VISTA VIEWS AT BLACK LAKE

CITY OF TUMWATER, WASHINGTON

CRITICAL AREAS REPORT & WETLAND MITIGATION PLAN

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OPTIMIZE USABLE LAND

8 August 2024

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&

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this Critical Areas Report is to identify and map Critical Areas on the subject property, satisfying City of Tumwater regulatory requirements under Critical Areas. Potential wetlands, streams, steep slopes, and their buffers were evaluated on the subject property and within three hundred (≤300) feet of the subject property.

Severe alteration of soils, hydrology, and vegetation has occurred on the subject property for decades as the result of agricultural livestock grazing. Livestock have compacted the soils and grazed the vegetation over a long period of time. The property has been managed for the optimal production of livestock. Vegetation on the property consists of a managed plant community for the optimization of livestock grazing. Livestock wallows that occur on the southern portion of the subject property contain some hydrophytic vegetation, namely rushes and sedges. The wallows are very disturbed from decades of trampling and grazing by livestock. Advanced methods have been applied in these areas as required under the US Army Corps of Engineers (USACE) (2010) Regional Supplement (**Appendix N**).

The "Routine Onsite Determination Method" was applied where normal conditions occur on the subject property as required under Chapters 2-4 of the USACE (2010) Regional Supplement. However, in "Difficult Areas," advanced methods were applied for a wetland determination as required in Chapter 5 of the USACE (2010) Regional Supplement (**Appendix N**). These difficult areas include livestock wallows that contain some rushes and sedges.

If these livestock wallows are wetlands that require buffers, the southern portion of the property would severely encumber any economically feasible potential land use project. The very small livestock wallows would be impacted under any potential land use project that could occur on this large property located within the City limits of Tumwater. It is likely that these small patches would naturally disappear if not maintained by chronic livestock wallowing.

Eliminating any potential wetlands that may have formed in the livestock wallows would provide a unique opportunity to enlarge, restore, and rehabilitate a severely degraded Category II wetland located on the northern portion of the subject property. This proposal would transform this severely degraded Category II wetland into one (1) large, high-quality wetland system. Wetland functions would be restored and enhanced within a larger and more diverse habitat. Invasive weeds would be eliminated and native plant species would be installed, improving wetland functions.

This report identifies wetlands, calculates buffers, and proposes a wetland mitigation plan compensating for the loss of potential wetlands that may have formed in the livestock wallows by enlarging and enhancing a Category II wetland located on the northern portion of the property. Removing livestock from the Category II wetland would vastly improve habitat quality and wetland functions. The elimination of invasive weeds and installation of native vegetation would transform this severely degraded Category II wetland into a high quality wetland system.

1.2 Property Location

The subject property is located in the City of Tumwater, Thurston County WA (**Figure 1; Table 1**).

Table 1. Subject Property

No#	Address	Parcel Number	Map Coordinates	Area
1	3717 49TH AVE SW	12832310700	Section 32 Township 18 Range 2W	~50.01
2	3825 58TH LN SW	12832310800		~5.00
2 Parcels	Total Size			54.36 acres

The permitting jurisdiction is the City of Tumwater.

1.3 Site Evaluation

A wetland and stream evaluation was performed on the subject property on:

- 26 July 2022
- 3 October 2022
- 5 October 2022
- 3 December 2023
- 3 January 2023
- 8 February 2023
- 1 April 2023
- 3 April 2023
- 4 April 2023
- 23 May 2023

1.4 Wetlands Do Not Include Detention Facilities

A farm pond occurs on the subject property. Under Tumwater Municipal Code (TMC) 16.28.030---*Definitions*, farm ponds are not regulated as wetlands.

Under TMC 16.28.030---*Definitions*, wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, **irrigation and drainage ditches**, **grass-lined swales**, canals, detention facilities, wastewater treatment facilities, **farm ponds**, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway.

1.5 Property Description

The subject property consists of a large (55.01-acre) pasture containing a dense population of livestock (**Figure 1, Table 1, Appendix A, Photos 1-8**). Trampling by large herbivores can cause soil compaction, altering soil permeability and infiltration rates and affecting the plant community (USACE 2010, P 103). Livestock wallow in cool moist soils during hot summer days, which can further compact and alter soils, hydrology, and vegetation through trampling, grazing, and dropping large quantities of manure.

Patches of soft rush (*Juncus effusus*, FACW) and slender rush (*Juncus tenuis*, FAC) with some limited slough sedge (*Carex obnupta*, OBL) occur in livestock wallows on the southern portion of the subject property. However, no hydric soils were identified in these areas and no hydrology was identified during the growing season using the routine onsite determination method. These areas did not satisfy all three (3) criteria (*i.e.*, hydric soils, hydrophytic vegetation, and wetland hydrology) for a wetland determination. Hydric soils and hydrology were not satisfied under the routine on-site determination method.

Generally, soils on the southern portion of the subject property consist of very dark grayish brown (10YR 3/2) to dark brown (10YR 3/3) sandy silt throughout. Soils appear to be consistent within or outside of the patches of rushes. Soil conditions on the southern portion of the subject property generally do not satisfy the hydric soils criteria.

No consistent hydrology indicators were identified on the southern portion of the subject property, including within the patches of rushes, using the routine on-site determination method. Although winter water was detectable in some areas, no water was identified in test pits during the growing season, which did not satisfy the hydrology criterion.

Secondary hydrology indicators were also explored, such as Geomorphic Position (D2) (*i.e., concave depression*) and FAC-Neutral Test (D5). The geomorphic positions at the rush patches are generally flat. A couple of the patches exhibit very slight concave depressions that are difficult to detect by visual observations. However, slight depressions are not exclusive to these areas, the entire southern portion of the subject property contains similar slightly uneven landscape, which is common in active pastures.

Although the FAC-Neutral test was satisfied in some patches of rushes, the test was not satisfied in other patches of rushes, exhibiting a majority of FACU species, including sweet vernal grass (*Anthoxanthum odoratum*, FACU), hairy cat's ear (*Hypochaeris radicata*, FACU), common plantain (*Plantago lancelata*, FACU), and dandelion (*Taraxacum officinale*), over one (1) or two (2) species wetter than FAC. The required two (2) secondary indicators were not satisfied.

Vegetation on the southern portion of the subject property primarily consists of a managed plant community of European pasture grasses and associated non-native forb species typically found in pastures or lawns. The vegetation community is managed to optimize livestock grazing. Areas of rushes are intermixed with European pasture species and non-native forbs. No native plant communities occur on the southern portion of the subject property.

Soils on the southern portion of the subject property have been altered through decades of intensive agricultural practices. Livestock causes soil compaction, altering soil permeability and infiltration rates and affecting the plant community (USACE 2010, P 103). Massive volumes of manure alter the soil chemistry, color, and texture and affect plant composition. Winter water may pond in livestock wallows. Water may follow the path of cattle trails, which can be seen clearly from aerial photographs.

Hydrology on the southern portion of the subject property has been altered from natural conditions. Historical agricultural ditches, labeled Ditch A & Ditch B, remain functional on the southern portion of the subject property (**Figure 2; Appendix A, Photos 69-79**). The agricultural ditches convey excess winter water from the southern portion of the subject property to the northern portion of the subject property (**Figures 2 & 3**). Ditch A bisects the central portion of the subject property from the eastern fence line to the western property boundary. Ditch B drains from south to north along the southern portion of the western property boundary. This water is piped from the confluence of the two (2) ditches northward along the western property line. Contours suggest that the historical drainage from the southern portion of the subject property flowed westward toward Black Lake.

This long-term alteration of vegetation, soils, and hydrology creates an "atypical" or "difficult" situation as described by the USACE (2010) Regional Supplement.

The "Routine On-site Determination Method" was applied in areas of normal conditions to identify and delineate wetlands. In difficult areas, advanced wetland methods were applied to provide additional information to assist in the wetland determination. These advanced methods were applied as required when evaluating difficult situations under Chapter 5 of the U.S. Army Corps of Engineers (USACE) (2010) *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)* (**Appendix N**).

2.0 METHODOLOGY

This report is based on a review of existing information and field investigations. The goal of these efforts is to collect and document existing information that reflects current site conditions for assessing potential impacts.

2.1 Review of Existing Literature

Prior to conducting fieldwork, biologists reviewed existing information to identify wetlands, streams, vegetation patterns, topography, soils, wildlife habitats, and other natural resources on the subject property. Existing data sources that were reviewed for this report included but were not limited to the following:

- Washington. U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) Soil Survey
- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI), online wetlands mapper
- Washington Department of Fish and Wildlife (WDFW) Salmonscape Database
- Washington Department of Fish and Wildlife (WDFW) Priority and Habitat Species Database
- Washington State Department of Natural Resources (DNR) Natural Heritage Database
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) and Flood Insurance Studies

2.2 Field Investigation

A wetland evaluation was performed onsite as well as offsite of the subject property to determine if wetlands, streams, or their buffers extend onto the subject property. The routine on-site determination method was used to identify potential wetlands using the procedures outlined in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory, 1987) and the 2010 USACE Regional Wetland Supplement.

2.3 Wetland Identification

Prior to 2010, biologists delineated wetlands according to the methods specified in the U.S. Army Corps of Engineers (USACE) Wetlands Delineation Manual (Environmental Laboratory 1987). At that time, these methods complied with those in the Washington State Wetland Identification and Delineation Manual (Washington State Department of Ecology [Ecology] 1997).

Following 2010, biologists evaluate wetlands according to the methods specified in the USACE's Wetlands Delineation Manual (Environmental Laboratory 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0) (USACE 2010). These methods comply with those adopted by Washington State pursuant to Washington Administrative Code (WAC) 173-22-035, Revised Code of Washington (RCW) 90.58.380.

2.3.1 Vegetation

The dominant plants and their wetland indicator status were evaluated to determine whether the vegetation is hydrophytic. Hydrophytic vegetation is generally defined as vegetation adapted to prolonged saturated soil conditions. To meet the hydrophytic vegetation criterion, more than 50 percent of the dominant plants must be facultative, facultative wetland, or obligate, according to the plant indicator status category assigned to each plant species by the USACE National Wetland Plant List. **Table 2** provides the definitions of the indicator status categories. The scientific and common names for plants follow the currently accepted nomenclature. Dominant plant species were observed and recorded on wetland determination data forms for each data plot (**Appendix M**).

Table 2. Key to Plant Indicator Status Categories

Plant Indicator Status Category	Symbol	Description
Obligate Wetland Plants	OBL	Plants that almost always (>99% of the time) occur in wetlands but may rarely (<1% of the time) occur in non-wetlands
Facultative Wetland Plants	FACW	Plants that often (67% to 99% of the time) occur in wetlands but sometimes (1% to 33% of the time) occur in non-wetlands
Facultative Plants	FAC	Plants with a similar likelihood (33% to 66% of the time) of occurring in both wetlands and non-wetlands
Facultative Upland Plants	FACU	Plants that sometimes (1% to 33% of the time) occur in wetlands but occur more often (67% to 99% of the time) in non-wetlands
Upland Plants	UPL	Plants that rarely (<1% of the time) occur in wetlands and almost always (> 99% of the time) occur in non-wetlands

2.3.2 Soils

Soils were excavated to 18 inches or more below the surface within test pits to evaluate soil characteristics and hydrological conditions throughout the property. Soil chroma (color) is evaluated using the *Munsell Color Chart* (Munsell Color, 1988). Generally, an area must have hydric soils to be considered a wetland. Hydric soil forms when soils are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper portion. Biological activities in saturated soil result in reduced concentrations of oxygen that in turn result in a preponderance of organisms that use anaerobic processes for metabolism. Over time, anaerobic biological processes result in certain soil color patterns, which are used as indicators of hydric soil. Typically, low-chroma colors are formed in the matrix of hydric soil. Bright-colored redoximorphic features form within the matrix under a fluctuating water table. Other important hydric soil indicators include organic matter accumulations in the surface layer, reduced sulfur odors, and organic matter staining in the subsurface.

2.3.3 Hydrology

The subject property was examined for evidence of hydrology. The U.S. Army Corps of Engineers (2005) provides a technical standard for monitoring hydrology on such sites. This standard requires 14 or more consecutive days of flooding or ponding, or a water table 12 in. (30 cm) or less below the soil surface, during the growing season at a minimum frequency of 5 years in 10 (50 percent or higher probability). The USACE 2010 Regional Supplement provides a list of hydrology indicators to evaluate whether the hydrology standard is satisfied. If wetland hydrology, including pooling, ponding, and soil saturation, is not clearly evident, hydrological conditions may be observed through surface or soil indicators. Indicators of hydrological conditions include oxidized root channels, drainage patterns, drift lines, sediment deposition, watermarks, historic records, visual observation of saturated soils, and visual observation of inundation.

2.4 Wetland Classification and Rating

Delineated wetlands, if identified, would be classified according to the USFWS Classification of Wetlands and Deepwater Habitats of the United States. Hydrogeomorphic classifications were assigned to wetlands using USACE methods established in ‘A Hydrogeomorphic Classification for Wetlands.’ Wetlands were rated using the revised Washington State Wetland Rating System for Western Washington.

3.0 STUDY RESULTS

3.1 Background Information

3.1.1 NRCS Soil Survey for Thurston County

Three (3) of the four (4) soils mapped on the subject property are listed as hydric by the NRCS Soil Survey (**Table 3; Appendix B**).

Table 3. NRCS Soils Survey

Soil Unit	Hydric	Comments
Mukilteo Muck, Drained	Yes	Northwestern corner of property
Norma Silt Loam	Yes	Northeastern and southern portions of property
Cagy Silt Loam	No	Central and southeastern portions of the property
McKenna Gravelly Silt	Yes	Southwestern corner of the property

3.1.2 National Wetlands Inventory (NWI)

Two (2) wetlands have been mapped on the subject property by the US Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) (**Appendix C**). Wetlands have been mapped on the northern and southern portions of the subject property. Off-site wetlands have been mapped west, north, and northeast of the northern portion of the subject property.

3.1.3 City of Tumwater Critical Areas Database

Potential wetlands are mapped on the northern and southern portions of the subject property and within three hundred (≤300) feet of the subject property mapped onsite by the City of Tumwater Critical Areas database (**Appendix D**).

3.1.4 Thurston County Geodata Center Wetlands

Five (5) wetlands have been mapped on the subject property by the Thurston County Geodata Center database (**Appendix E**). Three potential wetlands have been mapped on the northern portion of the subject property. Two (2) wetlands have been mapped on the southern portion of the subject property. Wetlands have been mapped offsite within three hundred (≤300) feet of the subject property.

3.1.5 Thurston County Geodata Center Contours

The southern and northwestern portions of the subject property are mapped relatively flat by the Thurston County Geodata Center database (**Appendix F**). A sub-basin divide extends across the central portion of the property in the east-west direction where precipitation falling north of the divide flows to the northern portion of the property and precipitation that falls on the southern half of the property flows to the southern portion of the property.

3.1.6 Department of Natural Resources (DNR) Water Typing Database

No streams are mapped on the subject property or within three hundred (≤300) feet of the subject property by the State Department of Natural Resources (DNR) Water Typing Database (**Appendix G**).

3.1.7 The WDFW PHS Database

No priority species have been mapped on the subject property or within one thousand (≤1,000) feet of the subject property by the Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) database (**Appendix H**).

Cutthroat trout (*Oncorhynchus clarki*) and pacific clubtail (*Phanogomphus kurilis*), State Priority Species, are mapped fifteen hundred (1,500) feet northwest of the subject property in Black Lake. The Oregon spotted frog, a Federally-listed species, is mapped eighteen hundred (1,800) feet southeast of the subject property.

Two (2) wetlands are mapped on the northern and southern portions of the subject property, respectively. Wetlands are mapped off-site west, north, and northeast of the subject property. Other wetlands have been mapped in the vicinity.

3.1.8 303(d) Water

One (1) 303(d) listed water has been mapped less than one (<1) mile downgradient of the subject property in Black Lake by the Department of Ecology Water Quality Atlas database (**Appendix I**). Wetlands mapped on the subject property by other databases would be in the larger Black Lake basin.

3.1.9 TMDL

No TMDL is mapped on the subject property by the Department of Ecology Water Quality Atlas Database (**Appendix J**).

3.1.10 Potential Flooding

A FEMA floodplain is mapped in Black Lake at one thousand five hundred (>1,500) feet west of the subject property. No FEMA floodplain is mapped on the subject property (**Appendix K**).

3.1.11 Oregon Spotted Frog

Oregon spotted frog screening area is mapped on the subject property by the Thurston County Geodata Center database (**Appendix O**).

No Oregon spotted frog Critical Habitat is mapped on the subject property. Oregon spotted frog Critical Habitat is mapped one thousand four hundred twenty-two (1,422) feet southeast of the subject property. The WDFW PHS database identifies the presence of the Oregon spotted frog one thousand eight hundred (1,800) feet southeast of the subject property (**Appendix H**).

Designated Critical habitat is defined under the Endangered Species Act (ESA) as "the specific areas within the geographic area occupied by the species at the time it was listed that contain the physical or biological features that are essential to the conservation of endangered and threatened species and that may need special management or protection." Designated Critical habitat may also include areas that were not occupied by the species at the time of listing but are essential to its conservation. Essentially, designated Critical Habitat is areas that contain specific habitat requirements necessary for a self-sustaining population of the species.

3.2 Field results

3.2.1 Routine Onsite Determination Method

One (1) wetland, labeled Wetland A, was identified on the northern portion of the subject property using the Routine Onsite Determination Method in compliance with the USACE (2010) Regional Supplement (**Figures 2 & 3; Table 4**).

Wetland identification procedures provided in USACE (2010) Chapters 2-4 are always applied prior to advancing to advanced methodologies of Chapter 5. If procedures in Chapters 2-4 are inconclusive as the result of a difficult situation, procedures from Chapter 5 should be applied for the determination of wetlands. Or if indicators are absent in a suspected wetland, Chapter 5 provides advanced procedures to compensate for missing indicators in suspected wetlands.

The southern portion of the subject property contains difficult areas that trigger the need for the difficult situation methodology of Chapter 5 of the U.S. Army Corps of Engineers (USACE) (2010) Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0).

The determination of hydric soils, hydrophytic vegetation, or wetland hydrology is in question in patches of soft rush (FACW) and slender rush (FAC). Some areas that satisfy the vegetation criterion, have not satisfied the hydric soil or wetland hydrology criteria. Advanced studies methodologies have been applied in these areas. Because the study is inconclusive when applying the Routine Onsite Determination Method, Advanced Studies Methodologies were applied in compliance with USACE (2010) Regional, Supplement.

3.2.2 Results of Advanced Study

Two (2) wetlands, labeled Wetland B and Wetland C, have been identified on the southern portion of the subject property using advanced methods described in Chapter 5 of the USACE (2010) Regional Supplement (**Figure 2**). Three (3) shallow groundwater monitoring wells, W2, W15, & W16, tested positive for the USACE Wetland Hydrology Standard (**Figure 2; Appendix N**). The Redox Test supports the hydrology results, indicating positive test results at W2 and W15. However, the positive results at these two (2) test locations are borderline, indicating very marginal wetland conditions. A negative Chemical Test result when applying alpha alpha dipyridyl further indicates very marginal wetland conditions, especially considering the definitive positive result at the reference sample in Wetland A (See **Appendix N**).

Table 4. Summary of Critical Areas Results

Wetlands	Area of Wetland		Veg Class Hydroperiod	Buffer Condition	Habitat Features	Comments
	Onsite	Total				
Wetland A	394,715 sf (9.61 acre)	456,181 sf (10.47 acres)	PEMC[1] PFOC[2] PSSC[3]	Roads, pasture, residential and farm buildings	Logs, snags, Amphibian habitat	Severely degraded habitat dominated by non-native invasive weeds
Wetland B	2,136 sf (0.05 acre)	2,136 sf (0.05 acre)	PEMC[1]	High Intensity Pasture	None	Small patch of wet pasture
Wetland C	1,652 sf (0.04 acre)	1,652 sf (0.04 acre)	PEMC[1]	High Intensity Pasture	None	Small patch of wet pasture
Drainages	On-site Reach	Channel Width	Channel Depth	Stream Bottom	Fish Presence	Comments
Ditch A	846 ft	1 ft	1 ft	Mud	No	Excavated channel
Ditch B	338 ft	1 ft	1 ft	Mud	No	Excavated channel

1. PEMC: Palustrine Emergent Seasonally-flooded
2. PFOC: Palustrine Forested Seasonally-flooded
3. PSSC: Palustrine Scrub-shrub Seasonally-flooded

3.2.3 Wetland A

The Wetland A boundary has been marked using orange ribbon flagging tied to vegetation and labeled A-1 through A-20 (**Figure 5**). Wetland flags were GNSS located using a Trimble Geo 7x with sub-foot accuracy. Wetland datasheets are provided in **Appendix M**. Advanced data is found in **Appendix N**.

3.2.3.1 Conditions

Wetland A is a severely degraded wetland grazed by numerous livestock and dominated by non-native invasive weeds, primarily reed canarygrass (*Phalaris arundinacea*; FACW) and Himalayan blackberry (*Rubus armeniacus*; FAC) (**Appendix A, Photos 15-20**).

The Cowardin (1979) classification of Wetland A is (**Figure 15**; **Table 4**):

- Palustrine Emergent Seasonally-flooded (PEMC)
- Palustrine Forested Seasonally-flooded (PFOC)
- Palustrine Scrub-shrub Seasonally-flooded (PFOC)

The wetland boundary on Wetland A is well-defined and consistent throughout (**Appendix A, Photos 15-20**). Potential pollutants within one hundred fifty (150) feet of Wetland A are illustrated in **Figure 17**. Land uses located within one (≤1) kilometer are illustrated in **Figure 18**. The Wetland A contributing basin is illustrated in **Figure 20**. Impaired Section 303(d) listed waters under the Clean Water Act (CWA) are illustrated in **Appendix I**. TMDL Water Quality Projects are illustrated in **Appendix J**.

3.2.3.2 Hydrology

Hydrology derives from local precipitation, groundwater, and agricultural drainage (**Appendix A, Photos 15-20**).

3.2.3.3 Vegetation

Three (3) vegetation classes that include forested, shrub-shrub, and emergent occur in Wetland A (**Figure 15**). Emergent areas are dominated by pasture grasses and reed canarygrass (*Phalaris arundinacea*, FACW). The scrub-shrub portion of Wetland A is dominated by Himalayan blackberry (*Rubus armeniacus*), salmonberry (Rubus spectabilis, FAC), Douglas spirea (*Spiraea douglasii*; FACW), and reed canarygrass (FACW). The forested portion contains a canopy of black cottonwood (*Populus trichocarpa*, FAC), Red alder (*Alnus rubra*, FAC), Oregon ash (*Fraxinus latifolia*, FACW) over plant species found in shrub-shrub areas.

Dominant upland plant species that have been identified adjacent to Wetland A consists of European pasture grasses, a patch of big-leaf maple (*Acer macrophyllum*, FACU), Scotch broom (*Cytisus scoparius*, FACU), and Himalayan blackberry (*Rubus spectabilis*, FAC). Vegetation in majority of the adjacent upland area is dominated by heavily grazed pastureland with very low habitat value.

Dominant plant species identified in Wetland A include:

- Red alder (*Alnus rubra*, FAC)
- Black cottonwood (*Populus trichocarpa*, FAC)
- Oregon ash (*Fraxinus latifolia*, FACW)
- Himalayan blackberry (*Rubus armeniacus*; FAC)
- English laurel (*Prunus laurocerasus*; NL)
- Reed canarygrass (*Phalaris arundinacea*, FACW)
- English Ivy (*Hedera helix*, FACU)
- Salmonberry (*Rubus spectabilis*; FAC)
- Douglas spirea (*Spiraea douglasii*; FACW)
- Slough sedge (*Carex obnupta*, OBL)

Dominant plant species outside of the Basin include:

- Big-leaf maple (*Acer macrophyllum*, FACU)
- Bitter cherry (*Prunus emarginata*; FACU)
- Himalayan blackberry (*Rubus armeniacus*; FAC)
- English laurel (*Prunus laurocerasus*; NL)
- English Ivy (*Hedera helix*, FACU)
- Trailing blackberry (*Rubus ursinus*, FACU)
- Sweet vernal grass (*Anthoxanthum odoratum*, FACU)
- Common bentgrass (*Agrostis stolonifera*, FAC)
- Red fescue (*Festuca rubra*, FAC)
- Hairy cat's ear (*Hypochaeris radicata*, FACU)
- Common Plantain (*Plantago lancelata*, FACU)
- Scotch broom (*Cytisus scoparius*, FACU)

3.2.3.4 Soils

Soils in Wetland A are highly disturbed and extremely variable. Much of the wetland appears to consist of compressed Norma soil unit historically drained and used for agriculture. Soils in Wetland A consist of a very dark grayish brown (10YR 3/2) sandy silt from zero (0) to twenty (20) inches in depth with very yellowish brown (10YR 3/6) redox concentrations and coated sand grains.

Soils adjacent to the wetland consist of a very dark grayish brown (10YR 3/2) sandy silt from zero (0) to twenty (20) inches in depth.

3.2.3.5 Habitat Features

Habitat features in Wetland A are minimal but include some minor fallen logs and some snags.

3.2.4 Wetland B

Wetland B (2,136 sf) is located on the southern portion of the subject property (**Figure 2 & 4; Appendix A, Photos 21-48**). The Wetland B boundary has been marked using orange ribbon flagging fastened to fence posts labeled B-1 through B-5 (**Figure 6; Appendix A, Photos 21-27**). Wetland boundary markers were GNSS located using a Trimble Geo 7x with sub-foot accuracy.

See **Appendix N** for wetland determination and Datasheets.

Vegetation classes and hydroperiods are provided in **Figure 16**. Potential pollutants within one hundred fifty (150) feet of Wetland A are illustrated in **Figure 17**. Land uses located within one (≤1) kilometer are illustrated in **Figure 19**. The Wetland B contributing basin is illustrated in **Figure 20**. Impaired Section 303(d) listed waters under the Clean Water Act (CWA) are illustrated in **Appendix I**. TMDL Water Quality Projects are illustrated in **Appendix J**.

3.2.5 Wetland C

Wetland C (1,652 sf) is located on the southern portion of the subject property (**Figure 6; Appendix A, Photos 49-68**). The Wetland C boundary has been marked using orange ribbon flagging fastened to fence posts labeled C-1 through C-8 (**Figure 6; Appendix A, Photos 49-54**). Wetland boundary markers were GNSS located using a Trimble Geo 7x with sub-foot accuracy.

See **Appendix N** for wetland determination and Datasheets.

Vegetation classes and hydroperiods are provided in **Figure 16**. Potential pollutants within one hundred fifty (150) feet of Wetland A are illustrated in **Figure 17**. Land uses located within one (≤1) kilometer are illustrated in **Figure 19**. The Wetland C contributing basin is illustrated in **Figure 20**. Impaired Section 303(d) listed waters under the Clean Water Act (CWA) are illustrated in **Appendix I**. TMDL Water Quality Projects are illustrated in **Appendix J**.

3.2.6 Drainages

Two (2) excavated agricultural drainage ditches, named Ditch A & Ditch B, have been identified and GNSS-located on the subject property (**Appendix A, Photos 69-79**).

Ditch A extends from east to west across the central portion of the subject property (**Figures 2 & 4**). A culvert extends under a dirt road where livestock move between fields (**Figures 2 & 4; Appendix A, Photos 69-74**). Both Ditches A & B drain to a catch basin where the two (2) drainages converge and flow into a pipe that extends to Wetland A on the northern portion of the subject property (**Appendix A, Photos 69-71**). Ditch B is located on the western edge of the property and flows south to north extending to the catch basin (**Appendix A, Photos 69-71**). Water that enters the catch basin is piped to Wetland A.

3.2.7 Farm Pond

An agricultural farm pond is located on the northern portion of the subject property south of Wetland A (**Figure 2; Appendix A, Photos 9 & 10**). The pond was excavated into an upland area surrounded by uplands vegetated by European pasture grasses, Himalayan blackberry, and upland, non-native pasture weeds.

3.2.8 Oregon Spotted Frog

Potential Oregon spotted frog habitat occurs in Wetland A, located on the northern-most portion of the subject property (**Figures 2 & 3; Appendix A, Photos 15-20**). However, no preferred habitat occurs in Wetland A. The Oregon spotted frog is almost always found in or near a perennial body of water that includes zones of shallow water and abundant emergent or floating aquatic plants, which the frogs use for basking and escape cover (Leonard *et al*. 1993, Corkran and Thoms 1996, McAllister and Leonard 1997, Pearl 1997, Pearl 1999). Wetland A does not contain perennial waters. Wetland A is seasonally flooded. Although, a farm pond, located adjacent to Wetland A, contains perennial waters, no abundant emergent or floating aquatic plants occur in this pond.

Wetlands B & C are small livestock wallows in containing hydrophytic vegetation. These areas may seasonally flood during winter storms when groundwater rises. However, surface water may not persist long enough to support Oregon spotted frog winter habitat. Wallowing livestock likely discourage any potential Oregon spotted frog utilization. Thereby, based on the lack of Oregon spotted frog habitat components, no Oregon spotted frogs are likely to occur in Wetlands B & C.

4.0 REGULATORY CONSIDERATIONS

Wetland regulatory considerations have been summarized in **Table 5**.

Table 5. Summary of Regulatory Considerations

Wetlands								
Wetland	Area of Wetland		Category	Habitat Score	Total Rating Score	Standard Buffer	Reduced Buffer	Comments
	Onsite	Total						
Wetland A	398,720 sf (9.15 acre)	436,607 sf (10.08 acres)	II	6 (MMM)	22	150 ft	110 ft	Wetland buffers can be reduced from 150' to 110'.
Wetland B	2,136 sf (0.05 acre)	2,136 sf (0.05 acre)	IV	4 (LML)	12	50 ft	40 ft	Wetland buffers can be reduced from 50' to 40'
Wetland C	1,652 sf (0.04 acre)	1,652 sf (0.04 acre)	IV	4 (LML)	12	50 ft	40 ft	Wetland buffers can be reduced from 50' to 40'
Drainages								
Drainages	DNR Mapped	Wetland Regulations	Stream Regulations	Comments				
Ditch A	None	Drainage ditches are not wetlands under TMC 16.28.030.	"Fish and wildlife habitat conservation areas" does not include such artificial features under TMC 16.32.050(C)	Artificially created drainages ditches are not defined as wetlands or streams, and thereby are not regulated as Critical Areas				
Ditch B	None							

4.1 Wetlands

4.1.1 Wetland A

Wetland A has been classified as a Category II wetland by the 2014 Department of Ecology Wetland Rating Form for Western Washington as required under Chapter 16.28.090---*Wetlands Rating System*. Wetland A is a depressional wetland under the 2014 Department of Ecology Wetland Rating System.

Under City of Tumwater Municipal Code (TMC) Title 16---*Environment*, Chapter 16.28.090---*Wetlands Rating System*, wetland buffers are calculated based on category of wetland and the habitat score determined by the 2014 Washington State Department of Ecology Wetland Rating System publication 14-06-029, effective January 2015), as revised. Wetland A scored for habitat a "Medium (M)" potential to provide habitat, a "Medium (M)" landscape potential to support habitat, and a "Medium (M)" potential value to society. Wetlands that rate as an M, M, M receive a score of six (6) points for total habitat functions (**Appendix L**).

The standard buffer for Category II wetlands that score between five (5) and Seven (7) points for Habitat Functions require a buffer width of one hundred fifty (150) feet (TMC Chapter 16.28.170---*Wetland buffers*, Table 16.28.170(2)---*Category II Wetland Buffer Widths*) (**Figure 7, Table 5**).

The one hundred fifty (150)-foot buffer on Wetland A could be reduced to one hundred ten (110) feet pursuant to compliance with criteria under TMC Chapter 16.28.170---*Wetland buffers*, Subsection (C)---*Buffer Width Reduction* (See Section 4.3 of this report).

4.1.2 Wetland B

Wetland B has been classified as a Category IV wetland by the 2014 Department of Ecology Wetland Rating Form for Western Washington as required under Chapter 16.28.090---*Wetlands Rating System*. Wetland B is a Depressional wetland under the 2014 Department of Ecology Wetland Rating System.

Under City of Tumwater Municipal Code (TMC) Title 16---*Environment*, Chapter 16.28.090---*Wetlands Rating System*, wetland buffers are calculated based on category of wetland and the habitat score determined by the 2014 Washington State Department of Ecology Wetland Rating System publication 14-06-029, effective January 2015), as revised. Wetland B scored for habitat a "Low (L)" potential to provide habitat, a "Medium (M)" landscape potential to support habitat, and a "Low (L)" potential value to society. Wetlands that rate as an L, M, L receive a score of four (4) points for total habitat functions (**Appendix L**).

The standard buffer for Category IV wetlands that score less than sixteen (<16) points for all three (3) functions and with a high intensity impact of proposed land use require a buffer width of fifty (50) feet under TMC Chapter 16.28.170---*Wetland buffers*, Table 16.28.170(4)---*Category IV Wetland Buffer Widths* (**Figure 7, Table 5**).

The fifty (50)-foot buffer on Wetland B could be reduced to forty (40) feet pursuant to compliance with criteria under TMC Chapter 16.28.170---*Wetland buffers*, Subsection (C)---*Buffer Width Reduction* (See Section 4.3 of this report).

4.1.3 Wetland C

Wetland C has been classified as a Category IV wetland by the 2014 Department of Ecology Wetland Rating Form for Western Washington as required under Chapter 16.28.090---*Wetlands Rating System*. Wetland C is a Depressional wetland under the 2014 Department of Ecology Wetland Rating System.

Under City of Tumwater Municipal Code (TMC) Title 16---*Environment*, Chapter 16.28.090---*Wetlands Rating System*, wetland buffers are calculated based on category of wetland and the habitat score determined by the 2014 Washington State Department of Ecology Wetland Rating System publication 14-06-029, effective January 2015), as revised. Wetland C scored for habitat a "Low (L)" potential to provide habitat, a "Medium (M)" landscape potential to support habitat, and a "Low (L)" potential value to society. Wetlands that rate as an L, M, L receive a score of four (4) points for total habitat functions (**Appendix L**).

The standard buffer for Category IV wetlands that score less than sixteen (<16) points for all three (3) functions and with a high intensity impact of proposed land use require a buffer width of fifty (50) feet under TMC Chapter 16.28.170---*Wetland buffers*, Table 16.28.170(4)---*Category IV Wetland Buffer Widths* (**Figure 7, Table 5**).

The fifty (50)-foot buffer on Wetland C could be reduced to forty (40) feet pursuant to compliance with criteria under TMC Chapter 16.28.170---*Wetland buffers*, Subsection (C)---*Buffer Width Reduction* (See Section 4.3 of this report).

4.2 Small Wetland Standards

Under TMC 16.28.095---*Small wetland standards*, small wetlands of four thousand square feet or less (≤4,000 sf) may or may not provide wetland functions that require protection.

Under TMC 16.28.095(B), for wetlands between one thousand and four thousand (1,000-4,000) sf in size, the wetland should be rated to establish the category and evaluate functions.

Wetland B (2,136 sf) and Wetland C (1,652 sf) are between one thousand and four thousand (1000-4000) sf in size and are rated at Category IV wetlands.

Under TMC 16.28.095(B), Type III and IV wetlands between one thousand and four thousand (1000-4000) sf in size may be disturbed or eliminated subject to all of the following criteria:

1. *The wetland is not associated with a riparian corridor*; (Satisfied)

   Wetlands B & C are not located within a riparian corridor.

2. *The wetland is not part of a wetland mosaic*; (Satisfied)

   Wetlands B & C are not a part of a mosaic wetland system. Under DOE (2014) *Washington State Wetland Rating System for Western Washington*, the definition of mosaic wetland requires at least three (≥3) patches of wetland less than one (<1) acre in size all located within one hundred (≤100) ft of each other. The areas of wetlands must be greater than fifty percent (>50%) of the total area of wetlands and uplands combined.

   However, Wetlands B & C do not satisfy the minimum number of wetlands or the distance requirement to qualify as mosaic wetlands. These two (2) wetlands are greater than five hundred (>500) feet apart and no other wetlands are located between them (**Figure 4**). Thereby, Wetlands B and C do not form a mosaic and are not a part of a mosaic wetland system.

3. *The wetland does not score thirteen points or more (<13) in the wetland rating score*; (Satisfied)

   Wetlands B & C score twelve (12) points in the wetland rating score, which is less than thirteen (<13) points.

4. *The wetland does not contain habitat identified as essential for local populations of priority species identified by the Washington State Department of Fish and Wildlife*; (Satisfied)

   No priority species have been identified in Wetlands B or C by the WDFW PHS database (**Appendix H**).

5. *Impacts allowed under this provision shall be fully mitigated as required in TMC 16.28.220*. (Satisfied).

   Impacts allowed under this provision have been fully mitigated as required under TMC 16.28.220 (See Section 6.0 of this report).

4.3 Sackett v. EPA (05/25/2023) 21-454

The Supreme Court has ruled that the Clean Water Act does not cover "isolated" wetlands. The Supreme Court ruled that the Clean Water Act does not cover wetlands that lack a continuous surface connection to a larger body of water, which excludes many waters that connect underground. The court also narrowed the law to exclude from protection "ephemeral" streams that flow only seasonally. In Sackett, the Court decided nine (9) to zero (0) that the wetlands on the Sackett property were beyond the jurisdiction of the Clean Water Act. The Court found five (5) votes to reject the "significant nexus" test holding instead that only those wetlands with a "continuous surface connection" to a covered waterbody are subject to Federal Clean Water Act jurisdiction.

As the result of the Sackett vs. EPA decision, isolated wetlands, such as Wetlands B and C, would not be covered under the Clean Water Act, and thereby, under this ruling, isolated wetlands, such as Wetlands B and C, would be non-jurisdictional under the US Army Corps of Engineers Section 404 permit authority.

4.4 Avoiding Wetland Impacts

Under TMC 16.28.110---*Allowed activities*, Subsection H(3)--- *Activities within the Improved Right-of-Way*, replacement, modification, installation, or construction of utility facilities, lines, pipes, mains, equipment, or appurtenances, not including substations, when such facilities are located within the improved portion of the public right-of-way or a city authorized private roadway except those activities that alter a wetland or watercourse, such as culverts or bridges, or result in the transport of sediment or increase stormwater; subject to the following:

a. Retention and replanting of native vegetation shall occur wherever possible along the right-of-way improvement and resulting disturbance.

Potential impacts to Critical Areas as a result of the installation of utilities at 49th Avenue SW are covered under TMC 16.28.110(H)(3).

4.5 Avoiding Wetland Impacts

Under TMC 16.28.180---*Avoiding wetland impacts*:

A. Regulated activities shall not be authorized in a regulated wetland or wetland buffer except where it can be demonstrated that the impact is both unavoidable and necessary or that all reasonable economic uses are denied.

B. With respect to category I wetlands, an applicant must demonstrate that denial of the permit would impose an extraordinary hardship on the part of the applicant brought about by circumstances peculiar to the subject property.

C. With respect to category II and III wetlands, the following provisions shall apply:

1. For water-dependent activities, unavoidable and necessary impacts can be demonstrated where there are no practicable alternatives which would not involve a wetland or which would not have less adverse impact on a wetland, and would not have other significant adverse environmental consequences;

2. Where non-water-dependent activities are proposed, it shall be presumed that adverse impacts are avoidable. This presumption may be rebutted upon a demonstration that:

   a. The basic project purpose cannot reasonably be accomplished utilizing one or more other sites in the general region that would avoid, or result in less, adverse impact on a regulated wetland;

   b. A reduction in the size, scope, configuration, or density of the project as proposed and all alternative designs of the project as proposed that would avoid, or result in less, adverse impact on a regulated wetland or its buffer will not accomplish the basic purpose of the project; and

   c. In cases where the applicant has rejected alternatives to the project as proposed due to constraints such as zoning, deficiencies of infrastructure, or parcel size, the applicant has made reasonable attempt to remove or accommodate such constraints.

D. With respect to category IV wetlands, unavoidable and necessary impacts can be demonstrated where the proposed activity is the only reasonable alternative which will accomplish the applicant's objectives.

E. If the city determines that alteration of a wetland and/or wetland buffer is necessary and unavoidable, the city shall set forth in writing its findings with respect to each of the items listed in this section.

Impacts to Wetland A, a Category II wetland, would be avoided, other than potential impacts associated with infrastructure installation on 49th Avenue SW. Any such impacts would be avoided or minimized to the greatest extent practicable to achieve project goals. Potential impacts associated with utility installation would be an alteration of a wetland and/or wetland buffer necessary and unavoidable. Impacts to Wetlands B & C, Category IV wetlands, are unavoidable and necessary and the only reasonable alternative which will accomplish the applicant's objectives. Thereby, these activities are covered under this section.

4.6 Exceptions for Infrastructure

The installation of infrastructure, including utilities along the edge of 49th Avenue SW qualifies for an exemption under TMC 16.28.115(A). This section allows for an exemption for a private entity installing public or private infrastructure. Under TMC 16.28.115(A), if the application of this title would prohibit a development proposal by a public agency, public utility, or a private entity installing public or private infrastructure that is in compliance with the comprehensive transportation, capital facilities or utility plans of Tumwater, the agency or utility may apply for an exception pursuant to this section.

Under TMC 16.28.115(B)---*Exception Request and Review Process*, an application for an infrastructure exception shall be made to the City and shall include a Critical Area Identification Form; Critical Area Report, including Mitigation Plan; and any other related project documents such as permit applications to other agencies, special studies, and environmental documents prepared pursuant to the State Environmental Policy Act (Chapter 43.21C RCW). The community development director shall prepare a recommendation to the hearing examiner based on review of the submitted information, a site inspection, and the proposal's ability to comply with infrastructure exception review criteria in Subsection D of TMC 16.28.115.

Any potential impacts to Critical Areas have not been well defined at the time when this report was prepared. However, mitigation sequencing would be applied where avoidance would prioritize any potential impacts.

Under TMC 16.28.115(C)---*Hearing Examiner Review*, the hearing examiner shall review the application and the community development director's recommendation and conduct a public hearing. The hearing examiner shall approve, approve with conditions, or deny the request based on the proposal's ability to comply with all of the infrastructure exception review criteria in subsection D of this section.

A mitigation plan has been prepared as part of this report to compensate for potential wetland impacts associated with required road improvements.

Under TMC 16.28.115(D), Infrastructure Exception Review Criteria, the criteria for review and approval of infrastructure exceptions follow:

1. *There is no other practical alternative to the proposed development with less impact on critical areas*;

   Practical alternatives to the proposed improvements required on 49th Avenue SW resulting in less impacts on Critical Areas have been analyzed by the project team. Project engineers have analyzed multiple routes for utilities and infrastructure improvements required for the feasibility of this project. Mitigation sequencing was applied to avoid and minimize potential impacts to the greatest extent practicable to achieve project goals.

2. *The application of this title would unreasonably restrict the ability to provide utility services to the public*;

   Utility and infrastructure improvements are required and necessary to achieve project and City goals. Eliminating these improvements would unreasonably restrict the ability to provide utility services to the public.

3. *The proposal does not pose an unreasonable threat to the public health, safety, or welfare on or off the development proposal site*;

   The proposal does not pose an unreasonable threat to the public health, safety, or welfare on or off the development proposal site. However, without any improvements on 49th Avenue SW, utility access, sanitary health measures, and safety improvements could be unavailable for future residents. Risks may occur if these improvements along 49th Avenue SW are eliminated.

4. *The proposal attempts to protect and mitigate impacts to the critical area functions and values consistent with other applicable regulations and standards*.

   The proposal attempts to protect and mitigate impacts to the critical area functions and values consistent with other applicable regulations and standards through preparing a mitigation plan applying mitigation sequencing to avoid and minimize potential impacts and to mitigate unavoidable impacts in compliance with City of Tumwater standards and regulations provided in TMC 16.28.

4.7 Conditions for Wetland Permits

Under TMC 16.28.210---*Acting on the application*:

A. Land Division Conditions for Wetland Permits.

1. Sensitive Area Tracts/Easements.

As a condition of any permit issued pursuant to this section, the permit holder shall be required to create a separate sensitive area tract(s)/easement(s) containing the areas determined to be wetland and/or wetland buffer in field investigations performed pursuant to TMC 16.28.080. Sensitive area tracts/easements are legally created tracts/easements containing wetlands and their buffers that shall remain undeveloped as long as wetland functions and values are present. Loss of wetland functions due to human impacts will result in sensitive area tracts/easements being maintained.

a. Protection of Sensitive Area Tracts/Easements.

The city shall require, as a condition of any permit issued pursuant to this section, that the sensitive area tract or tracts created pursuant to this section be protected by one of the following methods:

i. The permit holder shall convey an irrevocable offer to dedicate to the city of Tumwater or other public or nonprofit entity specified by the city an easement for the protection of native vegetation within a wetland and/or its buffer; or

ii. The permit holder shall establish and record a permanent and irrevocable deed restriction on the property title of all lots containing a sensitive area tract or tracts created as a condition of this permit. Such deed restriction(s) shall prohibit, as long as wetland function exists, the development, alteration, or disturbance of vegetation within the sensitive area except for purposes of habitat enhancement as part of an enhancement project which has received prior written approval from the city of Tumwater, and any other agency with jurisdiction over such activity.

2. The deed restriction shall also contain the following language:

a. "Before, beginning, and during the course of any grading, building construction, or other development activity on a lot or development site subject to this deed restriction, the common boundary between the area subject to the deed restriction and the area of development activity must be fenced or otherwise marked to the satisfaction of City of Tumwater."

b. Regardless of the legal method of protection chosen by the city, responsibility for maintaining tracts shall be held by a property owner's association, adjacent lot owners, the permit applicant or designee, or other appropriate entity as approved by the city.

c. The following note shall appear on the face of all plats, short plats, PUDs, or other approved site plans containing separate sensitive area tracts/easements, and shall be recorded on the title of record for all affected lots:

NOTE: All lots adjoining separate sensitive areas identified as Native Vegetation Protection Easements or protected by deed restriction are responsible for maintenance and protection. Maintenance includes insuring that no alterations occur within the separate tract and that all vegetation remains undisturbed unless the express written authorization of the City of Tumwater has been received.

The common boundary between a separate sensitive area tract/easement and the adjacent land must be permanently identified. This identification shall include permanent wood or metal signs on treated or metal posts.

Sign locations and size specifications shall be approved by the city. The city shall require permanent fencing of the sensitive area when there is a substantial likelihood of the presence of domestic grazing animals within the development proposal. The city shall also require as a permit condition that such fencing be provided if, subsequent to approval of the development proposal, domestic grazing animals are in fact introduced.

3. Additional Conditions.

   a. The location of the outer extent of the wetland buffer and the areas to be disturbed pursuant to an approved permit shall be marked in the field, and such field marking shall be approved by the city prior to the commencement of permitted activities. Such field markings shall be maintained throughout the duration of the permit.

   b. The city may attach such additional conditions to the granting of a wetland permit as deemed necessary to assure the preservation and protection of affected wetlands and to assure compliance with the purposes and requirements of this chapter.

B. Bonding.

1. Performance Bonds.

The city may require the applicant of a development proposal to post a cash performance bond or other security acceptable to the city in an amount and with surety and conditions sufficient to fulfill the requirements of this section. In addition, the city may secure compliance with other conditions and limitations set forth in the permit. The amount and the conditions of the bond shall be consistent with the purposes of this chapter. In the event of a breach of any condition of any such bond, the city may institute an action in a court of competent jurisdiction upon such bond and prosecute the same to judgment and execution. The city shall release the bond upon determining that:

   a. All activities, including any required compensatory mitigation, have been completed in compliance with the terms and conditions of the permit and the requirements of this chapter;

   b. Upon the posting by the applicant of a maintenance bond.

Until such written release of the bond, the principal or surety cannot be terminated or canceled.

The conditions for this wetland permit have been satisfied through the preparation and adherence of this Critical Areas Report and Mitigation Plan. Sensitive areas tracts have been created (**Figure 8**) and a performance bond has been calculated (See Section 8 of this report)

2. Maintenance Bonds.

The city may require the holder of a wetland permit issued pursuant to this chapter to post a cash performance bond or other security acceptable to the city in an amount and with surety and conditions sufficient to guarantee that structures, improvements, and mitigation required by the permit or by this chapter perform satisfactorily for a minimum of two years after they have been completed. The city shall release the maintenance bond upon determining that performance standards established for evaluating the effectiveness and success of the structures, improvements, and/or compensatory mitigation have been satisfactorily met for the required period. For compensation projects, the performance standards shall be those contained in the mitigation plan developed and approved during the permit review process to TMC 16.28.220. The maintenance bond applicable to a compensation project shall not be released until the city determines that performance standards established for evaluating the effect and success of the project have been met.

C. Other Laws and Regulations.

No permit granted pursuant to this chapter shall remove an applicant's obligation to comply in all respects with the applicable provisions of any other federal, state, or local law or regulation, including but not limited to the acquisition of any other required permit or approval.

D. Suspension, Revocation.

In addition to other penalties provided for elsewhere, the city may suspend or revoke a permit if it finds that the applicant or permittee has not complied with any or all of the conditions or limitations set forth in the permit, has exceeded the scope of work set forth in the permit, or has failed to undertake the project in the manner set forth in the approved application.

4.8 Compensating for Wetland Impacts

The Mitigation Plan and Monitoring and Maintenance Plan presented in Sections 6-8 satisfy the requirements under TMC 16.28.220---*Compensating for wetlands impacts* as summarized below:

Under TMC 16.28.220---*Compensating for wetlands impacts*:

A. As a condition of any permit allowing alteration of wetland and/or wetland buffers, or as an enforcement action pursuant to TMC 16.28.280, the city shall require that the applicant demonstrate that wetland impact avoidance is not possible and engage in the restoration, creation or enhancement of wetlands and their buffers in order to offset the impacts resulting from the applicant's or violator's actions. Mitigation for alterations to wetlands shall achieve equivalent or greater biologic functions. Mitigation plans shall be consistent with the Washington State Department of Ecology "Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans," 2006, as revised. The applicant shall develop a plan that provides for land acquisition, construction, maintenance and monitoring of replacement wetlands that recreate as nearly as possible the original wetlands in terms of acreage, function, geographic location and setting, and that are larger than the original wetlands. Compensatory mitigation shall be completed prior to wetland destruction, where possible. Mitigation shall result in no net loss of wetlands function and acreage and seeks a net resource gain in wetlands over present conditions with the exception of enforcement actions.

B. Mitigation actions shall address functions affected by the alteration in order to achieve functional equivalency or improvement and shall provide similar wetland functions as those lost except when the lost wetland provides minimal functions as determined by a site-specific function assessment and the proposed mitigation action(s) will provide equal or greater functions.

C. Mitigation actions that require compensation mitigation by replacing, enhancing, or substitution shall occur in the following order of preference:

1. Restoring wetlands on upland sites that were formerly wetlands.

2. Creating wetlands on disturbed upland sites such as those with vegetative cover consisting primarily of nonnative introduced species. This should only be attempted when there is a consistent source of hydrology, and it can be shown that the surface and subsurface hydrologic regime is conducive for the wetland community that is being designed.

3. Enhancing significantly degraded wetlands in combination with restoration or creation. Such enhancement should be part of a mitigation package that includes replacing the impacted area meeting appropriate ratio requirements.

D. Mitigation actions shall be conducted within the same subdrainage basin and on the same site as the alteration except when all of the following apply:

1. There are no reasonable on-site or in-subdrainage-basin opportunities or on-site and in-subdrainage-basin opportunities do not have a high likelihood of success due to development pressures, adjacent land uses, or on-site buffers or connectivity are inadequate;

2. Off-site mitigation has a greater likelihood of providing equal or improved wetland functions than the impacted wetland; and

3. Off-site locations shall be in the same subdrainage basin and the same water resource inventory area unless:

a. The impact is located near the boundary of a water resource inventory area;

b. Established regional or watershed goals for water quality, flood or conveyance, habitat or other wetland functions have been established and strongly justify location of mitigation at another site; or

c. Credits from a state certified wetland mitigation bank are used as mitigation and the use of credits is consistent with the terms of the bank's certification.

E. Mitigation projects, where feasible, shall be completed prior to activities that will disturb wetlands. In all other cases, mitigation shall be completed immediately following disturbance and prior to use or occupancy of the activity or development. Construction of mitigation projects shall be timed to reduce impacts to existing wildlife and flora. The community development director may authorize a one-time temporary delay, up to one hundred twenty days, in completing minor construction and landscaping when environmental conditions could produce a high probability of failure or significant construction difficulties. The delay shall not create or perpetuate hazardous conditions or environmental damage or degradation, and the delay shall not be injurious to the health, safety and general welfare of the public. The request for temporary delay must include a written justification that documents the environmental constraints that preclude implementation of the mitigation plan. The justification must be verified and approved by the city and include a financial guarantee.

F. Surface Area Replacement Ratio. The ratios in Table 16.28.220(6) apply to creation or restoration which is in kind, on site, timed prior to or concurrent with alteration, and has a high probability of success. These ratios do not apply to remedial actions resulting from illegal alterations. The first number specifies the area of wetlands requiring replacement and the second specifies the area of wetlands altered.

The ratios in Table 16.28.220(6) are based on the type of compensatory mitigation proposed, such as restoration, creation, and enhancement. In its Regulatory Guidance Letter 02-02, the U.S. Army Corps of Engineers provided definitions for these types of compensatory mitigation, which the Washington State Department of Ecology used in their Guidance on Buffers and Ratios for Western Washington as part of the Wetlands in Washington State Volume 2 – Protecting and Managing Wetlands in October 2014 and are provided below.

1. Restoration.

The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural or historic functions to a former or degraded wetland. For the purpose of tracking net gains in wetland acres, restoration is divided into two categories:

a. Reestablishment.

The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural or historic functions to a former wetland. Reestablishment results in a gain in wetland acres (and functions). Activities could include removing fill material, plugging ditches, or breaking drain tiles.

b. Rehabilitation.

The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural or historic functions of a degraded wetland. Rehabilitation results in a gain in wetland function but does not result in a gain in wetland acres. Activities could involve breaching a dike to reconnect wetlands to a floodplain or return tidal influence to a wetland.

2. Creation (Establishment).

The manipulation of the physical, chemical, or biological characteristics present to develop a wetland on an upland or deep-water site where a wetland did not previously exist. Establishment results in a gain in wetland acres. Activities typically involve excavation of upland soils to elevations that will produce a wetland hydroperiod, create hydric soils, and support the growth of hydrophytic plant species.

3. Enhancement.

The manipulation of the physical, chemical, or biological characteristics of a wetland site to heighten, intensify, or improve specific function(s) or to change the growth stage or composition of the vegetation present. Enhancement is undertaken for specified purposes such as water quality improvement, flood water retention, or wildlife habitat. Enhancement results in a change in some wetland functions and can lead to a decline in other wetland functions but does not result in a gain in wetland acres. Activities typically consist of planting vegetation, controlling non-native or invasive species, modifying site elevations or the proportion of open water to influence hydroperiods, or some combination of these activities.

Table 16.28.220(6): Mitigation Ratios for Projects in Western Washington

Category and Type of Wetland Impacts (1)	Reestablishment or Creation	Rehabilitation (2)	Enhancement (2)
Category I – bogs or wetlands of high conservation value	Not considered possible (3)	6:1	Case-by-case
Category I – mature forested	6:1	12:1	24:1
Category I based on score for functions	4:1	8:1	16:1
All category II	3:1	6:1	12:1
All category III	2:1	4:1	8:1
All category IV	1.5:1	3:1	6:1

Table 16.28.220(6) Explanatory Notes:

(1) Preservation is discussed in subsection J of this section.

(2) These ratios are based on the assumption that the rehabilitation or enhancement actions implemented represent the average degree of improvement possible for the site. Proposals to implement more effective rehabilitation or enhancement actions may result in a lower ratio, while less effective actions may result in a higher ratio. The distinction between rehabilitation and enhancement is not clear-cut. Instead, rehabilitation and enhancement actions span a continuum. Proposals that fall within the gray area between rehabilitation and enhancement will result in a ratio that lies between the ratios for rehabilitation and the ratios for enhancement.

(3) Wetlands of high conservation value and bogs are considered irreplaceable wetlands because they perform some special functions that cannot be replaced through compensatory mitigation. Impacts to such wetlands would therefore result in a net loss of some functions no matter what kind of compensation is proposed.

4. Increased Replacement Ratio. The city may increase the ratios under any of the following circumstances:

   a. Uncertainty as to the probable success of the proposed restoration or creation;

   b. Significant period of time between destruction and replication of wetland functions at the mitigation site;

   c. Proposed mitigation will result in a lower category wetland or reduced functions relative to the wetland being impacted; or

   d. The impact was unauthorized.

5. Decreased Replacement Ratio.

The city may decrease these ratios for category II, III, and IV wetlands under the following circumstances:

   a. Documentation by a qualified wetlands specialist demonstrates that the proposed mitigation actions have a very high likelihood of success based on prior experience;

   b. Documentation by a qualified wetlands specialist demonstrates that the proposed mitigation actions will provide functions and values that are significantly greater than the wetland being impacted;

   c. The proposed mitigation actions are conducted in advance of the impact and have been shown to be successful.

6. In wetlands where several hydrogeomorphic classes are found within one delineated boundary, the areas of the wetlands within each hydrogeomorphic class can be scored and rated separately and the ratios adjusted accordingly, if all of the following apply:
    a. The wetland does not meet any of the criteria for wetlands with "special characteristics" as defined in the rating system;
    b. The rating and score for the entire wetland are provided along with the scores and ratings for each area with a different hydrogeomorphic class;
    c. Impacts to the wetland are all within an area that has a different hydrogeomorphic class from the one used to establish the initial category; and
    d. The proponents provide adequate hydrologic and geomorphic data to establish that the boundary between hydrogeomorphic classes lies at least fifty feet outside of the footprint of the impacts.
7. In all cases, a minimum acreage replacement ratio of one-to-one shall be required.

G. Replacement Ratios for Temporal Impacts and Conversions.

1. When impacts to wetlands are not permanent, the city will require compensation for the temporal loss of wetland functions. Temporal impacts refer to impacts to those functions that will eventually be replaced but cannot achieve similar functionality in a short time.
2. In addition to restoring the affected wetland to its previous condition, the city will require compensation to account for the risk and temporal loss of wetland functions. The ratios for temporal impacts to forested and scrub-shrub wetlands are one-quarter of the recommended ratios for permanent impacts found in Table 16.28.220(6); provided, that the following measures are satisfied:
    a. An explanation of how hydric soil, especially deep organic soil, is stored and handled in the areas where the soil profile will be severely disturbed for a fairly significant depth or time;
    b. Surface and groundwater flow patterns are maintained or can be restored immediately following construction;
    c. A ten-year monitoring and maintenance plan is developed and implemented for the restored forest and scrub-shrub wetlands;
    d. Disturbed buffers are revegetated and monitored; and
    e. Where appropriate, the hydroseed mix to be applied on reestablishment areas is identified.
3. When impacts are to a native emergent community and there is a potential risk that its reestablishment will be unsuccessful, compensation for temporal loss and the potential risk will be required in addition to restoring the affected wetland and monitoring the site. If the impacts are to wetlands dominated by nonnative vegetation, such as blackberry, reed canarygrass, or pasture grasses, restoration of the affected wetland with native species and monitoring after construction is required.

4. Loss of functions due to the permanent conversion of wetlands from one type to another requires compensation. When wetlands are not completely lost but are converted to another type, such as a forested wetland converted to an emergent or shrub wetland, such as for a utility right-of-way, some functions are lost or reduced.

5. The ratios for conversion of wetlands from one type to another will vary based on the degree of the alteration, but they are generally one-half of the recommended ratios for permanent impacts found in Table 16.28.220(6).

H. Wetlands Enhancement.

1. Any applicant proposing to alter wetlands may propose to enhance existing significantly degraded wetlands in order to compensate for wetland losses. Applicants proposing to enhance wetlands must produce a critical area report that identifies how enhancement will increase the functions of the degraded wetland and how this increase will adequately mitigate for the loss of wetland area and function at the impact site. An enhancement proposal must also show whether existing wetland functions will be reduced by the enhancement actions.

2. A wetlands enhancement compensation project shall be determined pursuant to this section; provided, that enhancement for one function and value will not degrade another function or value and that acreage replacement ratios shall be in accordance with Table 16.28.220(6).

I. Wetland Type.

In-kind compensation shall be provided except where the applicant can demonstrate that:

1. The wetland system is already significantly degraded and out-of-kind replacement will result in a wetland with greater functional value;

2. Scientific problems such as exotic vegetation and changes in watershed hydrology make implementation of in-kind compensation impossible;

3. Out-of-kind replacement will best meet identified regional goals, such as replacement of historically diminished wetland types;

4. Where out-of-kind replacement is accepted, greater acreage replacement ratios may be required to compensate for lost functional values.

J. Wetland Preservation as Mitigation.

Impacts to wetlands may be mitigated by preservation of wetland areas, in a separate tract or easement when used in combination with other forms of mitigation such as creation, restoration, or enhancement at the preservation site or at a separate location. Preservation may also be used by itself, but more restrictions as outlined below will apply.

Preservation as mitigation is acceptable when done in combination with restoration, creation, or enhancement providing that a minimum of one-to-one acreage replacement is provided by restoration or creation and the criteria below are met:

1. The impact area is small, and impacts are to a category III or IV wetland;
2. Preservation of a high-quality system occurs in the same water resource inventory area or watershed basin as the wetland impact;
3. Acceptable sites for preservation include those that are important due to their landscape position, are rare or limited wetland types, and provide high levels of functions;
4. Preservation sites include buffer areas adequate to protect the habitat and its functions from encroachment and degradation; and
5. Mitigation ratios for preservation in combination with other forms of mitigation shall range from ten-to-one to twenty-to-one, as determined on a case-by-case basis by the city, depending on the quality of the wetlands being mitigated and the quality of the wetlands being preserved. Specific ratios will depend upon the significance of the preservation project and the quality of the wetland resources lost.

K. Cooperative Restoration, Creation or Enhancement Projects.

1. The city may encourage, facilitate, and approve cooperative projects wherein a single applicant or other organization with demonstrated capability may undertake a compensation project with funding from other applicants under the following circumstances:
   a. Restoration, creation, or enhancement at a particular site may be scientifically difficult or impossible; or
   b. Creation of one or several larger wetlands may be preferable to many small wetlands.
2. Persons proposing cooperative compensation projects shall:
   a. Submit a joint permit application;
   b. Demonstrate compliance with all standards;
   c. Demonstrate the organizational and fiscal capability to act cooperatively; and
   d. Demonstrate that long-term management can and will be provided.

4.9 On-site Drainage Ditches

Artificially created drainage ditches identified and mapped on the subject property are not regulated as wetlands or streams under TMC 16.28.030---*Definitions*. Wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including drainages ditches or grass-lined swales under TMC 16.28.030---*Definitions*. In additional these human-created agricultural ditches are not defined or rated by the DNR Stream Typing System.

On-site drainage ditches are “un-typed” under the DNR Stream Typing System WAC 222-16-031/030. No buffers required for un-typed watercourses. Thereby, no buffers will be applied to these un-typed watercourses.

4.10 Farm Pond

Under TMC 16.28.030---*Definitions,* Subsection FF, regulated wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including 'farm ponds.' Under TMC 16.32.050---*Habitats defined and protected,* Subsection A(2) naturally occurring ponds under twenty (<20) acres are protected. However, under this section, naturally occurring ponds do not include 'farm ponds.' Under 16.32.030---*Definitions*, Subsection G farm ponds are not 'naturally occurring ponds.' Thereby, under TMC 16.28.030(FF) and TMC 16.32.050(A)(2), the on-site farm pond is not regulated as a wetland.

5.0 LAND USE ACTION

5.1 Project Description

The land use proposal consists of a one hundred eighty-six (186) lot subdivision on approximately fifty-four (54) acres. The proposed project includes internal roads, utilities, stormwater facilities, and open spaces (**Figure 8**).

5.2 Impact Justification

5.2.1 Category IV Wetlands between 1,000-4,000 sf (TMC 16.28.095(B))

Small patches of hydrophytic vegetation located in the central portion of the subject property severely encumber any economically reasonable use of the subject property. The infrastructure required to develop this property precludes low intensity development from economic feasibility. Any economically viable project proposed for this encumbered property would require a high intensity development.

Because of the exorbitant cost of the real estate, utility installation, and infrastructure required for any economically viable land use project, unavoidable impacts to the scattered, low quality Category IV wetlands located on the central portion of the subject property would be required for an economically feasible land use project. Thereby, impacts to Category IV wetlands would be unavoidable to achieve the applicant's objectives of an economically viable land use project.

Under TMC 16.28.095(B), Type IV wetlands between one thousand and four thousand (1,000-4,000) sf may be disturbed or eliminated subject to criteria under this section. Wetlands B & C satisfy the conditions under this section. Wetlands B & C are not associated with a riparian corridor or part of a wetland mosaic. The total wetland score is less than thirteen (<13) points. Wetlands B & C are very small patches of rushes and sedges in an active livestock pasture and not identified by the Washington State Department of Fish and Wildlife. Impacts allowed under this provision would be fully mitigated as required in TMC 16.28.220.

Under TMC 16.28.180(D) with respect to Category IV wetlands, unavoidable and necessary impacts can be demonstrated where the proposed activity is the only reasonable alternative which will accomplish the applicant's objectives. In compliance under TMC 16.28.180(D), the proposed project is the only reasonable alternative which will accomplish the applicant's objectives, and thereby, unavoidable, and necessary impacts are demonstrated.

Under TMC 16.28.030(KK), "unavoidable and necessary impacts" are impacts to regulated wetlands that remain after a person proposing to alter regulated wetlands has demonstrated that no practicable alternative exists for the proposed project.

Unavoidable impacts to small and low-quality Category IV wetlands are the only reasonable alternative which would accomplish the applicant's objectives of an economically viable land use project on the subject property.

5.2.2 Required Road Improvements

Road improvements and utility installation are required at the 49th Avenue SW frontage of the subject property as part of the proposed project (**Figures 8 & 9**). Required road improvements and utility installation would result in wetland impacts along 49th Avenue SW totaling nineteen thousand four hundred fifty-seven (19,457) sf in size (**Figure 9**). No appreciable wetland buffer occurs in this area because the wetland extends to the edge of the road or fill slope. Some wetland buffer on the road fill slope would be impacted totaling five thousand fifteen (5,015) sf in size. This roadside buffer has no appreciable habitat value.

The installation of infrastructure, including utilities along the edge of 49th Avenue SW qualifies for an exemption under TMC 16.28.115(A). This section allows for an exemption for a private entity installing public or private infrastructure. Under TMC 16.28.115(A), if the application of this title would prohibit a development proposal by a public agency, public utility, or a private entity installing public or private infrastructure that is in compliance with the comprehensive transportation, capital facilities or utility plans of Tumwater, the agency or utility may apply for an exception pursuant to this section.

Impacts associated with required road improvements are unavoidable and would be mitigated for no net loss of wetland area or functions (See Section 6 of this report).

5.2.3 Potential Oregon Spotted Frog Impacts

5.2.3.1 Potential Direct Impacts

No measurable impacts to the Oregon spotted frog or its habitat would occur from relocating wetland functions from the two (2) small Category IV wetlands to the larger Category II wetland complex. Road improvements and utility installation along 49th Avenue SW would impact a portion of Wetland A that could provide some winter habitat.

Potential impacts to the Oregon spotted frog, a water-dependent species, would be minimized through construction timing during the dry season when no surface water occurs in the impacted portion of Wetland A. Impacts would be limited to the minimum area required by the project and the City of Tumwater for road improvements and utility installation. All wetland impacts would be mitigation tough wetland creation and rehabilitation for no net loss of wetland area or functions. The size of Wetland A, a Category II wetland, would increase through this proposed mitigation plan (See Section 6 of this report).

5.2.3.2 Potential Stormwater Impacts

Stormwater form the proposed land use area would be conveyed to an infiltration basin located in Tract B (**Figure 8**). The stormwater basin is sized to infiltrate stormwater runoff designed to meet the criteria of Minimum Requirement #6 – *Flow Control*. The WWHM model indicates that runoff will be infiltrated onsite. The infiltration basin is dry pond, which would consist of a shallow depression.

Post development hydrologic conditions meet the Standard Requirement under WWHM. The stormwater design considers information about the project site for the two (2) land use scenarios: 'Predeveloped' land use conditions and the 'Developed' land use conditions.

Predeveloped is defined as the existing conditions prior to land use development. Runoff from the Predeveloped scenario is used as the target for the developed scenario compliance. Unless there are special circumstances, the Department of Ecology requires that predeveloped land use be considered forest.

Developed is defined as the developed land use with mitigation measures (as selected by the user). Developed is used for sizing stormwater control and water quality facilities. The runoff from the Developed scenario is compared with the Predeveloped scenario runoff to determine compliance with Ecology standards.

The WWHM and Stormwater Management Manuals require the release of no more than the pre-developed rate based on a pre-developed forested condition. Stormwater infiltration basins are designed to mimic the release of water at a predeveloped forested condition; thereby, reducing the potential of flash-flooding downstream often attributed to stormwater runoff from impervious surfaces.

No surface or piped discharge would be released to Wetland A, ditches, or waters flowing to Oregon spotted frog designated Critical Habitat. On-site stormwater would be conveyed to the infiltration basin, where this water would be infiltrated. No prolonged ponding is anticipated and no point discharge to wetlands or conveyance networks discharging to wetlands would occur form the basin.

Stormwater management addresses potential alteration of water quality and quantity downstream as a result of the proposed project by constructing infiltration ponds that will treat stormwater runoff and release this treated water at a pre-developed forested rate through infiltration. This water would recharge the groundwater at the development site for which some of this groundwater would act to recharge wetland hydrology similar to that of the existing condition. Through this stormwater management approach, no "flashiness" of the water flow to the wetland and roadside ditches is anticipated.

5.2.3.2 Bull Frogs and Potential Biological Threats

The proposed dry infiltration basin will not create an ecological trap for the Oregon spotted frog and will not act as a steppingstone for bull frogs to invade Wetland A on the subject property.

Stormwater ponds typically hold standing water for treatment and slow release. However, the proposed infiltration basin, an alternative to the typical stormwater pond design, infiltrates incoming water rather than holding this water in a pond.

The WWHM model indicates that runoff will be infiltrated onsite. The infiltration basin is a dry pond, which would consist of a shallow depression.

A perennial water source is a habitat requirement for all stages of the bullfrog lifecycle (USFWS 1987). No perennial water source occurs in Wetland A or would occur in the infiltration basins following development. However, the perennial waters of the farm pond would remain. However, conifer trees would be installed around the pond to shade out sun-loving bull frogs.

The infiltration basin will not provide bullfrog breeding habitat. Bullfrogs breed only after the nights warm up and reach the high 60s and 70s (Fahrenheit), generally June and July here in Washington. No water would occur in the infiltration ponds in June or July. No water would occur in Wetland A in June through September.

The infiltration basin will not provide the habitat requirements necessary to sustain bullfrog tadpole development. Bullfrog tadpoles require perennial waters for up to three (3) years of development (USFWS 1987). Bullfrog tadpole mortality would occur in seasonally-ponded areas. Wetland A is seasonally ponded and would not sustain bullfrog tadpoles. Western red cedar trees would be installed around the existing farm pond, which would remain, to shade out sun-loving bullfrog tadpoles, preventing bullfrog invasion.

5.2.4 Compensatory Mitigation

Wetland impacts require compensatory mitigation as detailed under TMC 16.28.220---*Compensating for wetlands impacts.* As a condition of any permit allowing alteration of wetland and/or wetland buffers, the City requires that the applicant demonstrate that wetland impact avoidance is not possible and engage in the restoration, creation or enhancement of wetlands and their buffers in order to offset the impacts resulting from the proposed action.

Under TMC 16.28.030(F), "Compensatory mitigation" means replacing project-induced wetland losses or impacts, and includes, but is not limited to, the following:

1. "Restoration" means actions performed to reestablish wetland functional characteristics and processes which have been lost by alterations, activities, or catastrophic events within an area which no longer meets the definition of a wetland.
2. "Creation" means actions performed to intentionally establish a wetland at a site where it did not formerly exist.
3. "Enhancement" means actions performed to improve the condition of existing degraded wetlands so that the functions they provide are of a higher quality.
4. "Preservation" means actions taken to ensure the permanent protection of existing wetlands.

Mitigation for alterations to wetlands would achieve equivalent or greater biologic functions. The proposed mitigation would be consistent with the Washington State Department of Ecology "*Wetland Mitigation in Washington State* – Part 2: *Developing Mitigation Plans*," 2006, as revised. A Mitigation Plan has been prepared that provides for construction, maintenance, and monitoring of replacement wetlands that recreate, as nearly as possible, the original wetlands in terms of acreage, function, geographic location, and setting, and that are larger than the original wetlands.

Mitigation would result in no net loss of wetland functions and acreage and would provide a net resource gain in wetlands over present conditions.

The wetland mitigation plan analyses functions affected by the alteration in order to achieve functional equivalency or improvement and would provide similar wetland functions as those lost except when the lost wetland provides minimal functions as determined by a site-specific function assessment. The proposed wetland mitigation was designed to provide greater wetland functions.

The mitigation strategy would include creating wetlands on a disturbed upland site with vegetative cover consisting primarily of nonnative introduced species. A consistent source of hydrology would be supplied by providing a subsurface hydrologic regime conducive for the wetland community.

This innovative proposal provides the opportunity to enlarge and rehabilitate the existing degraded Category II system beyond existing conditions. The current wetland system is severely degraded by intensive livestock grazing and invasive weed invasion. This proposal would remove livestock and eliminate livestock grazing in the wetland, as well as eliminate non-native invasive weeds, enlarge the existing wetland, and install native plant species. The mitigation plan includes rehabilitating a significantly degraded wetland in combination with wetland creation. Such rehabilitation would be part of a mitigation package that includes replacing the impacted area with a higher quality wetland system that complies with the appropriate ratio requirements.

An economically viable project on the subject property would provide the unique opportunity to enlarge, restore, and enhance an existing Category II wetland on the subject property, improving wetland functions and values over existing conditions, which satisfies and exceeds the City of Tumwater code requirements.

Wetland impacts would include activities associated with utility installation or road improvements on 49th Avenue SW. Impacts would fall within the exceptions described under TMC 16.28.115 and would be avoided and minimized to the greatest extent practicable. The proposed mitigation strategy would also compensate for wetland impacts by improving the habitat quality and wetland functions far exceeding existing minimal requirements.

6.0 MITIGATION PLAN

6.1 General Mitigation Summery

This project would provide the unique opportunity to enlarge and rehabilitate a severely degraded Category II wetland. Unavoidable and necessary impacts would include:

1) Eliminating two (2) extremely marginal patches of sedges and rushes within an active livestock pasture and
2) Wetland impacts associated with required road improvements and utility installation.

The two (2) small, extremely marginal wetlands provide no measurable habitat value or significant wetland functions. The small patches of hydrophytic vegetation in the pasture rate as Category IV. A summary of proposed impacts and mitigation measures are provided in **Table 6, Figure 8**.

The installation of infrastructure, including utilities along the edge of 49th Avenue SW qualifies for an exemption under TMC 16.28.115(A). This section allows for an exemption for a private entity installing public or private infrastructure. However, mitigation will be proposed to offset wetland impacts for no net loss of wetland area and wetland functions.

Table 6. Impacts and Proposed Mitigation Strategy

Wetland Impacts				Wetland Mitigation				
Wetland	Category	Impact Area	Comments	Wetland Creation	Wetland Rehabilitation	Restore Forest in Graded Buffer	Buffer Enhancement	New Wetland Buffer
Wetland B	IV	2,136 sf (0.05 acre)	Small patches of hydrophytic vegetation in livestock pasture with no observable habitat value	3,204 sf 1:5 ratio	365,186 sf (16:1 ratio) Install 537 western red cedar trees Eliminate livestock and invasive weeds.	37,283 sf Dense plantings in buffer	153,478 sf Install 309 western red cedar trees. Eliminate livestock and invasive weeds.	15,802 sf Install 47 western red cedar trees. Eliminate livestock and invasive weeds.
Wetland C	IV	1,652 sf (0.04 acre)		2478 sf 1:5 ratio				
Wetland A	II	19,457 sf	Impacts as a result of required road improvements	24,336 sf 1.25:1 ratio				
Total Area		23,245 sf (0.53acre)		29,948 sf (0.69 acres)	365,186 sf (8.3 acres)	37,283 sf (0.86 acres)	153,478 sf (3.5 acres)	15,802 sf (0.36 acres)

6.2 Wetland Compensatory Mitigation Plan

This proposed mitigation plan includes:

1) Creation of a high-quality Category II wetland totaling twenty-nine thousand nine hundred forty-eight (29,948) sf enlarging Wetland A to one (1) contiguous high-quality wetland habitat (**Figure 8 & 9; Table 6**). Two (2) small, Category IV patches of hydrophytic vegetation in livestock wallows would be transformed into high quality Category II wetlands at a 1.5:1 ratio consolidated into one (1) larger Category II wetland complex.

   The northern edge of Wetland A would be impacted by road improvements on 49th Avenue. This roadside wetland would be relocated to the southern portion of Wetland A away from the road. No net loss of Category II wetlands would occur as part of this project.

2) Rehabilitation of the highly degraded Wetland A, a Category II wetland, totaling three hundred sixty-five thousand one hundred eighty-six (365,186) sf at a 16:1 rehabilitation ratio through removing livestock grazing, eliminating invasive weeds, planting native western red cedar trees (20 ft on center, 537 trees), and transforming non-native weed infested vegetation community into a vibrant forested wetland habitat (**Figures 8-14**).

3) Enhance buffer on Category II Wetland

   a. Wetland Buffer Planting.

      Install dense native trees, shrubs, and herbs around the created wetland totaling an area of thirty-seven thousand two hundred eighty-three (37,283) sf.

   b. Buffer Enhancement (Western Red Cedar)

      Buffer enhancement is proposed on the on-site portion of the wetland buffer through the installation of western red cedar trees at a density of fifteen (15) feet on center totaling three hundred nine (309) trees in an area of one hundred fifty-three thousand four hundred seventy-eight (153,478) sf.

   c. New Buffer

      Install western red cedar trees in new buffer area totaling fifteen thousand eight hundred two (15,802) sf.

3) Removal of trash and garbage from the wetlands and buffers to improve wetland and buffer habitat.

4) Removal of invasive weeds within the wetland and buffer areas of Wetland A onsite.

5) Preservation and rehabilitation of existing Wetland A on the subject property. No impacts to existing Wetland A are proposed at this time.

6) Install split rail fence at the edge of the buffer area to limit entry, if required.

7) Install educational signs at the edge of the buffer area according to City specifications.

8) Mitigation measures listed in TMC Table 16.28.170(5) would be implemented, as appropriate.

This mitigation plan will provide a visual screen between the wetlands and proposed land use. Habitat diversity would be improved through the installation of habitat features in the wetland and the buffer that include placing a select number of downed logs over twelve (12) inches in diameter on the forest floor, and/or by moving additional wood and downed woody debris into the wetland buffer to improve wildlife habitat functions.

6.3 On-site and In-kind Mitigation Strategy

On-site mitigation would provide a hydrological connection and landscape linkage for birds between onsite Wetland A and off-site habitat and would also provide improved water quality and hydrologic functions within the Black Lake basin. The wetland mitigation project would provide the opportunity to improve wetland functions within the Black Lake watershed.

The proposed mitigation project would improve water quality and hydrologic functions upstream of Black Lake, a 303(d) listed impaired water. Stormwater enters the wetland basin from streets, livestock farms, and residential lots. The proposed wetland creation project would allow for increased stormwater storage and filtration upstream of fish habitat in Black Lake. The created wetlands would also provide habitat for wildlife species.

The proposed compensatory mitigation project would provide the rare opportunity to preserve and enhance wetland functions upstream of salmonid habitat.

On-site and in-kind replacement and enhancement of wetland functions would benefit the larger basin where these functions are needed. The proposed compensatory mitigation project would improve wetland functions and habitat on the landscape scale. On-site and in-kind proposed mitigation would improve water quality and hydrologic functions within this basin where these functions are greatly needed.

Water quality functions would be increased and improved within the larger basin by improving wetlands and buffers upstream of impaired waters. Improved hydrologic functions would contribute to the amelioration of flooding.

For these reasons, the proposed compensatory mitigation plan provides a greater ecological benefit than existing conditions within the larger Black Lake watershed.

6.4 Watershed Approach

EnviroVector applied the Department of Ecology guidance, Selecting Wetland Mitigation Sites Using a Watershed Approach (Hruby *et al*. 2009; Publication #09-06-032), in order to ensure that the Project is meeting the Federal requirement that site selection include consideration of watershed needs (33 CFR, Part 332.4(c)(3)).

On-site mitigation would provide landscape linkages within the larger Black Lake watershed.

The proposed mitigation project would provide the rare opportunity to preserve and enhance wetland functions within an existing basin upstream of a 303(d) listed water and potential salmonid habitat in the urban environment of Black Lake.

On-site and in-kind creation and enhancement of wetland functions would benefit the basin where these functions would otherwise be lost. The proposed mitigation project is located upstream of a 303(d) listed water in Black Lake**.** On-site and in-kind proposed mitigation would preserve water quality and hydrologic functions within this urban basin where these functions are greatly needed and should not be lost.

Wetland impacts would occur within the Black Lake contributing basin. Black Lake is on the 303(d) list of impaired waters. The Black Lake watershed is in need of wetland restoration projects that would provide improved water quality and hydrologic functions.

For these reasons, we believe that the proposed compensatory mitigation plan provides a greater ecological benefit within a basin and sub-basin where wetland functions are needed.

The proposed compensatory mitigation area is located within the same watershed where it is most likely to successfully replace lost functions as the impact site in compliance with 33 CFR 332.3(b). The location of the compensatory mitigation takes into account:

1) Aquatic habitat diversity,
2) Habitat connectivity,
3) Relationships to hydrologic sources,
4) Trends in land use, ecological benefits, and
5) Compatibility with adjacent land uses.

The selection of the proposed compensatory mitigation site considers the importance of landscape position and resource type for the sustainability of aquatic resource functions within the watershed in compliance with 33 CFR 332.3(b).

The connectivity of the proposed mitigation area to diverse aquatic resources within the Black Lake watershed satisfies the intent of 33 CFR 332.3(b). Retaining and enhancing these wetland functions within the Black Lake basin and the Black Lake watershed would be of ecological benefit.

The compensatory mitigation plan is in compliance with 33 CFR 332.3(e), which states “in-kind mitigation is preferable to out-of-kind mitigation because it is most likely to compensate for the functions and services lost at the impact site”.

6.5 Selection of Mitigation Area

The site selection was determined by the opportunity to improve and enhance wetland functions upstream of a 303d impaired waster of Black Lake. The proposed mitigation project would contribute to improving water quality, reducing downstream flooding, and augmenting habitat in the Black Lake watershed.

The proposed mitigation project provides the opportunity to improve water quality functions upstream of a 303(d) listed impaired water. Black Lake is listed as a 303(d) water by the Department of Ecology Water Quality Atlas (**Appendix I**). Salmonid fish are identified to occur in Black Lake that would benefit from projects that improve water quality functions upstream (**Appendix H**).

The proposed mitigation project meets the watershed scale criteria for site potential and sustainability established in the guidance document, *Selecting Wetland Mitigation Sites Using a Watershed Approach* (Hruby *et al.* 2009). On a site-scale, the design of the proposed mitigation project addresses site constraints to improve hydrologic, water quality, and habitat functions.

6.6 Part 1: Analysis of Mitigation Site at a Watershed Scale

Site selection was determined by criteria in the publication *Selecting Wetland Mitigation Sites Using a Watershed Approach* (Hruby *et al.* 2009) and other relevant publications. The site satisfies the watershed scale criteria for potential and sustainability.

6.7 Wetland Creation

High-quality wetlands will be created at a 1:1 replacement to loss ratio to form one (1) large contiguous wetland habitat (**Figures 8 & 9**). This created wetland will replace low quality Category IV wetlands within the livestock pasture in favor of a high quality, forested Category II wetland system. Existing disturbed soils and non-native plants would be excavated to form a shallow depression that would fill with water from the existing wetland and from an existing farm pond (**Figures 8-14**). A clay layer would be installed to maintain wetland hydrology if the hydrology criterion is not satisfied. Invasive weeds will be eliminated. Native plant species would be installed throughout the created wetland system to provide the maximum habitat diversity (**Figures 12-14**).

Create High Quality Wetlands

- Maximize wetland vegetative diversity to improve wetland functions.
- Create seasonally flooded feature to enhance wetland functions and provide a habitat attribute.
- Install clay layer to obtain desired hydrological regime if the hydrology criterion is not satisfied.
- Install habitat features, including snags and downed logs to encourage wildlife habitation, improve aesthetic qualities of the site, provide a method of insect control, and enhance habitat functions.
- Remove exotic invasive plants in the wetland buffer enhancement area through manual removal.
- Plant a variety of native plants, including shrubs, trees, and herbaceous vegetation, in the buffer around the wetland creation areas to improve the quality and functions of the wetland (**Figures 12-14).**
- Plant western red cedar throughout the on-site wetland buffers to shade out non-native invasive weeds and to improve wetland buffer habitat functions (**Figures 12-14**).
- Remove garbage and trash, including bottles, cans, paper, toys, appliances, car parts, and other disregarded items, from wetland and buffers.
- Place large woody debris in the wetland buffer to enhance habitat structural diversity.

No Stockpiling in Wetlands or Buffers

No stockpiling of soils will occur in wetlands or buffers, other than in the created wetlands during the construction of the mitigation area.

Improve Habitat Functions

This mitigation plan will provide a visual screen between the wetlands and the proposed land use. Habitat diversity would be improved through the installation of habitat features in the wetland and the buffer that include placing a select number of downed logs over twelve (12) inches in diameter on the forest floor, and/or by moving additional wood and downed woody debris into the created wetland and wetland buffer to improve wildlife habitat functions.

Soils in the wetland creation area will be excavated to form a shallow depression that would catch and hold water from existing stormwater conveyances (**Figures 10 & 11**).

The wetland creation area would be monitored for hydrology by installing a groundwater monitoring well. The mitigation wetland must meet the USACE technical standard for created wetlands of thirty (30) or more consecutive days of flooding or ponding, or a water table twelve (12) inches (30 cm) or less below the soil surface, during the growing season at a minimum frequency of five (5) years in ten (10) (fifty percent (50%) or higher probability). If the wetland creation area does not meet this technical standard, measures, such as installing a clay layer, will be taken to retain wetland hydrology once a solution has been devised through adaptive management.

6.8 Wetland Hydrology

Following grading, wetland hydrology will be monitored to assure that hydrology performance standards are satisfied. Contingency measures, such as a clay liner, would be applied, if necessary, to achieve the desired water regime. The entire wetland area is designed to perform as a seasonally flooded wetland.

If the wetland creation area does not maintain wetland hydrology as defined by the water level within twelve (12) inches of the surface for a minimum of thirty (30) consecutive days during the wettest portion of the growing season, each monitoring year assuming a period of normal precipitation during the growing season and three (3) months prior to the beginning of the growing season, corrective measures would be implemented through adaptive management to retain wetland hydrology.

6.9 Buffer Enhancement

Buffer enhancement is proposed totaling one hundred fifty-three thousand four hundred seventy-eight (153,478) sf that will include a planting strategy minimizing mortality and temporal loss and maximizing planting success (**Figures 12-14**).

This strategy includes a planting plan to install a variety of hardy trees, shrubs, and herbaceous plant species at a high density. Habitat features, such as large woody debris, will be installed to jump start wildlife species diversity and to improve wildlife habitat.

Western red cedar will be planted in the majority of the wetland buffer to provide a more structurally diverse forested habitat (**Figures 12-14**). The advantage of planting conifers, such as the western red cedar (*Thuja plicata*, FAC), is reflected in the quality of habitat that would best benefit the entire ecosystem. The western red cedar would shade out invasive weeds and discourage the germination and growth of non-native invasive weeds that would otherwise invade and dominate valuable habitat. In addition, as the conifers mature, these large, long-lived trees produce large woody debris for wildlife habitat.

Habitat diversity is strongly influenced by large woody debris. Conifers would provide adequate and sustainable supplies of large woody debris. Hardwood-dominated stands are not capable of supplying sufficient long-term large woody debris inputs. The proposal would improve habitat and water quality functions in the Black Lake watershed.

Additional important considerations to achieve planting goals are invasive weed control, cost of plant stock, and the need to minimize maintenance by increasing plant survival. This can all be achieved through the planting of hardy, long-lived plant species, particularly conifers. Conifers would be installed to provide dense canopy cover, which would aid in shading-out sun-loving invasive weeds. Along with conifers, a variety of shrubs and herbs would be planted around wetland creation areas to increase the native plant diversity, increase the functional value of the wetland buffers, and to provide a more structurally diverse wildlife habitat.

The installed western red cedar will act as a visual and noise screen to the proposed land use. Western red cedar trees shade out invasive weeds and discourage the germination of non-native plants. Western red cedar needles on the forest floor acidifies the soils discouraging the germination of non-native invasive weeds, while creating a favorable environment for native understory vegetation to flourish. Removal of debris from the buffer will improve the health of the soil, vegetation, wildlife habitat, and water quality into the future.

A planting plan would enhance buffers into a vibrant conifer forest, providing high-quality habitat for wildlife species. Planting along the outer portion of the created wetlands will reduce edge effect and discourage invasive plants from acquiring a foothold in the buffer. A monitoring and maintenance plan would ensure that installed native plant species successfully grow into a forested plant community in the wetland buffers.

Additional measures mitigate wetland impacts includes:

1. **Light Reduction**

   Direct lights away from wetland and streams.

2. **Noise Reduction**

   - Locate activity that generates noise away from wetland and streams.
   - Enhance existing buffer with native vegetation plantings adjacent to noise source.

3. **Eliminate Toxic Runoff**

   - Establish covenants limiting use of pesticides within one hundred and fifty (150) feet of wetland.
   - Apply integrated pest management standards.

4. **Manage Stormwater Runoff**

   - Prevent channelized flow from lawn that directly enter the buffer.
   - Use Low Intensity Development techniques (per PSAT publication on LID techniques) when and if possible.

5. **Prevent Change in Water Regime**

   In order to maintain wetland hydrology, discharge only clean stormwater toward the wetland. Clean stormwater and roof-top runoff may be dispersed outside the wetland buffer for any new runoff from impervious surfaces and new lawns.

6. **Pets and Human Disturbance**

   - Plant thick tree cover to discourage disturbance.
   - Protect wetland and buffer with a conservation easement.

7. **Minimize Dust During Construction**

   - During construction or for commercial or industrial activities, use best management practices to control dust.

8. **Habitat Enhancement**

   - In order to improve habitat quality and connectivity, a vegetation enhancement plan that improves habitat functions and proposes removal of invasive vegetation will provide dense vegetative cover at maturity. Planting noninvasive trees that provide improved filtration of sediment, excess nutrients, and pollutants that may be present.

Other potential Construction impacts

No stockpiling of soils will occur in wetlands or streams. Erosion and sediment control Best Management Practices (BMPs) would be employed to prevent turbid runoff into the wetland and buffer during and after construction. All exposed soils would be covered. Dust control could be employed, if necessary. No fueling of machinery would occur within wetlands or buffers. Other BMPs would be employed if necessary.

Construction Schedule

The mitigation project will begin upon receipt of permits and should be completed within the duration of the permit.

6.10 Planting Plan

6.10.1 Planting Areas

The planting plan includes the planting of the wetland creation area, the dense planting of native vegetation in the wetland buffer adjacent to the wetland creation area, the planting of western red cedar in the remaining wetland buffer, and the planting of western red cedar in the existing Wetland A (**Figures 12-14**). Invasive species such as English holly (*Ilex aquifolium*), reed canarygrass (*Phalaris arundinacea*), and Himalayan blackberry (*Rubus armeniacus*) will be removed prior to planting to ensure successful propagation of planted species. Geofabric will be placed around installed cedar trees to discourage the growth of reed canarygrass until the tree is large enough to shade out the invasive species.

6.10.2 Planting Specification

The summary of the planting plan and costs is provided in **Table 7**.

Table 7. Planting Plan Area Calculations

Planting Plan	Area		Estimated Costs	
	SF	Acres		
Wetland Rehabilitation Area	365,186	8.3	$5,370	$10/tree, 537 trees
Wetland Creation Area	29,948	0.69	$6,199	Dense Planting
Buffer Planting Area (Adjacent to Created Wetland)	37,283	0.86	$7,135	Dense Planting
New Buffer Area	15,802	0.36	$470	$10/tree, 47 trees
Buffer Enhancement Area	153,478	3.5	$3,090	$10/tree, 309 trees
Total			$22,264	

6.10.2.1 Buffer Enhancement Planting Plan

The wetland buffer would be enhanced through two (2) planting strategies:

1. Install a variety of trees, shrubs, and herbs at the boundary of created wetlands in an area totaling thirty seven thousand two hundred eighty-three (37,283 sf) ($7,135)
2. Install western red cedar trees at fifteen (15)-feet on center to enhance wetland buffers onsite in an area totaling one hundred fifty-three thousand four hundred seventy-eight (153,478) sf ($3,090). New buffer area will be planted with forty-seven western red cedar trees in an area of

The existing vegetation primarily consists of non-native, invasive weeds, including, reed canarygrass, English holly, English Ivy, Himalayan blackberry, and European pasture grasses. The wetland buffer will be enhanced to a vibrant coniferous forest community. The installed conifers would eventually provide a screen between the proposed land use and the wetland. The conifers would shade out non-native invasive weeds and discourage germination.

Planting details are summarized in **Tables 8 & 9 and illustrated in Figures 12-14**.

Plants are proposed for installation in one-gallon containers. The planting plan for the buffer area consists of planting upland conifers, shrubs, and herbs.

6.10.2.2 Wetland Creation Area

The planting plan calls for the installation of diverse plant species to create a multilayered forested wetland vegetation community.

Planting details are summarized in **Tables 8-9 and illustrated in Figures 12-14**.

The cost for plant stock covering the created wetland will cost an estimated $6,119. The plant species in the wetland will consist of native hydrophytic plant species. In contrast, the planting plan for the buffer area consists of planting upland conifers, shrubs, and herbs.

Fertilizer and Irrigation.

A small amount of fertilizer will be added to the planting hole prior to installing the plant. A temporary irrigation system will be installed in the mitigation buffer, if necessary, until the plants are established.

6.11 Grading Plan

Fill material and disturbed soils would be removed from the wetland creation areas to the grade of the existing wetland **Figures 10 & 11**.

6.12 Oregon Spotted Frog

Measures to avoid, minimize, and mitigate for potential impacts to the Oregon Spotted frog:

- Minimize potential impacts to Wetland A, a Category II wetland, limited to required road improvements at 49th Avenue SW.
- Replace impacted wetlands for net gain of wetland area and functions.
- Mitigate the loss of low quality Category IV patches of hydrophytic vegetation by creating a higher quality, Category II wetland associated with the existing Wetland A.
- The wetland creation area will consist of three (3) ponds to provide habitat for the Oregon spotted frog.
- The farm pond would be preserved adjacent to Wetland A to provide potential habitat for the Oregon spotted frog. Trees would be planted around the farm pond to shade out sun-loving bullfrogs.
- The stormwater pond is designed as an infiltration basin to avoid potential take of the Oregon spotted frog and to avoid providing bullfrog habitat (See Section 5.2.3 of this report).
- Rehabilitate Wetland A to enhance wetland functions and Oregon spotted frog habitat value by removing livestock grazing and by eliminating non-native invasive weeds.

Table 8. Wetland Creation Area

Wetland Creation Area Planting Plan

Willow	Plant species	Scientific Name	Number	Container	Cost/plant	Cost
FAC	Sitka Willow	*Salix sitchensis*	156	3' cuttings	$0.60	$93.60
FAC	Scouler's Willow	*Salix scouleriana*	156	3' cuttings	$0.60	$93.60
FAC	Hooker's Willow	*Salix hookeriana*	156	3' cuttings	$0.60	$93.60
	Total		468			$467.94

Trees	Plant species	Scientific Name	Number	Container	Cost/plant	Cost
FACW	Oregon Ash	*Fraxinus latafolia*	44	1-gal	$4.00	$176.00
FAC	Western red cedar	*Thuja plicata*	44	1-gal	$4.00	$176.00
FAC	sitka sprice	*Picea sitchensis*	45	1-gal	$4.00	$180.00
	Total		133			$532.41

Shrubs	Plant species	Scientific Name	Number	Container		
FAC+	Black twinberry	*Lonicera involucrata*	67	1-gal	$4.00	$267.39
FAC+	Salmonberry	*Rubus spectabilis*	67	1-gal	$4.00	$267.39
FACW	Pacific ninebark	*Physocarpus capitatus*	67	1-gal	$4.00	$267.39
FACW	Red-osier dogwood	*Cornus stolonifera*	67	1-gal	$4.00	$267.39
FAC	Clustered rose	*Rosa pisocarpa*	67	1-gal	$4.00	$267.39
FAC	Nootka rose	*Rosa nutkana*	67	1-gal	$4.00	$267.39
FACW	Douglas spirea	*Spiraea douglasii*	67	1-gal	$4.00	$267.39
	Total		468			$1,871.75

Herbs	Plant species	Scientific Name	Number	Container		
OBL	slough Sedge	*Carex Obnupta*	139	1-gal	$4.00	$554.59
OBL	Small-fruited Bullrush	*Scirpus microcarpus*	139	1-gal	$4.00	$554.59
FACW	Soft Rush	*Juncus effusus*	139	1-gal	$4.00	$554.59
FAC	Lady Fern	*Athyrium filix-femina*	139	1-gal	$4.00	$554.59
FACW	Dagger-leaf Rush	*Juncus ensifolius*	139	1-gal	$4.00	$554.59
OBL	Hard-stem Bullrush	*Scirpus acutus*	139	1-gal	$4.00	$554.59
	Total		832			$3,327.56

Plant Types	Feet on center	Area (sf)	Plants/Acre	Plants/sf	# Plants
Willow	8	29,948	681	0.0156	468
Trees	15	29,948	194	0.0044	133
Shrubs	8	29,948	681	0.0156	468
Herbs	6	29,948	1210	0.0278	832

	Est. cost per plant	# Plants	Total Cost
Willow	$0.60	468	$467.94
Trees	$4.00	133	$532.41
Shrubs	$4.00	468	$1,871.75
Herbs	$4.00	832	$3,327.56
	Total	1901	$6,199.65

Total Cost of Plants		$6,199.65

Table 9. Wetland Buffer planting Plan Adjacent to Created Wetland

Buffer Planting Plan

Trees	Plant species	Scientific Name	Number	Container	Cost/plant	Cost
FACU	Western Hemlock	*Tsuga heterophylla*	55	6-ft	$15.00	$825.00
FACU	Douglas fir	*Pseudotsuga menziesii*	55	1-gal	$4.00	$220.00
FAC	Western red cedar	*Thuja plicata*	56	1-gal	$4.00	$224.00
	Total		166			$662.81

Shrubs	Plant species	Scientific Name	Number	Container		
FACU	Thimbleberry	*Rubus parvflorus*	83	1-gal	$4.00	$332.00
FACU	Osoberry	*Oemleria cerasiformis*	83	1-gal	$4.00	$332.00
FACU	Red elderberry	*Sambucus racemosa*	83	1-gal	$4.00	$332.00
FAC-	Vine Maple	*Acer circinatum*	83	1-gal	$4.00	$332.00
FAC	Clustered rose	*Rosa pisocarpa*	83	1-gal	$4.00	$332.00
FAC	Nootka rose	*Rosa nutkana*	84	1-gal	$4.00	$336.00
FACU	Snowberry	*Symphoricarpos albus*	84	1-gal	$4.00	$336.00
	Total		583			$2,330.19

Herbs	Plant species	Scientific Name	Number	Container		
FACU	Trailing blackberry	*Rubus Ursinus*	173	1-gal	$4.00	$690.43
FACU	Cascade Oregongrape	*Mahonia repens*	173	1-gal	$4.00	$690.43
FACU	salal	*Gaultheria shallon*	173	1-gal	$4.00	$690.43
FACU	Sword Fern	*Polystichum munitum*	173	1-gal	$4.00	$690.43
FAC	False lilly of the valley	*Maianthemum dilatatum*	173	1-gal	$4.00	$690.43
FAC	Deer Fern	*Blechnum spicant*	173	1-gal	$4.00	$690.43
	Total		1036			$4,142.56

Plant Types	Feet on center	Area (sf)	Plants/Acre	Plants/sf	# Plants
Trees	15	37,283	193.6	0.0044	166
Shrubs	8	37,283	680.625	0.0156	583
Herbs	6	37,283	1210	0.0278	1036

	Est. cost per plant	# Plants	Total Cost
Trees	$4.00	166	$662.81
Shrubs	$4.00	583	$2,330.19
Herbs	$4.00	1036	$4,142.56
	Total	1784	$7,135.55

Total Cost of Plants		$7,135.55

7.0 MONITORING AND CONTINGENCY PLAN

7.1 Monitoring Methodology

The monitoring program will be conducted for a period of five (5) years. A baseline assessment will be conducted at the end of the construction phase. This information will be used as a baseline to compare subsequent monitoring events.

Field visits will be completed as follows:

i. At completion of construction of mitigation project (as-built report);

ii. Thirty (30) days after completion;

iii. Early in the first (1st) growing season after construction;

iv. End of the first (1st) growing season after construction;

v. Twice the second (2nd) year; and

vi. Once in years 3, 4, & 5 years

Monitoring will evaluate plant growth and establishment, condition of habitat quality, and wildlife usage in the enhancement area. If objectives are met at an earlier date, the applicant may request to end the monitoring phase earlier. All reports and photos shall be submitted to the City of Tumwater.

7.2 Vegetation

Permanent vegetation sampling points or transects will be established in the planting areas to incorporate the installed plants. The same monitoring point will be re-visited throughout the monitoring period. Vegetation will be recorded on the basis of relative percent cover. General plant health, percent survival, and plant species occurrence (including volunteer species) will also be recorded. Qualified personnel or the property owners will conduct all monitoring.

Photo-points will be established from which photographs will be taken throughout the monitoring period. These photographs will document general appearance and progress in plant community establishment in the buffer enhancement area. Review of the photos over time will provide a semi-quantitative representation of success of the buffer enhancement plan.

Monitoring and photo-point locations will be recorded to keep a record of enhancement success.

7.3 Wildlife

Birds, mammals, reptiles, amphibians, and invertebrates, which are readily observable (either by direct or indirect means), will be identified and recorded in the buffer enhancement area. Direct observations would include actual sightings, while indirect observations include tracks, scat, nests, song, or other indicative signs.

7.4 Success Criteria

Success of plant establishment within the enhancement area will be evaluated on the basis of both percent survival and percent cover of installed species. Planting success will be based on at least an eighty percent (80%) survival rate following each monitoring event. Successful plant establishment will also be met if there is at least a sixty percent (60%) areal cover of a combination of planted species and equivalent recruitment of native conifer species by the end of the third to fifth-year monitoring period.

7.5 Performance Standards

Vegetation in Planting Areas

- 80% survival rate following each monitoring event.
- 60% areal cover of a combination of planted species and equivalent recruitment of native conifers by the end of the fifth (5^{th})-year monitoring period.

7.6 Maintenance (M) and Contingency (C)

Established performance standards for the project will be compared to the monitoring results in order to judge the success of the buffer enhancement plan. Contingency measures will include the items listed below and will be implemented if these performance standards are not met. Maintenance and remedial action on the site will be implemented immediately upon completion of the monitoring event (unless otherwise specifically indicated below).

Wetland Buffer Restoration

- Replace dead plants with the same species or a substitute species that meets the goals and objectives of the plan. (C)
- Re-plant areas after reason for failure has been identified (*e.g.*, moisture regime, poor plant stock, disease, shade/sun conditions, wildlife damage, *etc.*). (C)
- Remove/control weedy or exotic invasive plants (*e.g.*, Scotch broom [*Cytisus scoparius]*, reed canarygrass [*Phalaris arundinacea*], Himalayan blackberry [*Rubus armeniacus*], purple loosestrife [*Lythrum salicaria*], *etc.*) by manual or chemical means approved by City of Tumwater. Use of herbicides or pesticides within the buffer enhancement area would only be implemented if other measures failed or were considered unlikely to be successful. (C & M)

8.0 COST ESTIMATE AND PERFORMANCE BOND

Cost Estimate

Item	Estimate cost
Plant Stock	$22,264
Planting crew	$2,000
Monitoring	$3,500
Contingency	$1,000
Total	$28,764
Total (125%)	$35,955

9.0 SUMMARY & CONCLUSION

This proposal provides a unique opportunity to enlarge and rehabilitate a severely degraded Category II wetland and its buffer. Extremely marginal wetlands located on managed pastures would be impacted in favor of transforming a severely degraded Category II Wetland into a vibrant, high quality wetland system. This proposal would transform these severely degraded wetlands into one large high-quality wetland system. Wetland functions would be restored and enhanced within a larger and more diverse habitat. Invasive weeds would be eliminated, and native plant species would be installed.

Three (3) wetlands, labeled Wetlands A-C, were identified and delineated on the subject property (**Figure 2**). Wetland A is a relatively larger and more diverse wetland when comparing to the other wetlands identified on the subject property. Wetlands B & C were identified south of the basin divide on the southern half of the subject property.

Wetland A is heavily grazed and severely trampled by livestock. This degraded wet depression provides low quality habitat with the opportunity for habitat enhancement.

Wetlands B & C, located on the southern half of the subject property, are small patches of slough sedge, reed canarygrass, soft rush, and pasture grasses on sandy soils. These small wet patches are severely degraded with very negligible wetland functions. In the summer, livestock use these moist spots as wallows and for fresh grazing opportunities.

Wetland A has been classified as a Category II wetland by the 2014 Department of Ecology Wetland Rating Form for Western Washington as required under Chapter 16.28.090---*Wetlands Rating System*. Wetland A is a depressional wetland under the 2014 Department of Ecology Wetland Rating System.

Under City of Tumwater Municipal Code (TMC) Title 16---*Environment*, Chapter 16.28.090---*Wetlands Rating System*, wetland buffers are calculated based on category of wetland and the habitat score determined by the 2014 Washington State Department of Ecology Wetland Rating System publication 14-06-029, effective January 2015), as revised. Wetland A scored for habitat a “Medium (M)” potential to provide habitat, a “Medium (M)” landscape potential to support habitat, and a “Medium (M)” potential value to society. Wetlands that rate as an M, M, M receive a score of six (6) points for total habitat functions (**Appendix L**).

The standard buffer for Category II wetlands that score between five (5) and Seven (7) points for Habitat Functions require a buffer width of one hundred fifty (150) feet (TMC Chapter 16.28.170---*Wetland buffers*, Table 16.28.170(2)---*Category II Wetland Buffer Widths*) (**Figure 7, Table 5**).

Wetlands B & C have been classified as a Category IV wetlands by the Department of Ecology (2014) Wetland Rating Form for Western Washington as required under Chapter 16.28.090---*Wetlands Rating System*. Wetland B & C are flat depressional wetlands under the Department of Ecology (2014) Wetland Rating System.

Under City of Tumwater Municipal Code (TMC) Title 16---*Environment*, Chapter 16.28.090---*Wetlands Rating System*, wetland buffers are calculated based on category of wetland and the habitat score determined by the Washington State Department of Ecology (2014) Wetland Rating System publication 14-06-029, effective January 2015), as revised. Wetlands B & C scored for habitat a "Low (L)" potential to provide habitat, a "Medium (M)" landscape potential to support habitat, and a "Low (L)" potential value to society. Wetlands that rate as an L, M, L receive a score of four (4) points for total habitat functions (**Appendix L**).

The standard buffer for Category IV wetlands that score less than sixteen (<16) points for all three (3) functions and with a high intensity impact of proposed land use require a buffer width of fifty (50) feet under TMC Chapter 16.28.170---*Wetland buffers*, Table 16.28.170(4)---*Category IV Wetland Buffer Widths* (**Figure 7, Table 5**).

Wetlands B & C qualify for exemption under TMC 16.28.095(B). Unavoidable impacts to small and low quality Category IV wetlands are the only reasonable alternative which would accomplish the applicant's objectives of an economically viable land use project on the subject property.

Wetland impacts require compensatory mitigation as detailed under TMC 16.28.220---*Compensating for wetlands impacts.* As a condition of any permit allowing alteration of wetland and/or wetland buffers, the City requires that the applicant demonstrate that wetland impact avoidance is not possible and engage in the restoration, creation or enhancement of wetlands and their buffers in order to offset the impacts resulting from the proposed action.

The mitigation strategy includes creating wetlands on a disturbed upland site with vegetative cover consisting primarily of nonnative introduced species. A consistent source of hydrology is provided by groundwater and by an existing larger wetland that would be enlarged and enhanced.

This innovative proposal provides the opportunity to enlarge and enhance the existing degraded wetland system beyond existing conditions. The current wetland system consists of excavated depressions, stormwater discharges, excessive trash, and non-native invasive weeds. This proposal would remove garbage, eliminate non-native invasive weeds, enlarge the existing wetlands, and install native plant species. The mitigation plan includes enhancing significantly degraded wetlands in combination with restoration and creation. Such enhancement should be part of a mitigation package that includes replacing the impacted area meeting appropriate ratio requirements.

An economically viable project proposed, and the subject property would provide the unique opportunity to enlarge, restore, and enhance wetland on the subject property improving wetland functions and values over existing conditions, satisfying and exceeding the City of Tumwater code requirements.

10.0 REFERENCES

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service, Department of the Interior. FWSOBS-70/31.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Hitchcock, C.L., and A. Cronquist. 1973. *Flora of the Pacific Northwest*. University of Washington Press. 730 pp.

Iowa State University. 1995. Hydric Soils of Washington State. U.S. Department of Agriculture, Natural Resources Conservation Service. December 5.

Munsell Color. 1988. *Munsell Soil Color Charts*. Kollmorgen Instruments Corp., Baltimore, Maryland.

Reed, P.B. Jr. 1988. *National List of Plant Species that Occur in Wetlands: Northwest (Region 9)*. USF&WS Biol. Report 88.

Reed, P.B. Jr. 1993. Supplement to: *National List of Plant Species that Occur in Wetlands: Northwest (Region 9)*. USF&WS Biol. Report 88.

Reed, P.B. Jr. 1998. National List of Plant Species that Occur in Wetlands: Northwest (Region 9). USF&WS Update.

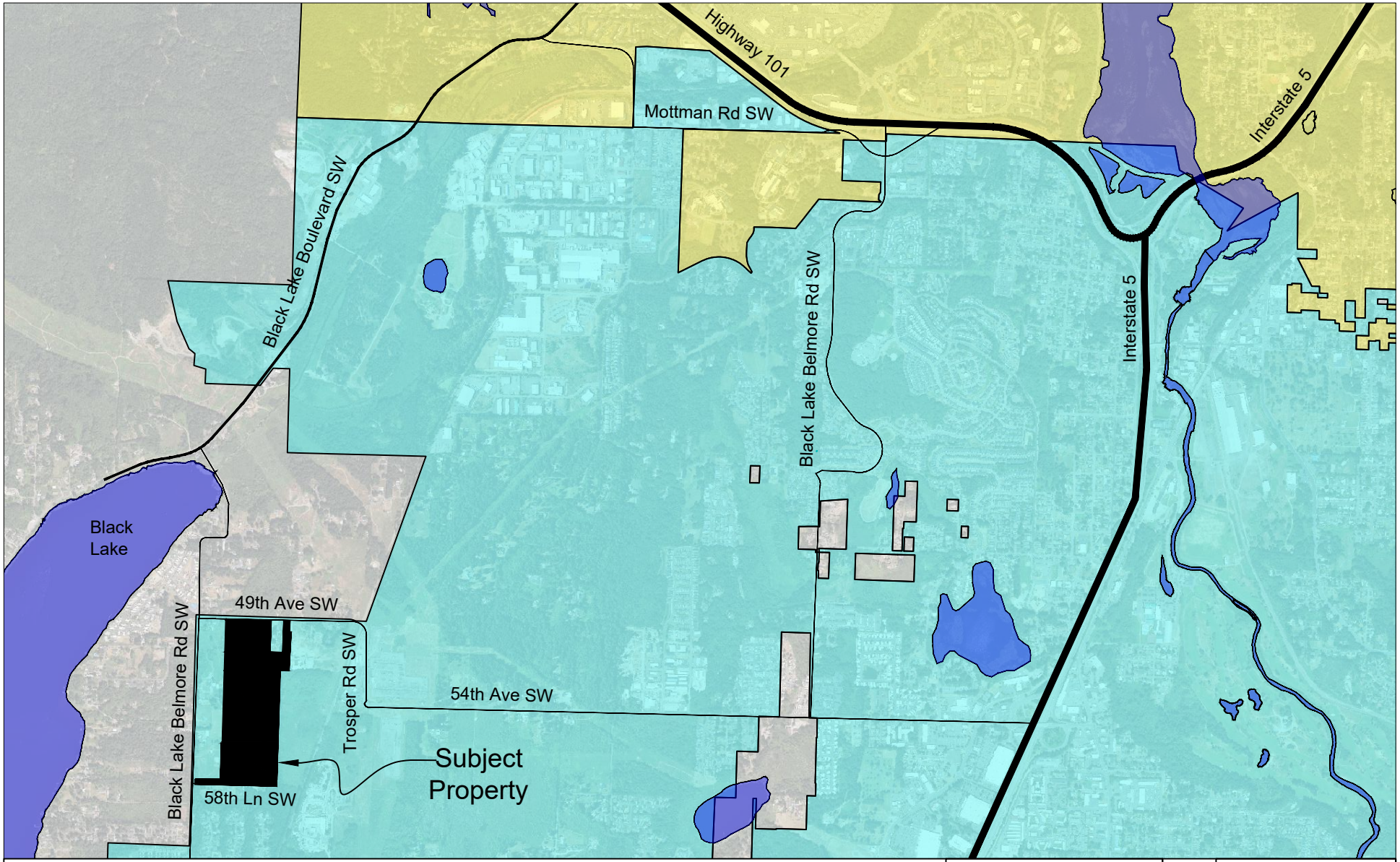
U.S. Department of Agriculture, Soil Conservation Service. June, 1991. *Hydric Soils of the United States.*

U.S. Department of Agriculture, Soil Conservation Service. Thurston County Area Soil Survey.

Washington State Department of Ecology. 1997. Washington State Wetland Identification and Delineation Manual. March.

Washington State Department of Ecology. 2004. Washington State Wetland Rating System for Western Washington. Ecology Publication # 04-06-025. August.

FIGURES



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City of Tumwater
City of Olympia
Water Bodies

Figure 1

Vista Views
at Black Lake

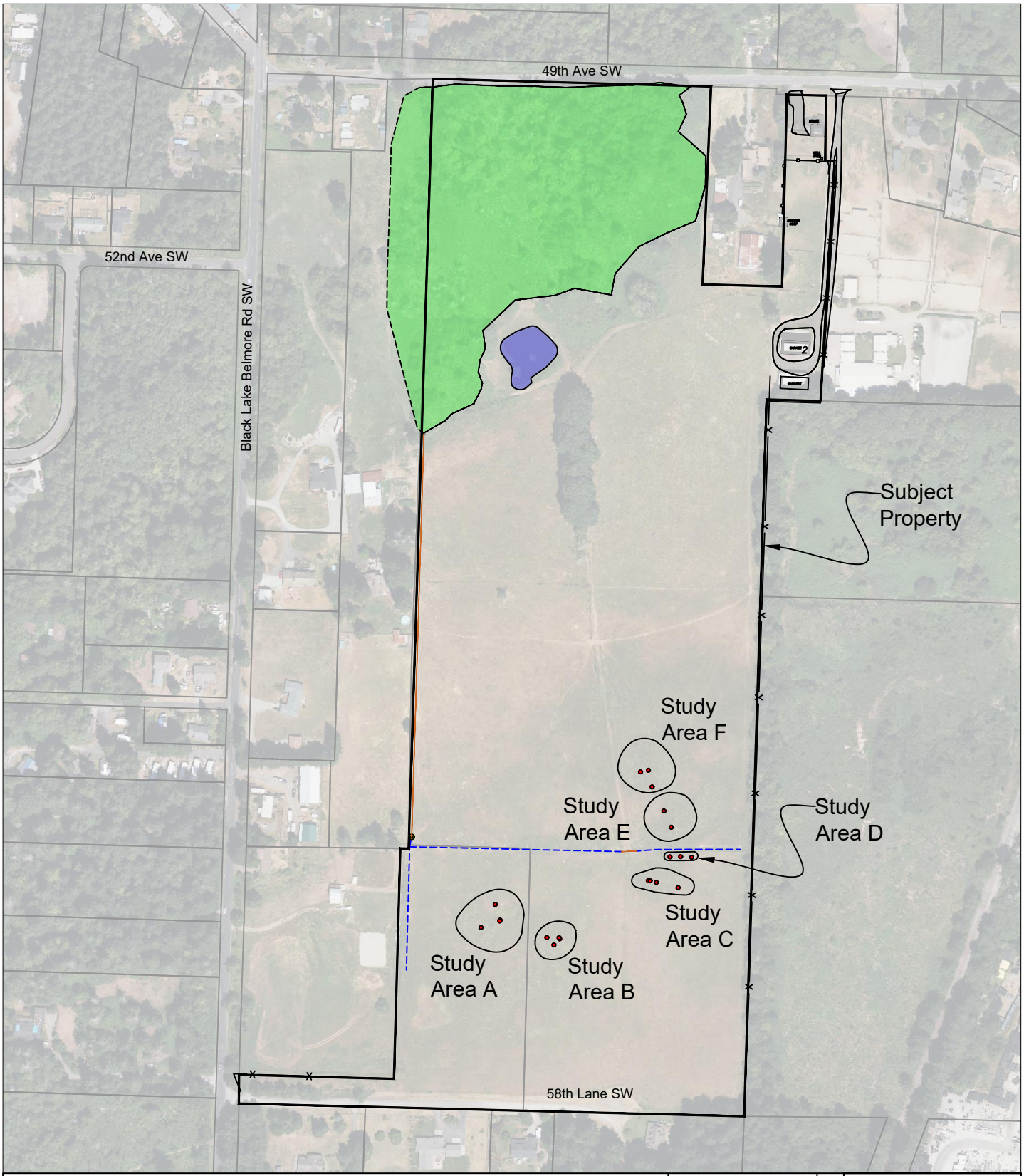
Vicinity Map

N

Scale: 1" = 2200'

0 2200'

6 August 2024



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Wetland (Delineated)
Wetland (Not Delineated)
Farm Pond
Farm Ditches
Conveyance Pipes
Monitoring Well Locations

Figure 2

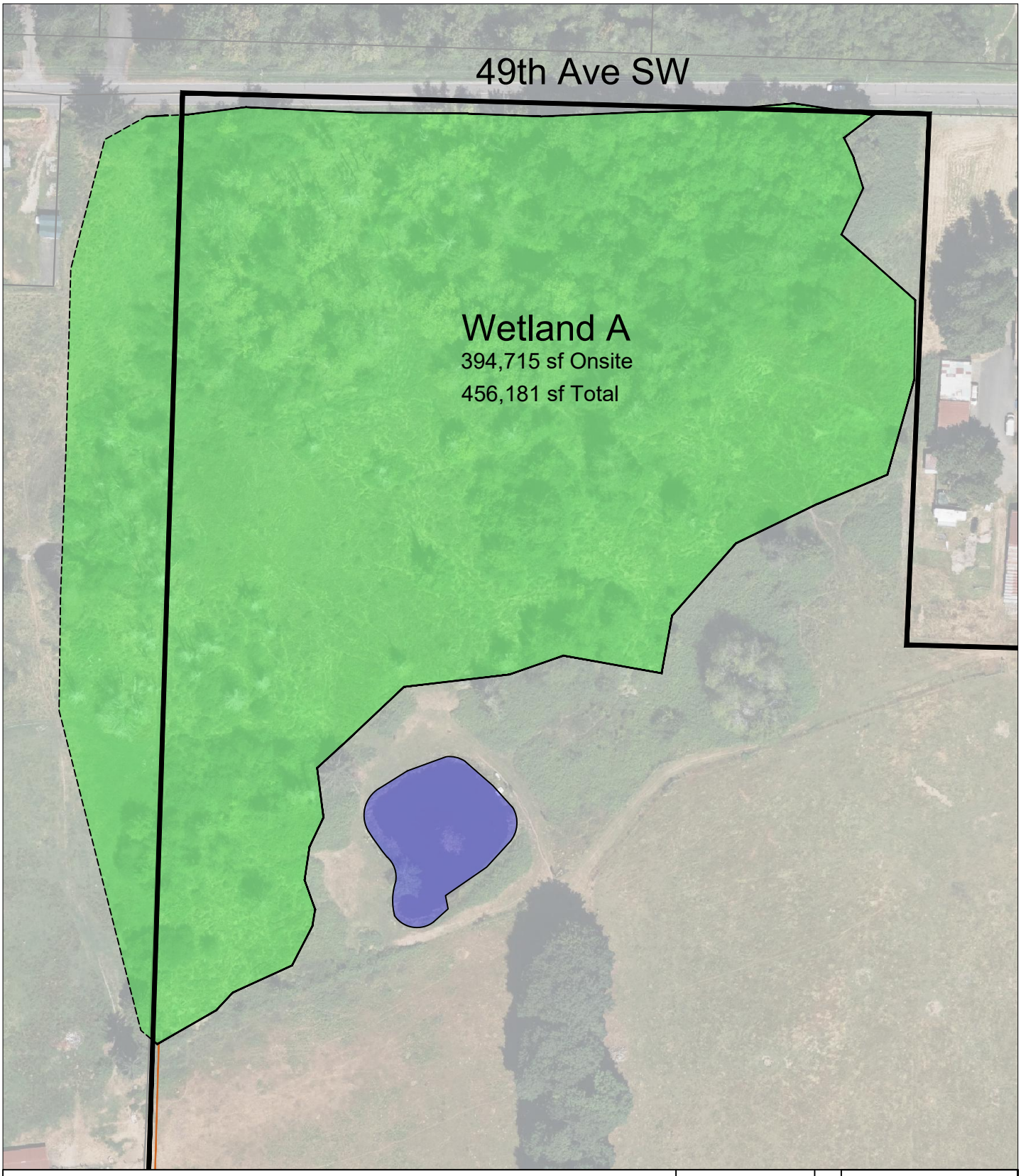
Vista Views at Black Lake

Monitoring Well Locations

Scale: 1" = 350'

0 350'

6 August 2024



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Wetland (Delineated)
Wetland (Not Delineated)
Farm Pond
Conveyance Pipes

Figure 3

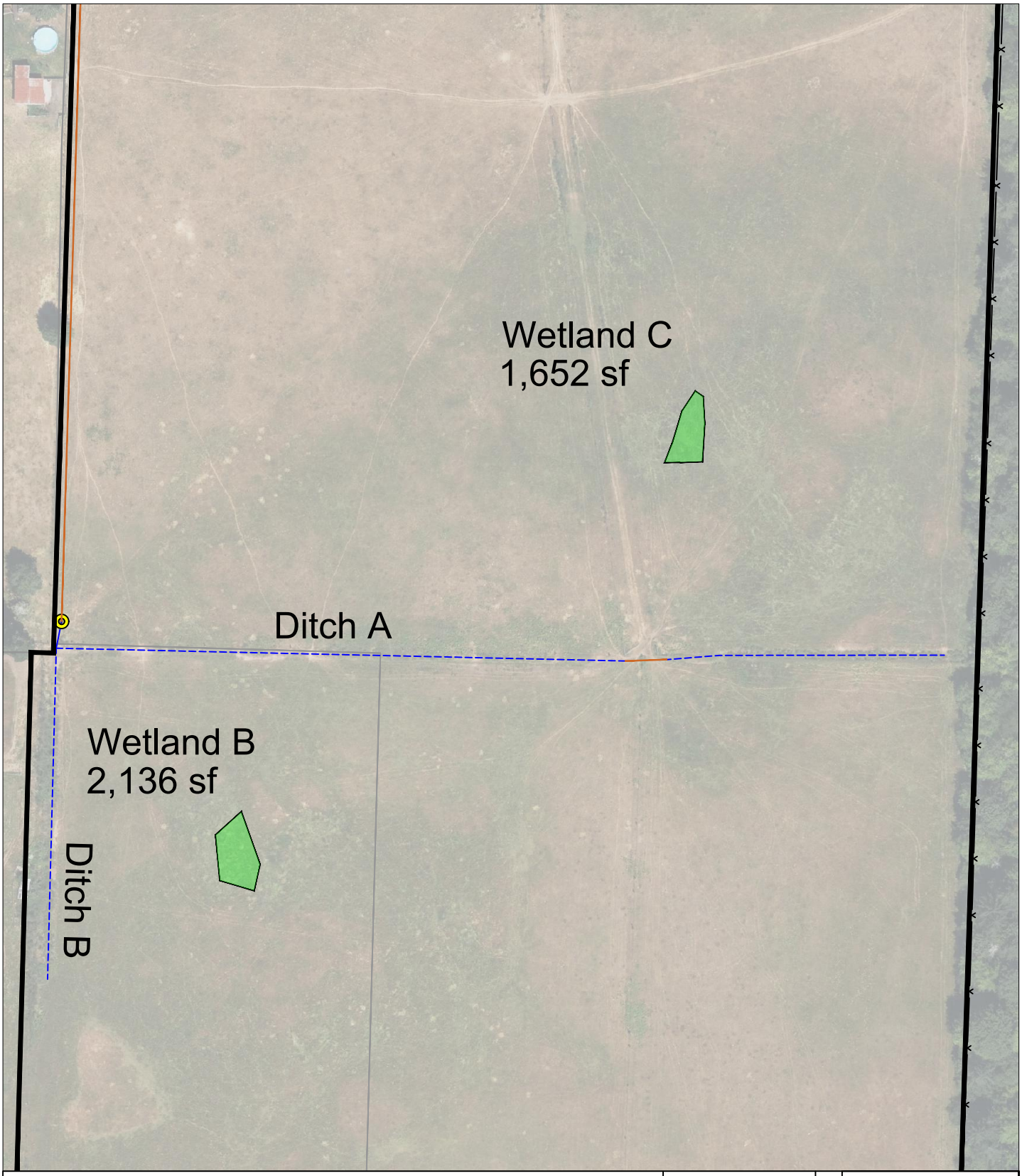
Vista Views at Black Lake

Wetland A

Scale: 1" = 130'

0 130'

6 August 2024



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360-790-1559

Wetland (Delineated)

Farm Ditches

Conveyance Pipes

Figure 4

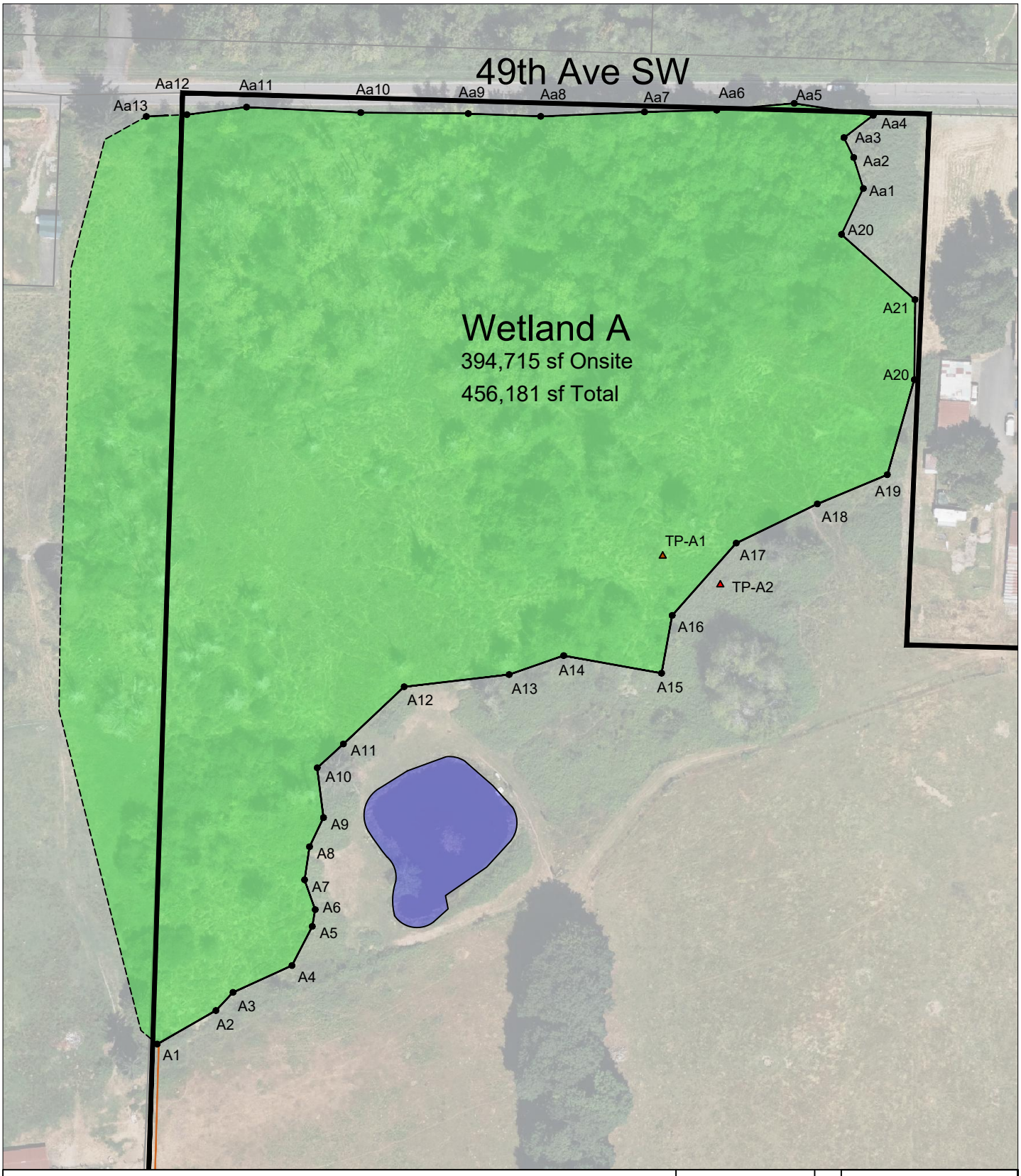
Vista Views
at Black Lake

Critical Areas
Wetlands B & C

Scale: 1" = 130'

0 130'

6 August 2024



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Wetland (Delineated)
Wetland (Not Delineated)
Active Farm Pond
C1 — C2 Wetland Delineation
TP A2 Test Plot

Figure 5

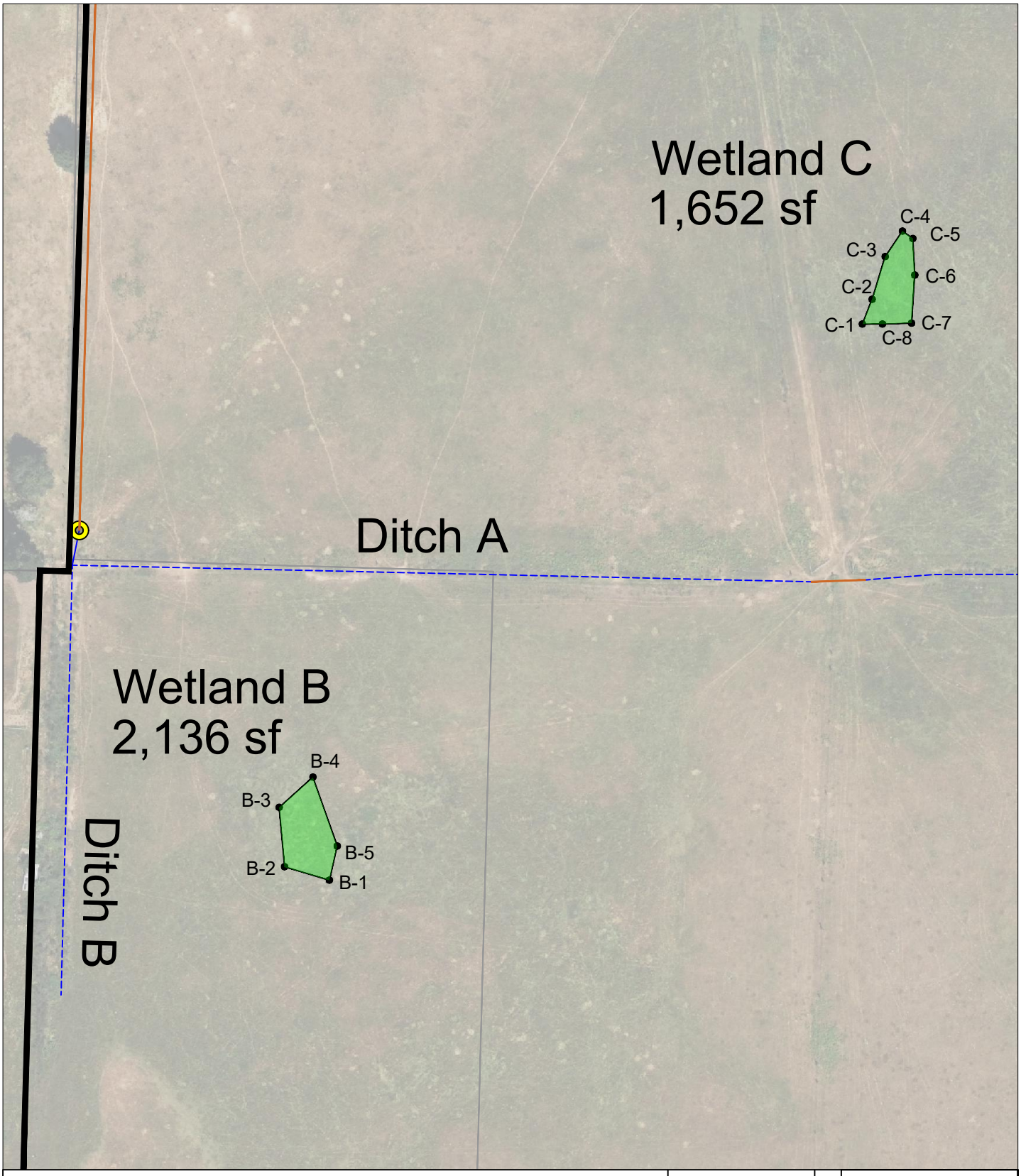
Vista Views at Black Lake

Wetland A Delineation

Scale: 1" = 130'

0 130'

6 April 2024



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Wetland (Delineated)
Wetland (Not Delineated)
C1 C2 Wetland Delineation
Farm Ditches
Conveyance Pipes

Figure 6

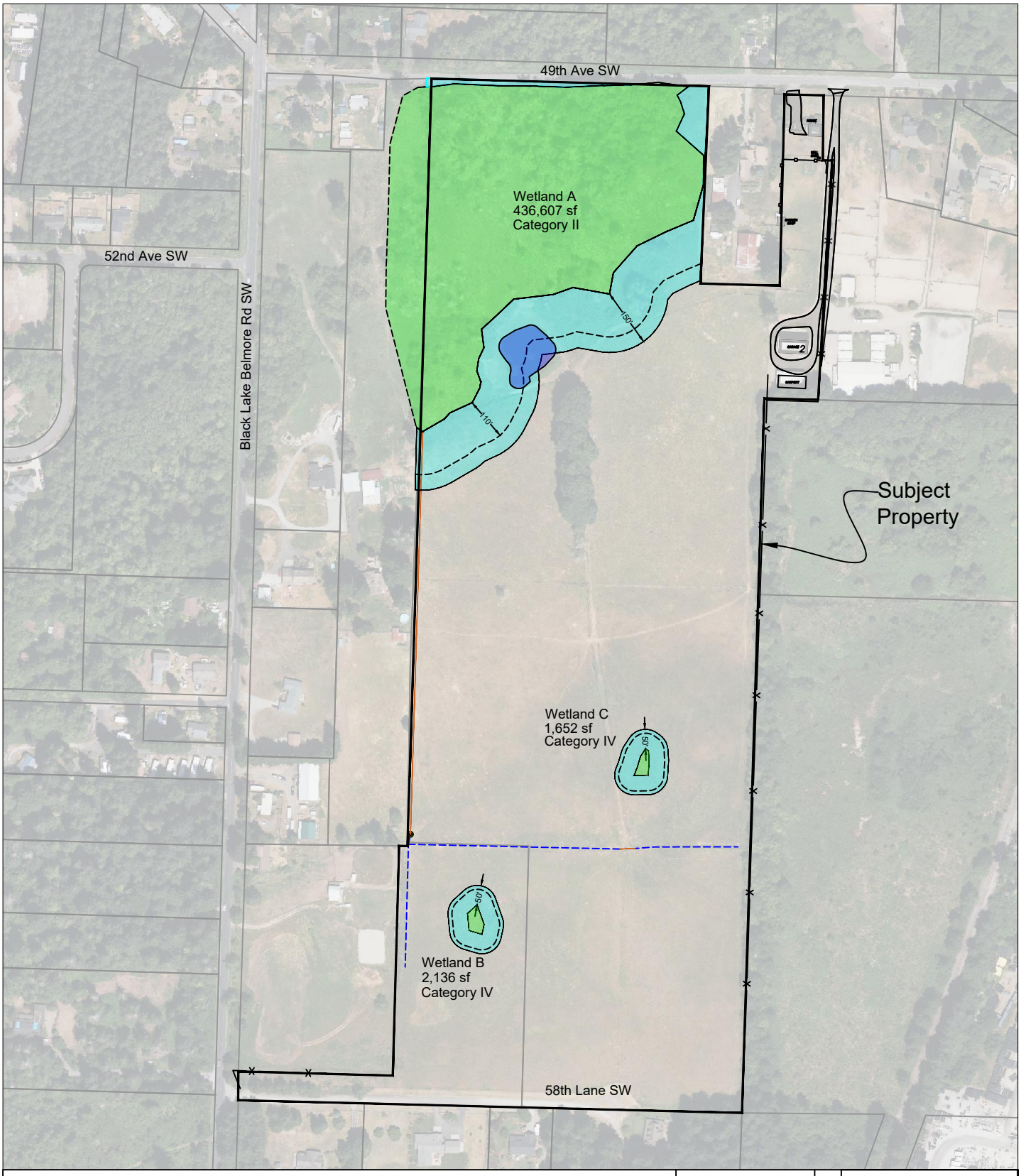
Vista Views at Black Lake

Delineation Wetlands B & C

Scale: 1" = 100'

0 100'

6 August 2024



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Wetland (Delineated)
Wetland (Not Delineated)
Farm Pond
Wetland Buffers Onsite
Farm Ditches
Reduced Buffers
Conveyance Pipes

Figure 7

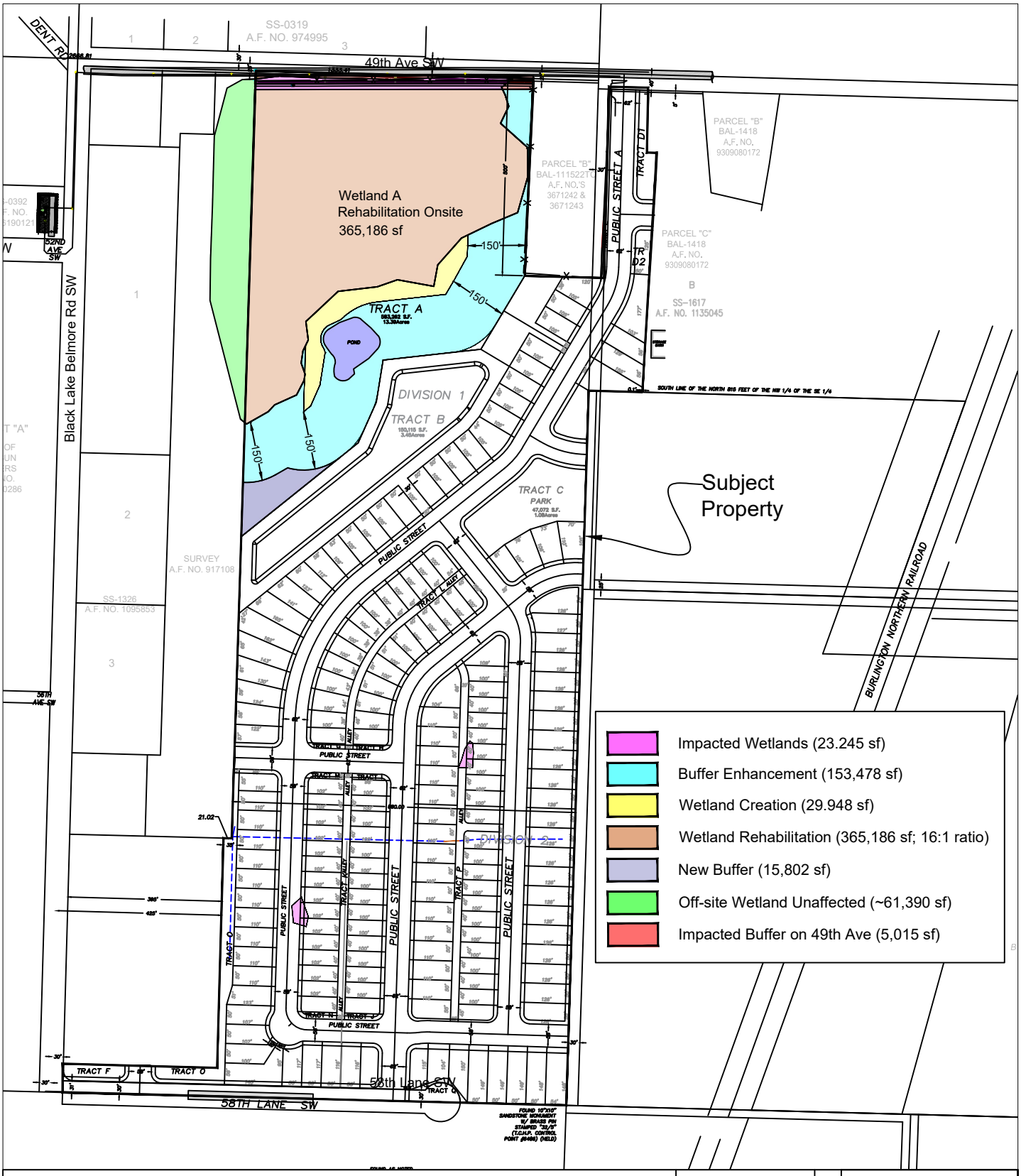
Vista Views at Black Lake

Wetland Buffers

Scale: 1" = 350'

0 350'

6 August 2024



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Wetland (Delineated)
Wetland (Not Delineated)
Farm Pond
Wetland Buffers Onsite
Farm Ditches
Reduced Buffers
Conveyance Pipes

Figure 8

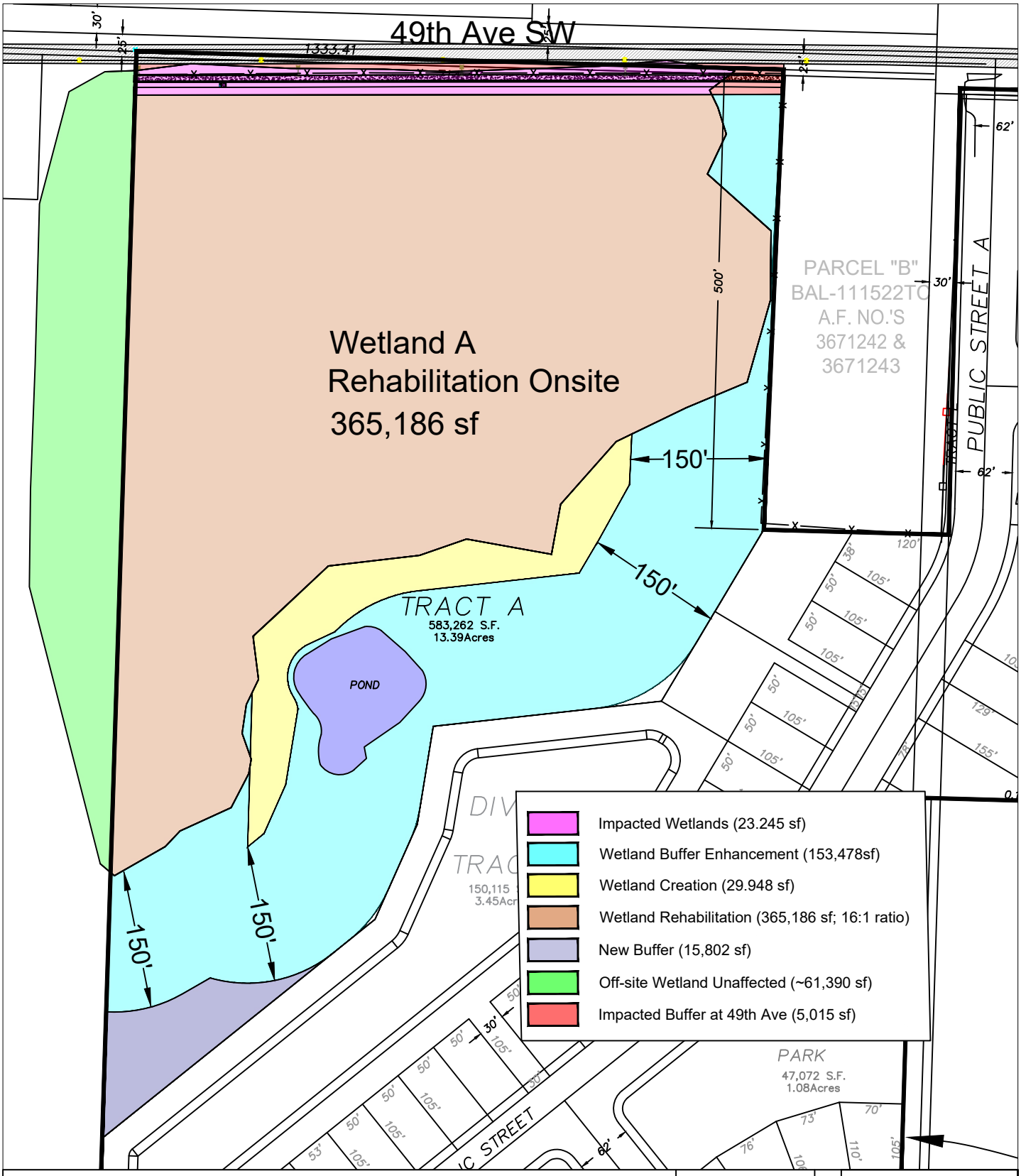
Vista Views at Black Lake

Site Plan, Impacts, & Mitigation Plan

Scale: 1" = 350'

0 350'

6 August 2024



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Wetland (Delineated)
Wetland (Not Delineated)
Farm Pond
Wetland Buffers Onsite
Farm Ditches
Reduced Buffers
Conveyance Pipes

Figure 9

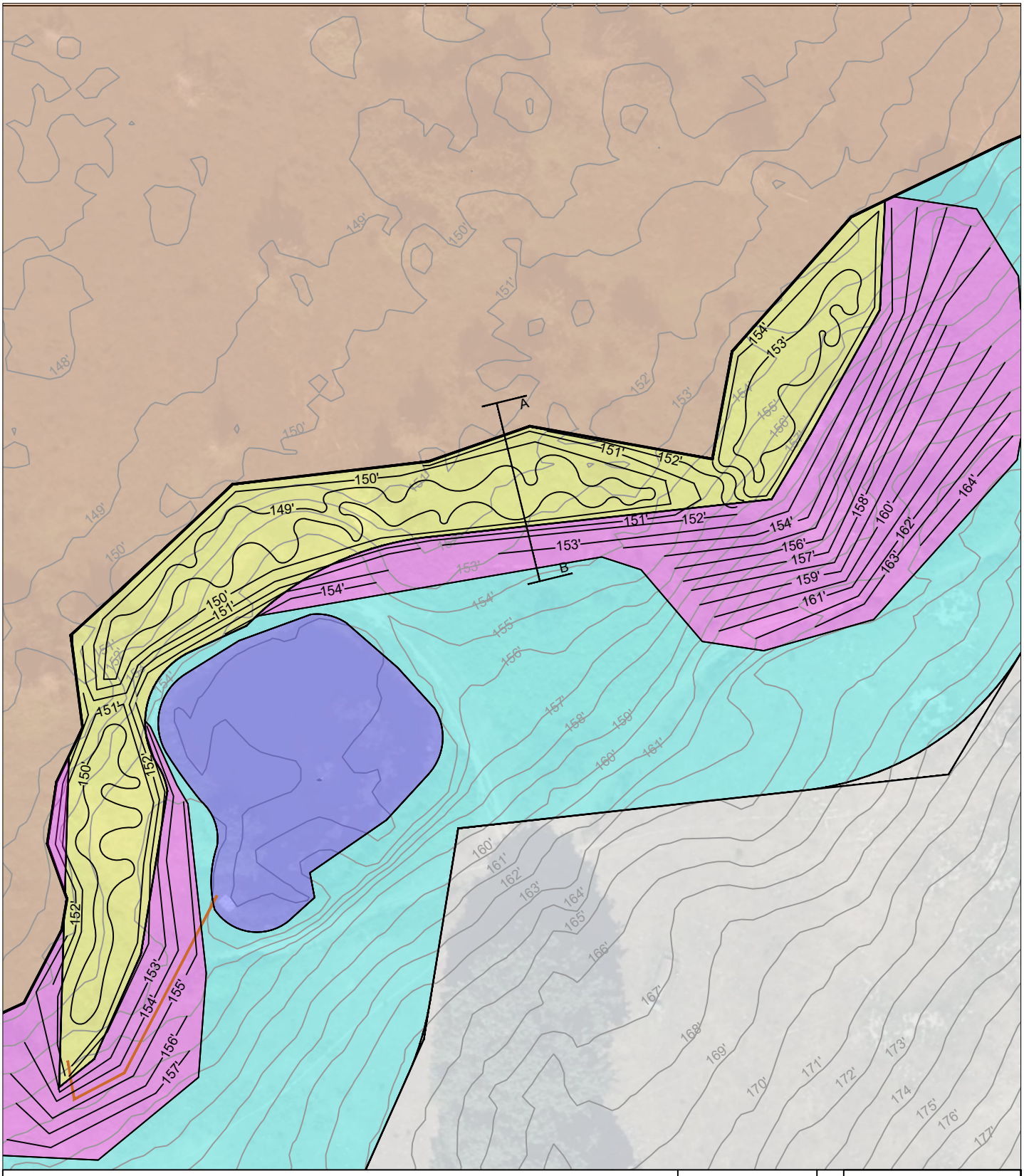
Vista Views at Black Lake

Site Plan, Impacts, & Mitigation Plan

Scale: 1" = 150'

0 150'

6 August 2024



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Wetland Buffer
Grading in Buffer
Wetland Creation Area
Wetland Rehabilitation Area
Conveyance Pipes
150' Proposed Contours
150' Existing Contours

Figure 10

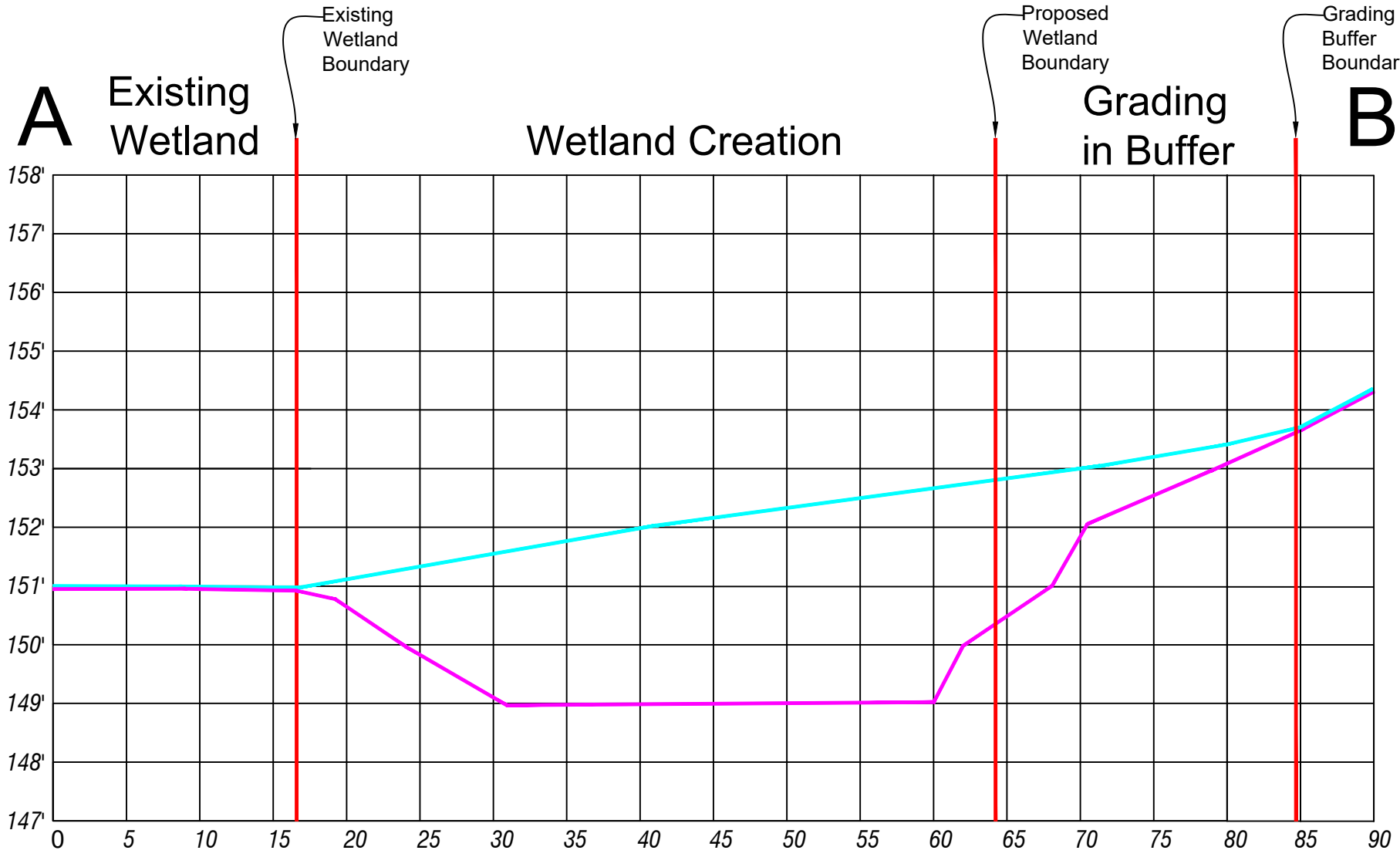
Vista Views at Black Lake

Grading Plan

Scale: 1" = 70'

0 70'

6 August 2024



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Proposed Contour
Existing Contour

Note: Vertically Exaggerated

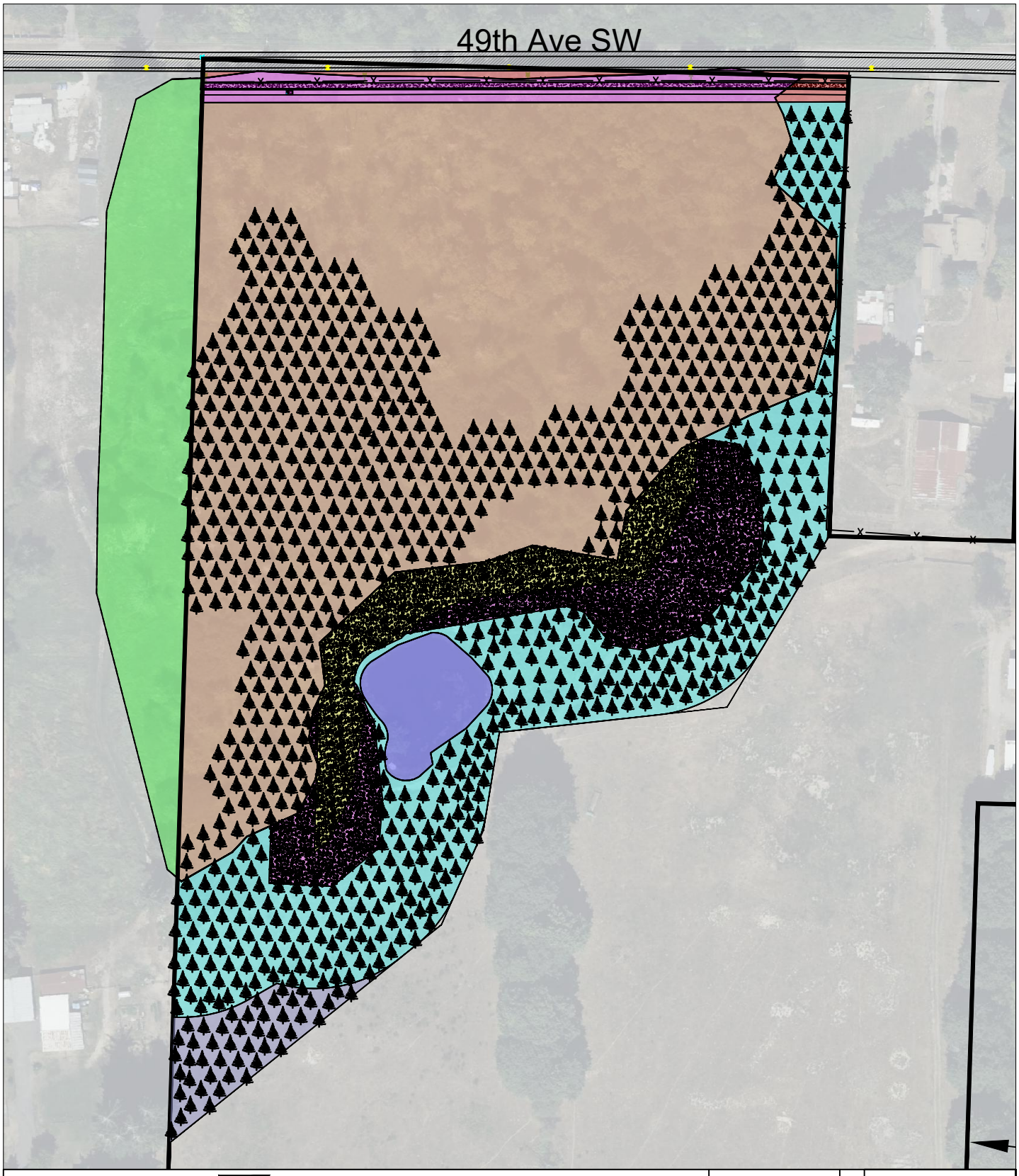
Figure 11

Vista Views at Black Lake

Grading Plan Cross Section

NTS

6 August 2024



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Wetland Rehabilitation (365,186 sf)

Wetland Creation Area Planting Plan (29,948 sf)

Buffer Enhancement Area (153,478 sf)

New Buffer Area (15,802 sf)

Wetland Buffer Planting (37,283 sf)

Installation of Western Red Cedar
- Wetland Rehabilitation Area (537 trees)
- Buffer Enhancement Area (309 Trees)
- New Buffer Area (47 Trees)

Figure 12

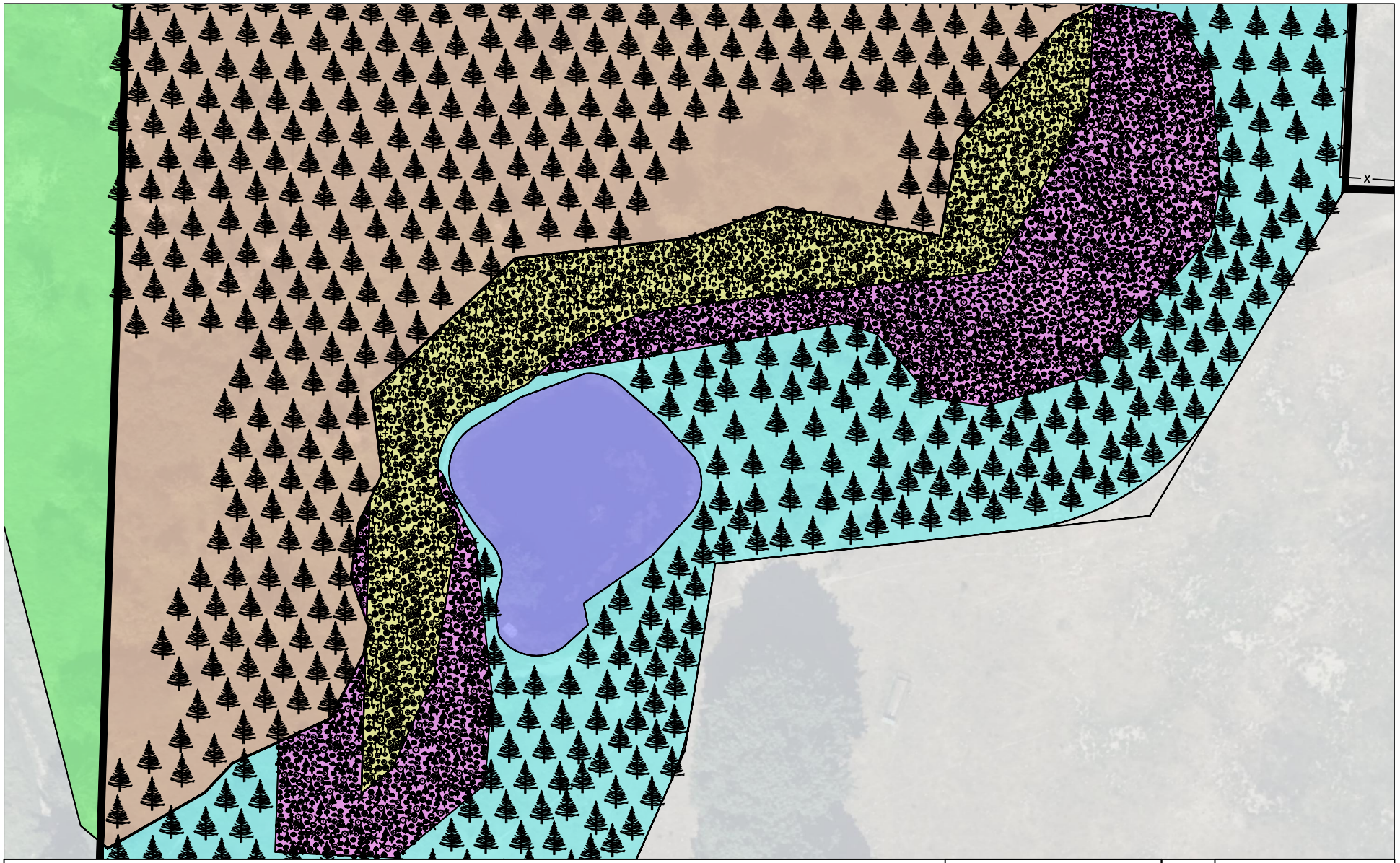
Vista Views at Black Lake

Planting Plan

Scale: 1" = 150'

0 150'

6 August 2024



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- Wetland Buffer Enhancement
- Wetland Creation Area
- Buffer Planting Area
- Wetland Buffer Planting

Installation of Western Red Cedar
Wetland Rehabilitation Area (537 trees)
Buffer Enhancement Area (309 Trees)
New Buffer Area (47 Trees)

Figure 13

Vista Views
at Black Lake

Planting Plan

N

Scale: 1"= 80'

0 80'

6 August 2024

Wetland Planting Schedule


Western Red Cedar


Oregon Ash


Sitka Spruce


Black Twinberry


Salmonberry


Pacific Ninebark


Douglas spirea


Small-fruited bulrush


Clustered Rose


Nootka Rose


Soft Rush


Slough Sedge


Lady Fern


Red-osier Dogwood


Dagger-leaf rush


Hard-stem bulrush


Willow

Buffer Planting Schedule


Western Hemlock


Douglas Fir


Western Red Cedar


Red Elderberry


False lily of the valley


Vine Maple


Osoberry


Thimbleberry


Clustered Rose


Nootka Rose


Snowberry


Trailing Blackberry


Cascade Oregongrape


Salal


Deer Fern


Sword Fern

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Figure 14

Bodenhamer

Plant Legend

NTS

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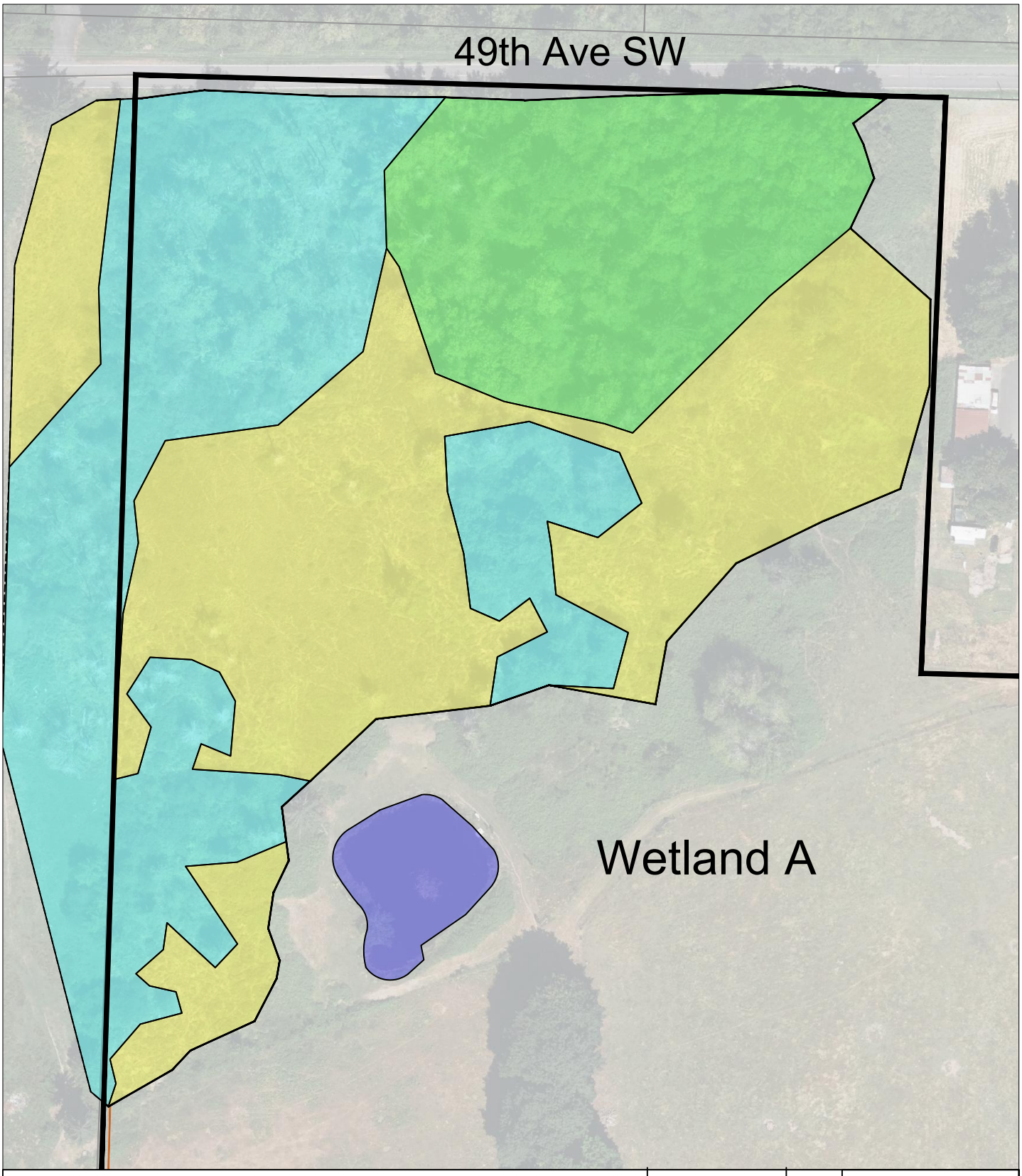

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Emergent Seasonally-flooded
Forested Seasonally-flooded
Scrub Shrub Seasonally-flooded

Figure 15

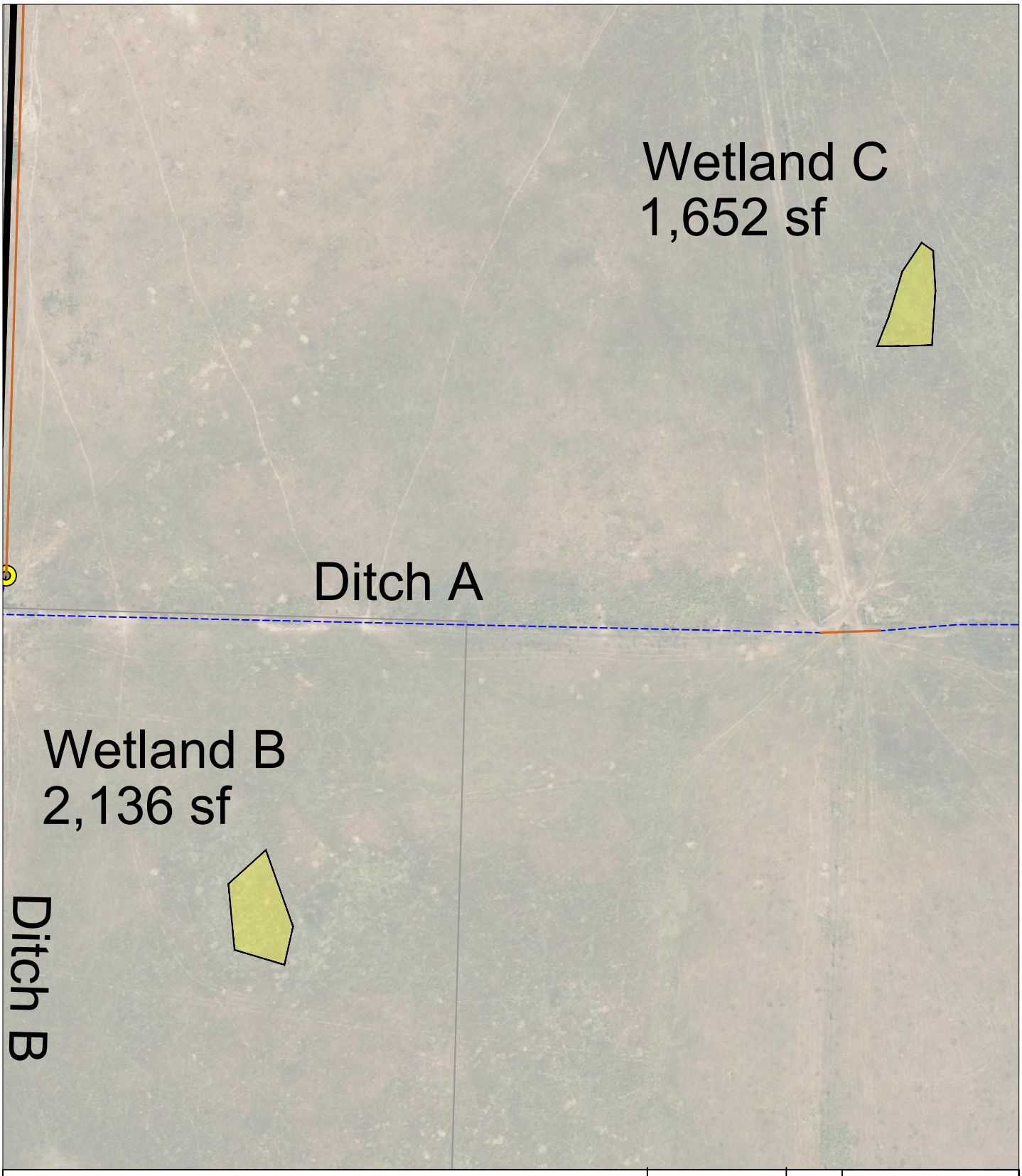
Vista Views at Black Lake

Wetland A Veg Classes & Hydroperiods

Scale: 1" = 120'

0 120'

6 August 2024



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Emergent Seasonally-flooded
Forested Seasonally-flooded
Scrub Shrub Seasonally-flooded

Figure 16

Vista Views at Black Lake

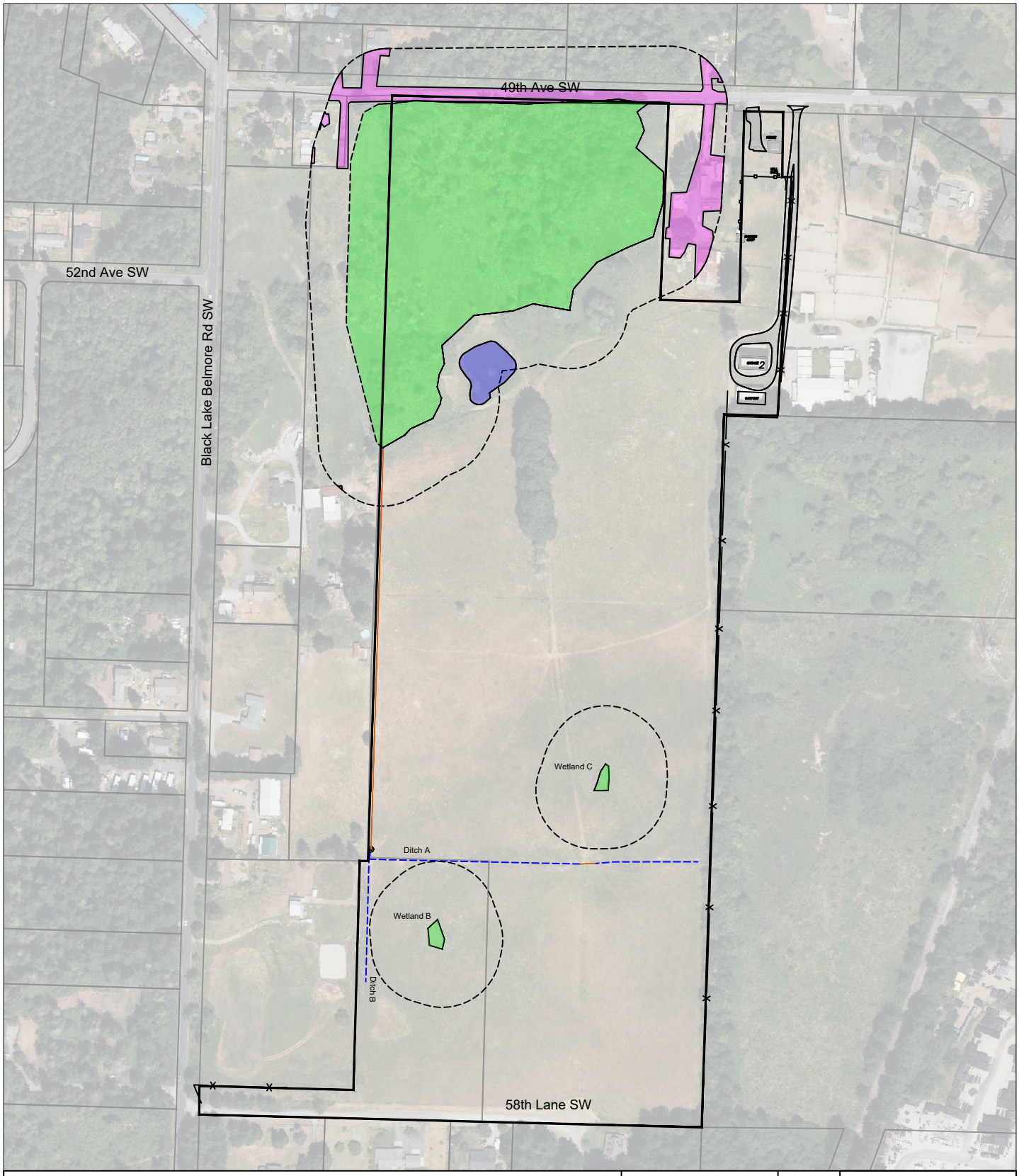
Wetlands B & C Veg Classes & Hydroperiods

N

Scale: 1" = 90'

0 90'

6 August 2024



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Wetland (Delineated)

Wetland (Not Delineated)

Potential Pollutants
Wetland A (>10%)
Wetlands B-F (<10%)

150-foot Polygon Around Wetland

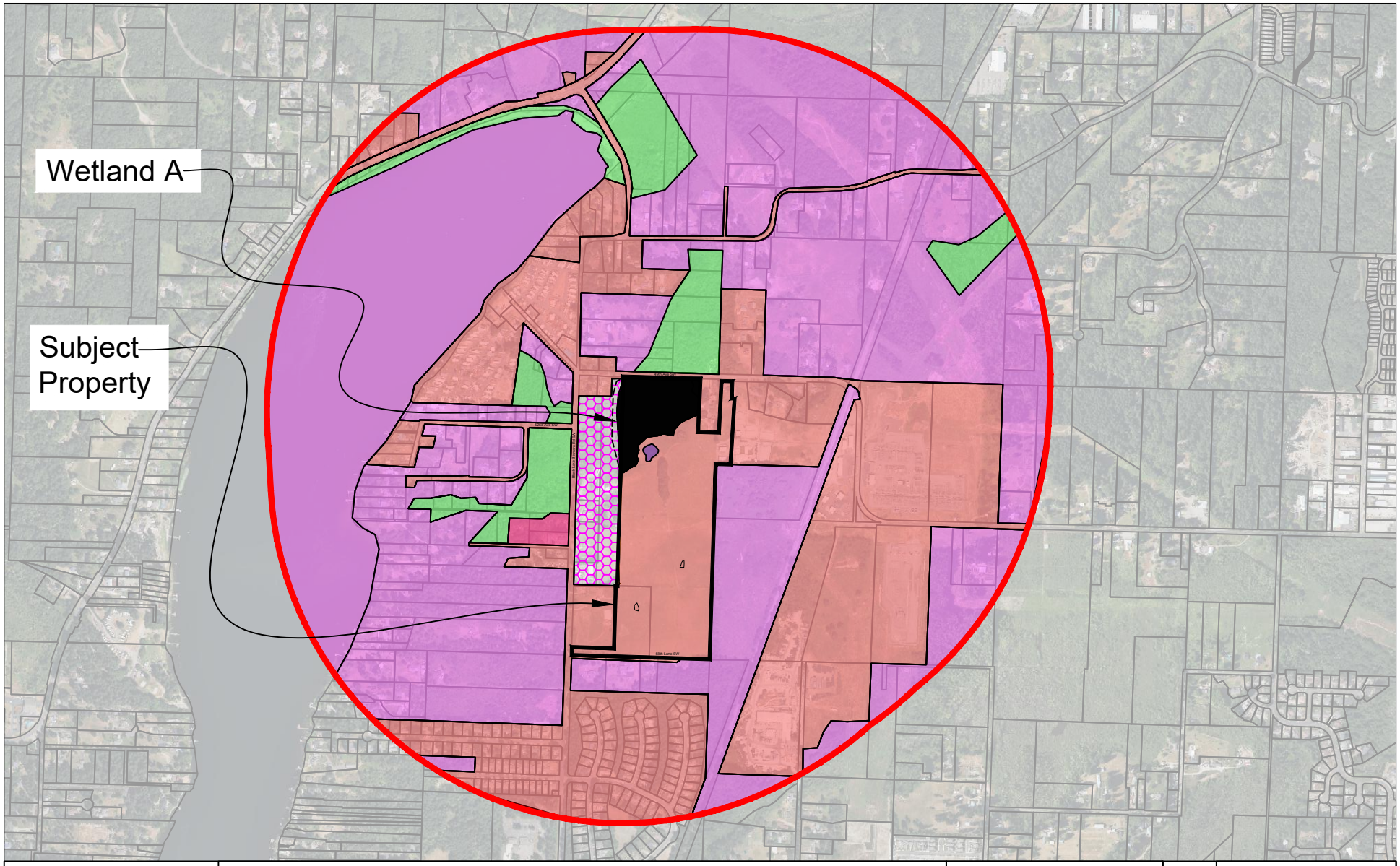
Figure 17
Vista Views at Black Lake

Potential Pollutants within 150 ft of Wetland

Scale: 1" = 350'

0 350'

6 August 2024



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Accessible Habitat (0 sf, 0 acres, 0%)

Accessible Moderate to Low Intensity Land Use (719,514 sf, 16 acres, 1.7%)

Relatively Undisturbed Habitat + Accessible Habitat (2,524,977 sf, 58 cres, 5.8%)

Low to Moderate Intensity Land Use + accessible Low to Moderate (26,065,296 sf, 598 acres, 59.8%)

High Intensity Land Use (14,469,422 sf, 332 acres, 33.2%)

1km Polygon (43,604,792 sf, 1,001 acres)

H2.1: 0% + 1.7% /2 = 0.85% (0 points)

H2.2: 5.8% + 59.8%/2 = 35.7% (1 point)

H2.3: High Intensity = 33.2% (0 points)

Figure 18

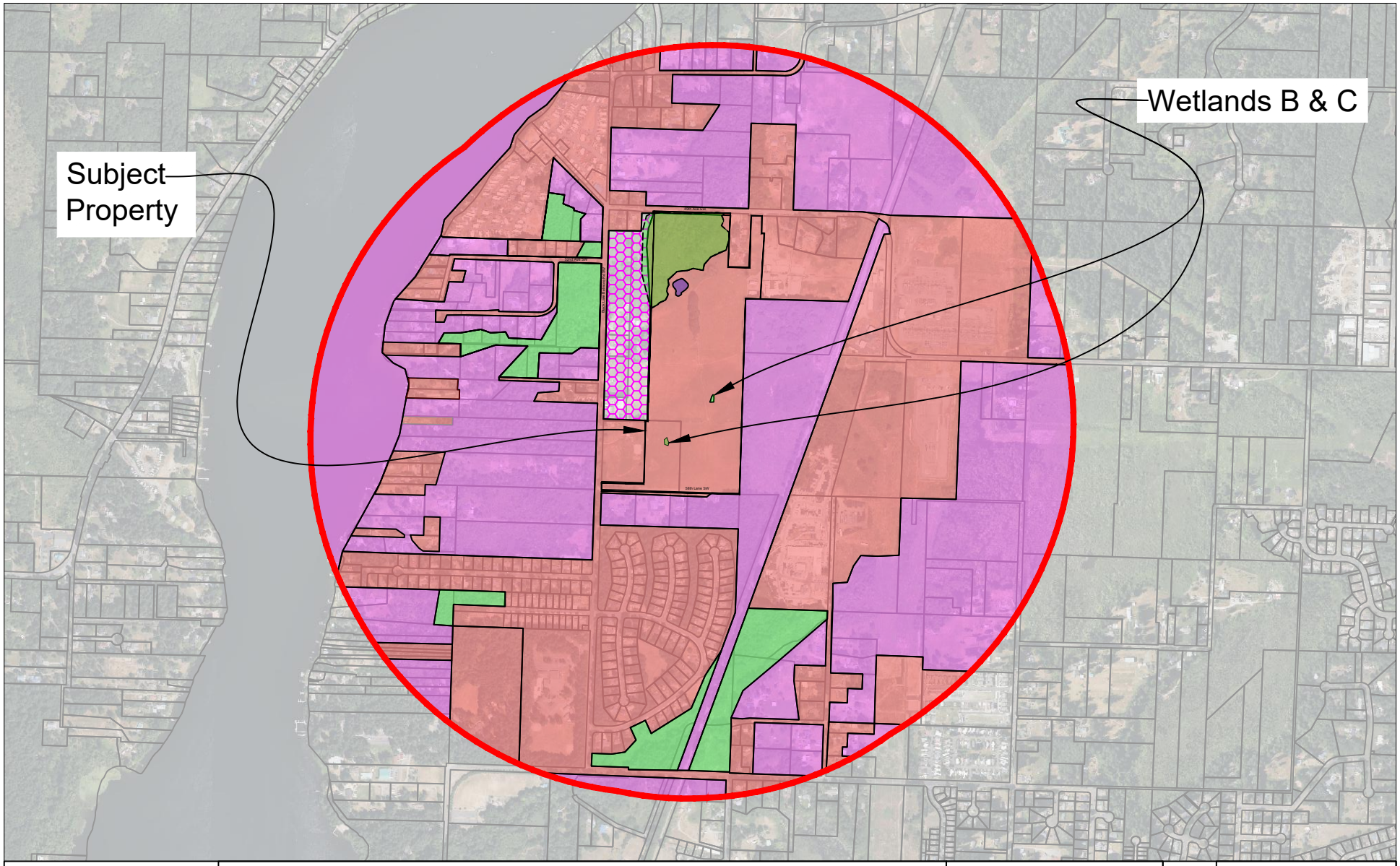
Vista Views at Black Lake

1 KM Polygon Wetland A

Scale: 1"= 1300'

0 1300'

6 August 2024



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Accessible Habitat (0 sf, 0 acres, 0%)

Accessible Moderate to Low Intensity Land Use (719,514 sf, 16.5 acres, 1.4%)

Relatively Undisturbed Habitat + Accessible Habitat (1,731,986 sf, 40 acres, 3.3%)

Low to Moderate Intensity Land Use + accessible Low to Moderate (19,247,985 sf, 56.3 acres, 36.4%)

High Intensity Land Use (18,313,900 sf, 420 acres, 34.6%)

1km Polygon (52,944,312 sf, 1,215 acres)

H2.1: 0% + 1.4% /2 = 0.7% (0 points)

H2.2: 3.3% + 36.4%/2 = 21.5% (1 points)

H2.3: High Intensity = 34.6% (0 points)

Figure 19

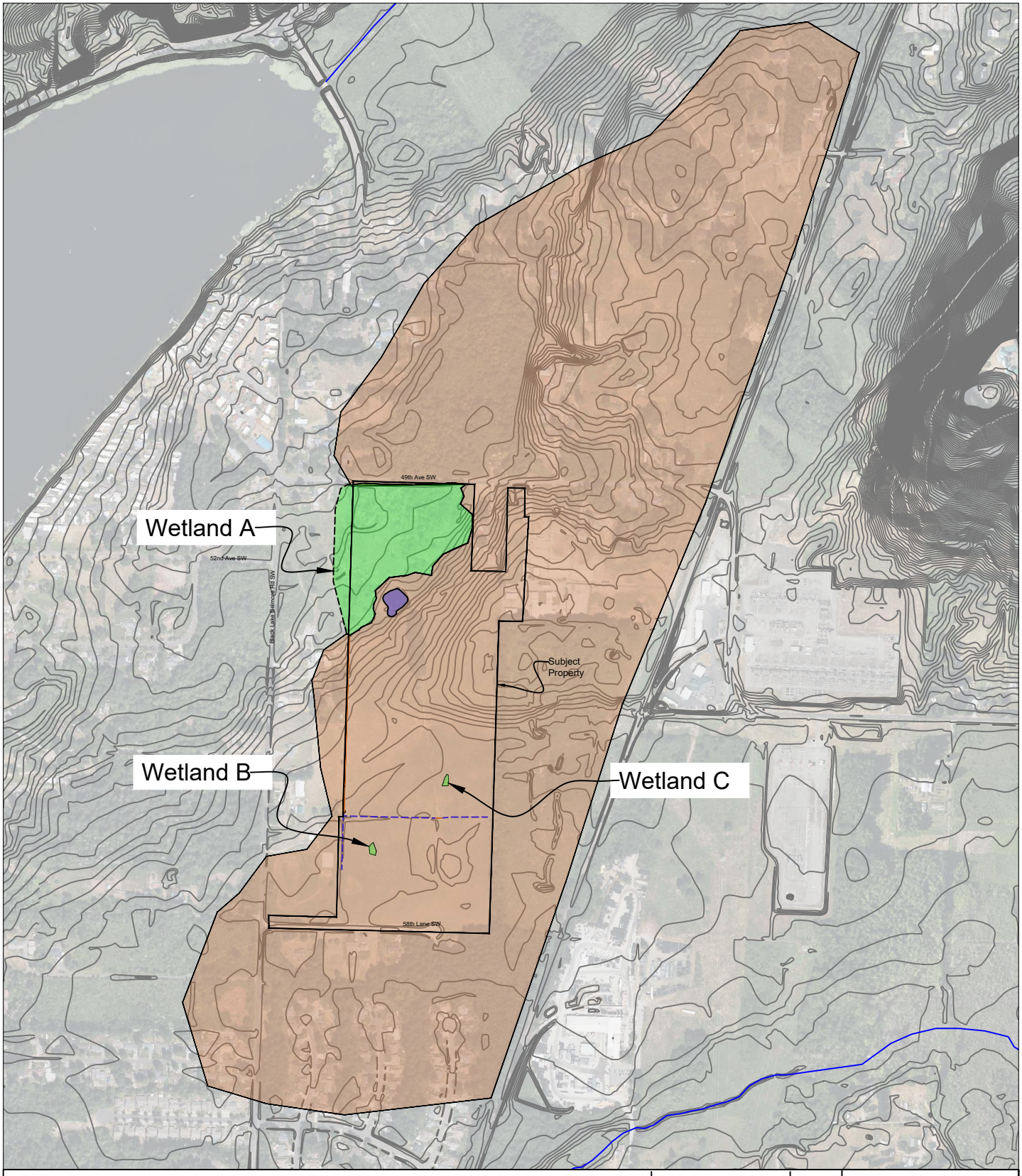
Vista Views at Black Lake

1 KM Polygon Wetlands B & C

Scale: 1"= 1300'

0 1300'

6 August 2024



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Wetland (Delineated)

Wetland (Not Delineated)

Contributing Basin
Wetland A (10-100x)
Wetland B & C (>100x)

Figure 20

Vista Views at Black Lake

Contributing Basin

Scale: 1" = 800'

0 800'

6 August 2024

APPENDIX A

PHOTOGRAPHS

Subject Property

Photo 1. Livestock roam the entire subject property

Photo 2. Livestock roam the entire subject property

Photo 3. European pasture grasses

Photo 4. Pastureland on the subject property

Photo 5. Densley grazing livestock

Photo 6. Livestock grazing on subject property

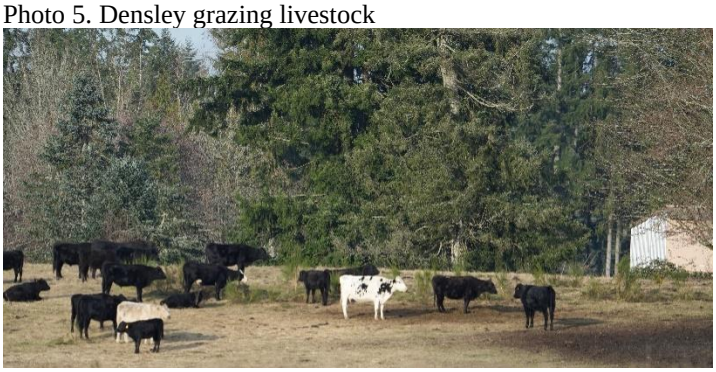


Photo 7. Large numbers of livestock grazing on subject property

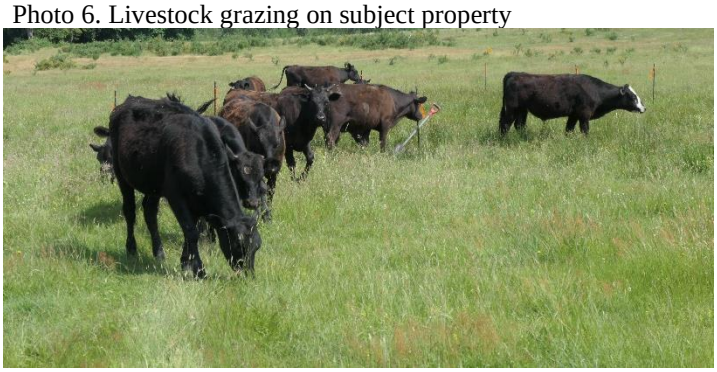


Photo 8. Livestock grazing on subject property

Photo 9. Heavily utilized farm pond near Wetland A

Photo 10. Heavily grazed around farm pond

Photo 11. Patches of scotch broom in the pasture

Photo 12. Highly trampled pasture from livestock

Photo 13. Heavily grazed and trampled pasture area

Photo 14. Pastureland facing west

Wetland A

Photo 15. Delineated on boundary of Wetland A

Photo 16. Wetland A1, reed canarygrass

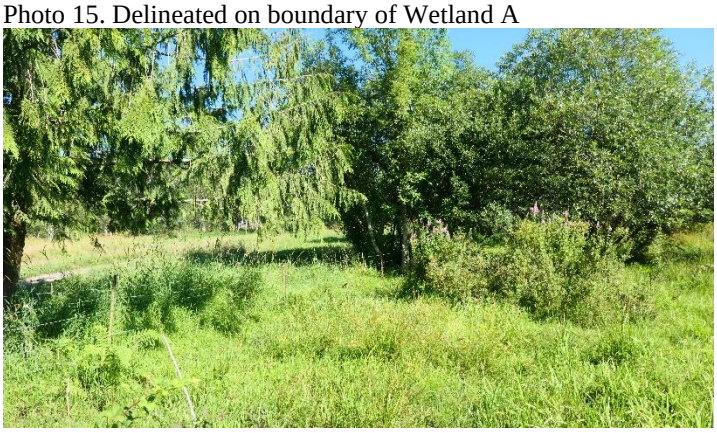


Photo 17. Wetland A sedges and reed canarygrass

Photo 18. Wetland A, sedges and reed canarygrass

Photo 19. Flag at the boundary of Wetland A

Photo 20. Heavily grazed portion of Wetland A

Wetland B

Photo 21. Flag B-1 on Wetland B, marked by fence posts


Photo 22. Flag B-1 on Wetland B, marked by fence posts


Photo 23. Patch of slough sedge in Wetland B

Photo 24. Slough sedge at wetland boundary

Photo 25. Flag B-4 on Wetland B, marked by fence posts


Photo 26. Wetland flags in Wetland B


Photo 27. Wetland boundary on Wetland B


Photo 28. Livestock in Wetland B

Photo 29. Slough sedge in Wetland B

Photo 30. Soft rush in Wetland B

Photo 31. Upland soils at Test plot TP-B1

Photo 32. Test plot TP-B1

Photo 33. Slough sedge at wetland test plot TP-B1

Photo 34. Wetting soils to collect soils information

Photo 35. Upland Test Plot TP-B2

Photo 36. Upland Test Plot TP-B2

Photo 37. Upland test plot TP-B2


Photo 38. Upland test plot TP-B2

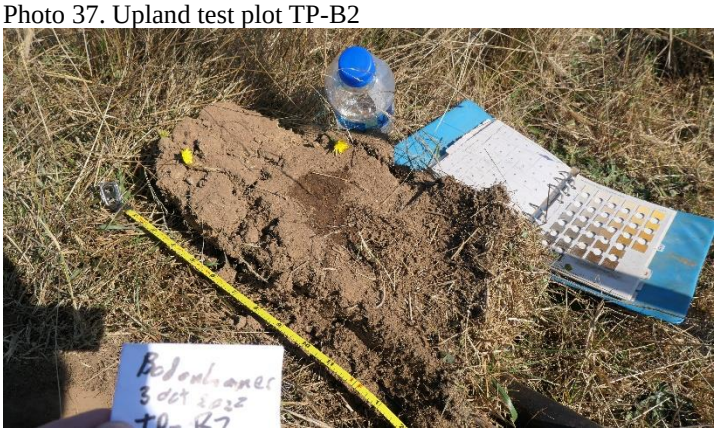


Photo 39. Upland test plot TP-B2

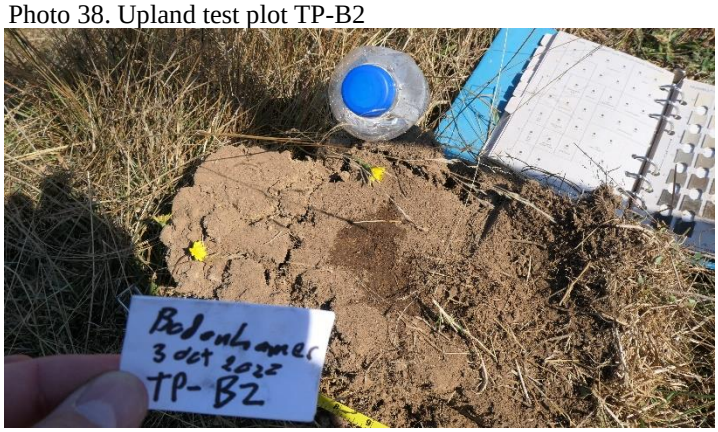


Photo 40. Upland test plot TP-B2


Photo 41. Red clover at TP-B1 (FACU)


Photo 42. Red clover at TP-B2 (FACU)


Photo 43. Cat's ear (FACU) at TP-B1


Photo 44. Cat's ear (FACU) and sweet vernal grass (FACU)

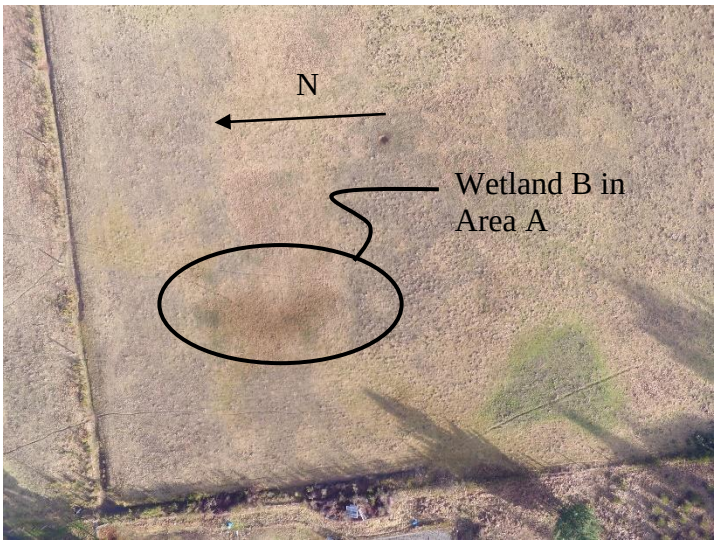


Photo 45. Wetland B from aerial photograph

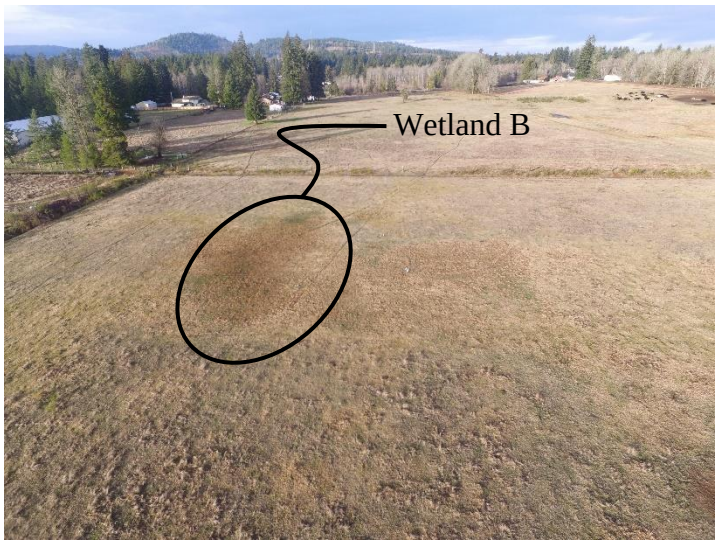


Photo 46. Wetland B from aerial photograph

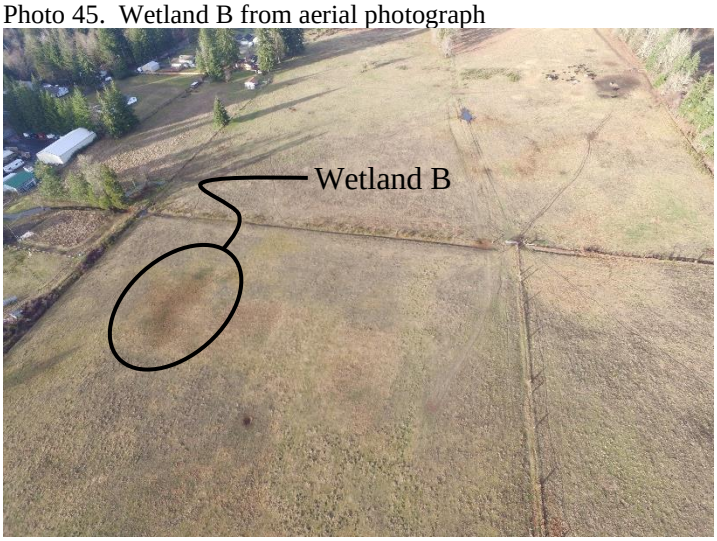


Photo 47. Wetland B from aerial photograph


Photo 48. Vegetation at Wetland B

Wetland C

Photo 49. Wetland C Flag C4

Photo 50. Wetland C Flag C4


Photo 51. Wetland delineation at Wetland C


Photo 52. Wetland delineation at Wetland C


Photo 53. Wetland delineation at Wetland C


Photo 54. Wetland delineation at Wetland C


Photo 55. Cat's ear (FACU)


Photo 56. Red soral (FACU)

Photo 57. Munsell color chart


Photo 58. Red soral (FACU)


Photo 59. Common plantain (FACU)


Photo 60. Cat's Ear (FACU)

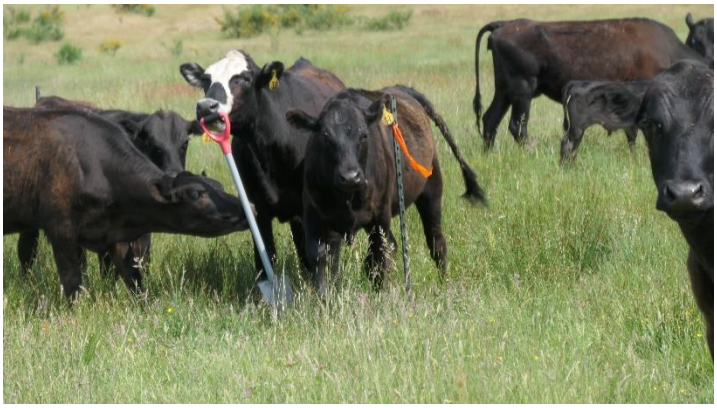


Photo 61. Livestock in Wetland C


Photo 62. Livestock in Wetland C


Photo 63. Livestock in Wetland C


Photo 64. Livestock in Wetland C

Photo 65. Collecting data at TP C1

Photo 66. Collecting data at TP C1

Photo 67. Collecting data at TP C1


Photo 68. Livestock in buffer

Drainages

Photo 69. Ditch drains to this make-shift catch basin

Photo 70. Ditch flows from west then to north at this structure

Photo 71. Inside of make-shift catch basin structure

Photo 72. Scotch broom (FACU) at catch basin structure

Photo 73. Ditch on western edge of subject property

Photo 74 Ditch on western edge of subject property


Photo 75. Ditch flows to west from east


Photo 76. Ditch flows to west from east


Photo 77. Culvert under crossing of east-west ditch


Photo 78. Culvert under crossing of east-west ditch

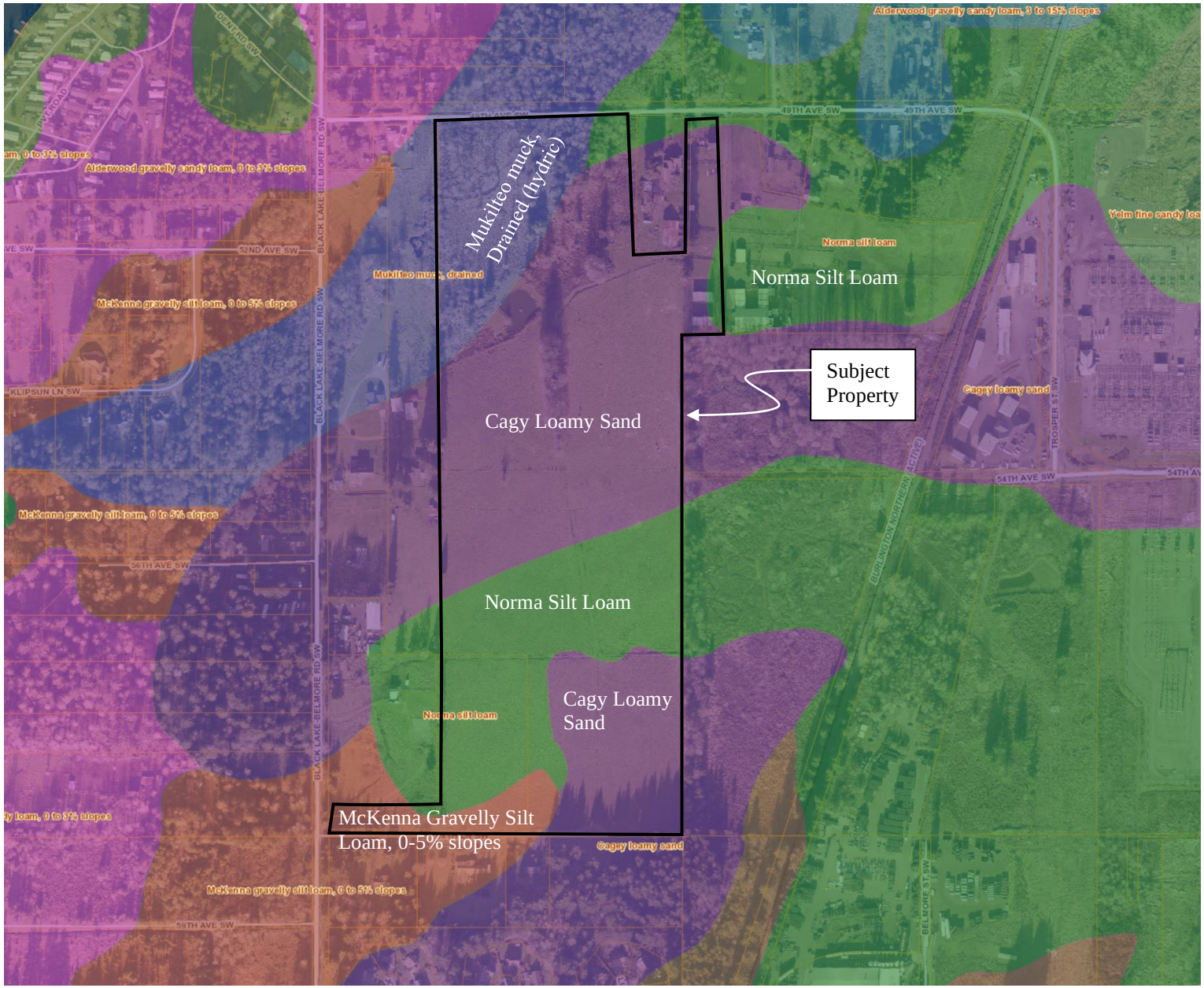

Photo 79. East-west ditch

Appendix B

Thurston County

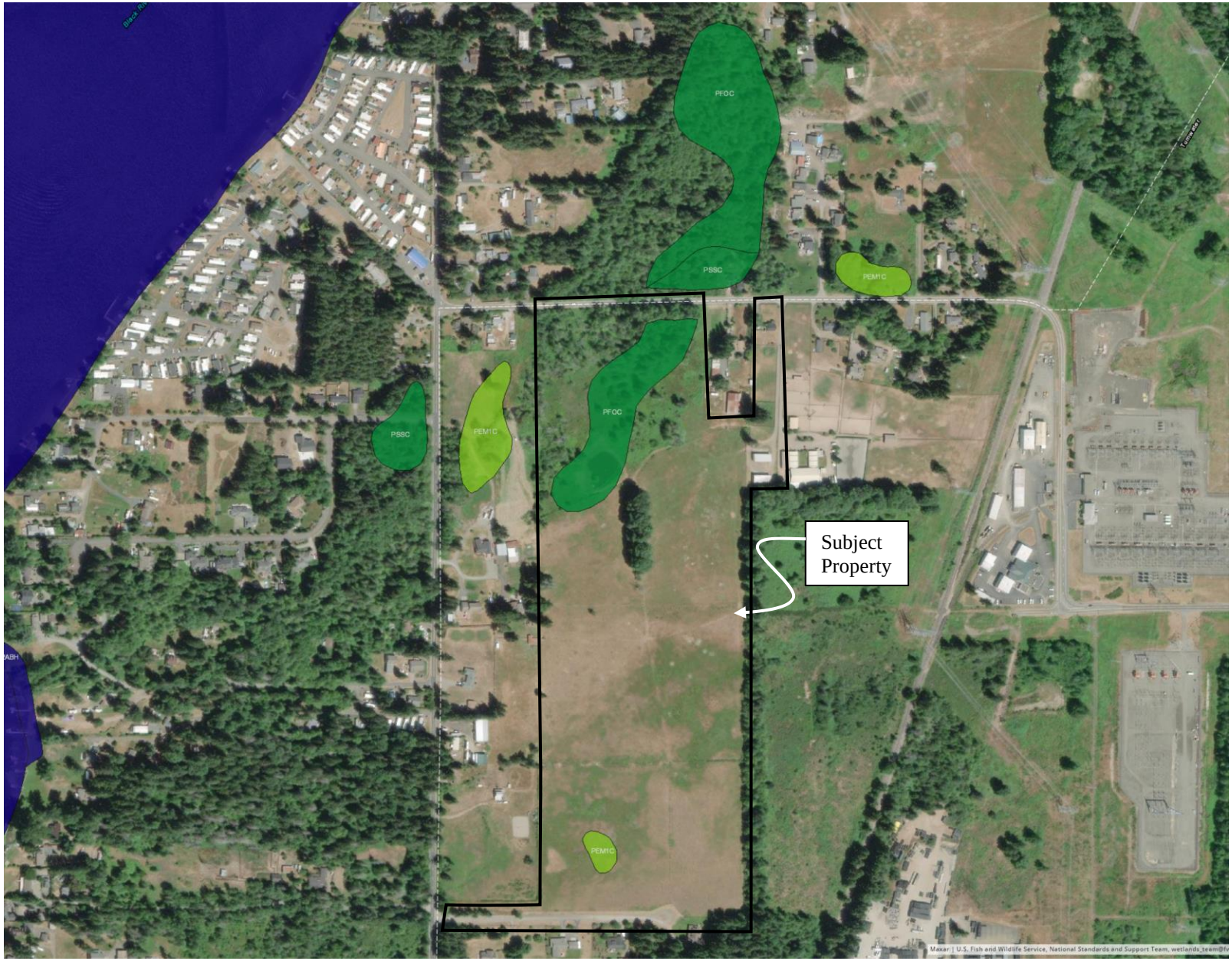
Geodata Center

Soils Survey


Alderwood gravelly sandy loam, 3 to 15% slopes
49TH AVE SW
Mukilteo muck, Drained (hydric)
Norma Silt Loam
Norma silt loam
Mukilteo muck, drained
Alderwood gravelly sandy loam, 0 to 3% slopes
52ND AVE SW
McKenna gravelly silt loam, 0 to 5% slopes
BLACK LAKE BELMORE RD SW
KLIPSUN LN SW
Subject Property
Cagy Loamy Sand
Cagy loamy sand
TROSPER ST SW
54TH AVE SW
BURLINGTON NORTHERN (ACTIVE)
56TH AVE SW
Norma Silt Loam
Norma silt loam
Cagy Loamy Sand
McKenna Gravelly Silt Loam, 0-5% slopes
Cagy loamy sand
McKenna gravelly silt loam, 0 to 5% slopes
59TH AVE SW
BELMORE ST SW

Appendix C

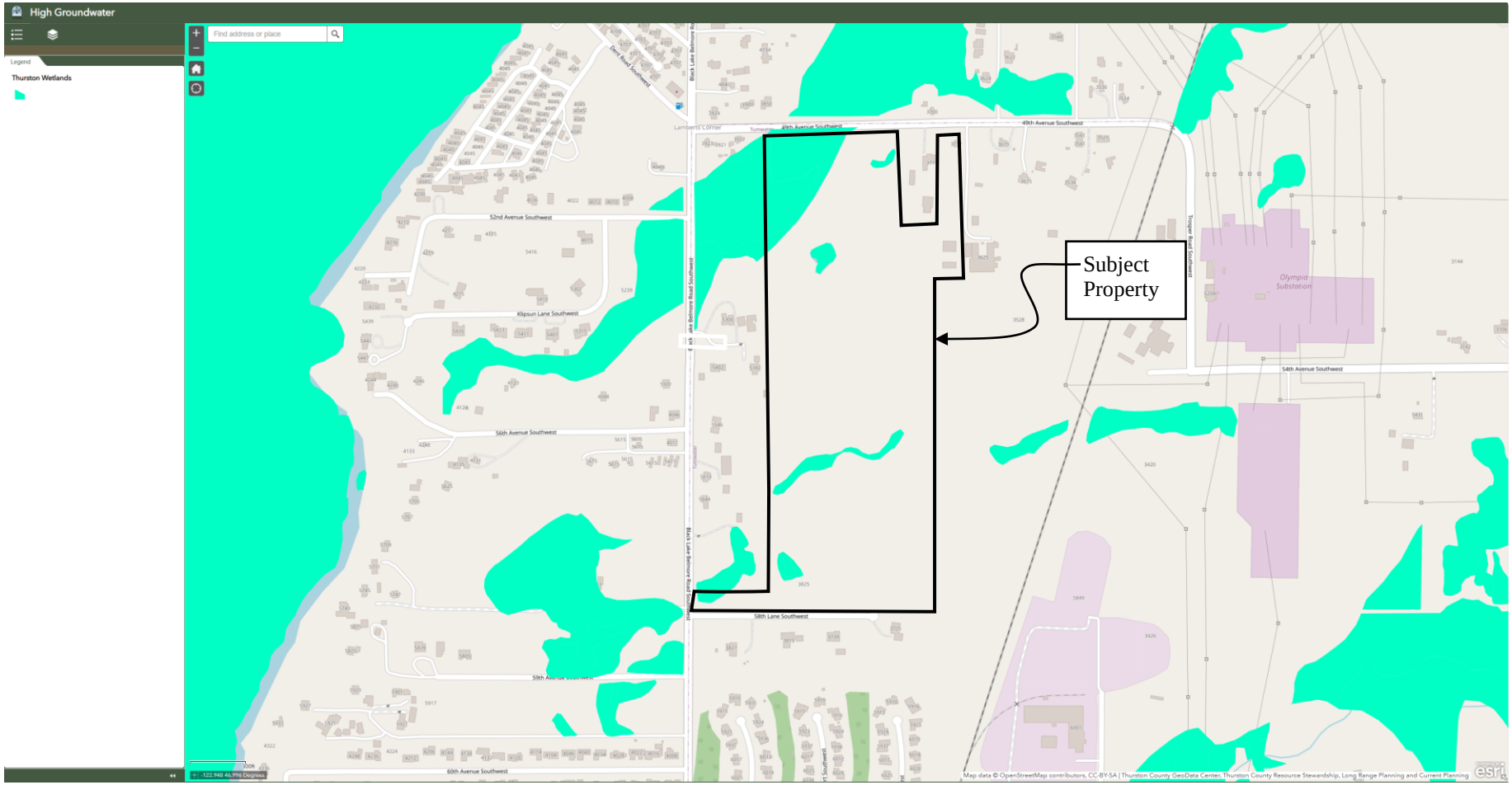
National Wetlands Inventory (NWI)


PFOC
PSSC
PEM1C
PSSC
PEM1C
PFOC
PEM1C
Subject Property

Appendix D

City of Tumwater

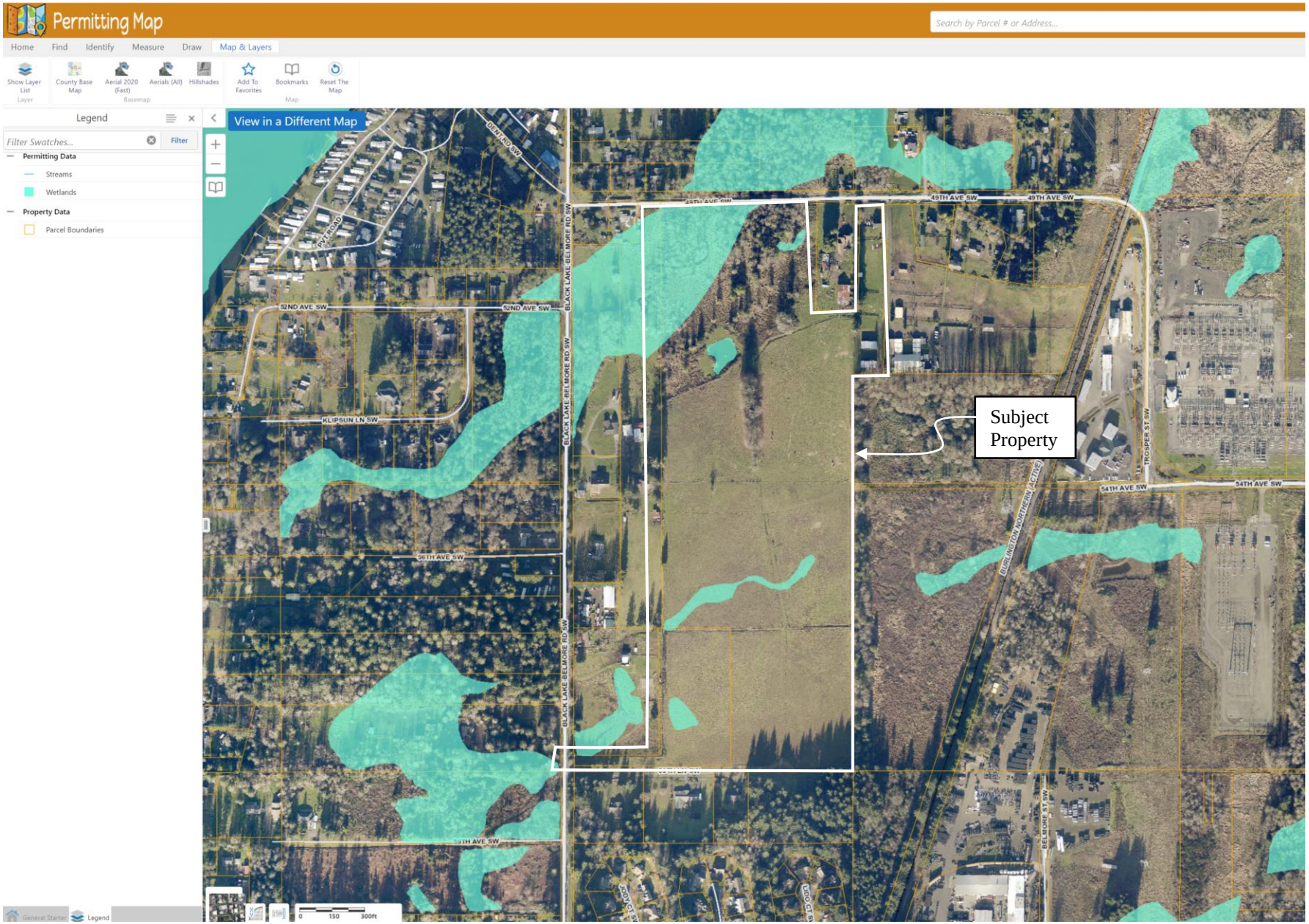
Wetlands and Streams


High Groundwater
Legend
Thurston Wetlands
Find address or place
Subject Property
52nd Avenue Southwest
Klipsun Lane Southwest
56th Avenue Southwest
58th Lane Southwest
60th Avenue Southwest
49th Avenue Southwest
54th Avenue Southwest
Olympia Substation
Black Lake Belmore Road Southwest
Lambert's Corner
Map data © OpenStreetMap contributors, CC-BY-SA | Thurston County GeoData Center, Thurston County Resource Stewardship, Long Range Planning and Current Planning
esri

Appendix E

Thurston County

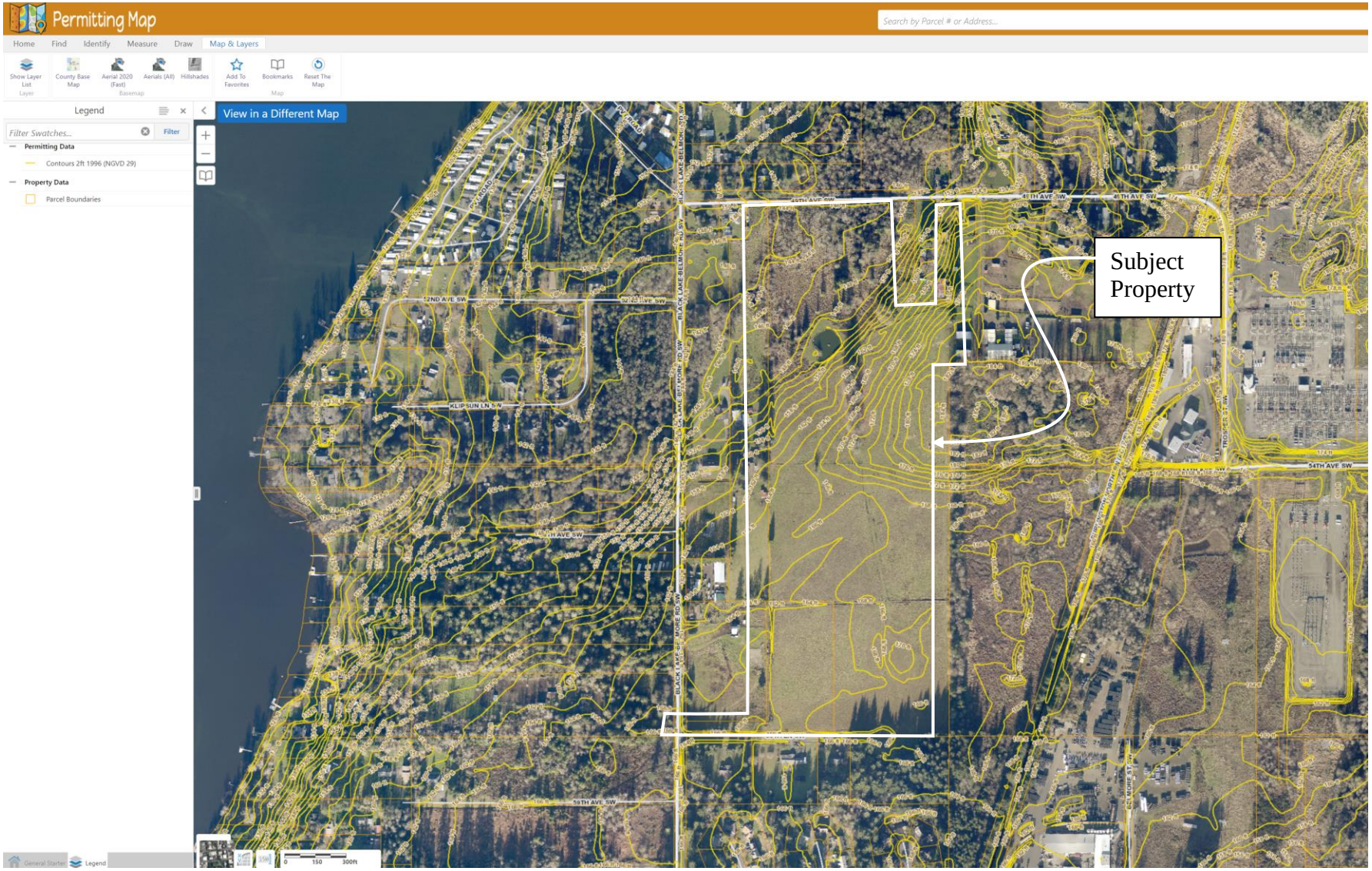
Geodata Center Database


Permitting Map
Search by Parcel # or Address...
Home
Find
Identify
Measure
Draw
Map & Layers
Legend
Filter Swatches...
Filter
Permitting Data
Streams
Wetlands
Property Data
Parcel Boundaries
View in a Different Map
Subject Property
49TH AVE SW
52ND AVE SW
KLIPSUN LN SW
54TH AVE SW
56TH AVE SW
59TH AVE SW
BLACK LAKE-BELMORE RD SW
BURLINGTON NORTHERN (ACTIVE)
TROSPER ST SW
BELMORE ST SW
0
150
300ft

Appendix F

Thurston County

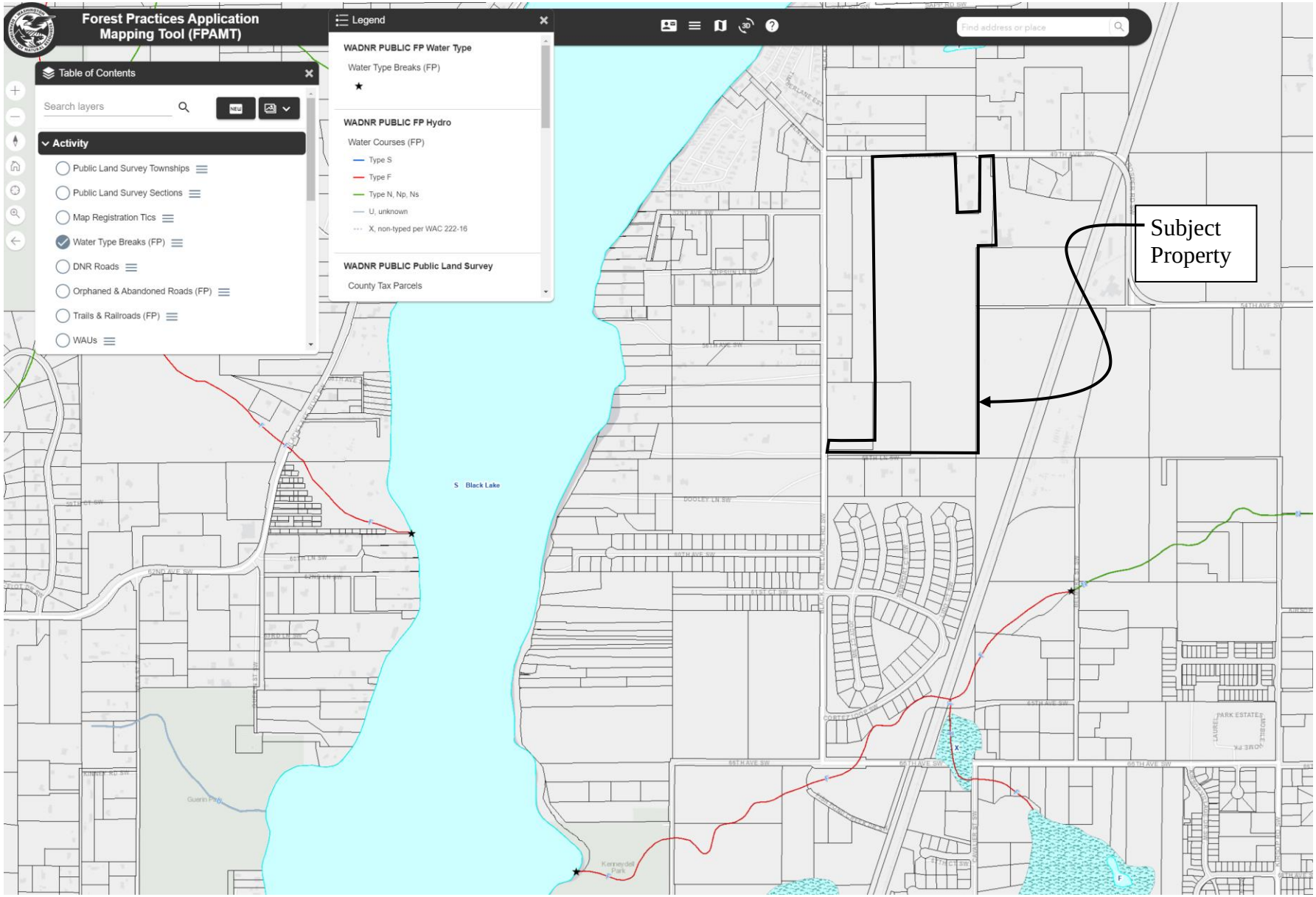
Contours


Permitting Map
Search by Parcel # or Address...
Home
Find
Identify
Measure
Draw
Map & Layers
Legend
Filter Swatches...
Filter
Permitting Data
Contours 2ft 1996 (NGVD 29)
Property Data
Parcel Boundaries
View in a Different Map
Subject Property
2ND AVE SW
KLIPSUN LN SW
11TH AVE SW
56TH AVE SW
45TH AVE SW
54TH AVE SW
BLACK LAKE BLVD SW
BLACK LAKE-BELMORE RD SW
BELMORE ST SW
TROSPER RD SW

Appendix G

State Department of Natural Resources (DNR)

Water Typing Database

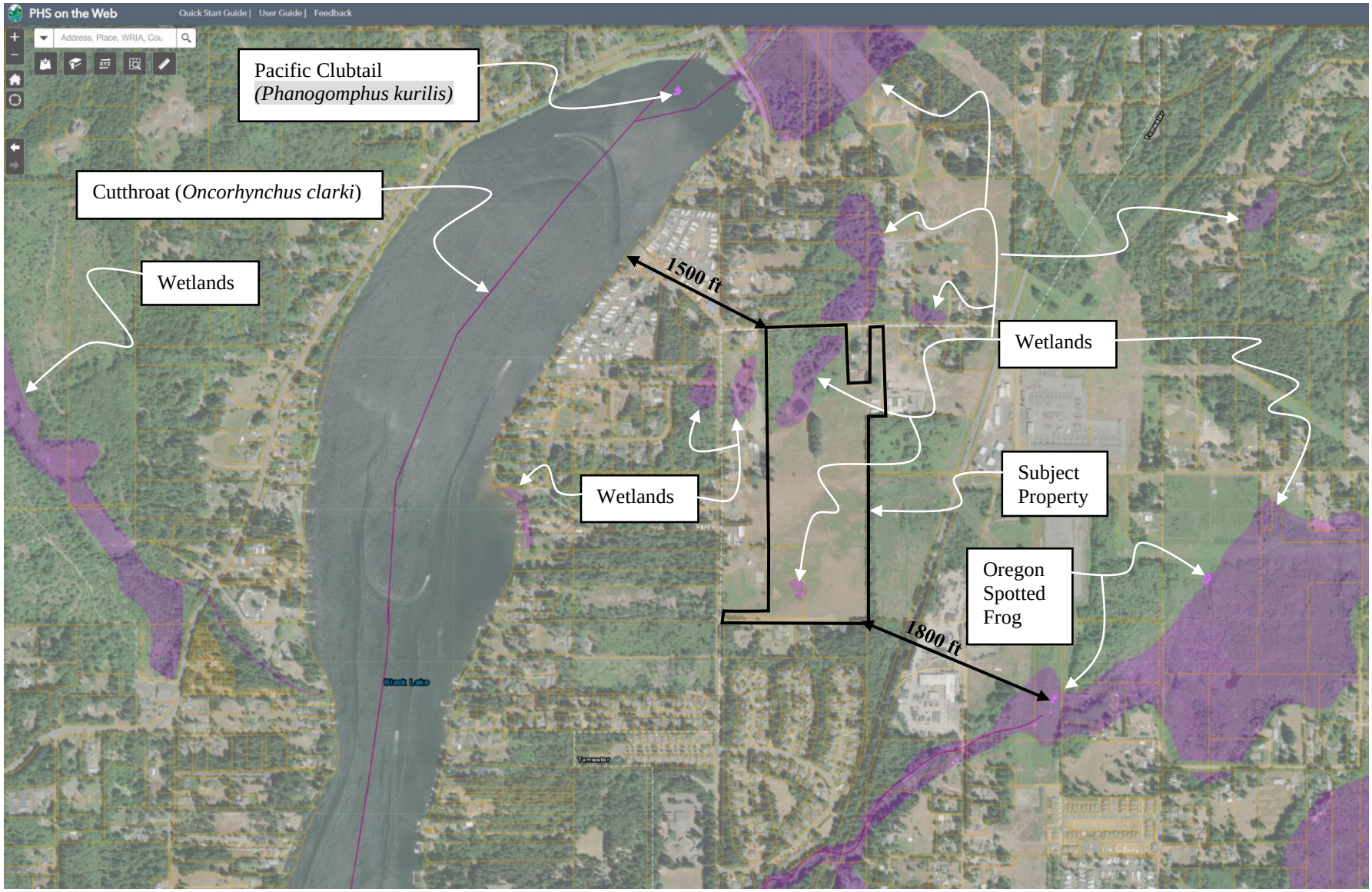

Forest Practices Application Mapping Tool (FPAMT)
Legend
WADNR PUBLIC FP Water Type
Water Type Breaks (FP)
WADNR PUBLIC FP Hydro
Water Courses (FP)
Type S
Type F
Type N, Np, Ns
U, unknown
X, non-typed per WAC 222-16
WADNR PUBLIC Public Land Survey
County Tax Parcels
Table of Contents
Search layers
Activity
Public Land Survey Townships
Public Land Survey Sections
Map Registration Tics
Water Type Breaks (FP)
DNR Roads
Orphaned & Abandoned Roads (FP)
Trails & Railroads (FP)
WAUs
Find address or place
Subject Property
S Black Lake

Appendix H

Washington Department of Fish and Wildlife (WDFW)

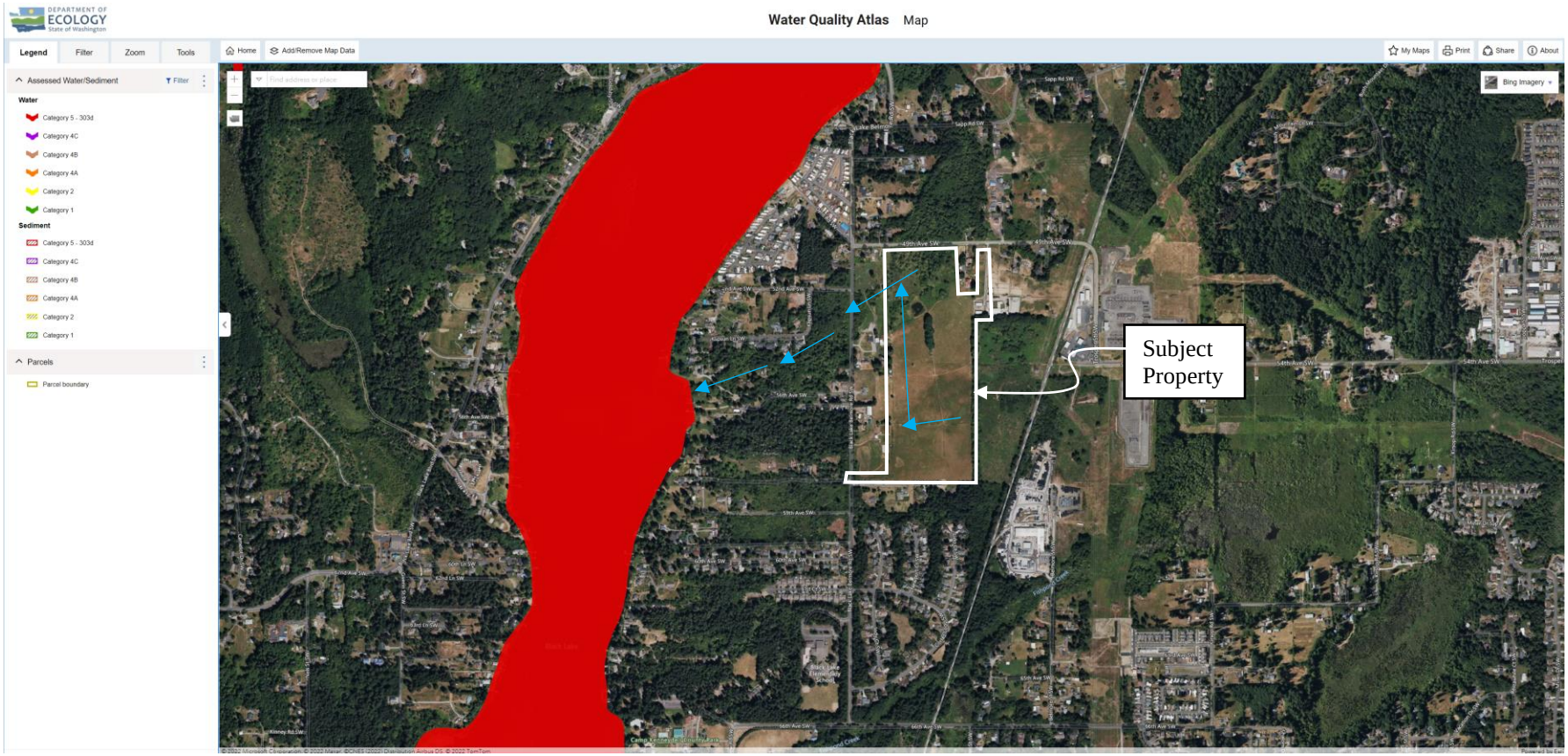
Priority Habitats and Species (PHS)

Database


PHS on the Web
Quick Start Guide | User Guide | Feedback
Pacific Clubtail (*Phanogomphus kurilis*)
Cutthroat (*Oncorhynchus clarki*)
Wetlands
1500 ft
Wetlands
Wetlands
Subject Property
Oregon Spotted Frog
1800 ft
Black Lake
Tumwater

Appendix I

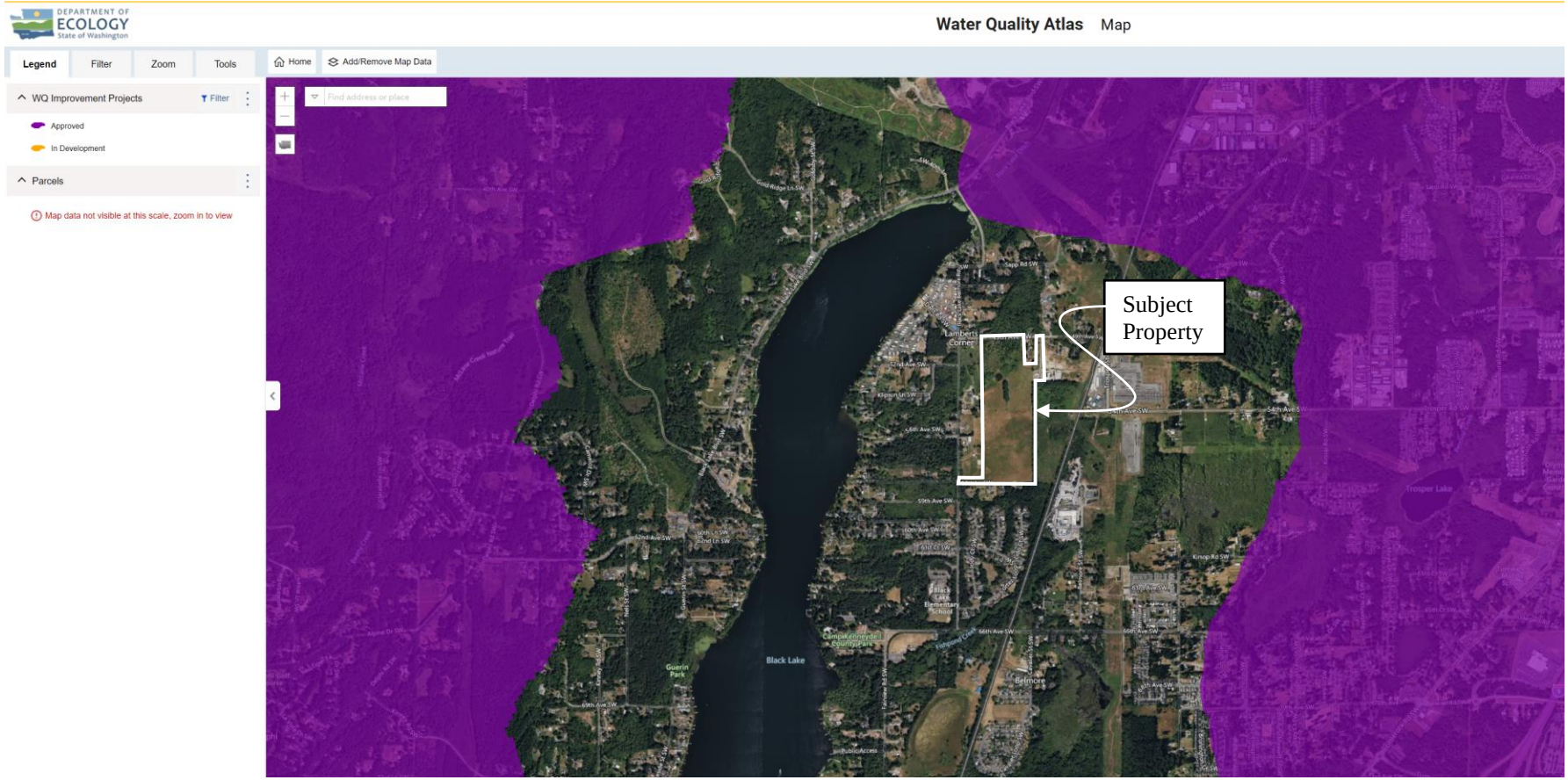
303(d)


DEPARTMENT OF ECOLOGY
State of Washington
Water Quality Atlas Map
Legend
Filter
Zoom
Tools
Home
Add/Remove Map Data
My Maps
Print
Share
About
Assessed Water/Sediment
Water
Category 5 - 303d
Category 4C
Category 4B
Category 4A
Category 2
Category 1
Sediment
Category 5 - 303d
Category 4C
Category 4B
Category 4A
Category 2
Category 1
Parcels
Parcel boundary
Bing Imagery
Subject Property

Appendix J

Department of Ecology Water Quality Atlas Database

TMDL


DEPARTMENT OF ECOLOGY State of Washington
Water Quality Atlas Map
Legend
Filter
Zoom
Tools
Home
Add/Remove Map Data
WQ Improvement Projects
Filter
Approved
In Development
Parcels
Map data not visible at this scale, zoom in to view
Find address or place
Subject Property
Black Lake
Guerin Park
Lamberts Corner
Belmore
Black Lake Elementary School
Trosper Lake

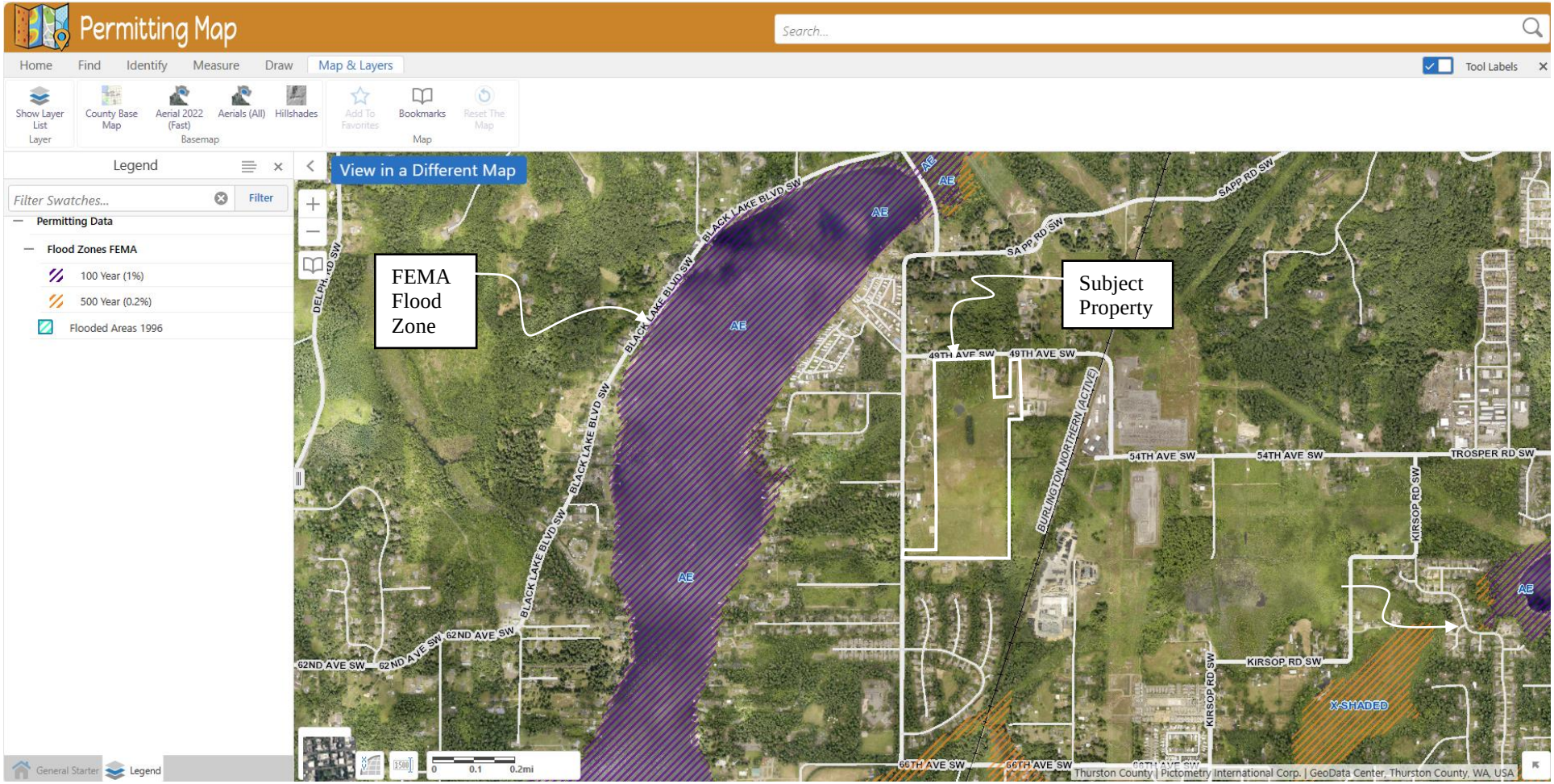
Appendix K

Thurston County

Geodata Center

&

FEMA Flooding


Permitting Map
Search...
Home
Find
Identify
Measure
Draw
Map & Layers
Tool Labels
Show Layer List
County Base Map
Aerial 2022 (Fast)
Aerials (All)
Hillshades
Add To Favorites
Bookmarks
Reset The Map
Layer
Basemap
Map
Legend
Filter Swatches...
Filter
Permitting Data
Flood Zones FEMA
100 Year (1%)
500 Year (0.2%)
Flooded Areas 1996
View in a Different Map
FEMA Flood Zone
Subject Property
AE
X-SHADED
BLACK LAKE BLVD SW
DELPHI RD SW
SAPP RD SW
49TH AVE SW
54TH AVE SW
62ND AVE SW
66TH AVE SW
BURLINGTON NORTHERN (ACTIVE)
KIRSOP RD SW
TROSPER RD SW
0 0.1 0.2mi
Thurston County | Pictometry International Corp. | GeoData Center, Thurston County, WA, USA
General Starter
Legend

Appendix L

Rating Forms

Wetland name or number Wet A

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Wetland A Date of site visit: 3-Oct-22

Rated by Curtis Wambach Trained by Ecology? ☑ Yes ☐ No Date of training Continual

HGM Class used for rating Depressional & Flats Wetland has multiple HGM classes? ☐ Yes ☑ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY II (based on functions ☑ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

	Category I - Total score = 23 - 27
X	**Category II** - Total score = 20 - 22
	Category III - Total score = 16 - 19
	Category IV - Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
		List appropriate rating (H, M, L)		
Site Potential	M	M	M	
Landscape Potential	H	H	M	
Value	H	H	M	**Total**
Score Based on Ratings	8	8	6	**22**

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	Category
Estuarine	
Wetland of High Conservation Value	
Bog	
Mature Forest	
Old Growth Forest	
Coastal Lagoon	
Interdunal	
None of the above	

Wetland name or number Wet A

Maps and Figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	Figure 16
Hydroperiods	D 1.4, H 1.2	Figure 16
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	Figure 16
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	Figure 17
Map of the contributing basin	D 4.3, D 5.3	Figure 20
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	Figure 19
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	Appendix I
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	Appendix J

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream (*can be added to another figure*)	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to another figure*)	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

HGM Classification of Wetland in Western Washington

For questions 1 -7, the criteria described must apply to the entire unit being rated.
If hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

☑ NO - go to 2 ☐ **YES** - the wetland class is **Tidal Fringe** - go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

☐ **NO - Saltwater Tidal Fringe (Estuarine)** ☐ **YES - Freshwater Tidal Fringe**
*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

☑ NO - go to 3 ☐ **YES** - The wetland class is **Flats**
*If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
☐ The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
☐ At least 30% of the open water area is deeper than 6.6 ft (2 m).

☑ NO - go to 4 ☐ **YES** - The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
☐ The wetland is on a slope (*slope can be very gradual*),
☐ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.
☐ The water leaves the wetland **without being impounded.**

☑ NO - go to 5 ☐ **YES** - The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
☐ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
☐ The overbank flooding occurs at least once every 2 years.

☑ NO - go to 6 ☐ **YES** - The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding.

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO - go to 7 ☑ **YES** - The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

☐ NO - go to 8 ☐ **YES** - The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

NOTES and FIELD OBSERVATIONS:

Wetland name or number Wet A

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?		
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. ☐ Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing ☐ Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch.	points = 3 points = 2 points = 1 points = 1	2
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions*).	Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area Wetland has persistent, ungrazed, plants > ½ of area Wetland has persistent, ungrazed plants > $^1/_{10}$ of area Wetland has persistent, ungrazed plants < $^1/_{10}$ of area	points = 5 points = 3 points = 1 points = 0	3
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland Area seasonally ponded is > ¼ total area of wetland Area seasonally ponded is < ¼ total area of wetland	points = 4 points = 2 points = 0	4
Total for D 1	Add the points in the boxes above	**9**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?		
D 2.1. Does the wetland unit receive stormwater discharges?	Yes = 1 No = 0	1
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants?	Yes = 1 No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland?	Yes = 1 No = 0	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3? Source	Yes = 1 No = 0	0
Total for D 2	Add the points in the boxes above	**3**

Rating of Landscape Potential If score is: ☑ **3 or 4 = H** ☐ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?		
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list?	Yes = 1 No = 0	1
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list?	Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)?	Yes = 2 No = 0	0
Total for D 3	Add the points in the boxes above	**2**

Rating of Value If score is: ☑ **2 - 4 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number Wet A

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?		
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) — points = 4 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet — points = 2 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch — points = 1 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing — points = 0		2
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* Marks of ponding are 3 ft or more above the surface or bottom of outlet — points = 7 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet — points = 5 ☑ Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet — points = 3 ☐ The wetland is a "headwater" wetland — points = 3 Wetland is flat but has small depressions on the surface that trap water — points = 1 Marks of ponding less than 0.5 ft (6 in) — points = 0		3
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* ☐ The area of the basin is less than 10 times the area of the unit — points = 5 The area of the basin is 10 to 100 times the area of the unit — points = 3 The area of the basin is more than 100 times the area of the unit — points = 0 ☐ Entire wetland is in the Flats class — points = 5		3
Total for D 4	Add the points in the boxes above	**8**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☑ **6 - 11 = M** ☐ **0 - 5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic function of the site?		
D 5.1. Does the wetland unit receive stormwater discharges?	Yes = 1 No = 0	1
D 5.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate excess runoff?	Yes = 1 No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)?	Yes = 1 No = 0	1
Total for D 5	Add the points in the boxes above	**3**

Rating of Landscape Potential If score is: ☑ **3 = H** ☐ **1 or 2 = M** ☐ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?		
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): ● Flooding occurs in a sub-basin that is immediately down-gradient of unit. — points = 2 ☐ ● Surface flooding problems are in a sub-basin farther down-gradient. — points = 1 ☑ Flooding from groundwater is an issue in the sub-basin. — points = 1 ☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. Explain why — points = 0 ☐ There are no problems with flooding downstream of the wetland. — points = 0		2
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan?	Yes = 2 No = 0	0
Total for D 6	Add the points in the boxes above	**2**

Rating of Value If score is: ☑ **2 - 4 = H** ☐ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number Wet A

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.*

- ☐ Aquatic bed
- ☑ Emergent
- ☑ Scrub-shrub (areas where shrubs have > 30% cover)
- ☑ Forested (areas where trees have > 30% cover)

4 structures or more: points = 4
3 structures: points = 2
2 structures: points - 1
1 structure: points = 0

If the unit has a Forested class, check if:

- ☑ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon

4

H 1.2. Hydroperiods

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*).

- ☐ Permanently flooded or inundated
- ☑ Seasonally flooded or inundated
- ☐ Occasionally flooded or inundated
- ☐ Saturated only

4 or more types present: points = 3
3 types present: points = 2
2 types present: points = 1
1 types present: points = 0

- ☐ Permanently flowing stream or river in, or adjacent to, the wetland
- ☐ Seasonally flowing stream in, or adjacent to, the wetland
- ☐ **Lake Fringe wetland** **2 points**
- ☐ **Freshwater tidal wetland** **2 points**

0

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft^2.
Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle***

If you counted:
- > 19 species — points = 2
- 5 - 19 species — points = 1
- < 5 species — points = 0

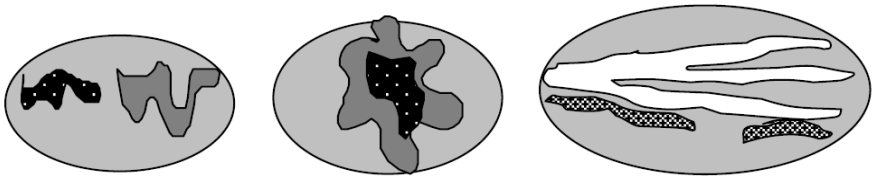
2

H 1.4. Interspersion of habitats

Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*

None = 0 points **Low** = 1 point **Moderate** = 2 points

All three diagrams in this row are **HIGH** = 3 points



2

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* ☑ Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long) ☑ Standing snags (dbh > 4 in) within the wetland ☐ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present (*cut shrubs or trees that have not yet weathered where wood is exposed*) ☑ At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (*structures for egg-laying by amphibians*) ☐ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	3
Total for H 1 Add the points in the boxes above	**11**

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☑ **7 - 14 = M** ☐ **0 - 6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat function of the site?	
H 2.1 Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* 0 % undisturbed habitat + (1.7 % moderate & low intensity land uses / 2) = 0.85% If total accessible habitat is: > 1/3 (33.3%) of 1 km Polygon points = 3 20 - 33% of 1 km Polygon points = 2 10 - 19% of 1 km Polygon points = 1 < 10 % of 1 km Polygon points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* 5.8 % undisturbed habitat + (59.8 % moderate & low intensity land uses / 2) = 35.7% Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches points = 2 Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	1
H 2.3 Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (-2) ≤ 50% of 1km Polygon is high intensity points = 0	0
Total for H 2 Add the points in the boxes above	**1**

Rating of Landscape Potential If Score is: ☐ **4 - 6 = H** ☑ **1 - 3 = M** ☐ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated*. Site meets ANY of the following criteria: points = 2 ☐ It has 3 or more priority habitats within 100 m (see next page) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) ☐ It is mapped as a location for an individual WDFW priority species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats (listed on next page) with in 100m points = 1 Site does not meet any of the criteria above points = 0	0

Rating of Value If Score is: ☐ **2 = H** ☑ **1 = M** ☐ **0 = L** *Record the rating on the first page*

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.
http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here:
http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE**: This question is independent of the land use between the wetland unit and the priority habitat.*

- ☐ **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha).
- ☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).
- ☐ **Herbaceous Balds**: Variable size patches of grass and forbs on shallow soils over bedrock.
- ☐ **Old-growth/Mature forests**: Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.
- ☐ **Oregon White Oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).
- ☐ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- ☐ **Westside Prairies**: Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).
- ☐ **Instream**: The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.
- ☐ **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page*).
- ☐ **Caves**: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.
- ☐ **Cliffs**: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.
- ☐ **Talus**: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
- ☑ **Snags and Logs**: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. List the category when the appropriate criteria are met.*	Category
SC 1.0. Estuarine Wetlands Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt ☐ Yes - Go to **SC 1.1** ☐ No = **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐ Yes = **Category I** ☐ No - Go to **SC 1.2**	
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina* , see page 25) ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. ☐ Yes = **Category I** ☐ No = **Category II**	
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☐ Yes - Go to **SC 2.2** ☐ No - Go to **SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes = **Category I** ☐ No = **Not WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes - **Contact WNHP/WDNR and to SC 2.4** ☐ No = **Not WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes = **Category I** ☐ No = **Not WHCV**	
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions*** . SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? ☐ Yes - Go to **SC 3.3** ☐ No - Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? ☐ Yes - Go to **SC 3.3** ☐ No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? ☐ Yes = **Is a Category I bog** ☐ No - Go to **SC 3.4** **NOTE**: If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? ☐ Yes = **Is a Category I bog** ☐ No = **Is not a bog**	

SC 4.0. Forested Wetlands

Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.***

☐ **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more.

☐ **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80-200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm).

☐ Yes = **Category I** ☐ No = **Not a forested wetland for this section**

SC 5.0. Wetlands in Coastal Lagoons

Does the wetland meet all of the following criteria of a wetland in a coastal lagoon?

☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks

☐ The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon (*needs to be measured near the bottom*)

☐ Yes - Go to **SC 5.1** ☐ No = **Not a wetland in a coastal lagoon**

SC 5.1. Does the wetland meet all of the following three conditions?

☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100).

☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland.

☐ The wetland is larger than $^{1}/_{10}$ ac (4350 ft^2)

☐ Yes = **Category I** ☐ No = **Category II**

SC 6.0. Interdunal Wetlands

Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.***

In practical terms that means the following geographic areas:

☐ Long Beach Peninsula: Lands west of SR 103

☐ Grayland-Westport: Lands west of SR 105

☐ Ocean Shores-Copalis: Lands west of SR 115 and SR 109

☐ Yes - Go to **SC 6.1** ☐ No = **Not an interdunal wetland for rating**

SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)?

☐ Yes = **Category I** ☐ No - Go to **SC 6.2**

SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger?

☐ Yes = **Category II** ☐ No - Go to **SC 6.3**

SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac?

☐ Yes = **Category III** ☐ No = **Category IV**

Category of wetland based on Special Characteristics

If you answered No for all types, enter "Not Applicable" on Summary Form

Wetland name or number Wet B

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Wetland B Date of site visit: 3-Oct-22

Rated by Curtis Wambach Trained by Ecology? ☑ Yes ☐ No Date of training Continual

HGM Class used for rating Depressional & Flats Wetland has multiple HGM classes? ☐ Yes ☑ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY IV (based on functions ☑ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

_____ **Category I** - Total score = 23 - 27
_____ **Category II** - Total score = 20 - 22
_____ **Category III** - Total score = 16 - 19
X **Category IV** - Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
		List appropriate rating (H, M, L)		
Site Potential	L	L	L	
Landscape Potential	L	L	M	
Value	M	M	L	**Total**
Score Based on Ratings	4	4	4	**12**

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	Category
Estuarine	
Wetland of High Conservation Value	
Bog	
Mature Forest	
Old Growth Forest	
Coastal Lagoon	
Interdunal	
None of the above	

Wetland name or number Wet B

Maps and Figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	Figure 16
Hydroperiods	D 1.4, H 1.2	Figure 16
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	Figure 16
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	Figure 17
Map of the contributing basin	D 4.3, D 5.3	Figure 20
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	Figure 19
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	Appendix I
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	Appendix J

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream (*can be added to another figure*)	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to another figure*)	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

HGM Classification of Wetland in Western Washington

For questions 1 -7, the criteria described must apply to the entire unit being rated.
If hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

☑ NO - go to 2 ☐ **YES** - the wetland class is **Tidal Fringe** - go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

☐ **NO - Saltwater Tidal Fringe (Estuarine)** ☐ **YES - Freshwater Tidal Fringe**
*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

☑ NO - go to 3 ☐ **YES** - The wetland class is **Flats**
*If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
☐ The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
☐ At least 30% of the open water area is deeper than 6.6 ft (2 m).

☑ NO - go to 4 ☐ **YES** - The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
☐ The wetland is on a slope (*slope can be very gradual*),
☐ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.
☐ The water leaves the wetland **without being impounded.**

☑ NO - go to 5 ☐ **YES** - The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
☐ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
☐ The overbank flooding occurs at least once every 2 years.

☑ NO - go to 6 ☐ **YES** - The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding.

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO - go to 7 ☑ **YES** - The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

☐ NO - go to 8 ☐ **YES** - The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

NOTES and FIELD OBSERVATIONS:

Wetland name or number Wet B

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?		
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. ☐ Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing ☐ Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch.	points = 3 points = 2 points = 1 points = 1	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions*).	Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area Wetland has persistent, ungrazed, plants > ½ of area Wetland has persistent, ungrazed plants > $^1/_{10}$ of area Wetland has persistent, ungrazed plants < $^1/_{10}$ of area	points = 5 points = 3 points = 1 points = 0	0
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland Area seasonally ponded is > ¼ total area of wetland Area seasonally ponded is < ¼ total area of wetland	 points = 4 points = 2 points = 0	0
Total for D 1	Add the points in the boxes above	**3**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☐ **6 - 11 = M** ☑ **0 - 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?		
D 2.1. Does the wetland unit receive stormwater discharges?	Yes = 1 No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants?	Yes = 1 No = 0	0
D 2.3. Are there septic systems within 250 ft of the wetland?	Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3? Source	 Yes = 1 No = 0	0
Total for D 2	Add the points in the boxes above	**0**

Rating of Landscape Potential If score is: ☐ **3 or 4 = H** ☐ **1 or 2 = M** ☑ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?		
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list?	Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list?	Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)?	Yes = 2 No = 0	0
Total for D 3	Add the points in the boxes above	**1**

Rating of Value If score is: ☐ **2 - 4 = H** ☑ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number Wet B

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?		
D 4.1. Characteristics of surface water outflows from the wetland:		
Wetland is a depression or flat depression with no surface water leaving it (no outlet)	points = 4	4
Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet	points = 2	
Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch	points = 1	
Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing	points = 0	
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.*		
Marks of ponding are 3 ft or more above the surface or bottom of outlet	points = 7	0
Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet	points = 5	
☐ Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet	points = 3	
☐ The wetland is a "headwater" wetland	points = 3	
Wetland is flat but has small depressions on the surface that trap water	points = 1	
Marks of ponding less than 0.5 ft (6 in)	points = 0	
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.*		
☐ The area of the basin is less than 10 times the area of the unit	points = 5	0
The area of the basin is 10 to 100 times the area of the unit	points = 3	
The area of the basin is more than 100 times the area of the unit	points = 0	
☐ Entire wetland is in the Flats class	points = 5	
Total for D 4	Add the points in the boxes above	**4**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☐ **6 - 11 = M** ☑ **0 - 5 = L** *Record the rating on the first page*

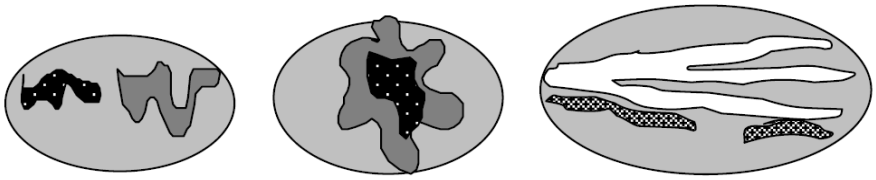
D 5.0. Does the landscape have the potential to support hydrologic function of the site?		
D 5.1. Does the wetland unit receive stormwater discharges?	Yes = 1 No = 0	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate excess runoff?	Yes = 1 No = 0	0
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)?	Yes = 1 No = 0	0
Total for D 5	Add the points in the boxes above	**0**

Rating of Landscape Potential If score is: ☐ **3 = H** ☐ **1 or 2 = M** ☑ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?		
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.*		
The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds):		1
• Flooding occurs in a sub-basin that is immediately down-gradient of unit.	points = 2	
☐ • Surface flooding problems are in a sub-basin farther down-gradient.	points = 1	
☐ Flooding from groundwater is an issue in the sub-basin.	points = 1	
☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. Explain why	points = 0	
☐ There are no problems with flooding downstream of the wetland.	points = 0	
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan?	Yes = 2 No = 0	0
Total for D 6	Add the points in the boxes above	**1**

Rating of Value If score is: ☐ **2 - 4 = H** ☑ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number Wet B

These questions apply to wetlands of all HGM classes.	
HABITAT FUNCTIONS - Indicators that site functions to provide important habitat	
H 1.0. Does the site have the potential to provide habitat?	
H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.* ☐ Aquatic bed — 4 structures or more: points = 4 ☑ Emergent — 3 structures: points = 2 ☐ Scrub-shrub (areas where shrubs have > 30% cover) — 2 structures: points - 1 ☐ Forested (areas where trees have > 30% cover) — 1 structure: points = 0 *If the unit has a Forested class, check if*: ☐ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	0
H 1.2. Hydroperiods Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*). ☐ Permanently flooded or inundated — 4 or more types present: points = 3 ☑ Seasonally flooded or inundated — 3 types present: points = 2 ☐ Occasionally flooded or inundated — 2 types present: points = 1 ☐ Saturated only — 1 types present: points = 0 ☐ Permanently flowing stream or river in, or adjacent to, the wetland ☐ Seasonally flowing stream in, or adjacent to, the wetland ☐ **Lake Fringe wetland** — **2 points** ☐ **Freshwater tidal wetland** — **2 points**	0
H 1.3. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold and you do not have to name the species.* ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle*** If you counted: > 19 species — points = 2 5 - 19 species — points = 1 < 5 species — points = 0	1
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points — **Low** = 1 point — **Moderate** = 2 points All three diagrams in this row are **HIGH** = 3 points 	0

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* ☐ Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long) ☐ Standing snags (dbh > 4 in) within the wetland ☐ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present (*cut shrubs or trees that have not yet weathered where wood is exposed*) ☐ At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (*structures for egg-laying by amphibians*) ☐ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	0
Total for H 1 Add the points in the boxes above	**1**

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☐ **7 - 14 = M** ☑ **0 - 6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat function of the site?	
H 2.1 Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* 0 % undisturbed habitat + (1.4 % moderate & low intensity land uses / 2) = 0.7% If total accessible habitat is: > 1/3 (33.3%) of 1 km Polygon points = 3 20 - 33% of 1 km Polygon points = 2 10 - 19% of 1 km Polygon points = 1 < 10 % of 1 km Polygon points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* 3.3 % undisturbed habitat + (36.4 % moderate & low intensity land uses / 2) = 21.5% Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches points = 2 Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	1
H 2.3 Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (-2) ≤ 50% of 1km Polygon is high intensity points = 0	0
Total for H 2 Add the points in the boxes above	**1**

Rating of Landscape Potential If Score is: ☐ **4 - 6 = H** ☑ **1 - 3 = M** ☐ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated*. Site meets ANY of the following criteria: points = 2 ☐ It has 3 or more priority habitats within 100 m (see next page) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) ☐ It is mapped as a location for an individual WDFW priority species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats (listed on next page) with in 100m points = 1 Site does not meet any of the criteria above points = 0	0

Rating of Value If Score is: ☐ **2 = H** ☐ **1 = M** ☑ **0 = L** *Record the rating on the first page*

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.
http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here:
http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE**: This question is independent of the land use between the wetland unit and the priority habitat.*

- ☐ **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha).
- ☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).
- ☐ **Herbaceous Balds**: Variable size patches of grass and forbs on shallow soils over bedrock.
- ☐ **Old-growth/Mature forests**: Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.
- ☐ **Oregon White Oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).
- ☐ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- ☐ **Westside Prairies**: Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).
- ☐ **Instream**: The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.
- ☐ **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page*).
- ☐ **Caves**: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.
- ☐ **Cliffs**: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.
- ☐ **Talus**: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
- ☐ **Snags and Logs**: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. List the category when the appropriate criteria are met.*	Category
SC 1.0. Estuarine Wetlands Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt ☐ Yes - Go to **SC 1.1** ☐ No = **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐ Yes = **Category I** ☐ No - Go to **SC 1.2**	
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina* , see page 25) ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. ☐ Yes = **Category I** ☐ No = **Category II**	
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☐ Yes - Go to **SC 2.2** ☐ No - Go to **SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes = **Category I** ☐ No = **Not WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes - **Contact WNHP/WDNR and to SC 2.4** ☐ No = **Not WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes = **Category I** ☐ No = **Not WHCV**	
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions*** . SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? ☐ Yes - Go to **SC 3.3** ☐ No - Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? ☐ Yes - Go to **SC 3.3** ☐ No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? ☐ Yes = **Is a Category I bog** ☐ No - Go to **SC 3.4** **NOTE**: If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? ☐ Yes = **Is a Category I bog** ☐ No = **Is not a bog**	

SC 4.0. Forested Wetlands

Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.***

☐ **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more.

☐ **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80-200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm).

☐ Yes = **Category I** ☐ No = **Not a forested wetland for this section**

SC 5.0. Wetlands in Coastal Lagoons

Does the wetland meet all of the following criteria of a wetland in a coastal lagoon?

☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks

☐ The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon (*needs to be measured near the bottom*)

☐ Yes - Go to **SC 5.1** ☐ No = **Not a wetland in a coastal lagoon**

SC 5.1. Does the wetland meet all of the following three conditions?

☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100).

☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland.

☐ The wetland is larger than $^{1}/_{10}$ ac (4350 ft^2)

☐ Yes = **Category I** ☐ No = **Category II**

SC 6.0. Interdunal Wetlands

Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.***

In practical terms that means the following geographic areas:

☐ Long Beach Peninsula: Lands west of SR 103

☐ Grayland-Westport: Lands west of SR 105

☐ Ocean Shores-Copalis: Lands west of SR 115 and SR 109

☐ Yes - Go to **SC 6.1** ☐ No = **Not an interdunal wetland for rating**

SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)?

☐ Yes = **Category I** ☐ No - Go to **SC 6.2**

SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger?

☐ Yes = **Category II** ☐ No - Go to **SC 6.3**

SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac?

☐ Yes = **Category III** ☐ No = **Category IV**

Category of wetland based on Special Characteristics

If you answered No for all types, enter "Not Applicable" on Summary Form

Wetland name or number Wet C

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Wetland C Date of site visit: 3-Oct-22

Rated by Curtis Wambach Trained by Ecology? ☑ Yes ☐ No Date of training Continual

HGM Class used for rating Depressional & Flats Wetland has multiple HGM classes? ☐ Yes ☑ No

NOTE: Form is not complete with out the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY IV (based on functions ☑ or special characteristics ☐)

1. Category of wetland based on FUNCTIONS

_____ **Category I** - Total score = 23 - 27
_____ **Category II** - Total score = 20 - 22
_____ **Category III** - Total score = 16 - 19
X **Category IV** - Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
		List appropriate rating (H, M, L)		
Site Potential	L	L	L	
Landscape Potential	L	L	M	
Value	M	M	L	**Total**
Score Based on Ratings	4	4	4	**12**

Score for each function based on three ratings (*order of ratings is not important*)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	Category
Estuarine	
Wetland of High Conservation Value	
Bog	
Mature Forest	
Old Growth Forest	
Coastal Lagoon	
Interdunal	
None of the above	

Wetland name or number Wet C

Maps and Figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	Figure 16
Hydroperiods	D 1.4, H 1.2	Figure 16
Location of outlet (*can be added to map of hydroperiods*)	D 1.1, D 4.1	Figure 16
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	D 2.2, D 5.2	Figure 17
Map of the contributing basin	D 4.3, D 5.3	Figure 20
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	Figure 19
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	Appendix I
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	Appendix J

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream (*can be added to another figure*)	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to another figure*)	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

HGM Classification of Wetland in Western Washington

For questions 1 -7, the criteria described must apply to the entire unit being rated.
If hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

☑ NO - go to 2 ☐ **YES** - the wetland class is **Tidal Fringe** - go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

☐ **NO - Saltwater Tidal Fringe (Estuarine)** ☐ **YES - Freshwater Tidal Fringe**
*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

☑ NO - go to 3 ☐ **YES** - The wetland class is **Flats**
*If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
☐ The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
☐ At least 30% of the open water area is deeper than 6.6 ft (2 m).

☑ NO - go to 4 ☐ **YES** - The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
☐ The wetland is on a slope (*slope can be very gradual*),
☐ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.
☐ The water leaves the wetland **without being impounded.**

☑ NO - go to 5 ☐ **YES** - The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
☐ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
☐ The overbank flooding occurs at least once every 2 years.

☑ NO - go to 6 ☐ **YES** - The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding.

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO - go to 7 ☐ **YES** - The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

☐ NO - go to 8 ☑ **YES** - The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

NOTES and FIELD OBSERVATIONS:

Wetland name or number Wet C

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?		
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. ☐ Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing ☐ Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch.	points = 3 points = 2 points = 1 points = 1	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (*use NRCS definitions*).	Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area Wetland has persistent, ungrazed, plants > ½ of area Wetland has persistent, ungrazed plants > $^1/_{10}$ of area Wetland has persistent, ungrazed plants < $^1/_{10}$ of area	points = 5 points = 3 points = 1 points = 0	0
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland Area seasonally ponded is > ¼ total area of wetland Area seasonally ponded is < ¼ total area of wetland	 points = 4 points = 2 points = 0	0
Total for D 1	Add the points in the boxes above	**3**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☐ **6 - 11 = M** ☑ **0 - 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?		
D 2.1. Does the wetland unit receive stormwater discharges?	Yes = 1 No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants?	Yes = 1 No = 0	0
D 2.3. Are there septic systems within 250 ft of the wetland?	Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1 - D 2.3? Source	 Yes = 1 No = 0	0
Total for D 2	Add the points in the boxes above	**0**

Rating of Landscape Potential If score is: ☐ **3 or 4 = H** ☐ **1 or 2 = M** ☑ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?		
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list?	Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list?	Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)?	Yes = 2 No = 0	0
Total for D 3	Add the points in the boxes above	**1**

Rating of Value If score is: ☐ **2 - 4 = H** ☑ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number Wet C

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?		
D 4.1. Characteristics of surface water outflows from the wetland:		
Wetland is a depression or flat depression with no surface water leaving it (no outlet)	points = 4	4
Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet	points = 2	
Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch	points = 1	
Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing	points = 0	
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.*		
Marks of ponding are 3 ft or more above the surface or bottom of outlet	points = 7	0
Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet	points = 5	
☐ Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet	points = 3	
☐ The wetland is a "headwater" wetland	points = 3	
Wetland is flat but has small depressions on the surface that trap water	points = 1	
Marks of ponding less than 0.5 ft (6 in)	points = 0	
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.*		
☐ The area of the basin is less than 10 times the area of the unit	points = 5	0
The area of the basin is 10 to 100 times the area of the unit	points = 3	
The area of the basin is more than 100 times the area of the unit	points = 0	
☐ Entire wetland is in the Flats class	points = 5	
Total for D 4	Add the points in the boxes above	**4**

Rating of Site Potential If score is: ☐ **12 - 16 = H** ☐ **6 - 11 = M** ☑ **0 - 5 = L** *Record the rating on the first page*

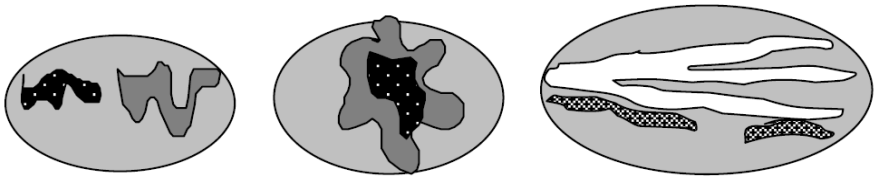
D 5.0. Does the landscape have the potential to support hydrologic function of the site?		
D 5.1. Does the wetland unit receive stormwater discharges?	Yes = 1 No = 0	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate excess runoff?	Yes = 1 No = 0	0
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)?	Yes = 1 No = 0	0
Total for D 5	Add the points in the boxes above	**0**

Rating of Landscape Potential If score is: ☐ **3 = H** ☐ **1 or 2 = M** ☑ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?		
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.*		
The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds):		1
• Flooding occurs in a sub-basin that is immediately down-gradient of unit.	points = 2	
☐ • Surface flooding problems are in a sub-basin farther down-gradient.	points = 1	
☐ Flooding from groundwater is an issue in the sub-basin.	points = 1	
☐ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. Explain why	points = 0	
☐ There are no problems with flooding downstream of the wetland.	points = 0	
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan?	Yes = 2 No = 0	0
Total for D 6	Add the points in the boxes above	**1**

Rating of Value If score is: ☐ **2 - 4 = H** ☑ **1 = M** ☐ **0 = L** *Record the rating on the first page*

Wetland name or number Wet C

These questions apply to wetlands of all HGM classes.	
HABITAT FUNCTIONS - Indicators that site functions to provide important habitat	
H 1.0. Does the site have the potential to provide habitat?	
H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.* ☐ Aquatic bed — 4 structures or more: points = 4 ☑ Emergent — 3 structures: points = 2 ☐ Scrub-shrub (areas where shrubs have > 30% cover) — 2 structures: points - 1 ☐ Forested (areas where trees have > 30% cover) — 1 structure: points = 0 *If the unit has a Forested class, check if*: ☐ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	0
H 1.2. Hydroperiods Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*). ☐ Permanently flooded or inundated — 4 or more types present: points = 3 ☑ Seasonally flooded or inundated — 3 types present: points = 2 ☐ Occasionally flooded or inundated — 2 types present: points = 1 ☐ Saturated only — 1 types present: points = 0 ☐ Permanently flowing stream or river in, or adjacent to, the wetland ☐ Seasonally flowing stream in, or adjacent to, the wetland ☐ **Lake Fringe wetland** — **2 points** ☐ **Freshwater tidal wetland** — **2 points**	0
H 1.3. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold and you do not have to name the species.* ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle*** If you counted: > 19 species — points = 2 5 - 19 species — points = 1 < 5 species — points = 0	1
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points — **Low** = 1 point — **Moderate** = 2 points All three diagrams in this row are **HIGH** = 3 points 	0

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* ☐ Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long) ☐ Standing snags (dbh > 4 in) within the wetland ☐ Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present (*cut shrubs or trees that have not yet weathered where wood is exposed*) ☐ At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (*structures for egg-laying by amphibians*) ☐ Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	0
Total for H 1 Add the points in the boxes above	**1**

Rating of Site Potential If Score is: ☐ **15 - 18 = H** ☐ **7 - 14 = M** ☑ **0 - 6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat function of the site?	
H 2.1 Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* 0 % undisturbed habitat + (1.4 % moderate & low intensity land uses / 2) = 0.7% If total accessible habitat is: > 1/3 (33.3%) of 1 km Polygon points = 3 20 - 33% of 1 km Polygon points = 2 10 - 19% of 1 km Polygon points = 1 < 10 % of 1 km Polygon points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* 3.3 % undisturbed habitat + (36.4 % moderate & low intensity land uses / 2) = 21.5% Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches points = 2 Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	1
H 2.3 Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (-2) ≤ 50% of 1km Polygon is high intensity points = 0	0
Total for H 2 Add the points in the boxes above	**1**

Rating of Landscape Potential If Score is: ☐ **4 - 6 = H** ☑ **1 - 3 = M** ☐ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated*. Site meets ANY of the following criteria: points = 2 ☐ It has 3 or more priority habitats within 100 m (see next page) ☐ It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) ☐ It is mapped as a location for an individual WDFW priority species ☐ It is a Wetland of High Conservation Value as determined by the Department of Natural Resources ☐ It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats (listed on next page) with in 100m points = 1 Site does not meet any of the criteria above points = 0	0

Rating of Value If Score is: ☐ **2 = H** ☐ **1 = M** ☑ **0 = L** *Record the rating on the first page*

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.
http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here:
http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE**: This question is independent of the land use between the wetland unit and the priority habitat.*

- ☐ **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha).
- ☐ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).
- ☐ **Herbaceous Balds**: Variable size patches of grass and forbs on shallow soils over bedrock.
- ☐ **Old-growth/Mature forests**: Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.
- ☐ **Oregon White Oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).
- ☐ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- ☐ **Westside Prairies**: Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).
- ☐ **Instream**: The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.
- ☐ **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page*).
- ☐ **Caves**: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.
- ☐ **Cliffs**: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.
- ☐ **Talus**: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
- ☐ **Snags and Logs**: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. List the category when the appropriate criteria are met.*	Category
SC 1.0. Estuarine Wetlands Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt ☐ Yes - Go to **SC 1.1** ☐ No = **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐ Yes = **Category I** ☐ No - Go to **SC 1.2**	
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina* , see page 25) ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. ☐ Yes = **Category I** ☐ No = **Category II**	
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☐ Yes - Go to **SC 2.2** ☐ No - Go to **SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes = **Category I** ☐ No = **Not WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes - **Contact WNHP/WDNR and to SC 2.4** ☐ No = **Not WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes = **Category I** ☐ No = **Not WHCV**	
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions*** . SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? ☐ Yes - Go to **SC 3.3** ☐ No - Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? ☐ Yes - Go to **SC 3.3** ☐ No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? ☐ Yes = **Is a Category I bog** ☐ No - Go to **SC 3.4** **NOTE**: If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? ☐ Yes = **Is a Category I bog** ☐ No = **Is not a bog**	

SC 4.0. Forested Wetlands

Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.***

☐ **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more.

☐ **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80-200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm).

☐ Yes = **Category I** ☐ No = **Not a forested wetland for this section**

SC 5.0. Wetlands in Coastal Lagoons

Does the wetland meet all of the following criteria of a wetland in a coastal lagoon?

☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks

☐ The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon (*needs to be measured near the bottom*)

☐ Yes - Go to **SC 5.1** ☐ No = **Not a wetland in a coastal lagoon**

SC 5.1. Does the wetland meet all of the following three conditions?

☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100).

☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland.

☐ The wetland is larger than $^{1}/_{10}$ ac (4350 ft^2)

☐ Yes = **Category I** ☐ No = **Category II**

SC 6.0. Interdunal Wetlands

Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.***

In practical terms that means the following geographic areas:

☐ Long Beach Peninsula: Lands west of SR 103

☐ Grayland-Westport: Lands west of SR 105

☐ Ocean Shores-Copalis: Lands west of SR 115 and SR 109

☐ Yes - Go to **SC 6.1** ☐ No = **Not an interdunal wetland for rating**

SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)?

☐ Yes = **Category I** ☐ No - Go to **SC 6.2**

SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger?

☐ Yes = **Category II** ☐ No - Go to **SC 6.3**

SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac?

☐ Yes = **Category III** ☐ No = **Category IV**

Category of wetland based on Special Characteristics

If you answered No for all types, enter "Not Applicable" on Summary Form

Appendix M

Datasheets

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Bodenhamer City/County: Thurston County Sampling Date: 3 Oct 2022

Applicant/Owner: Bodenhammer State: WA Sampling Point: TP-A1

Investigator(s): Curtis Wambach Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation no, Soil no, or Hydrology no significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation no, Soil no, or Hydrology no naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐ Hydric Soil Present? Yes ☒ No ☐ Wetland Hydrology Present? Yes ☒ No ☐	**Is the Sampled Area within a Wetland?** Yes ☒ No ☐

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 20')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 12')			
1. Douglas spirea (Spiraea douglasii)	5	Y	FACW
2. Salmon berry (Rubus spectabilis)	5	Y	FAC
3. Himalayan blackberry (Rubus armeniacus)	5	Y	FAC
4.			
5.			
	15 = Total Cover		
Herb Stratum (Plot size: 6')			
1. Reed canarygrass (Phalaris arundinacea)	80	Y	FACW
2. Lady Fern (Athyrium filix-femina)	20	Y	FAC
3. Slough Sedge (Carex obnupta)	10	Y	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	110 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species 10	x 1 = 10
FACW species 85	x 2 = 170
FAC species 25	x 3 = 75
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: 120 (A)	255 (B)

Prevalence Index = B/A = 2.13

Hydrophytic Vegetation Indicators:

- ☒ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks:

SOIL

Sampling Point: TP-A1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-20"	10YR 3/2		10YR 3/6	2	C			Sandy Silt

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ☒ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☒ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☒ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches):

Water Table Present? Yes ☐ No ☒ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 10"

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Bodenhamer City/County: Thurston County Sampling Date: 3 Oct 2022

Applicant/Owner: State: WA Sampling Point: TP-A2

Investigator(s): Section, Township, Range:

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): Slope (%):

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation no, Soil no, or Hydrology no significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation no, Soil no, or Hydrology no naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☐ No ☒ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 20')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 12')			
1. Himalayan blackberry (Rubus armeniacus)	20	Y	FAC
2. Scotch broom (Cytisus scoparius)	10	Y	FACU
3.			
4.			
5.			
	30 = Total Cover		
Herb Stratum (Plot size: 6')			
1. Sweet vernal grass (Anthoxanthum odoratum)	40	Y	FACU
2. Common bentgrass (Agrostis stolonifera)	35	Y	FACU
3. Hairy cat's ear (Hypochaeris radicata)	15	N	FAC
4. Common Plantain (Plantago lancelata)	15	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	105 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species 35	x 3 = 105
FACU species 100	x 4 = 400
UPL species	x 5 =
Column Totals: 135 (A)	505 (B)

Prevalence Index = B/A = 3.7

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ☐ **No** ☒

Remarks:

SOIL

Sampling Point: TP-A2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-20"	10YR 3/2		none					Sandy silt

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:_____

Depth (inches):_____

Hydric Soil Present? Yes ☐ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): none

Water Table Present? Yes ☐ No ☒ Depth (inches): none

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): none

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

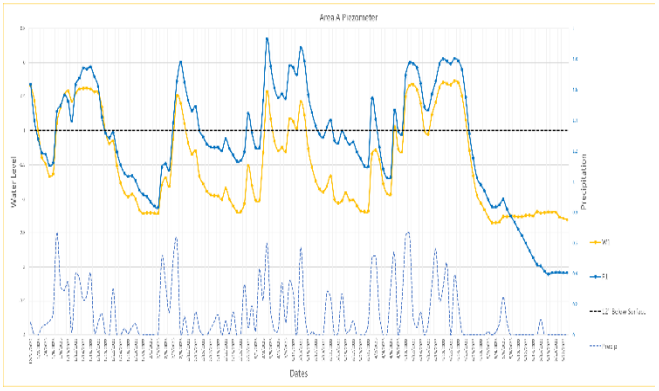
Appendix N

Advanced Studies Report

VISTA VIEWS AT BLACK LAKE

CITY OF TUMWATER, WASHINGTON

ADVANCED STUDIES REPORT



Prepared By:

Curtis Wambach, M.S.
Senior Biologist and Principal

EnviroVector
OPTIMIZE USABLE LAND

14 June 2023

360-790-1559

www.envirovector.com

VISTA VIEWS AT BLACK LAKE

ADVANCED STUDIES REPORT

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14 June 2023

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1.0 INTRODUCTION

1.1 Project Location

The subject property is located in the City of Tumwater, Thurston County WA (**Figure 1; Table 1**).

Table 1. Subject Property

No#	Address	Parcel Number	Map Coordinates	Area
1	3717 49TH AVE SW	12832310700	Section 32 Township 18 Range 2W	50.01
2	3825 58TH LN SW	12832310800		5.00
2 Parcels	Total Size			55.01 acres

The permitting jurisdiction is the City of Tumwater.

1.2 Property Description

The subject property consists of a large (55.01-acre) pasture containing a dense population of livestock (**Figure 1, Table 1, Appendix A, Photos 15-22**). Trampling by large herbivores can cause soil compaction, altering soil permeability and infiltration rates and affecting the plant community (USACE 2010, P 103). Livestock wallow in cool moist soils during hot summer days, which can further compact and alter soils, hydrology, and vegetation through trampling, grazing, and dropping large quantities of manure.

Patches of soft rush (*Juncus effusus*, FACW) and slender rush (*Juncus tenuis*, FAC) with some limited slough sedge (*Carex obnupta*, OBL) occur in livestock wallows on the southern portion of the subject property (**Appendix A, Photos 24, 31, 32, 38, & 42**). However, no hydric soils were identified in these areas and no hydrology was identified during the growing season using the routine onsite determination method. These areas did not satisfy all three (3) criteria (*i.e.*, hydric soils, hydrophytic vegetation, and wetland hydrology) for a wetland determination. Hydric soils and hydrology were not satisfied under the routine on-site determination method.

Although the patches of rushes did not satisfy the hydric soils or wetland hydrology criteria using the routine on-site determination method, wetlands have been mapped in these areas by several governmental Agencies, warranting a higher level of evaluation (**Appendices B, C, D, E, & F**).

Generally, soils on the southern portion of the subject property consist of very dark grayish brown (10YR 3/2) to dark brown (10YR 3/3) sandy silt throughout. Soils appear to be consistent within or outside of the patches of rushes. Soil conditions on the southern portion of the subject property generally do not satisfy the hydric soils criteria.

No consistent hydrology indicators were identified on the southern portion of the subject property, including within the patches of rushes, using the routine on-site determination method. Although winter water was detectable in some areas, no water was identified in test pits during the growing season, which did not satisfy the hydrology criterion.

Secondary hydrology indicators were also explored, such as Geomorphic Position (D2) (*i.e., concave depression*) and FAC-Neutral Test (D5). The geomorphic positions at the rush patches are generally flat. A couple of the patches exhibit very slight concave depressions that are difficult to detect by visual observations. However, slight depressions are not exclusive to these areas, the entire southern portion of the subject property contains similar slightly uneven landscape, which is common in active pastures.

Although the FAC-Neutral test was satisfied in some patches of rushes, the test was not satisfied in other patches of rushes, exhibiting a majority of FACU species, including sweet vernal grass (*Anthoxanthum odoratum*, FACU), hairy cat's ear (*Hypochaeris radicata*, FACU), common plantain (*Plantago lancelata*, FACU), and dandelion (*Taraxacum officinale*), over one (1) or two (2) species wetter than FAC. The required two (2) secondary indicators were not satisfied.

Vegetation on the southern portion of the subject property primarily consists of a managed plant community of European pasture grasses and associated non-native forb species typically found in pastures or lawns. The vegetation community is managed to optimize livestock grazing. Areas of rushes are intermixed with European pasture species and non-native forbs. No native plant communities occur on the southern portion of the subject property.

Soils on the southern portion of the subject property have been altered through decades of intensive agricultural practices. Livestock causes soil compaction, altering soil permeability and infiltration rates and affecting the plant community (USACE 2010, P 103). Massive volumes of manure alter the soil chemistry, color, and texture and affect plant composition. Winter water may pond in livestock wallows. Water may follow the path of cattle trails, which can be seen clearly from aerial photographs.

Hydrology on the southern portion of the subject property has been altered from natural conditions. Historical agricultural ditches, labeled Ditch A & Ditch B, remain functional on the southern portion of the subject property (**Figure 2; Appendix A, Photo 66**). The agricultural ditches convey excess winter water from the southern portion of the subject property to Wetland A, delineated by EnviroVector on the northern portion of the subject property (**Figures 2** & **Figure 3**). Ditch A bisects the central portion of the subject property from the eastern fence line to the western property boundary. Ditch B drains from south to north along the southern portion of the western property boundary. This water is piped from the confluence of the two (2) ditches northward along the western property line to Wetland A. Contours suggest that the historical drainage from the southern portion of the subject property flowed westward toward Black Lake.

This long-term alteration of vegetation, soils, and hydrology creates an "atypical" or "difficult" situation as described by the USACE (2010) Regional Supplement.

1.3 Study Summary

The "Routine On-site Determination Method" was applied in areas of normal conditions to identify and delineate wetlands. In difficult areas, advanced wetland methods were applied to provide additional information to assist in the wetland determination. These advanced methods were applied as required when evaluating difficult situations under Chapter 5 of the U.S. Army Corps of Engineers (USACE) (2010) *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0).*

The southern portion of the subject property contains difficult areas that trigger the need for the difficult situation methodology of Chapter 5 of the U.S. Army Corps of Engineers (USACE) (2010) Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0).

The determination of hydric soils, hydrophytic vegetation, or wetland hydrology is in question in patches of soft rush (FACW) and slender rush (FAC). Some areas that satisfy the vegetation criterion, have not satisfied the hydric soil or wetland hydrology criteria. Advanced studies methodologies have been applied in these areas.

Six (6) Study Areas, labeled Study Areas A-F, were established where difficult conditions have been identified (**Figure 4**). The advanced study period was implemented from 31 December 2022 to 23 May 2023. The study period extended for the duration of the wettest part of the growing season.

Seventeen (17) shallow groundwater monitoring wells were installed in difficult areas to determine whether groundwater levels satisfy the US Army Corps of Engineers (USACE) wetland hydrology standard as outlined in Chapter 5 of the USACE (2010) Regional Supplement (**Figure 4**).

Three (3) piezometers were installed within three (3) of the study areas, especially Study Areas A-C (**Figure 4**). Each of the piezometers were paired with a shallow monitoring well to determine the water level response, including whether hydrology in difficult areas is affected by an aquitard or perched aquifer. This pairing of a shallow wells with piezometers also determines whether hydrostatic pressure is pushing up groundwater from below or whether groundwater from precipitation is rapidly draining.

The Redox Test was performed to determine if soils within the Study Areas are functioning as hydric soils. A positive result applying alpha alpha dipyridyl to soils is a primary indicator of hydrology and an indicator of hydric soils. These two (2) additional tests are a supplement to the hydrology study that are in compliance with USACE wetland identification procedures within Chapter 5 of the USACE (2010) Regional Supplement.

1.5 Advanced Study Justification and Procedures

Wetland identification procedures provided in USACE (2010) Chapters 2-4 are always applied prior to advancing to advanced methodologies of Chapter 5. If procedures in Chapters 2-4 are inconclusive as the result of a difficult situation, procedures from Chapter 5 should be applied for the determination of wetlands. Or if indicators are absent in a suspected wetland, Chapter 5 provides advanced procedures to compensate for missing indicators in suspected wetlands.

1.5.1 Difficult Vegetation Methodology of USACE (2010) Regional Supplement Chapter 5

Problematic hydrophytic vegetation can be identified and delineated using a combination of observations made in the field and/or supplemental information from the scientific literature and other sources. These procedures should be applied where indicators of hydric soil and wetland hydrology are present, unless one (1) or both (2) of these factors are also disturbed or problematic, but no indicators of hydrophytic vegetation are evident. **Table 2** provides the procedural steps necessary to apply the correct methodology for a specific difficult situation considering site conditions (USACE 2010, P 99).

Table 2. Chapter 5---*Procedures for Problematic Vegetation*

Steps	Description	Decision		Actions
		Yes	No	
Step 1	1a. One (1) primary indicator of hydric soils	Go to Step 2	Go to Step 1b	**No**
	1b. One (1) primary indicator or two (2) secondary indicators of hydrology o	Go to Step 2	Go to Step 1c	**No**
	1c. Indicators of hydric soils and/or hydrology are disturbed or problematic.	Go to Step 2	Not Hydrophytic	**Yes**
Step 2	Landscape Position likely to hold water: a. Concave Surface b Active flood plain or low terrace c. Relatively Flat 0-3% slope d. Tow of Slope or Convergent Slopes e. Wetland fringe f. Restrictive layer or aquitard w/in 24 in g. Seeps h. Other (Explain)	Go to Step 3	Not Hydrophytic	**(c) relatively flat** **Go to Step 3**
Step 3	Use one or more of the approaches to determine whether the vegetation is hydrophytic described in: * Step 4 (Specific Problematic Vegetation Situations below) or * Step 5 (General Approaches to Problematic Hydrophytic Vegetation on page 108).	Go to Step 4		**Go to Steps 4 or 5**
Step 4 Specific Problematic Vegetation Situations	a. Temporal Problematic Vegetation Situations	If yes to one of the Items under Step 4: Use that specific procedure to determine hydrophytic vegetation.	If no to all, or none apply: Go to Step 5	**Apply Procedures** **(d) areas affected by grazing** **(e) Managed Plant Community**
	b. Sparse and Patchy Vegetation			
	c. Riparian Areas			
	d. Areas Affected by Grazing			
	e. Managed Plant Communities			
	f. Aggressive Invasive Plants			
	g. Areas Created by Fires, Floods, and other natural Disturbances			
	h. Vigor and Stress Responses to Wetland Conditions			
Step 5 General Approaches to Problematic Vegetation	a. Direct Hydrologic Observations 1. Inundation or saturation 2. Hydrology Monitoring	If yes to one of the Items under Step 5: Use that specific procedure to determine hydrophytic vegetation.	If no to all: No Hydrophytic Vegetation.	**No comparable reference sites** **Apply Hydrologic Monitoring**
	b. Reference Sites			
	c. Technical Literature			

1.5.1.1 Areas Affected by Grazing (Page 103 of USACE 2010, Step 4 Procedure d)

Short- and long-term grazing can cause shifts in dominant species in the vegetation. Grazers can influence the abundance of plant species in several ways. For example, trampling by large herbivores can cause soil compaction, altering soil permeability and infiltration rates and affecting the plant community. Grazers can also influence the abundance of plant species by selectively grazing certain species or avoiding other species. Shifts in species composition due to grazing can influence a hydrophytic vegetation determination.

Be aware that shifts in both directions, favoring either wetland species or non-wetland species, can occur in these situations. Limited grazing does not necessarily affect the outcome of a hydrophytic vegetation decision. However, the following approaches are recommended in cases where the hydrophytic vegetation determination would be unreliable or misleading due to the effects of grazing (**Table 3**).

1.5.1.1 Managed Plant Community (Step 4 Procedure e)

Many natural plant communities throughout the region have been altered and are managed to meet human goals. Examples include clearing of woody vegetation on rangelands, periodic disking or plowing, planting of native and nonnative species, irrigation of pastures and hayfields, suppression of wildfires, and the use of herbicides. These actions can result in elimination of certain species and their replacement with other species, changes in abundance of certain plants, and shifts in dominant species, possibly influencing a hydrophytic vegetation determination. The following approaches are recommended if the natural vegetation has been altered through management to such an extent that a hydrophytic vegetation determination may be unreliable (**Table 4**).

1.5.2 Difficult Soils Methodology of USACE (2010) Regional Supplement Chapter 5

Some wetlands can be difficult to identify because wetland indicators may be missing due to natural processes or disturbances. This procedure should be used where indicators of hydrophytic vegetation and wetland hydrology are present or are absent due to disturbance or other problem situations, but indicators of hydric soil are not evident (USACE 2010, P112 under Procedure) (**Table 5**).

Table 3. Areas Affected by Grazing Procedure

Procedures	Results	Description of Results
(1) Examine the vegetation on a nearby, ungrazed reference site having similar soils and hydrologic conditions. Ungrazed areas may be present on adjacent properties or in fenced exclosures or streamside management zones. Assume that the same plant community would exist on the grazed site, in the absence of grazing.	No	No ungrazed reference sites available that are not single-family developments
(2) If feasible, remove livestock or fence representative livestock exclusion areas to allow the vegetation time to recover from grazing, and reevaluate the vegetation during the next growing season.	No	Not practical
(3) If grazing was initiated recently, use offsite data sources such as aerial photography, NWI maps, and interviews with the landowner and other persons familiar with the area to determine the plant community present on the site before grazing began. If the previously ungrazed community was hydrophytic, then consider the current vegetation to be hydrophytic.	No	Grazing has occurred for many years, perhaps decades. Historical aerial photographs show no change in landscape conditions since at least 1990
(4) If an appropriate ungrazed area cannot be located or if the ungrazed vegetation condition cannot be determined, make the wetland determination based on indicators of hydric soils and wetland hydrology.	Indeterminate	Apply other methods

Results	Discussion
Indeterminate	Will apply another methods

Table 4. Managed Plant Community Procedure

Step	Procedure	Results	Description of Result
Step 1	Examine the vegetation on a nearby, unmanaged reference site having similar soils and hydrologic conditions. Assume that the same plant community would exist on the managed site, in the absence of human alteration.	No	No reference site available
Step 2	For recently cleared or tilled areas (not planted or seeded), leave representative areas unmanaged for at least one growing season with normal rainfall and reevaluate the vegetation.	No	Not applicable
Step 3	If management was initiated recently, use offsite data sources such as aerial photography, NWI maps, and interviews with the landowner and other persons familiar with the area to determine what plant community was present on the site before the management occurred.	No	Managed plant community has occurred for many years, perhaps decades. Historical aerial photographs show no change in landscape conditions since at least 1990
Step 4	If the unmanaged vegetation condition cannot be determined, make the wetland determination based on indicators of hydric soil and wetland hydrology.	Indeterminate	Apply other methods

Results	Discussion
Indeterminate	Will apply another methods

Table 5. USACE (2010) Regional Supplement for Difficult Hydric Soils

Procedures	Description for Difficult Hydric Soils	Actions		Procedures Taken
		Yes	No	
Step 1	Verify that one or more indicators of hydrophytic vegetation are present or that the vegetation is disturbed or problematic.	Go to Step 2	Relict Hydric Soil (Not a Wetland)	**Vegetation is problematic** **Go to Step 2**
Step 2	Verify that at least one (1) primary or two (2) secondary indicators of wetland hydrology are present or that indicators are absent due to disturbance or other factors.	Go to Step 3	Relict Hydric Soil (Not a Wetland)	**Other factors** **Go to Step 3**
Step 3	Verify that the area is in a landscape position that is likely to collect or concentrate water. a. Concave surface (e.g., depression or swale) b. Active floodplain or low terrace c. Level or nearly level area (e.g., 0- to 3-percent slope) d. Toe slope or an area of convergent slopes e. Fringe of another wetland or water body f. Area with a restrictive soil layer or aquitard within 24 in. (60 cm) of the surface g. Area where groundwater discharges (e.g., a seep) h. Other (explain in field notes why this area is likely to be inundated or saturated for long periods)	Go to Step 4	Relict Hydric Soil (Not a Wetland)	**(c) Nearly flat** **Go to Step 4**
Step 4 Use one or more of the following Approaches (NRCS Tech Note 11)	a. Indicator A10, TFs, or TF12	Hydric	Relict Hydric Soil (Not a Wetland)	**Apply** **d. Alpha, alpha-dipyridyl.** **e. Groundwater monitoring** & **e. NTCHS** **b. Oxidation-Reduction Potential (Eh) (Redox Test)** **c. Alpha, alpha-dipyridyl.**
	b. One or More of the Following Present: (1) Moderately to Very Strongly Alkaline Soils (LRR E) (2) Volcanic Ash or Diatomaceous Earth (3) Vegetated Sand and Gravel Bars within Floodplains (4) Dark Parent Materials (5) Recently Developed Wetlands (6) Seasonally Ponded Soils (7) Other (in field notes, describe the problematic soil situation and explain why it is believed that the soil meets the hydric soil definition)			
	c. A mineral layer 4 in. (10 cm) or more thick starting within 12 in. (30 cm) of the soil surface that has a matrix value of 4 or more and chroma of 2 or less becomes redder by one or more pages in hue and/or increases one or more in chroma when exposed to air within 30 minutes.			
	d. Alpha, alpha-dipyridyl. Apply to mineral soil material in at least 60 percent of a layer at least 4 in. (10 cm) thick within a depth of 12 in. (30 cm) of the soil surface results in a positive reaction within 30 seconds evidenced by a pink or red coloration to the reagent during the growing season.			
	e. Groundwater Monitoring or NTCHS. water table is 12 in. (30 cm) or less from the surface, for 14 or more consecutive days during the growing season in most years (at least 5 years in 10, or 50 percent or higher probability) (U.S. Army Corps of Engineers 2005). Or, any soil that meets the NTCHS hydric soil technical standard (NRCS Hydric Soils Technical Note 11): a. Indicator of Reduction in Soils (IRIS) tubes b. Oxidation-Reduction Potential (Eh) c. Alpha, alpha-dipyridyl			

1.5.3 Difficult Hydrology Methodology (USACE 2010 Page 116)

This section describes a number of approaches that can be used to determine whether wetland hydrology is present on sites where indicators of hydrophytic vegetation and hydric soil are present, but hydrology indicators may be lacking due to normal variations in rainfall or runoff, human activities that destroy hydrology indicators, and other factors (**Table 6**).

Table 6. USACE (2010) Regional Supplement for Difficult Hydrology

Procedures	Description for Difficult Hydrology	Action		Procedures Taken
		Yes	No	
Step 1	Verify that indicators of hydrophytic vegetation and hydric soil are present, or are absent due to disturbance or other problem situations. If so, proceed to step 2.	Go to Step 2	No Wetland Hydrology	**Problem Situation** **Go to Step 2**
Step 2	Verify that the area is in a landscape position that is likely to collect or concentrate water. Appropriate settings are listed below. If the landscape setting is appropriate, proceed to step 3. a. Concave surface (e.g., depression or swale) b. Active floodplain or low terrace c. Level or nearly level area (e.g., 0- to 3-percent slope) d. Toe slope or an area of convergent slopes e. Fringe of another wetland or water body f. Area with a restrictive soil layer or aquitard within 24 in. (60 cm) of the surface g. Area where groundwater discharges (e.g., a seep) h. Other (explain in field notes why this area is likely to be inundated or saturated for long periods)	Go to Step 3	No Wetland Hydrology	**c. level or nearly level** **Go to Step 3**
Step 3	Use one or more of the following approaches to determine whether wetland hydrology is present and the site is a wetland. In the remarks section of the data form or in the delineation report, explain the rationale for concluding that wetland hydrology is present even though indicators of wetland hydrology described in Chapter 4 were not observed. a. Site visits during the dry season. b. Periods with below-normal rainfall. c. Drought years. d. Years with unusually low winter snowpack. e. Reference sites. f. Hydrology tools. (1) Analyze stream and lake gauge data (2) Estimate runoff volumes to determine duration and frequency of ponding in depressional areas (3) Evaluate the frequency of wetness signatures on aerial photography (4) Model water-table fluctuations in fields with parallel drainage systems using the DRAINMOD model (5) Estimate the "scope and effect" of ditches or subsurface drain lines (6) Estimate the effectiveness of agricultural drainage systems using NRCS state drainage guides (7) Analyze data from groundwater Monitoring wells (Procedure h) g. Evaluating multiple years of aerial photography. h. Long-term hydrologic monitoring.	Wetland Hydrology Present	No wetland hydrology	**a.-e. does not apply** **Apply f(7) and h for long term hydrologic monitoring**

2.0 METHODOLOGY

2.1 Study Outline Overview

Study procedures include:

- Detailed Vegetation Study

  Chapter 5 of the USACE (2010) Regional Supplement Page 108 & 109 (Procedure 5a) provides a general approach to problematic hydrophytic vegetation through verifying that the plant community occurs in an area subject to prolonged inundation or soil saturation during the growing season. These procedures are applied where indicators of hydric soil and wetland hydrology are present or difficult but indicators of hydrophytic vegetation are not evident. Where indicators of hydrophytic vegetation are absent due to disturbance or are difficult, hydrophytic vegetation is considered to be present if the water table is twelve (12) inches (30 cm) or less from the surface for fourteen (14) or more consecutive days during the growing season five (5) years of ten (10). This would be accomplished through our hydrology study in those specific areas.

- Detailed Soil Study

  A detailed soil study was performed based on procedures outlined in the USACE (2010) Regional Supplement for areas of difficult soil where indicators of vegetation and/or hydrology are difficult or absent.

  Soils were excavated using a hand powered mud auger with a two (2) inch diameter bucket, which would minimize any additional soil disturbance. Soil features typically associated with wetlands, such as hydric soils, mottling, a restrictive layer or aquitard, sand lenses, or other features were recorded.

  In disturbed areas, hydric soil indicators may have been obscured. Procedures outlined in Section 3 below will determine if difficult or disturbed soils are functioning as wetland soils. Even if hydric soil indicators are absent or obscured, these procedures will aid in a definitive determination.

- Direct Hydrology Monitoring

  Collected and analyzed groundwater data from groundwater monitoring wells during the wettest portion of the growing season. Water level dataloggers were installed to automate the data collection process. Readings of the groundwater table were collected hourly. This hourly data collection was analyzed to determine if the USACE wetland hydrology stand has been satisfied.

2.2 Wetland Hydrology

2.2.1 Wetland Hydrology Procedural Considerations

Wetland hydrology indicators are used in combination with indicators of hydric soil and hydrophytic vegetation to determine whether an area is defined as a wetland under the USACE (2010) Regional Supplement. Wetland hydrology indicators provide evidence for determining wetland hydrology and are part of the wetland determination. Wetland hydrology indicators provide evidence to determine if an episode of inundation or soil saturation occurred recently.

Page 66 of the USACE (2010) Regional Supplement states that "on highly disturbed or problematic sites, direct hydrologic monitoring may be needed to determine whether wetland hydrology is present." The USACE WRAP (2005) provides a technical standard for monitoring hydrology on such sites. "This standard requires fourteen (14) or more consecutive days of flooding or ponding, or a water table twelve (12) inches (30 cm) or less below the soil surface, during the growing season at a minimum frequency of five (5) years in ten (10) (fifty percent [50%] or higher probability)."

Chapter 5 of the USACE (2010) Regional Supplement provides further information on hydrology studies using groundwater monitoring wells. The USACE WRAP (2005) provides technical standards and detailed specifications for performing groundwater monitoring studies.

The USACE WRAP (2005) is a technical note that describes national standards for the collection, analysis, interpretation, and reporting of hydrologic data, which may be used to help determine whether wetlands are present on disturbed or problematic sites that may be subject to Clean Water Act regulatory jurisdiction.

Some wetlands can be difficult to identify because wetland indicators may be missing due to recent or ongoing disturbances. Chapter 5 of the USACE (2010) Regional Supplement provides guidance for making wetland determinations in difficult to identify wetland situations in the Western Mountains, Valleys, and Coast Region. Chapter 5 includes regional examples of 'atypical' situations as defined in the Corps Manual, as well as other situations that can make wetland delineation more challenging. 'Atypical' situations are wetlands in which vegetation, soil, or hydrology indicators are absent due to recent human activities or natural events.

Human activities have created an 'atypical' situation on the subject property. Thereby procedures in Chapter 5 of the USACE (2010) regional supplement are recommended in the determination of wetland indicators. Vegetation and/or soil indicators are absent in areas on the subject property as a result of this human activity. Chapter 5 of the USACE (2010) Regional Supplement provides field procedures for quantifying the extent of wetlands in areas where wetlands and non-wetlands are recently disturbed.

Chapter 5 of the USACE (2010) Regional Supplement states that "wetland determinations on difficult or problematic sites must be based on the best information available to the field inspector, interpreted in light of his or her professional experience and knowledge of the ecology of wetlands in the region." The project researcher has twenty-five (25) years of experience administrating atypical situations methodologies in difficult areas in the region.

Chapter 5 of the USACE (2010) Regional Supplement describes a number of approaches that can be used to determine whether wetland hydrology is present on sites where hydrology indicators may be lacking due to human activities, or other factors, that alter hydrology indicators.

The procedures that apply specifically to the subject property include:

- Procedure f---*Hydrology tools*
  (7) Analyze data from groundwater monitoring wells (see item h below for additional information)
- Procedure h---*Long-term hydrologic monitoring.*

The USACE (2010) Regional Supplement provides step-wise procedures to evaluate and delineate potential wetlands.

2.2.2 Well Installation and Specifications (WRAP 2005)

Procedures and specifications of the hydrology monitoring study will follow the USACE Wetlands Regulatory Assistance Program (WRAP) (June 2005) *Technical Standards for Water Table Monitoring of Potential Wetland Sites*. WRAP 2005 provides the technical standards for the installation, analysis, interpretation, and monitoring of data. The hydrology monitoring study methodology is based on this guidance document and on twenty-five (25) years of experience in performing hydrology monitoring studies. Specifications of the monitoring wells are provided in **Insert 1** and **Table 7**. The locations of the installed monitoring wells are found in **Figure 2**.

Insert 1. Shallow groundwater monitoring well and piezometer installation methodology

ERDC TN-WRAP-00-02
July 2000

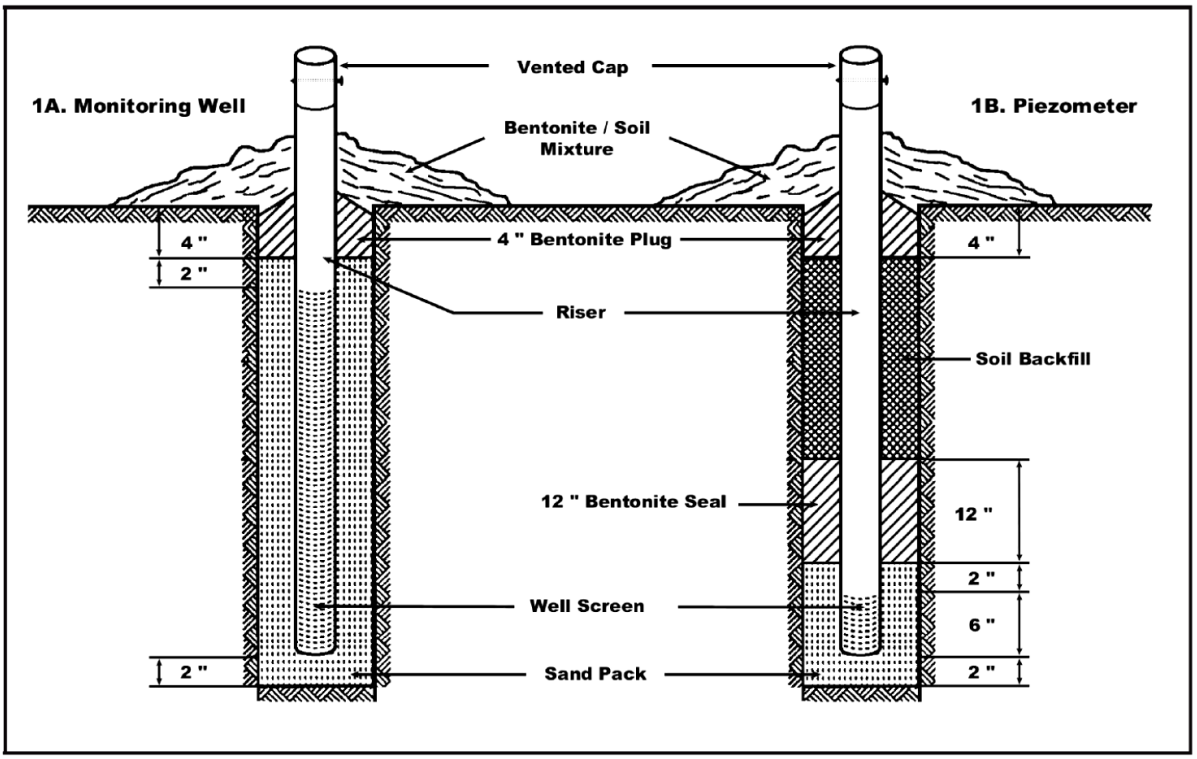


Figure 1. Schematic diagram of installed monitoring well and piezometer. A. Shallow monitoring well. B. Piezometer

Table 7. Specifications of Monitoring Wells

Wells	Types of Wells	Depth	Diameter	Slots	Between slots	Well Placement	Data Collection
Well 1	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”	Study Area A	Hourly Data Logging
Well 2	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”		Hourly Data Logging
Well 3	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”		Hourly Data Logging
Well 4	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”	Study Area B	Hourly Data Logging
Well 5	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”		Hourly Data Logging
Well 6	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”		Hourly Data Logging
Well 7	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”	Study Area C	Hourly Data Logging
Well 8	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”		Hourly Data Logging
Well 9	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”		Hourly Data Logging
Well 10	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”	Study Area D	Hourly Data Logging
Well 11	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”		Hourly Data Logging
Well 12	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”		Hourly Data Logging
Well 13	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”	Study Area E	Hourly Data Logging
Well 14	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”		Hourly Data Logging
Well 15	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”	Study Area F	Hourly Data Logging
Well 16	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”		Hourly Data Logging
Well 17	Shallow Monitoring Well	24-30”	2”	0.010”	0.125”		Hourly Data Logging
P-1	Piezometer	48”	2”	0.010”	0.125”	Study Area A	Hourly Data Logging
P-2	Piezometer	48”	2”	0.010”	0.125”	Study Area B	Hourly Data Logging
P-3	Piezometer	48”	2”	0.010”	0.125”	Study Area C	Hourly Data Logging

2.2.3 Data Loggers

Water level dataloggers were installed in monitoring wells and piezometers in order to record continuous water levels every hour from during the study period. The non-vented HOBO U20 water level logger was installed to collect water data and a HOBO U20L water level logger was used to collect barometric compensation data (**Insert 2**).

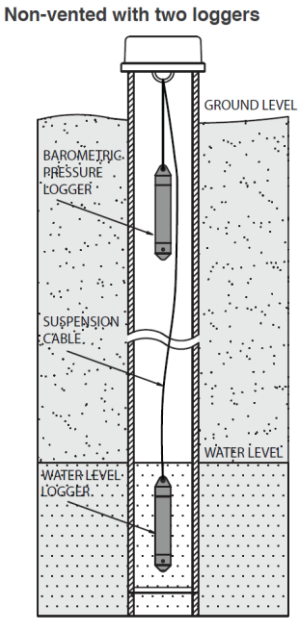
HOBOware software converts these pressure readings to barometrically-corrected water level values. A simple software function performs the mathematics.

Insert 2

Data Loggers

HOBO U20 water level logger for recording water pressure and temperature.

HOBO U20L water level logger for recording barometric pressure.



2.3 Hydrophytic Vegetation

Procedures in Chapter 5 outline steps to determine if hydrophytic vegetation is present in areas. Procedure 5a on page 108 of the USACE (2010) Regional Supplement provides a procedure for problematic hydrophytic vegetation that verifies the criterion for hydrophytic vegetation through direct hydrology observations during the growing season using monitoring wells. Hydrophytic vegetation is considered to be present if surface water is present and/or the water table is twelve (12) inches (30 cm) or less from the surface for fourteen (14) or more consecutive days during the growing season during a period when antecedent precipitation has been normal or drier than normal. The proposed groundwater study has recorded hourly groundwater levels during the wettest port of the growing season at a time of normal precipitation. If the wetland hydrology standard is satisfied, wetland vegetation can be assumed under this procedure.

2.4 Detailed Soil Study

The study evaluated soils to identify hydric soil indicators on the subject property. Soil evaluation utilizes the latest soil analysis procedures outlined in the USACE (2010) Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0). Procedures for faint or no soil indicators are listed in **Table 8**.

Natural Resources Conservation Service (NRCS) Hydric Soils Technical Note 11---*Hydric Soils Technical Standard and Data Submission Requirements for Field Indicators of Hydric Soils* describe the use of alpha, alpha-dipyridyl and shallow groundwater monitoring as quantitative methods to determine if a soil meets the definition of a hydric soil.

Table 8. Procedures for soils with Faint or No Indicators

#	Procedures	Description	Comments
1	Soils Survey	NRCS Soil Survey evaluation and analysis of mapped soil unit and inclusions	Applied, inconclusive
2	Indicators of Hydric Soils.	Document primary and secondary indicators listed in the Corps Regional Supplement for normal, sandy and problem soils. This includes evaluating soil color using the Munsell Color Chart.	Applied, inconclusive
3	Test for Moderately to Very Strongly Alkaline Soils	Test for PH of soils in order to determine if the soils are high alkaline, which may not readily form redox conditions.	No alanine soils in study area. (tested PH)
4	Volcanic Ash or Diatomaceous Earth.	Test for Volcanic Ash or Diatomaceous Earth, which does not readily exhibit hydric soil indicators.	None identified
5	Dark Parent Materials	Evaluate for soils that naturally have dark parent materials that are not hydric soils.	Soils are consistent throughout southern portion of property
6	Seasonally Ponded Soils	Some of these wetlands lack hydric soil indicators due to limited saturation depth, saline conditions, or other factors.	Does not apply
7	Alpha, Alpha-dipyridyl	If the soil is saturated at the time of sampling, alpha, alpha-dipyridyl reagent can be used in the following procedure to determine if reduced (ferrous) iron is present. If ferrous iron is present, then the soil is functioning as a wetland soil.	Applied technique

2.5 Alpha, Alpha Dipyridyl

It is important to consider the purpose of the Chemical Test and what exactly is the chemical testing. Alpha alpha dipyridyl solution is used to confirm the presence of ferrous (Fe2+) iron in soils. If the solution turns from clear to red when applied to soil, it indicates the soil is reduced and anaerobic (anoxic) at the time of application. Redox concentrations and depletions are hydric soils indicators that are formed in anoxic soils as a result of redox reactions. Organics accumulate in anoxic soils where the lack of oxygen slows decomposition. When soils are saturated, soil bacteria use up the oxygen and the soils become anoxic. Ferrous iron is released in anoxic soils. If anoxic, soils are functioning as wetland soils and are considered hydric and are not relic hydric soils. Therefore, the chemical is testing for whether the soils are currently functioning as hydric soils.

Natural Resources Conservation Service (NRCS) Hydric Soils Technical Note 11---*Hydric Soils Technical Standard and Data Submission Requirements for Field Indicators of Hydric Soils* describe the use of alpha, alpha-dipyridyl and shallow groundwater monitoring as quantitative methods to determine if a soil meets the definition of a hydric soil.

Soil Procedure (d) on P114 of the USACE (2010) Regional Supplement states that "if the soil is saturated at the time of sampling, alpha, alpha-dipyridyl reagent can be used in the following procedure to determine if reduced (ferrous) iron is present. If reduced (ferrous) iron is present, the soil is functioning as a wetland soil. Soils were chemically tested to determine if reduced (ferrous) iron is present at test plots based on sampling procedures outlined in the USACE (2010) Regional Supplement and in the Natural Resources Conservation Service (NRCS) Technical Notes 8 and 11. NRCS Technical Notes 8 and 11 provide specific procedures for applying the chemical alpha, alpha-dipyridyl to determine if reduced (ferrous) iron is present in soil samples as a wetland indicator. If samples test negative, additional procedures will be applied to strengthen scientific rigor in the determination of hydric soils.

Step 4(d) of the procedures in the USACE (2010) regional supplement tests for relic hydric soils through the chemical application of alpha alpha dipyridyl, which tests whether the soil currently functions as a hydric soil. This procedure is used when wetland plants and hydrology are present or difficult, but indicators of hydric soils are absent or equivocal. To avoid false positives or false negatives, tests were not performed in highly disturbed soils; rather, tests were performed in relatively undisturbed soils within the indicated Study Areas (**Figure 4**).

2.6 Redox Test

The USACE (2010) Regional Supplement, Page 125, states that "any soil that meets the NTCHS Hydric Soil Technical Standard (NRCS Hydric Soils Technical Note 11, http://soils.usda.gov/use/hydric/ntchs/tech_notes/index.html) is hydric."

NRCS Hydric Soils Technical Note 11---*Hydric Soils Technical Standard and Data Submission Requirements for Field Indicators of Hydric Soils* describes the use of oxidation-reduction potential (ORP) as a quantitative method to determine if a soil meets the definition of a hydric soil.

Measurements of soil oxidation-reduction potential (ORP) require applying a platinum (Pt) electrode within surface soil layers. Platinum electrode measurements must be anaerobic in order for a soil to meet the anaerobic conditions requirement of the Hydric Soil Technical Standard.

A Hanna Instruments Professional Waterproof Portable pH/ORP Meter Model HI98190 and a platinum wire electrode/reference probe combination was used to collect the data from two (2) samples at each test location. One (1) sample was tested at six (6) to eight (8) inches below the surface, while another (2^{nd}) sample was tested at eight (8) to twelve (12) inches below the surface. The meter also recorded temperature and pH measurements.

The slope of the Eh-pH diagram lines is based on both theoretical (*e.g.,* Nernst equation) and experimental values from scientific literature (Bohn 1985; Vepraskas and Faulkner 2001; Masscheleyn 1990). The NTCHS has established a corrected Eh-pH line with a y-intercept of 595 and slope of 60 [Eh = 595-60(pH). Thereby, the slope function y=mx+b when y=Eh, m=-60, x=pH, and b=595 would be Eh=-60(pH)+595. The Eh value changes with a different pH value. Samples taken with an Oxidation-reduction potential (ORP) value greater than the Eh would be non-anaerobic and not function as a wetland soil and a value less than the Eh would be anaerobic and, thereby, function as a wetland soil.

3.0 BACKGROUND INFORMATION

3.1 Average Precipitation During Study (WETS Tables)

A summary of the National Oceanic and Atmospheric Administration (NOAA) Climate Analysis for Wetlands Table, also known as the WETS Table, shows normal precipitation for the duration of the well monitoring period and three (3) months prior (**Table 9**). However, individual months during the study period fluctuated with some being higher or slightly lower than the range of normal precipitation. Normal precipitation is defined as the range of thirty percent (30%) greater or less than the average precipitation. The month of April, at the beginning of the growing season, exhibited abnormally high levels of precipitation, which was 2.57 inches above the normal range.

Groundwater levels typically stage during winter months. Normal precipitation during the study period would have contributed to normal groundwater staging and representative groundwater levels during the monitoring period. However, abnormally high precipitation levels during the month of April would have caused higher than normal water levels in the monitoring wells during that month and some duration thereafter, which creates a potential False Positive result. A False Negative is unlikely considering this abnormally high precipitation in April and normal staging of groundwater during the study period (**Table 9**).

Table 9. WETS Summary Table

Month	WETS Average[1]	WETS 30% Chance will have[1]		Total Precip.[2]	Deviation from +\- 30%	Normal Precipitation
		Less Than	More Than			
September 2022	2.03	0.88	2.33	0.15	-0.73	**Abnormally Low**
October 2022	4.19	2.42	5.09	3.35	Normal	**Normal**
November 2022	8.13	5.58	9.69	8.3	Normal	**Normal**
December 2022	7.89	5.76	9.28	8.79	Normal	**Normal**
January 2023	7.54	4.76	9.1	4.36	-0.4	**Abnormally Low**
February 2023	6.17	3.92	7.44	3.49	-0.43	**Abnormally Low**
March 2023	5.29	3.91	6.2	4.33	Normal	**Normal**
April 2023	3.58	2.53	4.24	6.81	2.57	**Abnormally High**
May 2023	2.27	1.41	2.74	0.59	-0.82	**Abnormally Low**
Entire study period and 3 months prior		**31.17**	**56.11**	**40.17**	**Normal**	**Normal**

1. WETS Station: TACOMA NO. 1, WA
2. Weather Underground Station KWATACOM151 at East D Street & E 91st Street, Larchmont
2. Weather Underground Station KWATACOM9 at 126th Street E & 78th Avenue E, Puyallup

3.2 Growing Season

The growing season is an important component in the definition of wetland hydrology. The USACE provides a procedure to approximate the growing season. Growing season dates may be approximated by using WETS tables available from the NRCS National Water and Climate Center to determine the median dates of twenty-eight degrees Fahrenheit (28 °F) (−2.2 °C) air temperatures in spring and fall based on long-term records gathered at the nearest appropriate National Weather Service meteorological station (**Insert 3**).

The WETS table approximates the growing season at a nearby weather station located at the Port of Olympia Airport as April 15th through October 27th with fifty (50) percent probability (**Insert 4**). According to the WETS table, the growing season totals one hundred ninety-five days (195) days.

The hydrology study was performed during the wettest part of the growing season and extended through the winter months. In addition, normal precipitation occurred during the study, making a false negative unlikely.

Insert 3. Approximation of Growing Season (USACE Regional Supplement Page 133)

"In the Western Mountains, Valleys, and Coast Region, growing season dates are determined through onsite observations of the following indicators of biological activity in a given year:

(1) above-ground growth and development of vascular plants, and/or
(2) soil temperature (see Chapter 4 for details). (**Insert 5**)
(3) If onsite data gathering is not practical, growing season dates may be approximated by using WETS tables available from the NRCS National Water and Climate Center to determine the median dates of 28 °F (−2.2 °C) air temperatures in spring and fall based on long-term records gathered at the nearest appropriate National Weather Service meteorological station." (**Insert 4**)

Insert 4. NRCS Climatological Tables to Estimate Growing Season

The growing season is defined for wetland hydrology on the basis of soil temperatures, which in turn are estimated based on NRCS reports of 50 percent likelihood of last and first 28° F frost. These dates are available in NRCS soil survey reports, but more current dates are available in the WETS Tables (below). This procedure is also outlined in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)

WETS Station: OLYMPIA AP, WA Requested years: 1971 - 2000	
GROWING SEASON DATES	
Years with missing data:	28 deg = 0
Years with no occurrence:	28 deg = 0
Data years used:	28 deg = 30
Probability	28 F or higher
50 percent *	4/15 to 10/27: 195 days
* Percent chance of the growing season occurring between the Beginning and Ending dates.	

Procedure 2 in Chapter 4 on Page 68, states that the growing season has begun when soil temperature measured at the twelve (12) inches (30-cm) depth is forty-one degrees (41°) F (5 °C) or higher (**Insert 3**). Procedure 2 on page 133 (Insert 2) refers to Procedure 2 on Page 68 (**Insert 5**).

Insert 5. Approximation of Growing Season (USACE Regional Supplement Chapter 4 Page 68)

"The growing season has begun in spring, and is still in progress, when soil temperature measured at 12-inches (30-cm) depth is 41 °F (5 °C) or higher. A one-time temperature measurement during a single site visit is sufficient, but is not required unless growing season information is necessary to evaluate particular wetland hydrology indicators. However, if long-term hydrologic monitoring is planned, then soil temperature should also be monitored to ensure that it remains continuously at or above 41° F during the monitoring period. Soil temperature can be measured directly in the field by immediately inserting a soil thermometer into the wall of a freshly dug soil pit."

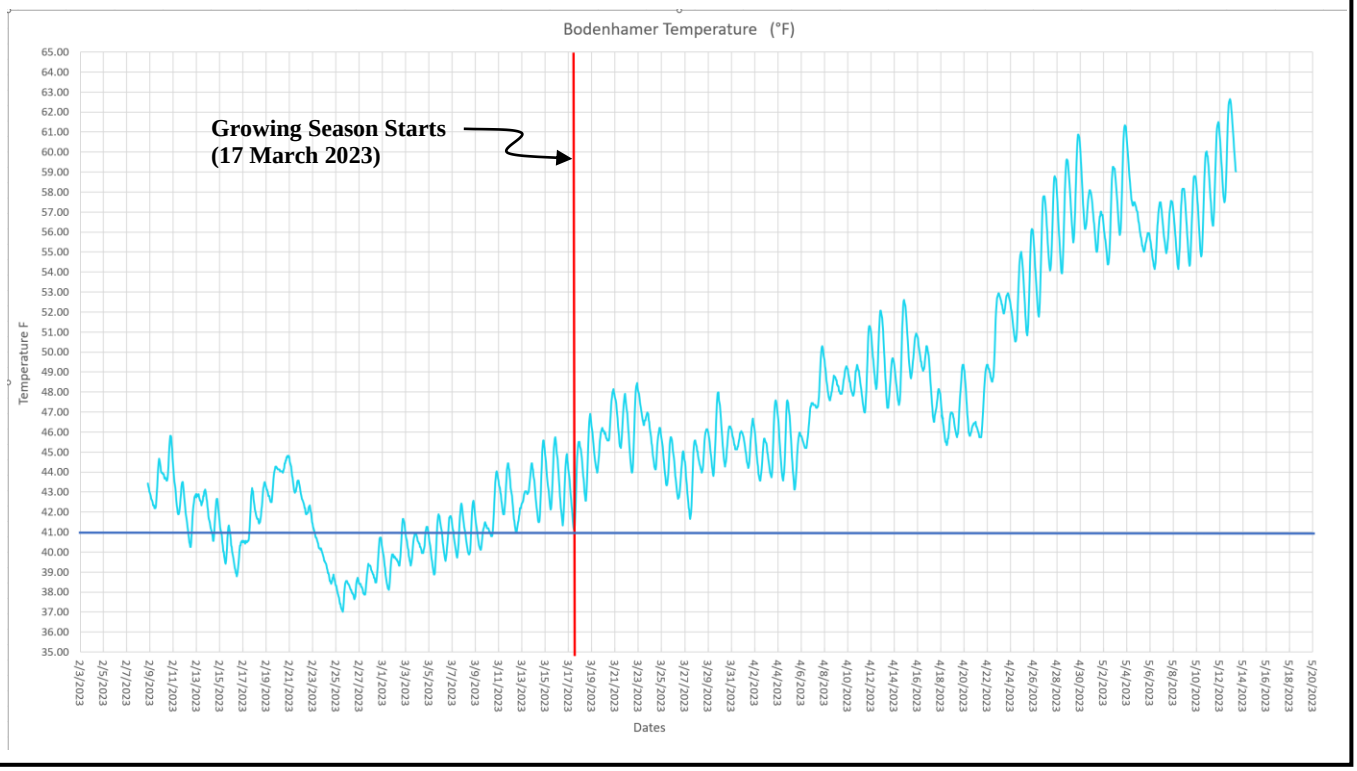
A one-time temperature measurement during a single site visit is sufficient but is not required unless growing season information is necessary to evaluate particular wetland hydrology indicators. However, if long-term hydrologic monitoring is planned, then soil temperature should also be monitored to ensure that it remains continuously at or above forty-one degrees (41°) F during the monitoring period.

Soil temperature can be measured directly in the field by immediately inserting a soil thermometer into the wall of a freshly dug soil pit. However, to ensure capturing the moment the growing season begins at the greatest possible accuracy, two (2) soil temperature data loggers were installed at W1 & W10 to record soil temperatures every hour at twelve (12) inches below the soil surface during the study. Using this information, the exact hour the growing season began during the study period was determined.

According to the dataloggers, the soil temperature remained above forty-one degrees (41°) F on 17 March 2023, and the soil temperature did not decrease below forty-one degrees (41°) F during the remainder of the study period (**Insert 6**). Thereby, the growing season at the subject property began on 17 March 2023.

In conclusion, the WETS table approximates the growing season based on historical patterns, while direct soil temperature readings using a soil temperature datalogger pinpoints the beginning of the growing season for the particular year of the study. Thereby, direct temperature readings using the soil temperature datalogger has been applied in this study.

Insert 6. Bodenhamer Soil Temperature Measurements



3.3 Reliability Alpha, Alpha-dipyridyl

Soil Procedure (d) on Page 114 of the USACE (2010) Regional Supplement states that if the soil is saturated at the time of sampling, alpha, alpha-dipyridyl reagent can be used in the following procedure to determine if reduced (ferrous) iron is present. If reduced (ferrous) iron is present, the soil is functioning as a wetland soil. Soils have been chemically tested to determine if reduced (ferrous) iron is present at test plots based on sampling procedures outlined in the USACE (2010) Regional Supplement and in the NRCS Technical Notes 8 and 11. NRCS Technical Notes 8 and 11 provide specific procedures for applying the chemical alpha, alpha-dipyridyl to determine if reduced (ferrous) iron is present in soil samples as a wetland indicator. If samples test negative, additional procedures will be applied to strengthen scientific rigor in the determination of hydric soils.

The reliability of the testing increases with the minimization of False Negatives or False Positives. The criteria used to define factors that are likely to cause potential False Positives or False Negatives when applying Alpha, Alpha-dipyridyl derive from four (4) sources that include:

1. USACE (2010) Regional Supplement
2. USDA NRCS Technical Note 8
3. USDA NRCS Technical Note 11
4. Richardson & Vepraskas (2011) Wetland Soils: Genesis, Hydrology, Landscapes, and Classification.

Alpha, alpha-dipyridyl solution is used to confirm the presence of ferrous (Fe2+) iron in soils. If the solution turns from clear to red when applied to soil, the color change reaction indicates that soils are anaerobic (anoxic) and that iron in the soil is reduced and at the time of application. Redox concentrations and depletions are hydric soil indicators that are formed in anoxic soils as a result of redox reactions. Organic materials accumulate in anoxic soils where the lack of oxygen slows decomposition. When soils are saturated, bacteria in the soils use up the oxygen and the soils become anoxic. Ferrous iron is released in anoxic soils. If anoxic, soils are functioning as wetland soils and are considered hydric and are not relict hydric soils. Therefore, the alpha, alpha-dipyridyl is testing whether the soils are currently functioning as hydric soils.

A false negative or false positive is possible when this procedure is used incorrectly or if the chemical has been incorrectly prepared or if it has been compromised. A checklist of possible false negatives or false positives has been examined as a part of this study and is provided in **Table 10**.

Table 10. Potential for False Positive or Negative using Alpha Alpha Dipyridyl

POTENTIAL FALSE POSITIVE	QUALIFY	COMMENTS
Abnormally high precipitation and/or flooding (Hydric soils technical note 11)	No	Normal precipitation occurred during the sample period.
If the soils have been moved/ disturbed (Hydric soils technical note 8)	Not recently	No testing had occurred in areas of disturbed soils to avoid both False positives or negatives
Metal fragments hidden in the soil (Hydric soils technical note 8)	Not observed	No metal fragments observed in the soils
Water being recently added to a site	No	It is possibly but unlikely that water has been recently added to the site.
Testing on metal shovel or auger (Wetland Soils2011)	No	Testing occurred on rite in the rain paper

POTENTIAL FALSE NEGATIVE	QUALIFY	COMMENTS
If the soils are not fully saturated (Hydric soils technical note 11)	No	Soils were wet at time of testing
Testing after drought (Hydric soils technical note 11)	No	No draught, abnormally high precipitation occurred at time of sampling
If the soils have been moved/ disturbed (Hydric soils technical note 8)	Not recently	No testing had occurred in areas of disturbed soils to avoid both False positives or negatives
Not in wettest part of the growing season	No	Tests were performed during the wettest part of the growing season.
Not making or storing the dipyridyl correctly (Hydric soils technical note 8)	No	The same batch of chemical worked correctly by getting a positive result at Wetland A
A soil that doesn't contain iron (Richardson & Vepraskas. 20112011)	No	Iron concretions were common in soils throughout the site, which is typical of agricultural land
If a soil sample is exposed to bright sunlight (Richardson & Vepraskas. 20112011)	No	Container covered by aluminum foil, avoiding light penetration. Reference site at Wetland A tested positive using same batch
Chemical in soil/ contaminated site (Richardson & Vepraskas. 2011)	No	No indication that the site is contaminated
No microbial activity in soil type (sand with no organics) (Richardson & Vepraskas. 20112011)	No	Normal microbial activity is likely
Alkaline soils with High pH ≥7.9	No	PH was taken at every sample site. No soil sample recorded a pH of 7.9 or greater
Moving water (flood) (Richardson & Vepraskas. 20112011)	No	No moving water or flooding was observed
Less than fourteen (<14) consecutive days of soil temperatures above 41 degrees F. (true Growing season)	No	Tests at well locations were performed during fourteen (<14) consecutive days of soil temperatures above 41 degrees F

4.0 ADVANCED STUDY RESULTS

4.1 Advanced Studies Results Summary

The results of the Advanced Study procedures are summarized in **Table 11**.

Table 11. Results of Advanced Study Procedures

Study Area	Test Plot	Wetland Hydrology Standard	Chemical Test (Dipyridyl)	Redox Meter	Comments
Study Area A	W1	No	---	---	W2 tested positive for the USACE Wetland Hydrology Standard and for the Redox Test.
	W2	**Yes**	No	**Yes**	
	W3	No	---	---	
Study Area B	W4	No	No	No	No well locations tested positive
	W5	No	---	---	
	W6	No	---	---	
Study Area C	W7	No	No	No	No well locations tested positive
	W8	No	---	---	
	W9	No	---	---	
Study Area D	W10	No	No	No	No well locations tested positive
	W11	No	---	---	
	W12	No	---	---	
Study Area E	W13	No	No	No	No well locations tested positive
	W14	No	---	---	
Study Area F	W15	**Yes**	No	**Yes**	W15 & W16 tested positive for the USACE Wetland Hydrology Standard. And W15 tested positive for the Redox Test
	W16	**Yes**	---	---	
	W17	No	---	---	
Wetland A	TP A1	**---**	**Yes**	**Yes**	TP-A1 located within Wetland A is the reference sample that tested positive for alpha alpha dipyridyl and for the Redox Test

4.2 Chemical Testing of Soils

Results of chemical testing of soils using alpha alpha dipyridyl is summarized in **Table 12**. The sample locations are shown in **Figure 2**. The reliability of tests is summarized in **Table 10**. The summary of all tests, including alpha alpha dipyridyl, is provided in **Table 12**.

All samples tested negative using alpha alpha dipyridyl, other than the reference site at TP-A1 in Wetland A, which tested positive (**Appendix A, Photos 87-98**). The sample at TP-A1 turned a bright red when alpha alpha dipyridyl was applied, producing a positive result (**Appendix A, Photos 97 & 98**). The TP-A1 sample test was performed on 4 April 2023, which was during the wettest part of the growing season. The other tests being negative at the time of testing, suggests that no hydric soil chemical processes were occurring at the other test plots during the testing period.

Table 12. Alpha Alpha Dipyridyl Summary of Results

No#	Test Plot	Chemical Test (Dipyridyl)	Comments
Study Area A	W2	No	Unlikely occurrence of false negative or false positive
Study Area B	W4	No	Unlikely occurrence of false negative or false positive
Study Area C	W7	No	Unlikely occurrence of false negative or false positive
Study Area D	W10	No	Unlikely occurrence of false negative or false positive
Study Area E	W13	No	Unlikely occurrence of false negative or false positive
Study Area F	W15	No	Unlikely occurrence of false negative or false positive
Wetland A	TP-A1	Yes	Reference area tested positive

A negative test using alpha, alpha-dipyridyl indicates the 'absence' of reduced (ferrous) iron in the upper twelve (12) inches. The 'absence' of reduced (ferrous) iron indicates that the soil is not functioning as a wetland soil during the sample date (Richardson & Vepraskas 2001).

This standard determines if soils are functioning as hydric or if 'relict' or non-hydric soils occur at the sample site that may superficially resemble hydric soils, but not function as hydric soils. Results demonstrate that soils at the monitoring wells were not functioning as hydric soils during the sample date.

Alpha, alpha-dipyridyl is a primary indicator of wetland hydrology according to the USACE (2010) Regional Supplement. The monitoring well locations are lacking this primary indicator of wetland hydrology during the sample date. None of the tests were performed outside of the growing season, which makes a potential 'False Negative' or 'False Positive' unlikely (See **Table 10**).

Although all the samples within the study areas tested negative, the reference sample within Wetland A at TP-A1 tested positive (**Figures 5 & 6; Appendix A, photos 97 & 98**). When alpha alpha dipyridyl was applied to soils at TP-A1, the reaction turned bright red, indicating a positive reaction (**Appendix A, photos 97 & 98**). This reference test indicates that the batch of alpha alpha dipyridyl was functioning as normal. Because the study area tests were negative indicates that the level of reduced (ferrous) iron in the upper twelve (12) inches of the soil was too low for detection.

4.3 Redox Test

The Redox Test was performed at sample locations to determine if soils are functioning as and meet the definition of hydric soils. A summary of results of the Redox Test is provided in **Table 13, Insert 7, and Figure 5**. The results of the Redox Test are consistent with the hydrology monitoring results, strengthening a wetland determination.

Samples at Well W2 within Study Area A and one (1) of two (2) samples at Well W15 within Study Area F tested positive (**Insert 7; Figure 5, Appendix A, Photos 77-86**). All of the other samples within the other study areas tested negative. Tests at W2 & W15 were weakly positive and barely passed the test (**Insert 7**). One (1) sample at W13 nearly passed the test. However, samples at the reference area TP-A1 within Wetland A strongly tested positive in comparison (**Insert 7; Figure 6**).

Analysis of the Redox Test concludes that soils at W2 and W15 have low level redox reactions, indicating that these soils may be very marginally functioning as hydric soils for some duration of the growing season. This degree of low function is evident when comparing the sample results from Wetland A, which is clearly a wetland.

Insert 7. Results of Redox Test

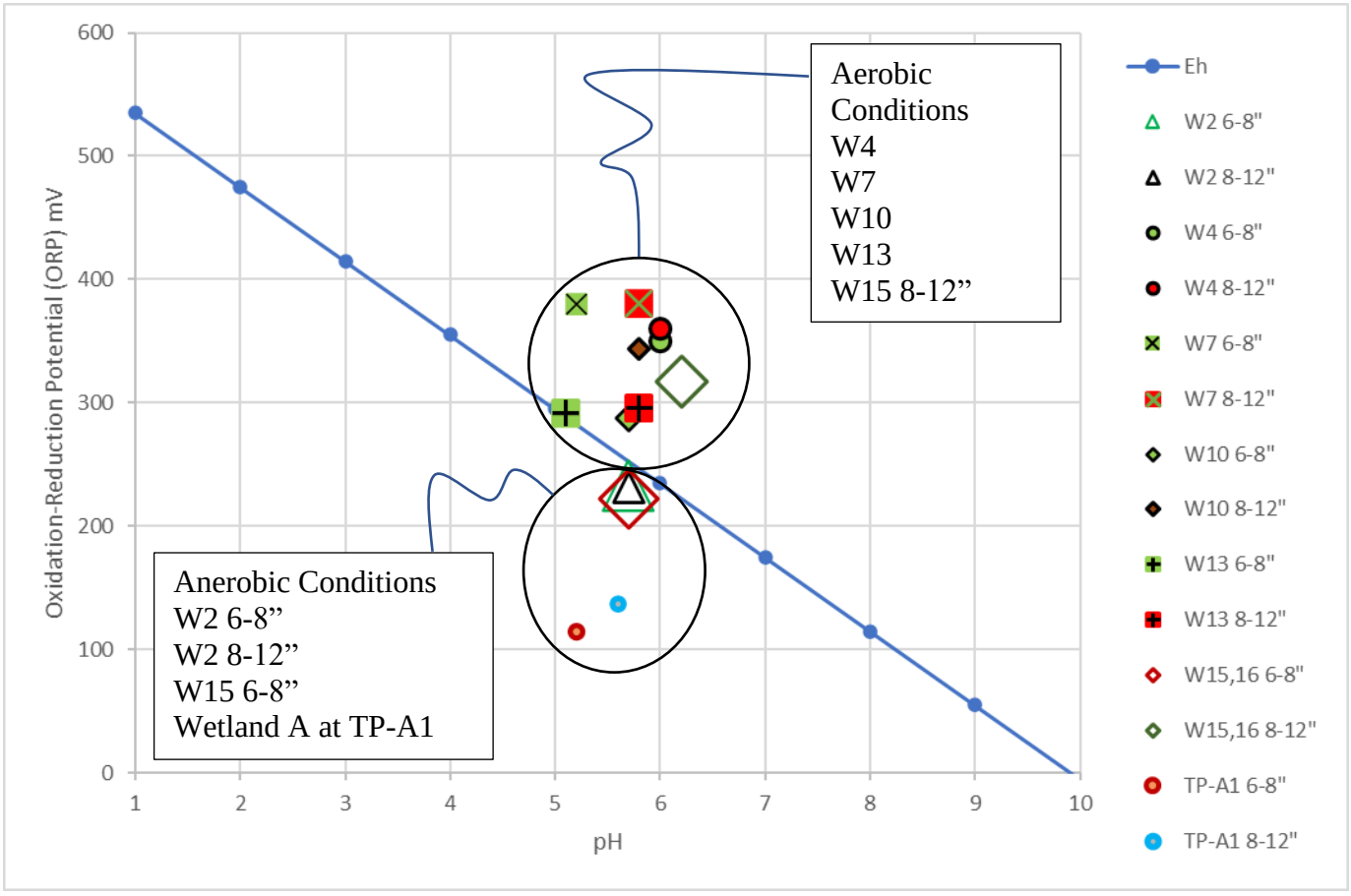


Table 13. Redox Test Results

Data	mv	pH	Anerobic
W2 6-8"	233.0	5.700	**Yes**
W2 8-12"	231.0	5.700	**Yes**
W4 6-8"	350.0	6.000	No
W4 8-12"	360.0	6.000	No
W7 6-8"	380.0	5.200	No
W7 8-12"	380.0	5.800	No
W10 6-8"	288.0	5.700	No
W10 8-12"	344.0	5.800	No
W13 6-8"	292.0	5.100	No
W13 8-12"	296.0	5.800	No
W15,16 6-8"	222.0	5.700	**Yes**
W15,16 8-12"	317.0	6.200	No
TP-A1 6-8"	115.0	5.200	**Yes**
TP-A1 8-12"	137.0	5.600	**Yes**

4.4 Summary of Hydrology Results

4.4.1 General Summary of Results

A summary of the hydrology study can be found in **Table 14** and **Figures 5 & 6**. A map of the well locations is provided in **Figure 4**.

Table 14. Summary of Hydrology Results

Wetland	Wells	Hydrology Standard Satisfied	Comments
Study Area A	W1	No	Well W2 Satisfies the USACE Wetland Hydrology Standard
	W2	**Yes**	
	W3	No	
Study Area B	W4	No	No Well Satisfies the USACE Wetland Hydrology Standard
	W5	No	
	W6	No	
Study Area C	W7	No	No Well Satisfies the USACE Wetland Hydrology Standard
	W8	No	
	W9	No	
Study Area D	W10	No	No Well Satisfies the USACE Wetland Hydrology Standard
	W11	No	
	W12	No	
Study Area E	W13	No	No Well Satisfies the USACE Wetland Hydrology Standard
	W14	No	
Study Area F	W15	**Yes**	Wells W15 & W16 Satisfy the USACE Wetland Hydrology Standard
	W16	**Yes**	
	W17	No	

The wetland hydrology standard is fourteen (14) or more consecutive days of flooding, ponding, or a water table twelve (12) inches (30 cm) or less below the soil surface during the growing season at a minimum frequency of five (5) years in ten (10) (fifty percent (50%) or higher probability). The minimum frequency of five (5) years in ten (10) (50 percent or higher probability) is assumed if the study has occurred during a period of normal precipitation. The study was performed at the time of normal precipitation according to the WETS Table. Thereby, the five (5) years in ten (10) (50 percent or higher probability) is presumed for this study.

4.4.2 Study Area A

Study Area A contains three (3) shallow groundwater monitoring wells, labeled W1-W3, and one (1) piezometer, labeled P1. Well W2 showed water within twelve (12) inches of the surface for more than fourteen (14) consecutive days (19 days) during the growing season at a time of normal precipitation (**Insert 9**). Thereby, Well W2 satisfies the USACE wetland hydrology standard. Wells W1 and W3 do not satisfy the USACE wetland hydrology standard with less than fourteen (<14) consecutive days of water within twelve (12) inches of the surface.

Water levels in Study Area A are clearly influenced by precipitation (**Insert 15**). Water levels rise and fall sharpy as much as two (2) feet as a response to storm events. No significant staging of groundwater occurred during the study period. Water levels did not rise gradually during the course of the study period. The wells went dry during mid-May when winter precipitation waned. This can be seen where water levels seem to hover at their lowest point because the well was dry.

When comparing the pared piezometer (P1) and shallow groundwater monitoring well (W1) at Study Area A, the Water Level Response (WLR) is classified as discharge, meaning that hydrostatic pressure forces water toward the surface (**Insert 16 & 17**). However, water forced to the surface does not drain out as surface water.

4.4.3 Study Area B

Study Area B contains three (3) shallow groundwater monitoring wells, labeled W4-W6, and one (1) piezometer, labeled P2. No water within twelve (12) inches of the surface occurred for more than fourteen (14) consecutive days during the growing season (**Insert 10**). Wells W4-W6 do not satisfy the USACE wetland hydrology standard with less than fourteen (<14) consecutive days of water within twelve (12) inches of the surface. The longest duration of consecutive days of water within twelve (12) inches of the surface was seven (7).

Water levels in Study Area B are clearly influenced by precipitation (**Insert 15**). Water levels rise and fall sharpy as much as two (2) feet as a response to storm events. Staging of groundwater is observed in February through April. Water levels rose during the course of the study period. The wells went dry during mid-May when winter precipitation waned. This can be seen where water levels seem to hover at their lowest point because the well was dry.

When comparing the pared piezometer and shallow groundwater monitoring well at Study Area B, the Water Level Response (WLR) is classified as discharge during later part of the wet season, meaning that hydrostatic pressure forces water toward the surface during this time. However, water forced to the surface does not drain out as surface water (See **Insert 16 & 17**).

4.4.4 Study Area C

Study Area C contains three (3) shallow groundwater monitoring wells, labeled W7-W9, and one (1) piezometer, labeled P3. No water within twelve (12) inches of the surface occurred for more than fourteen (14) consecutive days during the growing season (**Insert 11**). Wells W7-W9 do not satisfy the USACE wetland hydrology standard with less than fourteen (<14) consecutive days of water within twelve (12) inches of the surface. The longest duration of consecutive days of water within twelve (12) inches of the surface was a couple days. Well W9 was completely dry during the entirety of the study.

Water levels in Study Area C are influenced by precipitation (**Insert 15**). Water levels rise and fall sharpy as much as one (1) foot as a response to storm events. Staging of groundwater is observed in through the course of the study. Water levels generally rose during the course of the study period. The wells went dry during mid-May when winter precipitation waned. This can be seen where water levels seem to hover at their lowest point because the well was dry.

When comparing the pared piezometer and shallow groundwater monitoring well at Study Area B, the Water Level Response (WLR) is classified as recharge during the first part of the study and as discharge during the later part of the wet season. Because water levels in the shallow well was higher than the piezometer during the first part of the study, groundwater was recharged through precipitation entering the area. At the later portion of the growing season, the water levels in the piezometer were higher, indicating hydrostatic pressure from below. However, water forced to the surface does not drain out as surface water (See **Insert 16 & 17**). No surface water was observed in Area C during the duration of the study.

4.4.5 Study Area D

Study Area D contains three (3) shallow groundwater monitoring wells, labeled W10-W12. No water within twelve (12) inches of the surface occurred for more than fourteen (14) consecutive days during the growing season (**Insert 12**). Wells W10-W12 do not satisfy the USACE wetland hydrology standard with less than fourteen (<14) consecutive days of water within twelve (12) inches of the surface. The longest duration of consecutive days of water within twelve (12) inches of the surface was eight (8) days for W10. Well W12 was dry for the majority of the study and did not rise above twelve (12) inches of the surface.

Water levels in Study Area D are influenced by precipitation (**Insert 15**). Water levels rise and fall sharpy as much as one (1) foot as a response to storm events. Staging of groundwater is observed in through the course of the study. Water levels generally rose during the course of the study period. The wells went dry during mid-May when winter precipitation waned. This can be seen where water levels seem to hover at their lowest point because the well was dry.

4.4.6 Study Area E

Study Area E contains two (2) shallow groundwater monitoring wells, labeled W13-W14. No water within twelve (12) inches of the surface occurred for more than fourteen (14) consecutive days during the growing season (**Insert 13**). Wells W13-W14 do not satisfy the USACE wetland hydrology standard with less than fourteen (<14) consecutive days of water within twelve (12) inches of the surface. The longest duration of consecutive days of water within twelve (12) inches of the surface was eleven (11) days for W10. Well W12 was dry for the majority of the study and did not rise above twelve (12) inches of the surface.

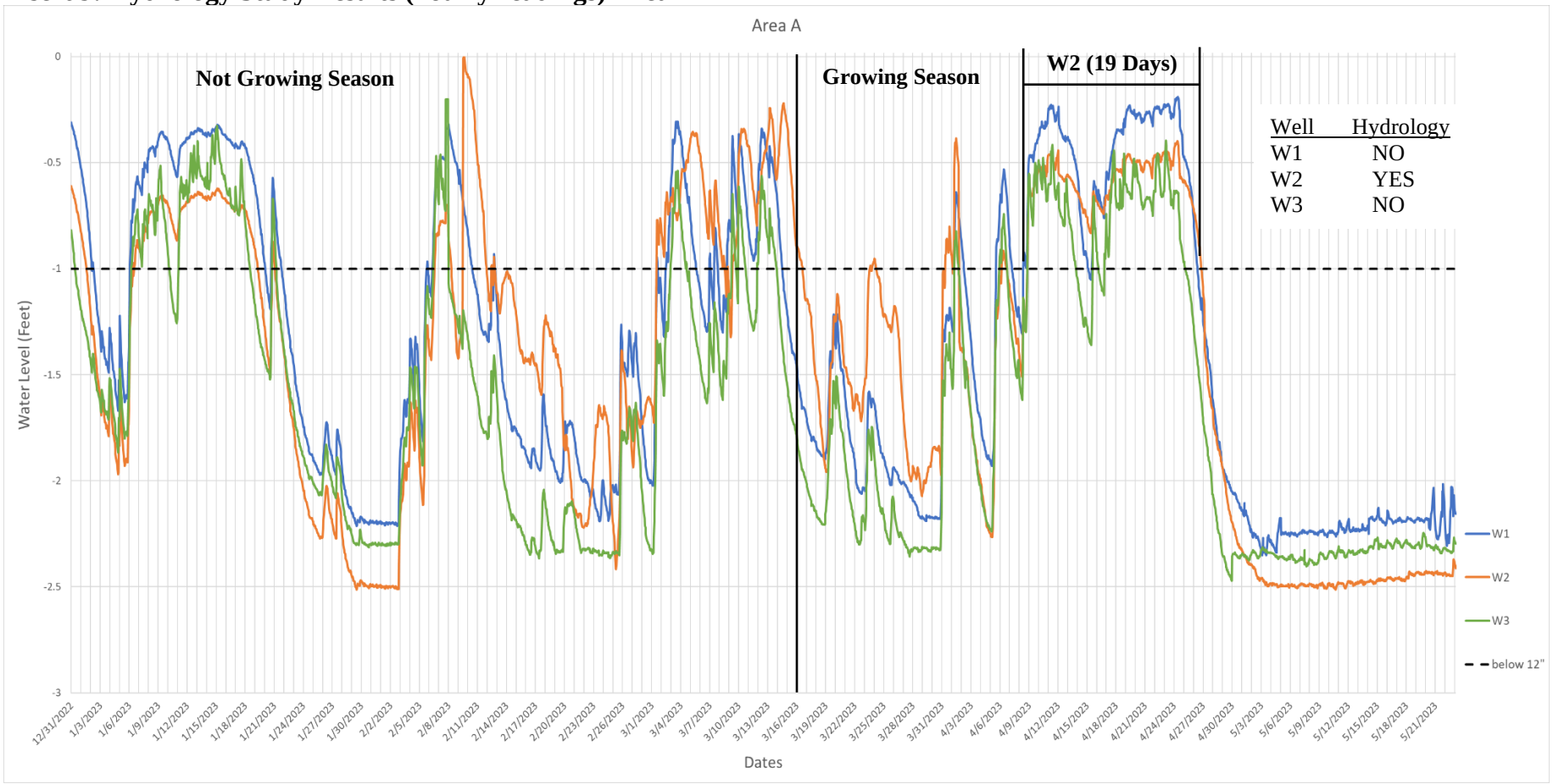
Water levels in Study Area E are influenced by precipitation (**Insert 15**). Water levels rise and fall as much as one and a half (1.5) foot as a response to storm events. Staging of groundwater is observed in through the course of the study. Water levels generally rose during the course of the study period. The wells went dry during mid-May when winter precipitation waned. This can be seen where water levels seem to hover at their lowest point because the well was dry.

4.4.7 Study Area F

Study Area F contains three (3) shallow groundwater monitoring wells, labeled W15-W17. Wells W15 & 16 showed water within twelve (12) inches of the surface for more than fourteen (14) consecutive days (21 days) during the growing season at a time of normal precipitation (**Insert 14**). Thereby, Wells W15 & 16 satisfy the USACE wetland hydrology standard. Well W17 does not satisfy the USACE wetland hydrology standard with less than fourteen (<14) consecutive days (10 days) of water within twelve (12) inches of the surface.

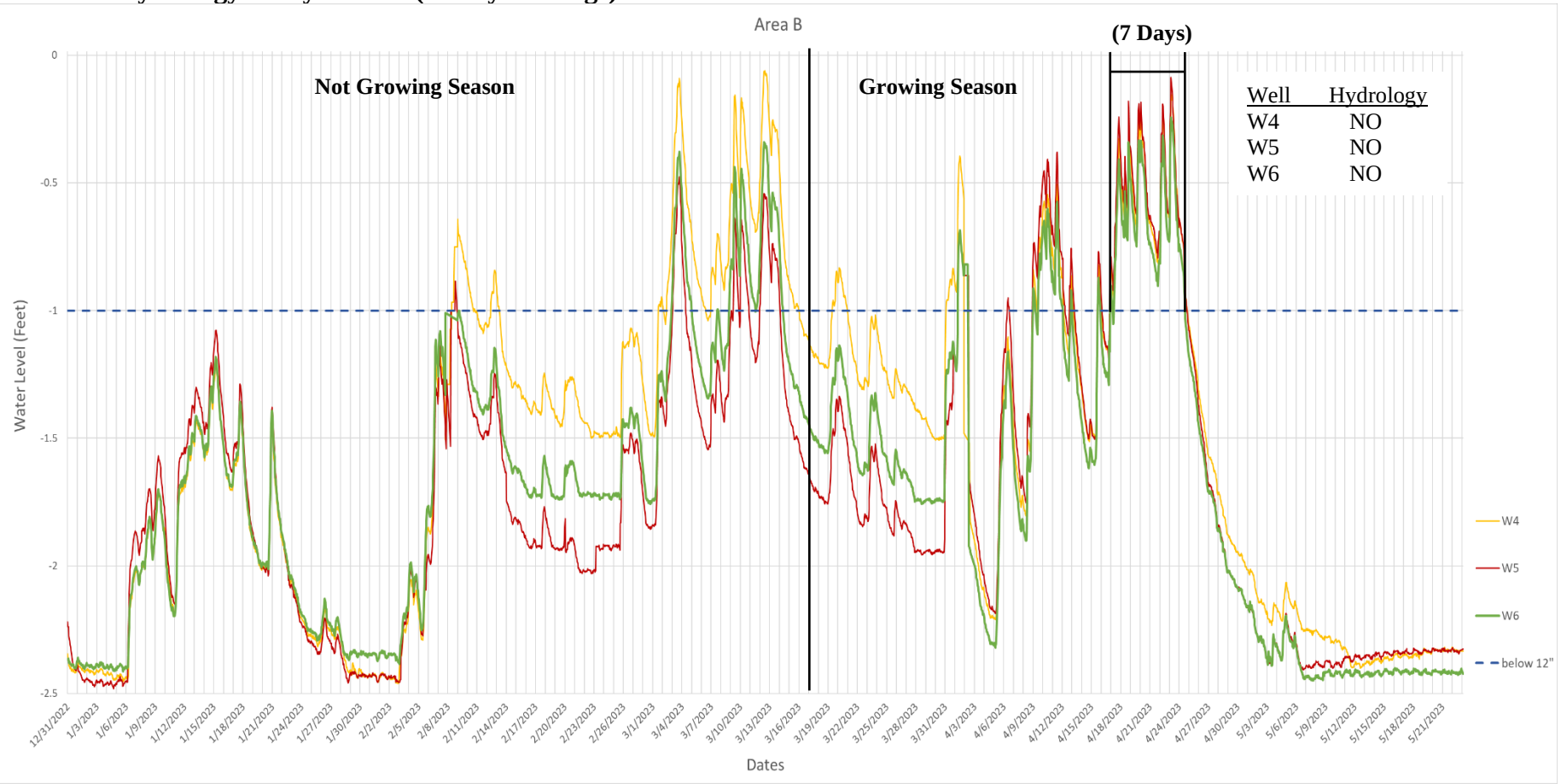
Water levels in Study Area F are influenced by precipitation (**Insert 15**). Water levels rise and fall as much as two (2) foot as a response to storm events. Staging of groundwater occurred less than seen at other study areas. Water appeared to rise during storm events and then fall to dry or almost dry between storm events. The wells went dry during mid-May when winter precipitation waned. This can be seen where water levels seem to hover at their lowest point because the well was dry.

Insert 9: Hydrology Study Results (hourly readings) Area A



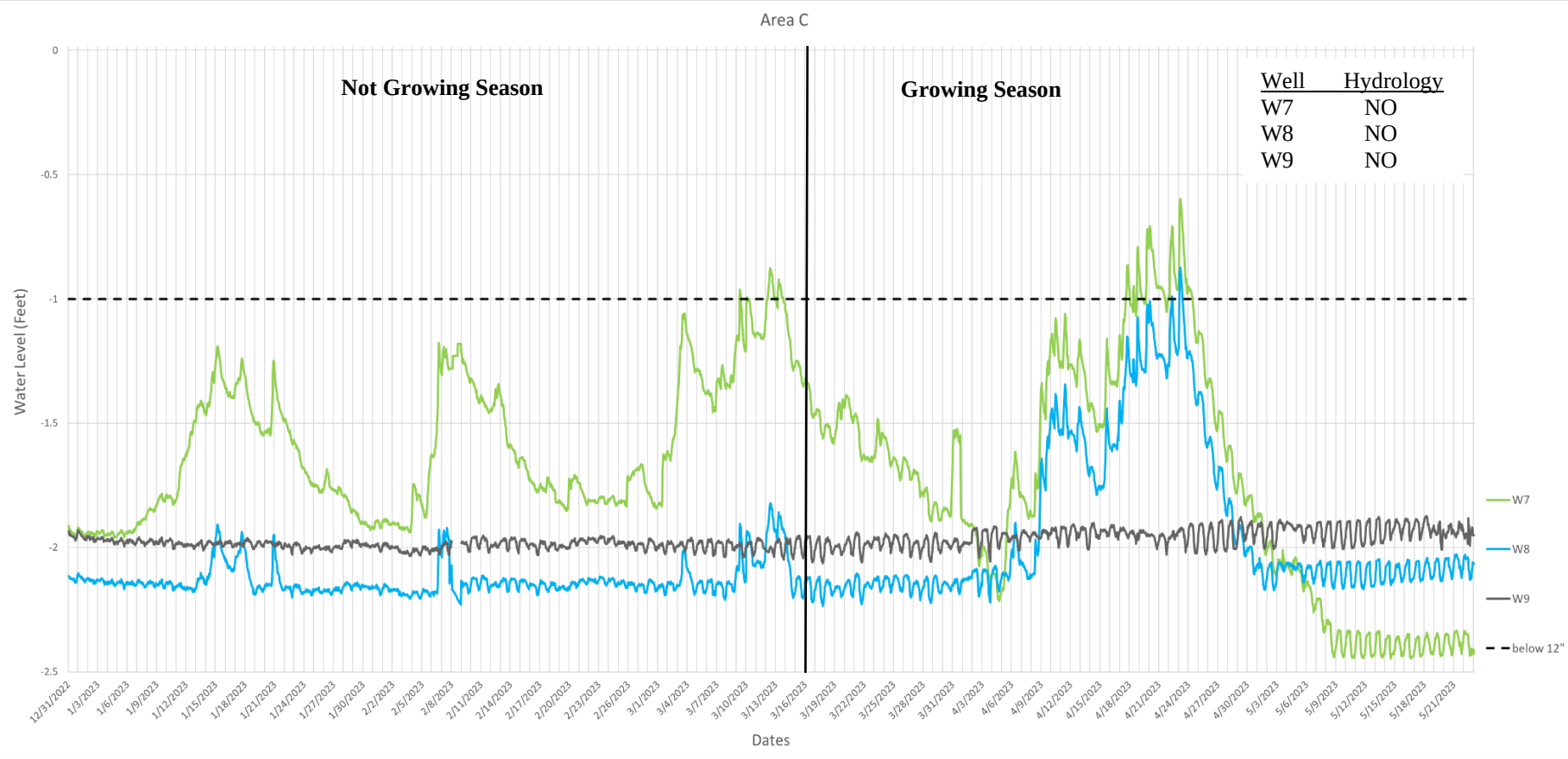
Standard: 14 or more consecutive days of flooding, ponding, or a water table 12 inches (30 cm) or less below the soil surface during the growing season at a minimum frequency of 5 years in 10 (50 percent or higher probability)

Insert 10. Hydrology Study Results (hourly readings) for Area B



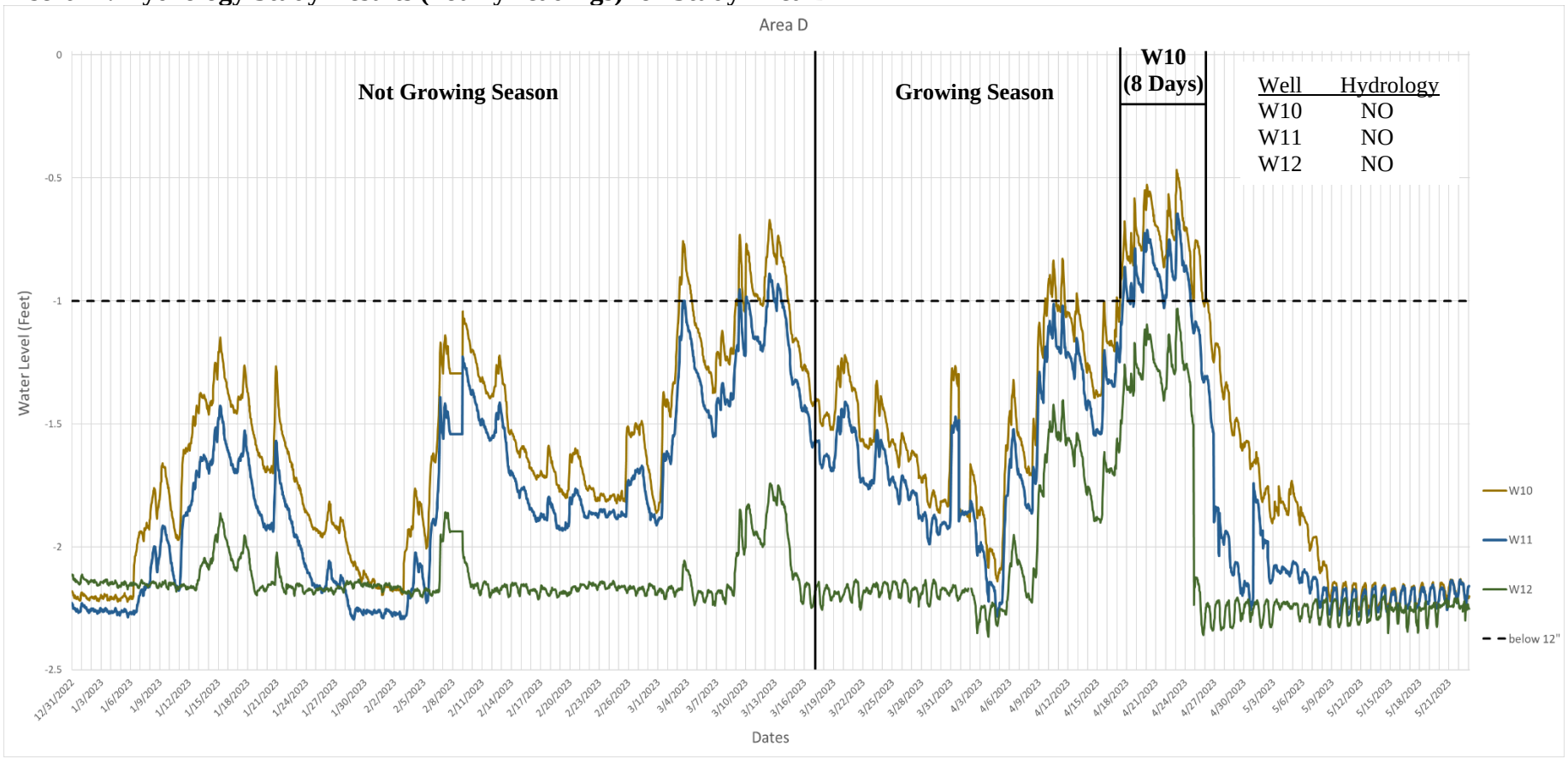
Standard: 14 or more consecutive days of flooding, ponding, or a water table 12 inches (30 cm) or less below the soil surface during the growing season at a minimum frequency of 5 years in 10 (50 percent or higher probability)

Insert 11. Hydrology Study Results (hourly readings) for Area C



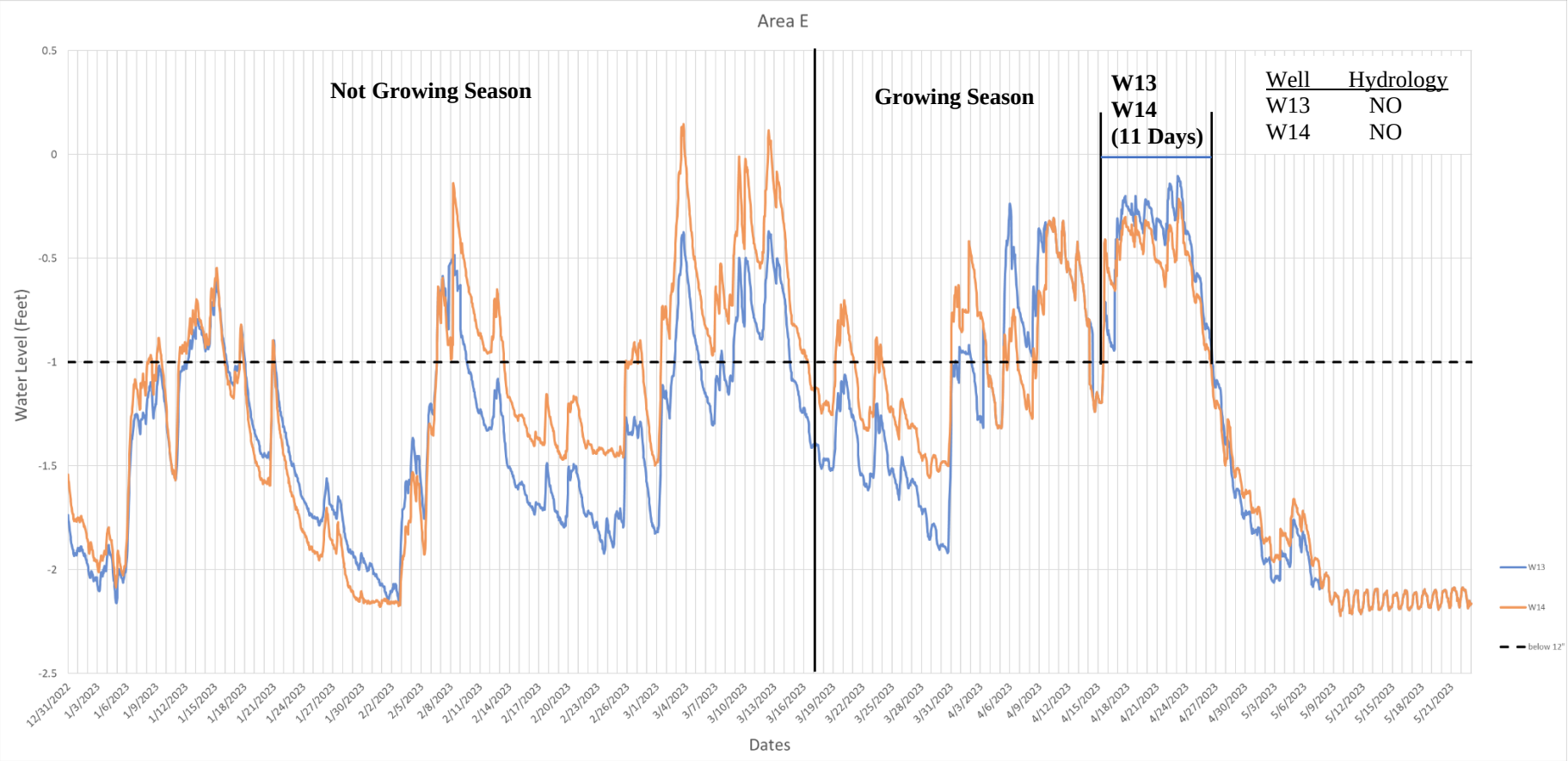
Standard: 14 or more consecutive days of flooding, ponding, or a water table 12 inches (30 cm) or less below the soil surface during the growing season at a minimum frequency of 5 years in 10 (50 percent or higher probability)

Insert 12. Hydrology Study Results (hourly readings) for Study Area D



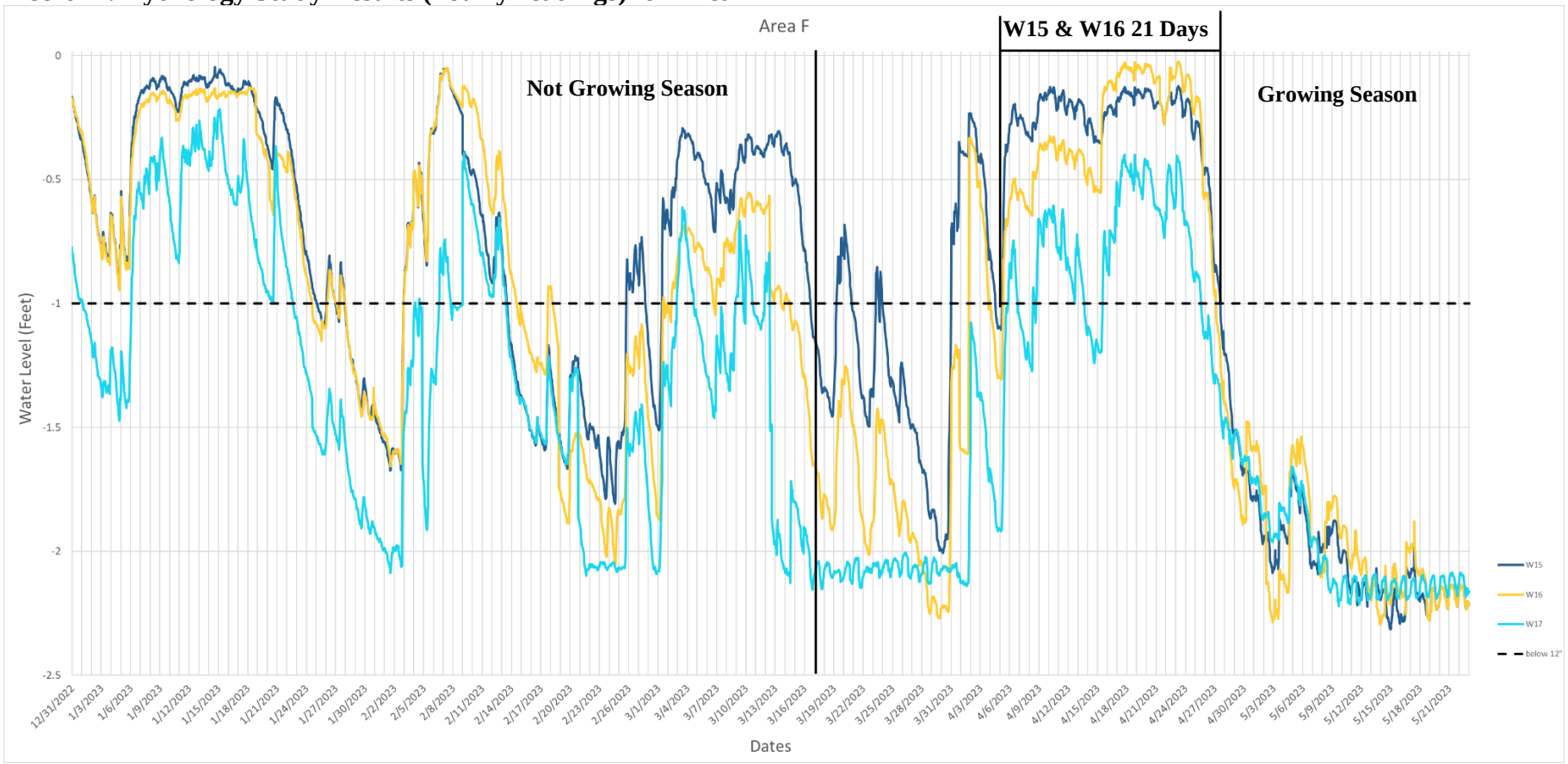
Standard: 14 or more consecutive days of flooding, ponding, or a water table 12 inches (30 cm) or less below the soil surface during the growing season at a minimum frequency of 5 years in 10 (50 percent or higher probability)

Insert 13. Hydrology Study Results (hourly readings) for Area E



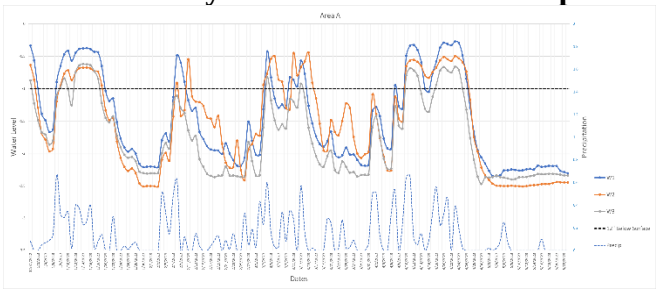
Standard: 14 or more consecutive days of flooding, ponding, or a water table 12 inches (30 cm) or less below the soil surface during the growing season at a minimum frequency of 5 years in 10 (50 percent or higher probability)

Insert 14. Hydrology Study Results (hourly readings) for Area F

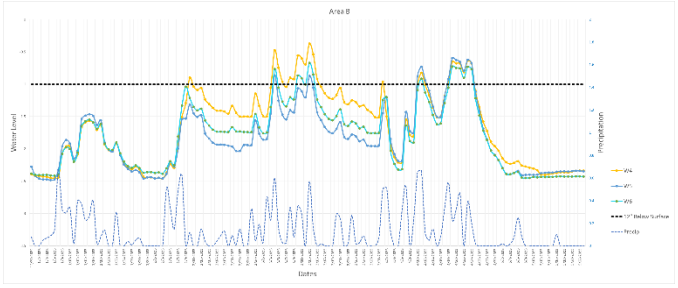


Standard: 14 or more consecutive days of flooding, ponding, or a water table 12 inches (30 cm) or less below the soil surface during the growing season at a minimum frequency of 5 years in 10 (50 percent or higher probability)

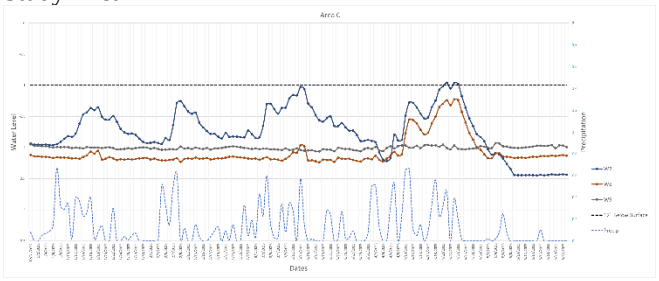
Insert 15. Daily Water Levels with Precipitation



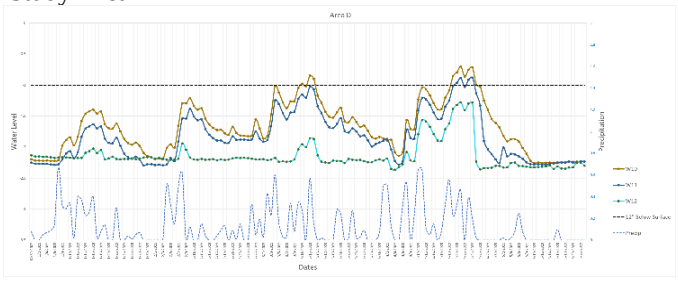
Study Area A



Study Area B

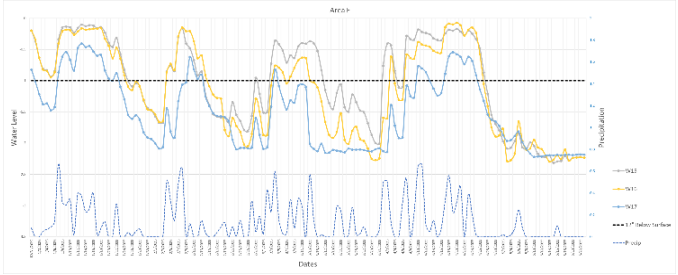


Study Area C



Study Area D

Study Area E



Study Area F

Insert 16. Water Level Response (NRCS [2008] Installing Monitoring Wells in Soils)

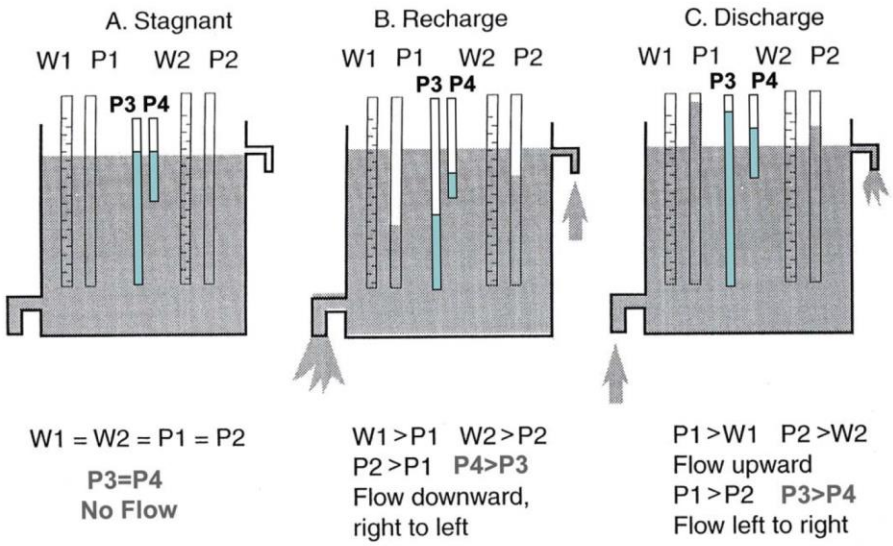


Figure 3. Schematic diagrams of water-table wells (W) and piezometers (P) demonstrating different water-level responses in different instruments. Water flows in tanks differ both laterally and vertically. Instrument pairs 1 vs 2 demonstrate contrasting measurements in instruments of the same length but spaced apart laterally. Instrument pairs P3 vs P4 demonstrate contrasting measurements of piezometers of different lengths located adjacent to each other. **(3A)** In **stagnant water** no head gradients exist, so water levels are the same in all piezometers and wells. **(3B)** In **recharge systems** water flows vertically downward to recharge the groundwater, so shallow P4 intercepts a higher hydraulic head than deeper P3. P1 and P2 pick up the lateral head difference from right to left as well as the vertical difference. **(3C)** In **discharge systems** water flows upward and discharges toward the land surface. Hydraulic gradients and instrument relationships are the reverse of those in recharge system 2B. In all three cases (A, B, and C) water levels are the same in water-table wells. Figure modified from Richardson et al. (2001).

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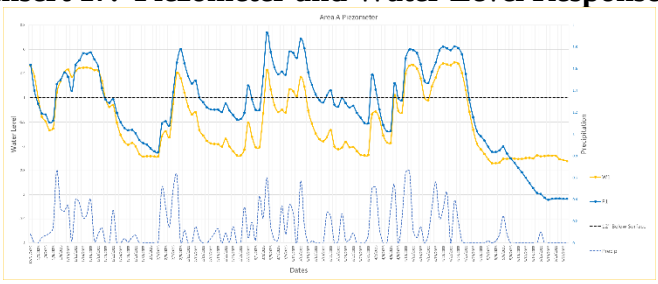
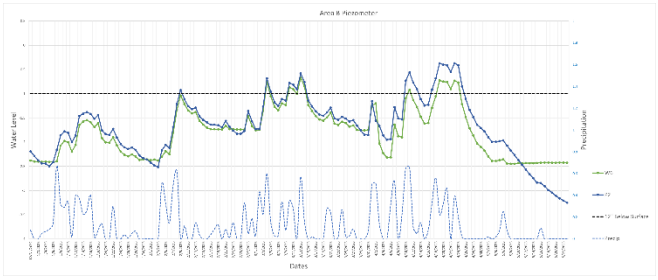
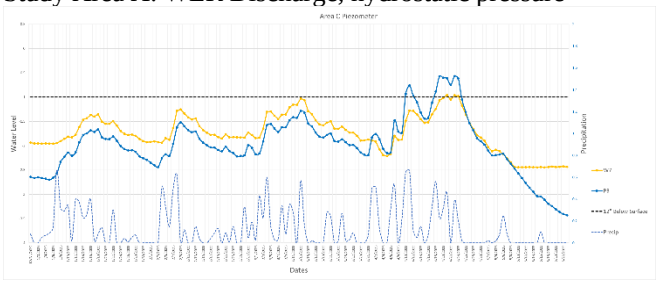
Insert 17. Piezometer and Water Level Response



Study Area A: WLR Discharge, hydrostatic pressure



Study Area B: WLR Discharge, weak hydrostatic pressure



Study Area B: WLR Discharge, weak hydrostatic pressure

Generally, hydrostatic pressure of groundwater increases with hydrological staging as the wet season progresses. The Water Level Response is Discharge because water levels in the piezometers are generally higher than the coupled shallow monitoring well, indicating that hydrostatic pressure pushing groundwater to the surface.

4.4.8 Groundwater or Precipitation Influence

Water levels within the wells correlated with precipitation levels. However, water levels in the wells were delayed for several hours following a storm event, indicating that water levels in the wells are influenced by groundwater moving through a larger basin. Groundwater levels are influenced by precipitation from storm evens in the larger contributing basin. However, some of this time gap between precipitation and groundwater response could be attributed to storms moving from the weather station at the Port of Olympia Airport to the study area, a distance of sixteen (16) miles.

4.4.9 Perched Water Table and Aquitard

Piezometers were paired with shallow groundwater monitoring wells for comparison. Higher water levels in piezometers in comparison to paired shallow wells indicate hydrological recharge originating from groundwater as hydrostatic pressure pushes water to the surface. If no difference between water levels in piezometers and shallow wells, passive groundwater influence can be presumed. Piezometer water depth lower than the paired shallow well typically would indicate that hydrology recharge occurs though precipitation rather than groundwater and/or a perched water table (aquitard) holds water near the soil surface.

Generally, the water levels in onsite piezometers were higher than in paired shallow monitoring wells, indicating a discharge WLR, however, with no surface discharge. Groundwater from the Study areas likely interflowed to the Agricultural ditches. However, recharge of hydrology generally appears to occur from groundwater, which becomes more apparent later in the wet season.

It is important to note that the shallow groundwater monitoring wells were not extended into an impermeable layer, thereby, the shallow wells did not penetrate an aquitard.

5.0 WETLAND DETERMINATION

5.1 General Determination

Two (2) wetlands, labeled Wetland B and Wetland C, have been identified on the southern portion of the subject property using advanced methods described in Chapter 5 of the USACE (2010) Regional Supplement (**Figure 7**). Three (3) shallow groundwater monitoring wells, W2, W15, & W16, tested positive for the USACE Wetland Hydrology Standard (**Figure 5**). The Redox Test supports the hydrology results, indicating positive test results at W2 and W15. However, the positive results at these two (2) test locations are borderline, indicating very marginal wetland conditions. A negative Chemical Test result applying alpha alpha dipyridyl further indicates very marginal wetland conditions, especially considering the obviously positive result at the reference sample in Wetland A.

5.2 Wetland B

Wetland B (2,136 sf) is located with Study Area A (**Figure 7**). Three (3) shallow monitoring wells were installed within Study Area A. The Redox Test and Chemical Test was performed at the sample point with the wettest appearance during the wettest part of the growing season.

Soils and vegetation can be assumed if the USACE hydrology standard is satisfied. The standard calls for fourteen (14) consecutive days of water within twelve (≤12) inches of the surface during the growing season five (5) out of ten (10) years. Well W2 shows water levels above twelve (12) inches of the surface for nineteen (19) consecutive days during the growing season, marginally passing the test, before falling sharply during mid-May (**Insert 5**). The Redox Test also marginally passes at Well W2. However, the Chemical Test does not pass at Well W2, indicating very marginal wetland conditions at best, especially considering the strongly positive test in Wetland A.

The patch of rushes growing in Wetland B can be seen from aerial photographs captured from a drone flown over the southern portion of the subject property (**Appendix A, Photos 25, 26, & 29**). Wetland B is a wallow that attracts livestock, which alter, soils, vegetation, and hydrology (USACE 2010). Livestock compressed soil, consumes the vegetation, and drops massive volumes of manure that alters the appearance and chemistry of the soils. Soil compaction from wallowing livestock can reduce percolation and increased wetness. Manure trampled into the ground can darken the soils, superficially resembling the color of organic soils. Wetter soils containing manure are more likely to exhibit anerobic conditions caused by bacterial decomposition.

Abnormally high precipitation occurred when Well W2 exceeded fourteen (14) consecutive days of water within twelve (12) inches of the surface. This abnormally high precipitation may have contributed to passing the USACE Wetland Hydrology Standard. Thereby, abnormally high precipitation during the month of April created the possibility of a 'False Positive' result. However, normal precipitation occurred when considering the entirety of the study and three (3) months prior. Essentially, this abnormally high precipitation made up for several prior months of abnormally low precipitation for levels to even out to normal. When considering that Well W2 did not pass the Chemical Test and marginally passed the Redox Test, the possibility of a 'False Positive' increases.

In conclusion, Wetland B is a very marginal wetland with no significant habitat value or wetland functions that may have been created by wallowing livestock. Wetland B is very marginal wetland at best and may not function as a wetland during years of lower precipitation.

5.3 Wetland C

Wetland C (2,136 sf) is located with Study Area F (**Figure 7**). Three (3) shallow monitoring wells were installed within Study Area F, W15, W16, & W17. The Redox Test and Chemical Test was performed at the sample point with the wettest appearance during the wettest part of the growing season.

Soils and vegetation can be assumed if the USACE hydrology standard is satisfied. The standard calls for fourteen (14) consecutive days of water within twelve (≤12) inches of the surface during the growing season five (5) out of ten (10) years. Wells W15 & W16 show water levels above twelve (12) inches of the surface for twenty-one (21) consecutive days during the growing season before falling sharply during mid-May (**Insert 10**). One (1) of the two (2) samples marginally passed the Redox Test at Well W15. However, the Chemical Test did not pass at Well W15, indicating very marginal wetland conditions at best, especially considering the strongly positive test in Wetland A.

Wetland C is a wallow that attracts livestock, which alter, soils, vegetation, and hydrology (USACE 2010). Livestock compressed soil, consumes the vegetation, and drops massive volumes of manure that alters the appearance and chemistry of the soils. Soil compaction from wallowing livestock can reduce percolation and increased wetness. Manure trampled into the ground can darken the soils, superficially resembling the color of organic soils. Wetter soils containing manure are more likely to exhibit anerobic conditions caused by bacterial decomposition.

Abnormally high precipitation occurred when Wells W15 & W16 exceeded fourteen (14) consecutive days of water within twelve (12) inches of the surface. This abnormally high precipitation may have contributed to passing the USACE Wetland Hydrology Standard. Thereby, abnormally high precipitation during the month of April created the possibility of a 'False Positive' result. However, normal precipitation occurred when considering the entirety of the study and three (3) months prior. Essentially, this abnormally high precipitation made up for several prior months of abnormally low precipitation for levels to even out to normal. When considering that Well W15 did not pass the Chemical Test and marginally passed the Redox Test, the possibility of a 'False Positive' increases.

In conclusion, Wetland C is a very marginal wetland with no significant habitat value or wetland functions that may have been created by wallowing livestock. Wetland C is very marginal wetland at best and may not function as a wetland during years of lower precipitation.

6.0 CONCLUSION

Advanced studies were performed on areas defined as difficult situations by the USACE (2010) Regional Supplement. These advanced methods were applied as required when evaluating difficult situations under Chapter 5 of the USACE (2010) Regional Supplement.

These difficult situations consist of patches of soft rush (*Juncus effusus*, FACW) and slender rush (*Juncus tenuis*, FAC) with some limited slough sedge (*Carex obnupta*, OBL) in livestock wallows on the southern portion of the subject property (**Appendix A, Photos 24, 31, 32, 38, & 42**). However, no hydric soils were identified in these areas and no hydrology was identified during the growing season using the routine onsite determination method. These areas did not satisfy all three (3) criteria (*i.e.*, hydric soils, hydrophytic vegetation, and wetland hydrology) for a wetland determination. Hydric soils and hydrology were not satisfied under the routine on-site determination method.

Although the patches of rushes did not satisfy the hydric soils or wetland hydrology criteria using the routine on-site determination method, wetlands have been mapped in these areas by several governmental Agencies, warranting a higher level of evaluation (**Appendices B, C, D, E, & F**).

Six (6) Study Areas, labeled Study Areas A-F, were established where difficult conditions have been identified (**Figure 4**). The advanced study period was implemented from 31 December 2022 to 23 May 2023. The study period extended for the duration of the wettest part of the growing season.

Seventeen (17) shallow groundwater monitoring wells were installed in difficult areas to determine whether groundwater levels satisfy the US Army Corps of Engineers (USACE) wetland hydrology standard as outlined in Chapter 5 of the USACE (2010) Regional Supplement (**Figure 4**).

Three (3) piezometers were installed within three (3) of the study areas, especially Study Areas A-C (**Figure 4**). The Redox Test was performed to determine if soils within the Study Areas are functioning as hydric soils. A positive result applying alpha alpha dipyridyl to soils is a primary indicator of hydrology and an indicator of hydric soils. These two (2) additional tests are a supplement to the hydrology study that are in compliance with USACE wetland identification procedures within Chapter 5 of the USACE (2010) Regional Supplement.

Wells W2 and W15 satisfied the USACE Wetland Hydrology Standard and the Redox Test. None of the Well locations satisfied the Chemical Test applying alpha alpha dipyridyl. Because W2 and W15 satisfied the USACE Hydrology Standard and the Redox Test, wetland criteria have been met. A

positive determination of wetlands, labeled Wetland B and Wetland C, have been made at these two (2) monitoring wells (**Figure 7**).

Abnormally high precipitation occurred during the month of April. This abnormally high precipitation may have contributed to passing the USACE Wetland Hydrology Standard. Thereby, abnormally high precipitation during the month of April created the possibility of a 'False Positive' result. However, normal precipitation occurred when considering the entirety of the study and three (3) months prior. Essentially, this abnormally high precipitation made up for several prior months of abnormally low precipitation for levels to even out to normal. When considering that Well W2 did not pass the Chemical Test and marginally passed the Redox Test, the possibility of a 'False Positive' increases.

In conclusion, Wetlands B & C are very marginal wetland with no significant habitat value or wetland functions that may have been created by wallowing livestock. These wetlands are very marginal at best and may not function as wetlands during years of lower precipitation.

7.0 REFERENCES

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service, Department of the Interior. FWSOBS-70/31.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Hitchcock, C.L., and A. Cronquist. 1973. *Flora of the Pacific Northwest*. University of Washington Press. 730 pp.

Iowa State University. 1995. Hydric Soils of Washington State. U.S. Department of Agriculture, Natural Resources Conservation Service. December 5.

Lichar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *Western Mountains, Vallies & Coast 2016 Regional Wetland Plant List.* 28 April 2016.

Munsell Color. 1988. *Munsell Soil Color Charts*. Kollmorgen Instruments Corp., Baltimore, Maryland.

U.S. Army Corps of Engineers. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0).* U.S. Army Engineer Research and Development Center. Vicksburg, MS.

U.S. Department of Agriculture, Soil Conservation Service. June, 1991. *Hydric Soils of the United States.*

U.S. Department of Agriculture, Soil Conservation Service. 1973. Kitsap County Area Soil Survey.

Washington State Department of Ecology. 1997. Washington State Wetland Identification and Delineation Manual. March.

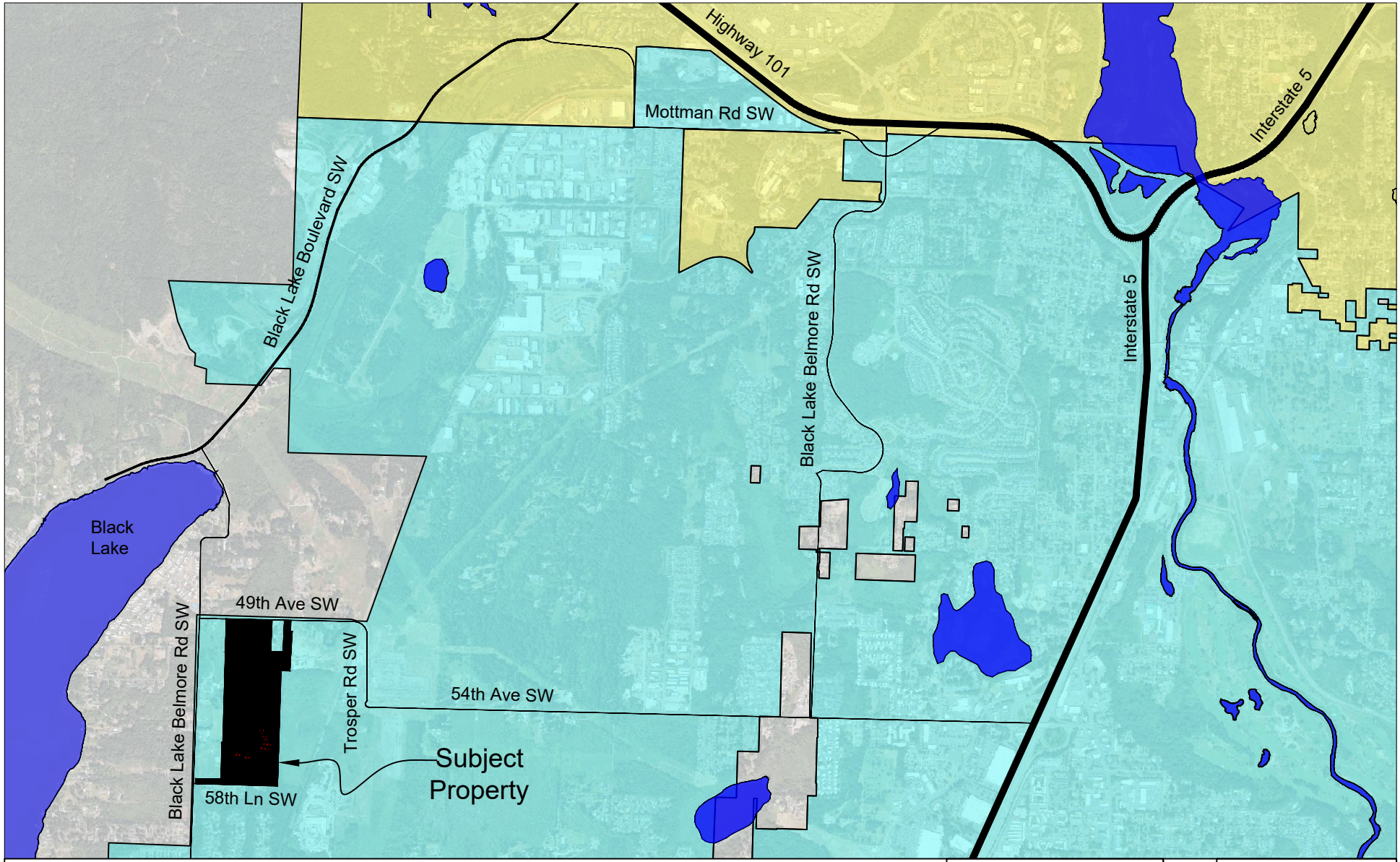
Washington State Department of Ecology. 1997. Washington State Wetland Identification and Delineation Manual. March.

Washington State Department of Ecology. 2006. Wetland Mitigation in Washington State Part 1: Agency Policies and Guidance. Version 1, March 2006 (Publication # 06-06-011a)

Washington State Department of Ecology. 2006. Wetland Mitigation in Washington State Part 2: Developing Mitigation Plans. Version 1, March 2006 (Publication # 06-06-011b)

Washington State Department of Ecology. 2014. . Washington State Wetland Rating System for Western Washington. Ecology Publication # 14-06-029. August.

FIGURES



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City of Tumwater
City of Olympia

Figure 1

Bodenhamer

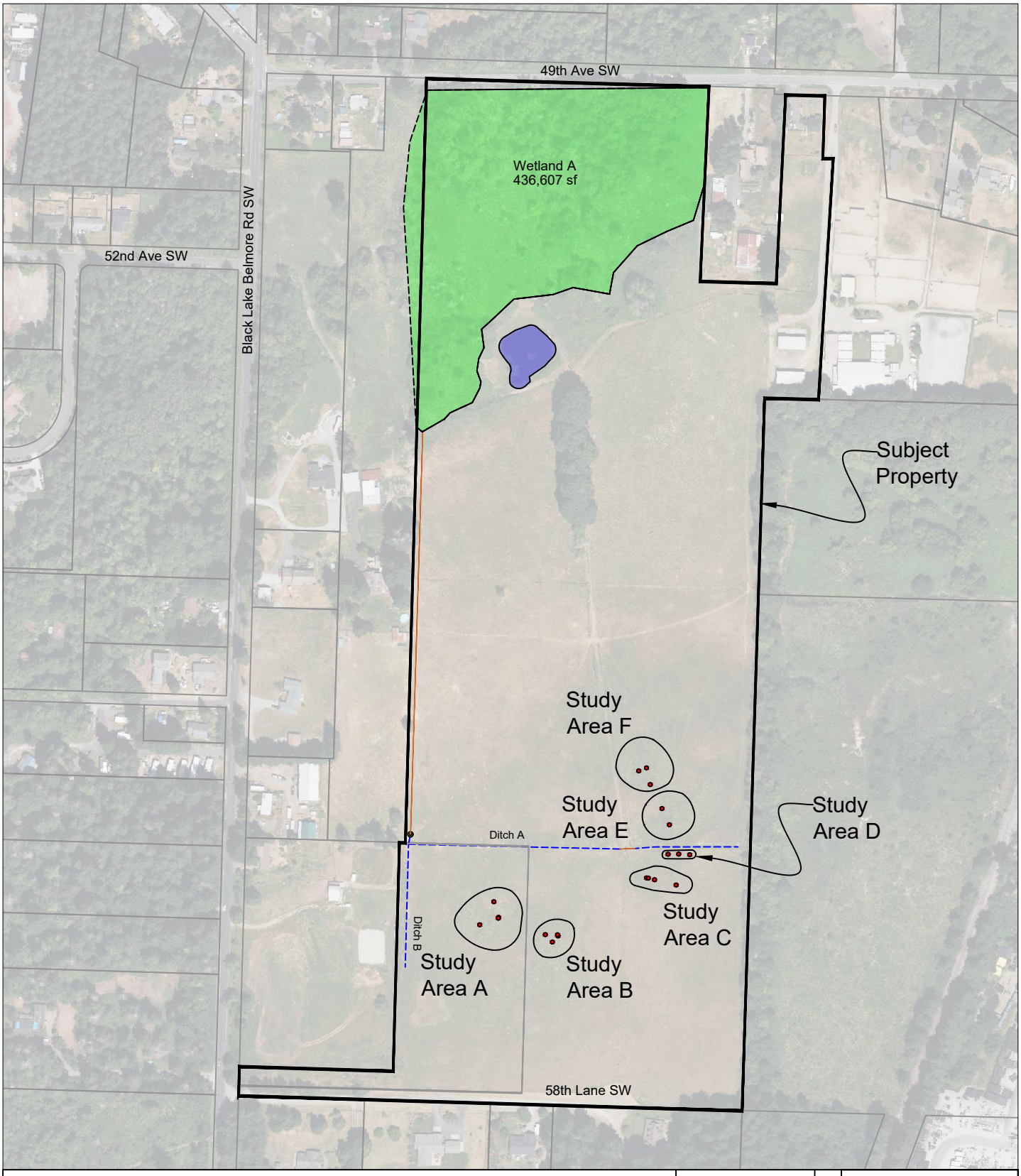
Vicinity Map

N

Scale: 1" = 2200'

0 2200'

14 June 2023



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Wetland (Delineated)
Wetland (Not Delineated)
Farm Pond
Farm Ditches
Conveyance Pipes
Monitoring Well Locations

Figure 2

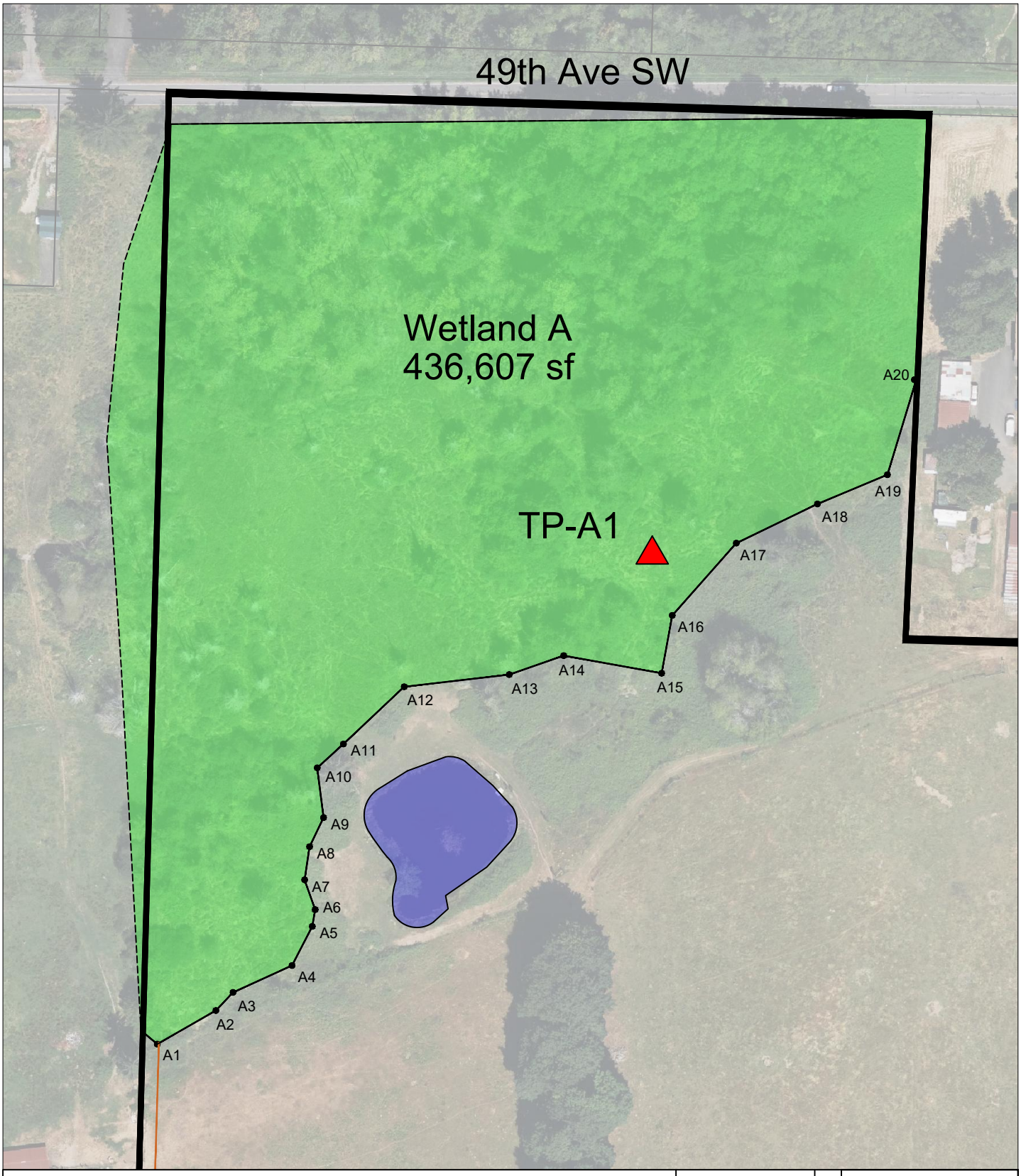
Bodenhamer

Study Areas

Scale: 1" = 350'

0 350'

14 June 2023



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Wetland (Delineated)
Wetland (Not Delineated)
Farm Pond
A1 — A2 Wetland Delineation
Conveyance Pipes
TP A1 Test Plot

Figure 3

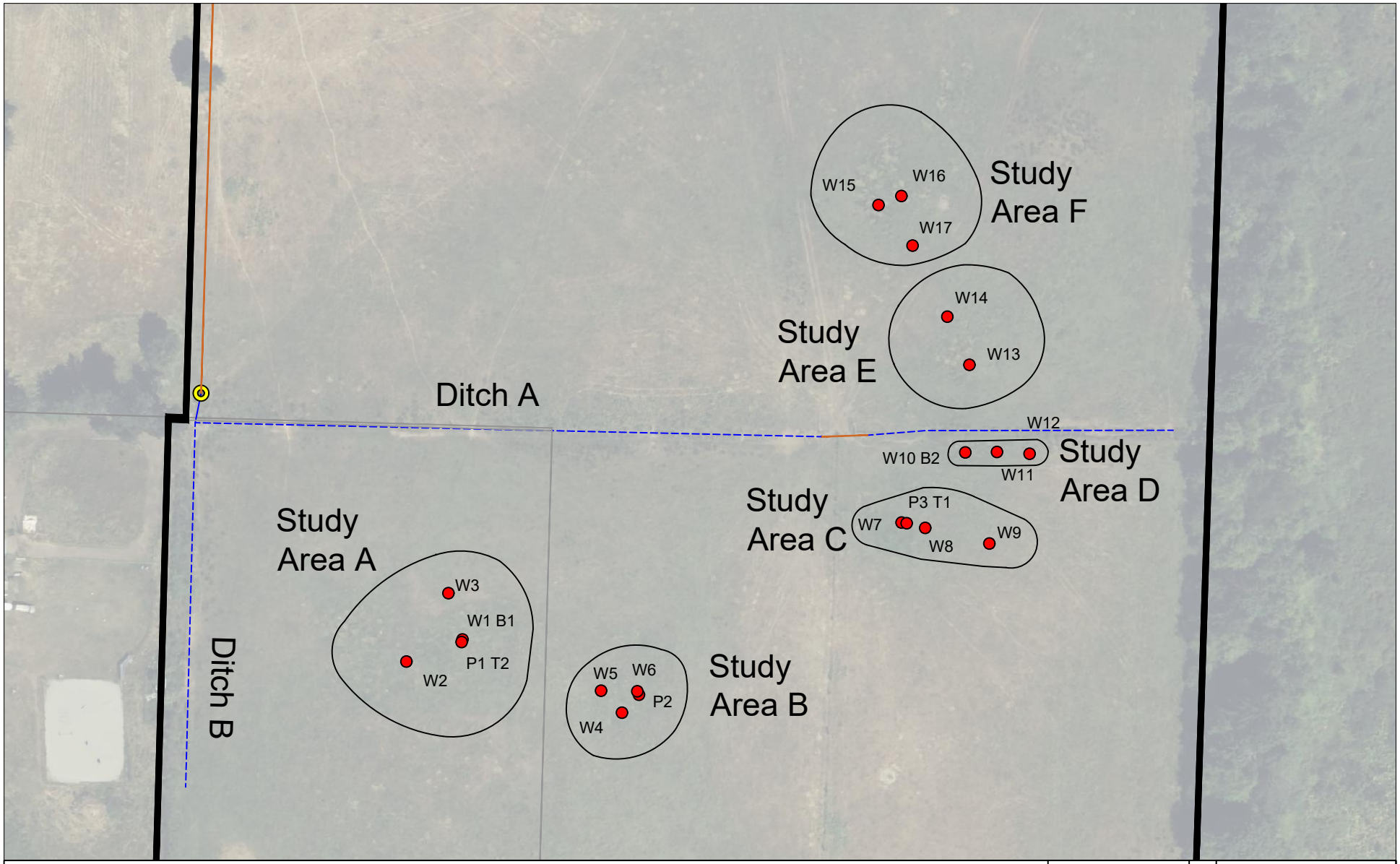
Bodenhamer

Wetland A Delineation

Scale: 1" = 130'

0 130'

14 June 2023



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Monitoring Well Locations
Farm Ditches
Conveyance Pipes

Figure 4

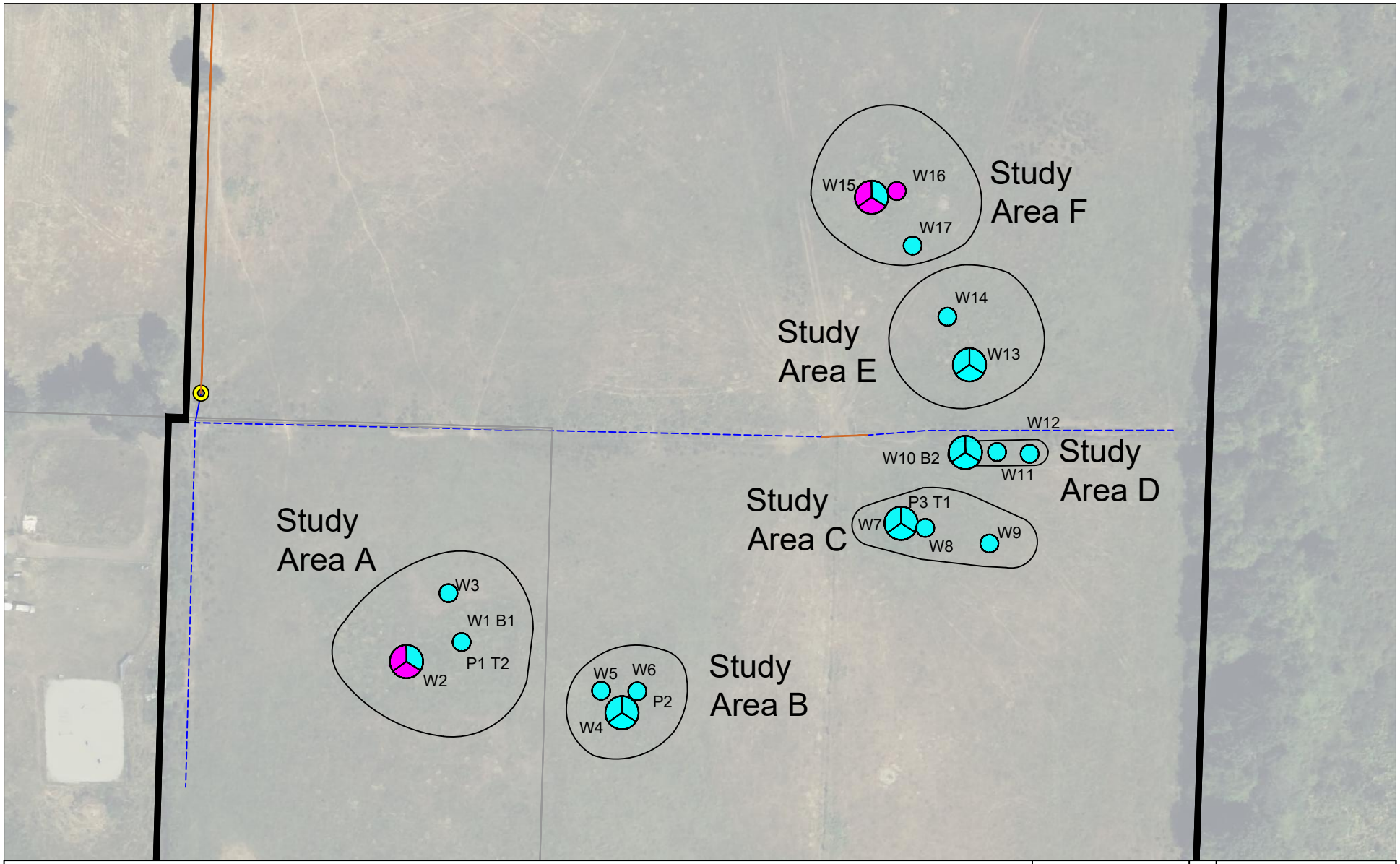
Bodenhamer

Study Areas

Scale: 1" = 120'

0 120'

14 June 2023



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Positive	Negative	Chemical Test
Positive	Negative	Redox Test
Positive	Negative	Well Results (Hydrology)
Positive	Negative	Well Results Alone (Hydrology)

Figure 5

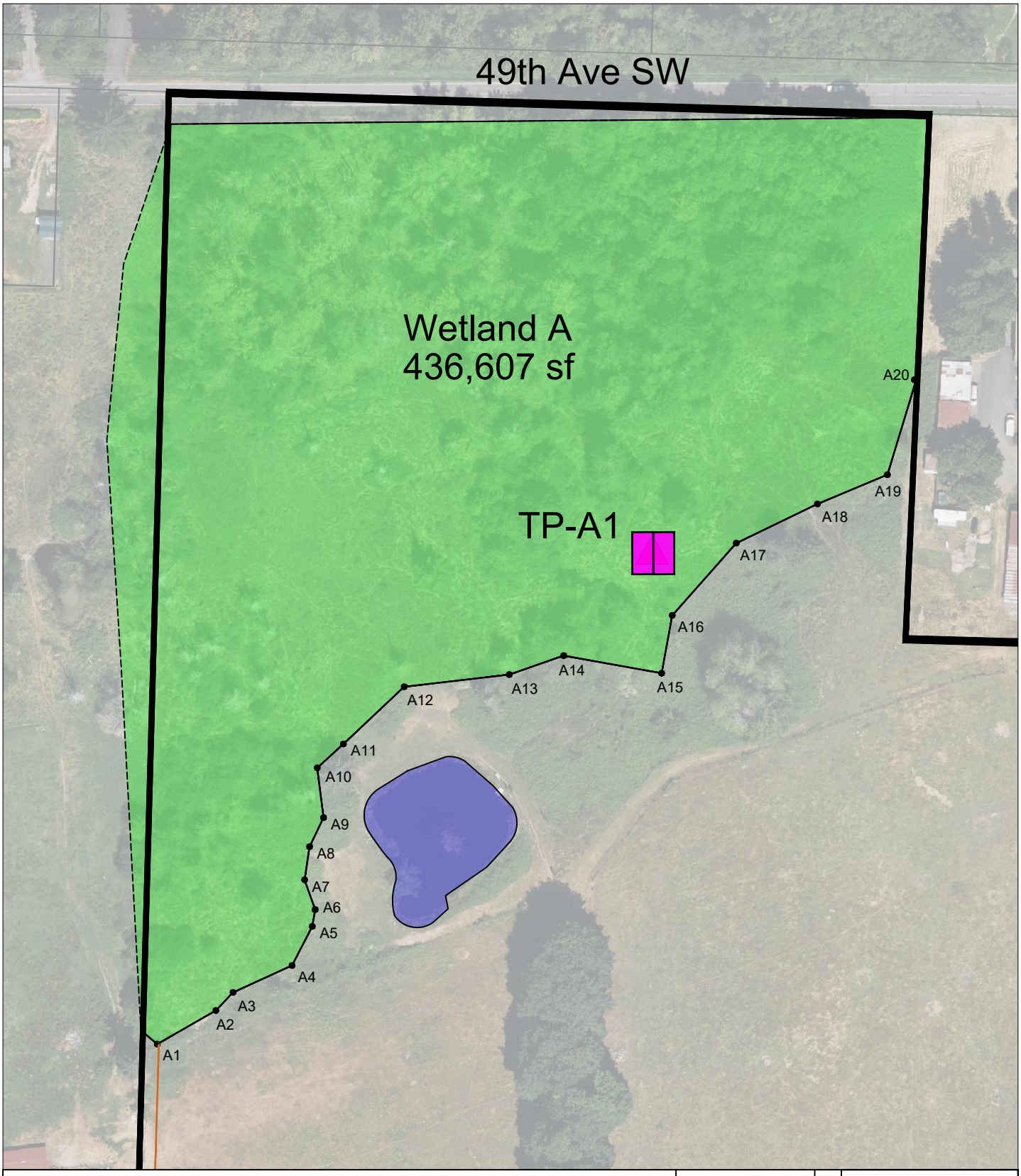
Bodenhamer

Results

Scale: 1" = 120'

0 120'

14 June 2023



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Wetland (Delineated)
Wetland (Not Delineated)
Active Farm Pond

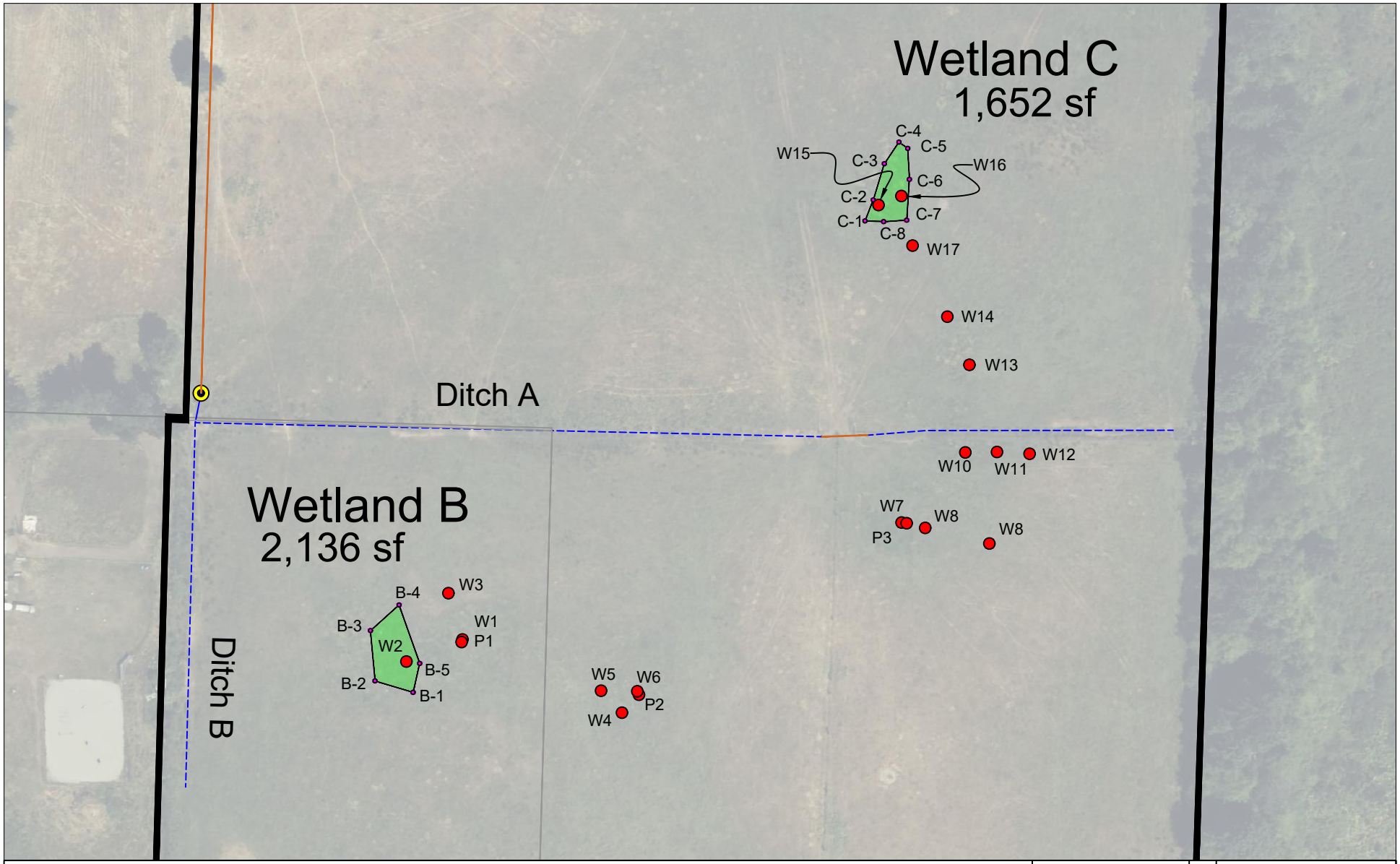
Positive	Negative	Chemical Test
Positive	Negative	Redox Test

Figure 6

Bodenhamer
Wetland A
Reference
Test Results

Scale: 1" = 130'
0 130'

14 June 2023



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Wetland (Delineated)

Figure 7

Bodenhamer

Results

Scale: 1" = 120'

0 120'

14 June 2023

APPENDIX A

Photographs

Subject Property

Photo 1. Livestock roam the entire subject property

Photo 2. Livestock roam the entire subject property

Photo 3. European pasture grasses dominate vegetation

Photo 4. Pastureland, livestock under trees in distance

Photo 5. Pastureland near farm pond, northern portion of property

Photo 6. Pastureland, European grasses

Photo 7. Farm pond on northern portion of property

Photo 8. Farm pond on northern portion of property

Photo 9. Heavily grazed grasses on edge of Wetland A

Photo 10. Heavily grazed pasture on northern part of property

Photo 11. Patches of scotch broom in the pasture

Photo 12. Highly trampled pasture from livestock

Photo 13. Heavily grazed and trampled pasture area

Photo 14. Pastureland facing west

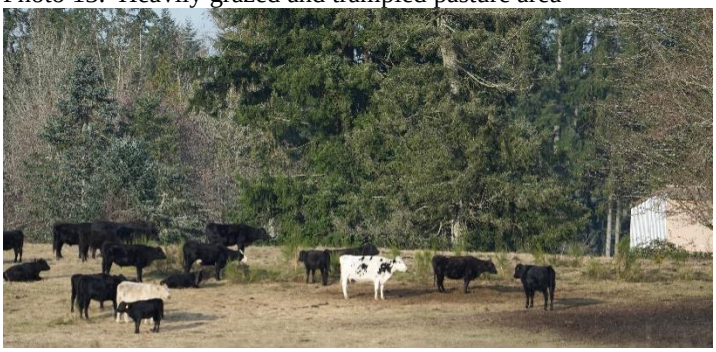


Photo 15. Livestock gathering in the pasture

Photo 16. Livestock near monitoring wells in pasture

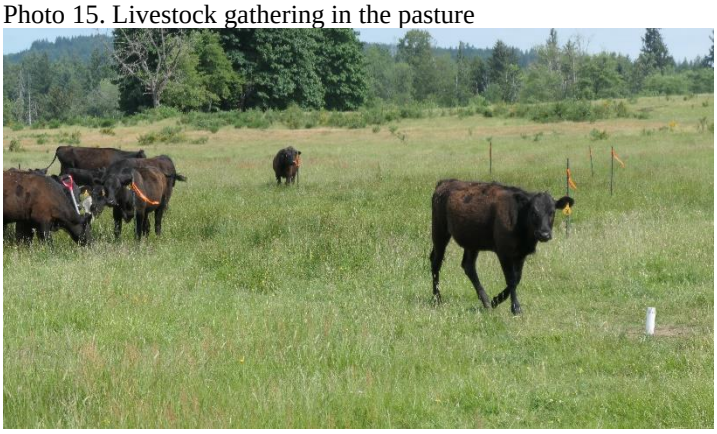


Photo 15. Livestock near Well W17

Photo 16. Livestock at Study Area F

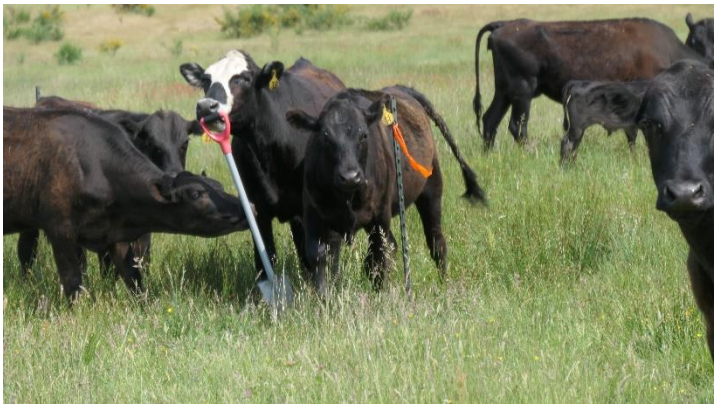


Photo 19. Livestock stole my shovel in Study Atea F

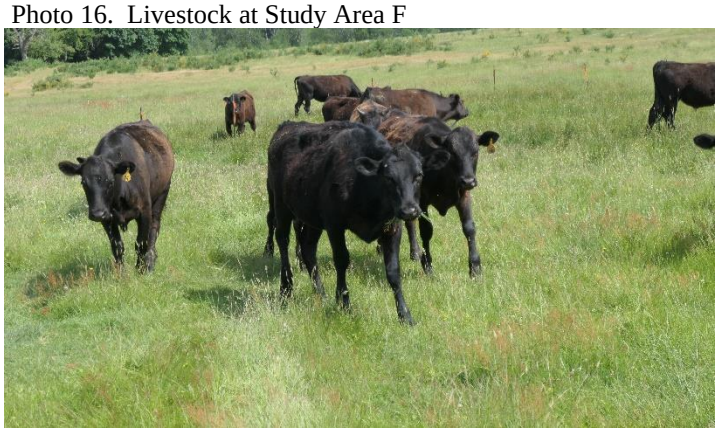


Photo 20. Livestock in Study Area E

Photo 21. Livestock near Well W17

Photo 22. Livestock on the subject property

Study Areas

Photo 23. Area A, winter, no water, buckets over the wells

Photo 24. Area A, summer, no water

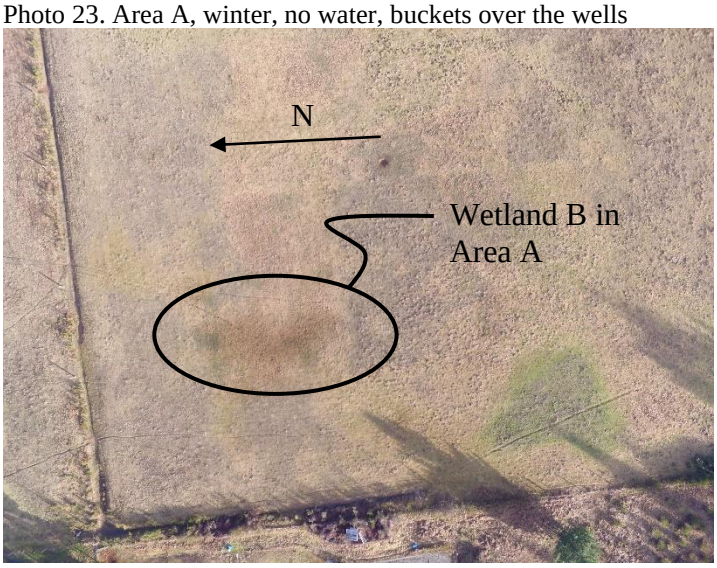


Photo 25. Area A from above

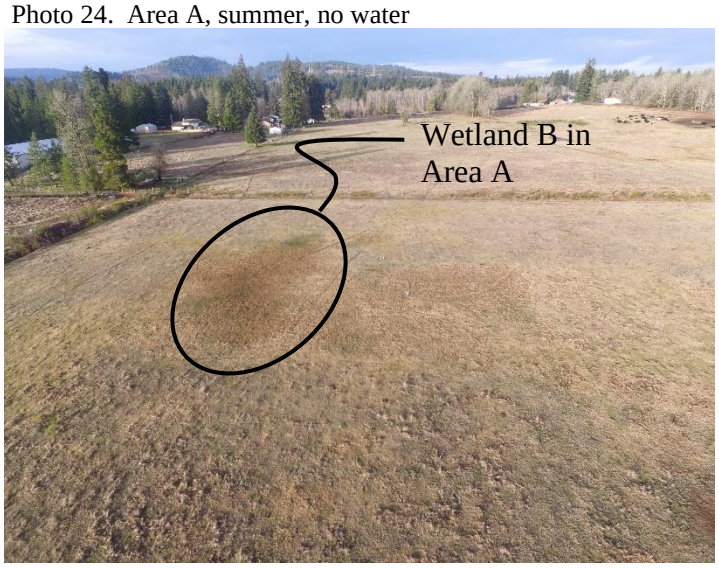


Photo 26. Area A from above

Photo 27. Area B during study, no water

Photo 28. Area B from a distance, no water

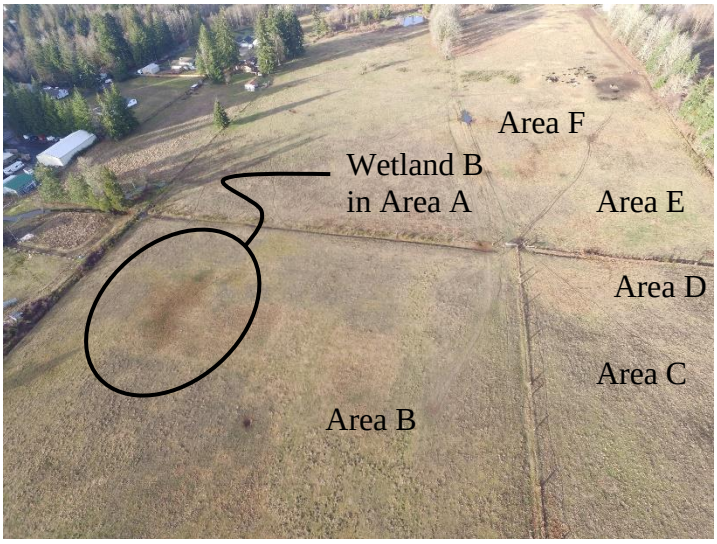


Photo 29. Areas A, B, C, E, & D

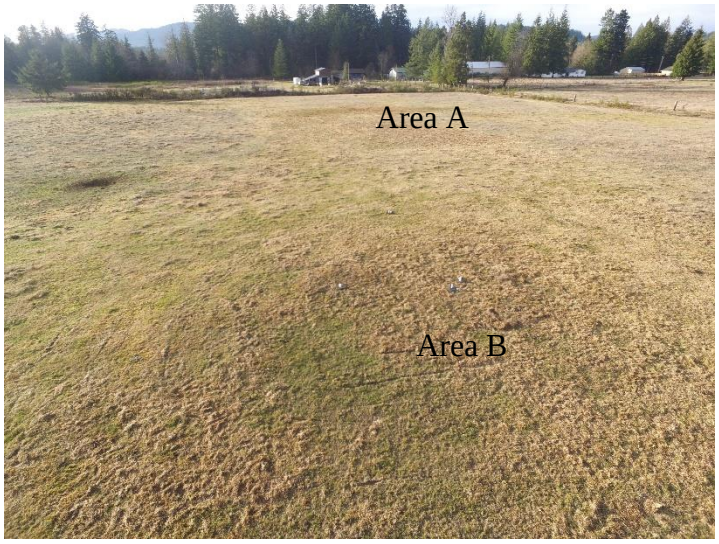


Photo 30. Areas A & B


Photo 31. Area C vegetation change, no water


Photo 32. Area C vegetation change, no water


Photo 33. Areas C & D

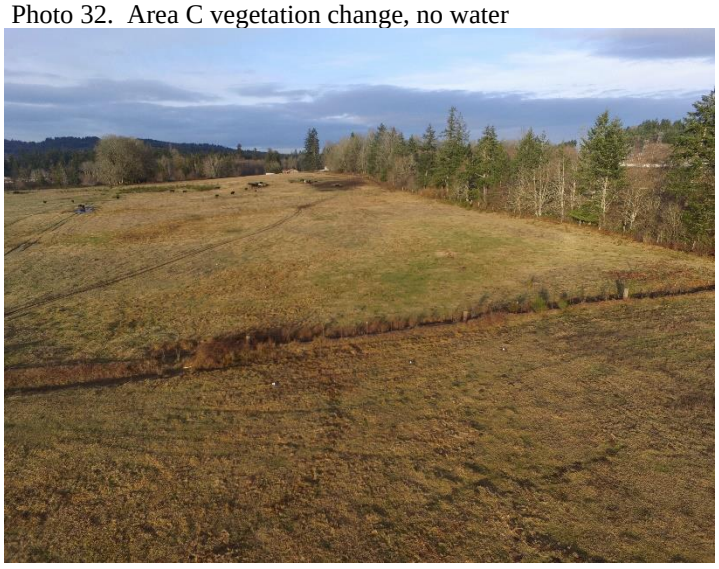


Photo 34. Areas B, E, & F

Photo 35. Wells 15 & 16 of Area F

Photo 36. Area F, no surface water

Photo 37. Area D in the winter, no surface water

Photo 38. Area D in the summer, no surface water

Photo 39. Area E in the winter, no surface water

Photo 40. Area E, Area F in background, no surface water

Photo 41. Area F, livestock in background, no surface water

Photo 42. Area F, no surface water, soft and slender rush

Well Monitoring

Photo 43. Installing Well W1 and Piezometer P1

Photo 44. Installing Well W1 and Piezometer P1

Photo 45. Wells W1, W2, & P1 in Area A

Photo 46. Wells W1, W3, & P1 in Area A

Photo 47. Well W2 in Area A

Photo 48. Well W3 in Area A

Photo 49. Well W3 in Area A

Photo 50. Well W3 in Area A

Photo 51. Datalogger in Well W3

Photo 52. Well W4, W6 & P2 in background, no surface water

Photo 53. Datalogger extracted from W3 at end of study, dry

Photo 54. Collecting well data in the field from dataloggers

Photo 55. Well W5 in Area B, no surface water

Photo 56. Well W5 in Area B, no surface water

Photo 57. Well W5 and Study Area B

Photo 58. Well W6 & Piezometer P2 in Study Area B

Photo 59. Well W9 in Study Area C

Photo 60. Device to measure water depth in well

Photo 61. Well W10 in Study Area D

Photo 62. Wells W10, W11, & W12 in Study Area D

Photo 63. Wells W10, W11, & W12 in Study Area D

Photo 64. Wells W10, W11, & W12 in Study Area D

Photo 65. Wells W10, W11, & W12 covered by blue buckets

Photo 66. Wells W10, W11, & W12 covered by blue buckets

Photo 67. Wells W17, W8, W9, & P3 under blue buckets, Area C

Photo 68. Wells W17, W8, & P3 under blue buckets, Area C

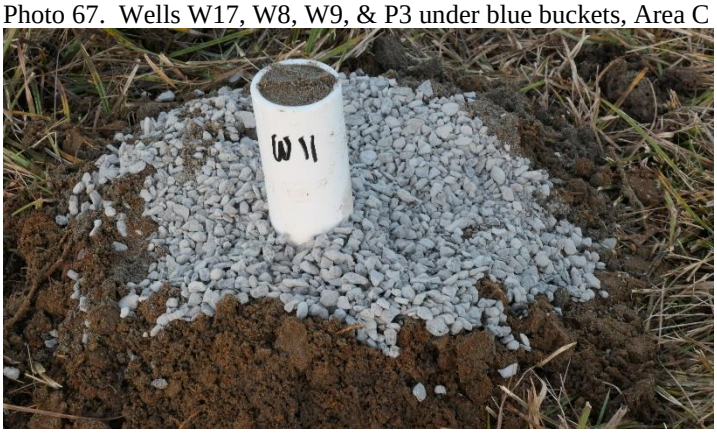


Photo 69. Well W11 in Study Area C

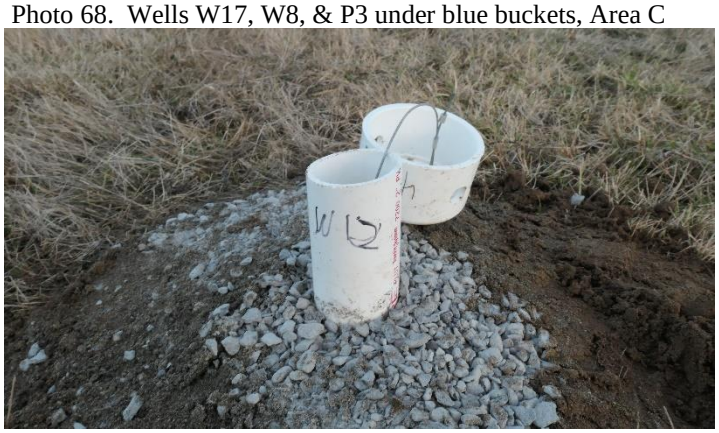


Photo 70. Well W12 in Study Area C

Photo 71. Well W15 in Study Area F

Photo 72. Well W15 in Study Area F

Photo 73. Well W16 in Study Area F

Photo 74. Well W17 in Study Area F

Photo 75. Installation of Well W17 in Study Area F

Photo 76. Datalogger installed within monitoring wells

Redox Test

Photo 77. Redox Test at Well W2, Study Area A


Photo 78. Redox Test at Well W2, Study Area A

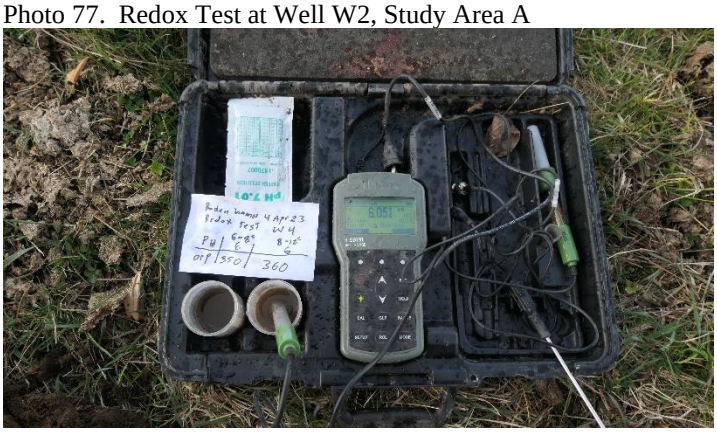


Photo 79. Redox Test at Well W4, Study Area B

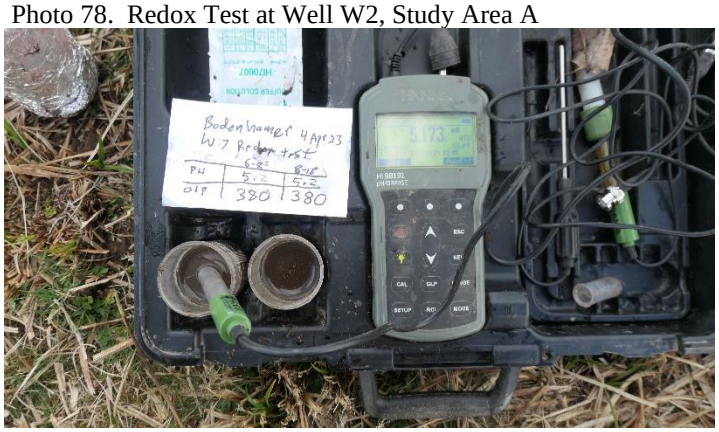


Photo 80. Redox Test at Piezometer W7, Study Area C

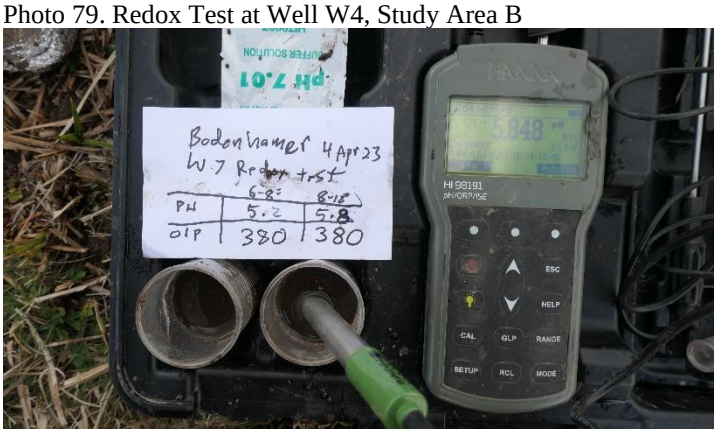


Photo 81. Redox Test at Well W7, Study Area C

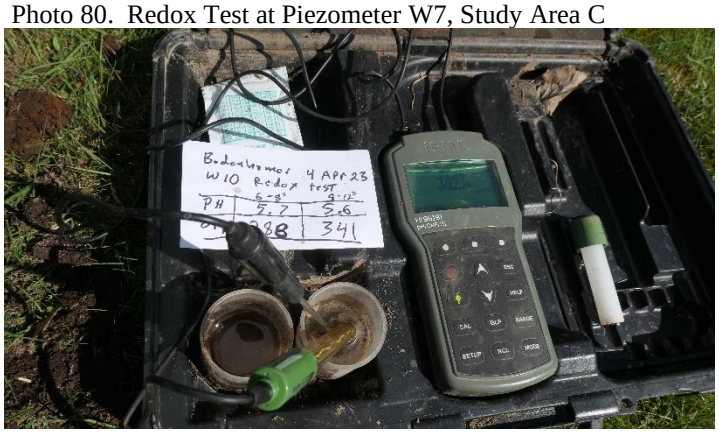


Photo 82. Redox Test at Well W10, Study Area D

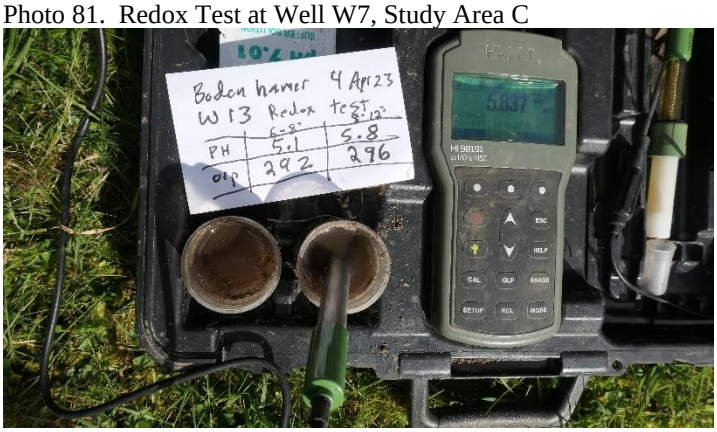


Photo 83. Redox Test at Well W13, Study Area E

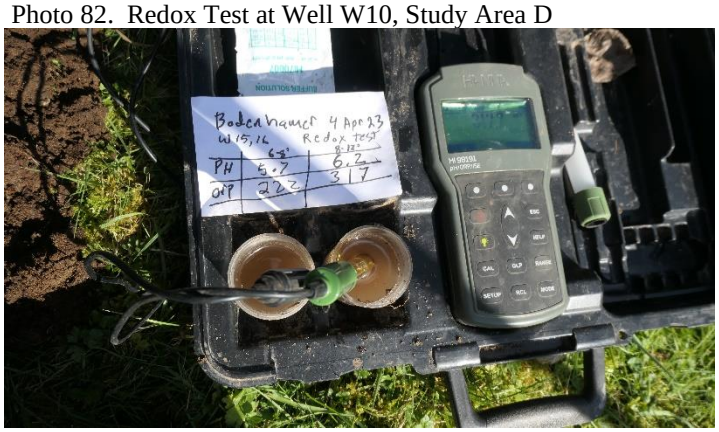


Photo 84. Redox Test at Well W15,W16, Study Area F

Photo 85. Redox Test Positive at TP-A1 in Wetland A

Photo 86. Redox Test Positive at TP-A1 in Wetland A

Chemical Test

Photo 87. Alpha alpha dipyridyl negative at W2, Study Area A

Photo 88. Alpha alpha dipyridyl negative at W2, Study Area A

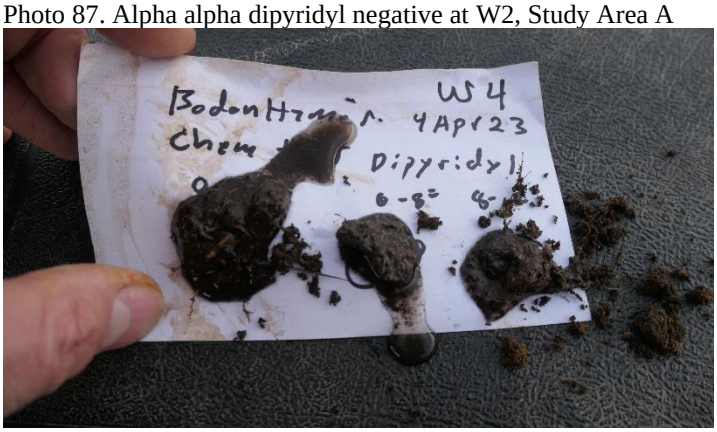


Photo 89. Alpha alpha dipyridyl negative at W4, Study Area B

Photo 90. Alpha alpha dipyridyl negative at W4, Study Area B

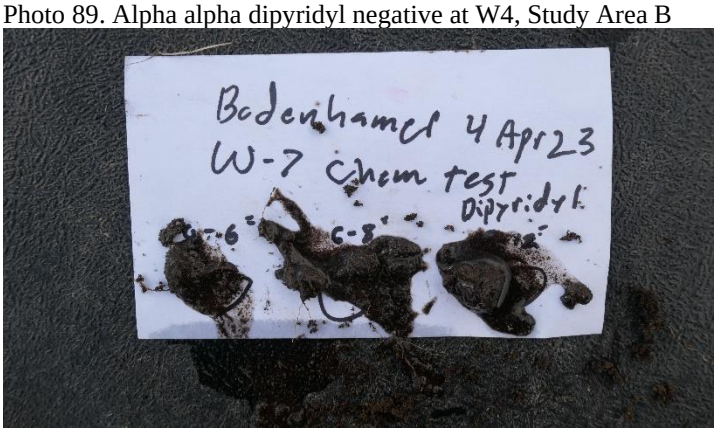


Photo 91. Alpha alpha dipyridyl negative at W7, Study Area C

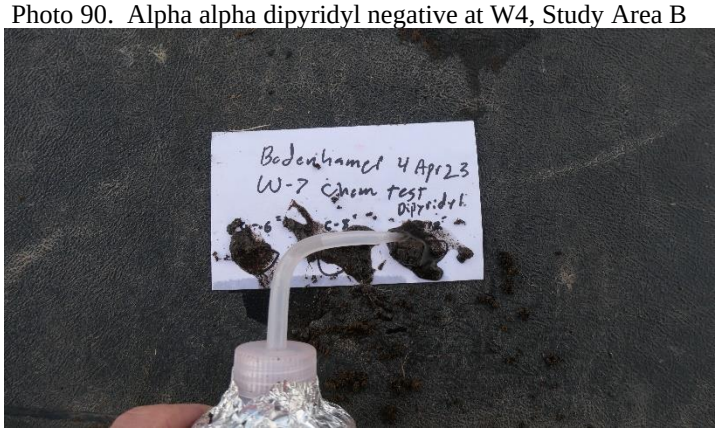


Photo 92. Alpha alpha dipyridyl negative at W7, Study Area C

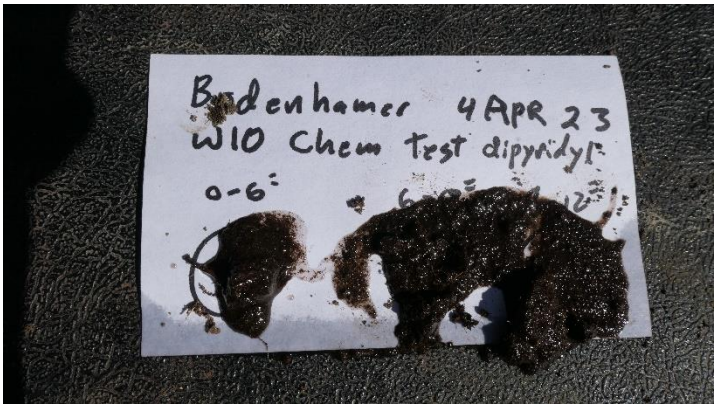


Photo 93. Alpha alpha dipyridyl negative at W10, Study Area D

Photo 94. Alpha alpha dipyridyl negative at W13, Study Area E

Photo 95. Alpha alpha dipyridyl negative at W15, Study Area F


Photo 96. Alpha alpha dipyridyl negative at W15, Study Area F

Photo 97. Alpha alpha dipyridyl positive in Wetland A

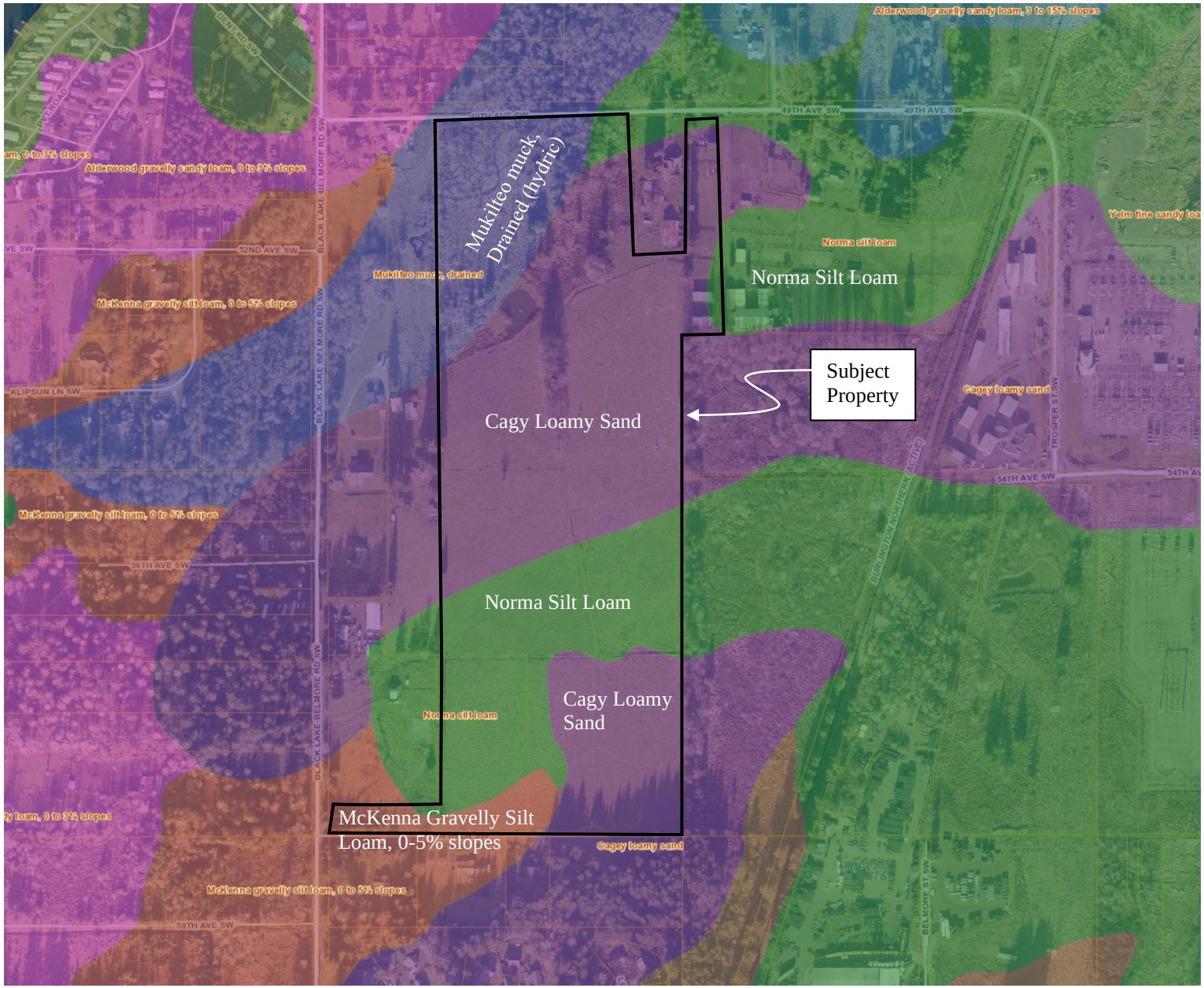
Photo 98 Alpha alpha dipyridyl Positive in Wetland A

Appendix B

Thurston County

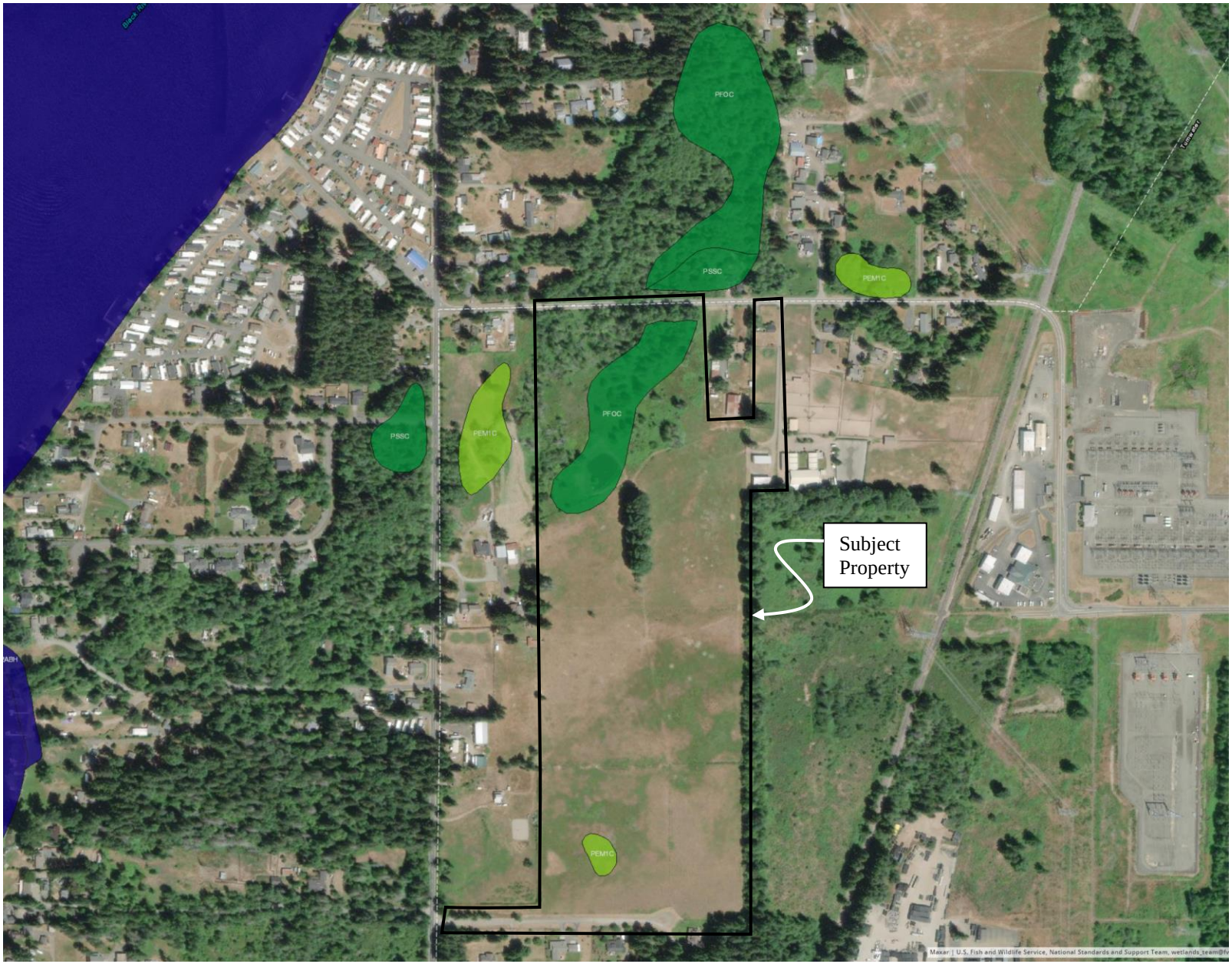
Geodata Center

Soils Survey


Alderwood gravelly sandy loam, 3 to 15% slopes
49TH AVE SW
Mukilteo muck, Drained (hydric)
Norma silt loam
Norma Silt Loam
Yelm fine sandy loa
Alderwood gravelly sandy loam, 0 to 3% slopes
52ND AVE SW
BLACK LAKE BELMORE RD SW
Mukilteo muck, drained
McKenna gravelly silt loam, 0 to 5% slopes
KLIPSUN LN SW
Subject Property
Cagy Loamy Sand
Cagy loamy sand
TROSPER ST SW
54TH AVE SW
BURLINGTON NORTHERN (ACTIVE)
McKenna gravelly silt loam, 0 to 5% slopes
56TH AVE SW
Norma Silt Loam
Cagy Loamy Sand
Norma silt loam
McKenna Gravelly Silt Loam, 0-5% slopes
Cagey loamy sand
McKenna gravelly silt loam, 0 to 5% slopes
59TH AVE SW
BELMORE ST SW

Appendix C

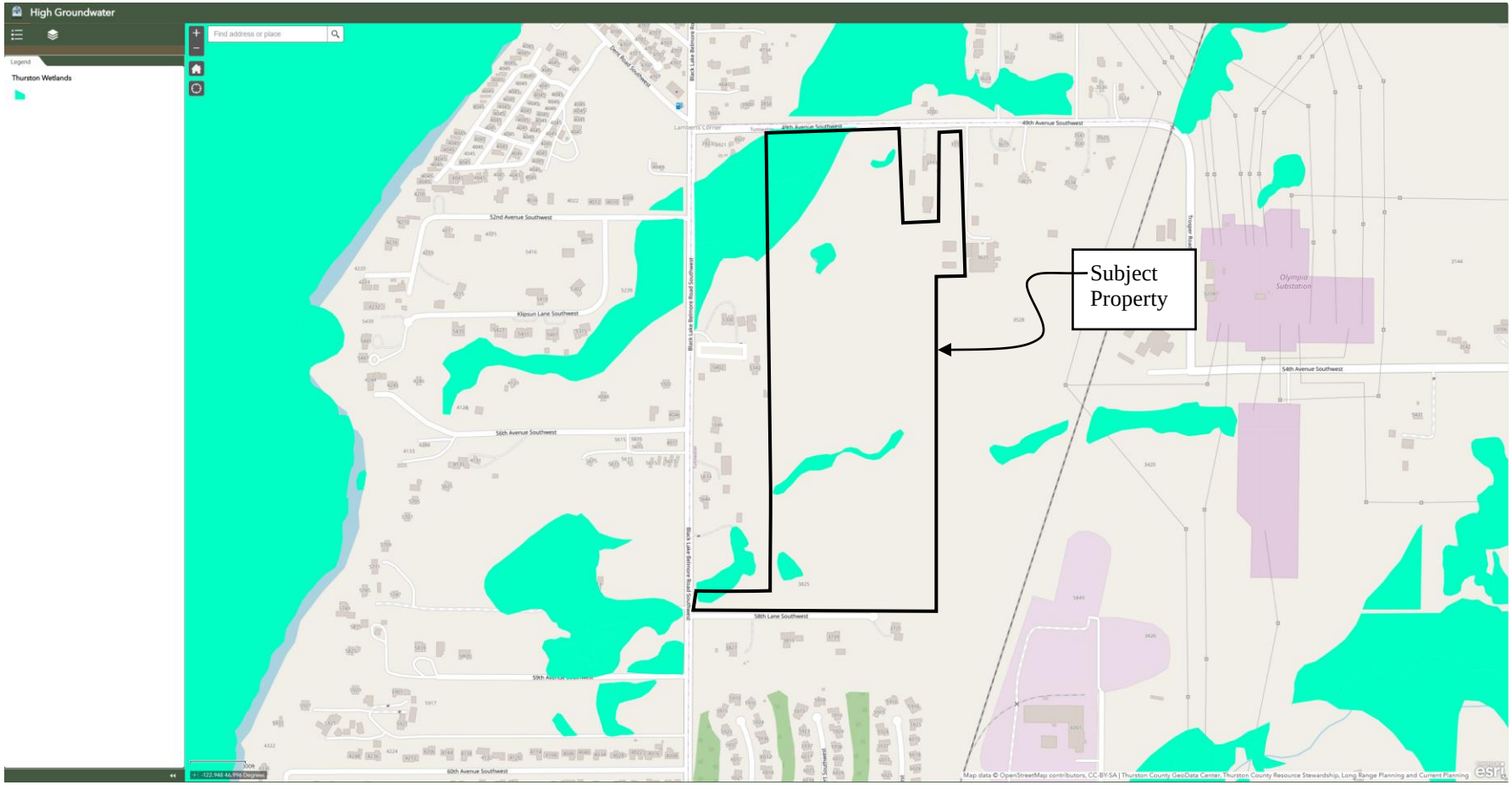
National Wetlands Inventory (NWI)


PFOC
PSSC
PEM1C
PFOC
PSSC
PEM1C
PEM1C
Subject Property

Appendix D

City of Tumwater

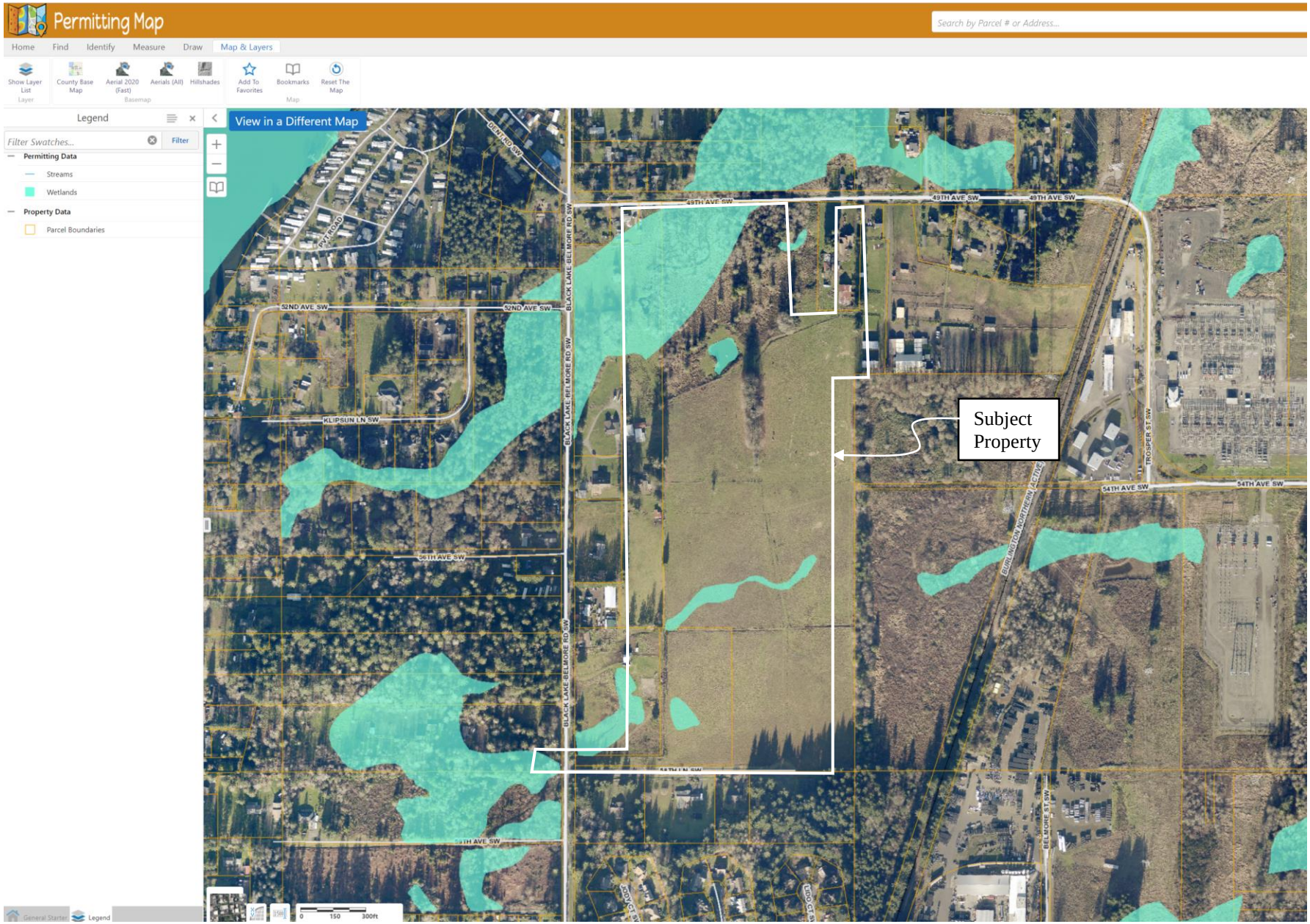
Wetlands and Streams


High Groundwater
Thurston Wetlands
Subject Property
52nd Avenue Southwest
Klipsun Lane Southwest
56th Avenue Southwest
58th Lane Southwest
60th Avenue Southwest
49th Avenue Southwest
54th Avenue Southwest
Olympia Substation

Appendix E

Thurston County

Geodata Center Database

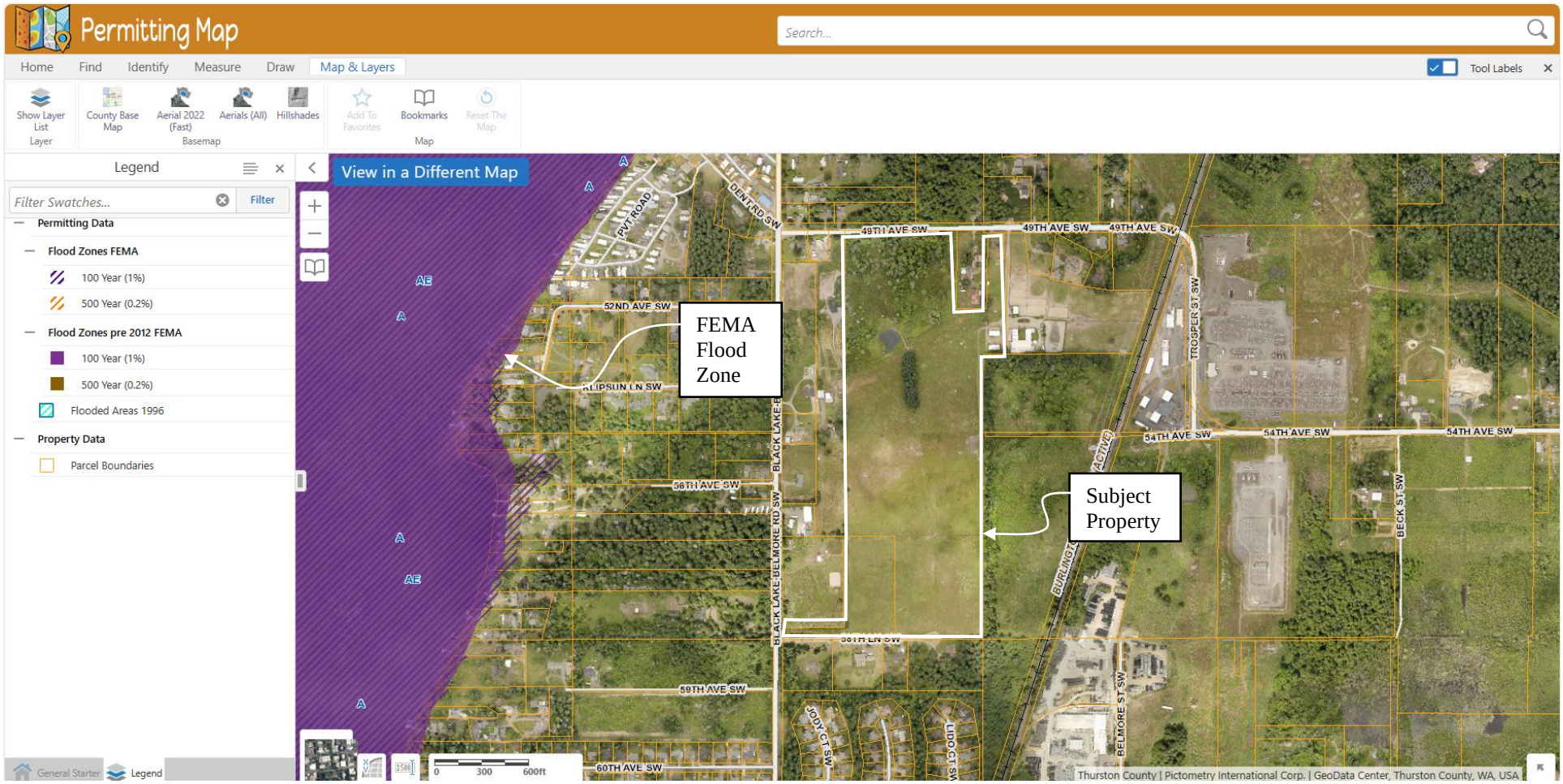

Permitting Map
Search by Parcel # or Address...
Home
Find
Identify
Measure
Draw
Map & Layers
Legend
Filter Swatches...
Filter
Permitting Data
Streams
Wetlands
Property Data
Parcel Boundaries
View in a Different Map
Subject Property
52ND AVE SW
KLIPSUN LN SW
56TH AVE SW
49TH AVE SW
54TH AVE SW
BLACK LAKE-BELMORE RD SW
BURLINGTON NORTHERN LINE
PROSPER ST SW
BELMORE ST SW

Appendix F

Thurston County

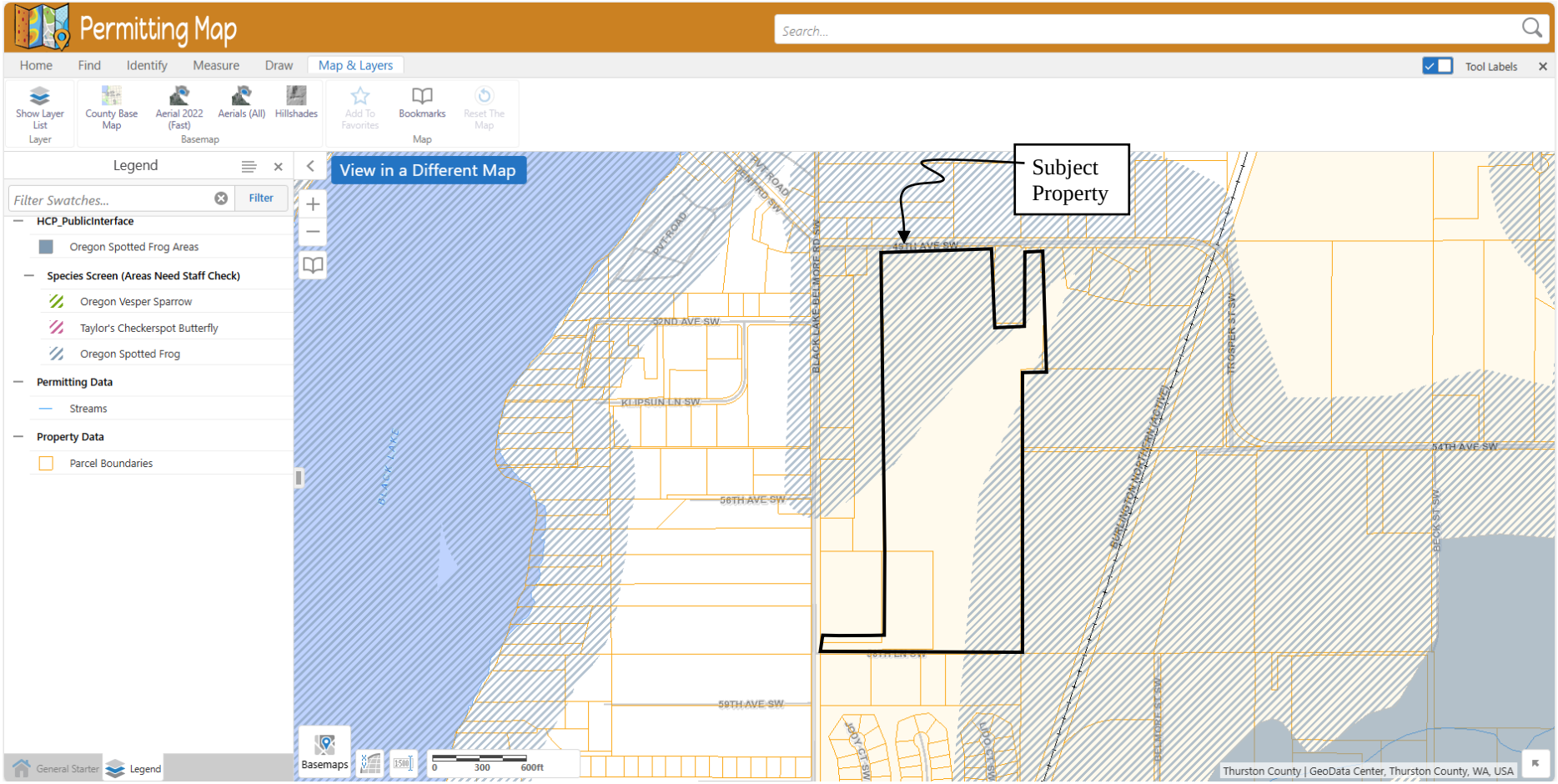
Geodata Center

FEMA Flooding


Permitting Map
Search...
Home
Find
Identify
Measure
Draw
Map & Layers
Tool Labels
Show Layer List
County Base Map
Aerial 2022 (Fast)
Aerials (All)
Hillshades
Bookmarks
Layer
Basemap
Map
Legend
Filter Swatches...
Filter
Permitting Data
Flood Zones FEMA
100 Year (1%)
500 Year (0.2%)
Flood Zones pre 2012 FEMA
100 Year (1%)
500 Year (0.2%)
Flooded Areas 1996
Property Data
Parcel Boundaries
View in a Different Map
FEMA Flood Zone
Subject Property
49TH AVE SW
52ND AVE SW
54TH AVE SW
56TH AVE SW
59TH AVE SW
60TH AVE SW
BLACK LAKE-BELMORE RD SW
BECK ST SW
BELMORE ST SW
TROSPER ST SW
BURLINGTON
AE
A
0 300 600ft
Thurston County | Pictometry International Corp. | GeoData Center, Thurston County, WA, USA

Appendix O

Oregon Spotted Frog Screening


Permitting Map
Search...
Home
Find
Identify
Measure
Draw
Map & Layers
Tool Labels
Show Layer List
County Base Map
Aerial 2022 (Fast)
Aerials (All)
Hillshades
Add To Favorites
Bookmarks
Reset The Map
Layer
Basemap
Map
Legend
Filter Swatches...
Filter
HCP_PublicInterface
Oregon Spotted Frog Areas
Species Screen (Areas Need Staff Check)
Oregon Vesper Sparrow
Taylor's Checkerspot Butterfly
Oregon Spotted Frog
Permitting Data
Streams
Property Data
Parcel Boundaries
View in a Different Map
Subject Property
49TH AVE SW
52ND AVE SW
KLIPSUN LN SW
56TH AVE SW
59TH AVE SW
54TH AVE SW
BLACK LAKE BELMORE ST SW
TROSPER ST SW
BURLINGTON NORTHERN RAILROAD
BLACK LAKE
Basemaps
0 300 600ft
General Starter
Legend
Thurston County | GeoData Center, Thurston County, WA, USA