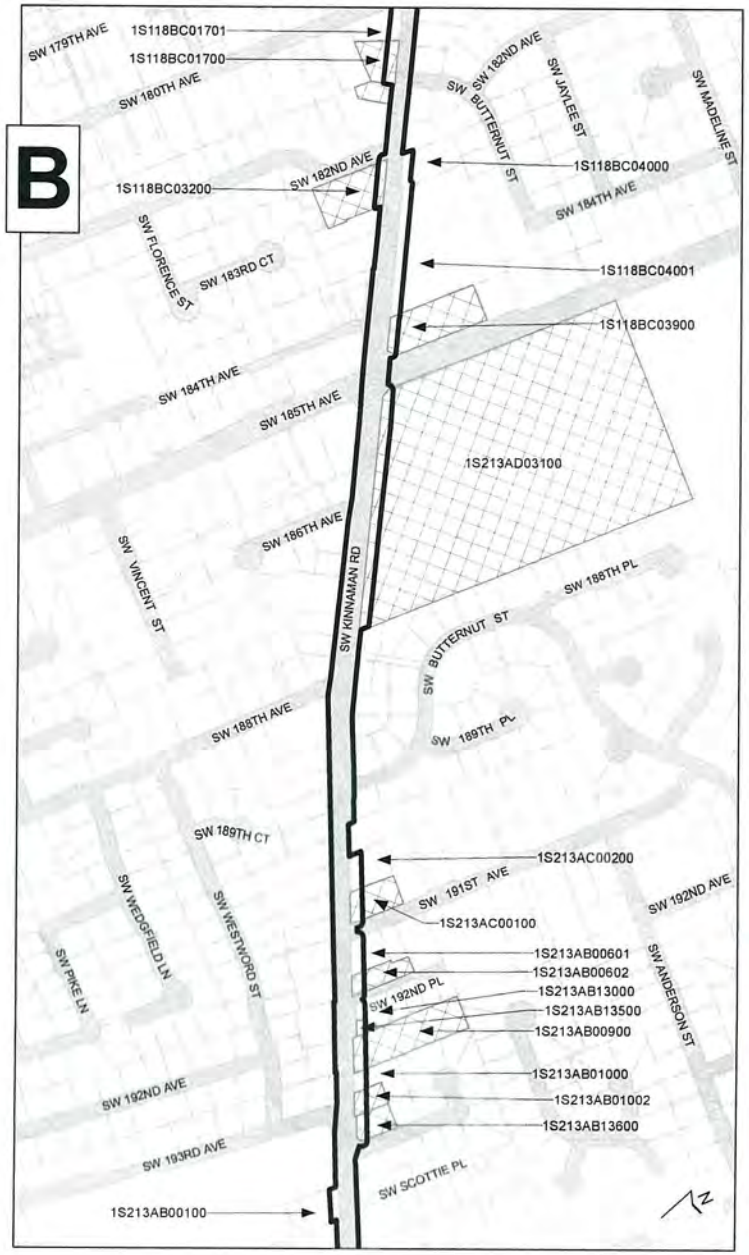
N

0 1 2 Miles

Willamette Water Supply Program
Beaverton Area Pipeline Project
(PLE1.0) Wetland Delineation

Figure 2, Sheet 1
Taxlots





Legend

- Study Area
- Area delineated by others
- No access as of 10/24/2016

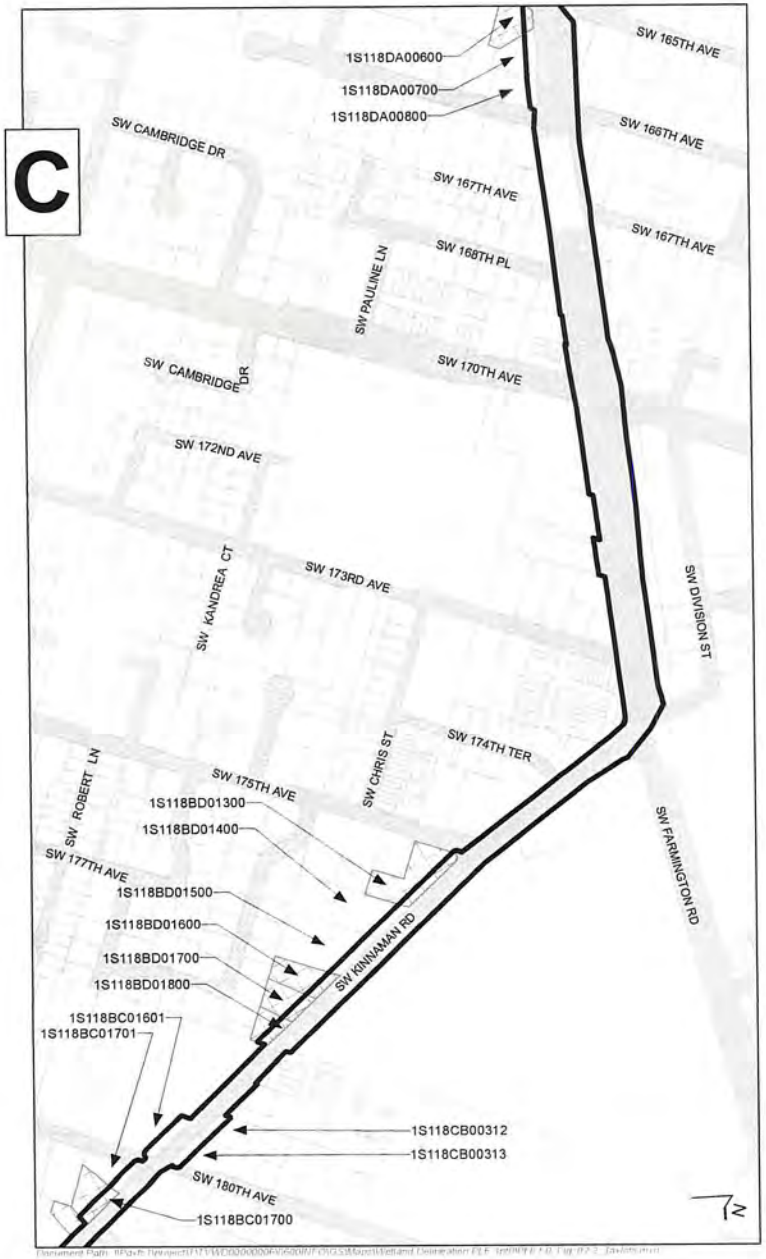
0 0.1 0.2
Miles

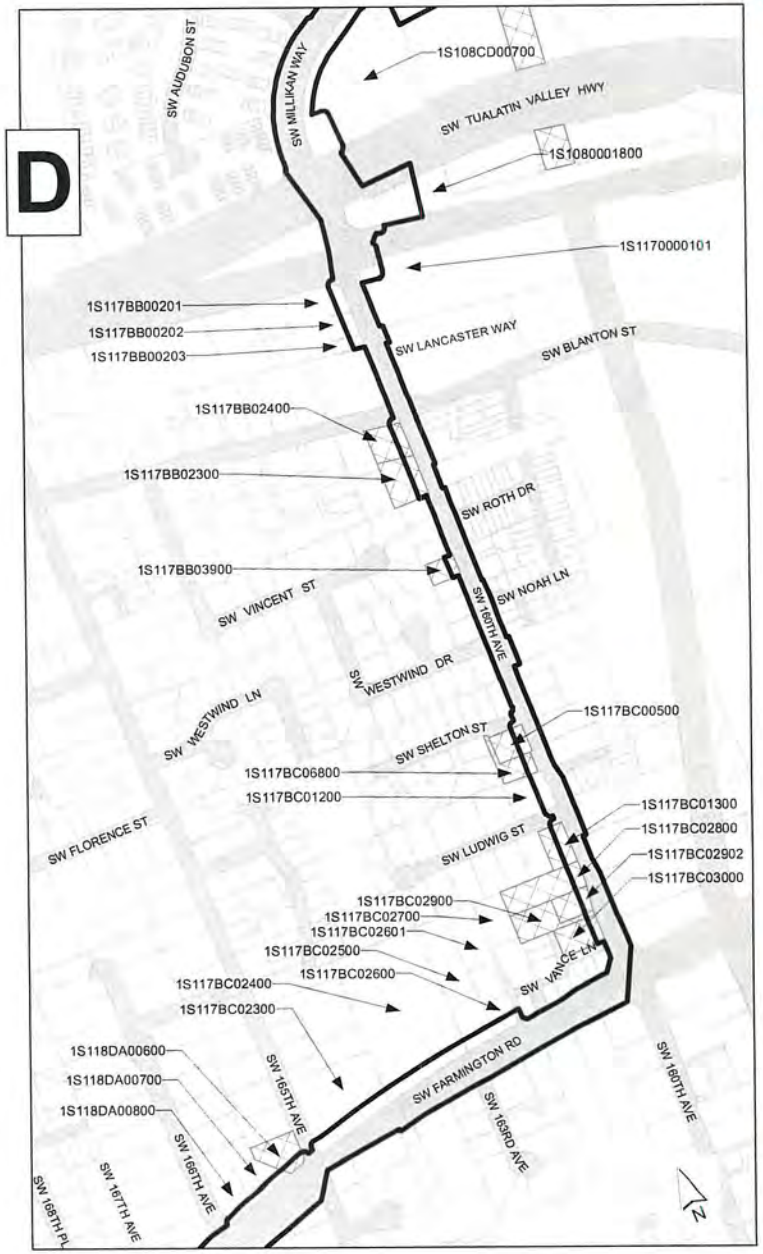
Metro RLIS Data, 2016.

Pathname Path: \\Pdx\Projects\PDX\WC\60000000\60000\PDX25\Map\Wetland Delineation PLE 1pt0\Fig 02-1_Taxlots.mxd
Date: 11/24/2016 Time: 3:31:20 PM User Name: ekh

Willamette Water Supply Program
Beaverton Area Pipeline Project
(PLE1.0) Wetland Delineation

Figure 2, Sheet 2
Taxlots





Legend

- Study Area
- Area delineated by others
- No access as of 10/24/2016

0 0.1 0.2
Miles

Metro RLIS Data. 2016.

Willamette Water Supply Program
Beaverton Area Pipeline Project
(PLE 1.0) Wetland Delineation

Figure 3
Aerial Photo

Legend

Study Area

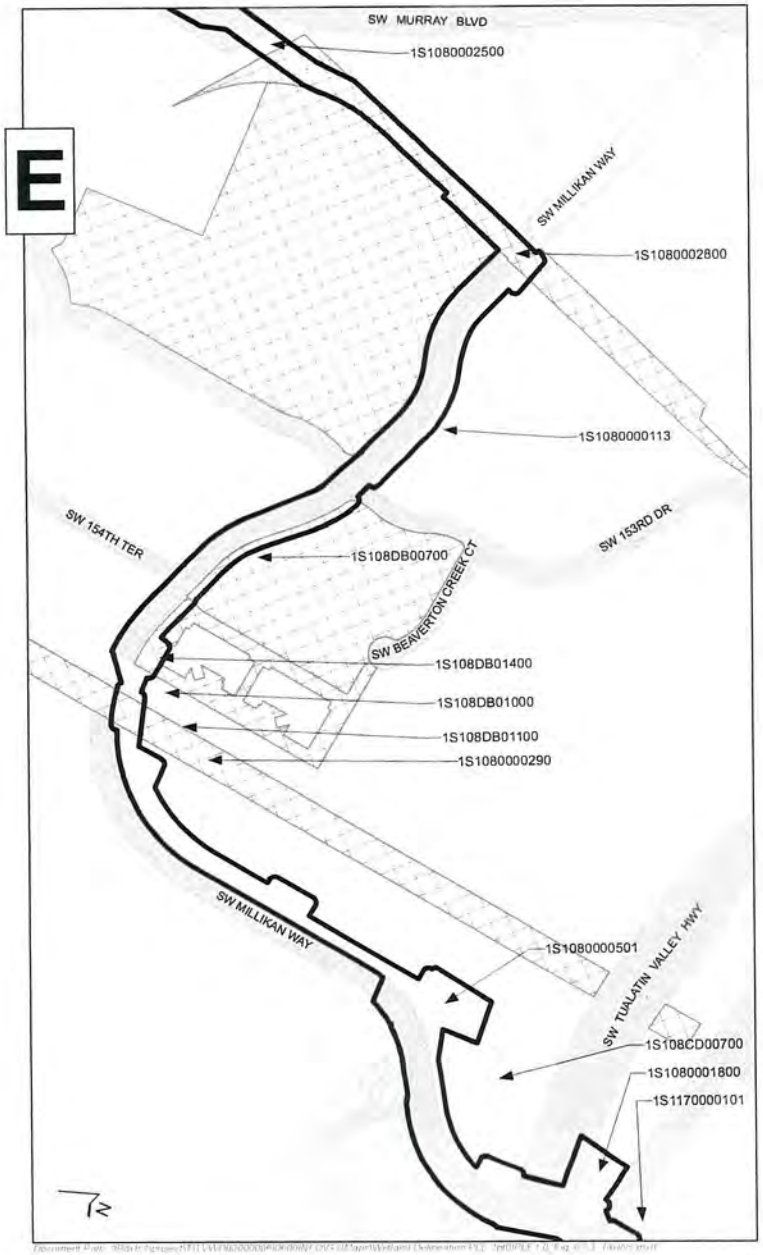
0 0.125 0.25 0.5 Miles

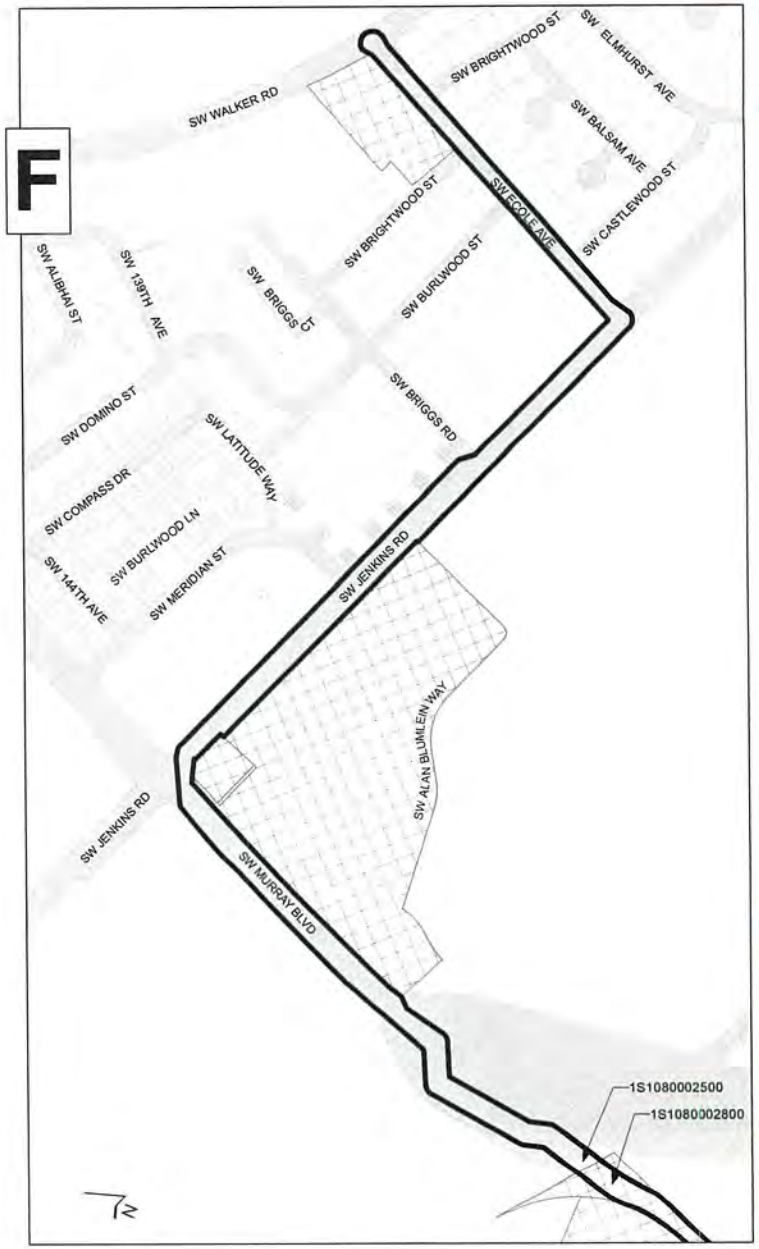
USDA NAIP orthophoto, 2016.

Date: 11/28/2016 Time: 1:45:57 PM User Name: Sast

Willamette Water Supply Program
Beaverton Area Pipeline Project
(PLE1.0) Wetland Delineation

Figure 2, Sheet 3
Taxlots





Legend

- Study Area
- Area delineated by others
- No access as of 10/24/2016

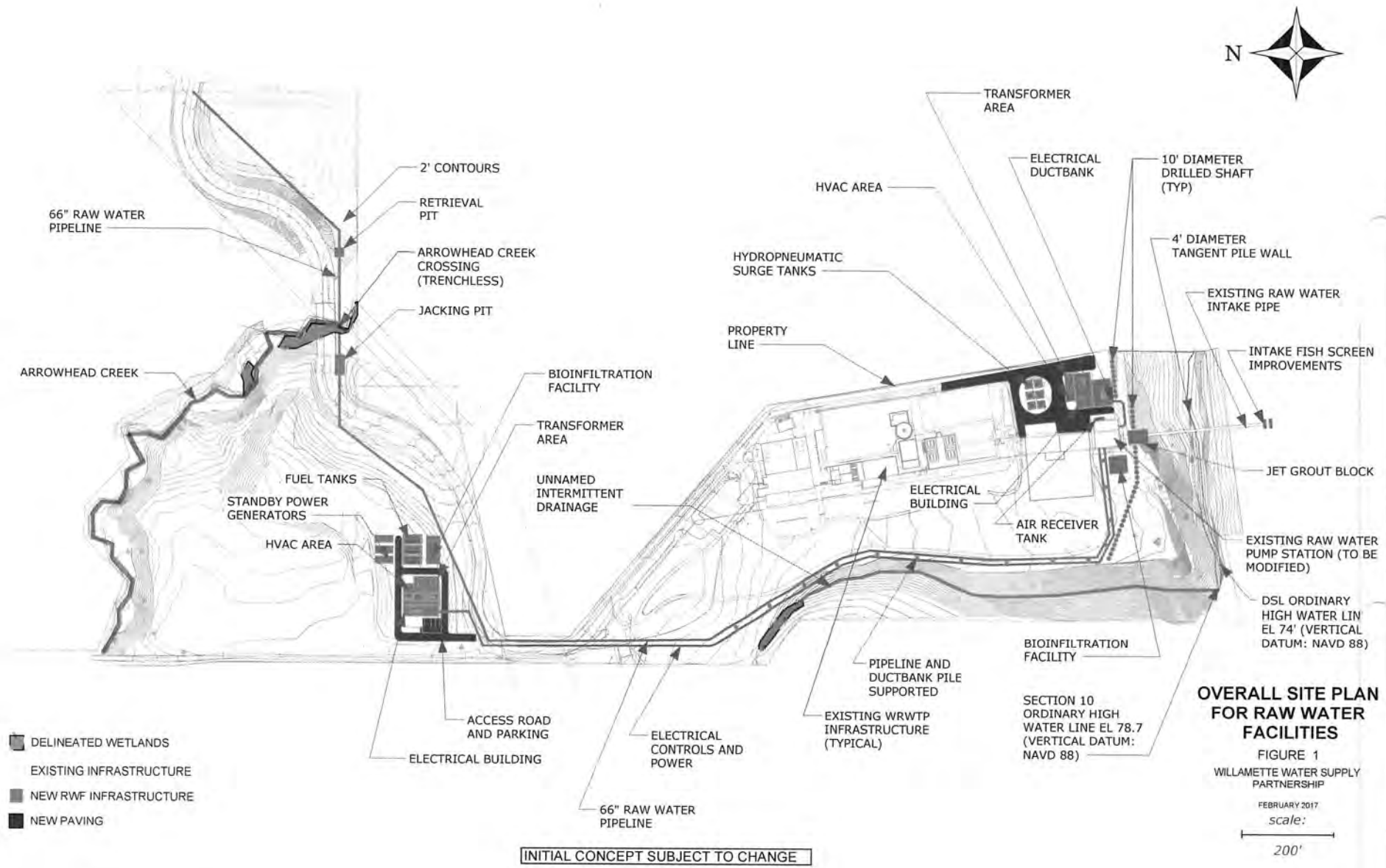
0 0.1 0.2
Miles

Metro RLIS Data. 2016.

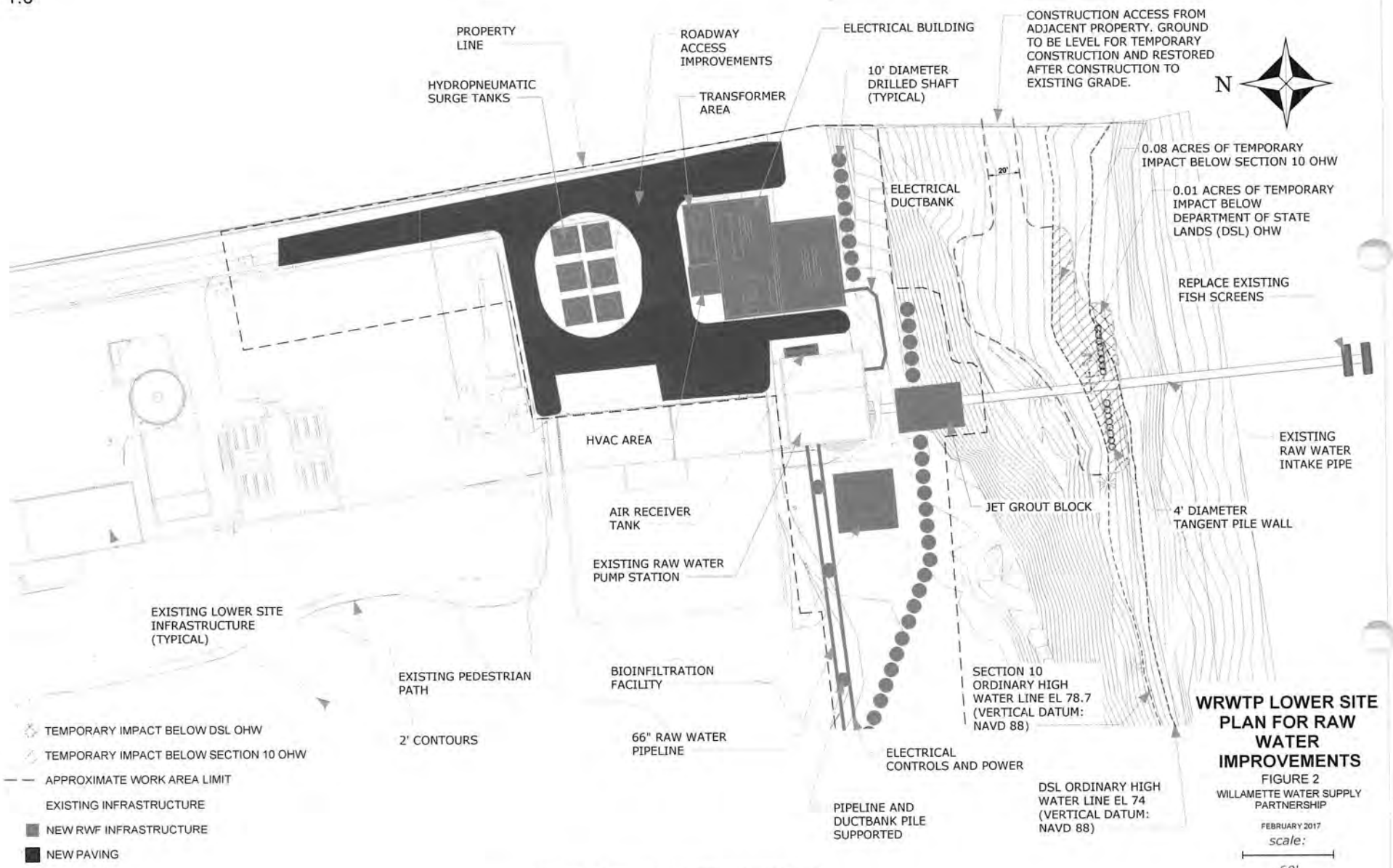
Work Package Design Drawings

Raw Water Facilities (RWF_1.0)

RWF 1.0

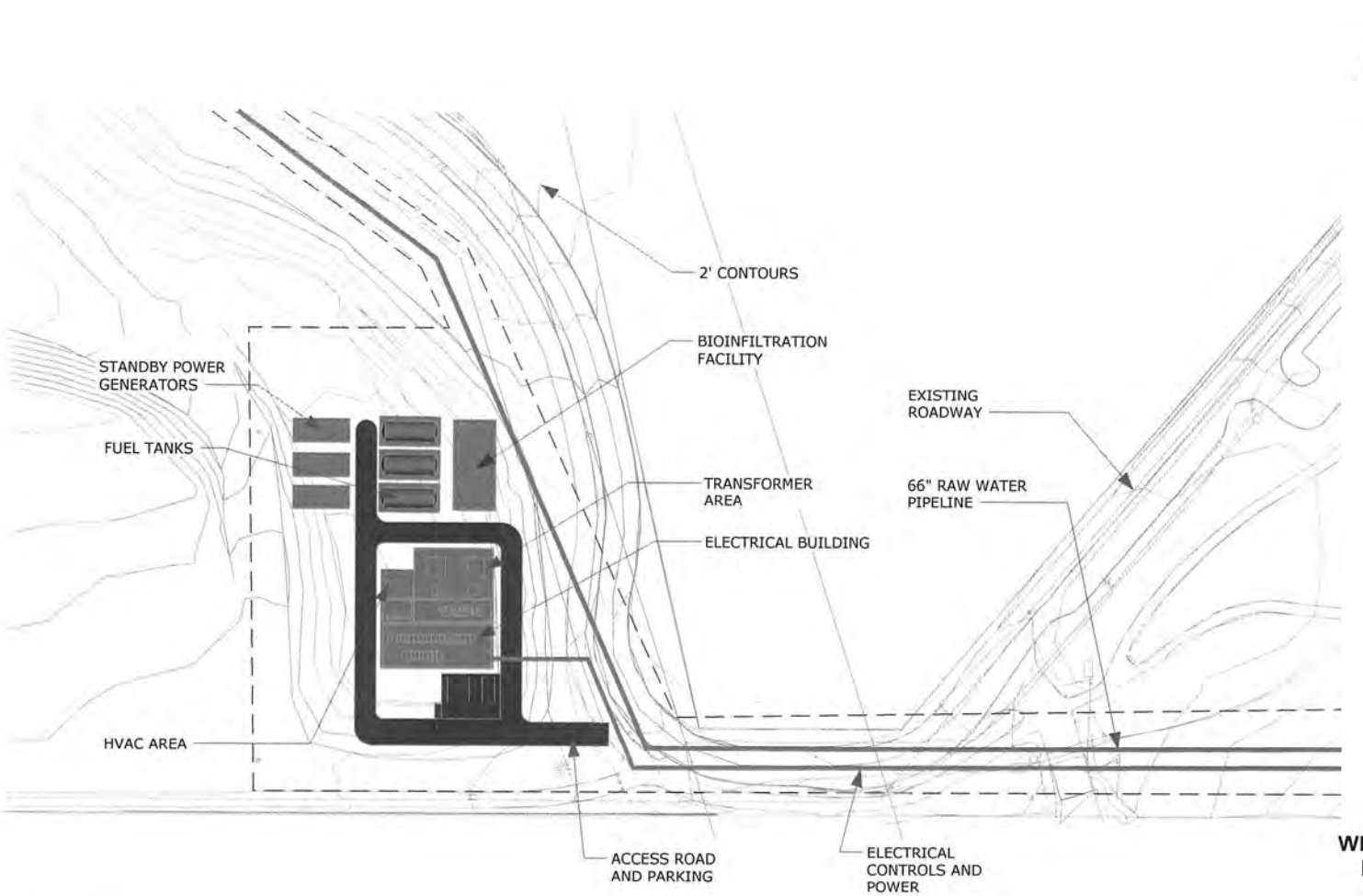

N
2' CONTOURS
RETRIEVAL PIT
66" RAW WATER PIPELINE
ARROWHEAD CREEK CROSSING (TRENCHLESS)
JACKING PIT
ARROWHEAD CREEK
BIOINFILTRATION FACILITY
TRANSFORMER AREA
FUEL TANKS
STANDBY POWER GENERATORS
HVAC AREA
UNNAMED INTERMITTENT DRAINAGE
ACCESS ROAD AND PARKING
ELECTRICAL BUILDING
ELECTRICAL CONTROLS AND POWER
66" RAW WATER PIPELINE
PIPELINE AND DUCTBANK PILE SUPPORTED
EXISTING WRWTP INFRASTRUCTURE (TYPICAL)
HVAC AREA
TRANSFORMER AREA
ELECTRICAL DUCTBANK
10' DIAMETER DRILLED SHAFT (TYP)
HYDROPNEUMATIC SURGE TANKS
4' DIAMETER TANGENT PILE WALL
EXISTING RAW WATER INTAKE PIPE
PROPERTY LINE
INTAKE FISH SCREEN IMPROVEMENTS
JET GROUT BLOCK
ELECTRICAL BUILDING
AIR RECEIVER TANK
EXISTING RAW WATER PUMP STATION (TO BE MODIFIED)
DSL ORDINARY HIGH WATER LIN EL 74' (VERTICAL DATUM: NAVD 88)
BIOINFILTRATION FACILITY
SECTION 10 ORDINARY HIGH WATER LINE EL 78.7 (VERTICAL DATUM: NAVD 88)
DELINEATED WETLANDS
EXISTING INFRASTRUCTURE
NEW RWF INFRASTRUCTURE
NEW PAVING
INITIAL CONCEPT SUBJECT TO CHANGE
OVERALL SITE PLAN FOR RAW WATER FACILITIES
FIGURE 1
WILLAMETTE WATER SUPPLY PARTNERSHIP
FEBRUARY 2017
scale:
200'

RWF 1.0



INITIAL CONCEPT SUBJECT TO CHANGE

RWF 1.0



— — APPROXIMATE WORK AREA LIMIT

EXISTING INFRASTRUCTURE

NEW RWF INFRASTRUCTURE

NEW PAVING

INITIAL CONCEPT SUBJECT TO CHANGE

WRWTP UPPER SITE PLAN FOR RAW WATER IMPROVEMENT

FIGURE 3

WILLAMETTE WATER SUPPLY PARTNERSHIP

FEBRUARY 2017

scale:

80'

RWF 1.0

N

— PROPERTY LINE

AERIAL PHOTO OF WRWTP SITE

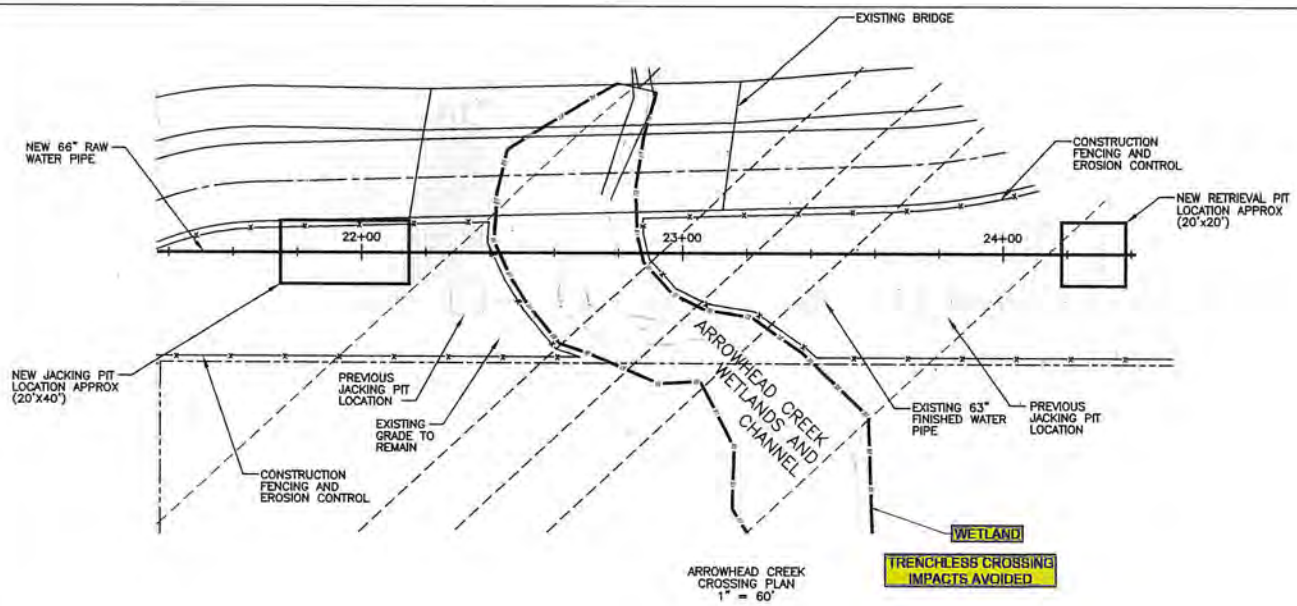
FIGURE 4

WILLAMETTE WATER SUPPLY PARTNERSHIP

FEBRUARY 2017

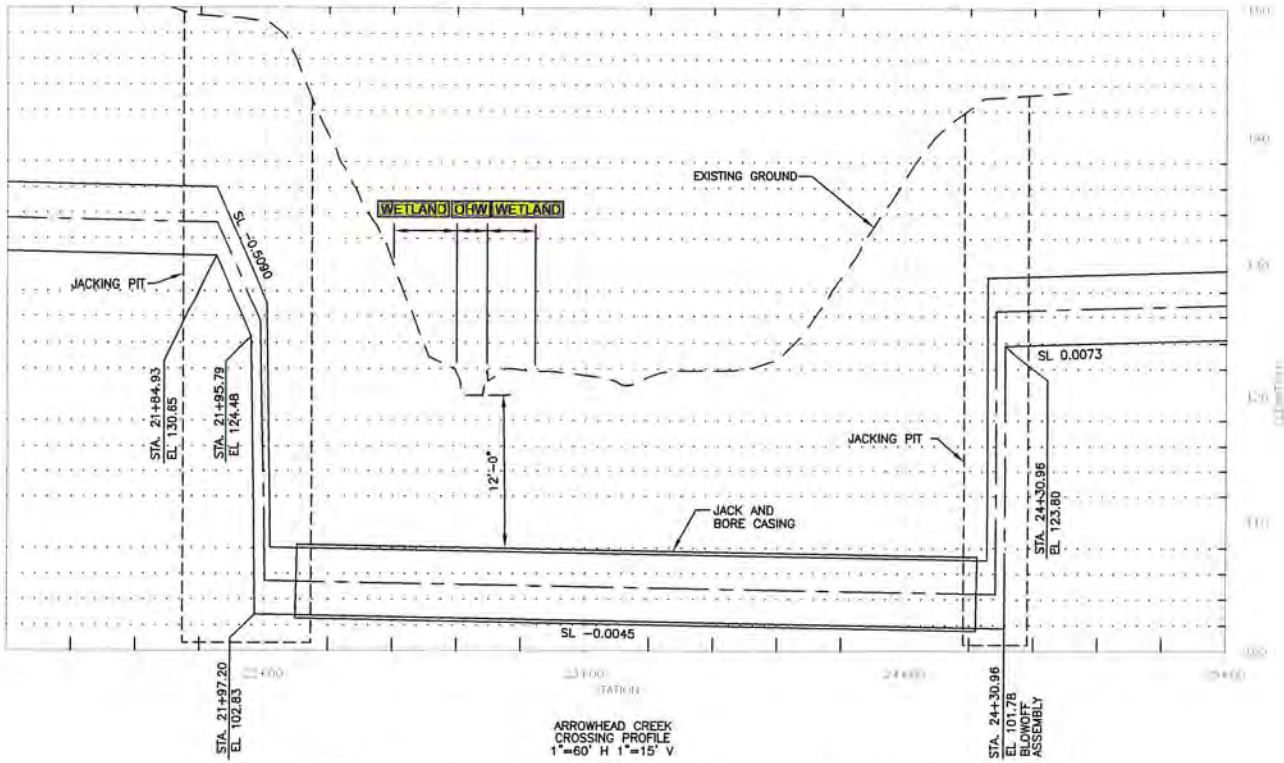
scale:

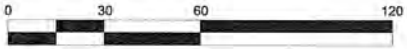
300'



LEGEND: (ORIGINALLY PRINTED IN COLOR)

- PLANIMETRICS (FROM LIDAR)
- PAVEMENT (FROM LIDAR)
- 100 CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
- ROAD CENTERLINE
- OVH POWER LINE
- UTILITY EASEMENT
- WWSP PROPOSED ALIGNMENT
- WETLAND BOUNDARY
- W2-4 WETLAND DESCRIPTION
- CONSTUCTION FENCING AND EROSION CONTROL

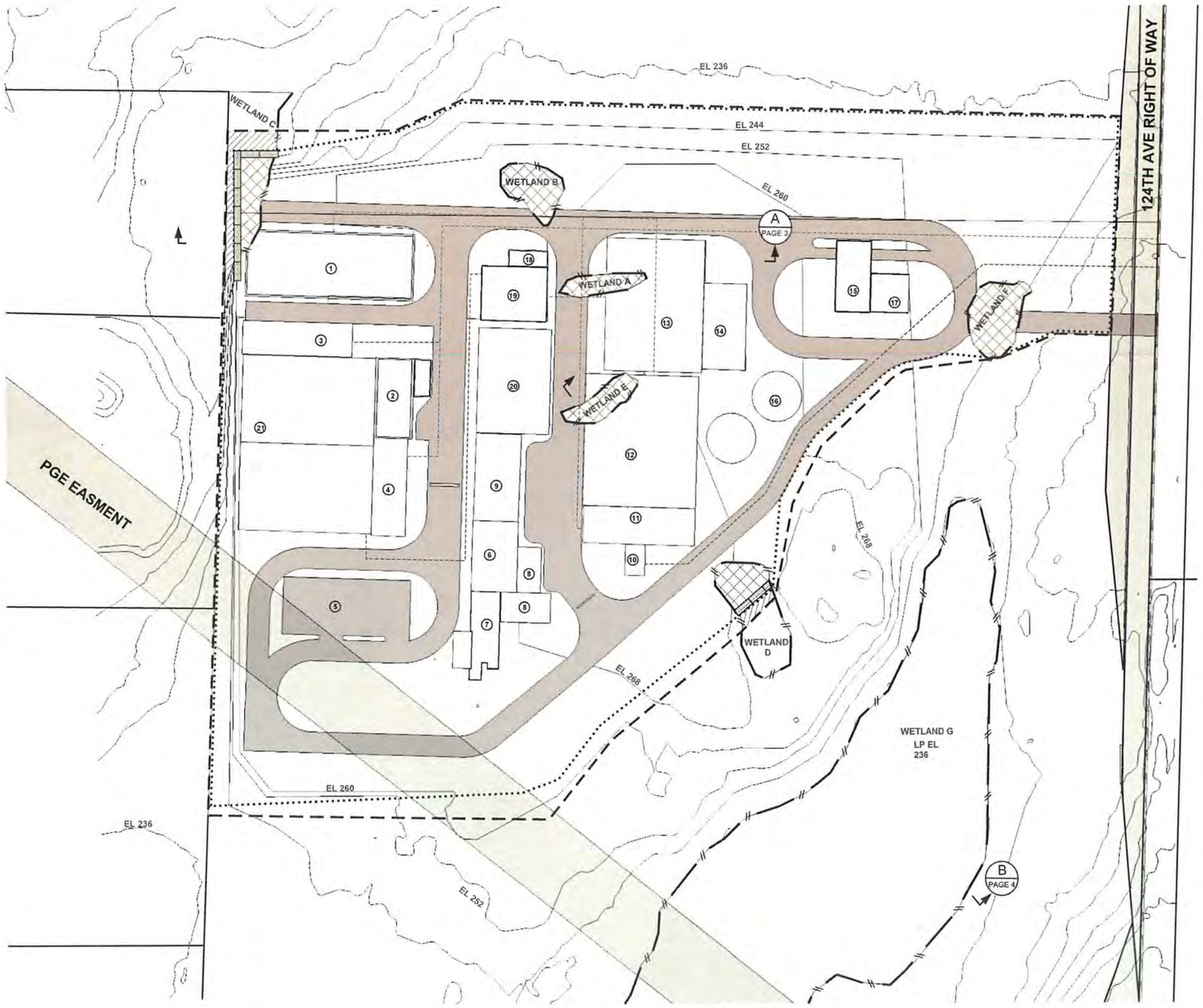




Elevations shown based on National Geodetic Vertical Datum of 1929 (NGVD 29)

FIGURE 5. ARROWHEAD CREEK CROSSING PLAN AND PROFILE

Willamette Water Supply System Water Treatment Plant (WWSS WTP) (WTP_1.0)



N

CONTOUR INTERVAL - 8 FT

- APPROXIMATE WORK AREA LIMIT
- PERMANENT IMPACT AREA
- LARGE PIPELINES GREATER THAN 60"
- WETLAND BORDER
- PERMANENT WETLAND IMPACT
- TEMPORARY WETLAND IMPACT
- PLANT ROADS
- WTP BUILDINGS
- RETAINING WALL
- TAXLOTS
- GRADE LINES

WWSS WTP FACILITIES

1. OVERFLOW BASIN
2. HSPS ELECTRICAL BUILDING AND TRANSFORMERS
3. SURGE TANKS
4. HIGH SERVICE PUMP STATION
5. PARKING AREA
6. MAINTENANCE AND STORAGE
7. ADMINISTRATION BUILDING
8. OZONE GENERATION AND LOX STORAGE
9. CHEMICAL BUILDING
10. RAPID MIX PUMP
11. FLOW SPLIT BUILDING
12. BALLASTED FLOCCULATION AND OZONE CONTACTORS
13. FILTERS
14. WWEQ AND PUMP STATION
15. MECHANICAL DEWATERING
16. GRAVITY THICKENERS
17. SOLIDS STORAGE BUILDING
18. FILTER BLOWERS
19. UV DISINFECTION
20. ELECTRICAL BUILDING
21. CLEARWELLS

WWSS WTP SITE LAYOUT

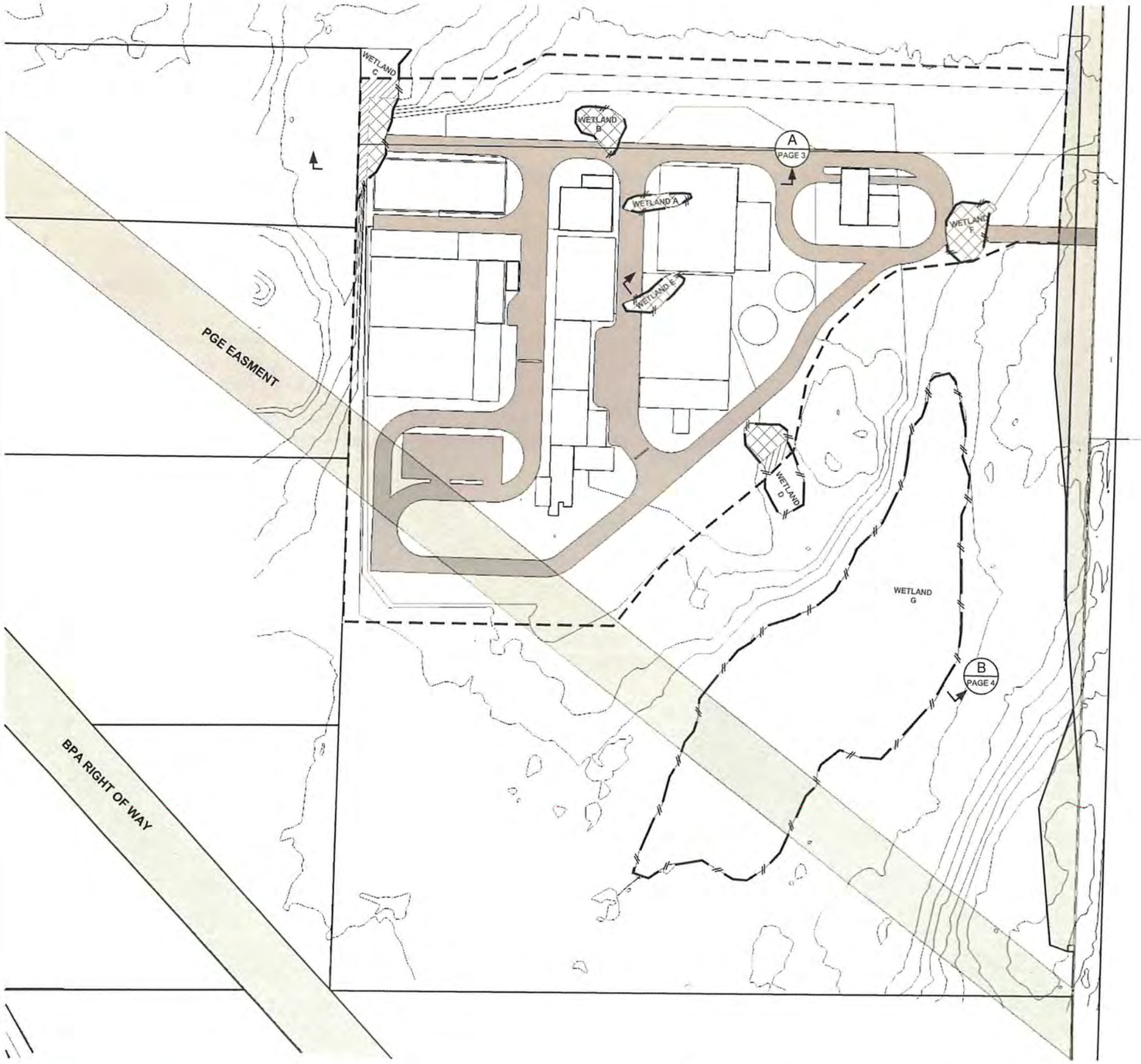
WILLAMETTE WATER SUPPLY PROGRAM
JANUARY 2017

scale: 1" = 150'

IF LINE IS NOT ONE INCH, SCALE ACCORDINGLY

INITIAL CONCEPT SUBJECT TO CHANGE

Willamette Water Supply
Our Reliable Water



N

CONTOUR INTERVAL - 8 FT

- APPROXIMATE WORK AREA LIMIT
- WETLANDS
- PERMANENT WETLAND IMPACT
- TEMPORARY WETLAND IMPACT
- PLANT ROADS
- WTP BUILDINGS
- TAXLOTS
- GRADE LINES

EXTENT OF WWSS WTP SITE

WILLAMETTE WATER SUPPLY PROGRAM
JANUARY 2017

scale: 1" = 200'

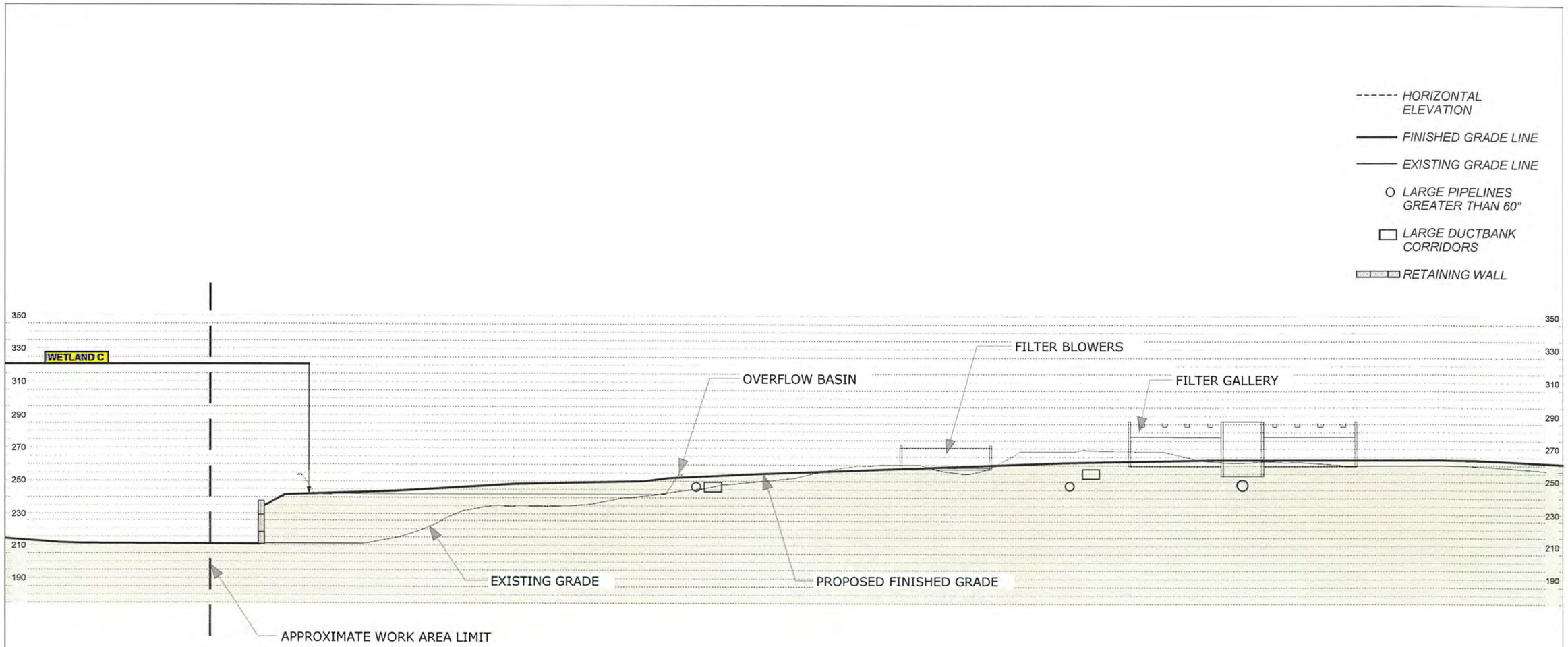
IF LINE IS NOT ONE INCH, SCALE ACCORDINGLY

INITIAL CONCEPT SUBJECT TO CHANGE

Willamette Water Supply
Our Reliable Water

Willamette Water Supply
Our Reliable Water

WTP 1.0



WWSS WTP SECTION A

PRELIMINARY

NOT FOR CONSTRUCTION

WILLAMETTE WATER SUPPLY PROGRAM

JANUARY 2017

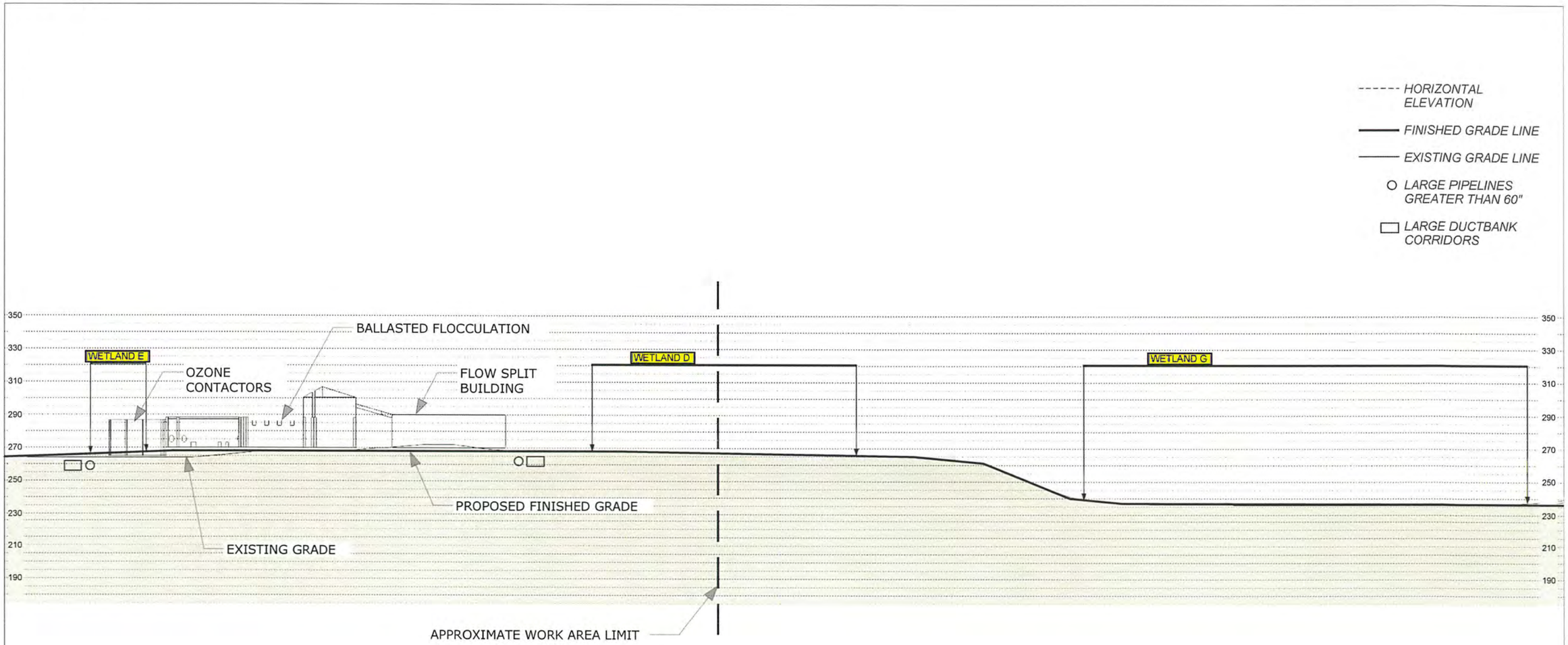
scale: 1" = 60'

IF LINE IS NOT ONE INCH, SCALE ACCORDINGLY

INITIAL CONCEPT SUBJECT TO CHANGE

Willamette Water Supply
Our Reliable Water

WTP 1.0



WWSS WTP SECTION B

PRELIMINARY

NOT FOR CONSTRUCTION

WILLAMETTE WATER SUPPLY PROGRAM

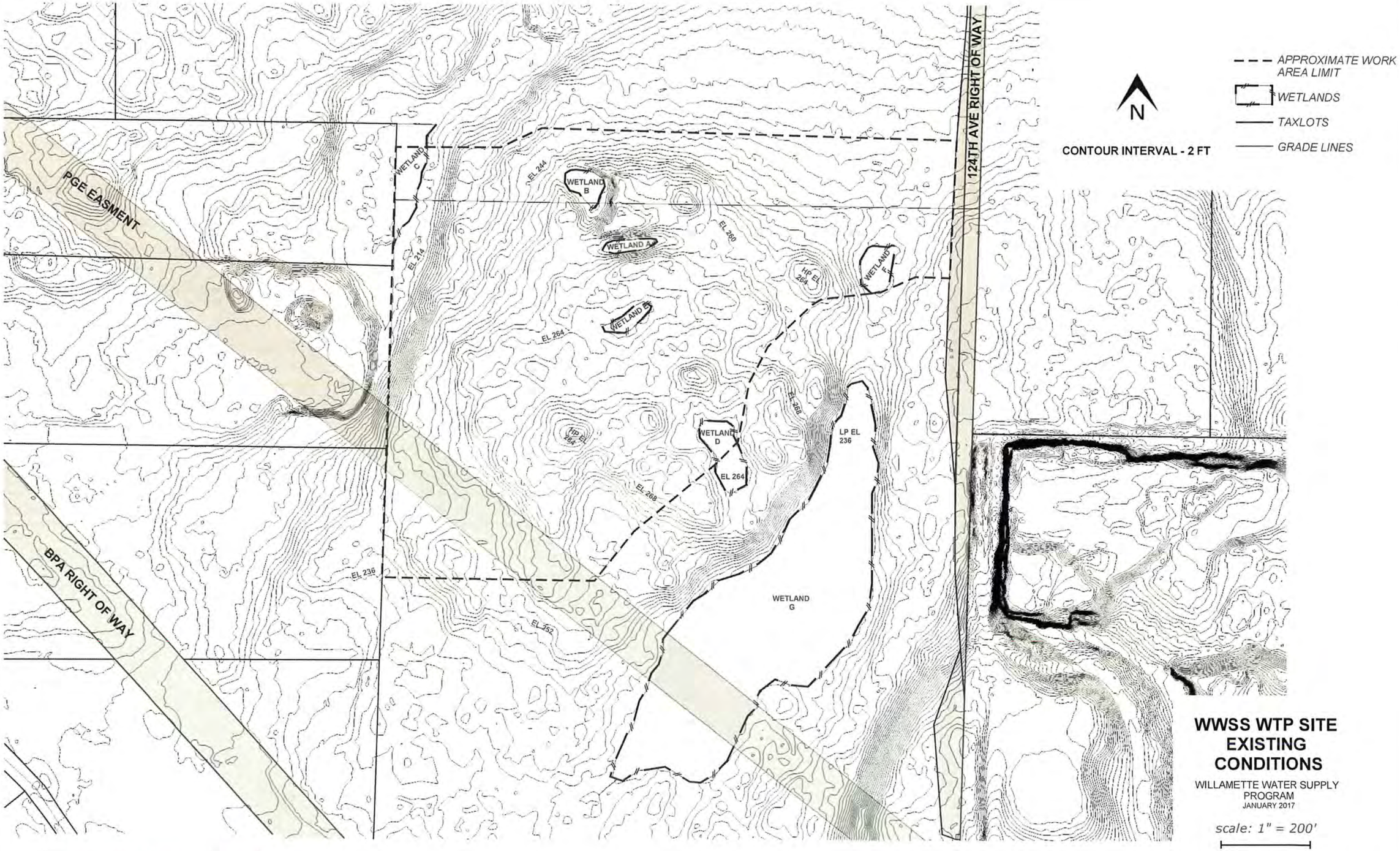
JANUARY 2017

scale: 1" = 60'

IF LINE IS NOT ONE INCH, SCALE ACCORDINGLY

INITIAL CONCEPT SUBJECT TO CHANGE

Willamette Water Supply
Our Reliable Water



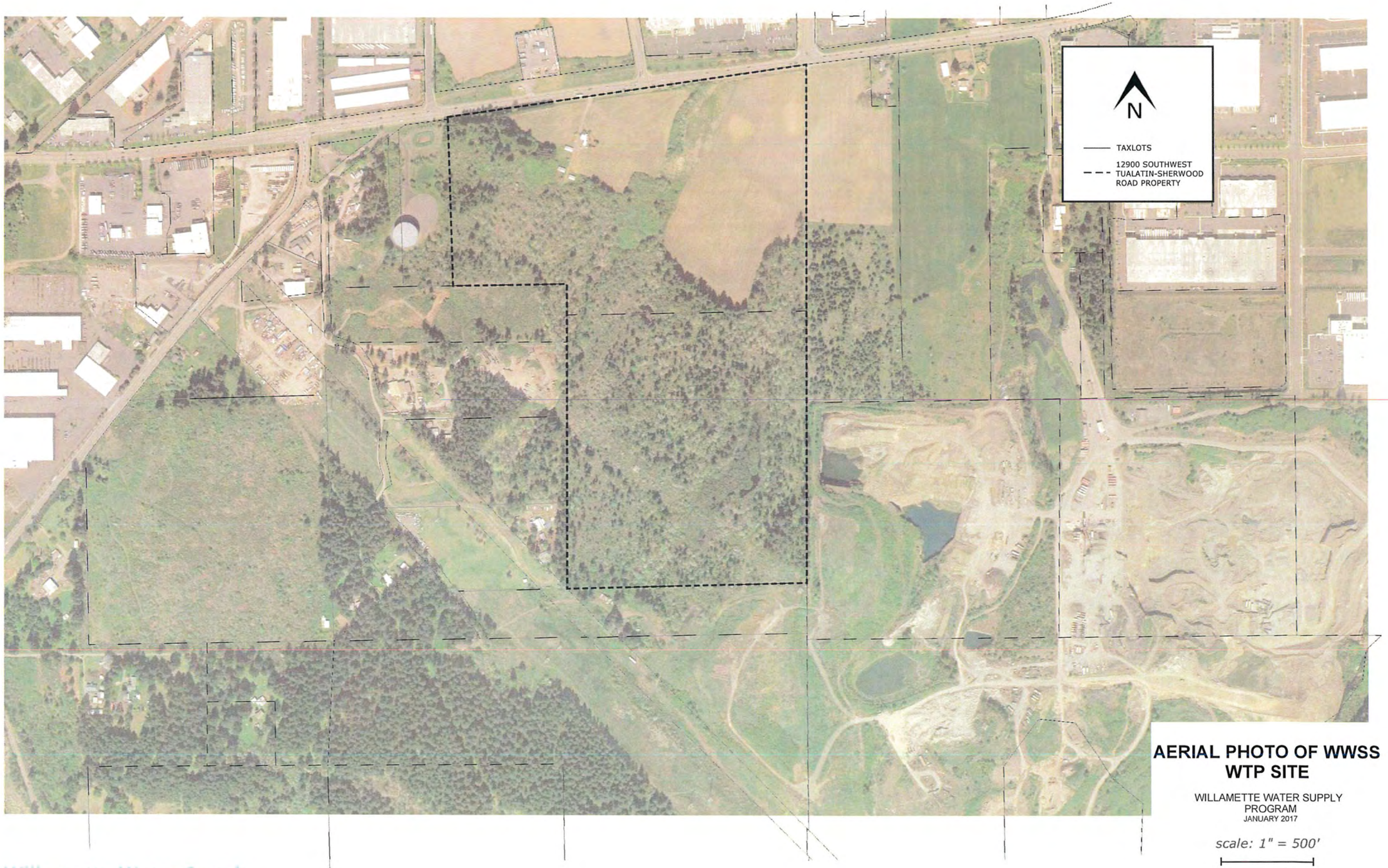
WWSS WTP SITE EXISTING CONDITIONS

WILLAMETTE WATER SUPPLY PROGRAM
JANUARY 2017

scale: 1" = 200'

IF LINE IS NOT ONE INCH, SCALE ACCORDINGLY

Willamette Water Supply
Our Reliable Water



AERIAL PHOTO OF WWSS WTP SITE

WILLAMETTE WATER SUPPLY PROGRAM
JANUARY 2017

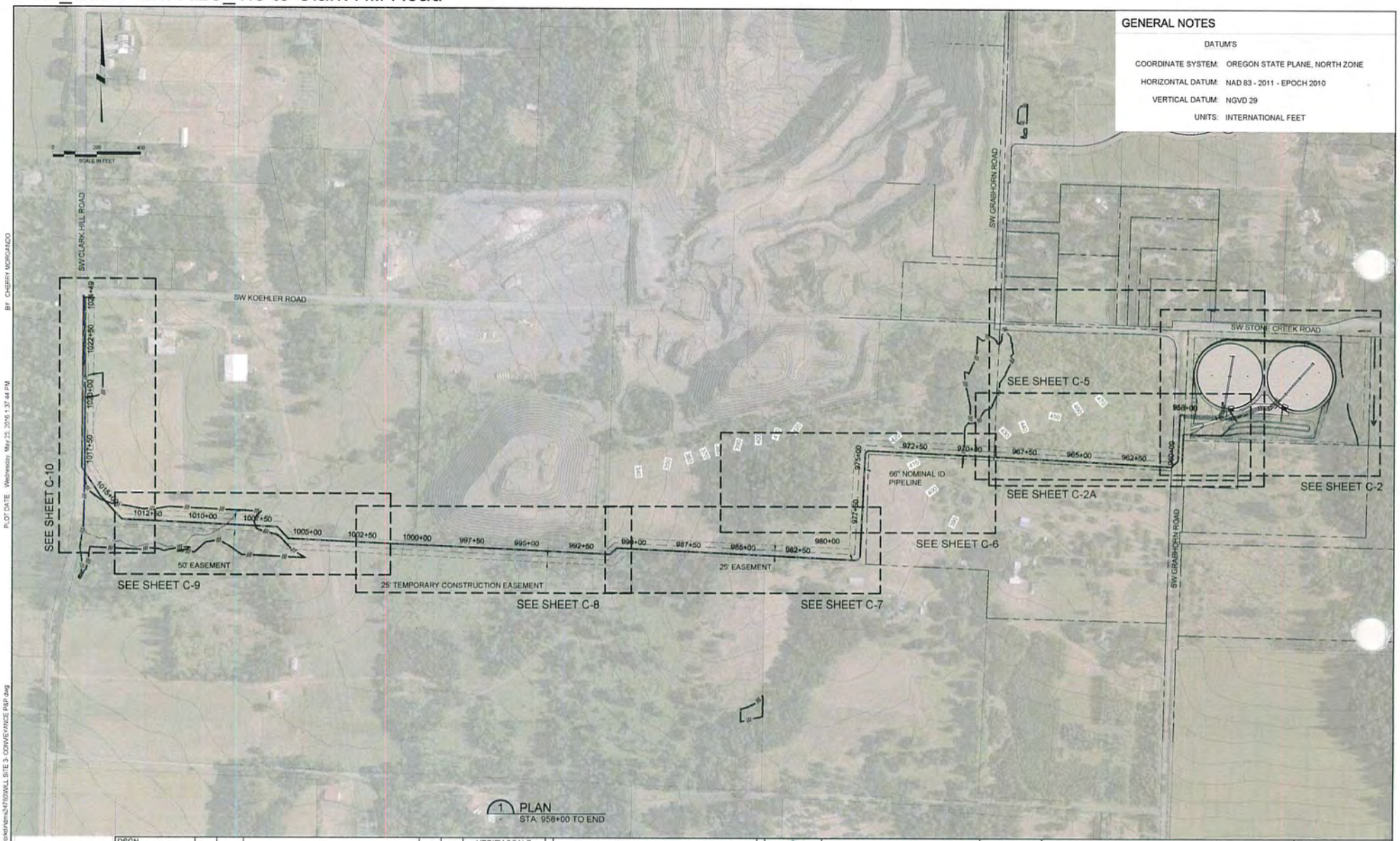
scale: 1" = 500'

IF LINE IS NOT ONE INCH, SCALE ACCORDINGLY

Willamette Water Supply
Our Reliable Water

Reservoir Facilities (RES_1.0) and Portion of Transmission Pipeline PLM_5.0 between RES_1.0 and SW Clark Hill Road

PLM_5.0: From RES_1.0 to Clark Hill Road



DSGN A. ODELL							VERIFY SCALE
DR J. CHAVEZ							BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.
CHK							
APVD	NO.	DATE	REVISION	BY	APVD		

PRELIMINARY DESIGN PHASE - OCTOBER 2016

NOT FOR CONSTRUCTION

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Willamette Water Supply
Our Reliable Water
WILLAMETTE WATER SUPPLY PROGRAM
TUALATIN STORAGE RESERVOIR STUDY

MWH.
Stantec

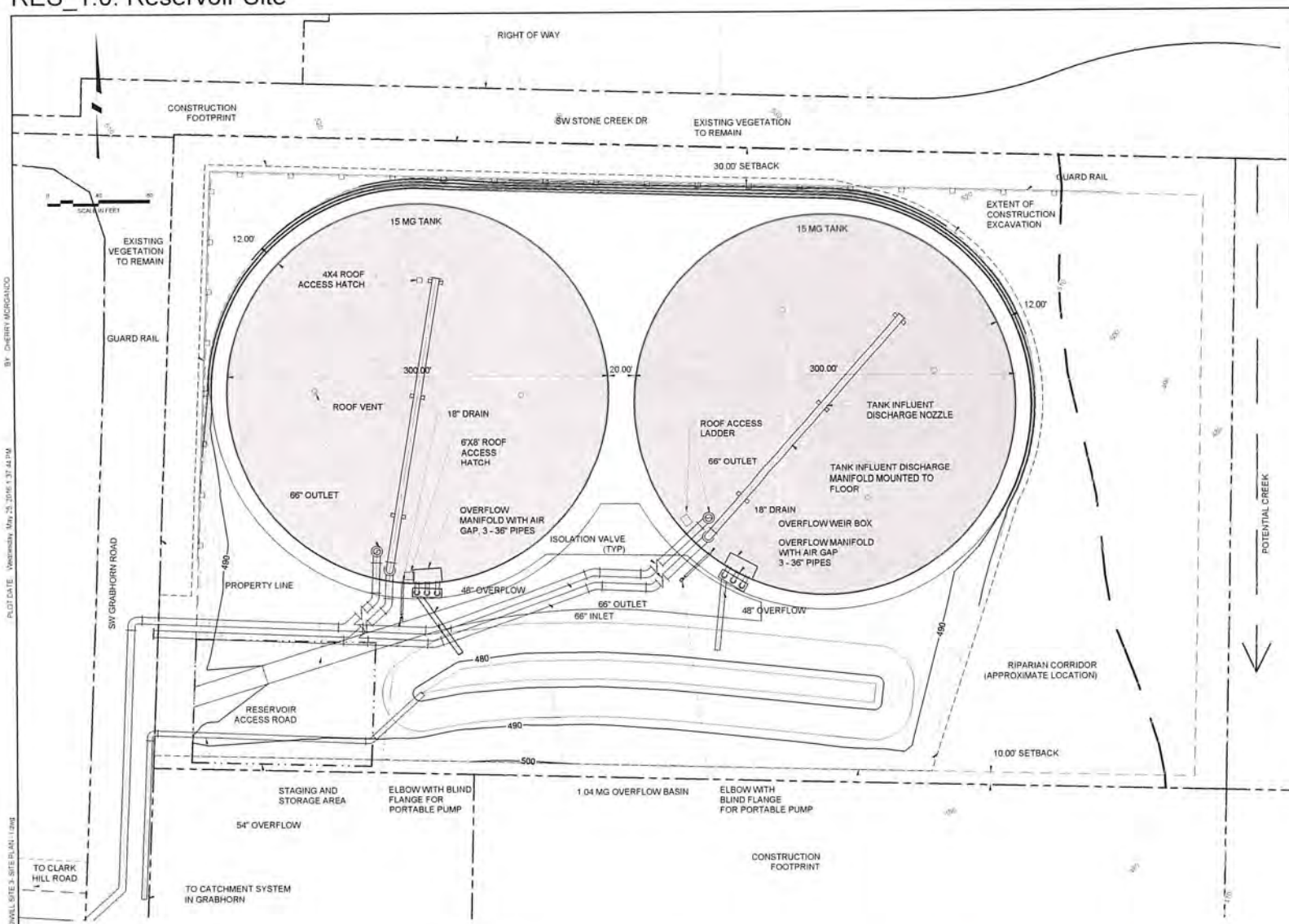
CIVIL
OVERALL SITE PLAN
PLM 5.0 FROM RES 1.0 TO CLARK HILL ROAD

SHEET	C-1
DWG	
DATE	09/16/2016
PROJ	PROJ

FILENAME: WILL SITE 3- CONVEYANCE P&P.DWGPLOT DATE AND TIME: 1/23/2017 9:32:06 AM

DWG FILE C:\pwworking\sms\34710\WILL SITE 3- CONVEYANCE P&P.dwg PLOT DATE Wednesday, May 25, 2016 1:37:44 PM BY CHERRY MORGANDO

RES_1.0: Reservoir Site



DESIGN CRITERIA

OVERFLOW EL 520
FLOOR EL 490
ROOF EL 525

VOLUMES
237,079.49 CY CUT 52.32 CY FILL

237,027.17 CY CUT (NET)

WETLAND NOTE:

1. PROPERTY HAS NOT BEEN DELINEATED. BASED ON NWI, SOILS, AND TOPOGRPAHY, THERE IS A LOW LIKELIHOOD FOR WETLANDS ON WESTERN 3/4 OF PROPERTY. THERE IS A HIGHER POTENTIAL FOR WETLANDS WITHIN THE RIPARIAN CORRIDOR.

DSGN A. ODELL							
DR J. CHAVEZ							
CHK							
APVD	NO.	DATE	REVISION	BY	APVD		

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

PRELIMINARY DESIGN PHASE - OCTOBER 2016

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Willamette Water Supply
Our Reliable Water
WILLAMETTE WATER SUPPLY PROGRAM
TUALATIN STORAGE RESERVOIR STUDY

MWH. Stantec

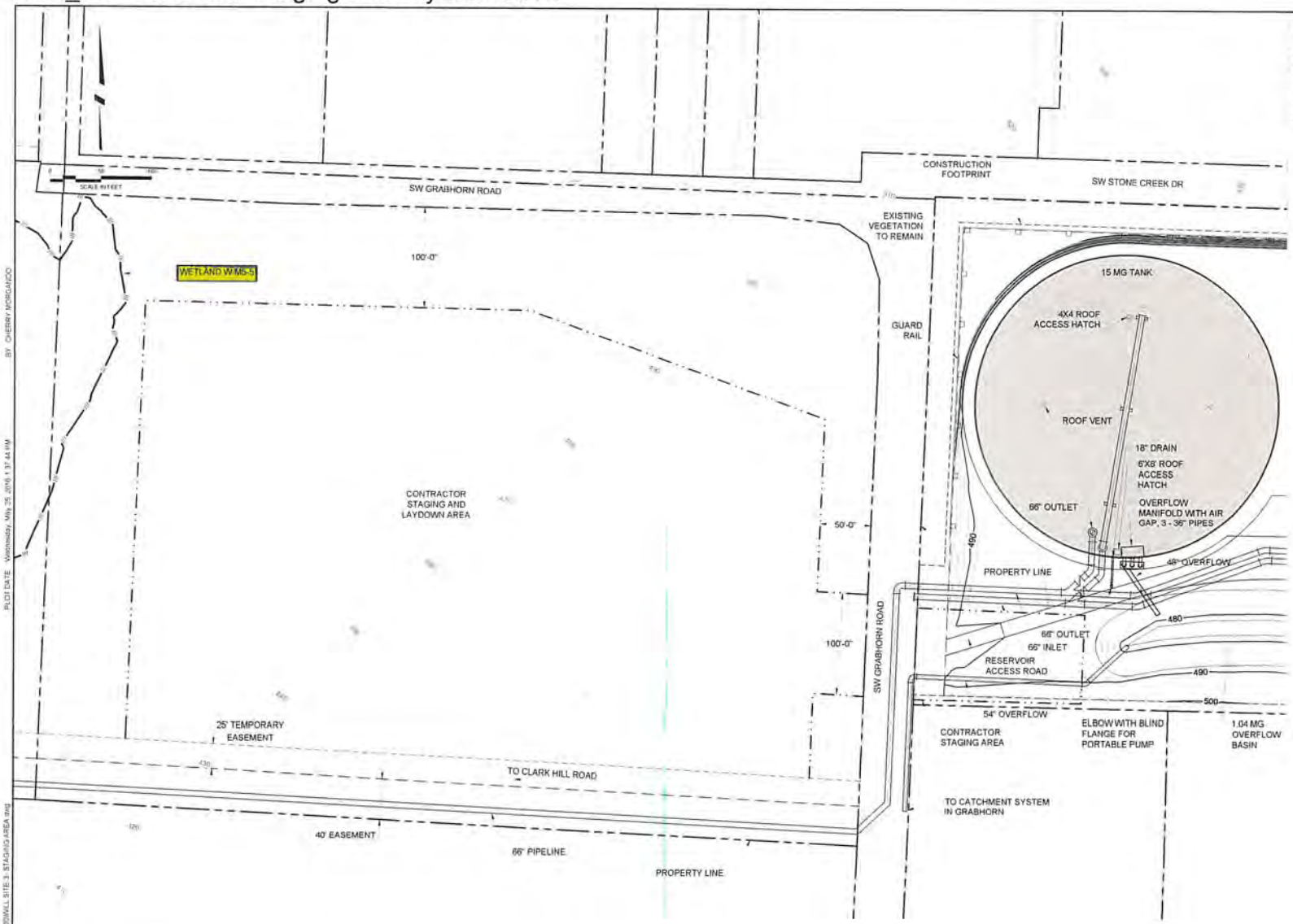
CIVIL
RESERVOIR SITE PLAN - I

SHEET	C-2
DWG	
DATE	09/16/2016
PROJ	PROJ

FILENAME: WILL SITE 3- SITE PLAN - I.DWG PLOT DATE AND TIME: 1/23/2017 8:03:21 AM

DWG FILE: C:\pwworking\sma247\d0\WILL SITE 3- SITE PLAN - I.dwg PLOT DATE: Wednesday, May 25, 2016 4:37:44 PM BY: CHERRY MORGANCO

RES_1.0: Contractor Staging and Laydown Area



DESIGN CRITERIA

OVERFLOW EL 520
FLOOR EL 490
ROOF EL 525

VOLUMES
237,079.49 CY CUT 52.32 CY FILL

237,027.17 CY CUT (NET)

DSGN A. ODELL							VERIFY SCALE
DR J. CHAVEZ							BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.
CHK							
APVD	NO.	DATE	REVISION	BY	APVD		

PRELIMINARY DESIGN PHASE - OCTOBER 2016

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Willamette Water Supply
Our Reliable Water
WILLAMETTE WATER SUPPLY PROGRAM
TUALATIN STORAGE RESERVOIR STUDY

MWH.
Stantec

CIVIL
RESERVOIR SITE PLAN
STAGING AREA

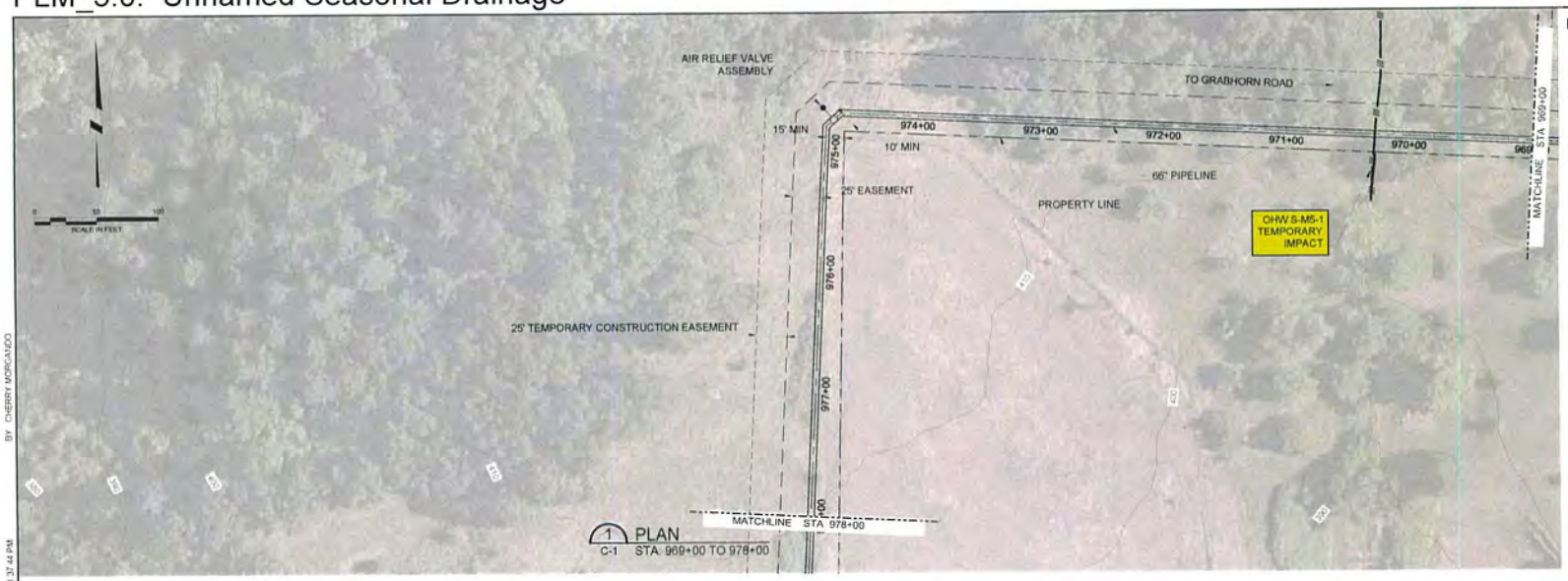
SHEET	C-2A
DWG	
DATE	09/16/2016
PROJ	PROJ

FILENAME: WILL SITE 3- STAGING AREA.DWG PLOT DATE AND TIME: 1/24/2017 10:55:50 AM

PLOT DATE Wednesday, May 25, 2016 1:37:44 PM BY CHERRY MORGANCO

DWG FILE C:\CAMWIND\PRINCATR\WILL SITE 3 STAGING AREA.dwg

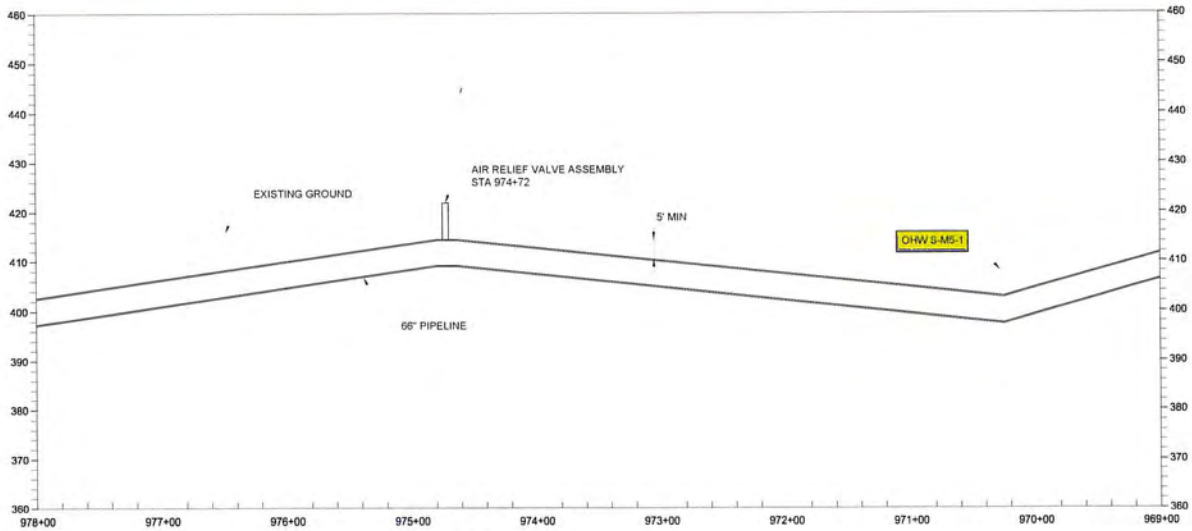
PLM_5.0: Unnamed Seasonal Drainage



1 PLAN
C-1 STA: 969+00 TO 978+00

LEGEND

- EXISTING CONTOURS
- PROPOSED CONTOURS
- PERMANENT EASEMENT
- TEMPORARY CONSTRUCTION EASEMENT
- OHW BOUNDARY
- W2-4 WETLAND DESCRIPTION



1 PROFILE
C-1 STA: 969+00 TO 978+00

DSGN A. ODELL							VERIFY SCALE
DR J. CHAVEZ							BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.
CHK							
APVD	NO.	DATE	REVISION	BY	APVD		

PRELIMINARY DESIGN PHASE - OCTOBER 2016

NOT FOR CONSTRUCTION

This document is an interim document and not suitable for construction. As an interim document, it may contain data that is potentially inaccurate or incomplete and is not to be relied upon without the express written consent of the preparer.

Willamette Water Supply Our Reliable Water
WILLAMETTE WATER SUPPLY PROGRAM
TUALATIN STORAGE RESERVOIR STUDY

MWH. now part of Stantec

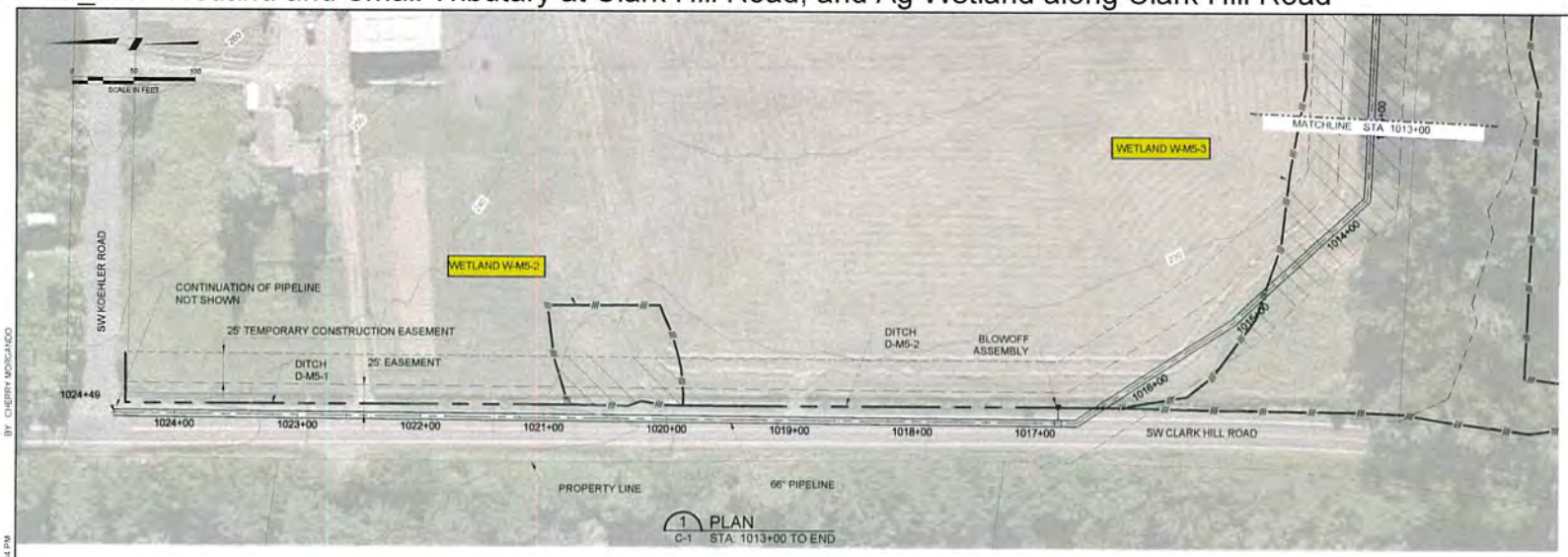
CIVIL
PLAN AND PROFILE - II
PLM 5.0 FROM RES 1.0 TO CLARK HILL ROAD

SHEET C-6
DWG
DATE 09/16/2016
PROJ PROJ

FILENAME: WILL SITE 3- CONVEYANCE P&P.DWGPLOT DATE AND TIME: 1/23/2017 9:16:09 AM

DWG FILE C:\pwworking\dms34760\WILL SITE 3- CONVEYANCE P&P.dwg PLOT DATE Wednesday, May 25, 2016 1:37:44 PM BY: CHERRY MORCAIDO

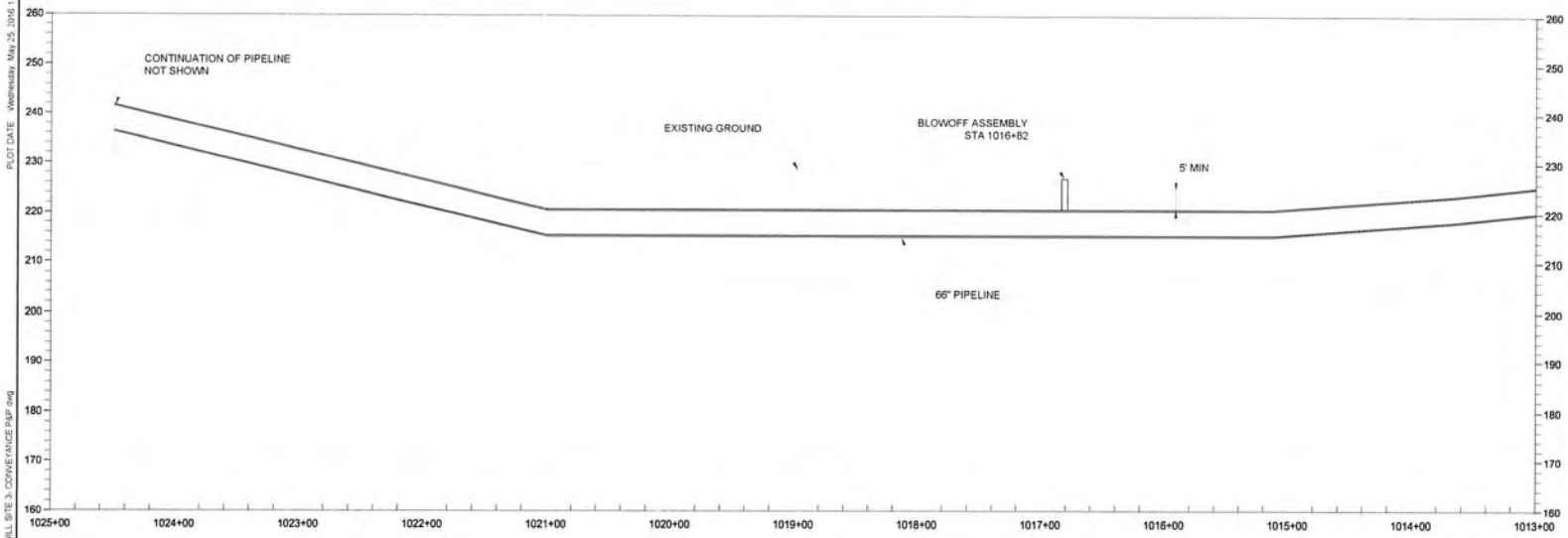
PLM_5.0: Wetland and Small Tributary at Clark Hill Road, and Ag Wetland along Clark Hill Road



1 PLAN
C-1 STA 1013+00 TO END

LEGEND

- EXISTING CONTOURS
- PROPOSED CONTOURS
- PERMANENT EASEMENT
- TEMPORARY CONSTRUCTION EASEMENT
- OHW BOUNDARY
- W2-4 WETLAND DESCRIPTION
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT
- TEMPORARY HIGHWATER IMPACT



1 PROFILE
C-1 STA 1013+00 TO END

DSGN A. ODELL							VERIFY SCALE
DR J. CHAVEZ							BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.
CHK							
APVD	NO.	DATE	REVISION	BY	APVD		

PRELIMINARY DESIGN PHASE - OCTOBER 2016

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WILLAMETTE WATER SUPPLY PROGRAM
TUALATIN STORAGE RESERVOIR STUDY

MWH. now part of Stantec

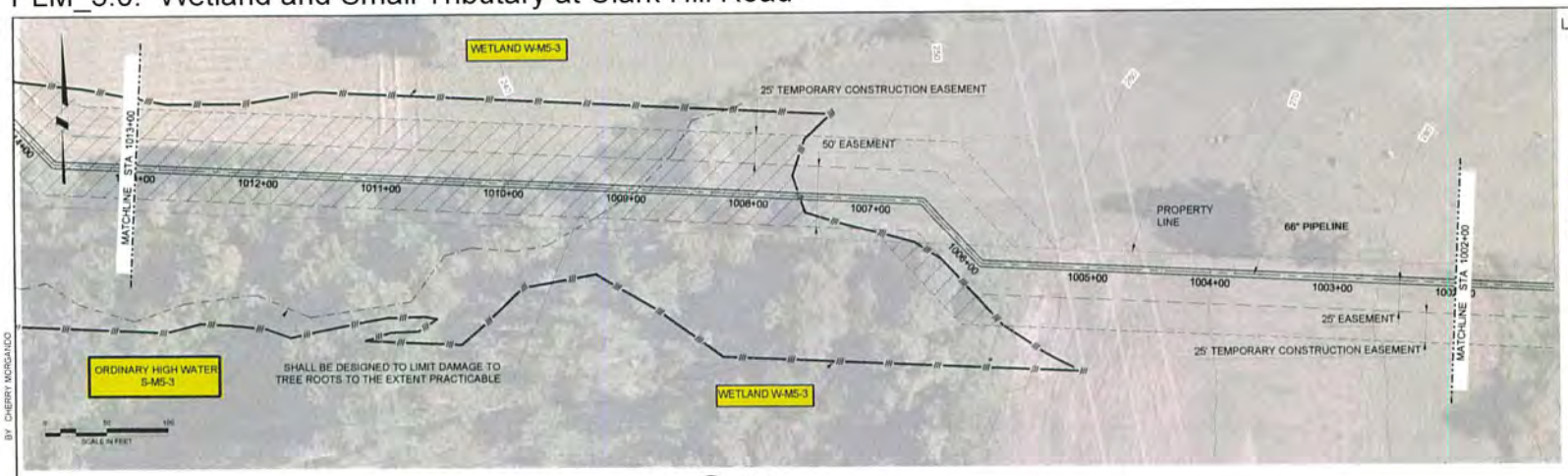
CIVIL
PLAN AND PROFILE - VI
PLM 5.0 FROM RES 1.0 TO CLARK HILL ROAD

SHEET	C-10
DWG	
DATE	09/16/2016
PROJ	PROJ

FILENAME: WILL SITE 3- CONVEYANCE P&P.DWGPLOT DATE AND TIME: 1/23/2017 9:16:09 AM

DWG FILE C:\pwworking\sms\24760\WILL SITE 3- CONVEYANCE P&P.dwg PLOT DATE Wednesday, May 25, 2016 1:37:44 PM BY: CHERRY MORCANDO

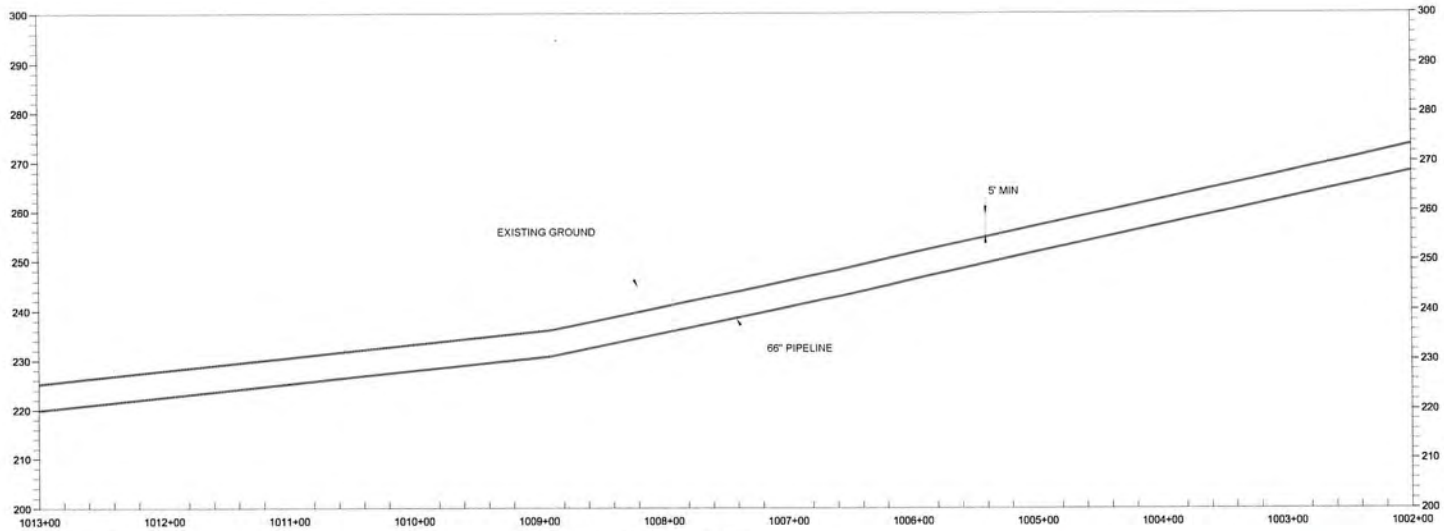
PLM_5.0: Wetland and Small Tributary at Clark Hill Road



LEGEND

- EXISTING CONTOURS
- PROPOSED CONTOURS
- PERMANENT EASEMENT
- TEMPORARY CONSTRUCTION EASEMENT
- OHW BOUNDARY
- W2-4 WETLAND DESCRIPTION
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT
- TEMPORARY HIGHWATER IMPACT

1 PLAN
C-1 STA: 1002+00 TO 1013+00



1 PROFILE
C-1 STA: 1002+00 TO 1013+00

DSGN A. ODELL							VERIFY SCALE
DR J. CHAVEZ							BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.
CHK							
APVD	NO.	DATE	REVISION	BY	APVD		

PRELIMINARY DESIGN PHASE - OCTOBER 2016

NOT FOR CONSTRUCTION

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Willamette Water Supply
Our Reliable Water
WILLAMETTE WATER SUPPLY PROGRAM
TUALATIN STORAGE RESERVOIR STUDY

MWH. now part of Stantec

CIVIL
PLAN AND PROFILE - V
PLM 5.0 FROM RES 1.0 TO CLARK HILL ROAD

SHEET	C-9
DWG	
DATE	09/16/2016
PROJ	PROJ

FILENAME: WILL SITE 3- CONVEYANCE P&P.DWGPLOT DATE AND TIME: 1/23/2017 9:16:09 AM

BY CHERRY MORGANCO

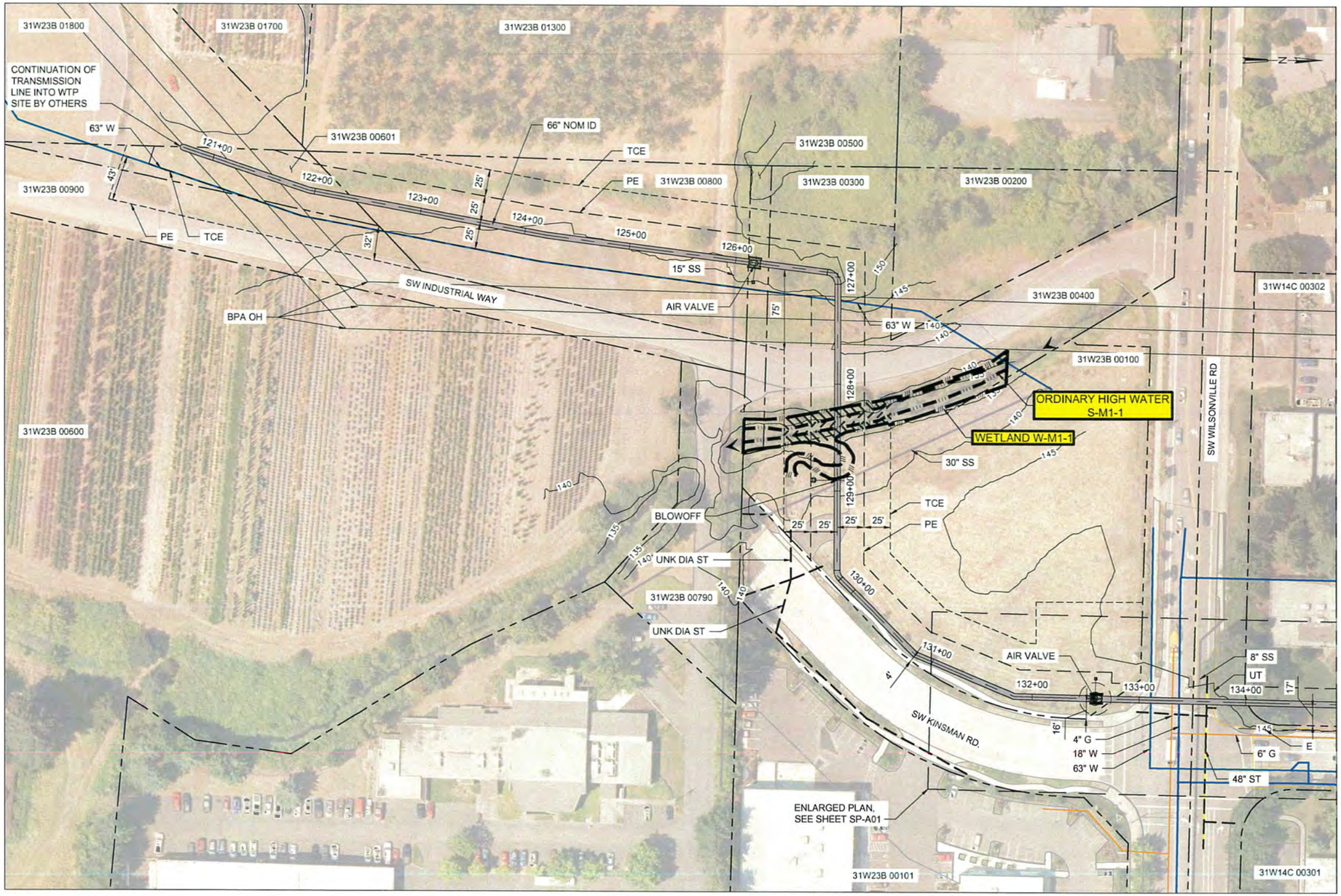
PLOT DATE Wednesday, May 25, 2016 1:37:44 PM

DWG FILE C:\pwworking\sfm\d478\WILL SITE 3- CONVEYANCE P&P.dwg

Transmission Pipelines

PLM 1.0

PLM _1.0: Coffee Lake Creek at Industrial Way



LEGEND (ORIGINALLY PRINTED IN COLOR) :

- PLANIMETRICS (FROM LIDAR)
- PAVEMENT (FROM LIDAR)
- 100 CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
- WWSP PROPOSED ALIGNMENT
- COMMUNICATION/UTILITY
- ELECTRICAL/UTILITY (OVERHEAD)
- ELECTRICAL/UTILITY (BURIED)
- GAS
- SANITARY
- STORM
- WATER
- PERMANENT EASEMENT (PE)
- TEMP CONSTRUCTION EASEMENT (TCE)
- FLOW DIRECTION
- ORDINARY HIGH WATER
- UPLAND DITCH
- WETLAND DITCH
- WETLAND BOUNDARY
- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT

NOTES:

1. SEE PRELIMINARY GEOTECHNICAL ANALYSIS MEMORANDUM, McMILLEN JACOBS & ASSOCIATE SEPTEMBER 2, 2015.
2. MAJOR UTILITIES ONLY IDENTIFIED CROSSING OR WITHIN 15 FEET OF PROPOSED WWSP PIPE.
3. IT IS ANTICIPATED THAT UTILITIES LOCATED WITHIN 2 PIPE DIAMETERS OF THE WWSP CENTERLINE WILL BE RELOCATED. VERIFY UTILITY LOCATIONS DURING FINAL DESIGN.
4. IT IS ANTICIPATED THAT UTILITIES LOCATED BETWEEN 2 AND 3 PIPE DIAMETERS OF THE WWSP CENTERLINE WILL BE SUPPORTED DURING CONSTRUCTION. UTILITIES NEED TO BE PHYSICALLY LOCATED DURING FINAL DESIGN.

PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN
MAIN STEM PLAN -
WATER TREATMENT PLANT TO KINSMAN -
STA 120+00

0 0.5" 1"

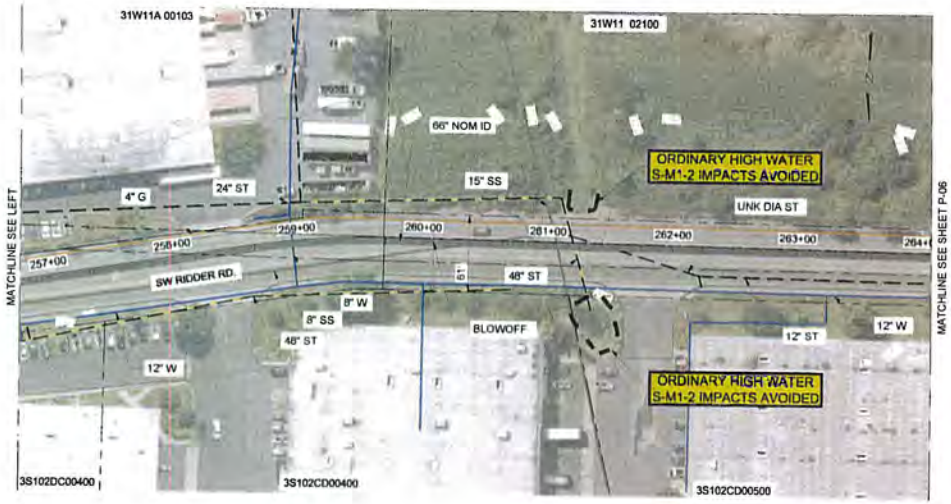
FILENAME	10002A60-P01.dwg
SCALE	AS SHOWN

P-01

10002A60-P01.DWG 2/9/2018 1:36:17 PM BBerg

PLM_1.0: Tapman Creek at SW Ridder Rd.

PLM 1.0



LEGEND (ORIGINALLY PRINTED IN COLOR)

- PLANIMETRICS (FROM LIDAR)
- PAVEMENT (FROM LIDAR)
- 100 CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
- WWSP PROPOSED ALIGNMENT
- COMMUNICATION/UTILITY
- ELECTRICAL/UTILITY (OVERHEAD)
- ELECTRICAL/UTILITY (BURIED)
- GAS
- SANITARY
- STORM
- WATER
- PERMANENT EASEMENT (PE)
- TEMP CONSTRUCTION EASEMENT (TCE)
- FLOW DIRECTION
- ORDINARY HIGH WATER
- UPLAND DITCH
- WETLAND DITCH
- WETLAND BOUNDARY
- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT

NOTES:

1. SEE PRELIMINARY GEOTECHNICAL ANALYSIS MEMORANDUM, McMILLEN JACOBS & ASSOCIATE SEPTEMBER 2, 2015.
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3. IT IS ANTICIPATED THAT UTILITIES LOCATED WITHIN 2 PIPE DIAMETERS OF THE WWSP CENTERLINE WILL BE RELOCATED. VERIFY UTILITY LOCATIONS DURING FINAL DESIGN.
4. IT IS ANTICIPATED THAT UTILITIES LOCATED BETWEEN 2 AND 3 PIPE DIAMETERS OF THE WWSP CENTERLINE WILL BE SUPPORTED DURING CONSTRUCTION. UTILITIES NEED TO BE PHYSICALLY LOCATED DURING FINAL DESIGN.

PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

0 0.5" 1"

FILENAME	10002A60-P05.dwg
SCALE	AS SHOWN

P-05

PLM 4.0

PLM_4.0: WQ Facility In-line with Tributary to Hedges Creek

PLM 4.0

LEGEND (ORIGINALLY PRINTED IN COLOR)

- PLANIMETRICS (FROM LIDAR)
- PAVEMENT (FROM LIDAR)
- 100 CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
- WWSP PROPOSED ALIGNMENT
- COMMUNICATION/UTILITY
- ELECTRICAL/UTILITY (OVERHEAD)
- ELECTRICAL/UTILITY (BURIED)
- GAS
- SANITARY
- STORM
- WATER
- PERMANENT EASEMENT (PE)
- TEMP CONSTRUCTION EASEMEN
- FLOW DIRECTION
- ORDINARY HIGH WATER
- UPLAND DITCH
- WETLAND DITCH
- WETLAND BOUNDARY
- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT

NOTES:

1. SEE PRELIMINARY GEOTECHNICAL ANALYSIS MEMORANDUM, M. MILLEN JACOBS ASSOCIATE SEPTEMBER 2, 2015.
2. MAJOR UTILITIES ONLY IDENTIFIED CROSSING OR WITHIN 15 FEET OF PROPOSED WWSP PIPE.
3. IT IS ANTICIPATED THAT UTILITIES LOCATED WITHIN 2 PIPE DIAMETERS OF THE WWSP CENTERLINE WILL BE RELOCATED. VERIFY UTILITY LOCATIONS DURING FINAL DESIGN.
4. IT IS ANTICIPATED TH UTILITIES LOCATED BE N 2 AND 3 PIPE DIAMETERS OF THE WWSP CENTERLINE WILL BE SUPPORTED DURING CONSTRUCTION. UTILITIES NEED TO BE PHYSICALLY LOCATED DURING FINAL DESIGN.
5. PIPELINE MAY RELOCATE IN SW GARDEN ACRES RD. IF ROW IS WIDENED IN THE FUTURE.

PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

0 0.5" 1"

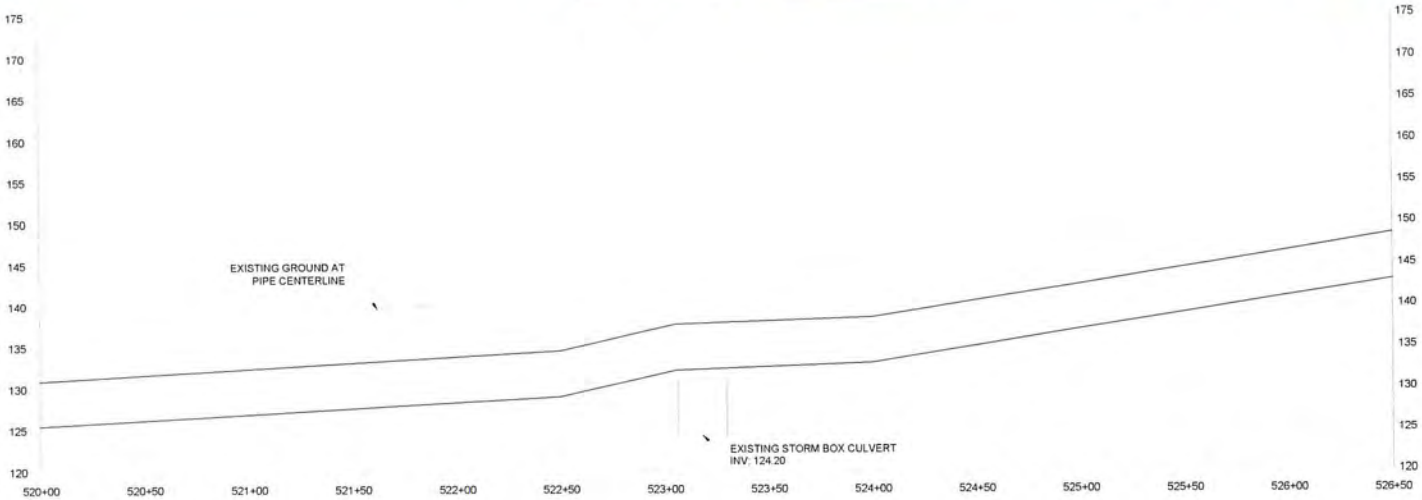
FILENAME	10002A60-P08.dwg
SCALE	AS SHOWN

P-08

PLM_4.0: Rock Creek at Tualatin-Sherwood Rd.

LEGEND (ORIGINALLY PRINTED IN COLOR) :

- 100 CONTOURS
- TAXLOTS
- WWSP PROPOSED ALIGNMENT
- COMMUNICATION/UTILITY
- ELECTRICAL/UTILITY (OVERHEAD)
- ELECTRICAL/UTILITY (BURIED)
- GAS
- SANITARY
- STORM
- WATER
- FENCE
- FLOW DIRECTION
- ORDINARY HIGH WATER
- UPLAND DITCH
- WETLAND DITCH
- WETLAND BOUNDARY
- W-2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT



N

NOTES:

1. UTILITIES SHOWN IN PLAN HAVE UNKNOWN DEPTHS AND ARE NOT SHOWN IN PROFILE

PROFILE

0 15 30 60

7.5

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

ROCK CREEK
OPEN-CUT INSTALLATION

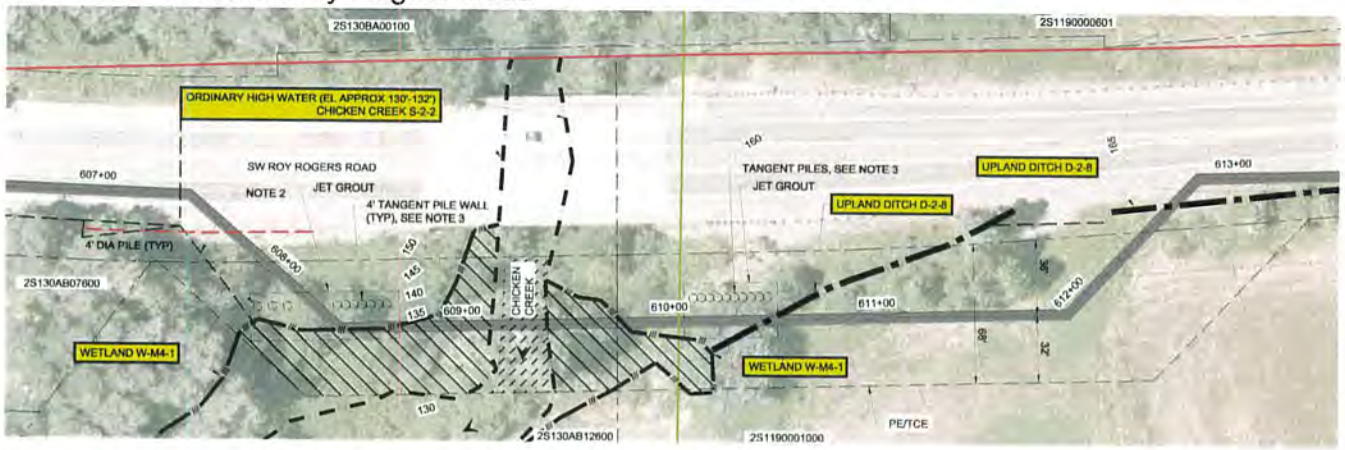
0 0.5" 1"

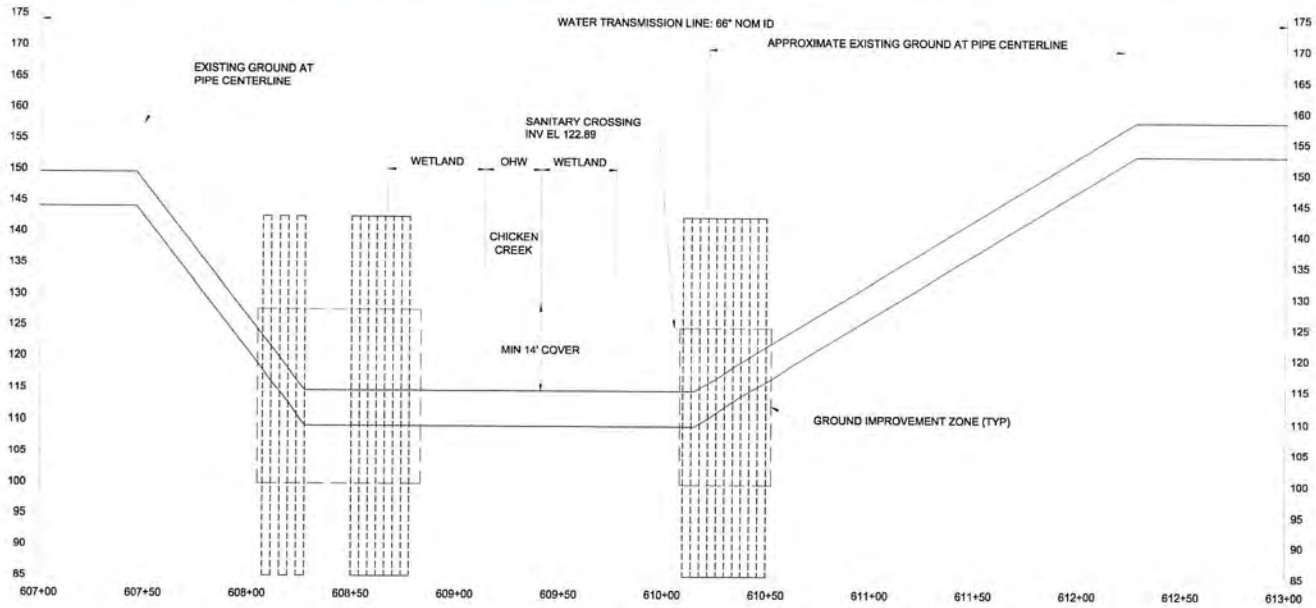
FILENAME	SP-B06.dwg
SCALE	AS SHOWN

SP-B06

PLM_4.0: Chicken Creek at Roy Rogers Road

PLM 4.0





LEGEND (ORIGINALLY PRINTED IN COLOR):

- 100 CONTOURS
- TAXLOTS
- WWSP PROPOSED ALIGNMENT
- ELECTRICAL/UTILITY (OVERHEAD)
- ELECTRICAL/UTILITY (BURIED)
- SANITARY
- STORM
- PERMANENT/TEMPORARY CONSTRUCTION EASEMENT (PE/TCE)
- FENCE
- FLOW DIRECTION
- ORDINARY HIGH WATER
- UPLAND DITCH
- WETLAND DITCH
- WETLAND BOUNDARY
- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT

NOTES:

1. UTILITIES SHOWN IN PLAN HAVE UNKNOWN DEPTHS AND ARE NOT SHOWN IN PROFILE
2. POTENTIAL RELOCATION OF 30" STORM OUTFALL
3. TANGENT PILES TO BE FLUSH WITH GRADE AT APPROXIMATELY 12' OFFSET FROM CENTER OF PILE TO PIPE CENTERLINE

PROFILE

0 15 30 60

10.0

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

CHICKEN CREEK
OPEN-CUT INSTALLATION

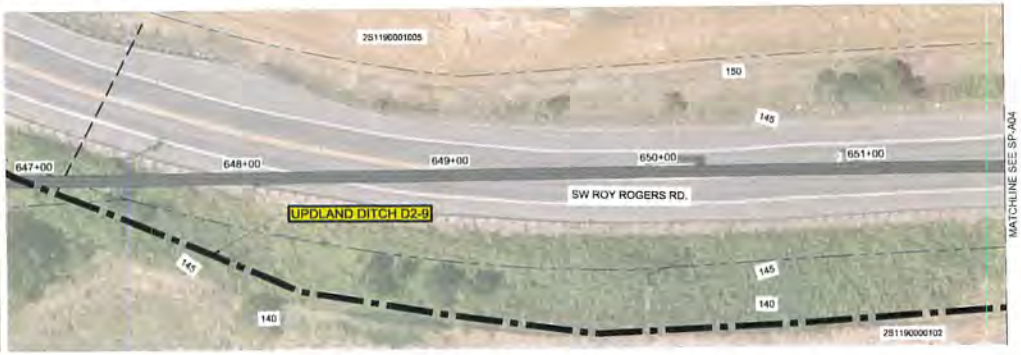
0 0.5" 1"

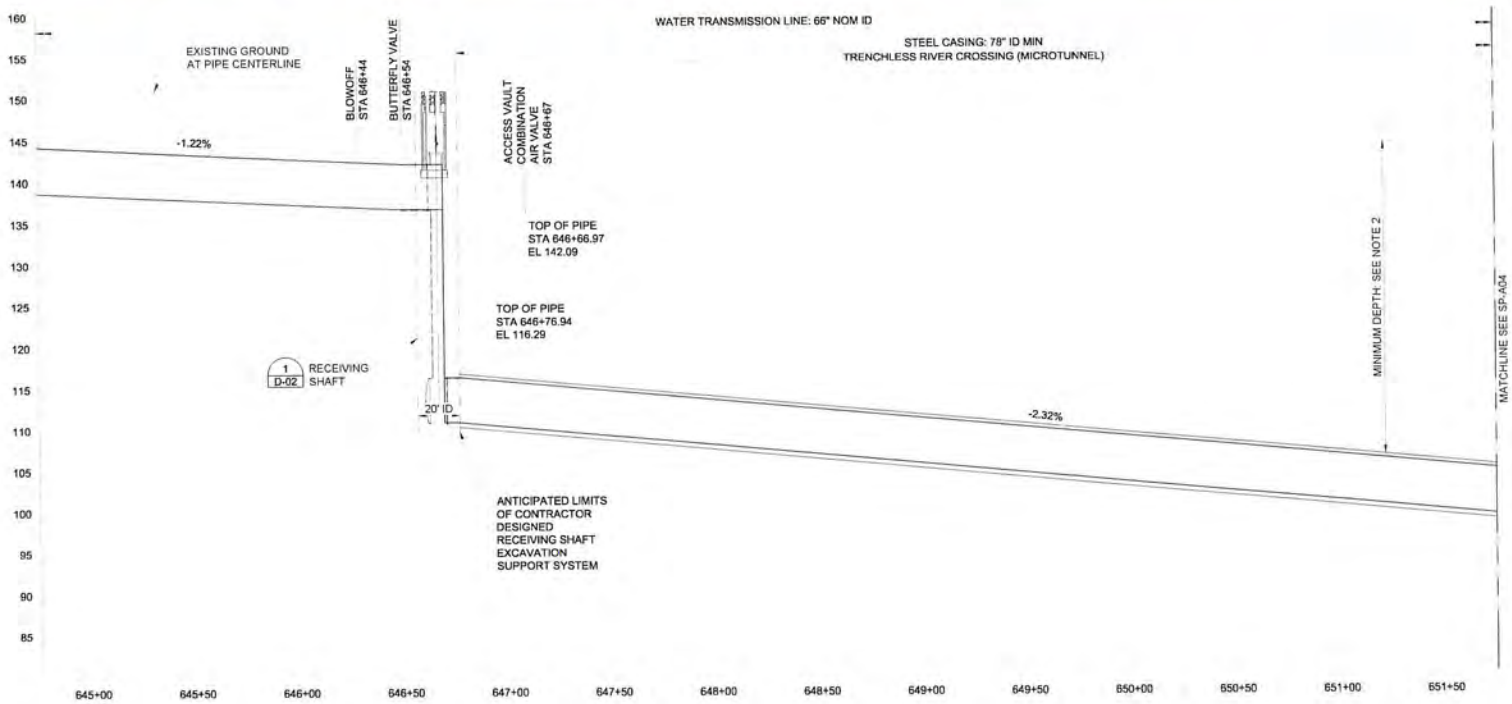
FILENAME	SP-A02.dwg
SCALE	AS SHOWN

SP-A02

PLM_4.0: Tualatin River at Roy Rogers Rd.

PLM 4.0





LEGEND (ORIGINALLY PRINTED IN COLOR) :

- PLANIMETRICS (FROM LIDAR)
- PAVEMENT (FROM LIDAR)
- 100 CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
- WWSP PROPOSED ALIGNMENT
- COMMUNICATION/UTILITY
- ELECTRICAL/UTILITY (OVERHEAD)
- ELECTRICAL/UTILITY (BURIED)
- GAS
- SANITARY
- STORM
- WATER
- PERMANENT EASEMENT (PE)
- TEMP CONSTRUCTION EASEMENT (TCE)
- FLOW DIRECTION
- ORDINARY HIGH WATER
- UPLAND DITCH
- WETLAND DITCH
- WETLAND BOUNDARY
- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT

ENLARGED PLAN 1 P-15

15 30 60

NOTES:

1. UTILITIES SHOWN IN PLAN HAVE UNKNOWN DEPTHS AND ARE NOT SHOWN IN PROFILE.
2. DEPTH BASED ON GEOTECHNICAL ENGINEER'S RECOMMENDATION OF APPROXIMATELY 20 FEET BELOW THE RIVER BOTTOM. LIQUEFIABLE SOILS EXTEND TO AN ELEVATION OF APPROXIMATELY 85 FEET AT THE RIVER AND APPROXIMATELY 90 FEET SOUTH OF THE RIVER.

PROFILE

0 15 30 60

7.5

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

0 0.5" 1"

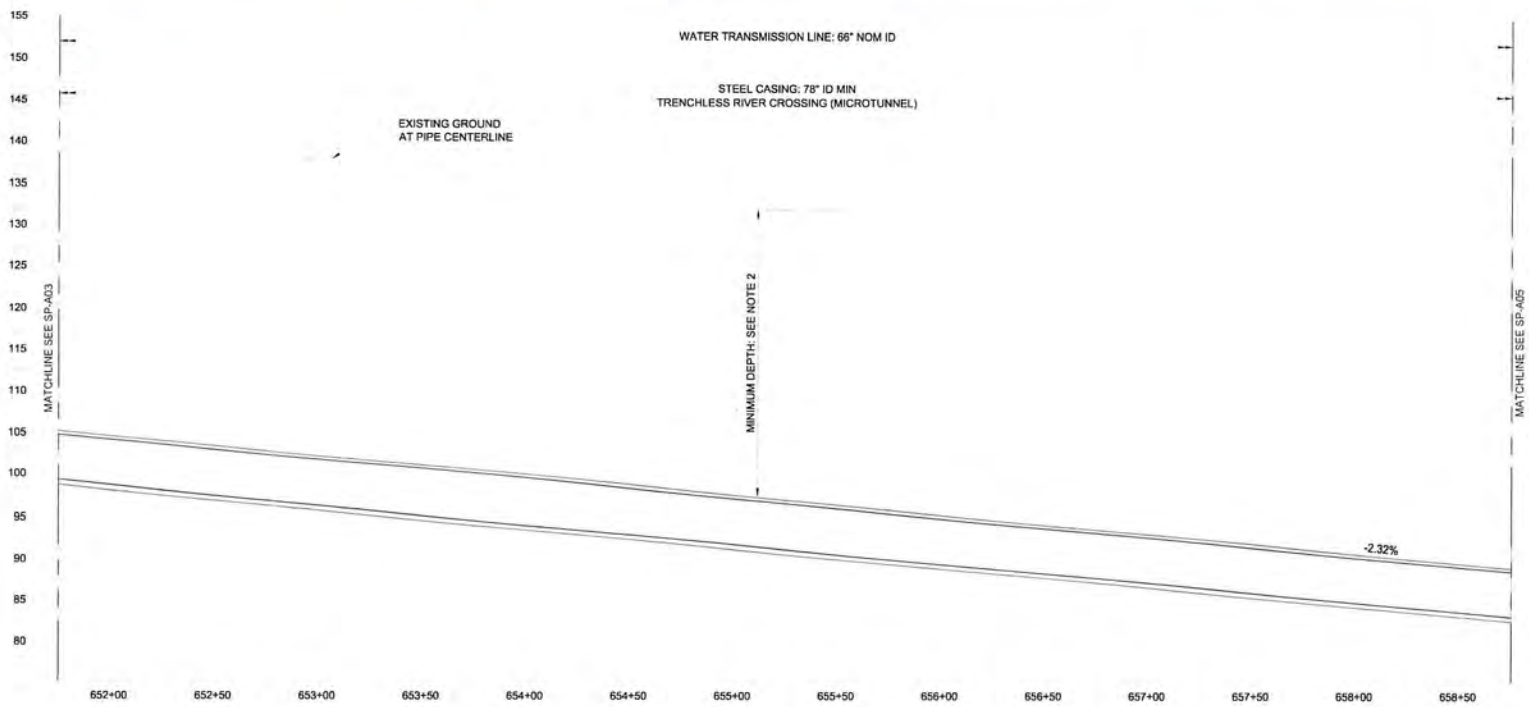
FILENAME 10002A60-SP-A03.dwg

SCALE AS SHOWN

SP-A03

PLM_4.0: Tualatin River at Roy Rogers Rd.

PLM 4.0



LEGEND (ORIGINALLY PRINTED IN COLOR):

- PLANIMETRICS (FROM LIDAR)
- PAVEMENT (FROM LIDAR)
- 100 CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
- WWSP PROPOSED ALIGNMENT
- COMMUNICATION/UTILITY
- ELECTRICAL/UTILITY (OVERHEAD)
- ELECTRICAL/UTILITY (BURIED)
- GAS
- SANITARY
- STORM
- WATER
- PERMANENT EASEMENT (PE)
- TEMP CONSTRUCTION EASEMEN.
- FLOW DIRECTION
- ORDINARY HIGH WATER
- UPLAND DITCH
- WETLAND DITCH
- WETLAND BOUNDARY
- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT

ENLARGED PLAN (P-15)

15 30 60

NOTES:

1. UTILITIES SHOWN IN PLAN HAVE UNKNOWN DEPTHS AND ARE NOT SHOWN IN PROFILE.
2. DEPTH BASED ON GEOTECHNICAL ENGINEER'S RECOMMENDATION OF APPROXIMATELY 20 FEET BELOW THE RIVER BOTTOM. LI: UEFIABLE SOILS EXTEND TO AN ELEVATION OF APPROXIMATELY 85 FEET AT THE RIVER AND APPROXIMATELY 90 FEET SOUTH OF THE RIVER.

PROFILE

0 15 30 60

7.5

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

0 0.5" 1"

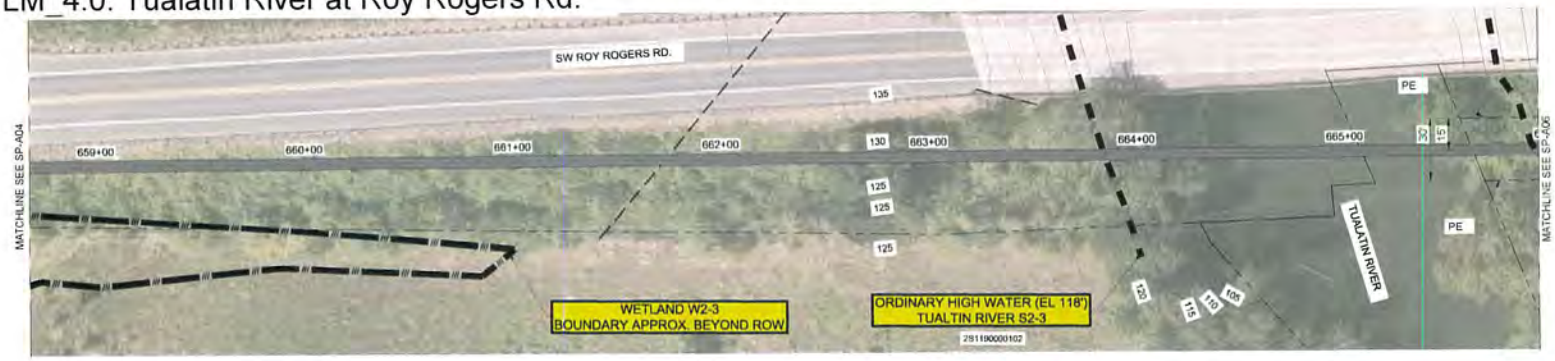
FILENAME 10002A60-SP-A04.dwg

SCALE AS SHOWN

SP-A04

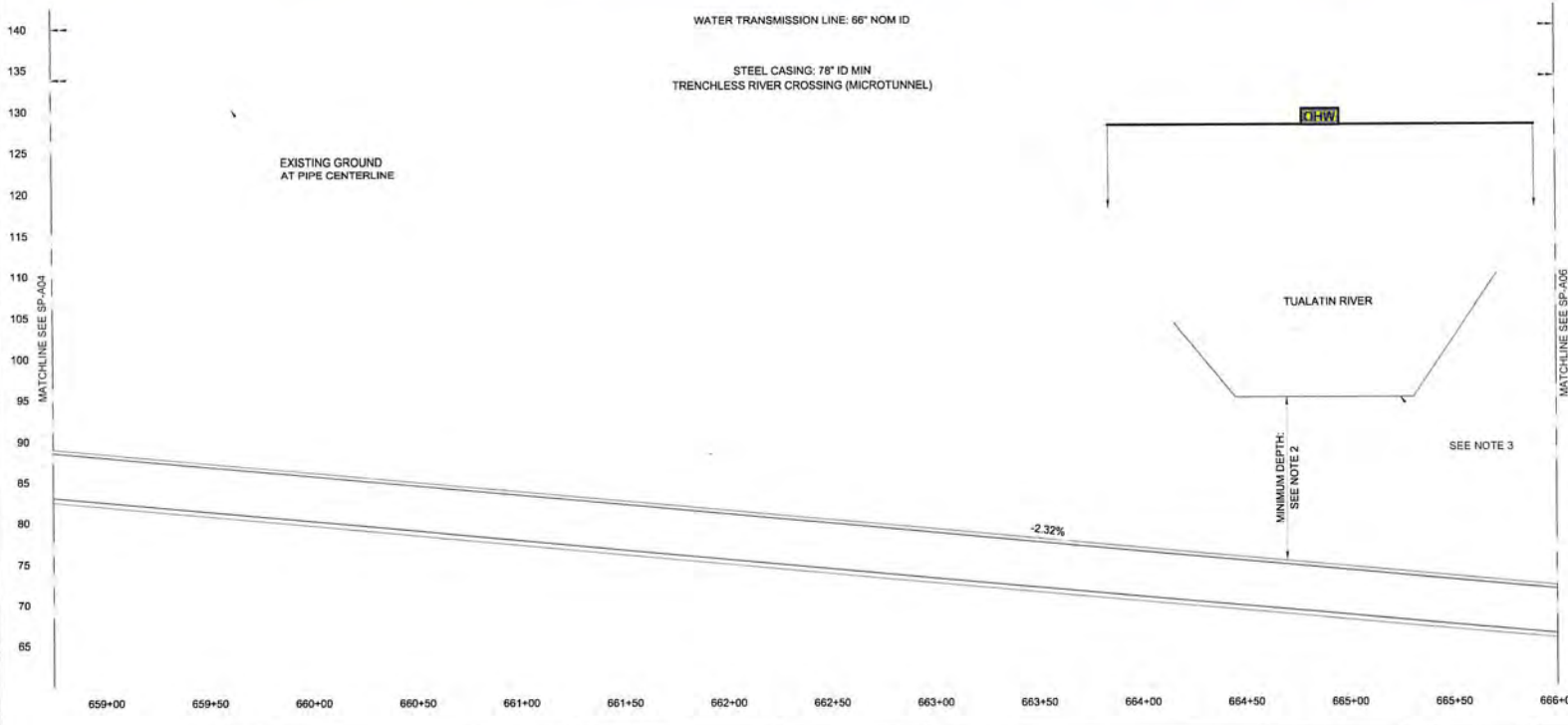
PLM_4.0: Tualatin River at Roy Rogers Rd.

PLM 4.0



LEGEND (ORIGINALLY PRINTED IN COLOR) :

- PLANIMETRICS (FROM LIDAR)
- PAVEMENT (FROM LIDAR)
- 100 CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
- WWSP PROPOSED ALIGNMENT
- COMMUNICATION/UTILITY
- ELECTRICAL/UTILITY (OVERHEAD)
- ELECTRICAL/UTILITY (BURIED)
- GAS
- SANITARY
- STORM
- WATER
- PERMANENT EASEMENT (PE)
- TEMP CONSTRUCTION EASEMENT (TCE)
- FLOW DIRECTION
- ORDINARY HIGH WATER
- UPLAND DITCH
- WETLAND DITCH
- WETLAND BOUNDARY
- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT



ENLARGED PLAN

0 15 30 60

P-15
P-16

NOTES:

1. UTILITIES SHOWN IN PLAN HAVE UNKNOWN DEPTHS AND ARE NOT SHOWN IN PROFILE.
2. DEPTH BASED ON GEOTECHNICAL ENGINEER'S RECOMMENDATION OF APPROXIMATELY 20 FEET BELOW THE RIVER BOTTOM. LI: UEFIABLE SOILS EXTEND TO AN ELEVATION OF APPROXIMATELY 85 FEET AT THE RIVER AND APPROXIMATELY 90 FEET SOUTH OF THE RIVER .
3. DEPTH OF RIVER APPROXIMATED FROM GEOTECHNICAL SEISMIC TRENCHLESS RECOMMENDATION.

PROFILE

0 15 30 60

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

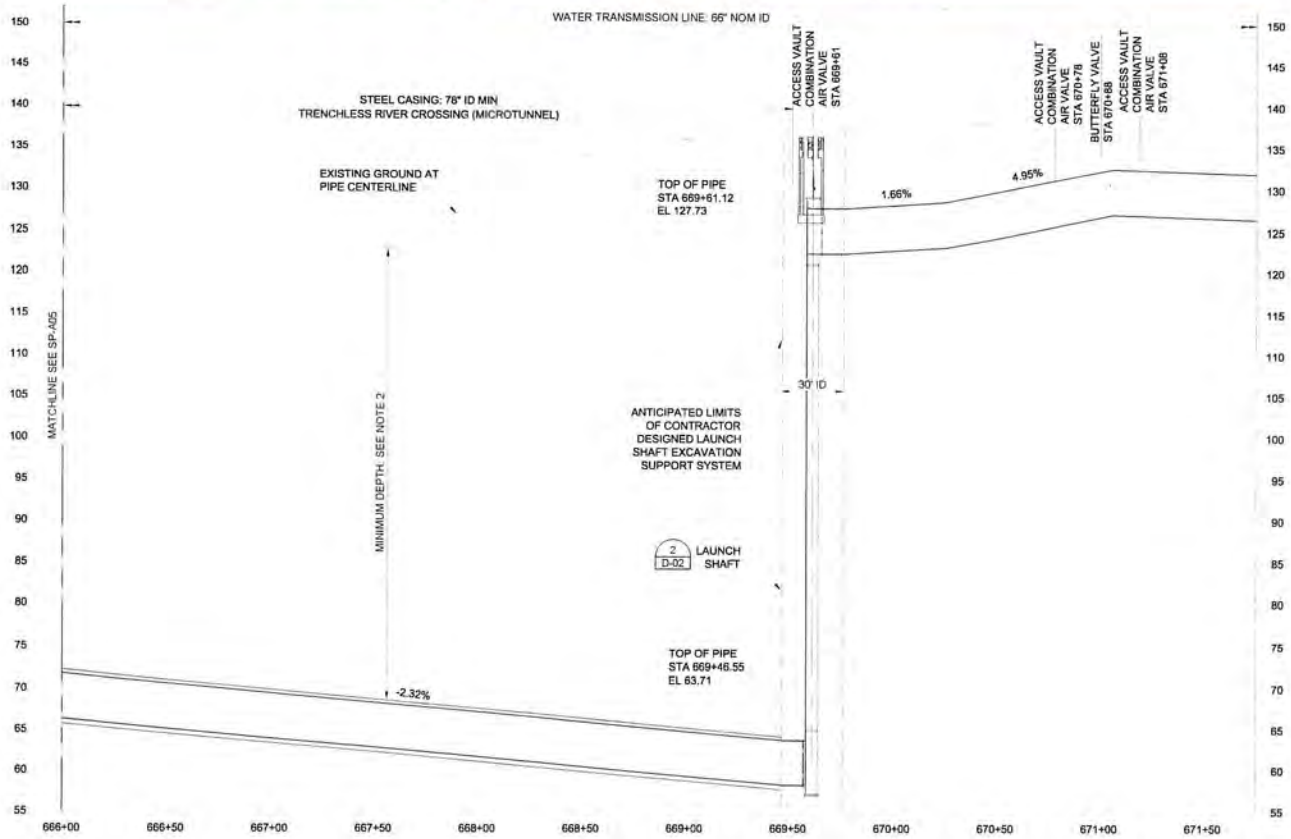
0 0.5" 1"

FILENAME	10002A60-SP-A05.dwg
SCALE	AS SHOWN

SP-A05

PLM_4.0: Tualatin River at Roy Rogers Rd.

PLM 4.0



LEGEND (ORIGINALLY PRINTED IN COLOR)

- PLANIMETRICS (FROM LIDAR)
- PAVEMENT (FROM LIDAR)
- 100 CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
- WWSP PROPOSED ALIGNMENT
- COMMUNICATION/UTILITY
- ELECTRICAL/UTILITY (OVERHEAD)
- ELECTRICAL/UTILITY (BURIED)
- GAS
- SANITARY
- STORM
- WATER
- PERMANENT EASEMENT (PE)
- TEMP CONSTRUCTION EASEMEN.
- FLOW DIRECTION
- ORDINARY HIGH WATER
- UPLAND DITCH
- WETLAND DITCH
- WETLAND BOUNDARY
- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT

ENLARGED PLAN (P-16)

0 15 30 60

NOTES:

1. UTILITIES SHOWN IN PLAN HAVE UNKNOWN DEPTHS AND ARE NOT SHOWN IN PROFILE.
2. DEPTH BASED ON GEOTECHNICAL ENGINEER'S RECOMMENDATION OF APPROXIMATELY 20 FEET BELOW THE RIVER BOTTOM. LIQUEFIABLE SOILS EXTEND TO AN ELEVATION OF APPROXIMATELY 85 FEET AT THE RIVER AND APPROXIMATELY 90 FEET SOUTH OF THE RIVER.
3. RELOCATE UTILITY POLE AND OVERHEAD UTILITY LINES PRIOR TO SHAFT CONSTRUCTION.

PROFILE

0 15 30 60

7.5

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

0 0.5" 1"

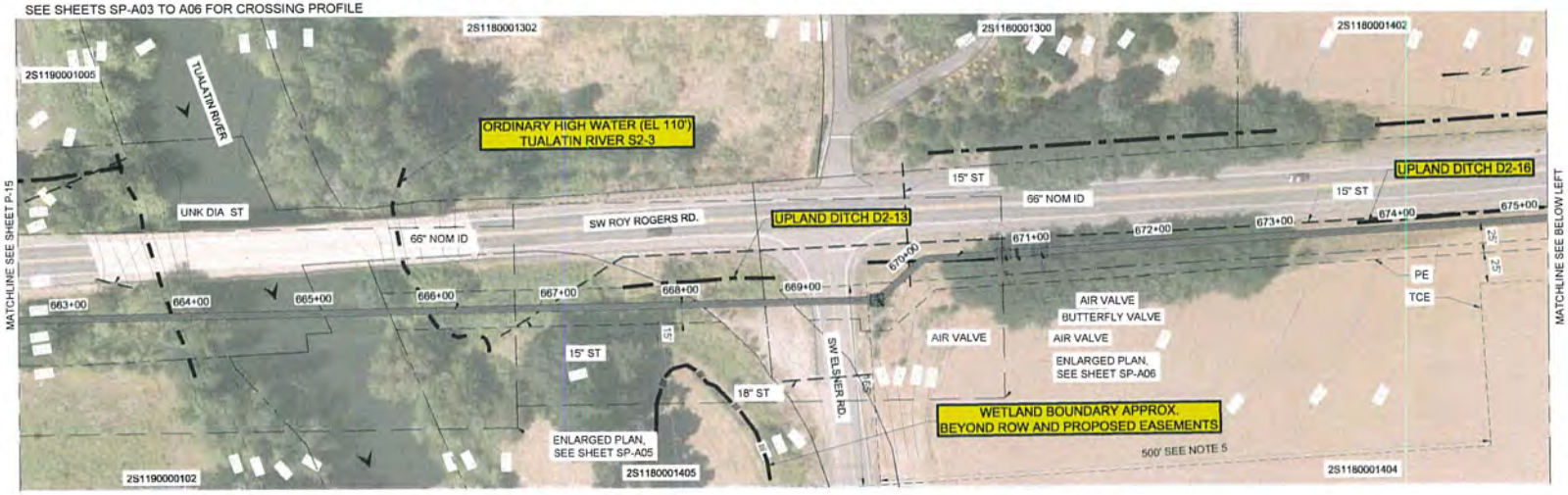
FILENAME	10002A60-SP-A06.dwg
SCALE	AS SHOWN

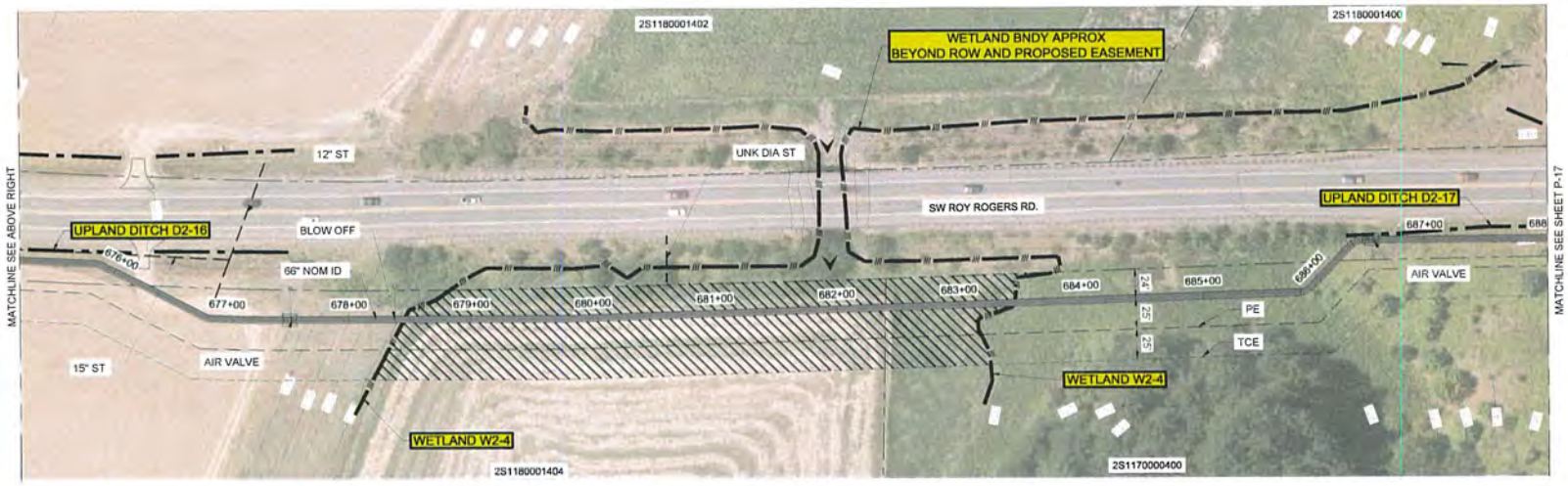
SP-A06

PLM_4.0: Tualatin River at Roy Rogers Rd. and Wetland North of Elsner Road

PLM 4.0

SEE SHEETS SP-A03 TO A06 FOR CROSSING PROFILE





LEGEND (ORIGINALLY PRINTED IN COLOR):

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- PAVEMENT (FROM LIDAR)
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- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT

NOTES:

1. SEE PRELIMINARY GEOTECHNICAL ANALYSIS MEMORANDUM, M. MILLEN JACOBS ASSOCIATE SEPTEMBER 2, 2015.
2. MAJOR UTILITIES ONLY IDENTIFIED CROSSING OR WITHIN 15 FEET OF PROPOSED WWSP PIPE.
3. IT IS ANTICIPATED THAT UTILITIES LOCATED WITHIN 2 PIPE DIAMETERS OF THE WWSP CENTERLINE WILL BE RELOCATED. VERIFY UTILITY LOCATIONS DURING FINAL DESIGN.
4. IT IS ANTICIPATED THAT UTILITIES LOCATED BETWEEN 2 AND 3 PIPE DIAMETERS OF THE WWSP CENTERLINE WILL BE SUPPORTED DURING CONSTRUCTION. UTILITIES NEED TO BE PHYSICALLY LOCATED DURING FINAL DESIGN.
5. ANTICIPATED STAGING LIMITS.

PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

0 0.5" 1"

FILENAME	10002A60-P16.dwg
SCALE	AS SHOWN

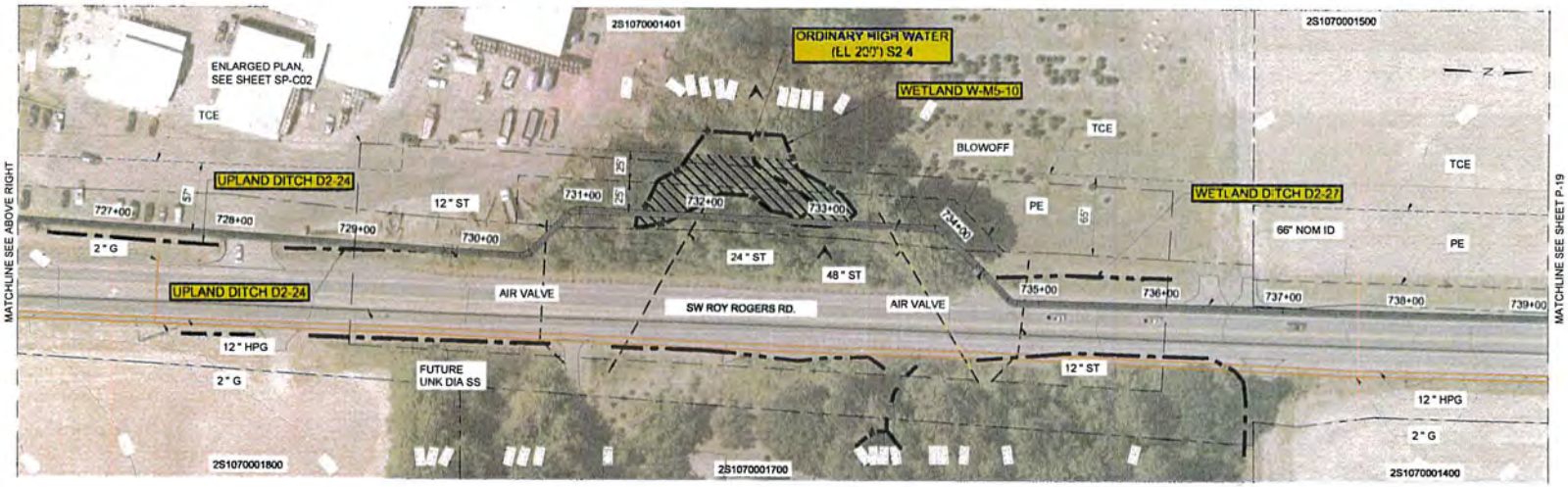
P-16

PLM 5.0

(see Reservoir Facilities figures for portion of PLM 5.0 between RES_1.0 westward to Clark Hill Road)

PLM_5.0: Drainage North of Beef Bend Road #1

PLM 5.0



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PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

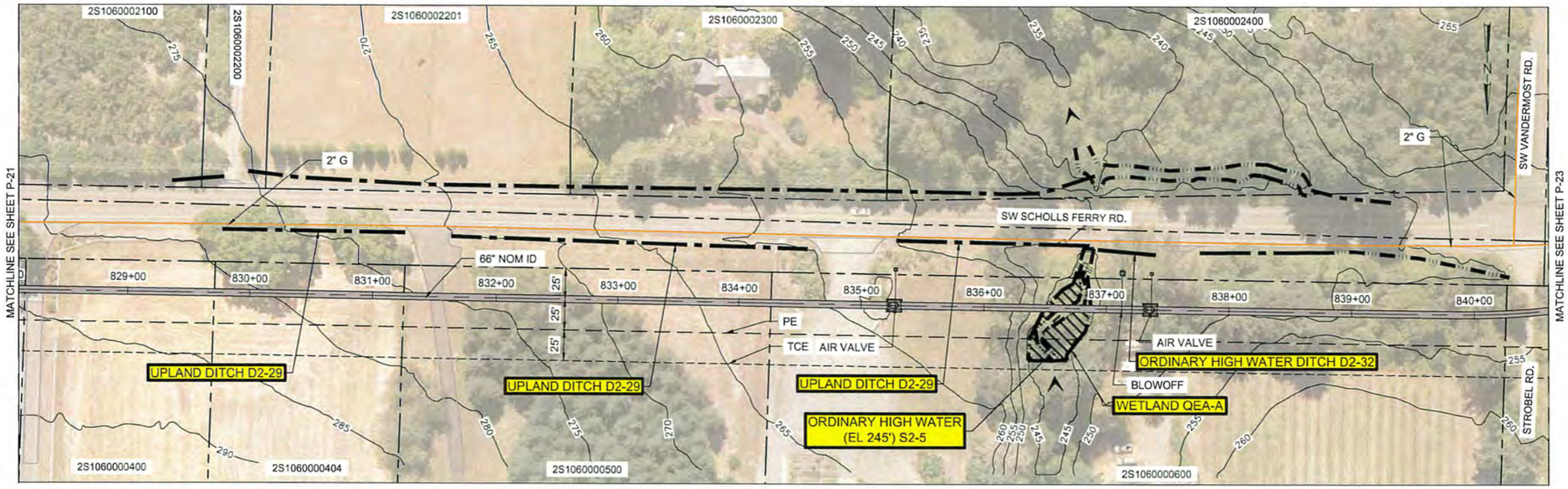
0 0.5" 1"

FILENAME	10002A60-P18.dwg
SCALE	AS SHOWN

P-18

PLM 5.0

PLM_5.0: Creek Crossings at Scholls Ferry RD near Vandermost Road



LEGEND (ORIGINALLY PRINTED IN COLOR) :

- PLANIMETRICS (FROM LIDAR)
- PAVEMENT (FROM LIDAR)
- 100 CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
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NOTES:

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PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

0 0.5" 1"

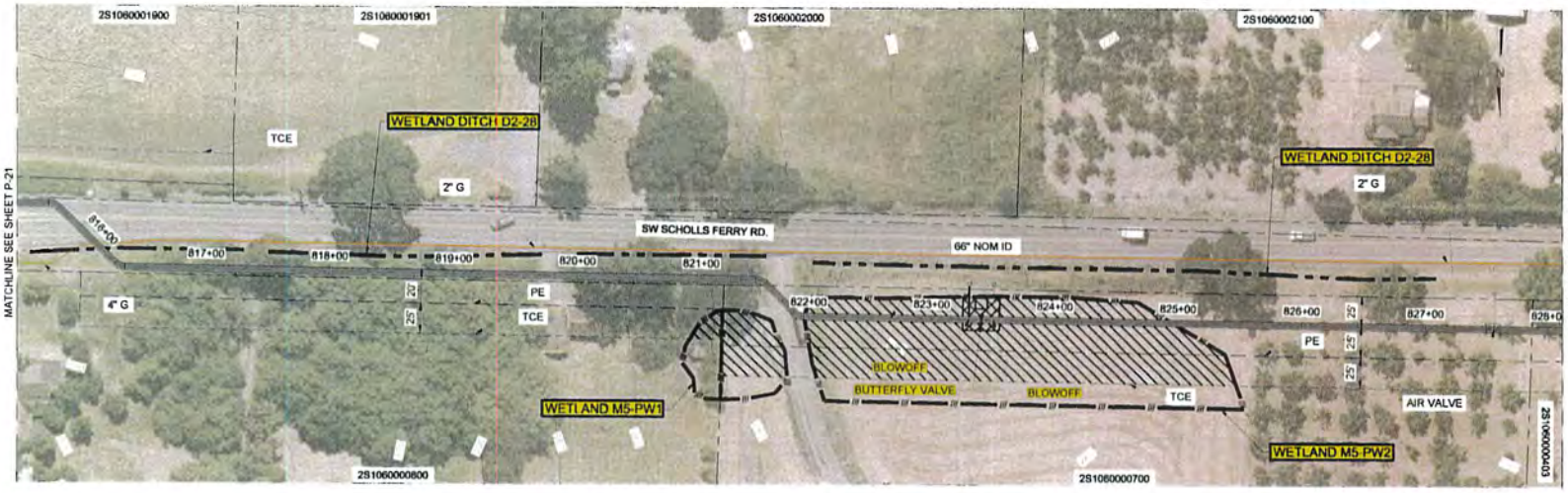
FILENAME	10002A60-P22.dwg
SCALE	AS SHOWN

P-22

----10002A60-P22.DWG 1/24/2018 1:52:34 PM BBerg

PLM_5.0: Potential Wetlands at Scholls Ferry Rd and Creek Crossings at Scholls Ferry Rd near Vandermost Road

PLM 5.0



LEGEND (ORIGINALLY PRINTED IN COLOR):

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NOTES:

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PLAN

0 25 50 100

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DESIGNED BY	
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CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

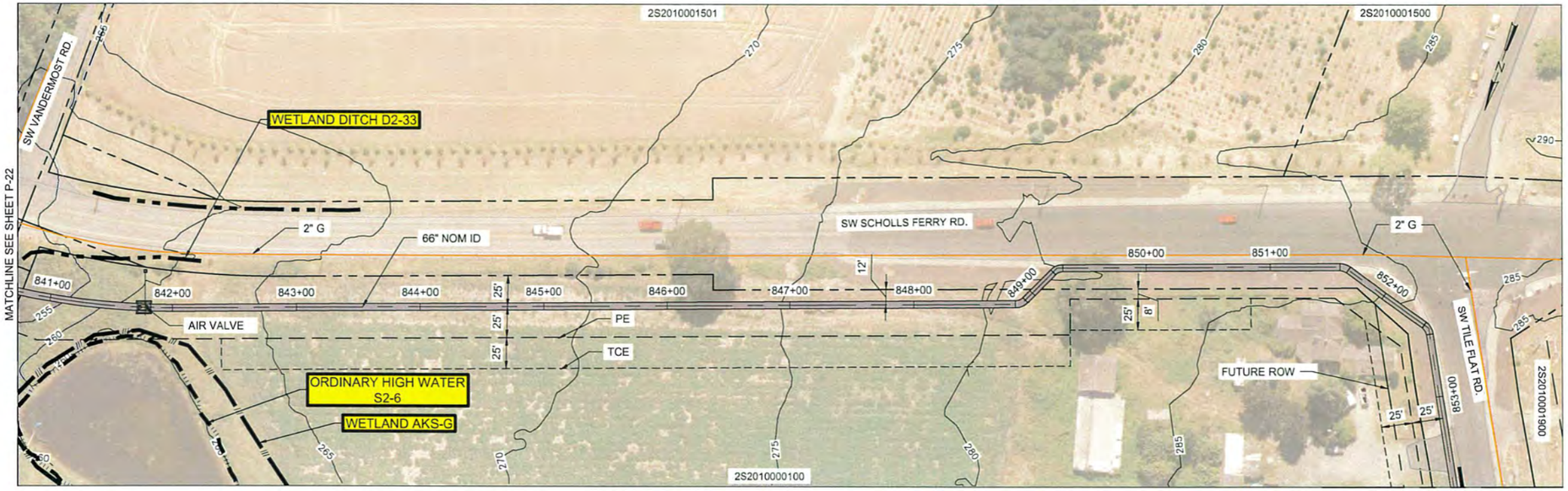
0 0.5" 1"

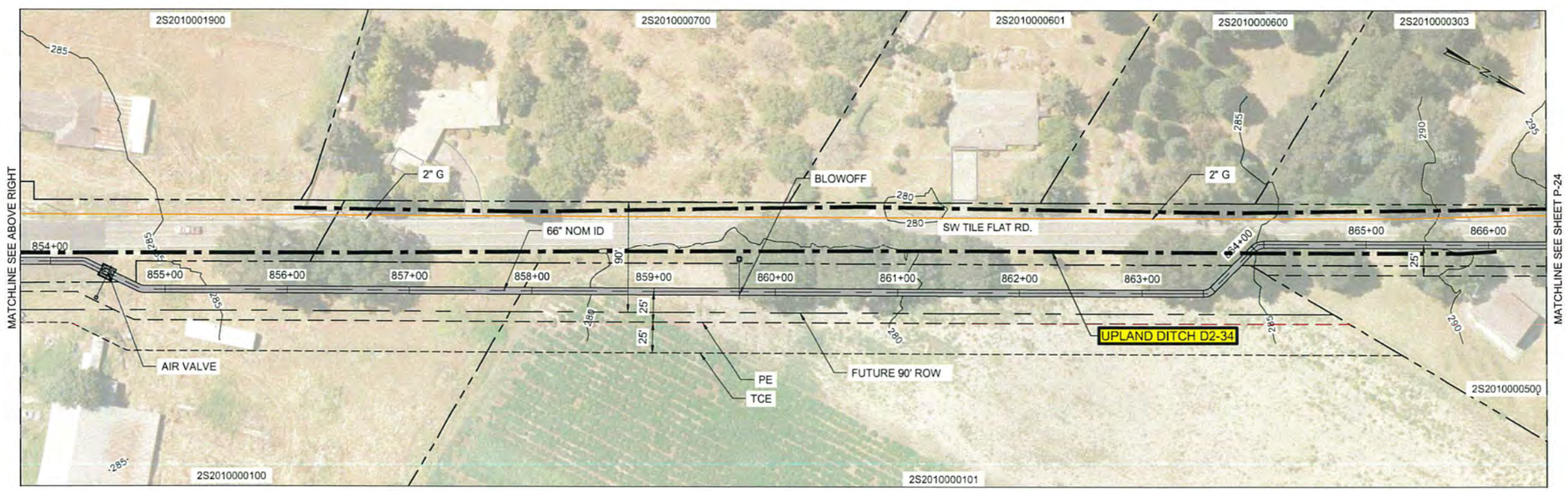
FILENAME	10002A60-P22.dwg
SCALE	AS SHOWN

P-22

PLM 5.0

PLM_5.0: Pond and Wetlands at Scholls Ferry Road near Vandermost Road





LEGEND (ORIGINALLY PRINTED IN COLOR) :

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NOTES:

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PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN
MAIN STEM PLAN -
SCHOLLS FERRY TO FARMINGTON -
STA 841+00

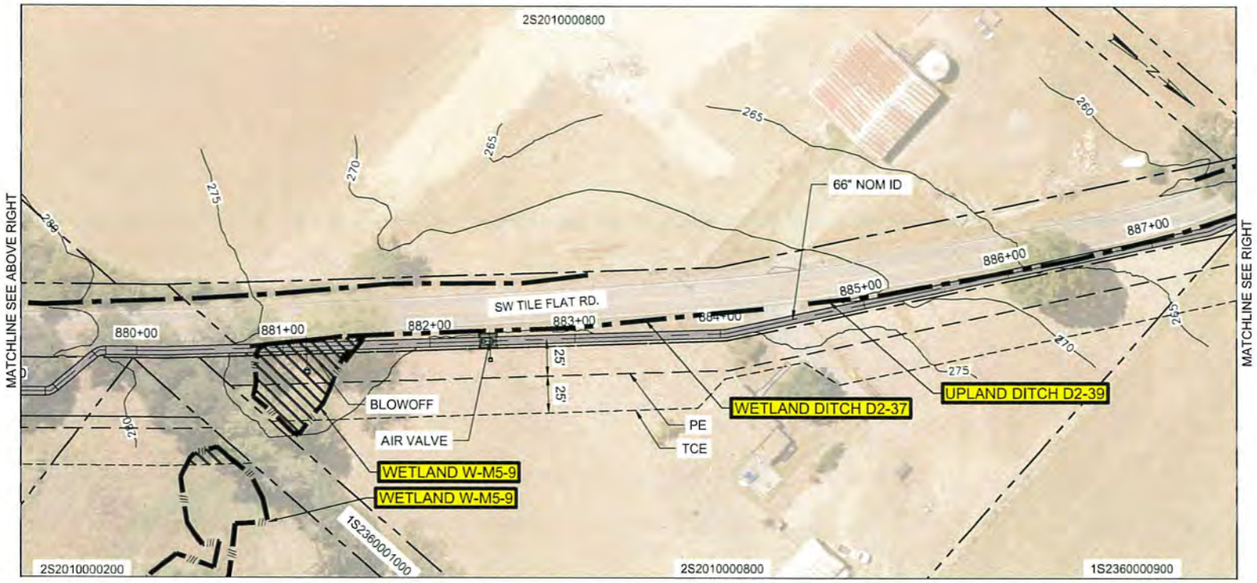
0 0.5" 1"

FILENAME	10002A60-P23.dwg
SCALE	AS SHOWN

P-23

10002A60-P23.DWG 2/7/2018 8:13:20 AM BBerg

PLM 5.0: Wetland at Tile Flat/Kobbe Drive



LEGEND (ORIGINALLY PRINTED IN COLOR) :

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NOTES:

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PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN
MAIN STEM PLAN -
SCHOLLS FERRY TO FARMINGTON -
STA 867+00

0 0.5" 1"

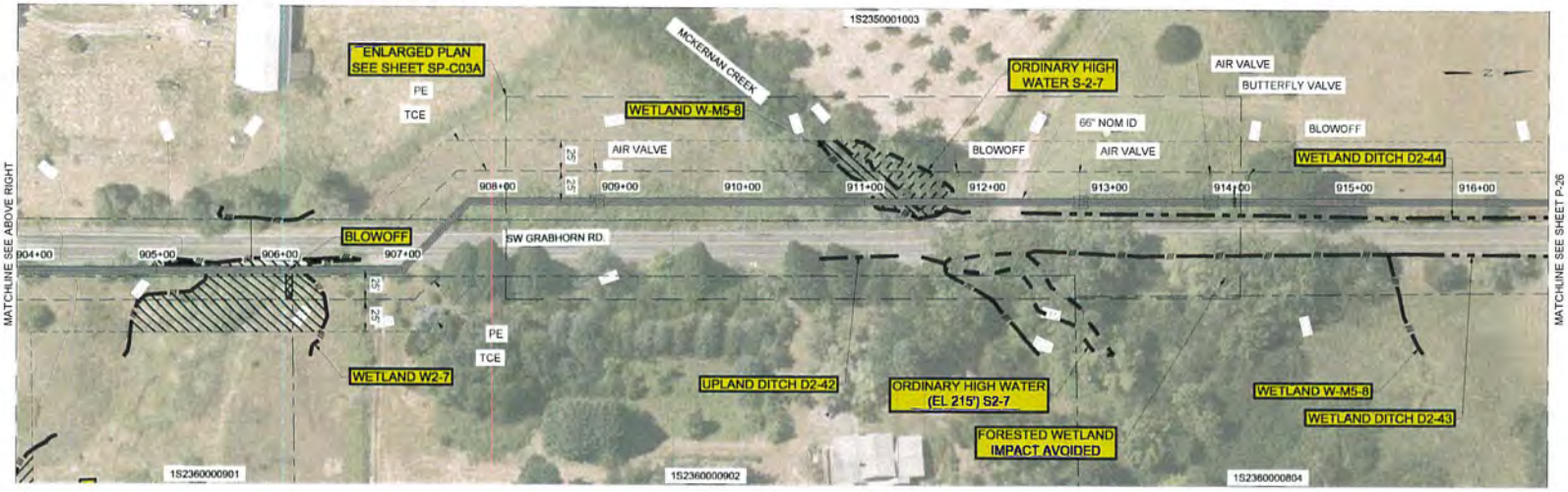
FILENAME	10002A60-P24.dwg
SCALE	AS SHOWN

P-24

----10002A60-P24.DWG 1/25/2018 6:33:09 AM BBerg

PLM_5.0: Wetlands near intersection of Tile Flat and Grabhorn Roads and McKernan Creek at Grabhorn Road

PLM 5.0



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NOTES:

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PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

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PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

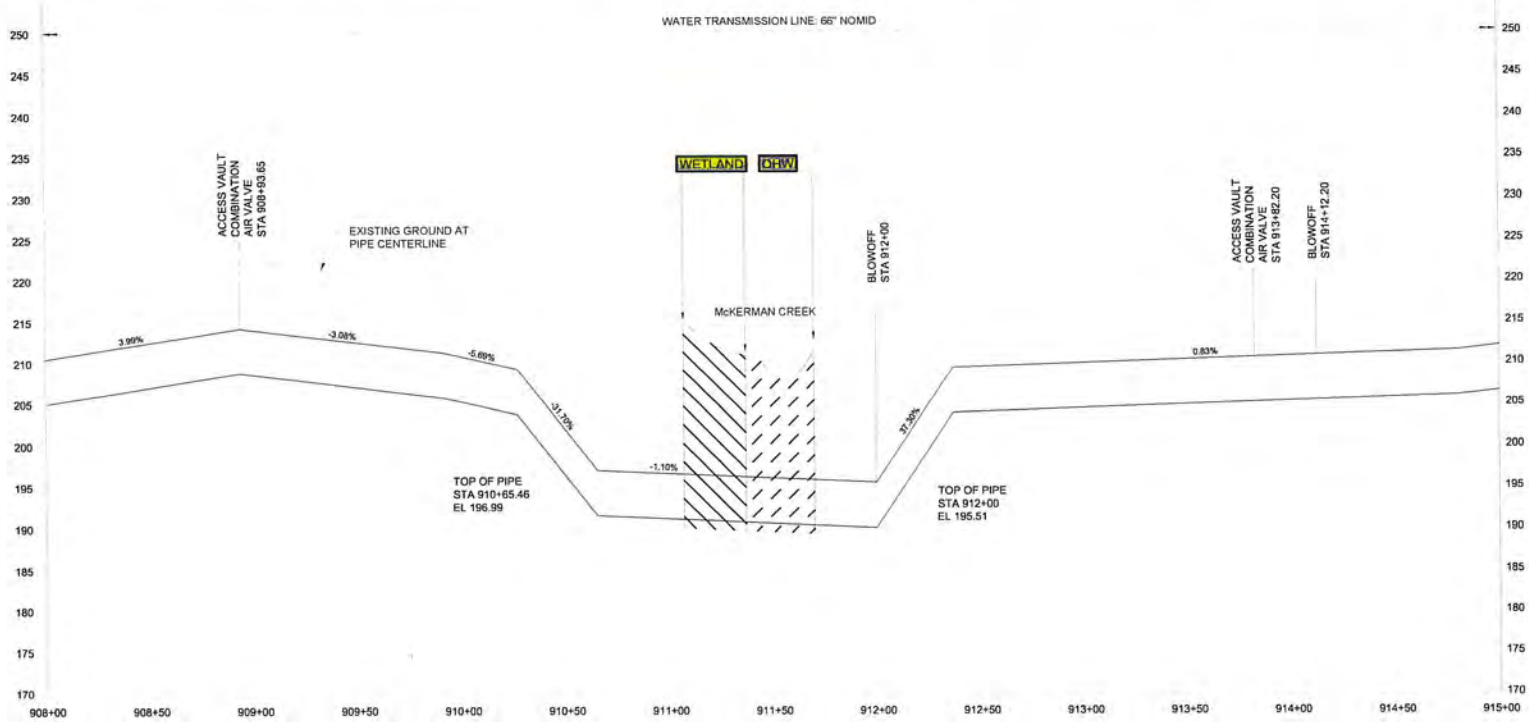
0 0.5" 1"

FILENAME	10002A60-P25.dwg
SCALE	AS SHOWN

P-25

PLM_5.0: McKernan Creek at Grabborn Rd.

PLM 5.0



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ENLARGED PLANS

0 15 30 60

NOTES:

1. REFER TO PLAN SHEETS FOR TAX LOT NUMBERS, TEMPORARY AND PERMANENT EASEMENTS, AND UTILITY INFORMATION.
2. UTILITIES SHOWN IN PLAN HAVE UNKNOWN DEPTHS AND ARE NOT SHOWN IN PROFILE.
3. PROFILES NOT SHOWN FOR MINOR CROSSINGS.

PROFILE

0 15 30 60

7.5

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN
MCKERNAN CREEK

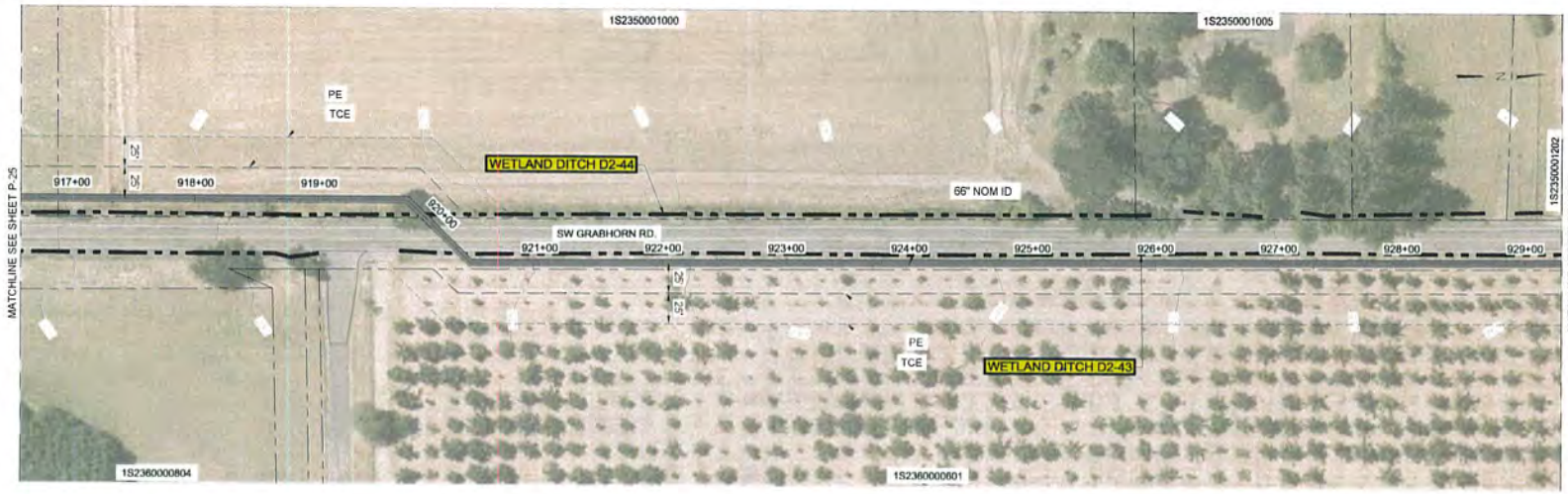
0 0.5" 1"

FILENAME 10002A60-SP-C03A.dwg
SCALE AS SHOWN

SP-C03A

PLM_5.0: Unnamed Seasonal Drainage North of McKernan Creek

PLM 5.0



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NOTES:

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PLAN 0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN
MAIN STEM PLAN -
SCHOLLS FERRY TO FARMINGTON -
STA 917+00

0 0.5" 1"

FILENAME	10002A60-P26.dwg
SCALE	AS SHOWN

P-26

PLM_5.0: Ag. Wetland along Farmington Rd.

LEGEND (ORIGINALLY PRINTED IN COLOR) :

- PLANIMETRICS (FROM LIDAR)
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- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT

NOTES:

1. SEE PRELIMINARY GEOTECHNICAL ANALYSIS MEMORANDUM, McMILLEN JACOBS & ASSOCIATE SEPTEMBER 2, 2015.
2. MAJOR UTILITIES ONLY IDENTIFIED CROSSING OR WITHIN 15 FEET OF PROPOSED WWSP PIPE.
3. IT IS ANTICIPATED THAT UTILITIES LOCATED WITHIN 2 PIPE DIAMETERS OF THE WWSP CENTERLINE WILL BE RELOCATED. VERIFY UTILITY LOCATIONS DURING FINAL DESIGN.
4. IT IS ANTICIPATED THAT UTILITIES LOCATED BETWEEN 2 AND 3 PIPE DIAMETERS OF THE WWSP CENTERLINE WILL BE SUPPORTED DURING CONSTRUCTION. UTILITIES NEED TO BE PHYSICALLY LOCATED DURING FINAL DESIGN.

PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

0 0.5" 1"

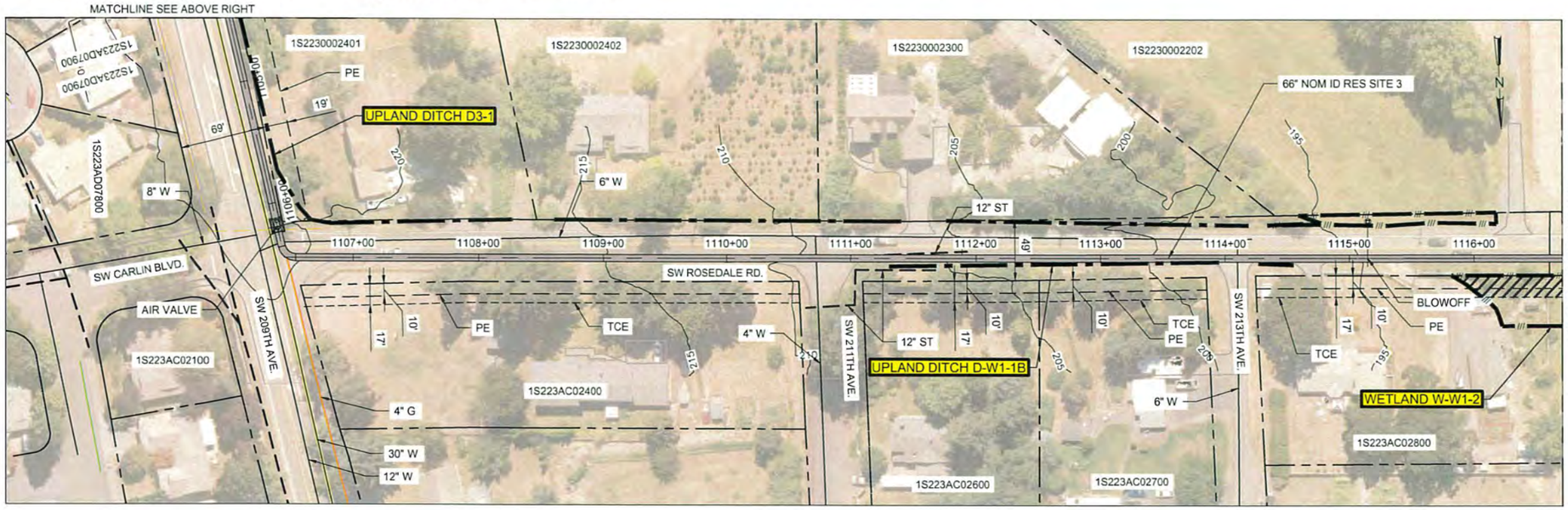
FILENAME	10002A60-P32.dwg
SCALE	AS SHOWN

P-32

PLW 1.0

PLW_1.0: Ag. Wetland along Rosedale Road

PLW 1.0



LEGEND (ORIGINALLY PRINTED IN COLOR) :

- PLANIMETRICS (FROM LIDAR)
- PAVEMENT (FROM LIDAR)
- 100 — CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
- WWSP PROPOSED ALIGNMENT
- COMMUNICATION/UTILITY
- ELECTRICAL/UTILITY (OVERHEAD)
- ELECTRICAL/UTILITY (BURIED)
- GAS
- SANITARY
- STORM
- WATER
- PERMANENT EASEMENT (PE)
- TEMP CONSTRUCTION EASEMENT (TCE)
- FLOW DIRECTION
- ORDINARY HIGH WATER
- UPLAND DITCH
- WETLAND DITCH
- WETLAND BOUNDARY
- W2-4 — WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
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PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

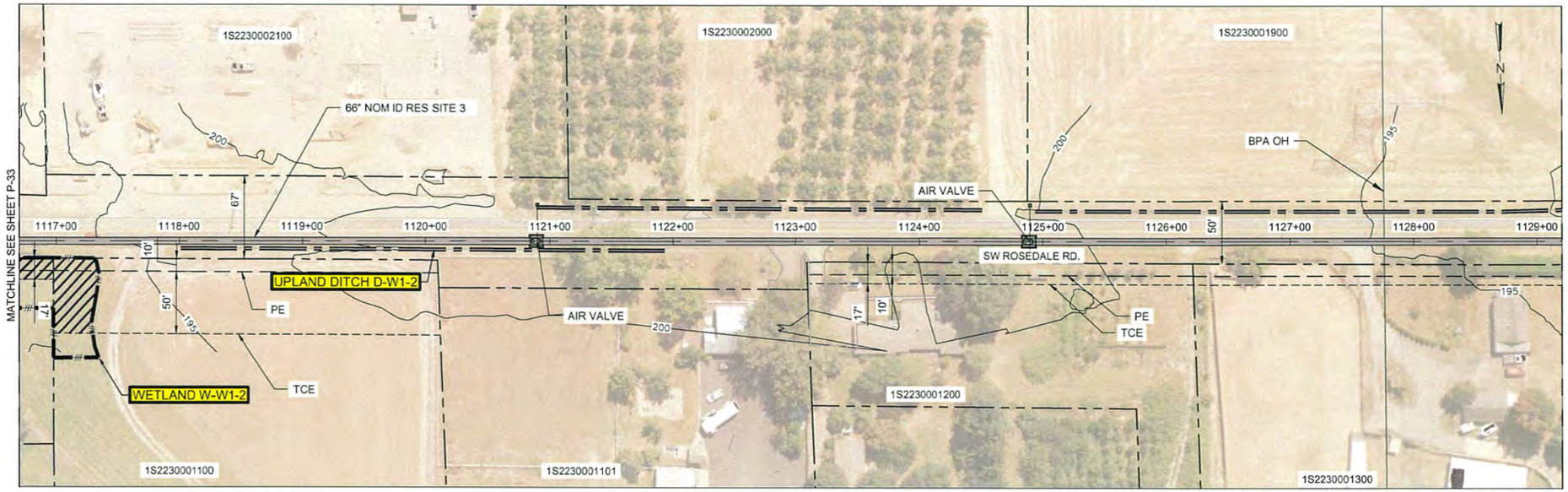
0 0.5" 1"

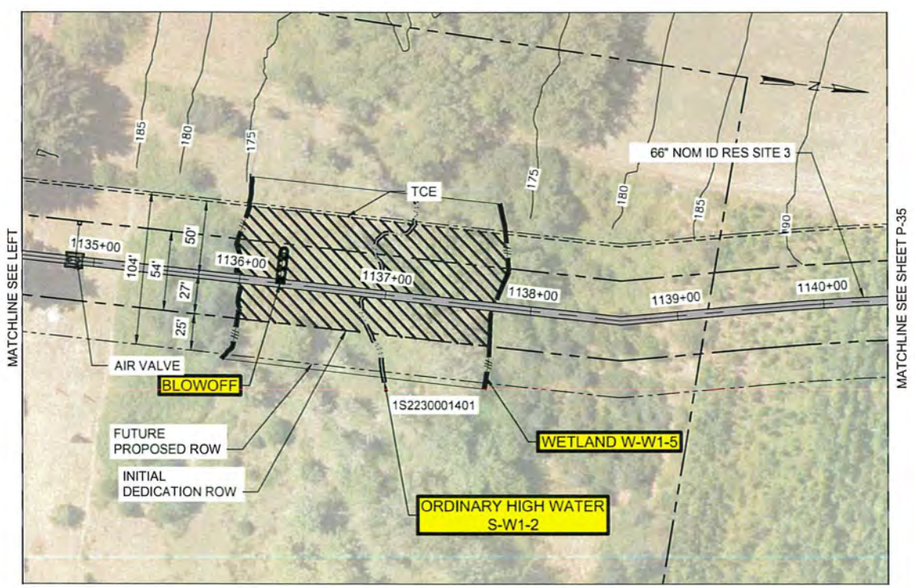
FILENAME	10002A60-P33.dwg
SCALE	AS SHOWN

P-33

----10002A60-P33.DWG 2/7/2018 8:19:43 AM BBerg

PLW_1.0: Ag. Wetland along Rosedale Rd. and Unnamed Seasonal Drainage North of Rosedale Rd.





LEGEND (ORIGINALLY PRINTED IN COLOR) :

- PLANIMETRICS (FROM LIDAR)
- PAVEMENT (FROM LIDAR)
- 100 CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
- WWSP PROPOSED ALIGNMENT
- COMMUNICATION/UTILITY
- ELECTRICAL/UTILITY (OVERHEAD)
- ELECTRICAL/UTILITY (BURIED)
- GAS
- SANITARY
- STORM
- WATER
- PERMANENT EASEMENT (PE)
- TEMP CONSTRUCTION EASEMENT (TCE)
- FLOW DIRECTION
- ORDINARY HIGH WATER
- UPLAND DITCH
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- WETLAND BOUNDARY
- W2-4 WETLAND DESCRIPTION
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- TEMPORARY WETLAND IMPACT
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PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

0 0.5" 1"

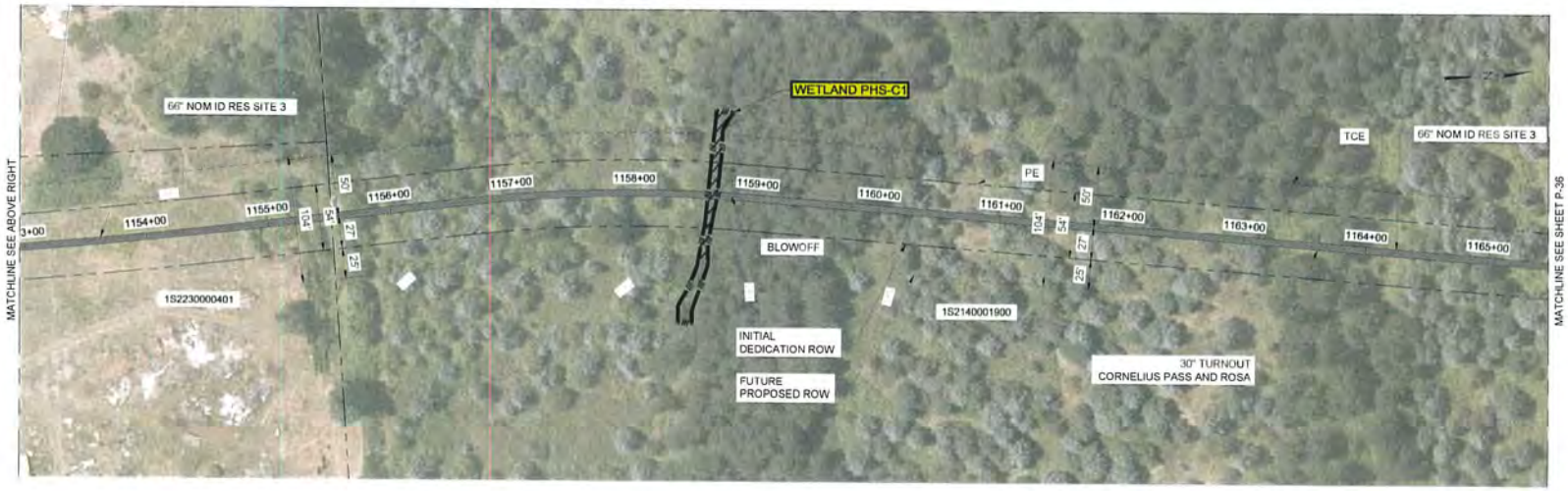
FILENAME	10002A60-P34.dwg
SCALE	AS SHOWN

P-34

10002A60-P34.DWG 2/7/2018 8:47:49 AM BBerg

PLW_1.0: Unnamed Tributary to Butternut Creek

PLW 1.0



LEGEND (ORIGINALLY PRINTED IN COLOR) :

- PLANIMETRICS (FROM LIDAR)
- PAVEMENT (FROM LIDAR)
- 100 CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
- WWSP PROPOSED ALIGNMENT
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- ELECTRICAL/UTILITY (OVERHEAD)
- ELECTRICAL/UTILITY (BURIED)
- GAS
- SANITARY
- STORM
- WATER
- PERMANENT EASEMENT (PE)
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PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

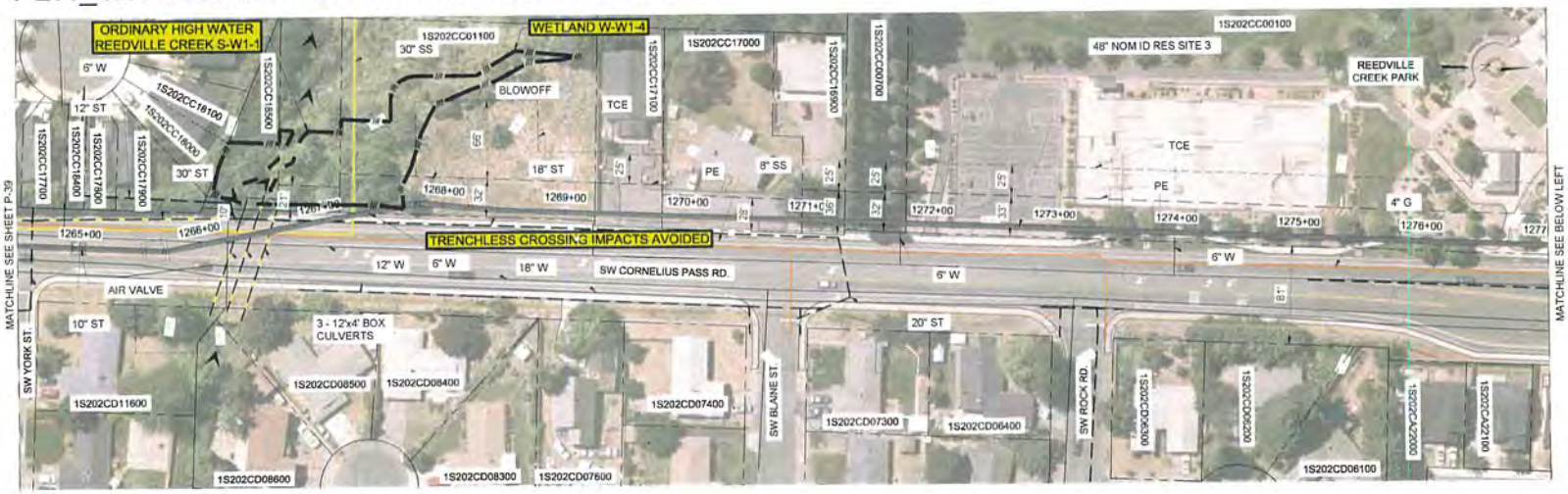
PRELIMINARY DESIGN

0 0.5" 1"

FILENAME	10002A60-P35.dwg
SCALE	AS SHOWN

P-35

PLW_1.0: Reedville Creek at Cornelius Pass Road



LEGEND (ORIGINALLY PRINTED IN COLOR) :

- PLANIMETRICS (FROM LIDAR)
- PAVEMENT (FROM LIDAR)
- 100 CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
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- WATER
- PERMANENT EASEMENT (PE)
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- TEMPORARY WETLAND IMPACT
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PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

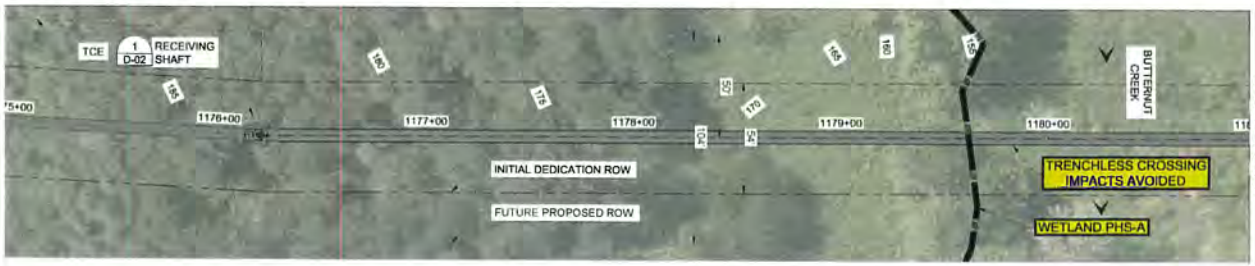
0 0.5" 1"

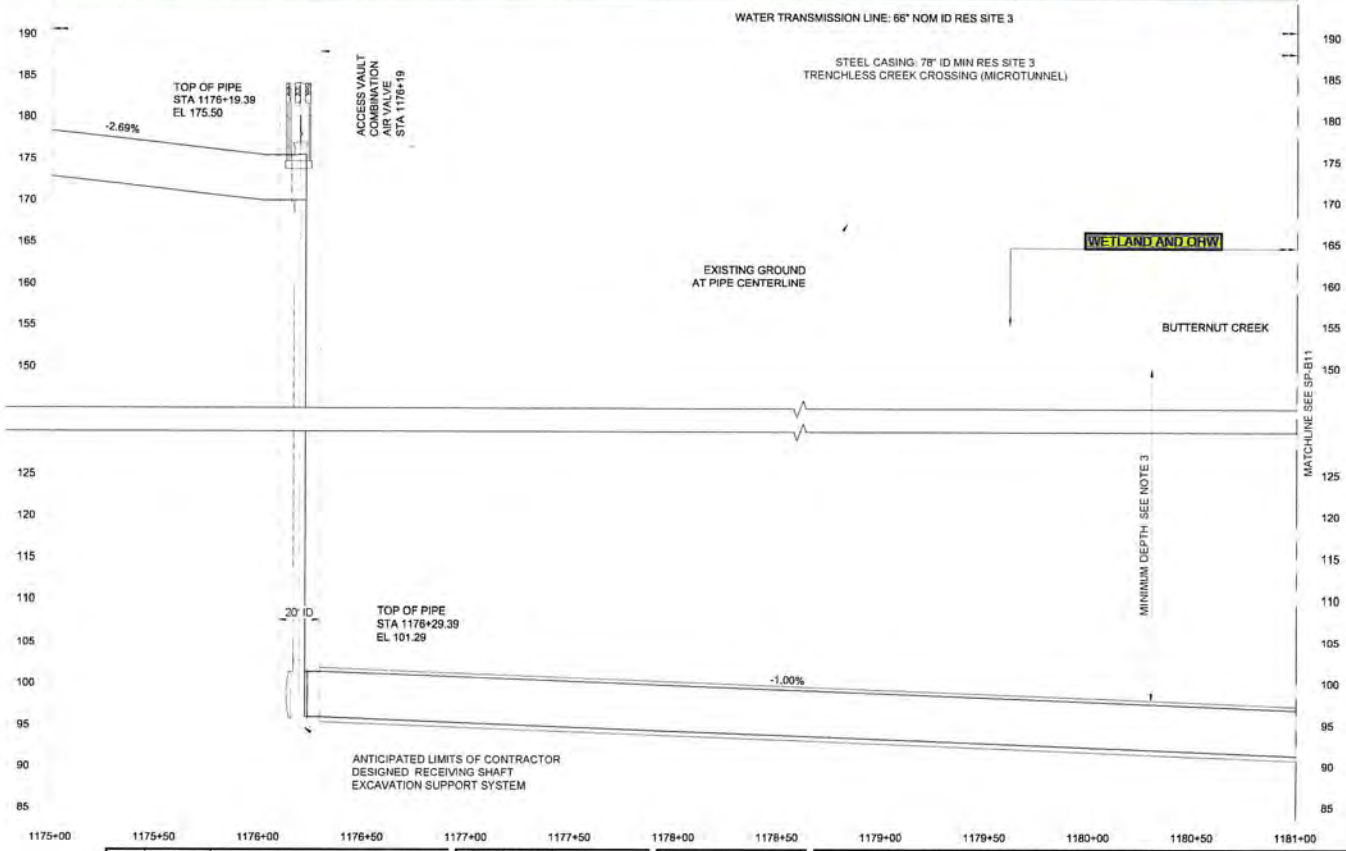
FILENAME	10002A60-P40.dwg
SCALE	AS SHOWN

P-40

PLW_1.0: Butternut Creek

PLW 1.0





LEGEND (ORIGINALLY PRINTED IN COLOR):

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- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT

ENLARGED PLAN

0 15 30 60 (P-36)

NOTES:

1. REFER TO PLAN SHEETS FOR TAX LOT NUMBERS, TEMPORARY AND PERMANENT EASEMENTS, AND UTILITY INFORMATION.
2. UTILITIES SHOWN IN PLAN HAVE UNKNOWN DEPTHS AND ARE NOT SHOWN IN PROFILE.
3. DEPTH BASED ON GEOTECHNICAL ENGINEER'S RECOMMENDATION. LIQUEFIABLE SOILS EXTEND TO AN ELEVATION OF APPROXIMATELY 110 FEET.

PROFILE

0 15 30 60

7.5

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

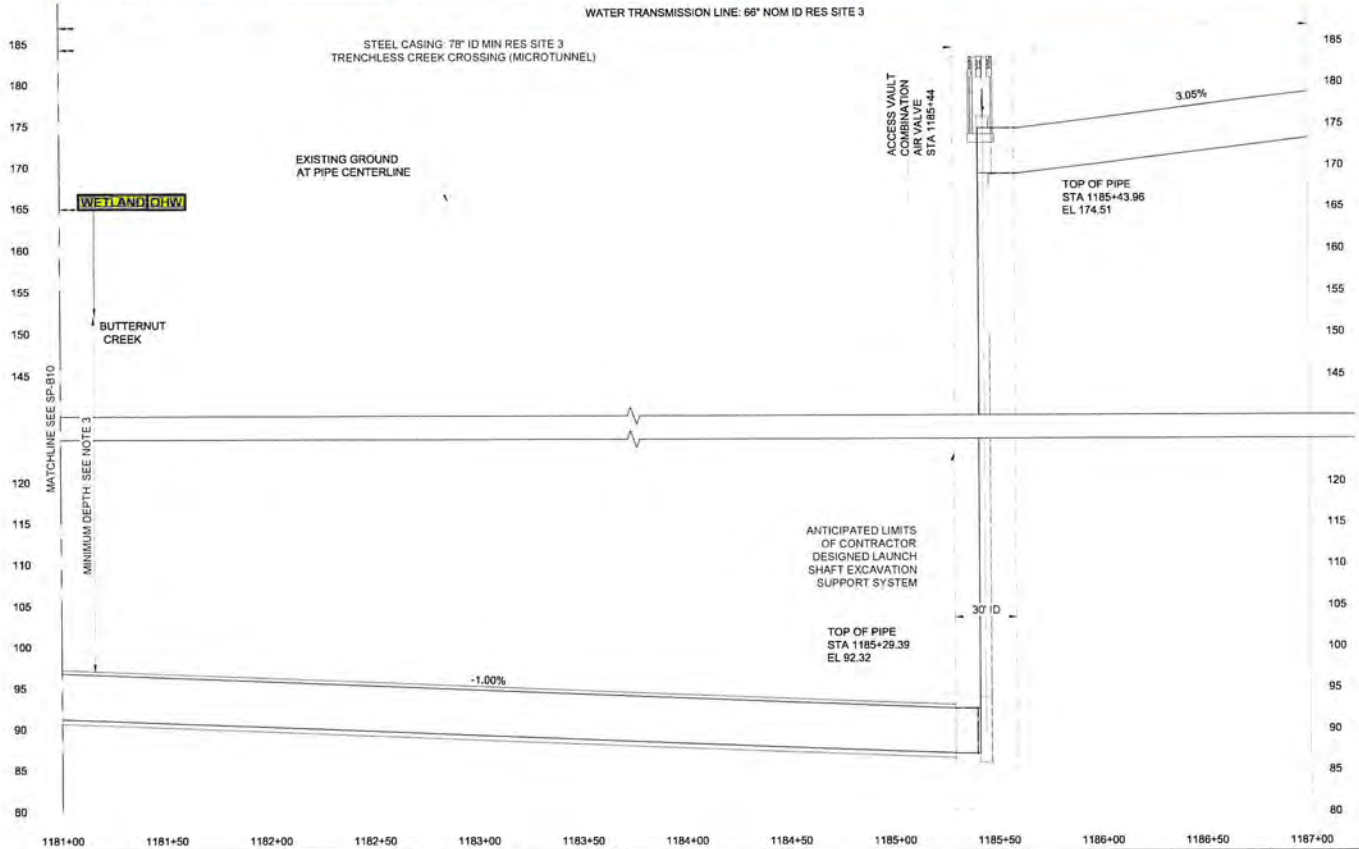
0 0.5" 1"

FILENAME	10002A60-SP-B10.dwg
SCALE	AS SHOWN

SP-B10

PLW_1.0: Butternut Creek

PLW 1.0



LEGEND (ORIGINALLY PRINTED IN COLOR)

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- WWSP PROPOSED ALIGNMENT
- COMMUNICATION/UTILITY
- ELECTRICAL/UTILITY (OVERHEAD)
- ELECTRICAL/UTILITY (BURIED)
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- SANITARY
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- ORDINARY HIGH WATER
- UPLAND DITCH
- WETLAND DITCH
- WETLAND BOUNDARY
- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT

ENLARGED PLAN - P-36

0 15 30 60

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PROFILE

0 15 30 60

7.5

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

0 0.5" 1"

FILENAME 10002A60-SP-B11.dwg

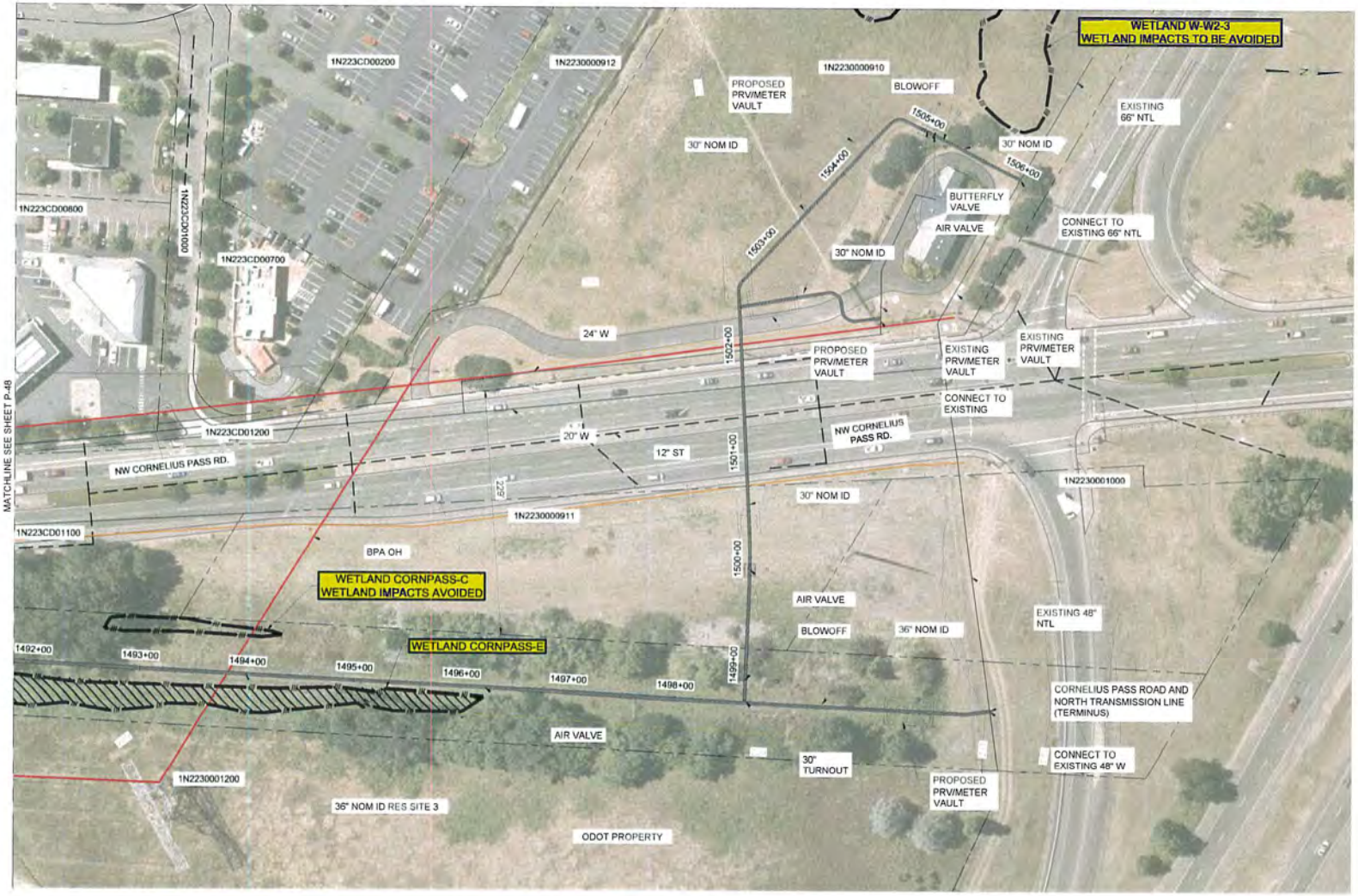
SCALE AS SHOWN

SP-B11

PLW 2.0

PLW_2.0: Wetlands near Cornelius Pass Northern Terminus and Wetlands near Pipe Connection at Cornelius Pass Pump Station

PLW 2.0



LEGEND (ORIGINALLY PRINTED IN COLOR) :

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- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
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PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

0 0.5" 1"

FILENAME	10002A60-P49.dwg
SCALE	AS SHOWN

P-49

PLW_2.0: Wetlands near Cornelius Pass northern terminus

LEGEND (ORIGINALLY PRINTED IN COLOR)

- PLANIMETRICS (FROM LIDAR)
- PAVEMENT (FROM LIDAR)
- 100 CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
- WWSP PROPOSED ALIGNMENT
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- STORM
- WATER
- PERMANENT EASEMENT (PE)
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- UPLAND DITCH
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- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
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PLAN
0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

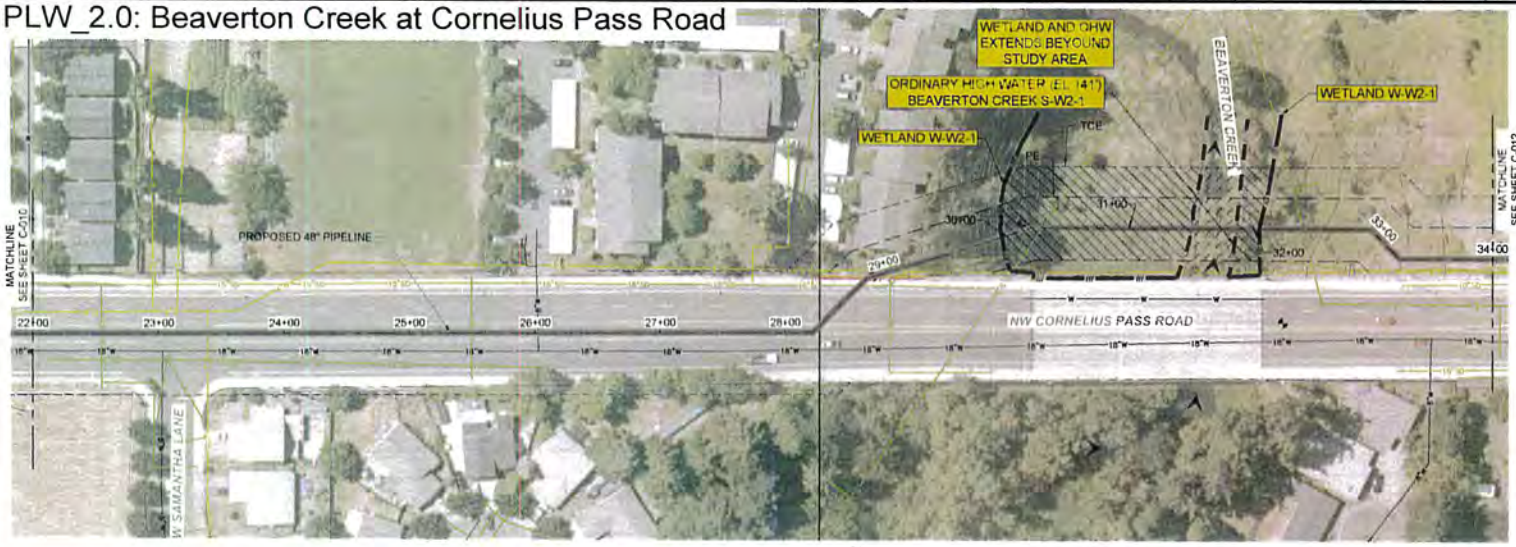
0 0.5" 1"

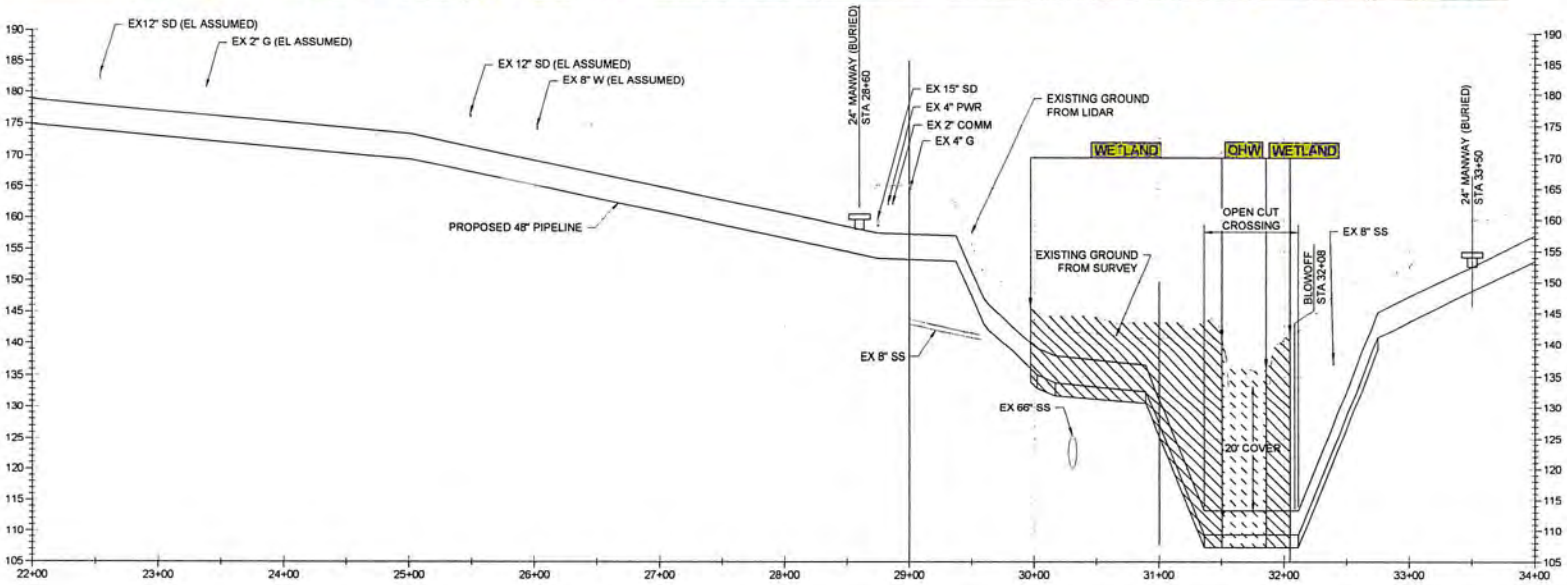
FILENAME	10002A60-P48.dwg
SCALE	AS SHOWN

P-48

PLW_2.0: Beaverton Creek at Cornelius Pass Road

PLW 2.0





LEGEND

- NEW 18" WATER MAIN
- EXISTING WATER
- EXISTING GAS
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING POWER
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPERTY LINE
- PERMANENT EASEMENT (PE)
- TEMP CONSTRUCTION EASEMENT (TCE)
- FLOW DIRECTION
- ORDINARY HIGH WATER
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- WETLAND BOUNDARY
- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT

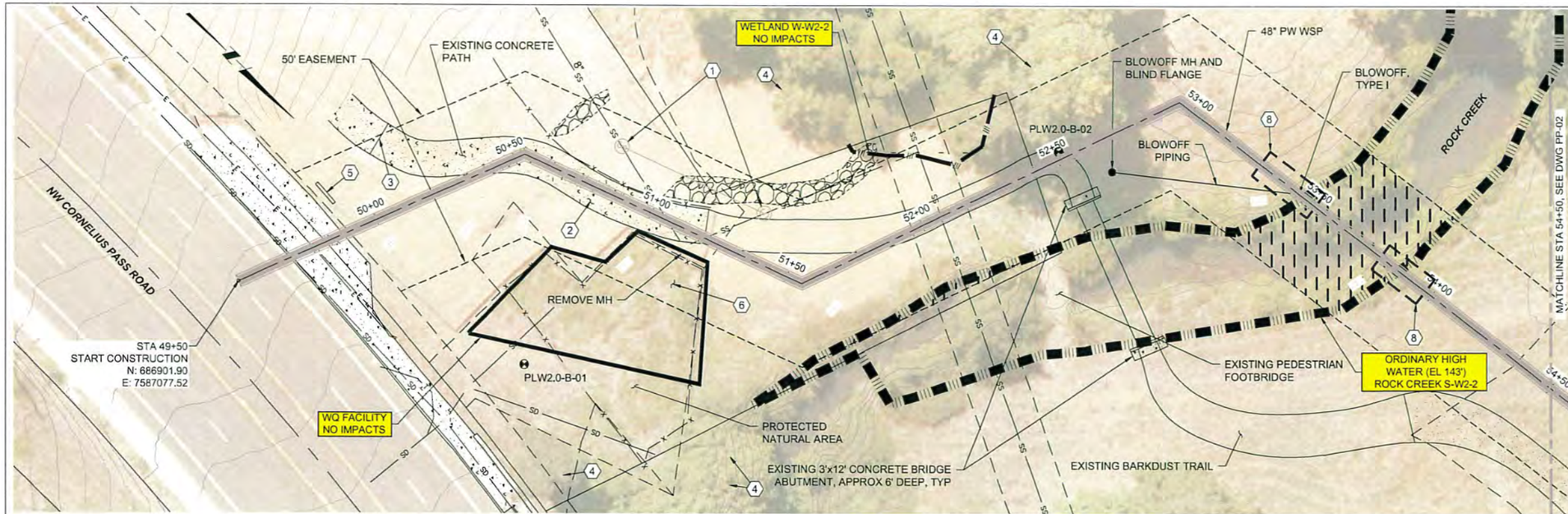
0 50 100
SCALE IN FEET

GENERAL NOTES:

1. SEE SHEET C-100 FOR PARTIAL PLAN OF THE AREA SOUTH OF THE BEAVERTON CREEK CROSSING.
2. UNDERGROUND UTILITIES SHOWN HAVE BEEN MAPPED FROM FIELD SURVEY INFORMATION, ABOVE GROUND EVIDENCE OR GROUND MARKING BY OTHERS, EXISTING DRAWINGS SUPPLIED BY OTHERS, OR GEOGRAPHIC INFORMATION SYSTEMS DATA PROVIDED BY OTHERS. NO GUARANTEE IS PROVIDED THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. PHYSICAL LOCATIONS OF UTILITIES CROSSING, OR ADJACENT TO THE PROPOSED ALIGNMENT IS NEEDED AS PART OF FUF DEVELOPMENT OF DESIGN DRAWINGS.

LINE IS 2 INCHES AT FULL SIZE (IF NOT 2" - SCALE ACCORDINGLY)	EXTERNAL REFERENCE FILES	WILLAMETTE WATER SUPPLY PROGRAM	REVISIONS: ZONE / REV / DESCRIPTION / DATE	PRELIMINARY NOT FOR CONSTRUCTION	CORNELIUS PASS ROAD ALIGNMENT CONCEPTUAL DESIGN
DESIGNED DRAWN CHECKED CHECKED APPROVED					FILENAME 10002A60-SF-C-011.DWG PROJECT NUMBER 10002A 60 SCALE AS SHOWN DRAWING NUMBER C-011 SHEET NUMBER XX OF XX

PLW_2.0: Rock Creek at Cornelius Pass Road



LEGEND

- NEW 48" WATER MAIN
- EXISTING WATER
- EXISTING GAS
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING POWER
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPERTY LINE
- PERMANENT EASEMENT (PE)
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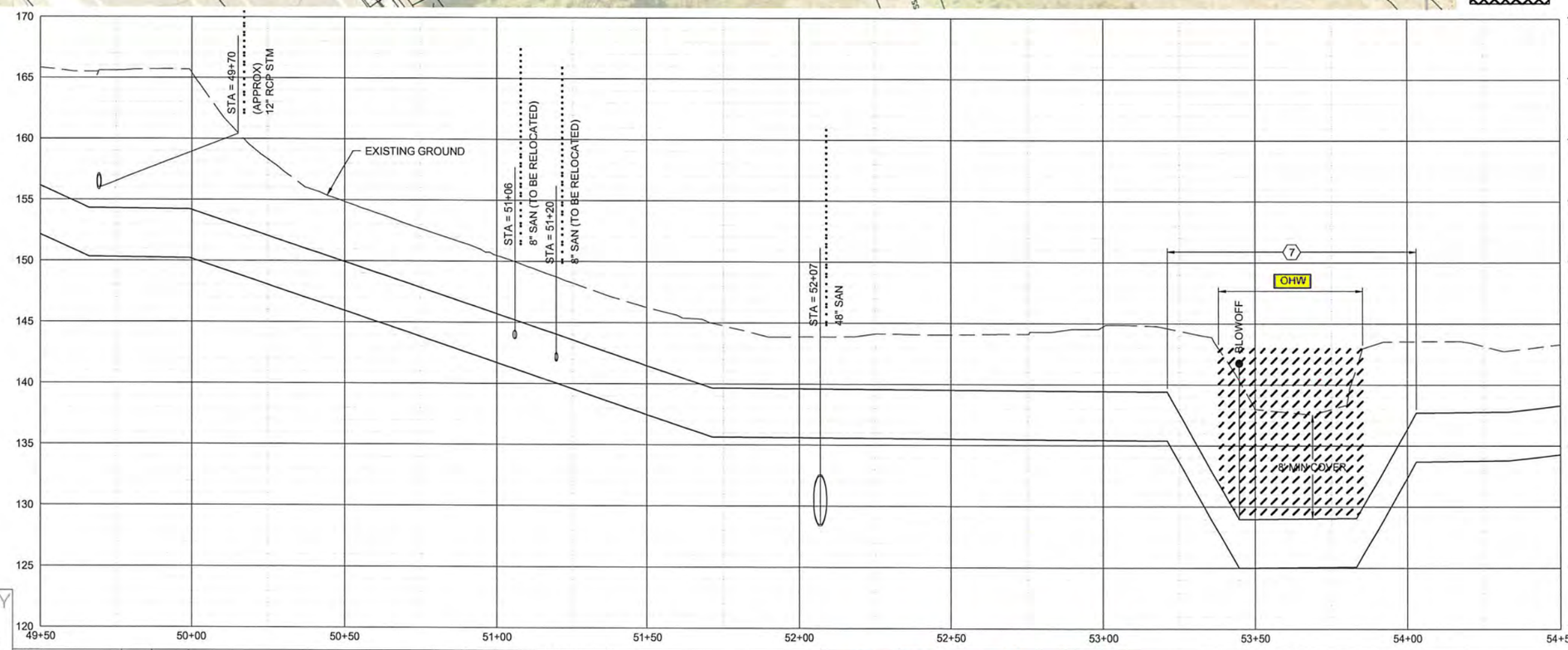
PLW 2.0



KEY NOTES

1. NEW 48" MH PER CWS STANDARDS. RELOCATE CONFLICTING 8" SANITARY.
2. REMOVE AND REPLACE THE ENTIRE CONCRETE PATH WITHIN 50' EASEMENT. REPLACEMENT SHALL BE FULL PANEL AND TAKEN TO THE NEXT CONSTRUCTION JOINT.
3. EXISTING CONSTRUCTION JOINT.
4. PROTECT EXISTING TREE. TREE SURVEY AND TREE PROTECTION ZONE TO BE EVALUATED DURING FINAL DESIGN AND COORDINATED WITH ENVIRONMENTAL.
5. EXISTING SIGN/MONUMENT TO BE REMOVED AND REPLACED.
6. AVOID PROTECTED NATURAL AREA. ANY DAMAGE TO EXISTING FACILITY, INCLUDING FENCING, SHALL BE RESTORED IF DAMAGED DURING CONSTRUCTION.
7. WORK AREA RESTRICTIONS PER ODFW AND CWS AS REQUIRED.
8. BIOENGINEERED BANK SLOPE STABILIZATION AS REQUIRED.

HORZ 0 20 40
VERT 0 5 10
SCALE IN FEET

PRELIMINARY DESIGN
THIS DRAWING IS NOT VALID FOR CONSTRUCTION PURPOSES UNLESS IT BEARS THE SEAL AND SIGNATURE OF A DULY REGISTERED PROFESSIONAL

DSGN					
DR					
CHK					
APVD	NO.	DATE	REVISION	BY	APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

30% SUBMITTAL

Willamette Water Supply
Our Reliable Water
WILLAMETTE WATER SUPPLY PROGRAM

Brown AND Caldwell

CIVIL

PLAN AND PROFILE
STA 49+50 TO STA 54+50

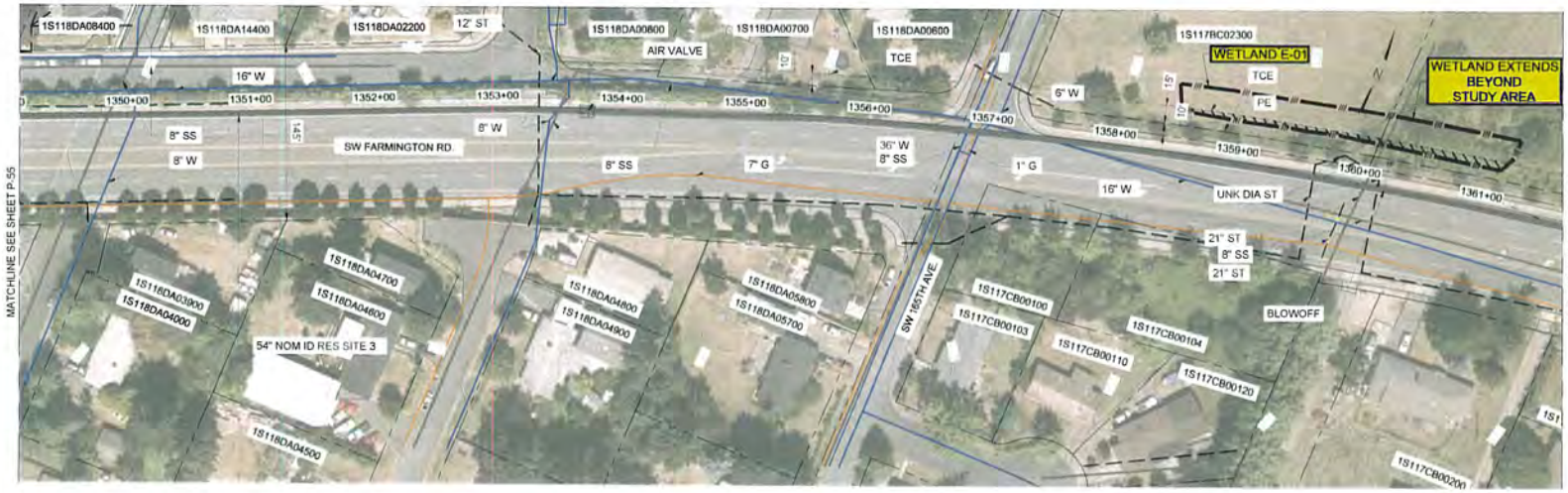
SHEET 5
DWG PP-01
DATE
PROJ PLW_2.0

FILENAME: 10002A60-C-PP-01.DWG PLOT DATE AND TIME: 2/27/2018 12:42:25 PM

PLE 1.0

PLE_1.0: Wetland near Corner of 165th/Farmington Intersection

PLE 1.0



LEGEND (ORIGINALLY PRINTED IN COLOR):

- PLANIMETRICS (FROM LIDAR)
- PAVEMENT (FROM LIDAR)
- 100 CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
- WWSP PROPOSED ALIGNMENT
- COMMUNICATION/UTILITY
- ELECTRICAL/UTILITY (OVERHEAD)
- ELECTRICAL/UTILITY (BURIED)
- GAS
- SANITARY
- STORM
- WATER
- PERMANENT EASEMENT (PE)
- TEMP CONSTRUCTION EASEMEN
- FLOW DIRECTION
- ORDINARY HIGH WATER
- UPLAND DITCH
- WETLAND DITCH
- WETLAND BOUNDARY
- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT

NOTES:

1. SEE PRELIMINARY GEOTECHNICAL ANALYSIS MEMORANDUM, McMILLEN JACOBS & ASSOCIATE SEPTEMBER 2, 2015.
2. MAJOR UTILITIES ONLY IDENTIFIED CROSSING OR WITHIN 15 FEET OF PROPOSED WWSP PIPE.
3. IT IS ANTICIPATED THAT UTILITIES LOCATED WITHIN 2 PIPE DIAMETERS OF THE WWSP CENTERLINE WILL BE RELOCATED. VERIFY UTILITY LOCATIONS DURING FINAL DESIGN.
4. IT IS ANTICIPATED THAT UTILITIES LOCATED BETWEEN 2 AND 3 PIPE DIAMETERS OF THE WWSP CENTERLINE WILL BE SUPPORTED DURING CONSTRUCTION. UTILITIES NEED TO BE PHYSICALLY LOCATED DURING FINAL DESIGN.

PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

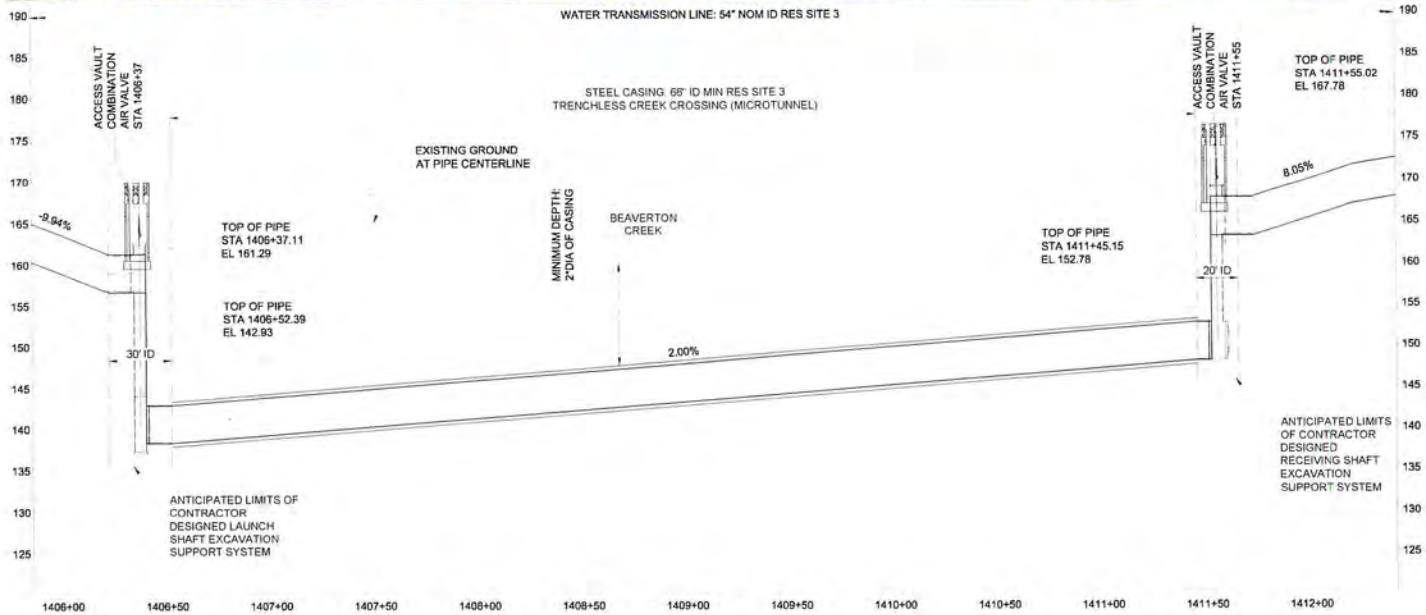
0 0.5" 1"

FILENAME	10002A60-P56.dwg
SCALE	AS SHOWN

P-56

PLE_1.0: Beaverton Creek at Milikan Way

PLE 1.0



LEGEND (ORIGINALLY PRINTED IN COLOR):

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- PAVEMENT (FROM LIDAR)
- 100 CONTOURS (FROM LIDAR)
- TAXLOTS (FROM METRO)
- WWSP PROPOSED ALIGNMENT
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- STORM
- WATER
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- WETLAND DITCH
- WETLAND BOUNDARY
- W2-4 WETLAND DESCRIPTION
- TEMPORARY WATER IMPACT
- TEMPORARY WETLAND IMPACT
- PERMANENT WETLAND IMPACT

ENLARGED PLAN (P-58)

0 15 30 60

NOTES:

1. REFER TO PLAN SHEETS FOR TAX LOT NUMBERS, TEMPORARY AND PERMANENT EASEMENTS, AND UTILITY INFORMATION
2. UTILITIES SHOWN IN PLAN HAVE UNKNOWN DEPTHS AND ARE NOT SHOWN IN PROFILE.

PROFILE

0 15 30 60

7.5

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

0 0.5" 1"

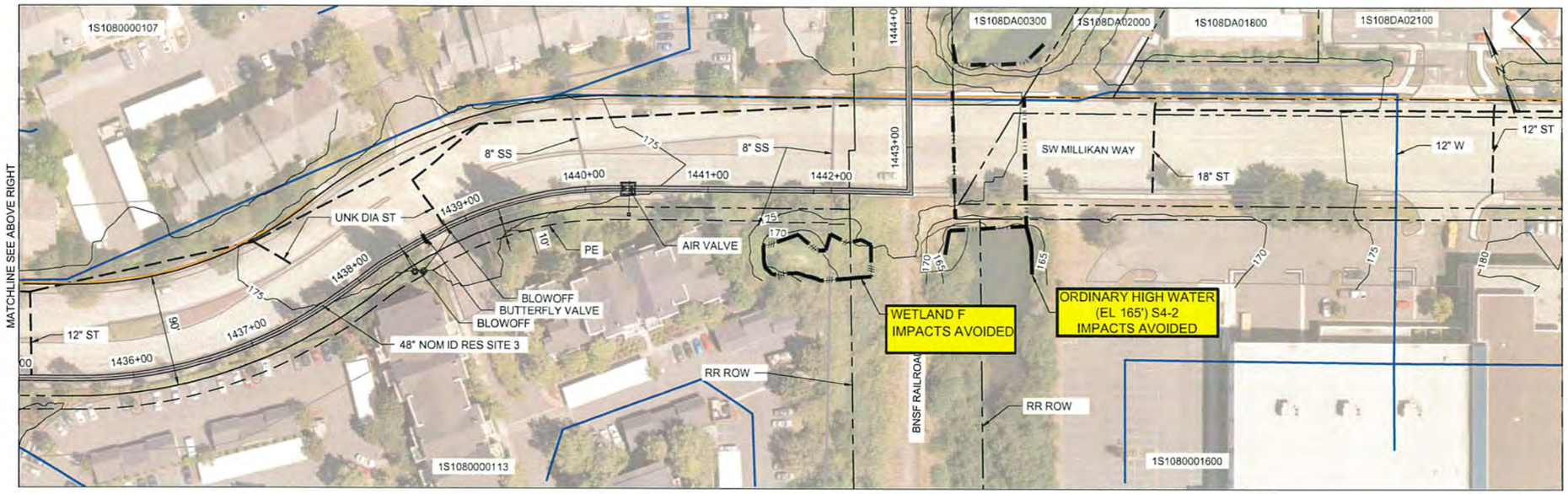
FILENAME 10002A60-SP-B20.dwg

SCALE AS SHOWN

SP-B20

PLE_1.0: Beaverton Creek at Milikan Way and BNSF Railroad

PLE 1.0



LEGEND (ORIGINALLY PRINTED IN COLOR) :

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- PAVEMENT (FROM LIDAR)
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- TAXLOTS (FROM METRO)
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NOTES:

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PLAN

0 25 50 100

ISSUE	DATE	DESCRIPTION

PROJ MANAGER	
DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJ NUMBER	

WILLAMETTE WATER SUPPLY PROGRAM

PRELIMINARY DESIGN

0 0.5" 1"

FILENAME	10002A60-P59.dwg
SCALE	AS SHOWN

P-59

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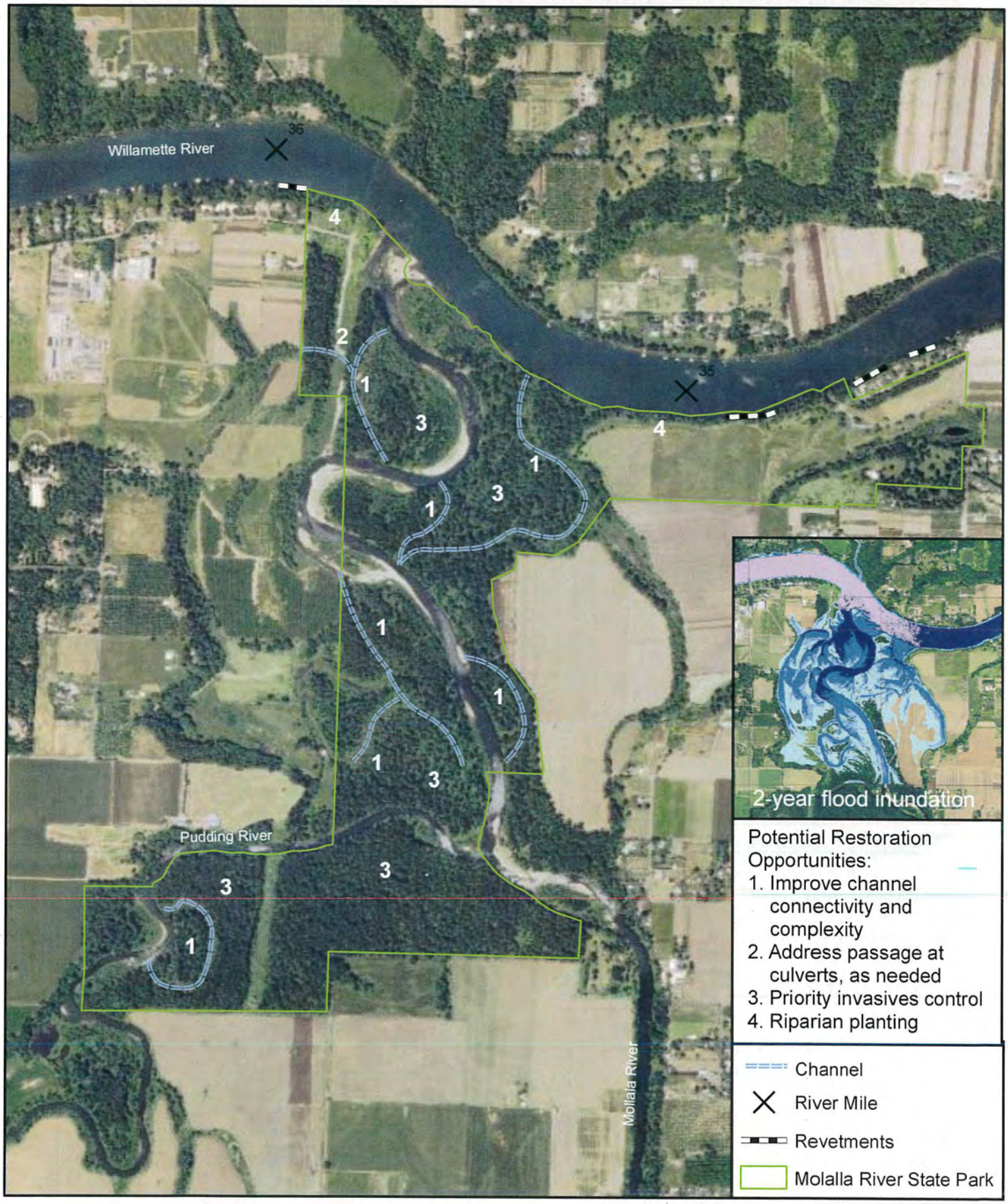
Additional Environmental Benefits Projects

Molalla River Confluence Project
Restoration Opportunities



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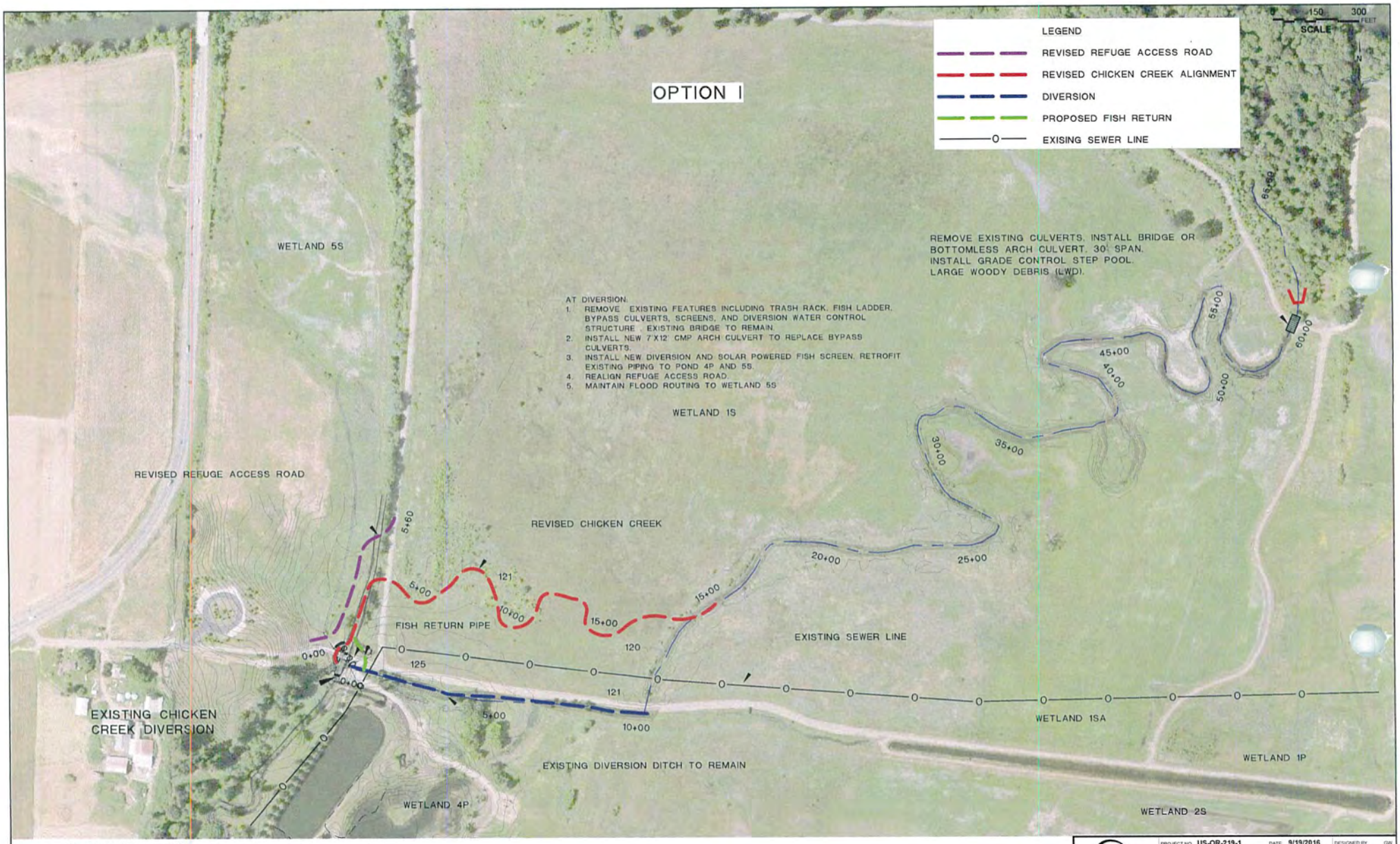


Unauthorized Changes & Uses
The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. All changes must be in writing and must be approved by the preparer of these plans.

Utility Notification Center
CALL BEFORE YOU DIG

DUCKS UNLIMITED

PROJECT NO. US-OR-219-1	DATE 9/19/2016	DESIGNED BY	GW
CHICKEN CREEK RESTORATION		DRAWN BY	DMC
		SURVEYED BY	JPS
		CHECKED BY	
OPTION I		SHEET NO.	1

Attachment F: Conceptual Post-Construction Site Restoration Plan

DAVID EVANS AND ASSOCIATES, INC.

MEMORANDUM

DATE: February 28, 2017

TO: Niki Iverson
Willamette Water Supply Program (WWSP)

FROM: Ethan Rosenthal
David Evans and Associates, Inc. (DEA)

SUBJECT: Willamette Water Supply Program–Conceptual Post-Construction Site Restoration Plan

CC: Sarah Betz, DEA and Jill Chomycia, MWH

Introduction

This memorandum provides a conceptual post-construction site restoration plan for proposed pipeline resources crossings (i.e., wetlands, creeks, and riparian areas) associated with the Willamette Water Supply Program (Program). This plan is considered conceptual and intended to provide overall site restoration guidance, specifically site revegetation guidance, along proposed pipeline construction corridors. Site specific resource crossing restoration design work will be required as part of final design for each Program work package and will need to take into consideration local site conditions, engineering constraints, local regulatory requirements (e.g., Clean Water Services (CWS) and local land use code requirements), and conditions associated with any issued Program wide permits (e.g., US Army Corps of Engineers 404 permit, Department of State Lands removal-fill permit).

Site Restoration Concept

Typical Planting Plan

The site restoration concept provides planting plans for disturbed riparian and wetlands areas at proposed resource crossings (Attachment 1). The Program has established planting restrictions in proximity to the pipe to avoid potential risks of disturbance and damage to the pipe due to plant roots. This results in the following planting zones:

- **Restricted Zone:** This is typically a 12-foot-wide corridor over the pipe in which only shallow rooting vegetation may be planted. An exception is along stream banks where the pipe will be buried deeper and medium rooting vegetation will be allowed.
- **Safety Zone:** This consists of the permanent easement area beyond the Restricted Zone. Medium rooting vegetation is allowed in this zone.
- **Temporary Easement:** Temporary easement areas may be planted with deep rooting vegetation.

Planting Plan Exceptions

Conceptual planting plans are provided in Attachment 1 and represent the typical planting plan for the majority of resource crossings. However, there are a few exceptions where the typical planting plan may be adjusted to accommodate current land use and land owner needs. Exceptions occur in areas of existing managed pasture or other agricultural wetlands.

Planting Plan by Resource Crossing

Attachment 2 provides a table listing of each crossing and whether or not the typical plan is likely to be applied. The presence of existing utilities at some locations could also result in modifications to the typical planting plan; however, although mentioned in some instances, this is beyond the level of detail provided in this conceptual plan and will be addressed during the final design stage for each work package.

Planting Densities

Planting densities shall be based on CWS design guidelines regardless of jurisdiction, unless local jurisdiction requirements specify otherwise or site specific habitat conditions warrant adjustments to CWS guidelines. The intent of CWS plant density guidelines is to assure the establishment of a dense cover by native plantings, with the understanding that some plantings will die off naturally.

Irrigation

Irrigation is not required by this plan unless required by the respective local jurisdiction or desired by the Partners to promote plant establishment. Success criteria described below allow for a 20-percent mortality rate.

Invasive Species Control

Most project crossings currently contain extensive coverage by invasive species, both at and adjacent to the crossing locations. The most prominent invasive species include Himalayan blackberry (*Rubus armeniacus*), reed canarygrass (*Phalaris arundinacea*), and English ivy (*Hedera helix*). Non-native pasture grasses are also ubiquitous throughout the project area. It is not reasonable to completely remove and eradicate these species from the project area. However, the Program shall be responsible for controlling such species within reason, so as to allow successful establishment of native plantings during the monitoring period described below.

Success Criteria

The following success criteria are proposed:

Areas with Native Plantings

1. For areas in which the typical or similar native plantings are proposed, tree and shrub survival will at a minimum be 80 percent of the initial installed total at each crossing (e.g. not on a parcel by parcel breakdown but for the entire crossing) by the end of the monitoring period. Native volunteer recruits may be included in plant counts.
2. For areas in which the typical or similar native plantings are proposed, invasive species shall be controlled to prevent them from smothering or otherwise preventing the successful establishment of planted native species during the monitoring period.

Managed Pasture Areas or Similar

3. Areas of managed pasture that will be replanted to pasture shall at a minimum have 90-percent coverage after the first growing season.

Areas of cropland shall be restored in accordance with landowner agreements. Success criteria, which are intended to serve regulatory requirements, are not included for croplands.

Monitoring and Reporting

Monitoring and reporting of all areas receiving native plantings shall occur for a minimum of three years post installation, which is the typical minimum requirement of the USACE and DSL. Individual jurisdictions may require longer monitoring periods. If plantings are unsuccessful, then permitting agencies may require new plantings and the monitoring period to be extended. Areas receiving pasture seeding shall only be monitored for one year (as-built plus end-of-year monitoring), assuming successful plant establishment. Monitoring and reporting for cropland areas are not included as part of this plan, which is intended for regulatory purposes.

The following monitoring schedule is proposed for areas receiving native plantings:

Monitoring	Protocol	Timing
As-built monitoring	Total plant count	Within 2 weeks of planting
Year 1	Total plant count	Summer to early Fall following initial planting season
Year 2	Total plant count	Summer to early Fall
Year 3	Total plant count	Summer to early Fall

A monitoring report or memo shall be prepared for each monitoring event. Monitoring shall compare findings relative to the success criteria outlined in this memorandum or as required by authorized permits. Site photos shall be taken and included in monitoring reports.

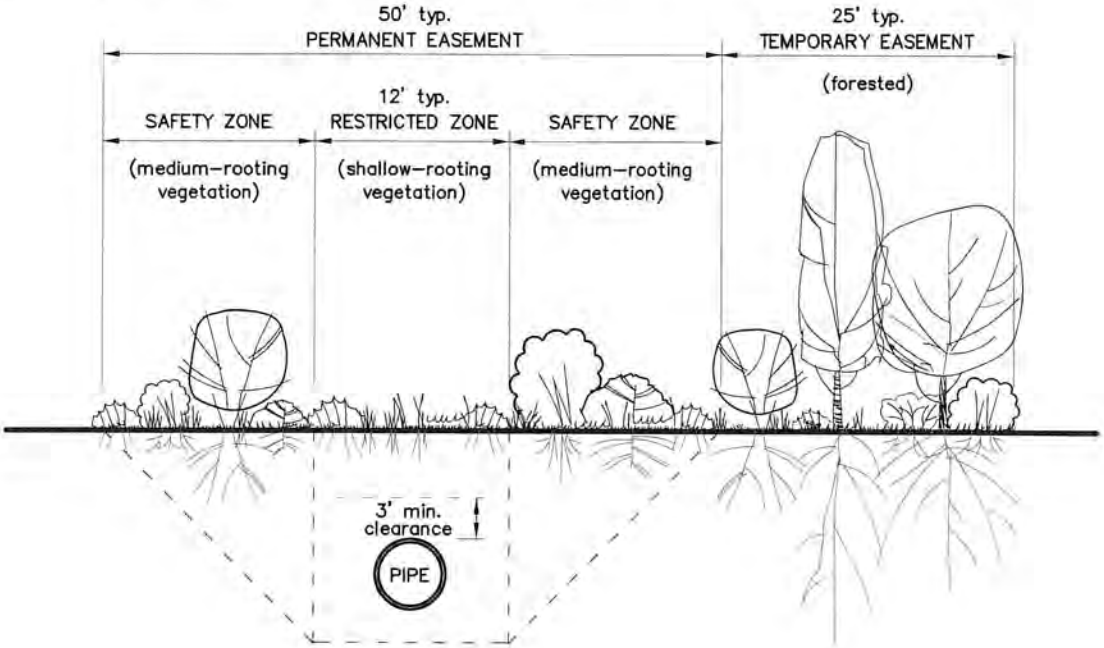
Attachments

Attachment 1: Typical Site Restoration Plans for Wetland and Riparian Areas
Attachment 2: Table 1: Site Restoration by Resource Crossing

Attachment 1: Typical Site Restoration Plans for Wetland and Riparian Areas

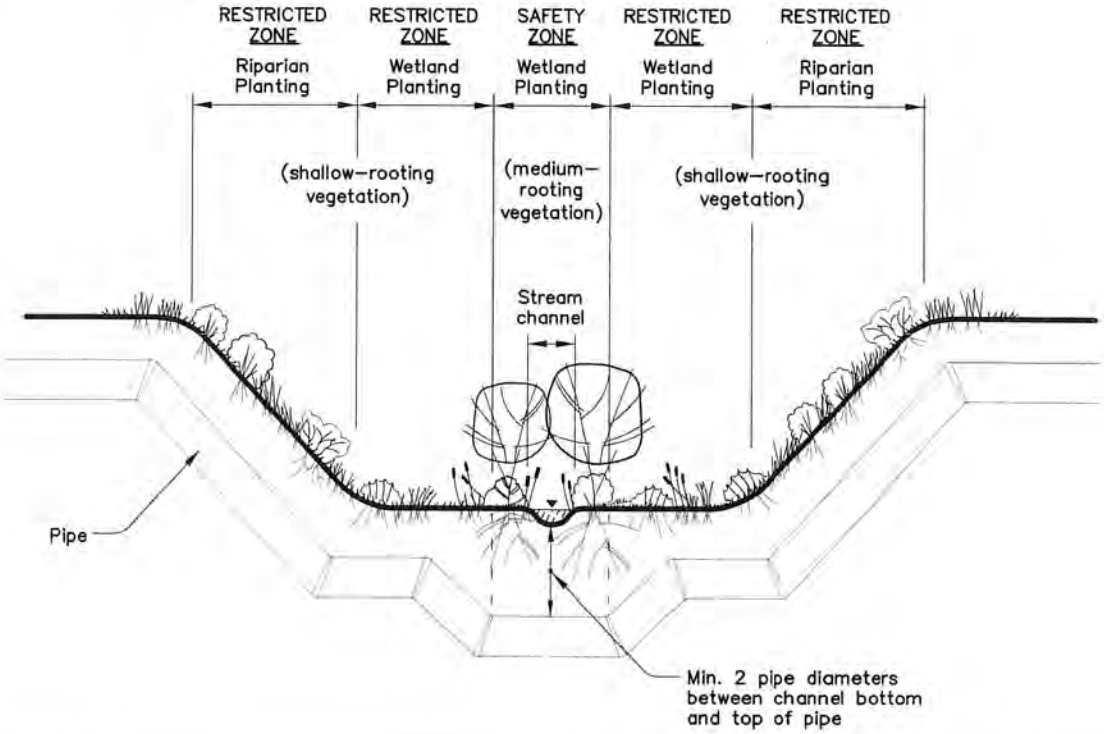
TYPICAL SITE RESTORATION IN WETLAND AND RIPARIAN RESOURCE CROSSINGS

- See plant communities for Wetland Areas and Riparian Areas on sheets 2 and 3.
- Refer to Crossings spreadsheet for areas where exceptions to typical site restoration apply (e.g. agricultural wetlands).



TYPICAL PROFILE ALONG RESTRICTED ZONE

- See plant communities for Restricted Zones and Safety Zones on sheets 2 and 3.
- Refer to Crossings spreadsheet for areas where exceptions to typical site restoration apply.



DSGN	DAVID EVANS AND ASSOCIATES INC.	Willamette Water Supply Our Reliable Water	RESOURCE CROSSING SITE RESTORATION PLAN	SHEET 1
DR				DATE
CHK				
APVD			WILLAMETTE WATER SUPPLY PROGRAM	PROJ

FILENAME: WILLAMETTE_MITIGATION TYPICALS.DWG PLOT DATE AND TIME:

TYPICAL SITE RESTORATION IN WETLANDS

WETLAND PLANT COMMUNITIES, TYPICAL *

"Restricted Zone" (shallow-rooting vegetation) WETLAND			
	Common Name	Botanical Name	Plant Category
	Slough Sedge	Carex obnupta	Herb
	Spreading Rush	Juncus patens	Herb
	Small Fruited Bulrush	Scirpus microcarpus	Herb
	Creeping Spike Rush	Elocharis palustris	Herb
	Tufted Hairgrass	Deschampsia cespitosa	Grass
	Meadow Barley	Hordeum brachyantherum	Grass
	Rice Cutgrass	Leersia oryzoides	Grass
	Spike Bentgrass	Agrostis exarata	Grass

"Safety Zone" (medium-rooting vegetation) WETLAND			
	Common Name	Botanical Name	Plant Category
	Swamp Rose	Rosa pisocarpa	Shrub
	Douglas Spirea	Spirea douglasii	Herb
	Redtwig Dogwood	Cornus sericea	Herb
	Pacific Ninebark	Physocarpus capitatus	Herb
	Small Fruited Bulrush	Scirpus microcarpus	Herb
	Slough Sedge	Carex obnupta	Herb
	Tufted Hairgrass	Deschampsia cespitosa	Grass
	Meadow Barley	Hordeum brachyantherum	Grass
	Rice Cutgrass	Leersia oryzoides	Grass
	Spike Bentgrass	Agrostis exarata	Grass

"Temporary Easement" (forested) WETLAND			
	Common Name	Botanical Name	Plant Category
	Red Alder	Alnus rubra	Tree
	Douglas Hawthorn	Crataegus douglasii	Tree
	Oregon Ash	Fraxinus latifolia	Tree
	Pacific Willow	Salix lasiandra	Shrub
	Pacific Ninebark	Physocarpus capitatus	Shrub
	Red-osier Dogwood	Cornus sericea	Shrub
	Snowberry	Symphoricarpos albus	Shrub
	Slough Sedge	Carex obnupta	Herb
	Dewey's Sedge	Carex deweyana	Herb
	Small Fruited Bulrush	Scirpus microcarpus	Herb
	Tall Managrass	Glyceria elata	Grass

* Typical plant communities. Species substitutions may occur during final design so long as substitute species are listed as native by Clean Water Services, Metro, or City of Portland plant lists and are consistent with the proposed habitat type.

TYPICAL SITE RESTORATION IN RIPARIAN AREAS

RIPARIAN PLANT COMMUNITIES, TYPICAL *

"Restricted Zone" (shallow-rooting vegetation) RIPARIAN

Common Name	Botanical Name	Plant Category
Snowberry	Symphoricarpos albus	Shrub
Kelsey's Dwarf Red-osier Dogwood	Cornus sericea 'Kelseyi'	Dwarf shrub
Western Swordfern	Polystichum munitum	Groundcover
Dewey's Sedge	Carex deweyana	Herb
Bigleaf lupine	Lupinus polyphillus	Herb
Yarrow	Achillea mellefolium	Herb
Canada Goldenrod	Solidago elongata	Herb
Spike Bentgrass	Agrostis exarata	Grass
Blue Wildrye	Elymus glaucus	Grass
Native California Brome	Bromus carinatus	Grass

"Safety Zone" (medium-rooting vegetation) RIPARIAN

Common Name	Botanical Name	Plant Category
Vine maple	Acer circinatum	Shrub
Red elderbery	Sambucus racemosa	Shrub
Snowberry	Symphoricarpos albus	Shrub
Salmonberry	Rubus spectabilis	Shrub
Swamp Rose	Rosa pisocarpa	Shrub
Dewey's Sedge	Carex deweyana	Herb
Bigleaf lupine	Lupinus polyphillus	Herb
Spike Bentgrass	Agrostis exarata	Grass
Blue Wildrye	Elymus glaucus	Grass
Native California Brome	Bromus carinatus	Grass

"Temporary Easement" (forested) RIPARIAN

Common Name	Botanical Name	Plant Category
Red Alder	Alnus rubra	Tree
Douglas Hawthorn	Crataegus douglasii	Tree
Western Red Cedar	Thuja plicata	Tree
Red Elderberry	Sambucus racemosa	Shrub
Red-osier Dogwood	Cornus stolonifera	Shrub
Indian Plum	Oemleris cerasiformis	Shrub
Snowberry	Symphoricarpos albus	Shrub
Salmonberry	Rubus spectabilis	Shrub
Spike Bentgrass	Agrostis exarata	Grass
Native California Brome	Bromus carinatus	Grass

* Typical plant communities. Species substitutions may occur during final design so long as substitute species are listed as native by Clean Water Services, Metro, or City of Portland plant lists and are consistent with the proposed habitat type.

DAVID EVANS
AND ASSOCIATES INC.

MEMORANDUM

DATE: February 27, 2018

TO: Anita Huffman
Oregon Department of State Lands
775 Summer St. NE, Suite 100
Salem, OR 97301-1279

FROM: Ethan Rosenthal, David Evans and Associates, Inc. (DEA)

SUBJECT: Response to ODFW comments regarding Willamette Water Supply System permit application

PROJECT: Willamette Water Supply System
DSL App. 0060102

CC: Niki Iverson (City of Hillsboro), Jill Chomycia (Stantec), Jennifer Miller (DEA), Sarah Betz (DEA), Tom Murtagh (ODFW)

This memorandum addresses comments provided by the Oregon Department of Fish and Wildlife (ODFW) to the Oregon Department of State Lands (DSL) as part of DSL's permit application review of the Willamette Water Supply System (WWSS or Program) (DSL App. 0060102). ODFW's comments are in italic font with responses provided in normal font.

GENERAL INFORMATION:

a) *The Water Supply Intake located on the mainstem Willamette River will be replaced and upgraded to meet increased water volume pumping and conveyance capacity. The applicant will need to meet state screening criteria for this to be approved. All designs, complete with engineering, screening dimensions, approach velocities, and sweeping velocities, etc., will need to be submitted to the ODFW Screening and Passage Program for review and approval prior to construction.*

Response: The Project Participants are aware of this requirement and will continue working with ODFW Screening and Passage Program staff to gain approvals. Similar coordination will continue with National Marine Fisheries Service staff. Joel Watts, ODFW, reviewed the preliminary intake screen design option technical memorandum and determined the proposed screen system appears to meet ODFW screening criteria. The Project Participants will continue to coordinate with ODFW as the screen design advances.

b) *Open Trench construction at certain stream crossings will require instream work area isolation, a construction method that will affect fish passage. ODFW requires that the contractor cannot block fish movement, both up and downstream in specified streams, for a period "not to exceed ten days". The following stream crossings will need to adhere to this requirement if open-trench construction is used; Coffee Lake Creek, Rock Creek, Chicken Creek, Unnamed Creek at Scholls Ferry Road (near Lolich's Farm),*

and Beaverton Creek and associated tributary streams. Should the contractor need more than ten days to finish up inwater work at any one specific location, ODFW will need to be notified for consideration of the request to ensure native migratory fish can move in accordance with life history needs as determined by location and water quality condition of the stream.

Response: The Project Participants plan to meet the fish passage criteria "not to exceed ten days" during the instream work window for the stream crossings listed above. The Project Participants will notify and coordinate with ODFW should a contractor need to block fish passage more than ten days to complete in-water work. A Fish Passage Permit will be acquired to address fish passage requirements for all open trench crossings prior to construction.

c) *The Inwater Work Window for all work related to streams is July 15th to September 30th .Inwater work that is proposed outside this timeframe will be considered by ODFW given suitable rationale and a low risk to fishery or certain wildlife resources in the area of proposed work.*

Response: The Project Participants acknowledge that all stream crossings associated with the project, exclusive of the Willamette River (Willamette Falls to Newberg), have an in-water work window from July 15th to September 30th. The in-water work window for the Willamette River (Willamette Falls to Newberg) is June 1 to October 31. The Project Participants intend to conduct in-water work during these time periods. The Project Participants will coordinate with ODFW through the DSL in-water work period variance process should adjustments to the work windows be needed.

d) *ODFW understands that the applicant is requesting a 75 foot wide vegetative clearance zone, about 37 feet to either side of the pipe alignment, at most stream crossings where open-trench methods are proposed. ODFW understands that this is to give the contractor flexibility in access, staging and construction. ODFW is concerned that a 75 foot wide clear-zone within the riparian and near-shore area of the stream will have significant impacts on the stream-bank interface and future function of the affected area due to vegetation removal and soil compaction. To minimize project impacts near stream crossing locations, ODFW recommends that all clearance zones at sites where open trench methods are proposed be reduced to 50 feet wide within the riparian zone of the site-stream within 75 feet of the waterline or bank. ODFW also recommends that the clear-zone be further reduced to 30 feet within the alignment that is 15 feet from the water line or top-of-bank.*

DATE: February 27, 2018

FROM: Ethan Rosenthal, David Evans and Associates, Inc. (DEA)

TO: Anita Huffman

SUBJECT: Response to ODFW comments regarding Willamette Water Supply System permit application

Response: Impacts to resource crossings are identified in the Joint Permit Application (JPA) submitted to DSL and USACE on April 4, 2017. The proposed width of construction corridors through resource crossings shown in the JPA varied by crossing, but is on the order of 75 feet at most crossings. The Project Participants reviewed the preliminary designs for each crossing in consideration of the criteria from ODFW. At several locations, the WWSP has reduced the proposed width of impacts to meet the criteria provided. At some crossings however, the criteria cannot be met due to site-specific technical considerations. Proposed crossing widths are shown in Table 1.

The Project Participants met with Tom Murtagh (ODFW) to discuss the proposed approach to minimizing bank impacts at crossings. After discussing the technical rationale for the widths that would exceed criteria he has recommended, Tom Murtagh indicated that the proposed widths and approach summarized in the enclosed notes from that meeting are acceptable to ODFW. The approach includes:

- The maximum construction corridor width for proposed at each crossing as shown in the enclosed table. Where the crossing widths are proposed to be reduced from what was illustrated in the JPA, the exact location of the construction corridor would ultimately be determined by the contractor but would be within the work limits shown in the JPA.
- Where fish passage is required additional space beyond the construction corridor widths identified in the attached table would be needed to construct fish passage, using methods described in Section 3.4.1.1.4 of the JPA. Fish passage requirements for all open-trench waterway crossings will be determined through the ODFW Fish Passage Permit application process. Additional space for a fish passage channel would be within the work limits identified in the JPA.

No revised drawings are provided because the exact location and impact areas at each crossing will depend on the ultimate pipeline alignment and fish passage needs. All impacts to jurisdictional resources would be the same or less than shown in the JPA, and would be located within the footprint shown in the JPA.

DATE: February 27, 2018

FROM: Ethan Rosenthal, David Evans and Associates, Inc. (DEA)

TO: Anita Huffman

SUBJECT: Response to ODFW comments regarding Willamette Water Supply System permit application

Table 1. Maximum Construction Corridors for Willamette Water Supply System at Selected Crossings and Associated Criteria from Oregon Department of Fish and Wildlife

WWSP Work Package	Crossing	Proposed Construction Corridor Width[1] (ft)	ODFW Criteria	
			Width ≤50 FT Within 75 ft[2]	Width ≤30 ft within 15 ft[3]
PLM_1.0	Coffee Lake Creek	60	Exceeded	--
PLM_4.0	Chicken Creek	50	Met	Exceeded
PLM_5.0	Drainage North of SW Beef Bend Rd #1	30	Met	Met
	Scholls Ferry Creek Crossings	75	Exceeded	--
	Wetland near intersection of Tile Flat and Grabhorn Rds	50	Met	--
	McKernan Creek at Grabhorn Rd	60	Exceeded	--
	Unnamed Seasonal Drainage at Tanabe Property	50	Met	--
PLW_1.0	Unnamed seasonal drainage north of Rosedale Rd	50	Met	--
	Unnamed tributary to Butternut Creek	50	Met	--
PLW_2.0	Beaverton Creek at Cornelius Pass Rd	60	Exceeded	Exceeded
	Rock Creek at Cornelius Pass Rd	50	Met	Exceeded

Key:
≤ = less than or equal to
-- = Criterion was not specified or does not apply at this crossing
CWS = Clean Water Services
ft = feet
ODFW = Oregon Department of Fish and Wildlife
WWSP = Willamette Water Supply Program

Notes:
[1] Where fish passage is required additional space beyond the construction corridor widths identified in the attached table would be needed to construct fish passage.
[2] The first ODFW criterion (Width ≤50 ft Within 75 ft) requires that the construction corridor not exceed 50 feet within 75 feet of the top of bank (generally equivalent to the ordinary high water mark) for identified streams.
[3] The second ODFW criterion (Width ≤30 ft within 15 ft) requires that the construction corridor not exceed 30 feet within 15 feet of the top of bank (generally equivalent to the ordinary high water mark) for identified streams.

e) *Per Oregon Administrative Rule and Statute, fish salvage will be required at certain project locations where open trench methods are used to cross the streams. ODFW recommends a pre-construction meeting to discuss work area isolation and fish removal techniques at the following stream crossings where open-trench methods are used: Coffee Lake Creek, Chicken Creek, and Beaverton Creek.*

Response: The Project Participants acknowledge the need for fish salvage where in-water work in fish bearing streams will occur. The Project Participants will coordinate with ODFW, including a pre-construction meeting, to discuss work area isolation and fish removal for the above listed streams.

f) *Per Oregon Administrative Rule and Statute, ODFW requires that Sensitive, Listed and Protected species of wildlife be salvaged (collected and moved out of harm's way) from specified project locations where mortality might occur due to heavy equipment operation, vegetation clearing and construction, etc. Therefore, ODFW requires that any contractor responsible for clearing and preparing land for construction along the alignment and at new Facility locations including staging area(s), storage facilities, pump stations and the Intake site, contact ODFW prior to commencing construction to discuss expectations, responsibilities, and permit requirements for capturing and transporting Protected wildlife consistent with state law.*

Response: The Project Participants will coordinate with ODFW regarding salvage of sensitive, listed, and protected species of wildlife (e.g. western pond turtle, northern red-legged frog) that may be in harms way during project construction. Coordination will occur prior to construction and appropriate permits obtained if deemed necessary by ODFW.

Please let me know if you have any questions regarding the information provided. Thank you for help on the project.

-Ethan

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Attachments/Enclosures: none

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