Lacamas North Shore Trail Project

City Project P1005

SEPA Environmental Checklist

Submitted By:

City of Camas

Parks and Recreation Department

616 NE 4th Avenue

Camas, Washington 98607

February 23, 2018

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A. Background [help]

1. Name of proposed project, if applicable: [help]

Lacamas North Shore Trail Project

2. Name of applicant: [help]

City of Camas, Washington

3. Address and phone number of applicant and contact person: [help]

Jerry Acheson
City of Camas
616 NE 4th Avenue
Camas, Washington 98607
(360) 834-7092

Name of person(s) completing form:

Kent E. Snyder, Ivy Watson, and Laura Haunreiter - Harper Houf Peterson Righellis Inc.

4. Date checklist prepared: [help]

February 19, 2018

5. Agency requesting checklist: [help]

Parks and Recreation Department, City of Camas, Washington

6. Proposed timing or schedule (including phasing, if applicable): [help]

Construction is proposed for summer and fall 2018 and is anticipated to require approximately 12 weeks.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain. [help]

No further additions or activities are planned in the foreseeable future.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal. [help]

Buchanan, Brian G., Sara J. Davis, and Jo Reese. 2010. *Cultural Resource Survey for the Proposed Lacamas Lake Shoreline Project, Clark County, Washington*. Archaeological Investigations Northwest, Inc. Report No.

2531. Prepared for Clark County, Vancouver, Washington.

DeLyria, David, and Todd Miles. 2004. *Archaeological Predetermination Report for Parcel No. 124244000, location directly west of 25700 SE 20th Circle, Camas, Washington*. Archaeological Services of Clark County, Vancouver, Washington.

Dubois, Sarah L., Ryan Swanson, Eva L. Hulse, and Jo Reese. 2018. Archaeological Survey for the Proposed Lacamas Lake North Shore Trail Project, Camas, Clark County, Washington. Archaeological Investigations Northwest, Inc. Report No. 3817. Prepared for City of Camas Department of Parks & Recreation, Camas, Washington.

Harper Houf Peterson Righellis Inc. 2018. Endangered Species Act No-effect Letter. City of Camas Lacamas North Shore Trail Project P1005. Prepared for City of Camas, Washington.

Harper Houf Peterson Righellis Inc. 2018. Wetland Report. Lacamas North Shore Trail Project. Prepared for City of Camas, Washington.

Harper Houf Peterson Righellis Inc. 2018. Lacamas North Shore Trail Project # P1005. Stormwater Technical Information Report.

Application for a Shoreline Variance. Concurrent.

Joint Aquatic Resources Permit Application (JARPA) for a Clean Water Act Section 404 Permit and Section 401 Water Quality Certification. Concurrent.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain. [help]

None to our knowledge.

10. List any government approvals or permits that will be needed for your proposal, if known. [help]

- City of Camas Shoreline Variance
- City of Camas Archeological Review
- Clean Water Act Section 404 Permit and 401 Water Quality Certification

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.) [help]

The City of Camas (City) proposes to extend the existing trail system at the south end of Lacamas Lake (Figures 1 and 2, Appendix A). The new trails would be located within City property on the northeast side of Lacamas Lake, from the Round Lake Loop Trail east of NE Everett Street (State Route 500) to a natural area on the lakeshore.

The main trail, approximately 3,300 feet, would traverse northwest from NE Everett Street, following the alignment of an abandoned access road. The main trail would include a 75-foot-long boardwalk, 25 feet of which would lie above a wetland. The boardwalk would be supported on 16 pin piers aligned in 8 pairs. Each pin pier would require excavation of 1 cubic foot of soil from the abandoned access road and cover an area of 1 square foot. Six pin piers would be in the road within the wetland boundary.

A shorter loop trail, approximately 1,120 feet in length, would connect to the main trail to create a loop in the natural area. A spur trail, approximately 180 feet in length, would follow the path of an existing packed dirt trail from the loop trail to a Lacamas Lake viewpoint.

The main trail would be 8-feet wide and constructed of impervious material (geotextile and a gravel cover). The spur and loop trails would be 2-feet wide and pervious (Appendix C).

Construction of the trails (including boardwalk) is scheduled for summer or fall 2018.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist. [help]

The Lacamas North Shore Trail is located west of NE Everett Street and north of Lacamas Lake (Figure 1) in Camas, Washington (parcel numbers 178099-000, 124244-000, and 177896-000) in: the NW ¼ of Section 2 of Township 1 North, Range 3 East; the SW ¼ of Section 35 of Township 2 North, Range 3 East; and the SE ¼ of Section 34 of Township 2 North, Range 3 East.

B. ENVIRONMENTAL ELEMENTS [help]

1. Earth [help]

a. General description of the site: [help]
Flat, rolling, hilly, steep slopes, mountainous, other _____

b. What is the steepest slope on the site (approximate percent slope)? [help]

The steepest slope along the trail would be approximately 15% (along the loop trail).

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils. [help]

The Clark County soil survey (USDA NRCS 2017) identifies three map units along or adjacent to the proposed trail project: 1) Washougal gravelly loam, 0 to 8% slopes (WgB), along the trail corridor; 2) Odne silt loam, 0 to 5% slopes (OdB), east of the north portion of the trail; and 3) Hesson clay loam, 0 to 8% slopes, east of the south portion of the trail. Washougal soils are somewhat excessively drained and formed on low terraces in alluvium deposited by swiftly flowing rivers and streams. Odne soils are poorly drained and formed in terrace drainageways. Hessen soils are well drained and formed on terraces and terrace escarpments.

Neither Washougal soils nor Odne soils are classified as prime farmland. Hesson soils are classified as prime farmland. The area along or adjacent to the trail project is neither in agricultural production nor abutting land in agricultural production. The potential for this project area being placed into agricultural production in the future is very low because of its isolation relative to other agricultural land, forested condition, or current site development. Thus no agricultural land of long-term significance would be removed as a result of this project.

USDA Natural Resources Conservation Service (NRCS). 2017. URL: http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx Accessed December 29, 2017.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe. [help]

Clark County GIS (2017) does not identify the project site or immediate vicinity as a severe erosion hazard or landslide hazard area. The earthquake hazard site class (NEHRP) is mapped as C and the Liquefaction hazard is mapped as low to moderate.

Clark County GIS. 2017. Clark County GIS MapsOnline. Available online at http://gis.clark.wa.gov/mapsonline. Accessed December 18, 2017.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill. [help]

Approximately 490 cubic yards of gravel (spread 6 inches thick) would be required to build 26,400 square feet of the impervious main trail. The gravel will be obtained from a permitted facility.

Approximately 64 cubic yards of wood chips (spread 4 inches thick) would be required to build 5,200 square feet of pervious trail (loop and spur trails). The wood chips will be obtained from a permitted facility.

Approximately 16 cubic feet (0.6 cubic yards) of the abandoned access road would be excavated to install 16 pin piers to support a boardwalk. Approximately 20 square feet of grading would be associated with this activity.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe. [help]

The potential for localized erosion would be associated with temporary disturbance associated with installation of the boardwalk. The chance of erosion would be greatest during a period of extended or intense rainfall.

g. ***About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)? [help]***

After project construction, approximately 1% (0.62 acres of 60 acres total) of the project site will be impervious gravel trail surface.

h. ***Proposed measures to reduce or control erosion, or other impacts to the earth, if any: [help]***

Proposed measures to reduce and control erosion, or other impacts to the earth, would be identified in a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP would include Best Management Practices (BMPs) that would be employed throughout the project to minimize impacts. The SWPPP would also include practices for the prevention of spills.

Proposed measures to reduce or control erosion, or other temporary impacts to water, will be outlined in the completed SWPPP. Specific BMPs related to erosion would include:

- High visibility plastic or metal fence near residences, commercial parcels, and NE Everett Street;
- Preserving natural vegetation;
- Temporary and permanent seeding;
- Mulching, nets, and blankets;
- Silt fence;
- Material stockpiling/staging; and
- Dust control.

Impacts from hazardous materials in the project corridor will be addressed through standard minimization measures and BMPs such as:

- All equipment to be used for construction activities will be cleaned and inspected prior to arriving at the project site, to ensure no potentially hazardous materials are exposed, no leaks are present, and the equipment is functioning properly;
- Construction equipment will be inspected daily to ensure there are no leaks of hydraulic fluids, fuel, lubricants, or other petroleum products; and
- Should a leak be detected on equipment used for the project, the equipment will be immediately removed from the area and not used again until adequately repaired.

2. Air [help]

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known. [help]

The only emissions would be from equipment used during construction. The equipment to be used could include:

- Excavator
- Pickup truck
- Dump truck
- Front-end loader
- Pin-pier hammer

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe. [help]

No off-site sources of emissions or odor would affect the proposal.

c. Proposed measures to reduce or control emissions or other impacts to air, if any: [help]

This project would comply with all federal, state, and local pollution control standards. Because no long-term adverse air quality effects are expected from the project, no long-term mitigation measures would be required. For short-term construction impacts, contractors are required to take reasonable precautions to avoid dust emissions, along with other construction-related air quality mitigation measures, to reduce the potential for air quality impacts during construction.

3. **Water** [help]

a. Surface Water:

1) ***Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into. [help]***

Lacamas Lake, west of the proposed trail alignment, is regulated as a water of the state, a shoreline of the state,

and a priority habitat.

The proposed trails would be oriented northwest-southeast on a gravel ridge or terrace, with Lacamas Lake to the west and wetland along the north, east, and south sides of the ridge.

To the east and south, a forested wetland (East wetland) intersects the proposed trail in a broad swale at the south end of the ridge, where a 12-inch steel culvert lies beneath the access road (HHPR 2018). A second wetland (Lake wetland) is a scrub-shrub fringe along Lacamas Lake at the northwest and north side of the ridge (HHPR 2018). This wetland includes aquatic vegetation, which forms mats when the lake is at full summer pool.

Harper Houf Peterson Righellis Inc. 2018. Wetland Report. Lacamas North Shore Trail. Prepared for City of Camas, Washington.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans. [help]

Yes, approximately 4,300 feet of the trail construction would occur within 200 feet of the Lacamas Lake OHWM or the East and Lake wetlands (Figures 2 and 3).

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material. [help]

Approximately 6 cubic feet of the abandoned access road would be excavated to install the pin piers that would support the boardwalk. Approximately 6 square feet of grading will be required.

No filling or dredging is proposed below the OHWM of Lacamas Lake.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known. [help]

No surface water withdrawal or diversions would occur.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan. [help]

The 100 year floodplain of Lacamas Lake, as mapped by FEMA (2012), extends across the upland ridge, including all trails proposed in the forested area (Figure 4). No floodway is mapped in this location.

FEMA. Flood Insurance Rate Map (FIRM) Clark County, Washington and Unincorporated Areas. Panel 531 of 600. Map Number 53011C0531D. Effective date September 5, 2012.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge. [help]

No. The project would not discharge waste materials to surface waters.

b. Ground Water:

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known. [help]

No groundwater withdrawals or discharges to groundwater would occur as a result of this project.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve. [help]

No waste material would be discharged into the ground from septic tanks or other sources.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe. [help]

The proposed main trail would be constructed by placing gravel over a geotextile base. Stormwater runoff from this impervious surface would be dispersed into the soil adjoining the trail. Stormwater falling onto the boardwalk would drain onto the abandoned access road and then be dispersed. No runoff is expected to flow into any waters or wetlands.

2) Could waste materials enter ground or surface waters? If so, generally describe. [help]

Waste materials associated with the use, storage, and maintenance of construction equipment (e.g., leaks or spills of fuel, hydraulic fluids, lubricants, and other chemicals from storage containers or machinery), as well as equipment wash water, could enter groundwater through infiltration or surface waters through stormwater runoff. However, BMPs would be used to prevent and minimize such releases.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe. [help]

No.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any: [help]

Proposed measures to reduce and control erosion, or other impacts to the earth, would be outlined in a SWPPP. The SWPPP would include BMPs that would be employed throughout the project to minimize impacts. The SWPPP would also include practices for the prevention of spills.

Proposed measures to reduce or control erosion, or other temporary impacts to water, will be outlined in the completed SWPPP. Specific BMPs related to erosion would include:

- High visibility plastic or metal fence near residences, commercial parcels, and NE Everett Street;
- Preserving natural vegetation;
- Temporary and permanent seeding;
- Mulching, nets, and blankets;
- Silt fence;

- Material stockpiling/staging; and
- Dust control.

Impacts from hazardous materials in the project corridor will be addressed through standard minimization measures and BMPs such as:

- All equipment to be used for construction activities will be cleaned and inspected prior to arriving at the project site, to ensure no potentially hazardous materials are exposed, no leaks are present, and the equipment is functioning properly;
- Construction equipment will be inspected daily to ensure there are no leaks of hydraulic fluids, fuel, lubricants, or other petroleum products; and
- Should a leak be detected on equipment used for the project, the equipment will be immediately removed from the area and not used again until adequately repaired.

4. **Plants** [help]

a. Check the types of vegetation found on the site: [help]

_x__deciduous tree: alder, maple, aspen, other (ash, oak)
_x__evergreen tree: fir, cedar, pine, other (western hemlock)
_x__shrubs
_x__grass
____pasture
____crop or grain
____orchards, vineyards or other permanent crops.
_x__wet soil plants: cattail, buttercup, bulrush, skunk cabbage, other
_x__water plants: water lily, eelgrass, milfoil, other
____other types of vegetation

b. What kind and amount of vegetation will be removed or altered? [help]

Installation of the main trail outside of the forest would impact approximately 9,600 square feet of non-native, herbaceous upland vegetation located in lawns and understory between the houses and lake. Installation of the main trail inside of the forest would not significantly impact native vegetation because the access road is already cleared.

Installation of the loop trail would impact approximately 2,500 square feet of native, herbaceous and shrub upland vegetation (clearing 4,160 square feet of forest understory that has 60% plant cover).

No significant trees would be removed.

c. List threatened and endangered species known to be on or near the site. [help]

An Endangered Species Act (ESA) list of species potentially affected by activities at the project site, obtained from the USFWS IPaC service (2018), identified one federally-listed plant species: golden paintbrush (*Castilleja levisecta*, federally-listed Threatened, state-listed Endangered).

Washington Natural Heritage Program (WNHP) rare plant spatial data (WDNR 2017) indicates the presence of three additional state-listed species in the project vicinity: Oregon yampah (*Perideridia oregano,* state-listed Sensitive), tall bugbane (*Cimicifuga elata*, state-listed Sensitive), and small-flowered trillium (*Trillium parviflorum*, state-listed Sensitive).

Of these four species, only tall bugbane (associated with margins and openings in mature coniferous and mixed evergreen-deciduous stands) and, possibly, small-flowered trillium (associated with moist, shady, hardwood forests) have the potential to occur along the trail alignment. Habitat for Oregon yampah (associated with prairies, meadows, and oak woodlands) or golden paintbrush (associated with open grasslands dominated by native grasses) does not occur along the alignment. In addition, WNHP data indicate that although the site is part of the historic range of golden paintbrush (last known observation 1889), there are no current populations mapped in the area.

US Fish and Wildlife Service (USFWS). 2018. Information for Planning and Consultation (IPaC). https://ecos.fws.gov/ipac/ Accessed January 5, 2018.

Washington Department of Natural Resources (WDNR). 2017. Washington Natural Heritage Program (WNHP). WNHP Current and Historic Element Occurrences. GIS Data Set. Updated February 2017.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any: [help]

Areas of disturbance not covered in impervious surfaces would be revegetated with native grass seed mix.

e. List all noxious weeds and invasive species known to be on or near the site. [help]

No noxious weeds listed as Class A or Class C in the 2017 Clark County Weed List were observed on the site. Shiny geranium (*Geranium lucidum*), a Class B weed, was observed along the abandoned access road.

Several other invasive species *previously* listed (2016) as Class C by Clark County—reed canarygrass (*Phalaris arundinacea*), Himalayan blackberry (*Rubus armeniacus*), and English ivy (*Hedera spp.*) —occur on the site. Additional invasive species present on the site include Scotch broom (*Cytisus scoparius*), periwinkle (*Vinca* sp.), and English holly (*Ilex aquifolium*).

Clark County. 2017. 2017 Clark County Noxious Weed List. URL: https://www.clark.wa.gov/sites/default/files/dept/files/public-works/Vegetation/2017_Clark_County_Noxious_Weed_List.pdf. Accessed January 2018

5. Animals [help]

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site. [help]

Examples include:

birds: hawk, heron, eagle, songbirds, other: crows
mammals: deer, bear, elk, beaver, other: rabbits, raccoon, opossums
fish: bass, salmon, trout, herring, shellfish, other _____

Wildlife that could be near the project site include those typically habituated to human presence, such as small mammals (e.g., raccoons, opossums, rabbits, squirrels, shrews, mice), chorus frogs, snakes, coyotes, deer, and passerine birds. Other bird species such as crows and raptors could use the site for foraging or perching.

b. List any threatened and endangered species known to be on or near the site. [help]

An ESA list of species potentially in the project vicinity, obtained from the USFWS IPaC service (2018), identifies three wildlife species: Oregon spotted frog (*Rana pretiosa*, federally-listed Threatened, state-listed Endangered), streaked horned lark (*Eremophila alpestris strigata*, federally-listed Threatened, state-listed Endangered), and yellow-billed cuckoo (*Coccyzus americanus*, federally-listed Threatened, state-listed Species of Concern). There is no designated Critical Habitat in the project vicinity for these species.

Habitat with the necessary characteristics to support habitat for Oregon spotted frogs ("an expansive

meadow/wetland with a continuum of vegetation densities along edges and in pools and an absence of introduced predators" [USFWS 2016]), streaked horned lark (flat, open areas with sparse low-stature vegetation and substantial areas of bare ground) or yellow-billed cuckoo (large patches—typically >50 acres—of riparian habitat dominated by cottonwood and willow [Wiles and Kalasz 2017]) do not occur in the project vicinity.

There are no ESA-listed fish species or associated Critical Habitat in Lacamas Lake, Round Lake, or their tributaries. Lacamas Dam is a total passage barrier (WDFW 2018, NOAA 2016, USFWS 2018). The nearest location of a listed fish species (including bull trout [*Salvelinus confluentus*]) is approximately 1 mile below Lacamas Lake Dam in Lacamas Creek.

Lacamas Lake is within the Lower Columbia/Sandy basin (USGS HUC 170800010606) and thus, based on historical presence (pre-Lacamas Dam), is considered Essential Fish Habitat (EFH) for Chinook (*Oncorhynchus tshawytscha*) and coho (*O. kisutch*) salmon (NOAA 2014). The project would have no impacts on waters or substrate of Lacamas Lake for spawning, breeding, feeding, or maturation of Chinook or coho salmon.

NOAA National Marine Fisheries Service. 2014. Fisheries Off West Coast States; West Coast Salmon Fisheries; Amendment 18 to the Salmon Fishery Management Plan. Federal Register 79: 75449-75454. December 18, 2014. http://www.westcoast.fisheries.noaa.gov/publications/habitat/essential_fish_habitat/west_coast_salmon_efh_2014__1_.pdf

NOAA National Marine Fisheries Service. 2016. Status of ESA Listings & Critical Habitat Designations for West Coast Salmon & Steelhead (July 2016). http://www.westcoast.fisheries.noaa.gov/publications/gis_maps/maps/salmon_steelhead/critical_habitat/wcr_salmonid_ch_esa_july2016.pdf.

US Fish and Wildlife Service (USFWS). 2016. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Oregon Spotted Frog. Federal Register 81: 29335 – 29396. May 11, 2016.

US Fish and Wildlife Service (USFWS). 2018. Information for Planning and Consultation (IPaC).https://ecos.fws.gov/ipac/ Accessed January 5, 2018.

Washington Department of Fish and Wildlife (WDFW). 2018. Priority Habitat and Species (PHS) on the Web. Olympia, Washington. URL: http://wdfw.wa.gov/mapping/phs/disclaimer.html. Accessed January 5, 2018.

Wiles, G. J., and K. S. Kalasz. 2017. Draft Status Report for the Yellow-billed Cuckoo in Washington. WDFW, Olympia, Washington. URL: http://wdfw.wa.gov/publications/01881/.

c. Is the site part of a migration route? If so, explain. [help]

The site is part of the Pacific Flyway, which hosts migrating bird species.

d. Proposed measures to preserve or enhance wildlife, if any: [help]

The following are measures taken to avoid and minimize impacts at the East wetland and associated wildlife:

- Install a boardwalk to avoid construction of a large earthen fill (either by removing/replacing or raising/widening the existing road crossing) for an at-grade trail;
- Use pin piers to avoid potential impacts from pouring concrete footings for the boardwalk;
- Utilize the existing abandoned access road crossing as the boardwalk crossing location to minimize impacts from the boardwalk;
- Utilize a boardwalk design that minimizes the number of pin piers required (six) in the wetland; and
- Use low-impact pin piers to minimize the amount of excavation to 1/10 that required for an equivalent concrete footing (6 cubic feet for six pre-cast concrete pier heads vs. 60 cubic feet for cylindrical footings poured in place).
- Wetland and vegetation mitigation plantings.

The trails were realigned and redesigned multiple times (based on field reviews) to avoid and minimize impacts to wetlands, wetland buffers, and associated wildlife. Specific measures included:

- Utilizing the existing abandoned access road for the main trail to the maximum extent possible;
- Reducing the width of the main trail from 12 feet (the preferred width for regional trails [Camas 2014]) to 8 feet to remain inside the footprint of the abandoned access road;
- Crossing the East wetland on the existing fill for the abandoned access road and utilizing a low-impact boardwalk design: 6 cubic feet of excavation vs. 60 cubic feet of excavation and concrete for cylindrical footings, and eliminating presence of green concrete in wetland;
- Designing the trails for construction with low-impact manual methods to the extent practical (e.g. using a geotextile and gravel surface in place of a paved surface);
- Avoiding removal of mature trees;
- The stormwater design for the main trail is full dispersion within 20 feet of the edge of the trail, which avoids stormwater impacts to wetlands and Lacamas Lake;
- Utilizing the existing dirt path for the loop and spur trails to the maximum extent possible;
- Utilizing level areas wherever possible for the loop and spur trails to minimize the need for filling or grading;
- Changing the loop and spur trail design from a 12-foot wide impervious surface to 4-foot wide, pervious surface;
- Rerouting the loop trail around wetlands and backwaters;
- Eliminating a viewpoint along the loop trail that would have encroached into the Lake wetland;
- Shortening the loop trail and realigning it uphill, away from the Lake wetland; and
- Eliminating a segment of the loop trail that would have encroached closer toward the East wetland.

In addition to project design measures, BMPs implemented to minimize and avoid construction impacts to earth (B.1.h), air (2.c), and water (B.3.d) would also serve to benefit wildlife.

e. List any invasive animal species known to be on or near the site. [help]

No animal species on the priority species list of the Washington Invasive Species Council were observed at or near the site.

Washington State Recreation and Conservation Office. Washington Invasive Species Council Priority List. URL: http://www.invasivespecies.wa.gov/priorities.shtml. Accessed January 9, 2018.

6. Energy and Natural Resources [help]

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc. [help]

After construction, the boardwalk and trail could require limited maintenance throughout its serviceable life. Maintenance staff would likely be transported to the project site in vehicles powered by petroleum, electricity, natural gas, or some other energy source.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe. [help]

No effects. Except for the boardwalk (30 inches or less high), the trails would be at or near grade and would not block solar access for adjacent properties.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any: [help]

Construction would use conventional means, methods, and equipment (e.g., petroleum powered) to construct the project elements. Due to the scale of the various project elements, cost-effective, extraordinary energy-saving measures are limited. However, ordinary measures such as, not leaving equipment idling for extensive periods, would be specified and/or implemented as practical.

7. Environmental Health [help]

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe. [help]

Potential environmental health hazards could include breathing, ingesting, or absorbing through the skin hazardous materials associated with fluids, fuels, and lubricants used in the operation of construction equipment. There is also a risk of accidental spills and leaks of these same fluids during construction and staging. There could also be a risk of exposure to fires and explosions from working in or near storage facilities for these materials located in staging areas.

1) ***Describe any known or possible contamination at the site from present or past uses. [help]***

There is no known or possible contamination at the project site from past or present uses, per the State of Washington Department of Ecology (2017).

Washington Department of Ecology. 2017. Toxics Cleanup Program. What's In My Neighborhood interactive web map. https://fortress.wa.gov/ecy/neighborhood/ Accessed December 8, 2017.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity. [help]

There are no existing hazardous chemicals/conditions that might affect the proposed project.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project. [help]

There would be no toxic or hazardous chemicals (other than those associated with operation of construction equipment, see 7.a), stored, used or produced during the project's development or construction.

4) Describe special emergency services that might be required. [help]

No special emergency services are anticipated.

5) ***Proposed measures to reduce or control environmental health hazards, if any: [help]***

Any potential impacts from hazardous materials would be addressed through standard minimization measures and BMPs such as:

- All equipment to be used for construction activities would be cleaned and inspected prior to arriving at the project site, to ensure no potentially hazardous materials are exposed, no leaks are present, and the equipment is functioning properly.
- Construction equipment would be inspected daily to ensure there are no leaks of hydraulic fluids, fuel, lubricants, or other petroleum products.
- Should a leak be detected on heavy equipment used for the project, the equipment would be immediately removed from the area and not used again until adequately repaired.
- Management of contaminated media will be in accordance with applicable environmental regulations.
- The City will comply with current local, state, and federal regulations for worker safety.

b. Noise [help]

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)? [help]

The dominant noise source within the project site is vehicles along NE Everett Street. Such traffic is not anticipated to have adverse impact on the project.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site. [help]

During construction, short-duration increases in the local noise environment are expected. The contractors are required to comply with all applicable regulations governing equipment levels and noise resulting from construction site activities. The City noise ordinance (City of Camas Municipal Code 9.32.050) permits unrestricted construction noise between 7 a.m. and 7 p.m. Monday through Friday and from 7 a.m. to 5 p.m. on Saturdays. Therefore, as long as all construction is performed during these daytime hours, no direct construction related impacts are predicted. The Washington Administrative Code (Chapter 173-60) exempts most project construction noise during normal daytime hours (7 a.m. to 10 p.m.). If construction is performed during nighttime, the contractors must meet special noise-level requirements.

No long-term noise impacts are anticipated.

3) Proposed measures to reduce or control noise impacts, if any: [help]

By complying with the City noise ordinance, no additional BMPs or mitigation measures are needed to control noise impacts.

8. Land and Shoreline Use [help]

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe. [help]

The site is currently vacant, with an abandoned access road traversing the site. The parcels are zoned Parks and Open Space (P/OS), with a comprehensive plan designation of Open Space/Green Space.

The project would not affect current land uses of nearby or adjacent properties. The adjacent parcels to the east are zoned Commercial (MX) and Residential (R-12).

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use? [help]

The site is not currently used as agricultural or production forest land. No agricultural or forest land of long-term commercial significance would be converted to other uses by the proposal. No designated resource lands would be converted.

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how: [help]

No. There is no working farm or forest land abutting the project site, or close enough to affect or be affected by the proposal.

c. Describe any structures on the site. [help]

There are no existing structures (buildings), occupied or otherwise, on the proposed trail alignments.

d. Will any structures be demolished? If so, what? [help]

No structures would be demolished.

e. What is the current zoning classification of the site? [help]

The property is zoned Open Space (OS) and Parks/Open Space (P/OS). There is an Urban Holding – 20 (UH-20) Zoning overlay.

Clark County GIS. 2017. Clark County GIS MapsOnline. Available online at http://gis.clark.wa.gov/mapsonline. Accessed December 15, 2017.

f. What is the current comprehensive plan designation of the site? [help]

The comprehensive plan designation for the subject site is Open Space/Green Space (OS/GS). The comprehensive plan overlay is Urban Holding / Gateway Corridor.

City of Camas. June 2016. Comprehensive Plan Map. http://www.ci.camas.wa.us/maps. Accessed January 2, 2018.

Clark County GIS. 2017. Clark County GIS MapsOnline. Available online at http://gis.clark.wa.gov/mapsonline. Accessed December 15, 2017.

g. If applicable, what is the current shoreline master program designation of the site? [help]

The shoreline designation for the parcel is Urban Conservancy according to the 2015 Camas Shoreline Master Program.

Table 6-1 of the SMP indicates that Recreational Uses (water-related/enjoyment trails) within Urban Conservancy shorelines are a Permitted Use.

City of Camas. 2015. Camas Shoreline Master Program. URL: http://www.ci.camas.wa.us/images/DOCS/PLANNING/REPORTS/shorelinemasterplancurrent.pdf.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify. [help]

The project site contains the following critical areas:

- Wetland. The East wetland is a forested wetland along the east and south sides of the ridge. This wetland intersects the proposed main trail in a broad swale at the south end of the ridge, where a 12-inch (diameter) steel culvert lies beneath the abandoned access road. A second wetland, the Lake wetland, is a scrub-shrub fringe along Lacamas Lake at the northwest and north side of the ridge (Figure 3). No proposed trail would intersect this wetland. In the proposed design, the main trail would be within wetland buffers for impervious trails for approximately 1,610 feet. The loop trail would be a new trail, 4-feet wide, with a pervious surface. Approximately 550 feet of the loop trail, at the north end, would be within the Lake wetland buffer for pervious trails.
- Frequently Flooded Areas. The 100 year floodplain is designated as a Frequently Flooded Area (Figure 4). The 100 year floodplain of Lacamas Lake, as mapped by FEMA (2012), extends across the upland ridge, including all trails proposed in the forested area. From NE Everett Street to the forest, the mapped 100 year floodplain extends inland from the OHWM approximately 30 to 80 feet, depending on the location; the proposed trail would generally be located outside of the 100 year floodplain in this segment. No floodway is mapped in either location.
- Fish and Wildlife Habitat Conservation Areas.

  Priority Habitats. Lacamas Lake and associated floodplain is mapped as a Riparian Habitat Conservation Area (Figure 5). Five additional priority habitat and species areas (WDFW 2018) are mapped in and abutting the project site: resident cutthroat trout (*O. clarki*) in Lacamas Lake, a Cave-rich Area (the 6-mile by 8.5-mile rectangle mapped across southeastern Clark County), the Camas Biodiversity Area (mapped in natural areas around Round Lake and west across Lacamas Lake from the project area), herbaceous balds (southeast of the project area next to Round Lake), and white oak woodlands (also at Round Lake). Pedestrian reviews determined that no caves or herbaceous balds are present in the project area.

  WDFW PHS data (WDFW 2017) indicates the presence of a Bald Eagle breeding area approximately 4,000 feet from the beginning of the trail at NE Everett Street. The largest buffer recommended under the National Bald Eagle Management Guidelines (USFWS 2007) is 660 feet for all activities, except blasting (which is 0.5 miles).

  Habitats of Local Importance. The entire project area is listed by the City's *Park, Recreation and Open Space Comprehensive Plan Update 2014* as natural open space and is therefore designated as a Habitat of Local Importance (per SMP 16.61.010.A.3). In addition, the tree survey identified five Oregon white oaks greater than or equal to 20 inches DBH within 10 feet of the proposed alignment; all are in the strip of land between residential homes and the lake. Additional oaks likely to fall in this size class were observed along the edge of Lacamas Lake west of the loop and main trails at the north end of the project. No stands of white oak greater than one acre, or oak snags, were identified adjacent to the proposed project.

FEMA. Flood Insurance Rate Map (FIRM) Clark County, Washington and Unincorporated Areas. Panel 531 of 600. Map Number 53011C0531D. Effective date September 5, 2012.

National Oceanic and Atmospheric Administration (NOAA) Fisheries. 2016. Status of ESA Listings & Critical Habitat Designations for West Coast Salmon & Steelhead. http://www.westcoast.fisheries.noaa.gov/publications/protected_species/salmon_steelhead/status_of_esa_salmon_listings_and_ch_designations_map.pdf. Accessed January 5, 2018.

US Fish and Wildlife Service (USFWS). 2007. National Bald Eagle Management Guidelines. https://www.fws.gov/pacific/eagle/. Accessed January 11, 2018.

US Fish and Wildlife Service (USFWS). GeoFin. Geospatial Fisheries Information Network. https://ecos.fws.gov/ipac/ Accessed January 11, 2018.

Washington Department of Fish and Wildlife (WDFW). 2017. Priority Habitat and Species (PHS) on the Web. Olympia, Washington. URL: http://wdfw.wa.gov/mapping/phs/disclaimer.html. Accessed January 5, 2018.

i. Approximately how many people would reside or work in the completed project? [help]

No people will reside or work in the completed project.

j. Approximately how many people would the completed project displace? [help]

None.

k. Proposed measures to avoid or reduce displacement impacts, if any: [help]

Not applicable. No people would be displaced by this project.

L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any: [help]

The site is within the City, zoned Parks and Open Space. This proposal supports and enhances an existing use.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any: [help]

No impacts are anticipated (see section 8.b. for land use description.)

9. Housing [help]

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing. [help]

No housing units would be provided.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing. [help]

No housing units would be eliminated as a result of this project.

c. Proposed measures to reduce or control housing impacts, if any: [help]

Not applicable (no impacts).

10. Aesthetics [help]

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed? [help]

The tallest structure proposed is a wooden boardwalk, 30 inches maximum height.

b. What views in the immediate vicinity would be altered or obstructed? [help]

No views in the vicinity of the project will be altered or obstructed.

c. Proposed measures to reduce or control aesthetic impacts, if any: [help]

No aesthetic improvement measures are proposed, as the project will be entirely at grade, with the exception of the proposed boardwalk.

11. Light and Glare [help]

a. What type of light or glare will the proposal produce? What time of day would it mainly occur? [help]

During construction activities, typical temporary light, glare, and other visual impacts would result from construction equipment, traffic signage, stockpiled materials, and accessories (such as worker's vehicles). Greatest visual impacts would occur during the typical work hours of 7 a.m. to 7 p.m. Monday through Friday and from 7 a.m. to 5 p.m. on Saturdays. There would also be the typical visual impacts from traffic signage and barricades left on site during the evening hours for safety.

b. Could light or glare from the finished project be a safety hazard or interfere with views? [help]

No additional lighting is proposed as part of this project.

c. What existing off-site sources of light or glare may affect your proposal? [help]

The surrounding property is commercial and residential. No off-site sources of light will affect the proposal.

d. Proposed measures to reduce or control light and glare impacts, if any: [help]

No additional lighting is proposed as part of this project.

12. Recreation [help]

a. What designated and informal recreational opportunities are in the immediate vicinity? [help]

The project is in the immediate vicinity of Lacamas Lake, designated Open Space. Recreational activities in the vicinity of the project include walking, running, bike riding, and wildlife viewing.

City of Camas. 2014 Park, Recreation and Open Space Comprehensive Plan. http://www.ci.camas.wa.us/index.php/parkshome/68-parkscat/575-2014parksrecopensspacecompplan.

b. Would the proposed project displace any existing recreational uses? If so, describe. [help]

No existing formal recreational use will be enhanced by this project. However, the abandoned access road and dirt paths appear to receive some (undetermined) pedestrian use by people in the neighborhood.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any: [help]

This project will enhance and support existing recreational use of Lacamas Lake and Lacamas Lake Park by expanding the opportunity for recreational trail use.

13. Historic and cultural preservation [help]

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers ? If so, specifically describe. [help]

There are no buildings or structures over 45 years old located within the project area. Four archaeological resources have been identified in the project area including two pre-contact archaeological sites, one historic-period archaeological site, and one historic-period isolate. The two pre-contact sites have not been evaluated for eligibility for listing in the National Register of Historic Places (NRHP). The historic-period site and the historic-period isolate are not recommended to be eligible for listing in the NRHP.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources. [help]

Archaeological surveys were conducted for the proposed project by Archaeological Investigations Northwest, Inc. (AINW) in 2016, and for a different project in 2010. Another survey on one parcel was done by Archaeological Services of Clark County in 2004. Two pre-contact lithic scatters, one historic-period debris scatter, and one isolated historic-period glass fragment have been recorded in the project area.

Buchanan, Brian G., Sara J. Davis, and Jo Reese. 2010. *Cultural Resource Survey for the Proposed Lacamas Lake Shoreline Project, Clark County, Washington*. Archaeological Investigations Northwest, Inc. Report No. 2531. Prepared for Clark County, Vancouver, Washington.

DeLyria, David, and Todd Miles. 2004. *Archaeological Predetermination Report for Parcel No. 124244000, location directly west of 25700 SE 20th Circle, Camas, Washington*. Archaeological Services of Clark County, Vancouver, Washington.

Dubois, Sarah L., Ryan Swanson, Eva L. Hulse, and Jo Reese. 2018. Archaeological Survey for the Proposed Lacamas Lake North Shore Trail Project, Camas, Clark County, Washington. Archaeological Investigations Northwest, Inc. Report No. 3817. Prepared for City of Camas Department of Parks & Recreation, Camas, Washington.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc. [help]

AINW reviewed records held by the Washington Department of Archaeology and Historic Preservation (DAHP), AINW's library, and the Clark County GIS. AINW archaeologists conducted a pedestrian survey and shovel testing within the project area. Four archaeological resources were identified within the project area including two pre-contact lithic scatters, one historic-period refuse scatter, and one historic-period isolated glass fragment. The final report will be placed on file with DAHP.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required. [help]

There are four archaeological resources within the project area. Archaeological permits would be needed from DAHP prior to construction within the two pre-contact lithic scatter sites. AINW recommends that no additional archaeological excavation is needed for either site, as long as trail construction methods involve minimal ground disturbance (for example, gravel on top of permeable ground protection such as filter fabric). Archaeological monitoring may be needed for ground disturbing activities within the two pre-contact archaeological sites, depending on the nature and extent of the final project design. An Inadvertent Discovery Plan will outline procedures to be followed if archaeological resources are encountered during construction. DAHP permits would not be needed for the historic-period refuse scatter and the isolated historic-period glass fragment, because they are not recommended to be eligible for the NRHP.

14. Transportation [help]

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any. [help]

The existing site is accessed from NE Everett Street in Camas, Washington.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop? [help]

The nearest bus route is C-Tran Route 92, which offers service along NE 3rd Avenue in downtown Camas, approximately 1.3 miles south of the project trailhead.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate? [help]

No parking spaces will be added or eliminated as part of this project.

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private). [help]

None are required.

The project anticipates pedestrians crossing at the intersection of NE Everett Street and NE 35th Avenue. Based on conversations with Washington State Department of Transportation (WSDOT) staff, a crosswalk is not required here because every unsignalized intersection is a legal crosswalk. However, if the City thinks a crosswalk is needed at this location at any point, WSDOT would be willing to add a marked crosswalk (Personal communication Michael Southwick, WSDOT SW Region, SWR Traffic Operations, with Kent Snyder, HHPR on July 11, 2017).

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe. [help]

No. The project will not use water, rail or air transportation.

f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates? [help]

This expanded trail opportunity could increase the number of recreational users from Lacamas Lake Park. There is no estimate of the number of increased vehicular trips that could be generated by this trail expansion.

g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe. [help]

No. The project will not affect or be affected by the movement of agricultural and forest products.

h. Proposed measures to reduce or control transportation impacts, if any: [help]

None deemed necessary.

15. Public Services [help]

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe. [help]

No. The project does not create demand for these services.

b. Proposed measures to reduce or control direct impacts on public services, if any. [help]

Not applicable.

16. Utilities [help]

a. ***Circle utilities currently available at the site: [help]***

There are no utilities along the proposed trail corridor; however, along NE Everett Street the utilities include: electricity, natural gas, water, refuse service, telephone (possibly other telecommunication such as cable), and sanitary sewer.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed. [help]

No additional utilities are proposed for this project.

C. Signature [help]

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: _____

Name of signee: **Kent E. Snyder, PhD**

Position and Agency/Organization: **Harper Houf Peterson Righellis Inc.**

Date Submitted: _____

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Appendix A: Figures

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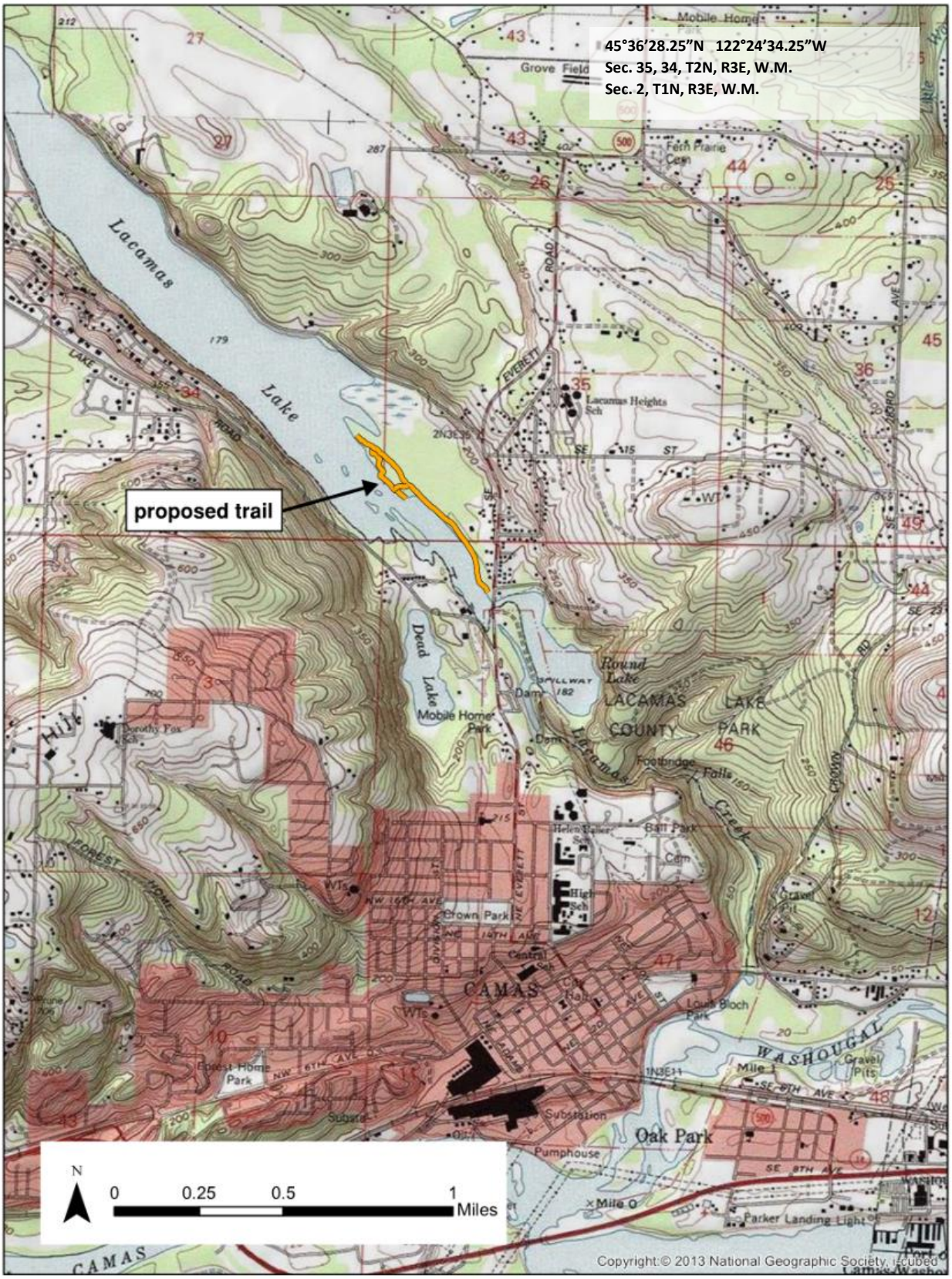


Figure 1: Project Vicinity

Lacamas North Shore Trail
Camas, Washington

Harper Houf Peterson Righellis Inc.
ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS

Figure 2: Proposed Trail

Lacamas North Shore Trail
Camas, Washington

HHPR Harper Houf Peterson Righellis Inc.
ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS

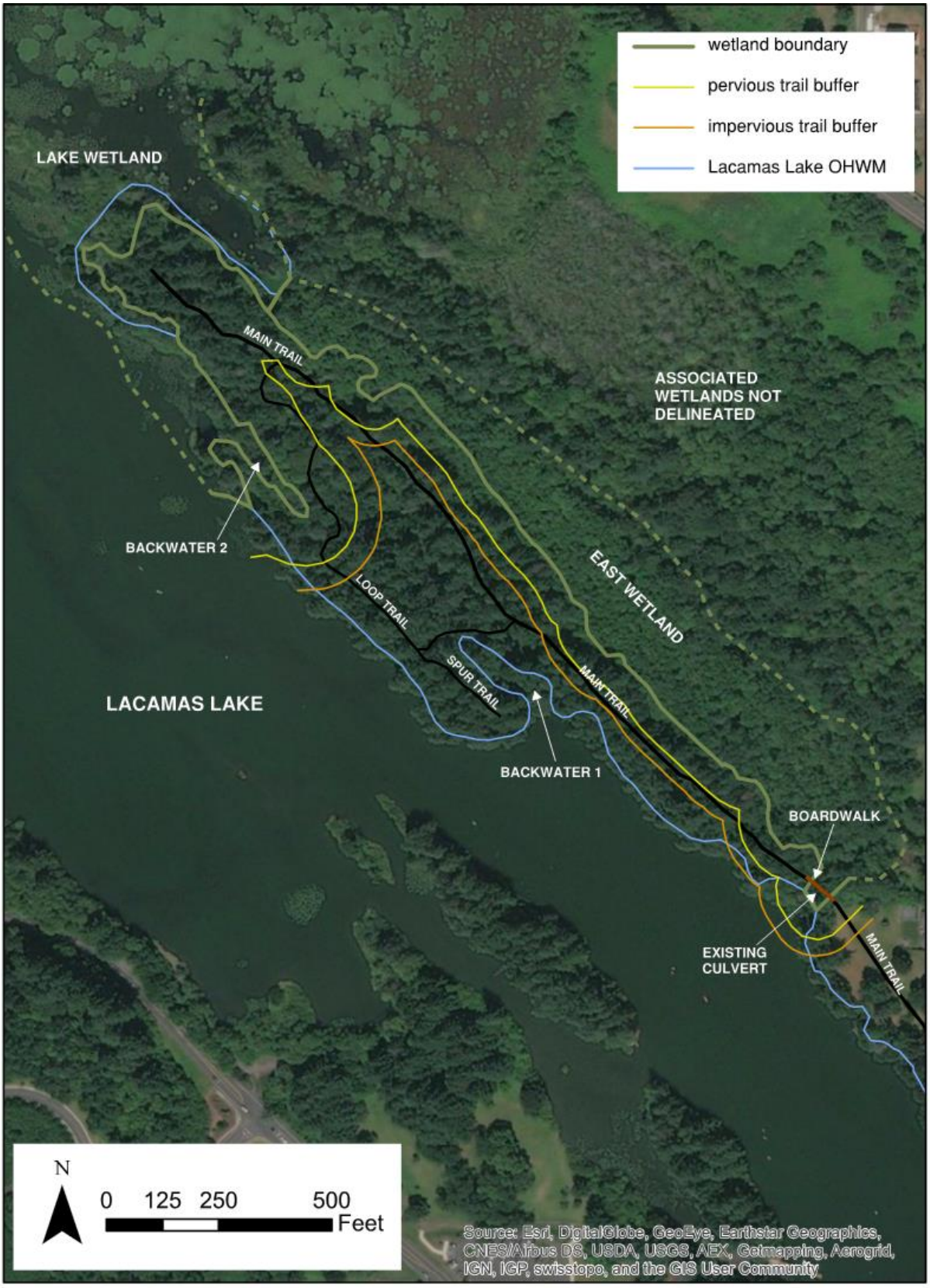
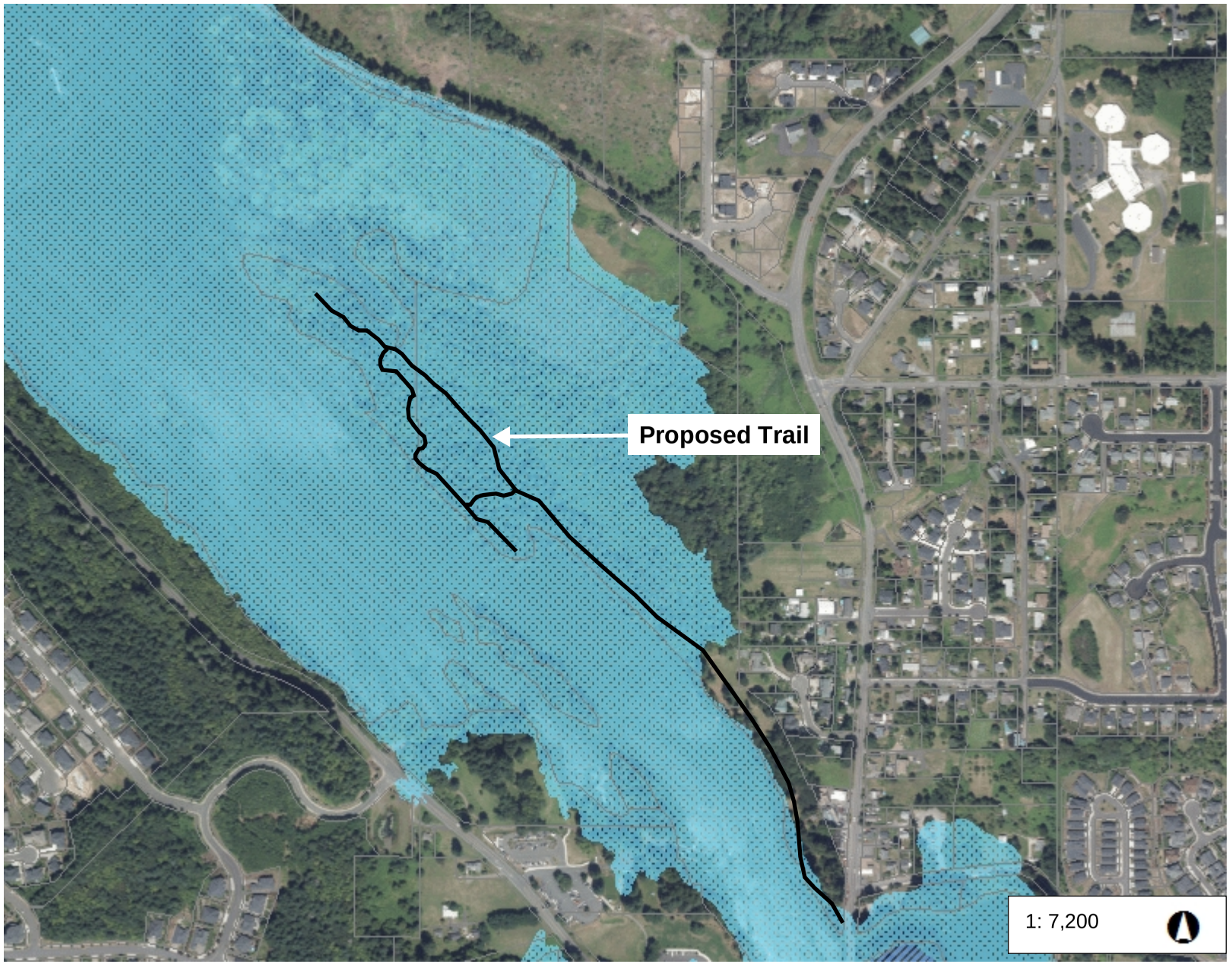


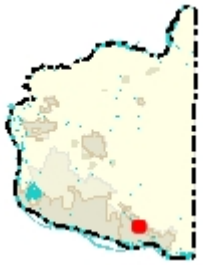
Figure 3: Wetlands and Wetland Buffers

Lacamas North Shore Trail
Camas, Washington

Harper Houf Peterson Righellis Inc.
ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS

Figure 4: 100 Year Floodplain.





Legend

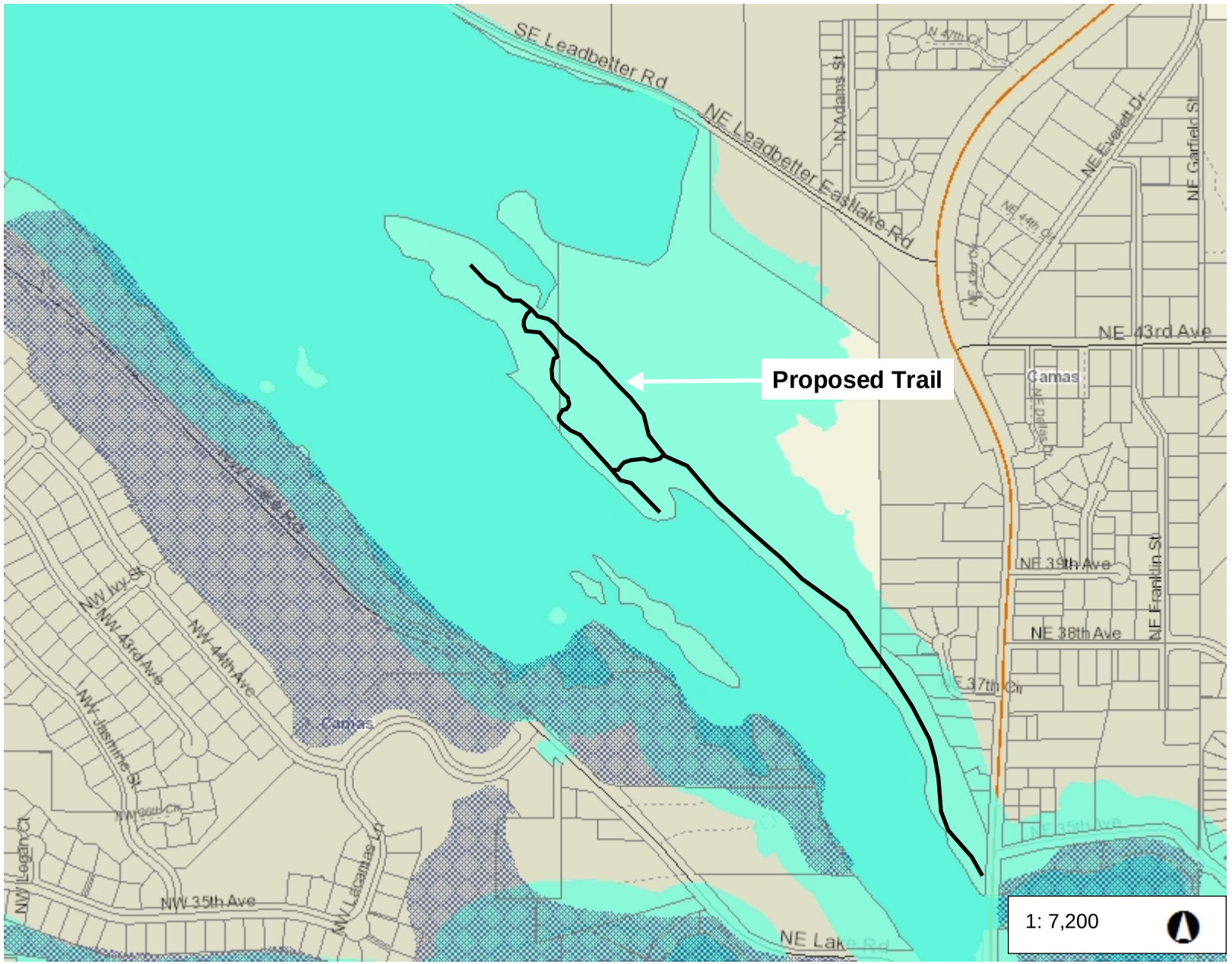
- Taxlots
- Flood Zone Designation
  - Floodway
  - Floodway Fringe
  - 500 Year Flood Area
  - Area Not Studied

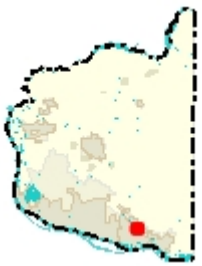
Notes:

1,200.0 0 600.00 1,200.0 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - http://gis.clark.wa.gov

Figure 5: Priority Habitat and Species Areas.





Legend

- Taxlots
- Priority Habitat and Species Ar
  - Non-riparian Habitat Conservation A
  - Species Areas
  - Riparian Habitat Conservation Area
- Cities Boundaries
- Urban Growth Boundaries

Notes:

1,200.0 0 600.00 1,200.0 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - http://gis.clark.wa.gov

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Appendix B: Photographs

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Photograph 1: View looking south toward NE Everett Street. Proposed Main trail to pass through Douglas fir stand, avoiding trees. Photograph taken January 14, 2018.

Photograph 2: View looking south where the proposed Main trail crosses mowed lawns. Abandoned access road visible through shrubs beyond lawn, in center mid-ground of photograph. Photograph taken January 14, 2018.

Photograph 3: View looking north along abandoned access road to be used for proposed Main trail. Photograph taken January 14, 2018.

Photograph 4: View looking north along abandoned access road at the northern junction of proposed Main and Loop trails. Photograph taken January 14, 2018.

Photograph 5: View of typical vegetation along proposed route of Loop trail. Photograph taken December 14, 2017.

Photograph 6: View along current packed dirt trail to be used for Spur trail. Photograph taken December 1, 2016.

Photograph 7: Culvert outfall (bottom left) at the abandoned access road crossing where the boardwalk is proposed. Photograph taken January 14, 2018.

Photograph 8: View south where the abandoned access road (culvert out fall on left side) crosses the East wetland and where the boardwalk is proposed. Photograph taken December 1, 2016.

Appendix C: Engineering Drawings

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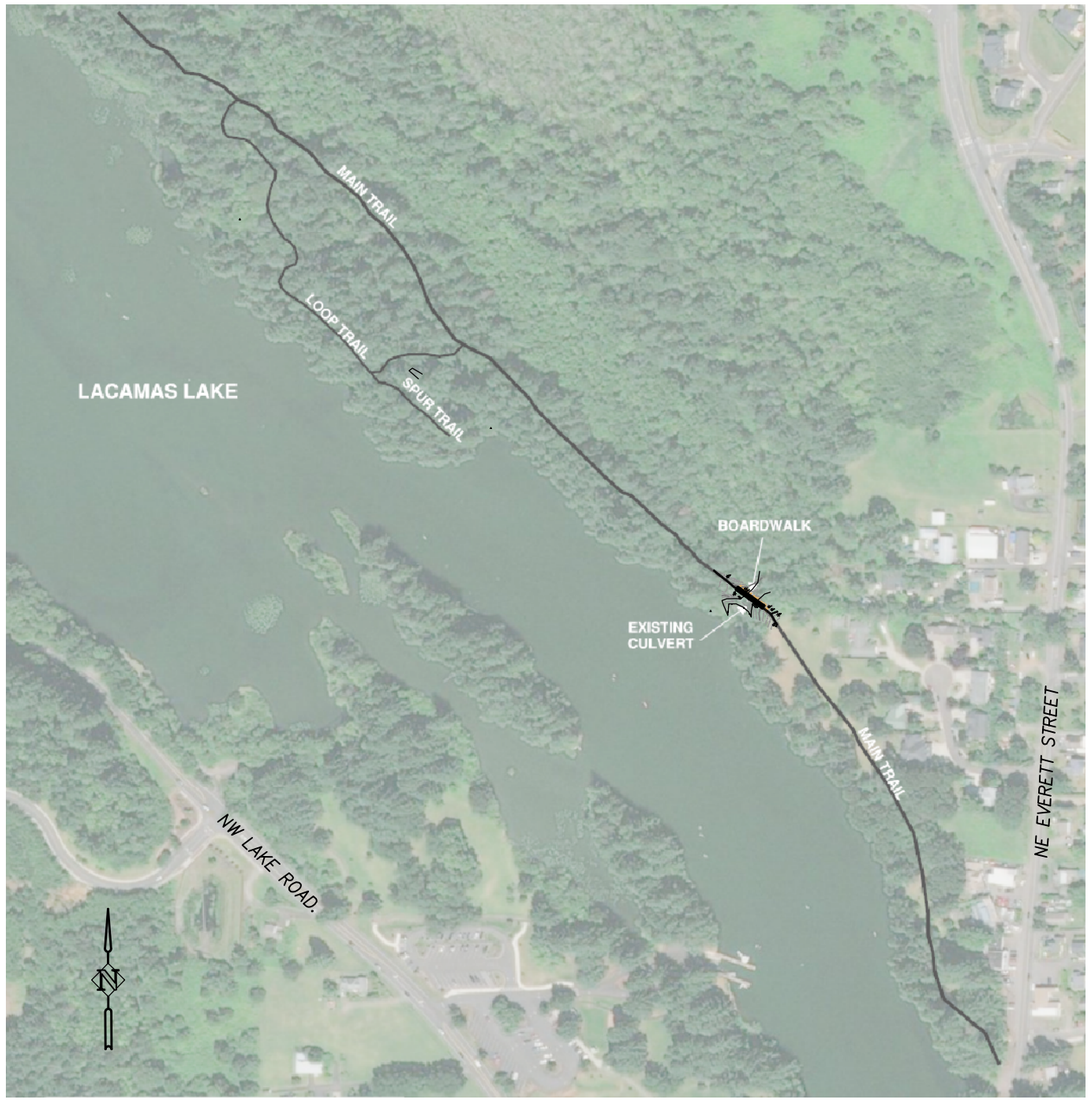
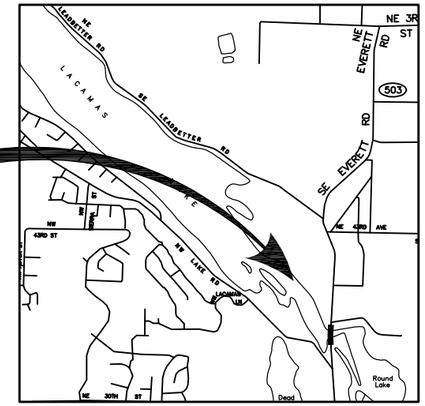
LACAMAS NORTH SHORE TRAIL

CAMAS, WASHINGTON



PROJECT LOCATION



VICINITY MAP

N.T.S.

OWNER

CITY OF CAMAS
CONTACT: JERRY ACHESON
616 NE 4TH AVENUE
CAMAS, WA 98607
TEL: 360-834-7092
FAX: 360-834-1535
EMAIL: JACHESON@CITYOFCAMAS.US

CIVIL ENGINEER

HARPER HOUF PETERSON RIGHELLIS INC.
CONTACT: ROB VANDERZANDEN, P.E.
1104 MAIN STREET, SUITE 100
VANCOUVER, WA 98660
TEL: 360-750-1131
FAX: 360-750-1141
EMAIL: ROBV@HHPR.COM

SHEET INDEX

ROBERT A. VANDERZANDEN
STATE OF WASHINGTON
23841
REGISTERED
PROFESSIONAL ENGINEER
3-8-18

DATE	NO.	DESCRIPTION

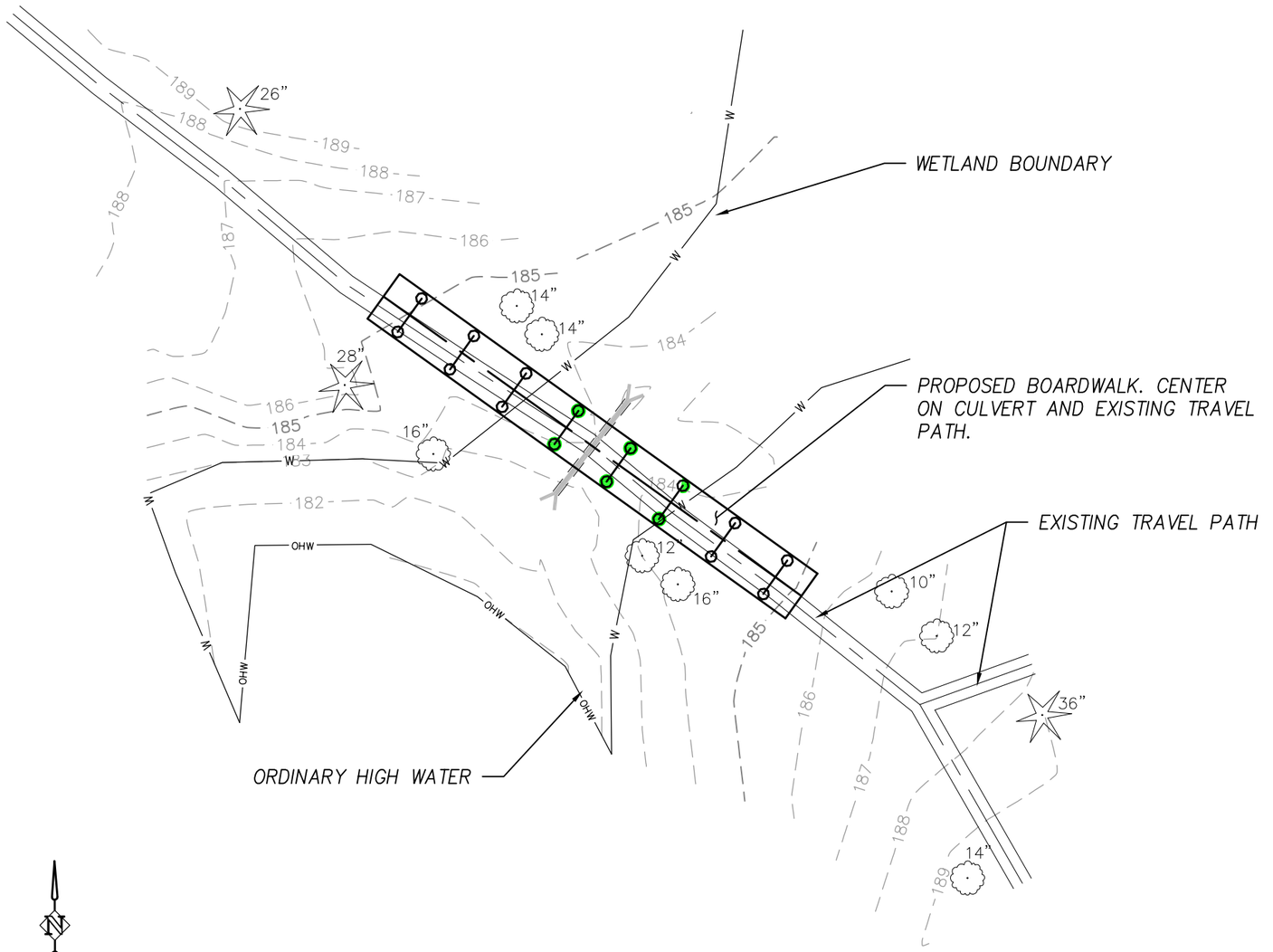
REVISIONS

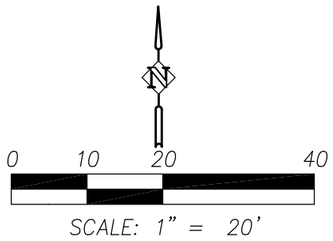
DESIGNED: RAV
DRAWN: JDB
CHECKED: RAV
DATE: 3/08/2018

Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS
LANDSCAPE ARCHITECTS • SURVEYORS
1104 Main Street, Suite 100, Vancouver, WA 98660
phone: 360.750.1131 www.hhpr.com fax: 360.750.1141

COVER SHEET
NORTH SHORE TRAIL
CAMAS, WASHINGTON

SHEET NO. C0
JOB NO. CAM-11A





6 SQFT TOTAL WETLAND IMPACT (SIX PIN PIERS)

ROBERT A. VANDERZANDEN
STATE OF WASHINGTON
23841
REGISTERED
PROFESSIONAL ENGINEER

3-8-18

DATE	NO.	DESCRIPTION

REVISIONS

DESIGNED:	RAV
DRAWN:	JDB
CHECKED:	RAV
DATE:	3/08/2018

Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS
LANDSCAPE ARCHITECTS • SURVEYORS
1104 Main Street, Suite 100, Vancouver, WA 98660
phone: 360.750.1131 www.hhpr.com fax: 360.750.1141

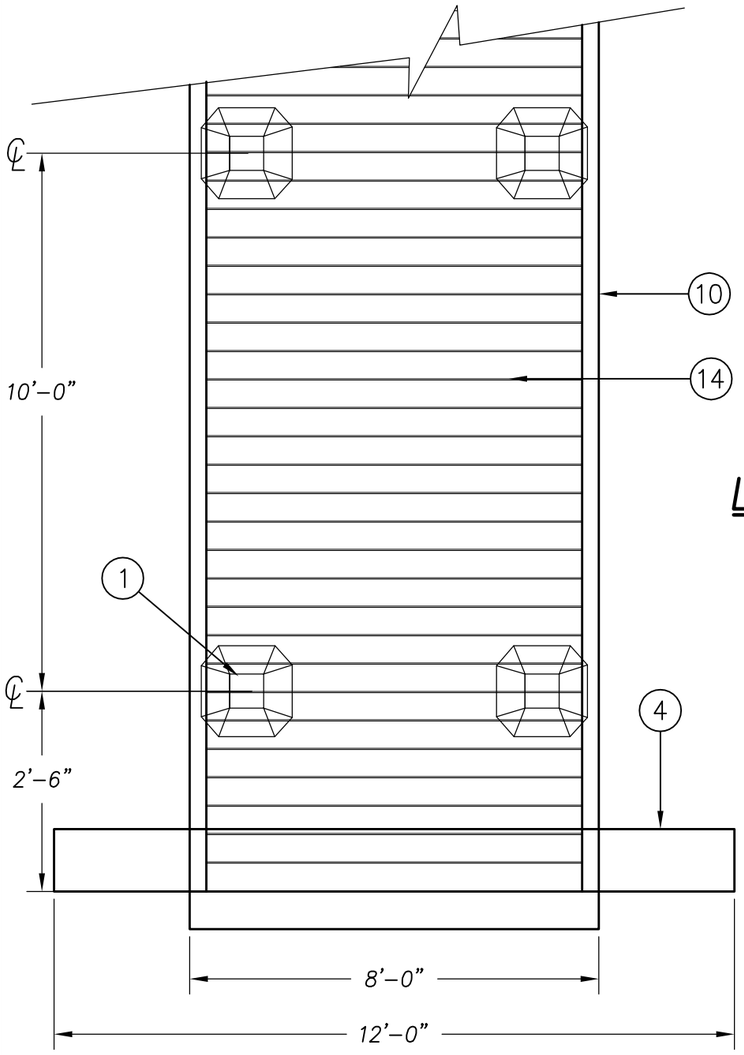
LACAMAS TRAIL BOARDWALK PLAN

NORTH SHORE TRAIL

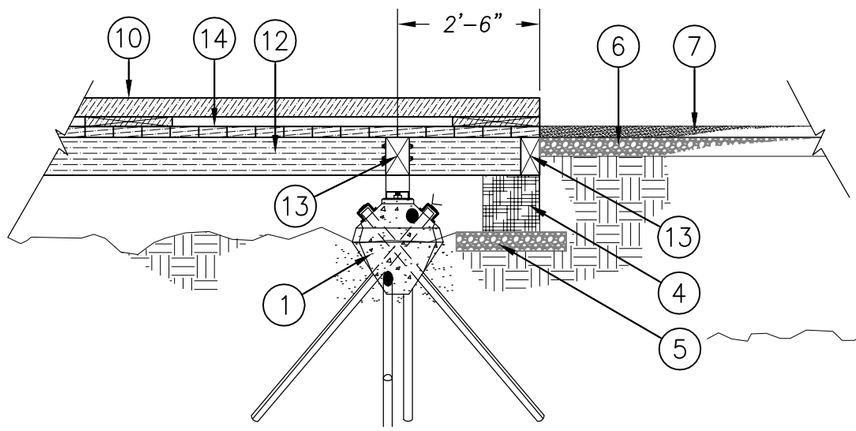
CAMAS, WASHINGTON

SHEET NO.
C1

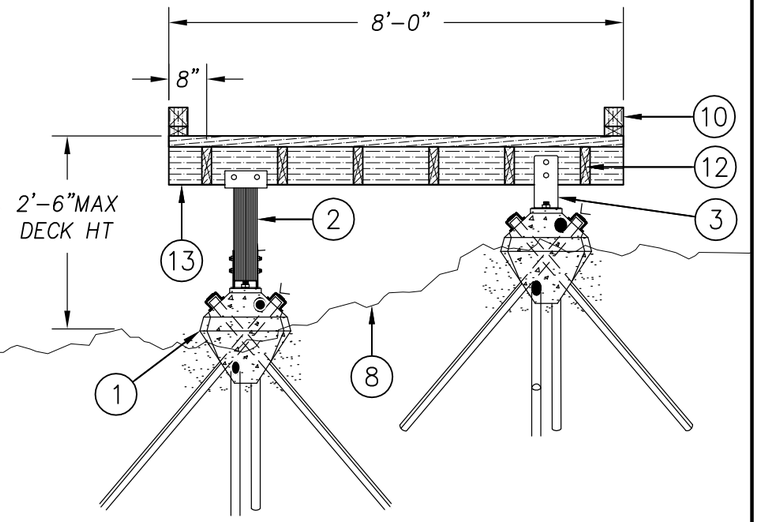
JOB NO.
CAM-11A



PLAN VIEW
N.T.S.



LONGITUDINAL SECTION VIEW
N.T.S.



CROSS SECTION VIEW
N.T.S.

1. PIN PIER FOOTING W/ "DP–50" UNIT, 4 PINS EACH @ 48" (GALVANIZED SCHEDULE 40) INSTALL PER MANUFACTURER SPECIFICATIONS.
2. POST AND BEAM WHERE SURFACE GRADE REQUIRES, CONSTRUCT SUPPORT USING SIMPSON ABU44 (OR APPROVED EQUAL) FOR POST BASE. USE SIMPSON PC44 TO CONNECT AT BEAM 4x6 PT POST.
3. BEAM SADDLE – AS GRADES ALLOW USE SIMPSON ABU44 (OR APPROVED EQUAL) AS A BEAM SADDLE – FASTEN TO PIN PIER.
4. CONCRETE MASONRY WALL UNITS 12" HIGH.
5. 4" THICK COMPACTED CRUSHED SURFACING BASE COURSE (1 1/4 – 0) PER WSDOT SECTION 9–03.9(3).
6. 4" THICK 1 1/4 MINUS CRUSHED ROCK PATHWAY BASE.
7. 2" THICK 3/8" – #4 CRUSHED ROCK PATHWAY PAVING.
8. COMPACTED NATIVE SOILS.
10. 4x4 PT KICK RAIL (BOTH SIDES TYP.) ON 18" – 2x4 PT LIFT SPACED 6'0" O.C. w/2–1/2" GALV. HEX BOLTS.
12. 2X8 PT JOISTS @ 16" O.C. (TYP.)
13. 4x8 PT BEAMS (TYP.)
14. 2x6 PT DECKING WITH 1/8" GAPS (TYP.)

DATE	NO.	DESCRIPTION

REVISIONS

DESIGNED: RAV
DRAWN: JDB
CHECKED: RAV
DATE: 3/08/2018

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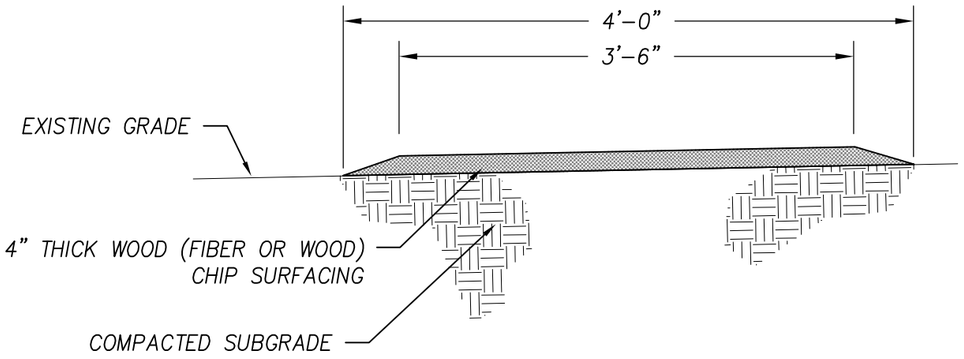
BOARDWALK
NORTH SHORE TRAIL
CAMAS, WASHINGTON

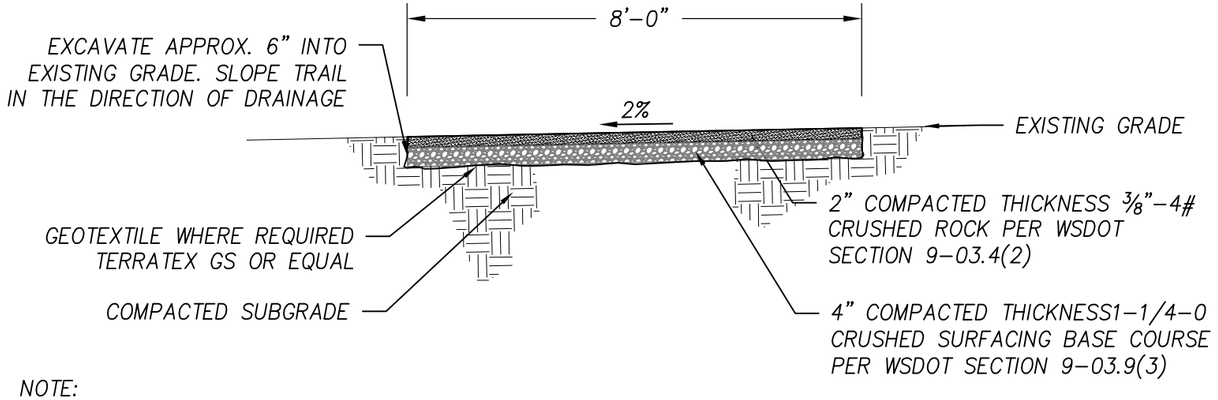
SHEET NO. C2
JOB NO. CAM-11A



NOTE:
THIS SECTION TO BE USED FOR THE LOOP AND SPUR TRAILS.

WOOD CHIP TRAIL SECTION

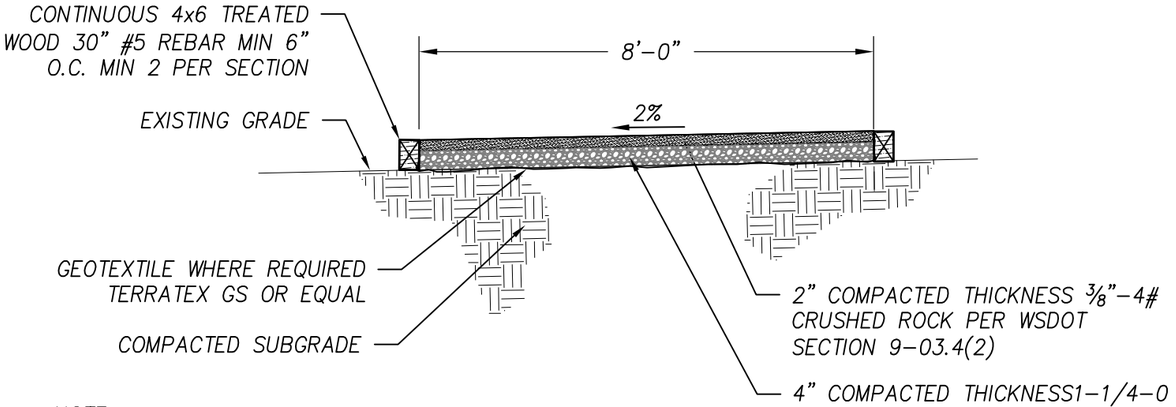
N.T.S.



NOTE:
THIS SECTION TO BE USED FOR THE MAIN TRAIL, EXCEPT FIRST 250 FEET AT NE EVERETT STREET.

CRUSHED SURFACING TRAIL EXCAVATED SECTION

N.T.S.



NOTE:
THIS SECTION TO BE USED FOR THE FIRST 250 FEET OF THE MAIN TRAIL BEGINNING AT NE EVERETT STREET.

CRUSHED SURFACING TRAIL CAUSEWAY SECTION

N.T.S.

ROBERT A. VANDERZANDEN
STATE OF WASHINGTON
23841
REGISTERED
PROFESSIONAL ENGINEER
3-8-18

DATE	NO.	DESCRIPTION

REVISIONS

DESIGNED: RAV
DRAWN: JDB
CHECKED: RAV
DATE: 3/08/2018

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TRAIL SECTIONS
NORTH SHORE TRAIL
CAMAS, WASHINGTON

SHEET NO. C3
JOB NO. CAM-11A

Appendix D: Other Technical Reports

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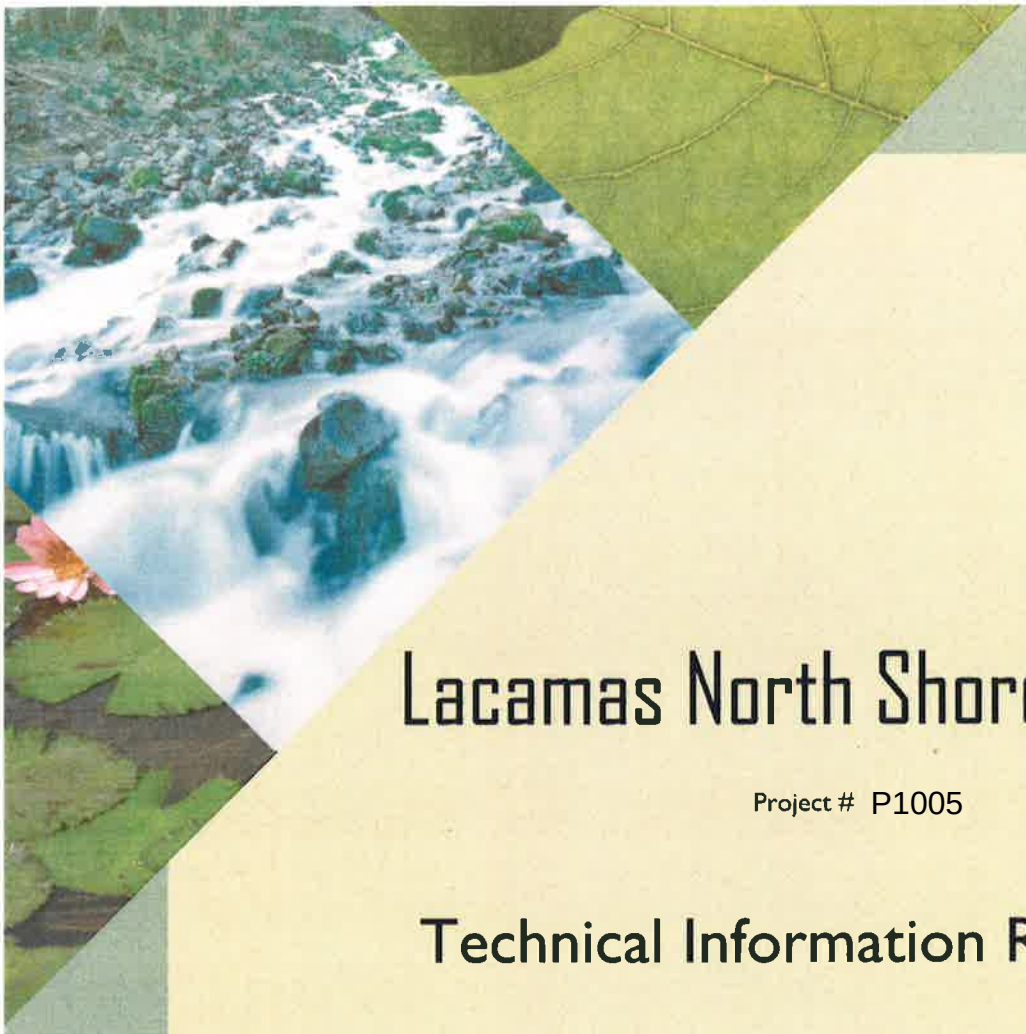

Harper
Houf Peterson
Righellis Inc.

Lacamas North Shore Trail

Project # P1005

Technical Information Report

February 13, 2018

Prepared For:

City of Camas
Jerry Acheson
616 NE Fourth Ave.
Camas, WA 98607

CAM-11A

Prepared By:

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P: 360-750-1131 F: 360-750-1141

Kelly D. Bachelder, PE

KELLY D. BACHELDER
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40581
REGISTERED
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2/13/18

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TECHNICAL APPENDICES

1. Maps
    a. Vicinity Map
    b. Shoreline Boundary
    c. Wetland and Buffers Map
    d. Flood Zone Map
    e. Soils Map
2. Technical Supporting Documents
    a. Flow Chart for New Development
    b. BMP T5.12
    c. WWHM Print Screens
3. Project Plan Set

REFERENCES

1. Camas Stormwater Design Standards Manual
2. Department of Ecology Stormwater Management Manual for Western Washington.

SECTION A – PROJECT OVERVIEW

1. Site Location: The City of Camas proposes to extend the existing trail system at the south end of Lacamas Lake. The new trails would be located within City property on the northeast side of Lacamas Lake, from the Round Lake Loop Trail east of NE Everett Street (State Route 500) to a natural area on the lakeshore.

2. Site Topography / Critical Areas: The existing area slopes gently southwest, typically within the shoreline of Lacamas Lake, but above the OHWM. The main trail would include a 75-foot-long boardwalk, 25 feet of which would lie above a wetland. The boardwalk would be supported on 16 pin piers (8 pairs). Six pin piers would be placed in the abandoned access road where it crosses a wetland. There is a small wetland impact where the pin piers will be installed to support the boardwalk. A wetland mitigation plan and shoreline application have been prepared for this project.

3. Existing Storm System: The existing area is typically undeveloped and the stormwater currently flows overland towards Lacamas Lake or wetlands to the east.

4. Site Parameters: The site slopes and the project desire to match existing flow patterns as much as possible have led the project to propose low impact development measures of sheet flow dispersion BMP T5.12.

5. Adjacent Parcels: Lacamas Lake borders the trail on the west side with typical forested uplands or wetlands on the east side. For the beginning portion of the trail, single family homes border the east side.

6. Affected Areas: The runoff from the 8' crushed surfacing trail should not adversely affect any adjacent areas. The site runoff from the post-developed condition will mimic the runoff from the pre-developed condition.

7. Proposed Site Construction: The City of Camas proposes to extend the existing trail system at the south end of Lacamas Lake. The new trails would be located within City property on the northeast side of Lacamas Lake, from the Round Lake Loop Trail east of NE Everett Street (State Route 500) to a natural area on the lakeshore. The main trail, approximately 3,300 feet in length, would traverse northwest from NE Everett Street, following the alignment of an abandoned access road. The main trail would include a 75-foot-long boardwalk, 25 feet of which would lie above a wetland. The boardwalk would be supported on 16 pin piers (8 pairs). Six pin piers would be placed in the abandoned access road where it crosses a wetland.

   A shorter loop trail, approximately 1,120-feet long, would connect to the main trail to create a loop in the natural area. A spur trail, approximately 180-feet long, would follow the path of an existing informal packed dirt trail from the south end of the loop trail to a viewpoint of Lacamas Lake. The latter two trails would have a pervious surface. The main trail would be 8-feet wide and constructed of impervious material (geotextile and a gravel cover); the loop and spur trails would be 4-feet wide and pervious.

SECTION B – MINIMUM REQUIREMENTS

The existing areas for this project consist of all pervious surfaces. Approximately 0.75 acres of land disturbing activities will be involved with this trail project. A summary of the project's surface impacts to the site is provided in the table below.

TABLE B-1. PROJECT IMPACT AREA VALUES

Existing Impervious	New Impervious (Main Trail)	Replaced Impervious	Native /Existing Vegetation or Converted to Lawn or Landscaping (loop and spur trails)	Native Vegetation Converted to Pasture	Total Land-Disturbing Activity
(ACRES)	(ACRES)	(ACRES)	(ACRES)	(ACRES)	(ACRES)
0	0.61	0	0.10	0.00	0.75

Since the project results in at least 5,000 square feet of new or replaced hard surface area, all Minimum Requirements apply to the new and replaced impervious surfaces (See Flow Chart in Appendix 2).

There is one Threshold Discharge Area.

A summary of how the project meets each of the minimum requirements is described below. See additional sections of this report for more detailed information.

MR#1 – Preparation of Stormwater Site Plans
See the project drawings for stormwater information (included in Appendix 3).

MR#2 - Construction Stormwater Pollution Prevention Plans
The contractor is responsible for conforming to the City of Camas Municipal Code Title 14. The 12 elements of the Construction Stormwater Pollution Prevention Plan (SWPPP) must be considered and will be prepared for this project prior to construction.

MR#3 – Source Control of Pollution
The project consists of a non-pollution generating walking trails and therefore the development does not include any pollutant generating sources as listed in the Stormwater Manual.

MR#4 – Preservation of Natural Drainage Systems and Outfalls
All existing natural drainage systems and outfalls will be maintained with this project.

MR#5 – On-site Stormwater Management
The project will utilize dispersion BMP's to meet the LID Performance Standard. BMP T5.12 Sheet flow dispersion will be utilized for all trail areas. All disturbed soils will be amended with BMP T5.13 Post-Construction Soil Quality and Depth.

MR#6 – Runoff Treatment
All hard surface will be non-pollution generating, therefore the MR#6 Runoff Treatment threshold is not

met and is not required.

MR#7 – Flow Control
Because the project is adding 26,400 sf of impervious surface, this minimum requirement must be met. See the WWHM printouts in Appendix 2 that shows the project "passes".

MR#8 – Wetlands Protection
There will be a small impact to the wetland with the project. The main trail will include a 75-foot-long boardwalk, 25 feet of which would lie above a wetland. The boardwalk would be supported on 16 pin piers (8 pairs). Six pin piers would be placed in the abandoned access road where it crosses a wetland. The wetland will be impacted (6 sf) where the pin piers will be installed. A wetland mitigation report has been prepared for the project.

MR#9 – Operation and Maintenance
The project will be publically maintained by the City of Camas.

SECTION C – SOILS EVALUATION

1. According to the NRCS Soils Survey, the project site consists mostly of Washougal Gravelly Loam (WgB). The soils are typically well drained. The LID treatment for the project consists of BMP T5.12 Sheet Flow Dispersion. The existing soils will be adequate for the BMP.

2. No geotechnical study was performed with this project, so the depth to the water table is unknown. However, Lacamas Lake is adjacent to the project and the OHWM was determined and shown on the Shoreline Boundary Map within the map section (Appendix 1). Because the stormwater BMP is Sheet Flow Dispersion which is all on the surface, the water table has little impact on the effectiveness of the BMP.

3. Maintaining the existing stormwater flows, low impact development and the ability to integrate into the existing surroundings were the main parameters utilized in the storm design.

4. The infiltration of the site soils was determined through the Soil Survey of Clark County. Slight infiltration was utilized within the dispersion areas.

SECTION D – SOURCE CONTROL

1. The primary use of the project is for walking and biking trails. No development activities listed in Section 2.2 of the Stormwater Manual are proposed for this site. Temporary Best Management Practices (BMP's) in accordance with City of Camas Standard Details will be implemented during construction to control stormwater pollution. After the project is completed, long-term stormwater pollution control measures include sheet flow dispersion.

SECTION E – ONSITE STORMWATER MANAGEMENT

1. BMP T5.12 Sheet Flow Dispersion will be utilized adjacent to the trail for the entire length of the project.

2. The information used to complete the analysis included the characteristics of the existing site, the existing soil parameters and the adjacent area deemed suitable for sheet flow dispersion.

3. The criteria for Sheet Flow Dispersion includes:
    a. avoid concentrated flows
    b. no downstream flooding or erosion

    Because the project consists of a new non-pollution generating trail that is long, but not wide, the sheet flow dispersion works well within the natural area.

4. The project will utilize BMP T5.12 Sheet Flow Dispersion for stormwater management.

5. The project will utilize the LID measure of sheet flow dispersion.

6. The assumptions used to complete the analysis are:

    a. The trail and adjacent area will be well-maintained throughout the life of the project.
    b. WWHM calculations mimic actual rainfall data on the site.

7. The project is good candidate for the chosen BMP. The construction will disturb very little area outside of the trails. The slopes are fairly consistent throughout the project and all drain at a gentle slope away from the trails. Because the project consists of a nature trail, the adjacent areas will be kept in natural vegetation and are unlikely to be developed in the near future.

8. Refer to the project plan set, Appendix 3, for trail sections, including crushed rock type, geotextile requirement and type of wood chip surfacing.

SECTION F – RUNOFF TREATMENT ANALYSIS AND DESIGN

There will not be any pollution-generating surfaces constructed with the project, therefore MR #6 Runoff Treatment is not required.

SECTION G – FLOW CONTROL ANALYSIS AND DESIGN

Flow control is required for TDA's with greater than 10,000 square feet of new impervious surface. Therefore, flow control is required for the project.

1. Washougal gravelly loam (WgB) is a somewhat excessively drained soil that is generally moderately permeable. To model BMP T5.12, sheet flow dispersion in WWHM for flow control, the dispersion area was modeled as an extremely shallow pond (0.10' high) with limited infiltration (0.1 iph). While the runoff will disperse over fifty feet prior to Lacamas Lake, twenty feet of dispersion was utilized in design. According to the NRCS Soil Survey, the permeability of WgB is in the range of 0.63 – 2.0 iph for the top 22 inches of soil. A conservative 0.1 iph was utilized in design.

2. A geotechnical report was not provided for the project. The NRCS Soil Survey of Clark County was referenced for the site soils.

3. BMP T5.12 Sheet Flow Dispersion will be utilized for all of the hard surfaces and converted pervious surfaces within the project.

4. The site is not known to be a historical prairie, therefore a forested condition is utilized for the pre-developed surfaces in the WWHM calculations.

5. Refer to Appendix 2 for the WWHM printouts.

6. The method of flow control for the project is sheet flow dispersion. The continuous flow model Western Washington Hydrology Model (WWHM) was utilized in design. Refer to Appendix 2.

7. See Appendix 1, Maps for all exhibit.

SECTION H – WETLANDS PROTECTION

There will be a small impact to the wetland with the project. The main trail will include a 75-foot-long boardwalk, 25 feet of which would lie above a wetland. The boardwalk would be supported on 16 pin piers (8 pairs). Six pin piers would be placed in the abandoned access road where it crosses a wetland. The wetland will be impacted (6 sf) where the pin piers will be installed. A wetland mitigation report has been prepared for the project.

APPENDIX 1 –Maps

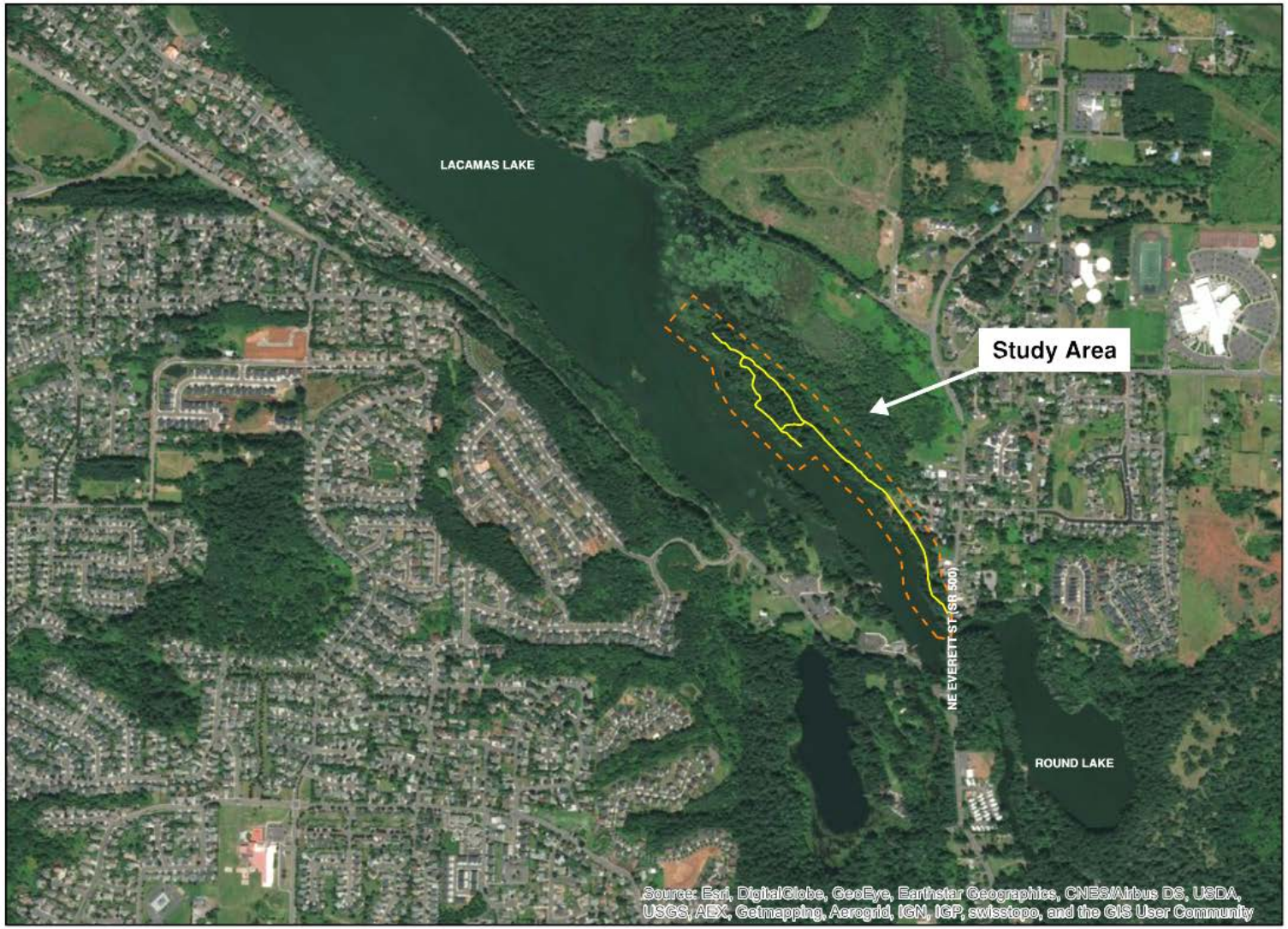

Figure 1: Vicinity Map

Lacamas North Shore Trail
Camas, Washington

Harper Houf Peterson Righellis Inc.
ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS

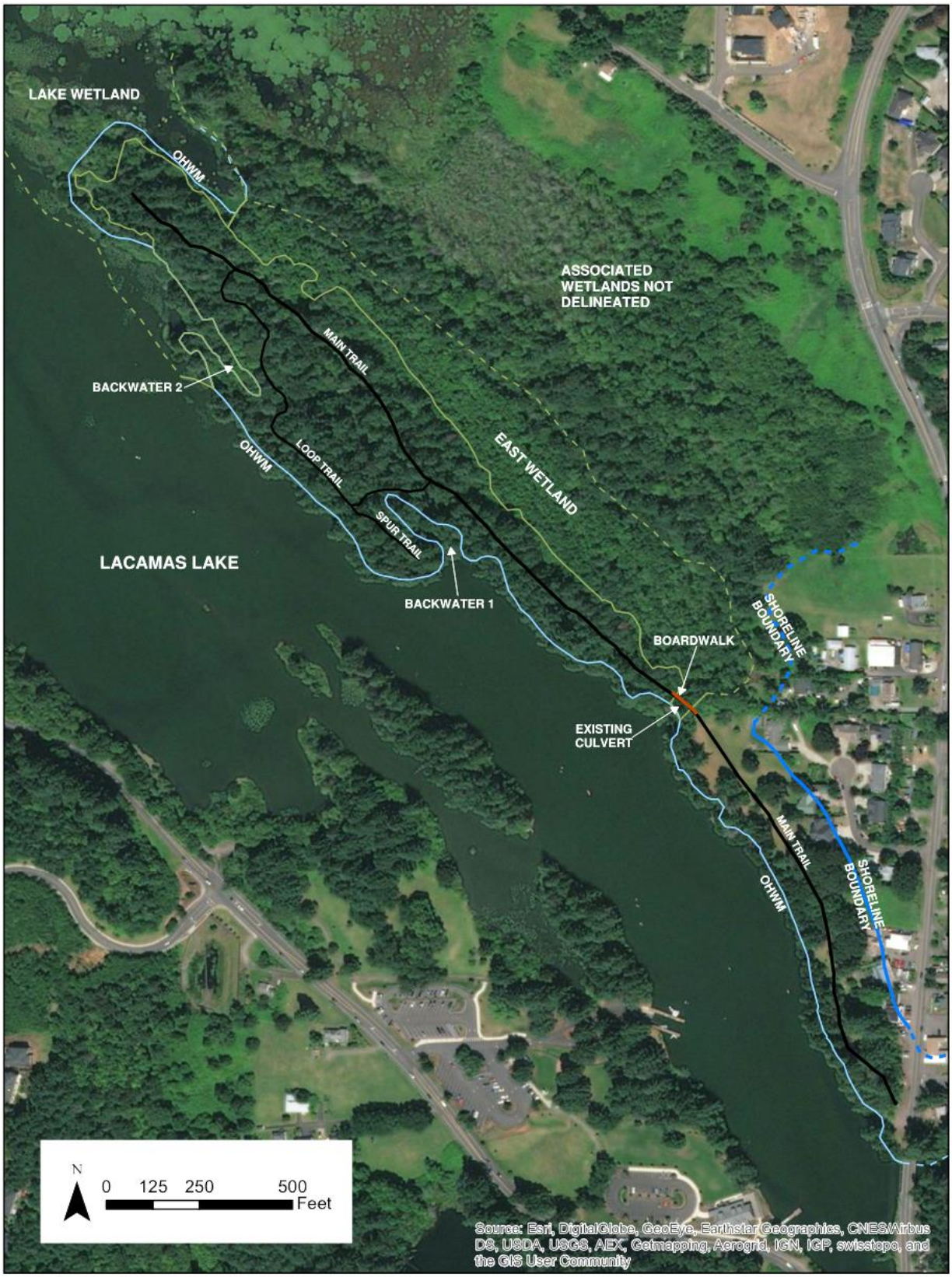

Figure 2: Shoreline Boundary

Lacamas North Shore Trail
Camas, Washington

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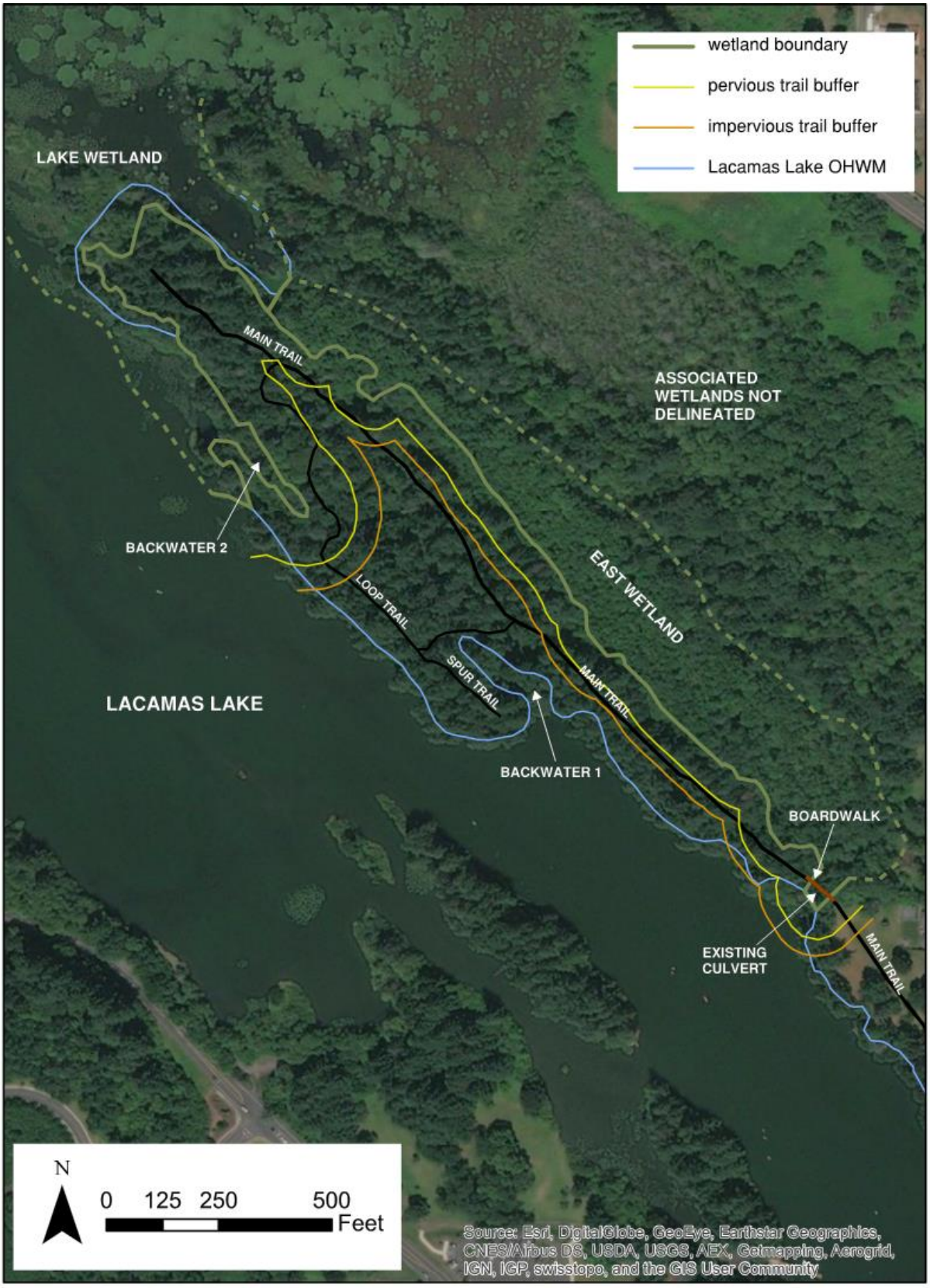

Figure 3: Wetlands and Wetland Buffers

Lacamas North Shore Trail
Camas, Washington

Harper Houf Peterson Righellis Inc.
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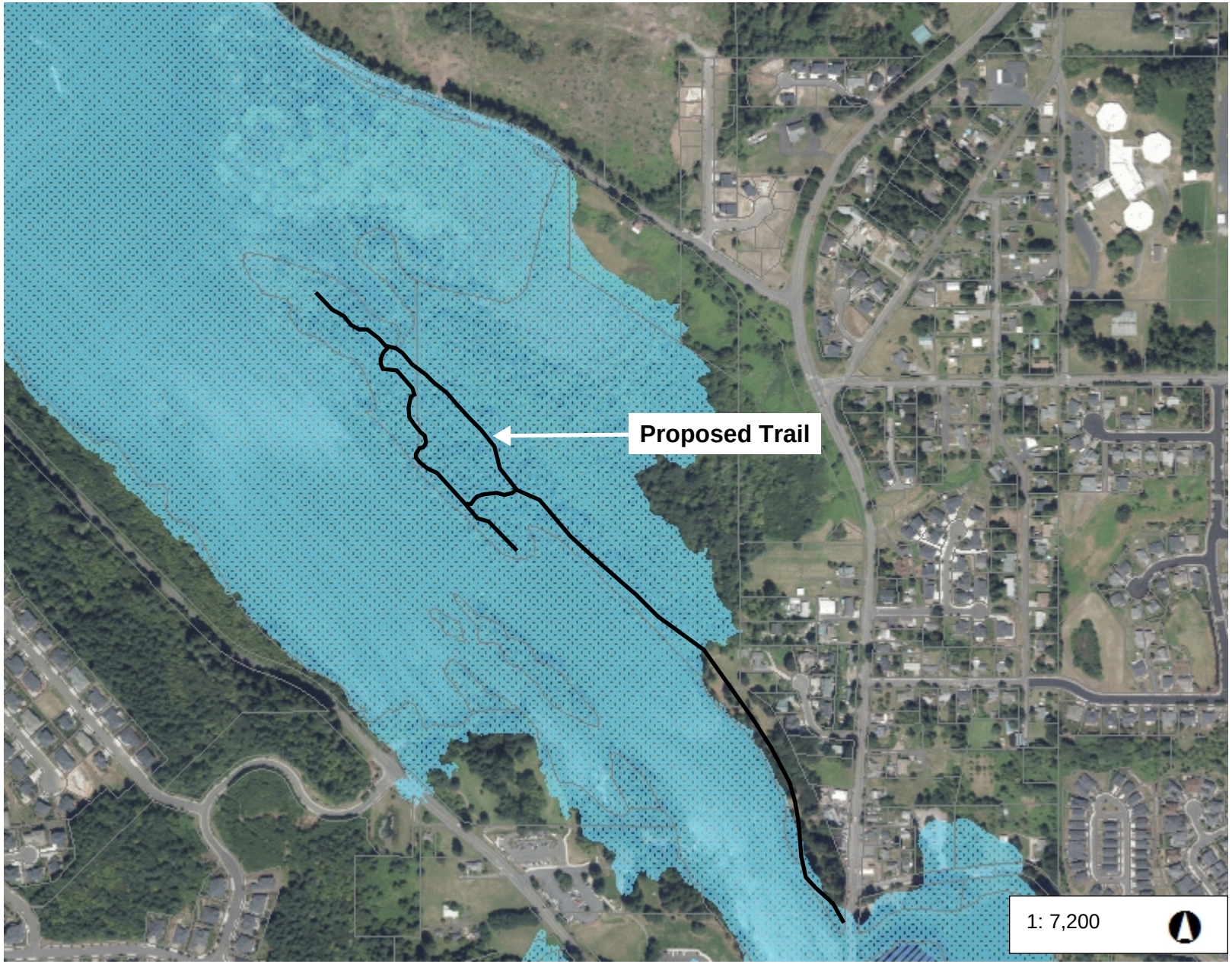
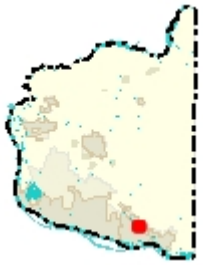
LANDSCAPE ARCHITECTS ◆ SURVEYORS

Figure 4: Frequently Flooded Area.





Legend

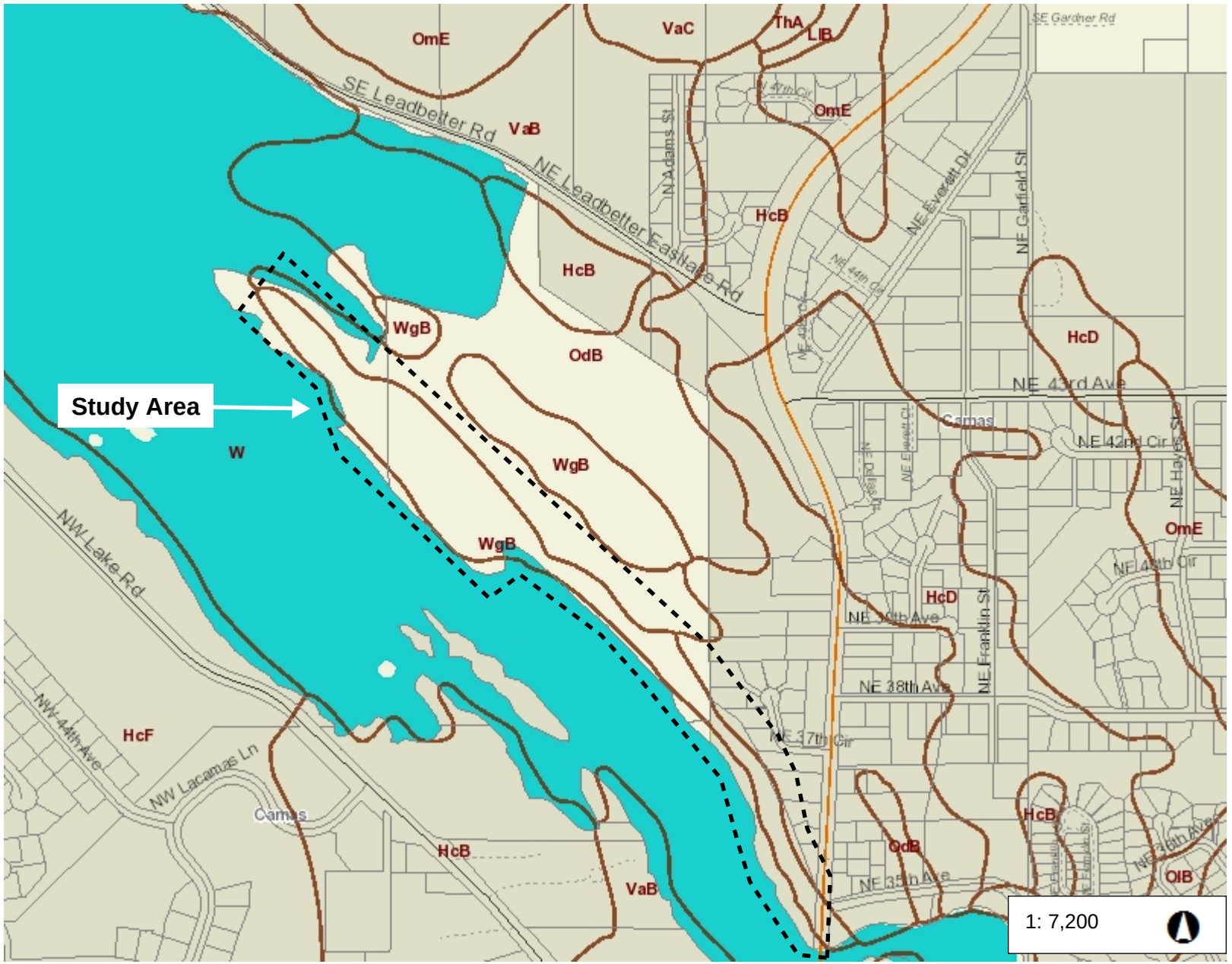
- Taxlots
- Flood Zone Designation
  - Floodway
  - Floodway Fringe
  - 500 Year Flood Area
  - Area Not Studied

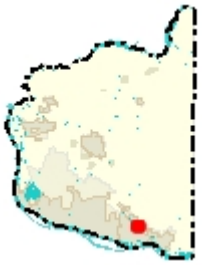
Notes:

1,200.0 0 600.00 1,200.0 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - http://gis.clark.wa.gov

Figure 5: Soil Map Units within the Study Area





Legend

- Taxlots
- Soil Map Units

Soil Map Units in Study Area

WgB - Washougal Gravelly Loam, 0 to 8 percent slopes, well drained.

OdB - Odne silt loam, 0 to 5 percent slopes, poorly drained.

HcB - Hesson Clay Loam, 0 to 8 percent slopes, well drained.

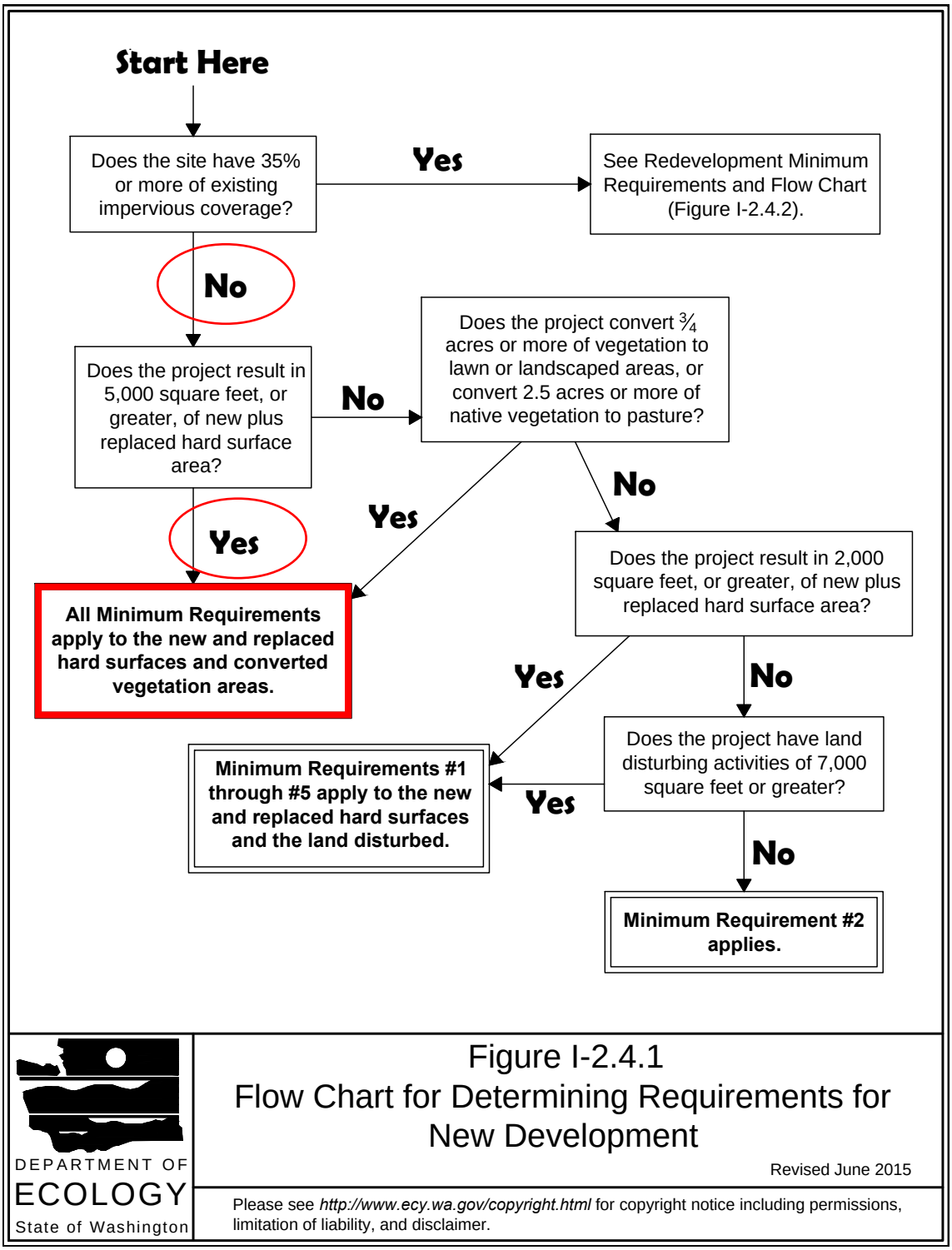
Notes:

1,200.0 0 600.00 1,200.0 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - http://gis.clark.wa.gov

APPENDIX 2 –Technical Supporting Documents

Figure I-2.4.1 Flow Chart for Determining Requirements for New Development



BMP T5.12: Sheet Flow Dispersion

Purpose and Definition

Sheet flow dispersion is the simplest method of runoff control. This BMP can be used for any impervious or pervious surface that is graded to avoid concentrating flows). Because flows are already dispersed as they leave the surface, they need only traverse a narrow band of adjacent vegetation for effective attenuation and treatment.

Applications and Limitations

Use this BMP for flat or moderately sloping (< 15% slope) surfaces such as driveways, sports courts, patios, roofs without gutters, lawns, pastures; or any situation where concentration of flows can be avoided.

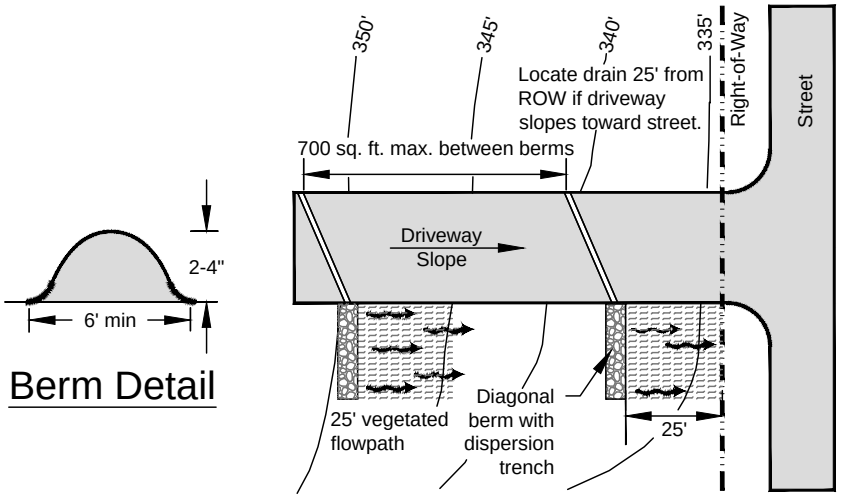
Design Guidelines

- See Figure V-5.3.2 Sheet Flow Dispersion for Driveways (p.910) for details for driveways.
- Provide a 2-foot-wide transition zone to discourage channeling between the edge of the impervious surface (or building eaves) and the downslope vegetation. This transition zone may consist of an extension of subgrade material (crushed rock), modular pavement, drain rock, or other material acceptable to the Local Plan Approval Authority.
- Provide a 10-foot-wide vegetated buffer for up to 20 feet of width of paved or impervious surface. Provide an additional 10 feet of vegetated buffer width for each additional 20 feet of impervious surface width or fraction thereof. (For example, if a driveway is 30 feet wide and 60 feet long provide a 20-foot wide by 60-foot long vegetated buffer, with a 2-foot by 60-foot transition zone.)
- No erosion or flooding of downstream properties may result.
- Runoff discharge toward landslide hazard areas must be evaluated by a geotechnical engineer or a qualified geologist. Do not allow sheet flow on or above slopes greater than 20%, or above erosion hazard areas, without evaluation by a geotechnical engineer or qualified geologist and approval by the Local Plan Approval Authority.
- For sites with septic systems, the discharge area must be ten feet downgradient of the drainfield primary and reserve areas (WAC 246-272A-0210). A Local Plan Approval Authority may waive this requirement if site topography clearly prohibits flows from intersecting the drainfield.

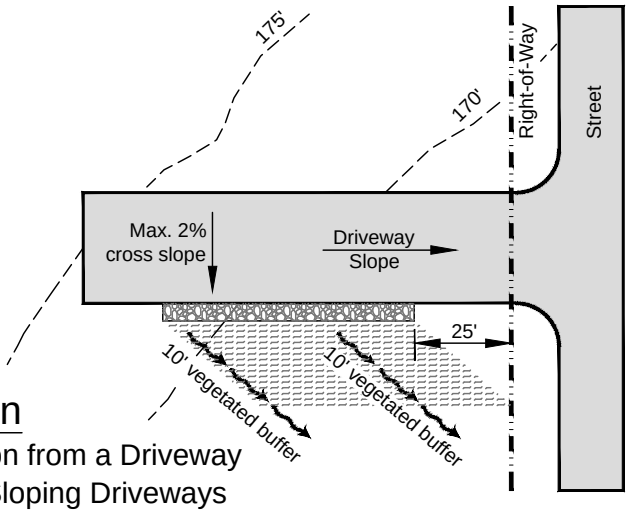
Runoff Modeling

Where BMP T5.12: Sheet Flow Dispersion is used to disperse runoff into an undisturbed native landscape area or an area that meets BMP T5.13: Post-Construction Soil Quality and Depth (p.911), and the vegetated flow path is 50 feet or more, the impervious area may be modeled as landscaped area. Where the vegetated flowpath is 25 to 50 feet, use of a dispersion trench (see BMP T5.10B: Downspout Dispersion Systems (p.905)) allows modeling the impervious area as 50% impervious/50% landscape. This is done in the WWHM3 on the Mitigation Scenario screen by entering the dispersed impervious area into one of the entry options for dispersal of impervious area runoff. For procedures in WWHM 2012, see Appendix III-C: Washington State Department of Ecology Low Impact Development Flow Modeling Guidance (p.587).

Figure V-5.3.2 Sheet Flow Dispersion for Driveways



Driveway Dispersion Trench
Driveway Slope Varies and Slopes Toward Street



Sheet Flow Dispersion from a Driveway
Flat to Moderately Sloping Driveways

NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Figure V-5.3.2
Sheet Flow Dispersion for Driveways

Revised January 2016

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	CAM-11A WWHM
Site Name:	
Site Address:	
City:	
Report Date:	2/13/2018
Gage:	Lacamas
Data Start:	1948/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.300
Version Date:	2017/04/14
Version:	4.2.13

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Pre path area

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Forest, Flat	0.75
Pervious Total	0.75

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.75

Element Flows To:

Surface	Interflow	Groundwater

Pre dispersion area

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Forest, Flat	2.11
Pervious Total	2.11

Impervious Land Use	acre
Impervious Total	0
Basin Total	2.11

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Main Trail

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
SIDEWALKS FLAT	0.6
Impervious Total	0.6
Basin Total	0.6

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Basin 2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Lawn, Flat	0.12
Pervious Total	0.12

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.12

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 2	Trapezoidal Pond 2	

Routing Elements
Predeveloped Routing

Mitigated Routing

Trapezoidal Pond 1

Bottom Length:	3300.00 ft.	
Bottom Width:	20.00 ft.	
Depth:	1.1 ft.	
Volume at riser head:	0.1667 acre-feet.	
Infiltration On		
Infiltration rate:	0.1	
Infiltration safety factor:	1	
Total Volume Infiltrated (ac-ft.):		118.681
Total Volume Through Riser (ac-ft.):		0
Total Volume Through Facility (ac-ft.):		118.681
Percent Infiltrated:		100
Total Precip Applied to Facility:		0
Total Evap From Facility:		0
Side slope 1:	0 To 1	
Side slope 2:	0 To 1	
Side slope 3:	0 To 1	
Side slope 4:	0 To 1	
Discharge Structure		
Riser Height:	0.1 ft.	
Riser Diameter:	39600 in.	
Element Flows To:		
Outlet 1	Outlet 2	

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	1.515	0.000	0.000	0.000
0.0122	1.515	0.018	0.000	0.152
0.0244	1.515	0.037	0.000	0.152
0.0367	1.515	0.055	0.000	0.152
0.0489	1.515	0.074	0.000	0.152
0.0611	1.515	0.092	0.000	0.152
0.0733	1.515	0.111	0.000	0.152
0.0856	1.515	0.129	0.000	0.152
0.0978	1.515	0.148	0.000	0.152
0.1100	1.515	0.166	35.05	0.152
0.1222	1.515	0.185	116.1	0.152
0.1344	1.515	0.203	224.0	0.152
0.1467	1.515	0.222	353.3	0.152
0.1589	1.515	0.240	500.9	0.152
0.1711	1.515	0.259	664.7	0.152
0.1833	1.515	0.277	843.2	0.152
0.1956	1.515	0.296	1035.	0.152
0.2078	1.515	0.314	1240.	0.152
0.2200	1.515	0.333	1457.	0.152
0.2322	1.515	0.351	1685.	0.152
0.2444	1.515	0.370	1924.	0.152
0.2567	1.515	0.388	2173.	0.152
0.2689	1.515	0.407	2432.	0.152
0.2811	1.515	0.425	2701.	0.152
0.2933	1.515	0.444	2979.	0.152
0.3056	1.515	0.463	3266.	0.152
0.3178	1.515	0.481	3562.	0.152

0.3300	1.515	0.500	3866.	0.152
0.3422	1.515	0.518	4178.	0.152
0.3544	1.515	0.537	4498.	0.152
0.3667	1.515	0.555	4826.	0.152
0.3789	1.515	0.574	5162.	0.152
0.3911	1.515	0.592	5505.	0.152
0.4033	1.515	0.611	5855.	0.152
0.4156	1.515	0.629	6213.	0.152
0.4278	1.515	0.648	6577.	0.152
0.4400	1.515	0.666	6949.	0.152
0.4522	1.515	0.685	7327.	0.152
0.4644	1.515	0.703	7711.	0.152
0.4767	1.515	0.722	8103.	0.152
0.4889	1.515	0.740	8500.	0.152
0.5011	1.515	0.759	8904.	0.152
0.5133	1.515	0.777	9314.	0.152
0.5256	1.515	0.796	9730.	0.152
0.5378	1.515	0.814	10153	0.152
0.5500	1.515	0.833	10581	0.152
0.5622	1.515	0.851	11015	0.152
0.5744	1.515	0.870	11455	0.152
0.5867	1.515	0.888	11900	0.152
0.5989	1.515	0.907	12351	0.152
0.6111	1.515	0.925	12808	0.152
0.6233	1.515	0.944	13270	0.152
0.6356	1.515	0.963	13737	0.152
0.6478	1.515	0.981	14210	0.152
0.6600	1.515	1.000	14689	0.152
0.6722	1.515	1.018	15172	0.152
0.6844	1.515	1.037	15661	0.152
0.6967	1.515	1.055	16155	0.152
0.7089	1.515	1.074	16654	0.152
0.7211	1.515	1.092	17158	0.152
0.7333	1.515	1.111	17667	0.152
0.7456	1.515	1.129	18180	0.152
0.7578	1.515	1.148	18699	0.152
0.7700	1.515	1.166	19223	0.152
0.7822	1.515	1.185	19751	0.152
0.7944	1.515	1.203	20284	0.152
0.8067	1.515	1.222	20822	0.152
0.8189	1.515	1.240	21365	0.152
0.8311	1.515	1.259	21912	0.152
0.8433	1.515	1.277	22464	0.152
0.8556	1.515	1.296	23020	0.152
0.8678	1.515	1.314	23581	0.152
0.8800	1.515	1.333	24146	0.152
0.8922	1.515	1.351	24716	0.152
0.9044	1.515	1.370	25290	0.152
0.9167	1.515	1.388	25869	0.152
0.9289	1.515	1.407	26451	0.152
0.9411	1.515	1.425	27039	0.152
0.9533	1.515	1.444	27630	0.152
0.9656	1.515	1.463	28226	0.152
0.9778	1.515	1.481	28826	0.152
0.9900	1.515	1.500	29430	0.152
1.0022	1.515	1.518	30038	0.152
1.0144	1.515	1.537	30651	0.152
1.0267	1.515	1.555	31267	0.152

1.0389	1.515	1.574	31888	0.152
1.0511	1.515	1.592	32513	0.152
1.0633	1.515	1.611	33141	0.152
1.0756	1.515	1.629	33774	0.152
1.0878	1.515	1.648	34411	0.152
1.1000	1.515	1.666	35051	0.152

Trapezoidal Pond 2

Bottom Length:	1300.00 ft.	
Bottom Width:	20.00 ft.	
Depth:	1.1 ft.	
Volume at riser head:	0.0657 acre-feet.	
Infiltration On		
Infiltration rate:	0.1	
Infiltration safety factor:	1	
Total Volume Infiltrated (ac-ft.):		0.123
Total Volume Through Riser (ac-ft.):		0
Total Volume Through Facility (ac-ft.):		0.123
Percent Infiltrated:		100
Total Precip Applied to Facility:		0
Total Evap From Facility:		0
Side slope 1:	0 To 1	
Side slope 2:	0 To 1	
Side slope 3:	0 To 1	
Side slope 4:	0 To 1	
Discharge Structure		
Riser Height:	0.1 ft.	
Riser Diameter:	15600 in.	
Element Flows To:		
Outlet 1	Outlet 2	

Pond Hydraulic Table

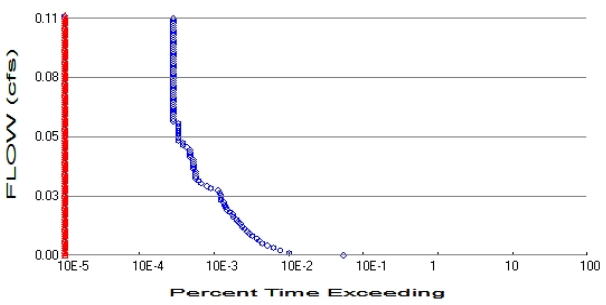
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.596	0.000	0.000	0.000
0.0122	0.596	0.007	0.000	0.060
0.0244	0.596	0.014	0.000	0.060
0.0367	0.596	0.021	0.000	0.060
0.0489	0.596	0.029	0.000	0.060
0.0611	0.596	0.036	0.000	0.060
0.0733	0.596	0.043	0.000	0.060
0.0856	0.596	0.051	0.000	0.060
0.0978	0.596	0.058	0.000	0.060
0.1100	0.596	0.065	13.80	0.060
0.1222	0.596	0.073	45.74	0.060
0.1344	0.596	0.080	88.27	0.060
0.1467	0.596	0.087	139.2	0.060
0.1589	0.596	0.094	197.3	0.060
0.1711	0.596	0.102	261.8	0.060
0.1833	0.596	0.109	332.1	0.060
0.1956	0.596	0.116	407.8	0.060
0.2078	0.596	0.124	488.5	0.060
0.2200	0.596	0.131	574.0	0.060
0.2322	0.596	0.138	663.9	0.060
0.2444	0.596	0.145	758.0	0.060
0.2567	0.596	0.153	856.2	0.060
0.2689	0.596	0.160	958.4	0.060
0.2811	0.596	0.167	1064.	0.060
0.2933	0.596	0.175	1173.	0.060
0.3056	0.596	0.182	1286.	0.060
0.3178	0.596	0.189	1403.	0.060
0.3300	0.596	0.197	1523.	0.060
0.3422	0.596	0.204	1646.	0.060

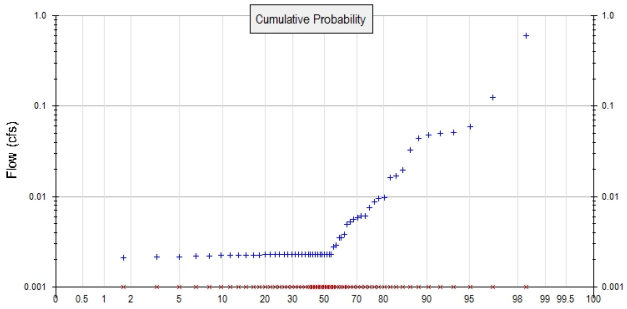
0.3544	0.596	0.211	1772.	0.060
0.3667	0.596	0.218	1901.	0.060
0.3789	0.596	0.226	2033.	0.060
0.3911	0.596	0.233	2168.	0.060
0.4033	0.596	0.240	2306.	0.060
0.4156	0.596	0.248	2447.	0.060
0.4278	0.596	0.255	2591.	0.060
0.4400	0.596	0.262	2737.	0.060
0.4522	0.596	0.269	2886.	0.060
0.4644	0.596	0.277	3038.	0.060
0.4767	0.596	0.284	3192.	0.060
0.4889	0.596	0.291	3348.	0.060
0.5011	0.596	0.299	3507.	0.060
0.5133	0.596	0.306	3669.	0.060
0.5256	0.596	0.313	3833.	0.060
0.5378	0.596	0.321	3999.	0.060
0.5500	0.596	0.328	4168.	0.060
0.5622	0.596	0.335	4339.	0.060
0.5744	0.596	0.342	4512.	0.060
0.5867	0.596	0.350	4687.	0.060
0.5989	0.596	0.357	4865.	0.060
0.6111	0.596	0.364	5045.	0.060
0.6233	0.596	0.372	5227.	0.060
0.6356	0.596	0.379	5411.	0.060
0.6478	0.596	0.386	5598.	0.060
0.6600	0.596	0.393	5786.	0.060
0.6722	0.596	0.401	5977.	0.060
0.6844	0.596	0.408	6169.	0.060
0.6967	0.596	0.415	6364.	0.060
0.7089	0.596	0.423	6560.	0.060
0.7211	0.596	0.430	6759.	0.060
0.7333	0.596	0.437	6959.	0.060
0.7456	0.596	0.445	7162.	0.060
0.7578	0.596	0.452	7366.	0.060
0.7700	0.596	0.459	7572.	0.060
0.7822	0.596	0.466	7780.	0.060
0.7944	0.596	0.474	7990.	0.060
0.8067	0.596	0.481	8202.	0.060
0.8189	0.596	0.488	8416.	0.060
0.8311	0.596	0.496	8631.	0.060
0.8433	0.596	0.503	8849.	0.060
0.8556	0.596	0.510	9068.	0.060
0.8678	0.596	0.518	9289.	0.060
0.8800	0.596	0.525	9512.	0.060
0.8922	0.596	0.532	9736.	0.060
0.9044	0.596	0.539	9962.	0.060
0.9167	0.596	0.547	10190	0.060
0.9289	0.596	0.554	10420	0.060
0.9411	0.596	0.561	10651	0.060
0.9533	0.596	0.569	10884	0.060
0.9656	0.596	0.576	11119	0.060
0.9778	0.596	0.583	11355	0.060
0.9900	0.596	0.590	11593	0.060
1.0022	0.596	0.598	11833	0.060
1.0144	0.596	0.605	12074	0.060
1.0267	0.596	0.612	12317	0.060
1.0389	0.596	0.620	12561	0.060
1.0511	0.596	0.627	12807	0.060

1.0633	0.596	0.634	13055	0.060
1.0756	0.596	0.642	13304	0.060
1.0878	0.596	0.649	13555	0.060
1.1000	0.596	0.656	13807	0.060

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 2.86
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.12
Total Impervious Area: 0.6

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.004161
5 year	0.013008
10 year	0.026083
25 year	0.059273
50 year	0.105318
100 year	0.182094

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.002	0.000
1950	0.003	0.000
1951	0.050	0.000
1952	0.002	0.000
1953	0.005	0.000
1954	0.017	0.000
1955	0.002	0.000
1956	0.051	0.000
1957	0.002	0.000
1958	0.002	0.000

1959	0.002	0.000
1960	0.002	0.000
1961	0.004	0.000
1962	0.002	0.000
1963	0.002	0.000
1964	0.004	0.000
1965	0.002	0.000
1966	0.003	0.000
1967	0.002	0.000
1968	0.002	0.000
1969	0.006	0.000
1970	0.600	0.000
1971	0.002	0.000
1972	0.016	0.000
1973	0.002	0.000
1974	0.033	0.000
1975	0.006	0.000
1976	0.006	0.000
1977	0.002	0.000
1978	0.006	0.000
1979	0.002	0.000
1980	0.002	0.000
1981	0.010	0.000
1982	0.009	0.000
1983	0.124	0.000
1984	0.002	0.000
1985	0.002	0.000
1986	0.002	0.000
1987	0.009	0.000
1988	0.002	0.000
1989	0.002	0.000
1990	0.002	0.000
1991	0.002	0.000
1992	0.002	0.000
1993	0.002	0.000
1994	0.002	0.000
1995	0.002	0.000
1996	0.044	0.000
1997	0.048	0.000
1998	0.002	0.000
1999	0.020	0.000
2000	0.008	0.000
2001	0.002	0.000
2002	0.060	0.000
2003	0.002	0.000
2004	0.002	0.000
2005	0.002	0.000
2006	0.005	0.000
2007	0.002	0.000
2008	0.003	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.6000	0.0000
2	0.1243	0.0000
3	0.0597	0.0000
4	0.0514	0.0000

5	0.0496	0.0000
6	0.0480	0.0000
7	0.0442	0.0000
8	0.0326	0.0000
9	0.0197	0.0000
10	0.0169	0.0000
11	0.0161	0.0000
12	0.0097	0.0000
13	0.0094	0.0000
14	0.0086	0.0000
15	0.0076	0.0000
16	0.0061	0.0000
17	0.0060	0.0000
18	0.0058	0.0000
19	0.0056	0.0000
20	0.0052	0.0000
21	0.0050	0.0000
22	0.0038	0.0000
23	0.0035	0.0000
24	0.0035	0.0000
25	0.0029	0.0000
26	0.0028	0.0000
27	0.0023	0.0000
28	0.0023	0.0000
29	0.0023	0.0000
30	0.0023	0.0000
31	0.0023	0.0000
32	0.0023	0.0000
33	0.0023	0.0000
34	0.0023	0.0000
35	0.0023	0.0000
36	0.0023	0.0000
37	0.0023	0.0000
38	0.0023	0.0000
39	0.0023	0.0000
40	0.0023	0.0000
41	0.0023	0.0000
42	0.0023	0.0000
43	0.0023	0.0000
44	0.0023	0.0000
45	0.0023	0.0000
46	0.0023	0.0000
47	0.0023	0.0000
48	0.0023	0.0000
49	0.0023	0.0000
50	0.0023	0.0000
51	0.0022	0.0000
52	0.0022	0.0000
53	0.0022	0.0000
54	0.0022	0.0000
55	0.0022	0.0000
56	0.0022	0.0000
57	0.0021	0.0000
58	0.0021	0.0000
59	0.0021	0.0000
60	0.0021	0.0000

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0021	1125	0	0	Pass
0.0031	213	0	0	Pass
0.0042	162	0	0	Pass
0.0052	131	0	0	Pass
0.0063	109	0	0	Pass
0.0073	93	0	0	Pass
0.0083	86	0	0	Pass
0.0094	78	0	0	Pass
0.0104	68	0	0	Pass
0.0115	63	0	0	Pass
0.0125	58	0	0	Pass
0.0136	54	0	0	Pass
0.0146	50	0	0	Pass
0.0156	47	0	0	Pass
0.0167	44	0	0	Pass
0.0177	42	0	0	Pass
0.0188	38	0	0	Pass
0.0198	37	0	0	Pass
0.0209	34	0	0	Pass
0.0219	31	0	0	Pass
0.0229	30	0	0	Pass
0.0240	29	0	0	Pass
0.0250	28	0	0	Pass
0.0261	26	0	0	Pass
0.0271	26	0	0	Pass
0.0282	26	0	0	Pass
0.0292	25	0	0	Pass
0.0302	24	0	0	Pass
0.0313	19	0	0	Pass
0.0323	17	0	0	Pass
0.0334	14	0	0	Pass
0.0344	13	0	0	Pass
0.0355	12	0	0	Pass
0.0365	12	0	0	Pass
0.0375	12	0	0	Pass
0.0386	12	0	0	Pass
0.0396	11	0	0	Pass
0.0407	11	0	0	Pass
0.0417	11	0	0	Pass
0.0427	11	0	0	Pass
0.0438	11	0	0	Pass
0.0448	10	0	0	Pass
0.0459	10	0	0	Pass
0.0469	10	0	0	Pass
0.0480	10	0	0	Pass
0.0490	9	0	0	Pass
0.0500	8	0	0	Pass
0.0511	8	0	0	Pass
0.0521	7	0	0	Pass
0.0532	7	0	0	Pass
0.0542	7	0	0	Pass
0.0553	7	0	0	Pass
0.0563	7	0	0	Pass

0.0573	7	0	0	Pass
0.0584	7	0	0	Pass
0.0594	7	0	0	Pass
0.0605	6	0	0	Pass
0.0615	6	0	0	Pass
0.0626	6	0	0	Pass
0.0636	6	0	0	Pass
0.0646	6	0	0	Pass
0.0657	6	0	0	Pass
0.0667	6	0	0	Pass
0.0678	6	0	0	Pass
0.0688	6	0	0	Pass
0.0699	6	0	0	Pass
0.0709	6	0	0	Pass
0.0719	6	0	0	Pass
0.0730	6	0	0	Pass
0.0740	6	0	0	Pass
0.0751	6	0	0	Pass
0.0761	6	0	0	Pass
0.0772	6	0	0	Pass
0.0782	6	0	0	Pass
0.0792	6	0	0	Pass
0.0803	6	0	0	Pass
0.0813	6	0	0	Pass
0.0824	6	0	0	Pass
0.0834	6	0	0	Pass
0.0845	6	0	0	Pass
0.0855	6	0	0	Pass
0.0865	6	0	0	Pass
0.0876	6	0	0	Pass
0.0886	6	0	0	Pass
0.0897	6	0	0	Pass
0.0907	6	0	0	Pass
0.0918	6	0	0	Pass
0.0928	6	0	0	Pass
0.0938	6	0	0	Pass
0.0949	6	0	0	Pass
0.0959	6	0	0	Pass
0.0970	6	0	0	Pass
0.0980	6	0	0	Pass
0.0991	6	0	0	Pass
0.1001	6	0	0	Pass
0.1011	6	0	0	Pass
0.1022	6	0	0	Pass
0.1032	6	0	0	Pass
0.1043	6	0	0	Pass
0.1053	6	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Trapezoidal Pond 1 POC	☐	108.00			☐	100.00			
Trapezoidal Pond 2 POC	☐	0.11			☐	98.26			
Total Volume Infiltrated		108.11	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

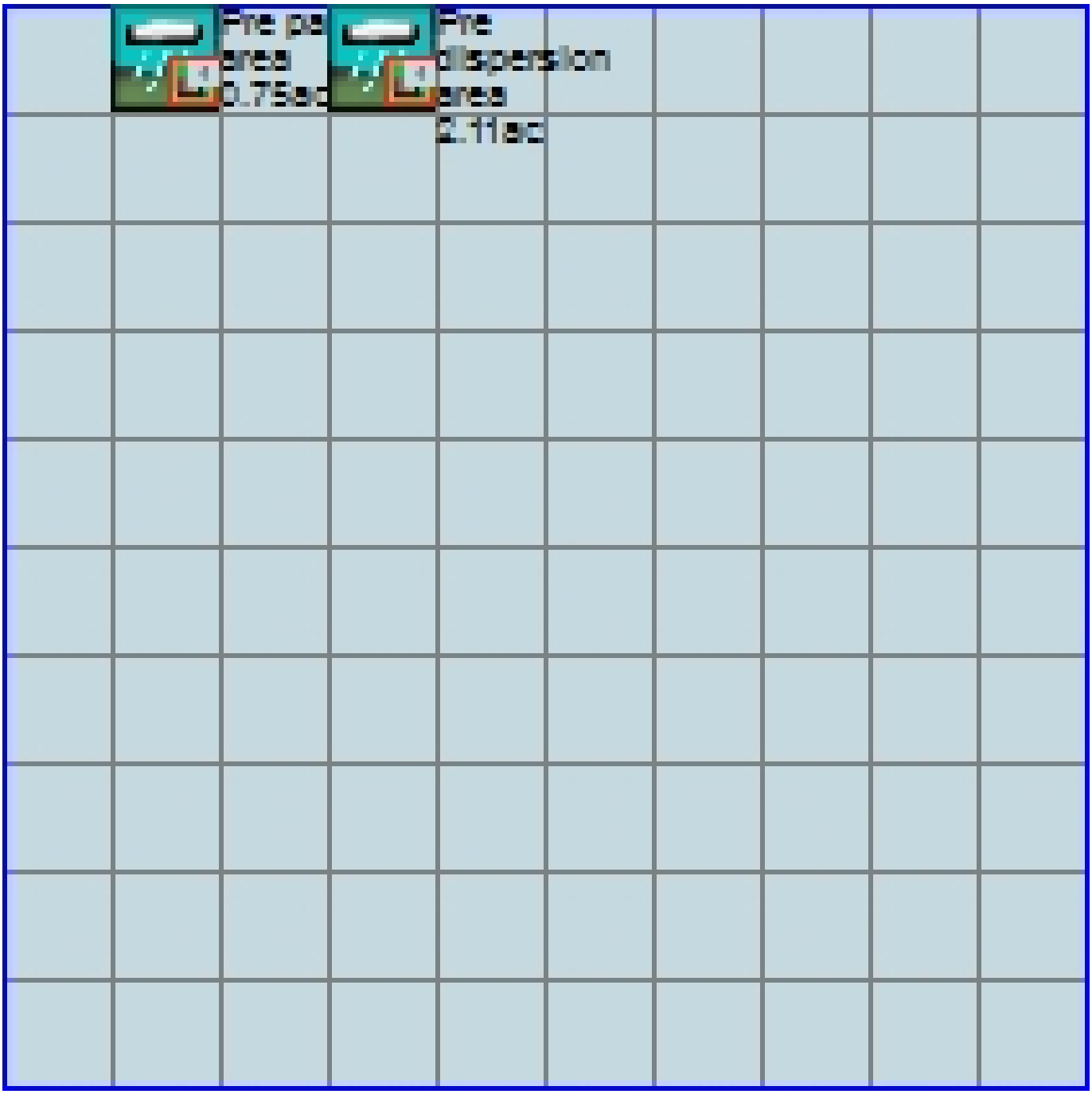
No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix

Predeveloped Schematic



Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2008 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   CAM-11A WWHM.wdm
MESSU       25   PreCAM-11A WWHM.MES
            27   PreCAM-11A WWHM.L61
            28   PreCAM-11A WWHM.L62
            30   POCCAM-11A WWHM1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Pre path area               MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                       in  out           ***
    1     A/B, Forest, Flat       1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    1         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    1         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    1         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    1               0         5         2       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    1              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    1          0.2       0.5      0.35         0       0.7       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    1              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Pre path area***
PERLND   1                        0.75     COPY   501     12
PERLND   1                        0.75     COPY   501     13
Pre dispersion area***
PERLND   1                        2.11     COPY   501     12
PERLND   1                        2.11     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
```

```
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.3            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.3            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.8            PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8            IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2008 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   CAM-11A WWHM.wdm
MESSU       25   MitCAM-11A WWHM.MES
            27   MitCAM-11A WWHM.L61
            28   MitCAM-11A WWHM.L62
            30   POCCAM-11A WWHM1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND       8
      PERLND       7
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Trapezoidal Pond  1         MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
    7     A/B, Lawn, Flat         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    7         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
```

```
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    7         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    7         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    7             0         5       0.8       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    7             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    7          0.1       0.5      0.25         0       0.7      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    7             0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    8      SIDEWALKS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    8         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    8         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    8         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    8            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
```

```
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    8             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    8             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Main Trail***
IMPLND   8                        0.6     RCHRES   1      5
Basin  2***
PERLND   7                       0.12     RCHRES   2      2
PERLND   7                       0.12     RCHRES   2      3

******Routing******
IMPLND   8                        0.6     COPY     1     15
PERLND   7                       0.12     COPY     1     12
PERLND   7                       0.12     COPY     1     13
RCHRES   1                          1     COPY   501     17
RCHRES   2                          1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
    1     Trapezoidal Pond-009    2    1    1    1   28    0    1
    2     Trapezoidal Pond-010    2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
```

```
    1        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN      DELTH     STCOR        KS      DB50        ***
  <------><--------><--------><--------><--------><--------><-------->        ***
    1              1      0.63       0.0       0.0       0.5       0.0
    2              2      0.25       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   90    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  1.515152  0.000000  0.000000  0.000000
  0.012222  1.515152  0.018519  0.000000  0.152778
  0.024444  1.515152  0.037037  0.000000  0.152778
  0.036667  1.515152  0.055556  0.000000  0.152778
  0.048889  1.515152  0.074074  0.000000  0.152778
  0.061111  1.515152  0.092593  0.000000  0.152778
  0.073333  1.515152  0.111111  0.000000  0.152778
  0.085556  1.515152  0.129630  0.000000  0.152778
  0.097778  1.515152  0.148148  0.000000  0.152778
  0.110000  1.515152  0.166667  35.05269  0.152778
  0.122222  1.515152  0.185185  116.1188  0.152778
  0.134444  1.515152  0.203704  224.0784  0.152778
  0.146667  1.515152  0.222222  353.3712  0.152778
  0.158889  1.515152  0.240741  500.9230  0.152778
  0.171111  1.515152  0.259259  664.7020  0.152778
  0.183333  1.515152  0.277778  843.2354  0.152778
  0.195556  1.515152  0.296296  1035.391  0.152778
  0.207778  1.515152  0.314815  1240.265  0.152778
  0.220000  1.515152  0.333333  1457.110  0.152778
  0.232222  1.515152  0.351852  1685.299  0.152778
  0.244444  1.515152  0.370370  1924.294  0.152778
  0.256667  1.515152  0.388889  2173.627  0.152778
  0.268889  1.515152  0.407407  2432.885  0.152778
  0.281111  1.515152  0.425926  2701.702  0.152778
  0.293333  1.515152  0.444444  2979.750  0.152778
  0.305556  1.515152  0.462963  3266.731  0.152778
  0.317778  1.515152  0.481481  3562.377  0.152778
  0.330000  1.515152  0.500000  3866.439  0.152778
  0.342222  1.515152  0.518519  4178.691  0.152778
  0.354444  1.515152  0.537037  4498.924  0.152778
  0.366667  1.515152  0.555556  4826.943  0.152778
  0.378889  1.515152  0.574074  5162.568  0.152778
  0.391111  1.515152  0.592593  5505.630  0.152778
  0.403333  1.515152  0.611111  5855.971  0.152778
  0.415556  1.515152  0.629630  6213.444  0.152778
  0.427778  1.515152  0.648148  6577.907  0.152778
  0.440000  1.515152  0.666667  6949.231  0.152778
  0.452222  1.515152  0.685185  7327.290  0.152778
  0.464444  1.515152  0.703704  7711.967  0.152778
  0.476667  1.515152  0.722222  8103.149  0.152778
  0.488889  1.515152  0.740741  8500.731  0.152778
  0.501111  1.515152  0.759259  8904.609  0.152778
  0.513333  1.515152  0.777778  9314.689  0.152778
```

```
0.525556  1.515152  0.796296  9730.878  0.152778
0.537778  1.515152  0.814815  10153.09  0.152778
0.550000  1.515152  0.833333  10581.23  0.152778
0.562222  1.515152  0.851852  11015.23  0.152778
0.574444  1.515152  0.870370  11455.00  0.152778
0.586667  1.515152  0.888889  11900.48  0.152778
0.598889  1.515152  0.907407  12351.59  0.152778
0.611111  1.515152  0.925926  12808.25  0.152778
0.623333  1.515152  0.944444  13270.41  0.152778
0.635556  1.515152  0.962963  13738.00  0.152778
0.647778  1.515152  0.981481  14210.95  0.152778
0.660000  1.515152  1.000000  14689.21  0.152778
0.672222  1.515152  1.018519  15172.72  0.152778
0.684444  1.515152  1.037037  15661.42  0.152778
0.696667  1.515152  1.055556  16155.25  0.152778
0.708889  1.515152  1.074074  16654.17  0.152778
0.721111  1.515152  1.092593  17158.12  0.152778
0.733333  1.515152  1.111111  17667.06  0.152778
0.745556  1.515152  1.129630  18180.93  0.152778
0.757778  1.515152  1.148148  18699.69  0.152778
0.770000  1.515152  1.166667  19223.29  0.152778
0.782222  1.515152  1.185185  19751.68  0.152778
0.794444  1.515152  1.203704  20284.83  0.152778
0.806667  1.515152  1.222222  20822.70  0.152778
0.818889  1.515152  1.240741  21365.23  0.152778
0.831111  1.515152  1.259259  21912.40  0.152778
0.843333  1.515152  1.277778  22464.16  0.152778
0.855556  1.515152  1.296296  23020.47  0.152778
0.867778  1.515152  1.314815  23581.31  0.152778
0.880000  1.515152  1.333333  24146.62  0.152778
0.892222  1.515152  1.351852  24716.38  0.152778
0.904444  1.515152  1.370370  25290.55  0.152778
0.916667  1.515152  1.388889  25869.10  0.152778
0.928889  1.515152  1.407407  26452.00  0.152778
0.941111  1.515152  1.425926  27039.21  0.152778
0.953333  1.515152  1.444444  27630.70  0.152778
0.965556  1.515152  1.462963  28226.44  0.152778
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0.990000  1.515152  1.500000  29430.55  0.152778
1.002222  1.515152  1.518519  30038.87  0.152778
1.014444  1.515152  1.537037  30651.32  0.152778
1.026667  1.515152  1.555556  31267.88  0.152778
1.038889  1.515152  1.574074  31888.51  0.152778
1.051111  1.515152  1.592593  32513.20  0.152778
1.063333  1.515152  1.611111  33141.92  0.152778
1.075556  1.515152  1.629630  33774.64  0.152778
1.087778  1.515152  1.648148  34411.33  0.152778
END FTABLE  1
FTABLE      2
 90    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.596878  0.000000  0.000000  0.000000
0.012222  0.596878  0.007295  0.000000  0.060185
0.024444  0.596878  0.014590  0.000000  0.060185
0.036667  0.596878  0.021886  0.000000  0.060185
0.048889  0.596878  0.029181  0.000000  0.060185
0.061111  0.596878  0.036476  0.000000  0.060185
0.073333  0.596878  0.043771  0.000000  0.060185
0.085556  0.596878  0.051066  0.000000  0.060185
0.097778  0.596878  0.058361  0.000000  0.060185
0.110000  0.596878  0.065657  13.80863  0.060185
0.122222  0.596878  0.072952  45.74373  0.060185
0.134444  0.596878  0.080247  88.27320  0.060185
0.146667  0.596878  0.087542  139.2066  0.060185
0.158889  0.596878  0.094837  197.3329  0.060185
0.171111  0.596878  0.102132  261.8517  0.060185
0.183333  0.596878  0.109428  332.1828  0.060185
0.195556  0.596878  0.116723  407.8802  0.060185
0.207778  0.596878  0.124018  488.5874  0.060185
```

0.220000	0.596878	0.131313	574.0107	0.060185
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0.244444	0.596878	0.145903	758.0517	0.060185
0.256667	0.596878	0.153199	856.2729	0.060185
0.268889	0.596878	0.160494	958.4040	0.060185
0.281111	0.596878	0.167789	1064.301	0.060185
0.293333	0.596878	0.175084	1173.834	0.060185
0.305556	0.596878	0.182379	1286.886	0.060185
0.317778	0.596878	0.189675	1403.351	0.060185
0.330000	0.596878	0.196970	1523.131	0.060185
0.342222	0.596878	0.204265	1646.138	0.060185
0.354444	0.596878	0.211560	1772.289	0.060185
0.366667	0.596878	0.218855	1901.507	0.060185
0.378889	0.596878	0.226150	2033.721	0.060185
0.391111	0.596878	0.233446	2168.864	0.060185
0.403333	0.596878	0.240741	2306.875	0.060185
0.415556	0.596878	0.248036	2447.696	0.060185
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0.488889	0.596878	0.291807	3348.731	0.060185
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```
  1.075556  0.596878  0.641975  13304.75  0.060185
  1.087778  0.596878  0.649270  13555.55  0.060185
  END FTABLE  2
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.3            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.3            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.8            PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8            IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1001 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
RCHRES   2 HYDR   RO     1 1        1      WDM   1004 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      1 1        1      WDM   1005 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      2 1        1      WDM   1006 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1007 STAG     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

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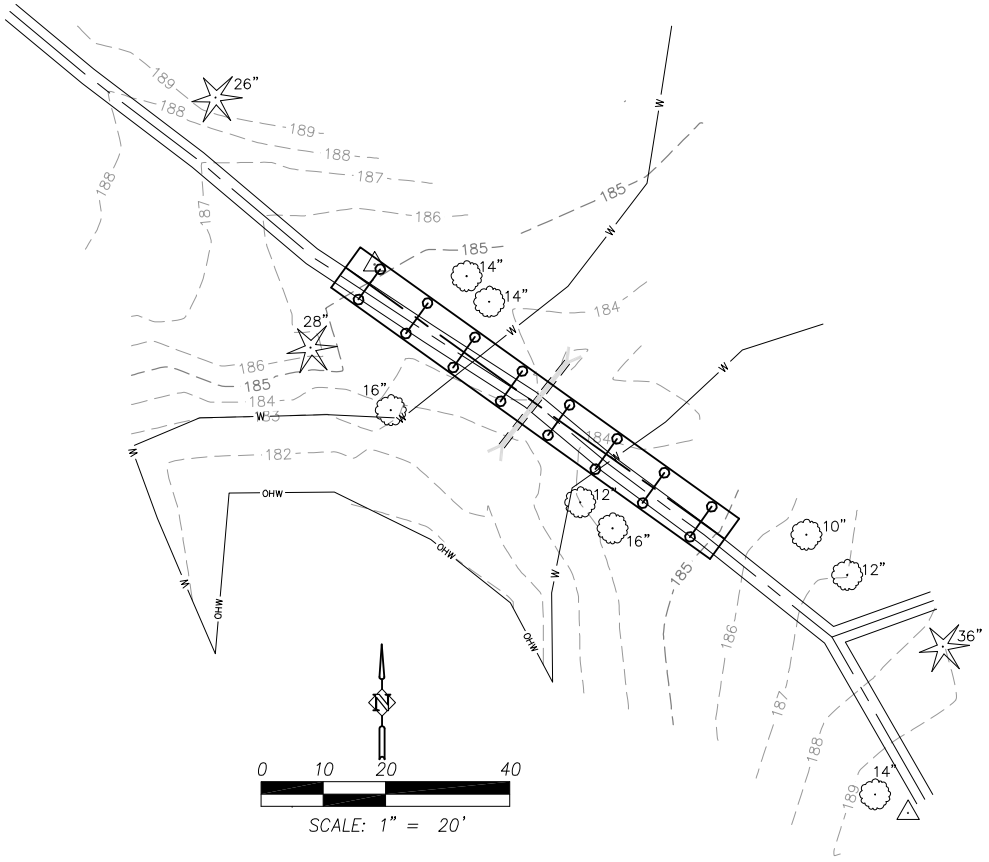
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

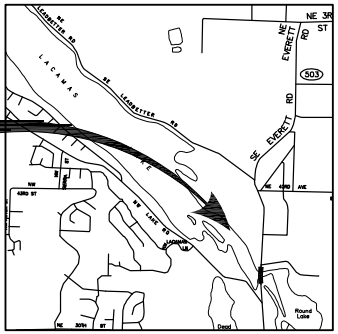
APPENDIX 3 – Project Plan Set

LACAMAS NORTH SHORE TRAIL

CAMAS, WASHINGTON



PROJECT LOCATION



VICINITY MAP

N.T.S.

OWNER

CITY OF CAMAS
CONTACT: JERRY ACHESON
616 NE 4TH AVENUE
CAMAS, WA 98607
TEL: 360-834-7092
FAX: 360-834-1535
EMAIL: JACHESON@CITYOFCAMAS.US

CIVIL ENGINEER

HARPER HOUF PETERSON RIGHELLIS INC.
CONTACT: ROB VANDERZANDEN, P.E.
1104 MAIN STREET, SUITE 100
VANCOUVER, WA 98660
TEL: 360-750-1131
FAX: 360-750-1141
EMAIL: ROBV@HHPR.COM

SHEET INDEX

ROBERT A. VANDERZANDEN
STATE OF WASHINGTON
23841
REGISTERED
PROFESSIONAL ENGINEER

PRELIMINARY

PRELIMINARY REVIEW ONLY
NOT FOR CONSTRUCTION

DATE	NO.	DESCRIPTION
		REVISIONS

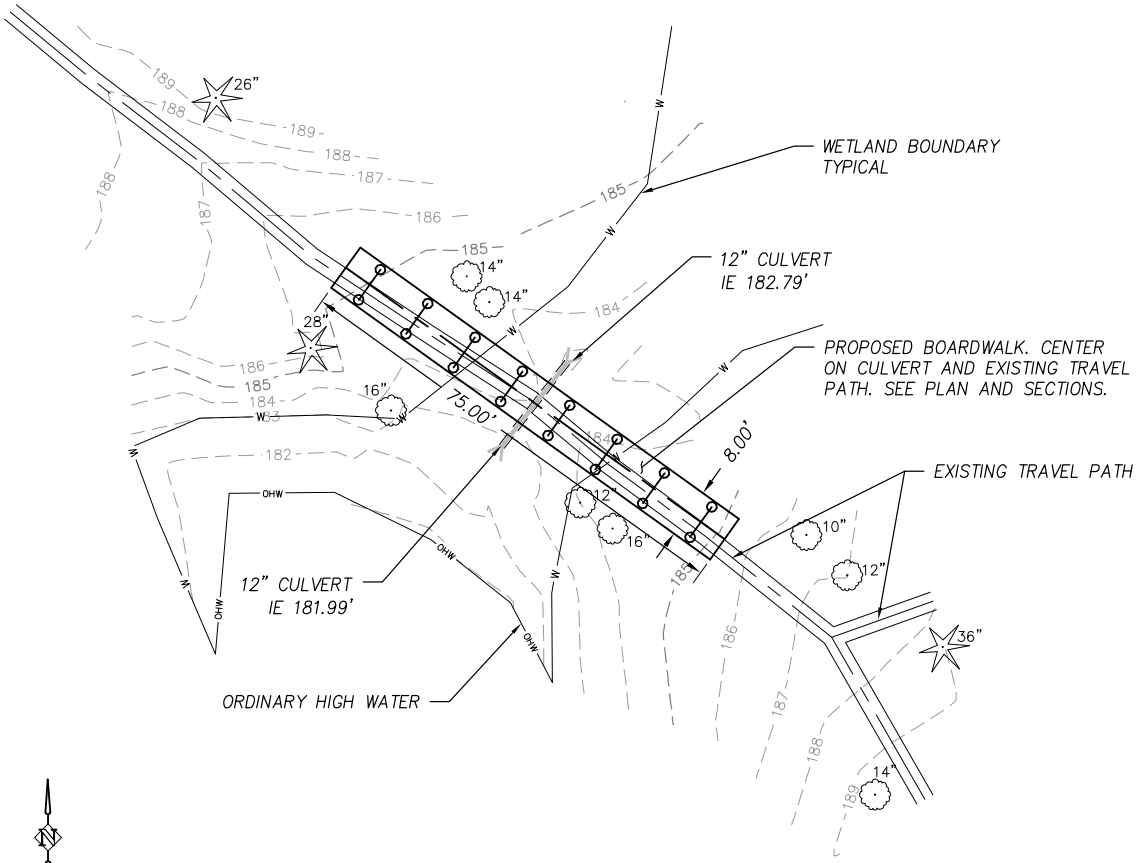
DESIGNED: RAV
DRAWN: JDB
CHECKED: RAV
DATE: 02/XX/2018

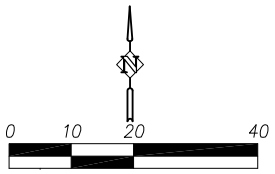
Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS
LANDSCAPE ARCHITECTS • SURVEYORS
1104 Main Street, Suite 100, Vancouver, WA 98660
phone: 360.750.1131 www.hhpr.com fax: 360.750.1141

COVER SHEET
NORTH SHORE TRAIL
CAMAS, WASHINGTON

SHEET NO. C0

JOB NO. CAM-11A





SCALE: 1" = 20'

PRELIMINARY REVIEW ONLY
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DATE	NO.	DESCRIPTION

REVISIONS

DESIGNED: RAV
DRAWN: JDB
CHECKED: RAV
DATE: 02/XX/2018

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ROBERT A. VANDERZANDEN
STATE OF WASHINGTON
23841
REGISTERED
PROFESSIONAL ENGINEER

PRELIMINARY

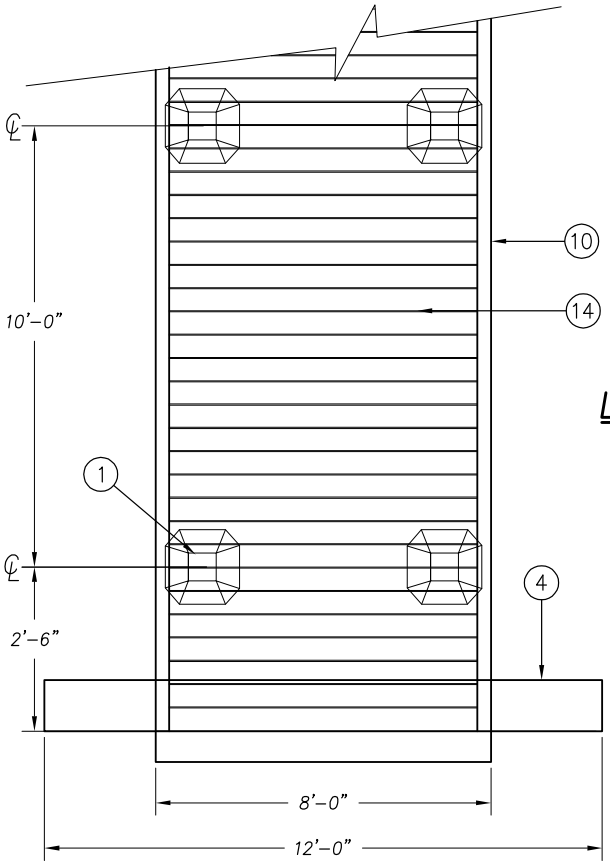
LACAMAS TRAIL BOARDWALK PLAN

NORTH SHORE TRAIL

CAMAS, WASHINGTON

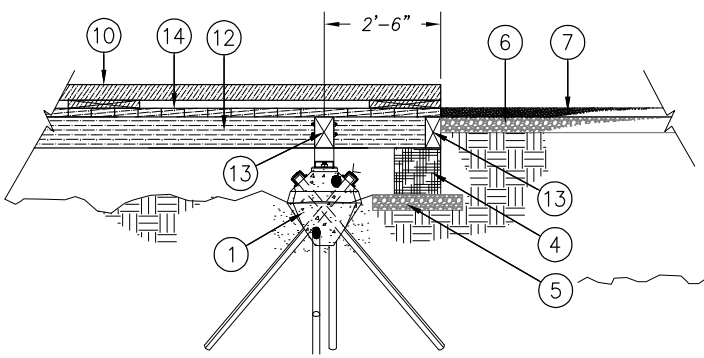
SHEET NO.
C1

JOB NO.
CAM-11A



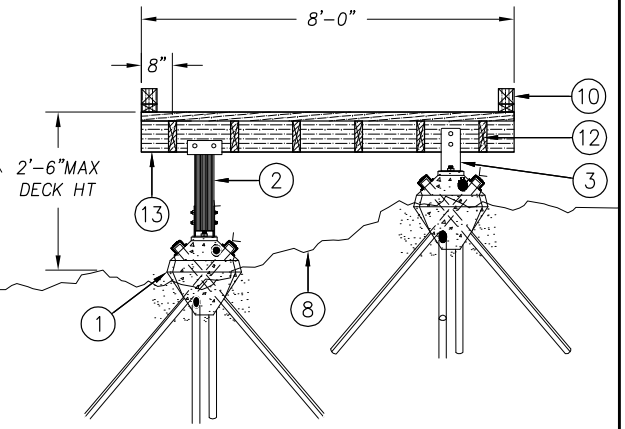
PLAN VIEW

N.T.S.



LONGITUDINAL SECTION VIEW

N.T.S.



CROSS SECTION VIEW

N.T.S.

1. PIN PIER FOOTING W/ "DP-50" UNIT, 4 PINS EACH @ 48" (GALVANIZED SCHEDULE 40) INSTALL PER MANUFACTURER SPECIFICATIONS.
2. POST AND BEAM WHERE SURFACE GRADE REQUIRES, CONSTRUCT SUPPORT USING SIMPSON ABU44 (OR APPROVED EQUAL) FOR POST BASE. USE SIMPSON PC44 TO CONNECT AT BEAM 4x6 PT POST.
3. BEAM SADDLE - AS GRADES ALLOW USE SIMPSON ABU44 (OR APPROVED EQUAL) AS A BEAM SADDLE - FASTEN TO PIN PIER.
4. CONCRETE MASONRY WALL UNITS 12" HIGH.
5. 4" THICK COMPACTED CRUSHED SURFACING BASE COURSE (1 1/4 - 0) PER WSDOT SECTION 9-03.9(3).
6. 4" THICK 1 1/4 MINUS CRUSHED ROCK PATHWAY BASE.
7. 2" THICK 3/8" - #4 CRUSHED ROCK PATHWAY PAVING.
8. COMPACTED NATIVE SOILS.
10. 4x4 PT KICK RAIL (BOTH SIDES TYP.) ON 18" - 2x4 PT LIFT SPACED 6'0" O.C. w/2-1/2" GALV. HEX BOLTS.
12. 2X8 PT JOISTS @ 16" O.C. (TYP.)
13. 4x8 PT BEAMS (TYP.)
14. 2x6 PT DECKING WITH 1/8" GAPS (TYP.)

ROBERT A. VANDERZANDEN
STATE OF WASHINGTON
23841
REGISTERED
PROFESSIONAL ENGINEER

PRELIMINARY

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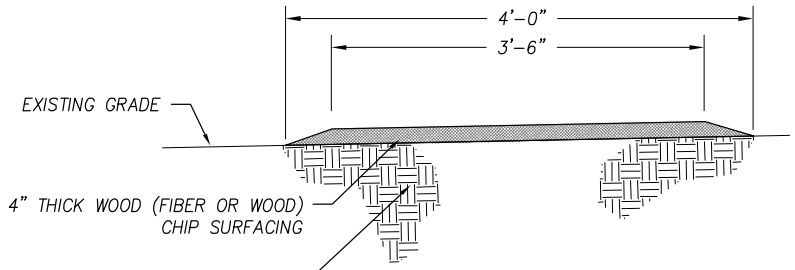
DATE	NO.	DESCRIPTION
		REVISIONS

DESIGNED: RAV
DRAWN: JDB
CHECKED: RAV
DATE: 02/XX/2018

HHPR Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS
LANDSCAPE ARCHITECTS • SURVEYORS
1104 Main Street, Suite 100, Vancouver, WA 98660
phone: 360.750.1131 www.hhpr.com fax: 360.750.1141

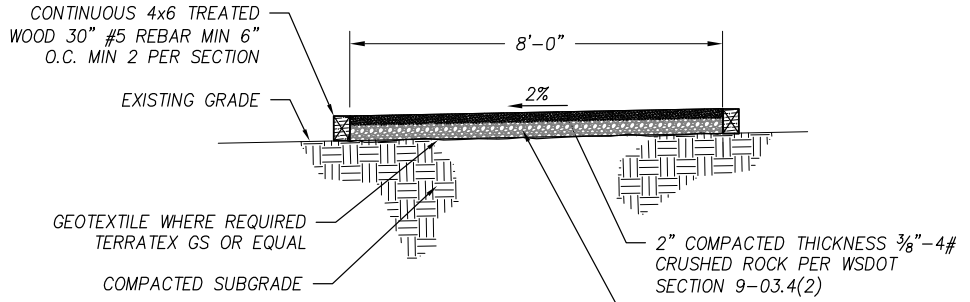
BOARDWALK
NORTH SHORE TRAIL
CAMAS, WASHINGTON

SHEET NO. C2
JOB NO. CAM-11A



WOOD CHIP TRAIL SECTION

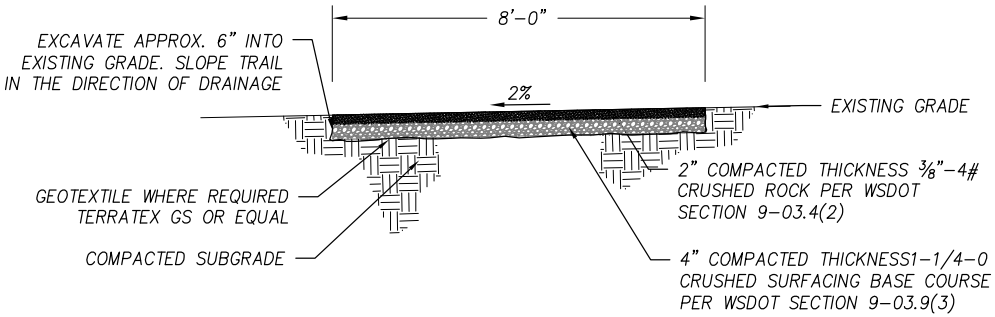
N.T.S.



NOTE:
THIS SECTION TO BE USED FOR THE FIRST 250 FEET OF THE TRAIL BEGINNING AT NE EVERETT STREET.

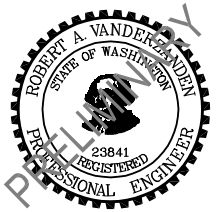
CRUSHED SURFACING TRAIL CAUSEWAY SECTION

N.T.S.



CRUSHED SURFACING TRAIL EXCAVATED SECTION

N.T.S.



PRELIMINARY

PRELIMINARY REVIEW ONLY
NOT FOR CONSTRUCTION

DATE	NO.	DESCRIPTION

REVISIONS

DESIGNED: RAV
DRAWN: JDB
CHECKED: RAV
DATE: 02/XX/2018

Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS
LANDSCAPE ARCHITECTS • SURVEYORS
1104 Main Street, Suite 100, Vancouver, WA 98660
phone: 360.750.1131 www.hhpr.com fax: 360.750.1141

TRAIL SECTIONS
NORTH SHORE TRAIL
CAMAS, WASHINGTON

SHEET NO.
C3

JOB NO.
CAM-11A

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WETLAND REPORT

Lacamas North Shore Trail Project
City of Camas Project P1005

Prepared for:
City of Camas
Parks and Recreation Department
616 NE 4th Avenue
Camas, Washington 98607

Prepared by:
Harper Houf Peterson Righellis Inc.
1104 Main Street, Suite 100
Vancouver, Washington 98660

February 14, 2018

Harper Houf Peterson Righellis Inc.
ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS

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TABLE OF CONTENTS

1. INTRODUCTION

The City of Camas (City) proposes to extend the existing trail system at the south end of Lacamas Lake (Figure 1, Appendix A). The new trails would be located within City property on the northeast side of Lacamas Lake, from the Round Lake Loop Trail east of NE Everett Street (State Route 500) to a natural area on the lakeshore. The main trail, approximately 3,300 feet, would traverse northwest from NE Everett Street, following the alignment of an abandoned access road. The main trail would include a 75-foot-long boardwalk, 25 feet of which would lie above a wetland. This is the only portion of the trail system that would be within wetland or Ordinary High Water Mark (OHWM) boundaries. The boardwalk would be supported on 16 pin piers (six would be within wetland). A shorter loop trail, approximately 1,120 feet in length, would connect to the main trail to create a loop in the natural area. A spur trail, approximately 180 feet in length, would follow the path of an existing packed dirt trail from the south end of the loop trail to a viewpoint of Lacamas Lake. The main trail would be 8 feet wide and constructed of impervious material (geotextile and a gravel cover); the spur and loop trails would be 4-feet wide and pervious.

2. GENERAL SITE DESCRIPTION

2.1 Land Use and Landscape Setting

Lacamas Lake, a man-made lake, lies to the west of the proposed trail alignment, which traverses an eroded stream terrace. The route is typically through Douglas fir stands (Photograph 1, Appendix B), except for a 450-feet long segment that passes through mowed lawns (Photograph 2). The southerly portion, from NE Everett Street northward for approximately 1,200 feet, traverses City property abutting single family residences. The trails would pass through parcels 178099-000, 124244-000, and 177896-000 within: the NW ¼ of Section 2 of Township 1 North, Range 3 East; SW ¼ of Section 35 of Township 2 North, Range 3 East; and SE ¼ of Section 34 of Township 2 North, Range 3 East. These parcels are owned by the City and zoned Open Space (Camas 2017).

2.2 Soils

The Clark County soil survey (Soil Survey Staff, accessed December 29, 2017) identifies two map units in the wetland study area (Figure 2): 1) Washougal gravelly loam, 0 to 8% slopes, which is somewhat excessively well drained; and 2) Odne silt loam, 0 to 5% slopes, which is poorly drained. Washougal soils are non-hydric and Odne soils are hydric.

2.3 Lacamas Lake

The project alignment is typically between 50 and 100 feet from the OHWM of Lacamas Lake and approximately 20 feet at the nearest point. Thus, the project is within Water Resource Inventory Area (WRIA) 28 and the 6th field Hydrologic Unit Code (HUC) Lower Columbia/Sandy 170800010606. Except for the southerly 1,200 feet, the project is within the 100-year floodplain of Lacamas Lake (FEMA 2012). Lacamas Lake flows southeast and discharges into Round Lake, which in turn discharges to Lacamas Creek. The lake is listed as

habitat for resident fish (WDFW 2018); however, anadromous fishes are prevented from entering Lacamas Lake by Lacamas Lake and Round Lake dams (WDFW 2018).

Lacamas Lake is regulated as a shoreline under the City of Camas Shoreline Master Program (SMP). Project elements within 200 feet of the OHWM, associated wetlands, and their buffers are within City regulated shorelands (SMP 2015). The project is within the Urban Conservancy shoreline designation (Camas 2017).

3. METHODS

3.1 Office Review

Staff reviewed the following resources to assess the presence of wetlands in the study area:

- Clark County GIS (2017) topography;
- Clark County GIS (2017) wetland data and Wetland Inventory maps from the City (http://www.cityofcamas.us/images/DOCS/MAPS/wetlandsmap.pdf);
- USDA Natural Resources Conservation Service (NRCS) Web Soil Survey; and
- Precipitation and climate data from the NOAA National Weather Service (NOAA NWS 2017).

The City's Wetland Inventory is based on the National Wetland Inventory (NWI) data (Clark County GIS 2017), which broadly maps wetland in the northern portion of the proposed alignment (Figure 3). Clark County's modeled wetland data (Clark County GIS 2017) shows a similar pattern. However, both the NWI and modeled wetland are inconsistent with elongate ridges of non-hydric soils mapped by USDA NRCS in the same area.

Rainfall was evaluated for the three months preceding the wetland field visit as measured at the Portland International Airport weather station (Table 1, NOAA NWS 2017). The precipitation for July through October was slightly above average (18%) for that time period. While July and August were drier than the normal range, precipitation in September and October were wetter than normal, thus starting the fall recharge cycle after summer. In October, 98% of the precipitation fell before October 26. A total of 3.83 inches of precipitation fell in the 7 days prior to October 26 and approximately half of that (2.13 inches) was associated with a storm on October 21. Based on this analysis, climatic and hydrologic conditions at the time of the delineation are considered normal.

Table 1. Summary of Monthly Precipitation at Portland International Airport (NOAA NWS 2017).

Month	Precipitation (inches)	Normal Range WETS (inches)	Within Normal Range	Average (inches)
July	T	0.33 – 0.86	Drier	0.72
August	0.06	0.35 – 1.09	Drier	0.93
September	2.38	0.72 – 1.93	Wetter	1.65
October 1-25	4.56	1.57 – 3.52	Wetter	2.88
Totals for July through October	7.01	N/A	N/A	6.18

The growing season recorded in the Portland International Airport Station WETS table, based on 28°F for the 50 percentile, is 288 days, beginning February 15 and ending November 30 (USDA NRCS 2017).

3.2 Field Wetland Delineation

The three-parameter wetland delineation method approach was used as described in the *Corps of Engineers Wetland Delineation Manual* (US Army Corps of Engineers [USACE] 1987) and guidance in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys and Coast Region* (USACE 2010). This method is consistent with the requirements of the City's Shoreline Master Program critical areas code (SMP 16.53).

Data plots were recorded on Regional Supplement (USACE 2010) data forms. Plant names and wetland indicator status on the data forms follow the 2016 National Wetland Plant List (NWPL) (Lichvar et.al. 2016). Wetland boundaries and data plots were flagged with sequentially numbered flagging tape. In the vicinity of potential wetland impacts, the wetland boundary was located by HHPR professional land surveyors. In locations where the wetland boundary and shoreline boundary were only needed to establish buffer limits, a handheld GPS unit with sub-meter accuracy was used.

Delineated wetland habitats were classified according to the system outlined in *Classification of Wetlands and Deepwater Habitats of the United States* (Federal Geographic Data Committee 2013) and rated using the *Washington State Wetland Rating System for Western Washington—2014 Update* (Hruby 2014).

3.3 Field Ordinary High Water Mark Delineation

The OHWM of Lacamas Lake was evaluated following methods in *Determining the Ordinary High Water Mark for Shoreline Management Act Compliance in Washington State* (Anderson, et al. 2016). The OHWM for Lacamas Lake in the study area, was consistent with the three primary indicators—break-in-slope, change in sediment texture, and change in vegetation characteristics—applied by the USACE.

4. WETLAND DELINEATION RESULTS

HHPR staff (Kent Snyder, PhD, CPSS and/or Ivy Watson) made reconnaissance visits on November 10 and December 1, 2016 to review a preliminary trail alignment, wetlands, and the OHWM of Lacamas Lake. Wetland boundaries and the Lacamas Lake OHWM were identified on October 26 and 30, 2017. Two wetlands were identified (Figure 4).

4.1 Location and General Description

Approximately two-thirds of the proposed trails are laid out on a northwest-southeast oriented gravel ridge with wetlands or open water along the margins. The East wetland is a forested wetland along the east and south sides of the ridge (Table 2; Photograph 3). This wetland intersects the proposed main trail in a broad swale at the south end of the ridge, where a 12-inch steel culvert lies beneath the access road (Photographs 4 and 5). The second wetland, the Lake wetland, is a scrub-shrub fringe along Lacamas Lake at the northwest and north side of the ridge, extending into a wide aquatic bed in the lake (Table 2; Photographs 6 and 7).

Table 2. Summary of the wetlands in study area.

Wetland	Size (acres)†	HGM Classification	Cowardin Class
East	4.5	Depressional	Palustrine Forested
Lake	5.5	Lacustrine Fringe	Palustrine Scrub-shrub/ Aquatic bed

† Acreage within the study area, although wetlands extend beyond.

The wetland-upland boundary of East wetland is typically defined by a distinct break in topography and associated parameters: change in dominant vegetation (from hydrophytic to upland), soils (hydric to non-hydric), and lack of wetland hydrology (Photograph 8). The boundary of the lake fringe wetland is similarly distinct as that of the East wetland.

4.2 Vegetation

The core of the East wetland is dominated by a dense canopy of Oregon ash (*Fraxinus latifolia*, FACW), with occasional red alder, and an understory of slough sedge (*Carex obnupta*, OBL) (Photograph 3). At the northwest and southeast ends, the tree canopy thins and a shrub understory is present (Photograph 9), composed of salmonberry (*Rubus spectabilis*, FAC), twinberry (*Lonicera involucrata*, FAC), redosier dogwood (*Cornus alba*, FACW), Douglas spirea (*Spiraea douglasii*, FACW), Pacific ninebark (*Physocarpus capitatus*, FACW), and occasional Himalayan blackberry (*Rubus armeniacus*, FAC). In these areas, Western lady fern (*Athyrium cyclosorum*, FAC), piggyback plant (*Tolmiea menziesii*, FAC), tall mannagrass (*Glyceria elata*, FACW), skunk cabbage (*Lysichiton americanus*, OBL), and reed canarygrass (*Phalaris arundinacea*, FACW) join slough sedge in herbaceous openings and understory.

The Lake wetland contains a scrub-shrub area along the upland boundary, above the OHWM (Photograph 6). Vegetation in this area, sometimes heavily shaded by Douglas fir in adjacent uplands, is composed of a variety of shrub species, including salmonberry, redosier dogwood, Pacific ninebark, and Himalayan blackberry. Waterward of the scrub-shrub vegetation, the wetland can include a strip of reed canarygrass along the OHWM (Photograph 10). Below the OHWM, aquatic bed vegetation, dominated by yellow pond lily (*Nuphar polysepala*, OBL), extends into the lake (Photograph 7). Small, discontinuous pockets of wetland may be present along the lake below the OHWM.

Backwater areas, where water is shallow and vegetation is shaded by fir trees and protected from the fetch of the lake, are dominated by emergent species, including skunk cabbage, lady fern, reed canarygrass, slough sedge, and water parsley (*Oenanthe sarmentosa*, OBL); although, the amount of vegetation may vary (Photographs 11 and 12).

Tree canopy in the upland forest on the ridge between the two wetlands is dominated by Douglas fir and bigleaf maple (*Acer macrophyllum*, FACU), interspersed with occasional western hemlock (*Tsuga heterophylla*) (Photographs 1 and 8). There is a diverse shrub layer—including vine maple (*Acer circinatum*), beaked hazelnut (*Corylus cornuta*), Pacific ninebark (*Physocarpus capitatus*), salmonberry, common snowberry (*Symphoricarpos albus*), salal (*Gaultheria shallon*), and mock orange (*Philadelphus lewisii*)—with sword fern (*Polystichum munitum*), dull Oregon grape (*Mahonia nervosa*), fringe cup (*Tellima grandiflora*), threeleaf foamflower (*Tiarella trifoliata*), and other herbs in the understory. Invasive upland species, including English holly (*Ilex aquifolium*), ivy (*Hedera spp.*), periwinkle (*Vinca sp.*), and shiny geranium (*Geranium lucidum*), are well established in some locations, but generally not dominant.

4.3 Soils

The proposed main trail is proposed to cross the East wetland with a boardwalk. Wetland soils have black to very dark grayish brown (10YR2/1 and 3/1-2) surface horizons with common, distinct or prominent (10YR3-4/4-3, 10YR5/6-8) redox concentrations and faint (10YR4/1) redox depletions in the matrix (Data Forms K8-W and K5-W, Appendix C). The lower soil horizons are similar in matrix color and redox features or have a depleted matrix (10YR4/1) with common, prominent (10YR5-6/6-8 and 7.5YR2.5/2) redox concentrations in the matrix (e.g., Data Form K8-W). Textures throughout are typically silt loam, but may vary to loam and/or have greater than 15% gravel or cobbles.

4.4 Hydrology

Hydrology of the East wetland appears to be driven by a high water table resulting from the surrounding upland of the gravel ridges to the west and east, stream flow from the hills to the southeast, and possibly backwater from Lacamas Lake when the water level is above full summer pool elevation (181 feet, which is the OHWM elevation). Extensive surface water ponding and saturated soils were observed during the fall 2016 site visits. During the 2017 delineation, when the pool had been lowered, the wetland soil was moist to ponded on the surface depending on the location (Photograph 3).

Hydrology of the Lake wetland is driven by the high water table associated with the seasonal (full pool) elevation of Lacamas Lake.

4.5 Wetland Rating

The East and Lake wetlands were rated (Appendix D) following Hruby (2014). Overall, these wetlands have a score of 19 and 21 points, Category III and II respectively (Table 3). These wetlands score moderate to high water quality function (score of 7 and 8), with moderate hydrologic function (score of 6), and moderate to high habitat function (score of 6 and 7).

Table 3. Summary of the Wetland Ratings and Buffer Widths.

Wetland	Wetland Rating	Habitat Score	Maximum Wetland Buffer Width (ft)§
East	III	6	65 for pervious trail (low intensity use) 100 for impervious trail (moderate intensity use)
Lake	II	7	110 for pervious trail (low intensity use) 165 for impervious trail (moderate intensity use)

§ SMP Tables 16.53.040-2 and -3 applying uses per SMP Table 16.53.040-4

Wetland buffer widths are based on the rating and the habitat score for each wetland (SMP Tables 16.53.040-2 and 16.53.040-3) and the intensity of the proposed land use (SMP Table 16.53.040-4 Land Use Intensity Matrix). Pervious trails are considered a low intensity land use and impervious trails are considered a moderate intensity use. Thus, as shown in Table 3, the buffers designated by the City vary from 65 to 165 feet wide depending on the wetland and the type of trail proposed in the buffer.

4.6 Lacamas Lake

The OHWM was evaluated along Lacamas Lake and mapped via GPS. The boundary character varies depending on the precise location (Photographs 13, 14 and 15), but typically integrates three or more of the following:

- A vegetation change from lacustrine or wetland to upland community;
- An abrupt topographic break;
- A sediment change from gravel beach to soil with a developed soil profile;
- Watermarks on boulders and dock structures along the bank;
- Wrack accumulation;
- Full pool elevation of Lacamas Lake (181 feet).

Two backwater areas are protected from the fetch of the lake and thus vegetation and sediment below the OHWM is somewhat different than typical. In these backwaters there are large areas of bare ground (leaf litter) and herbaceous vegetation (Photograph 11). The vegetation above the OHWM is similar to other areas in the study area: a canopy dominated by Douglas fir and other upland species, and an understory of vine maple, sword fern, salal, and dull Oregon grape. Below the OHWM the sediment is finer in texture and soils with hydric characteristics may be present.

5. CONCLUSIONS

One depressional, forested wetland (East wetland) and one lake fringe, scrub-shrub wetland (Lake wetland) were identified in the study area. These two wetlands rate, respectively, as a Category III and Category II wetland, with habitat scores of 6 and 7 (Hruby 2014).

The City's wetland buffer width (SMP 16.53) also depends on the type of trail—pervious versus impervious. Therefore, the buffers required to protect habitat function varies from 65 feet for pervious trails near the East wetland to 165 feet for impervious trails near the Lake wetland. The entire project is within 200 feet of the OHWM and buffers of associated wetlands are within City regulated shorelands (SMP 2015). The OHWM was evaluated and mapped along Lacamas Lake.

6. LITERATURE CITED

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Appendix A – Figures

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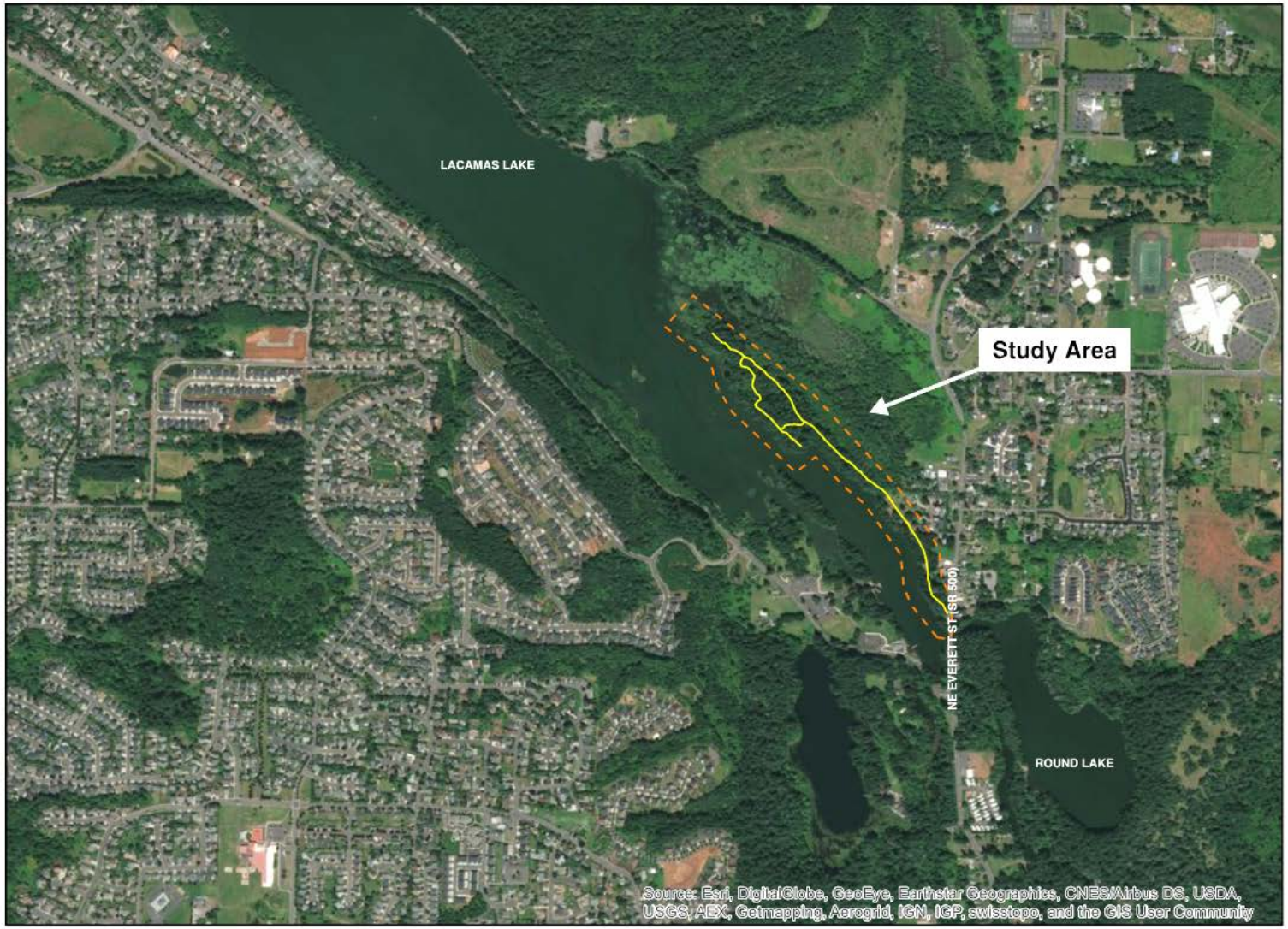
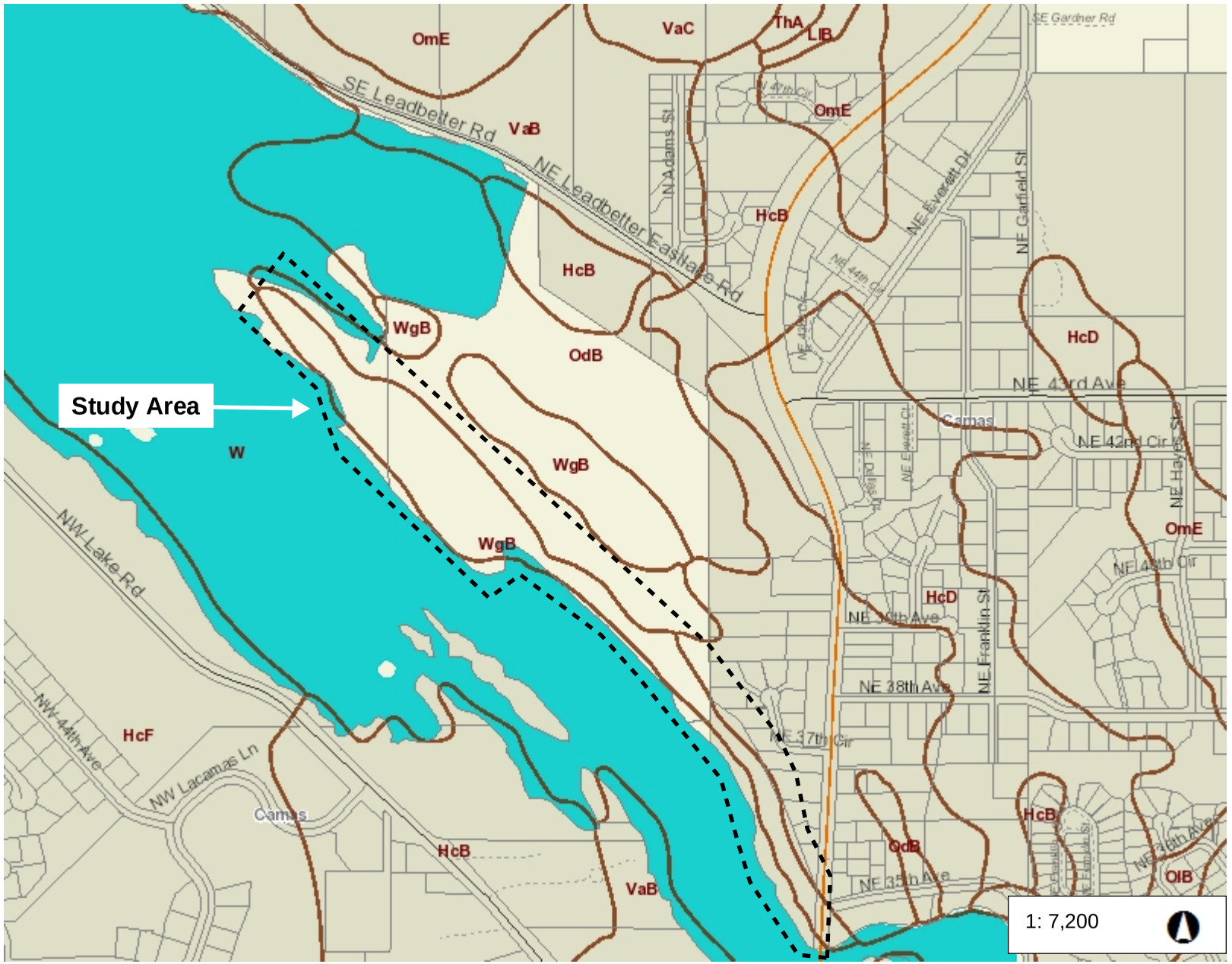


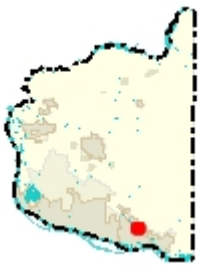
Figure 1: Vicinity Map

Lacamas North Shore Trail
Camas, Washington

Harper Houf Peterson Righellis Inc.
ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS

Figure 2: Soil Map Units within the Study Area





Legend

- Taxlots
- Soil Map Units

Soil Map Units in Study Area

WgB - Washougal Gravelly Loam, 0 to 8 percent slopes, well drained.

OdB - Odne silt loam, 0 to 5 percent slopes, poorly drained.

HcB - Hesson Clay Loam, 0 to 8 percent slopes, well drained.

Notes:

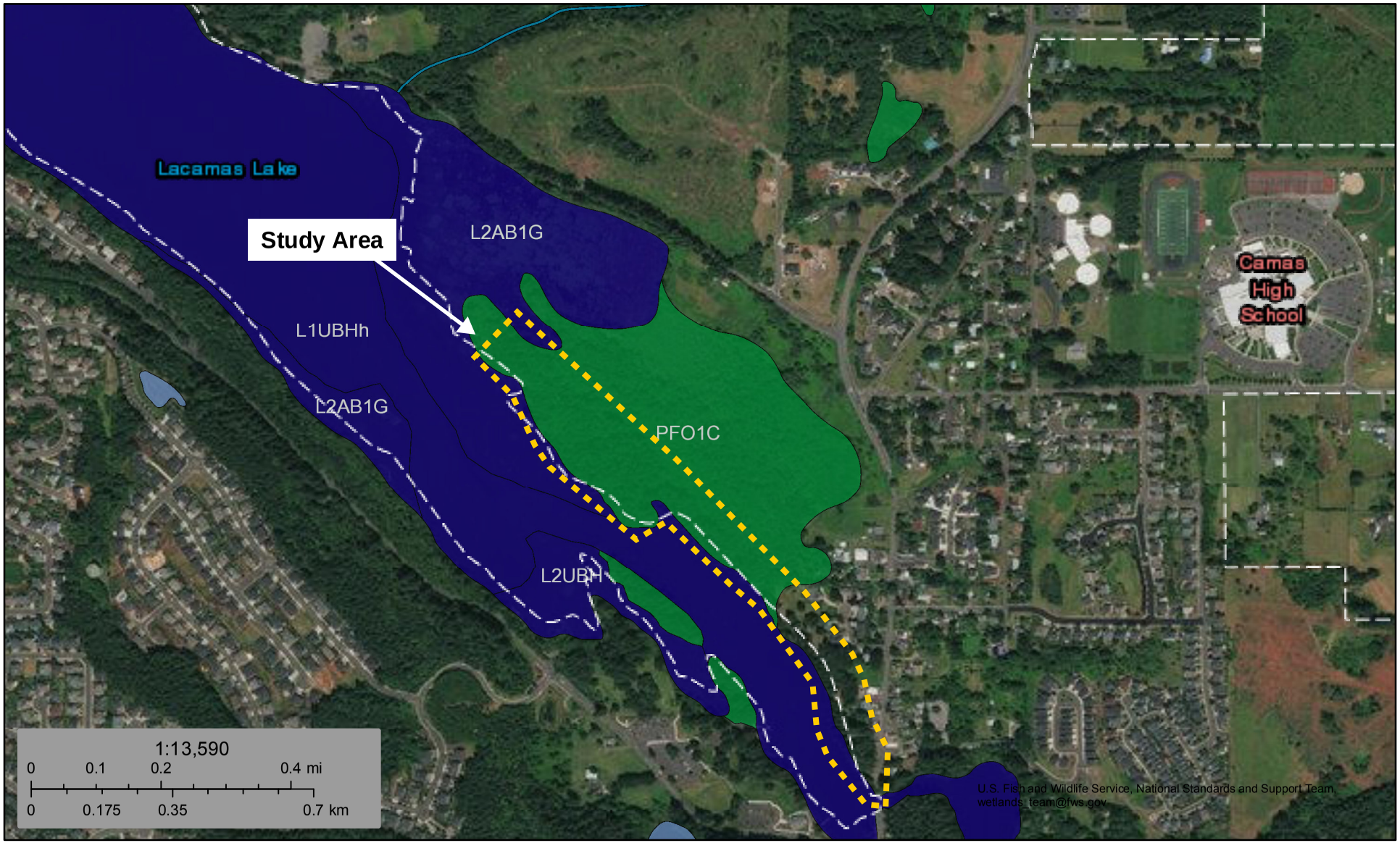
1,200.0 0 600.00 1,200.0 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - http://gis.clark.wa.gov

U.S. Fish and Wildlife Service

National Wetlands Inventory

Figure 3: National Wetlands Inventory



January 4, 2018

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

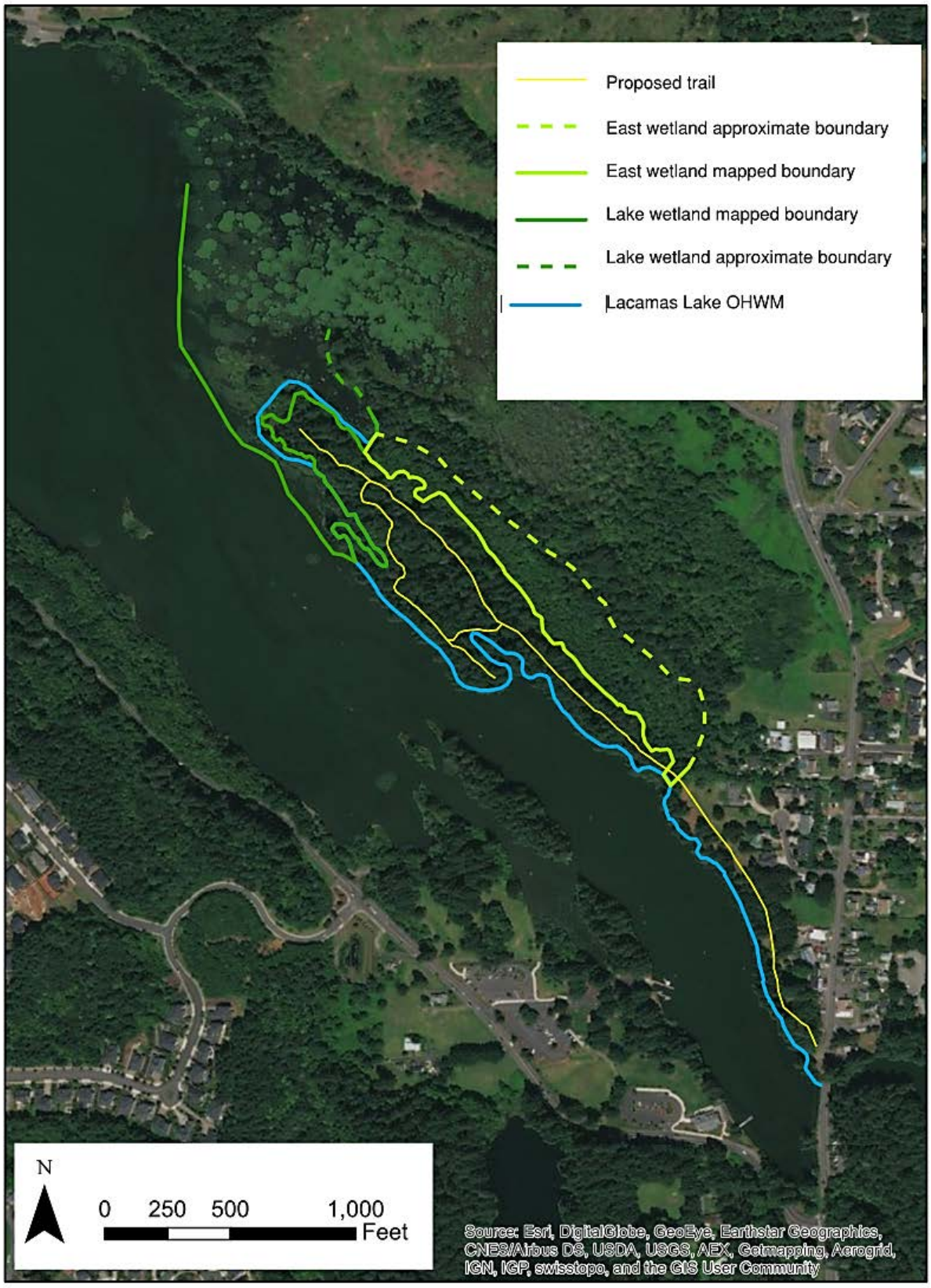


Figure 4: Wetlands and Waters

Lacamas North Shore Trail
Camas, Washington

HHPR Harper Houf Peterson Righellis Inc.
ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS

Appendix B – Photographs

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Photograph 1: View looking north showing abandoned access road and typical Douglas fir forest present along the majority of the proposed trail alignment. Photograph taken December 1, 2016.

Photograph 2: View looking south where the proposed alignment crosses mowed lawns. In this area, private residences (left) are close to the shore. Photograph taken January 14, 2018.

Photograph 3: View looking south, showing typical forest in core of East wetland: dense Oregon ash canopy and slough sedge understory, with areas of ponded water. Photograph taken October 30, 2017.

Photograph 4: Culvert outfall (bottom left) from East wetland at the abandoned access road crossing, where boardwalk proposed. Photograph taken January 14, 2018.

Photograph 5: View south along the abandoned access road where it crosses East wetland, where boardwalk proposed. Photograph taken December 1, 2016.

Photograph 6: View looking southwest, towards Lacamas Lake, showing typical shrub-shrub fringe in Lake wetland: redosier dogwood and Himalayan blackberry with slough sedge interspersed, shaded by trees in adjacent upland. Photograph taken October 30, 2017.

Photograph 7: View looking northwest, showing exposed aquatic bed plants in the Lake wetland when Lacamas Lake is drawn down. Photograph taken October 30, 2017.

Photograph 8: View looking north along the boundary of East wetland, showing the distinct topographic break and associated change in vegetation from wetland (slough sedge, right) to upland (sword fern, left). Photograph taken January 14, 2018.

Photograph 9: View looking north, showing typical vegetation at the north and south ends of East wetland: thinner tree canopy and thickets of shrubs intermixed with patches of bare ground/open water and herbaceous vegetation. Photograph taken October 26, 2017.

Photograph 10: View looking east, showing a strip of reed canarygrass along the OHWM of Lacamas Lake, part of Lake wetland. Bare ground (center) is below the OHWM. Photograph taken October 30, 2017.

Photograph 11: View looking northwest along one of the backwaters, showing areas of bare ground, open water, and patches of herbaceous vegetation below the OHWM of Lacamas Lake. Photograph taken December 1, 2016.

Photograph 12: View looking southeast along one of the backwaters, showing areas of bare ground and patches of herbaceous vegetation below the OHWM of Lacamas Lake. Backwater is 950 feet northwest of the proposed boardwalk. Photograph taken December 1, 2016.

Photograph 13: View looking southeast showing watermarks on a large boulder on the shore of Lacamas Lake. Photograph taken October 30, 2017.

Photograph 14: View looking southeast along the shore of Lacamas Lake, showing watermarks on a dock. Photograph taken October 30, 2017.

Photograph 15: View east from Lacamas Lake towards the trail alignment. Wrack accumulation and change in vegetation from bare or herbaceous to scrub-shrub can be seen at the OHWM. Photograph taken October 26, 2017.

Appendix C – Wetland Data Forms

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

Project/Site: Lacamas North Shore Trail City/County: Camas Sampling Date: 10/26/2017
Applicant/Owner: City of Camas State: WA Sampling Point: K5-W
Investigator(s): Kent Snyder and Ivy Watson Section, Township, Range: SW ¼ S35 T2N R3E
Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): <5%
Subregion (LRR): LRR A Lat: 45.60777064 Long: -122.40988791 Datum:
Soil Map Unit Name: WgB, Washougal gravelly loam, 0 to 8% slope NWI classification: PFO1C
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___ , Soil ___ , or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___ , Soil ___ , or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

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

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

Remarks: West of trail

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Alnus rubra*	30	Y	FAC
2. *Fraxinus latifolia*	30	Y	FACW
3.			
4.			
	60	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5 ft)			
1. *Physocarpus capitatus*	35	Y	FACW
2. *Rubus armeniacus*	40	Y	FAC
3. *Rubus spectabilus*	5	N	FAC
4.			
5.			
	80	= Total Cover	

Herb Stratum (Plot size: 5 ft)			
1. *Carex obnupta*	45	Y	OBL
2. *Rubus ursinus*	2	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	47	= Total Cover	

Woody Vine Stratum (Plot size: 30 ft)			
1. None.	0		
2.			
	45	= Total Cover	

% Bare Ground in Herb Stratum 55

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 1.0 (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- x 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - 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 x No**

Remarks:

SOIL

Sampling Point: K5-W

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR3/2		10YR3/3	20	C	M	Gravelly loam	
4-8	10YR3/2		10YR5/8	2	C	M	Gravelly loam	
			10YR3/4	35	C	M		
			10YR4/1	10	D	M		
8-15	10YR3/1		10YR4/6	15	C	M	Gravelly loam	
			7.5YR3/4	10	C	M		

[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)
- x 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** x **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**)
- x Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- x 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	x	Depth (inches):	___
Water Table Present?	Yes	___	No	x	Depth (inches):	___
Saturation Present? (includes capillary fringe)	Yes	___	No	x	Depth (inches):	___

Wetland Hydrology Present? **Yes** x **No** ___

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

Remarks: Lake level has been lowered for winter.

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

Project/Site: Lacamas North Shore Trail City/County: Camas Sampling Date: 10/30/2017
Applicant/Owner: City of Camas State: WA Sampling Point: K8-W
Investigator(s): Kent Snyder and Ivy Watson Section, Township, Range: SW ¼ S35 T2N R3E
Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 2
Subregion (LRR): LRR A Lat: 45.60791325 Long: -122.40972698 Datum:
Soil Map Unit Name: WgB, Washougal gravelly loam, 0 to 8% slope NWI classification: PFO1C
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___ , Soil ___ , or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___ , Soil ___ , or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

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

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

Remarks: East of trail

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fraxinus latifolia*	5	Y	FACW
2. *Alnus rubra*	5	Y	FAC
3.			
4.			
	10	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5 ft)			
1. *Rubus spectabilis*	35	Y	FAC
2. *Rubus armeniacus*	15	Y	FAC
3. *Symphoricarpos albus*	1	N	FACU
4. *Acer circinatum*	2	N	FAC
5.			
	50	= Total Cover	

Herb Stratum (Plot size: 5 ft)			
1. *Athyrium cyclosorum*	40	Y	FAC
2. *Tolmiea menziesii*	30	Y	FAC
3. *Glyceria elata*	2	N	FACW
4. *Hedera helix*	2	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	74	= Total Cover	

Woody Vine Stratum (Plot size: 30 ft)			
1. None.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 35

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: 1.0 (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
x 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - 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 x No**

Remarks:

SOIL

Sampling Point: K8-W

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-7	10YR2/1						Silt loam	
7-11	10YR3/1		10YR5/6	10	C	M	Silt loam	
			10YR4/1	15	D	M		
			10YR4/3	15	C	M		
11-16	10YR4/1		10YR5/6	15	C	M	Cobbly silt loam	Wet colors & texture
			10YR6/8	5	C	M		
			7.5YR2.5/2	5	C	M		

[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)
- x 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** x **No** ___

Remarks: Probably more redox features in 11-16 inch, but saturation makes difficult to identify.

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- x High Water Table (A2)
- x 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**)
- x Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- x 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	x	Depth (inches):	
Water Table Present?	Yes	x	No	___	Depth (inches):	12
Saturation Present? (includes capillary fringe)	Yes	x	No	___	Depth (inches):	9

Wetland Hydrology Present? **Yes** x **No** ___

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

Remarks:

Appendix D – Wetland Rating Forms

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Wetland name or number East

RATING SUMMARY – Western Washington

Name of wetland (or ID #): East wetland Date of site visits: 12/1/16 & 10/30/17

Rated by Kent Snyder Trained by Ecology? x Yes ___No Date of training 11/05/14

HGM Class used for rating Depressional Wetland has multiple HGM classes? x Y ____N

NOTE: **Form is not complete without the figures requested** *(figures can be combined)*.

Source of base aerial photo/map ESRI

OVERALL WETLAND CATEGORY III (based on functions x or special characteristics___)

1. Category of wetland based on FUNCTIONS

_____**Category I** – Total score = 23 - 27

_____**Category II** – Total score = 20 - 22

__x__**Category III** – Total score = 16 - 19

_____**Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H (M) L	H M (L)	H (M) L	
Landscape Potential	H (M) L	H (M) L	H (M) L	
Value	(H) M L	(H) M L	H (M) L	**TOTAL**
Score Based on Ratings	7	6	6	19

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

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

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	**I II**
Wetland of High Conservation Value	**I**
Bog	**I**
Mature Forest	**I**
Old Growth Forest	**I**
Coastal Lagoon	**I II**
Interdunal	**I II III IV**
None of the above	

Wetland name or number East

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	
Hydroperiods	D 1.4, H 1.2	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 4.3, D 5.3	
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)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	

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 figure above)*	S 4.1	
Boundary of 150 ft buffer (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	

Wetland name or number East

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

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

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

   NO – go to 2 x **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 x **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 x **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 x **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.

Wetland name or number East

NO – go to 6 x **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** x

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 x
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.*

Wetland name or number East

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). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. 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 points = 5 Wetland has persistent, ungrazed, plants > ½ of area points = 3 Wetland has persistent, ungrazed plants > $^1/_{10}$ of area points = 1 Wetland has persistent, ungrazed plants < $^1/_{10}$ of area points = 0	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 points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland 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** _X_ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	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 phosphorous Yes = 1 No = 0	1
Total for D 2 Add the points in the boxes above	1

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

D 3.0. 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	2
Total for D 3 Add the points in the boxes above	4

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

Wetland name or number East

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	0
Total for D 4 Add the points in the boxes above	5

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

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0	0
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	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	1
Total for D 5 Add the points in the boxes above	1

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

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: _X_ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number _____

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

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 type present: points = 0
____Permanently flowing stream or river in, or adjacent to, the wetland	
____Seasonally flowing stream in, or adjacent to, the wetland	
____**Lake Fringe wetland**	**2 points**
____**Freshwater tidal wetland**	**2 points**

H 1.3. Richness of plant species

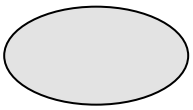
Count the number of plant species in the wetland that cover at least 10 ft^2.

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***

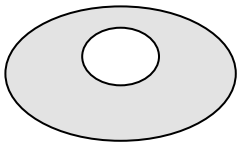
If you counted: > 19 species	points = 2
5 - 19 species	points = 1
< 5 species	points = 0

H 1.4. Interspersion of habitats

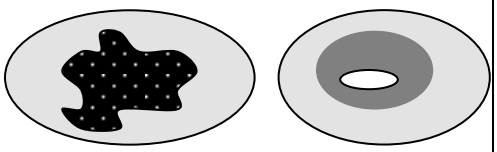
Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always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



None = 0 points

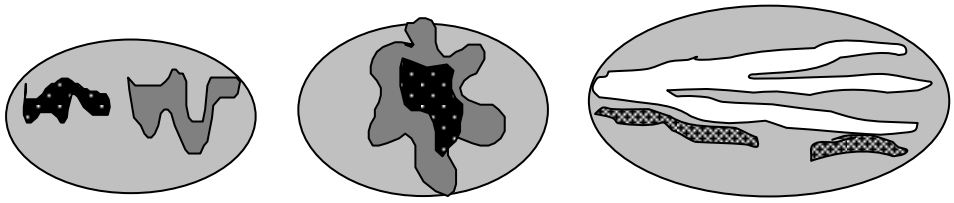


Low = 1 point



Moderate = 2 points

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



Wetland name or number East

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*)	
Total for H 1 Add the points in the boxes above	

Rating of Site Potential If score is:___**15-18 = H** _X_**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 functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat___ **+** [(% moderate and low intensity land uses)/2]___ **=** __12__% 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	
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* % undisturbed habitat___ **+** [(% moderate and low intensity land uses)/2]___ **=** __42__% 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	
H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 1 km Polygon is high intensity points = 0	
Total for H 2 Add the points in the boxes above	3

Rating of Landscape Potential If score is:___**4-6 = H** _X_**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) within 100 m points = 1 Site does not meet any of the criteria above points = 0	

Rating of Value If score is:___**2 = H** _X_**1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number East

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).*

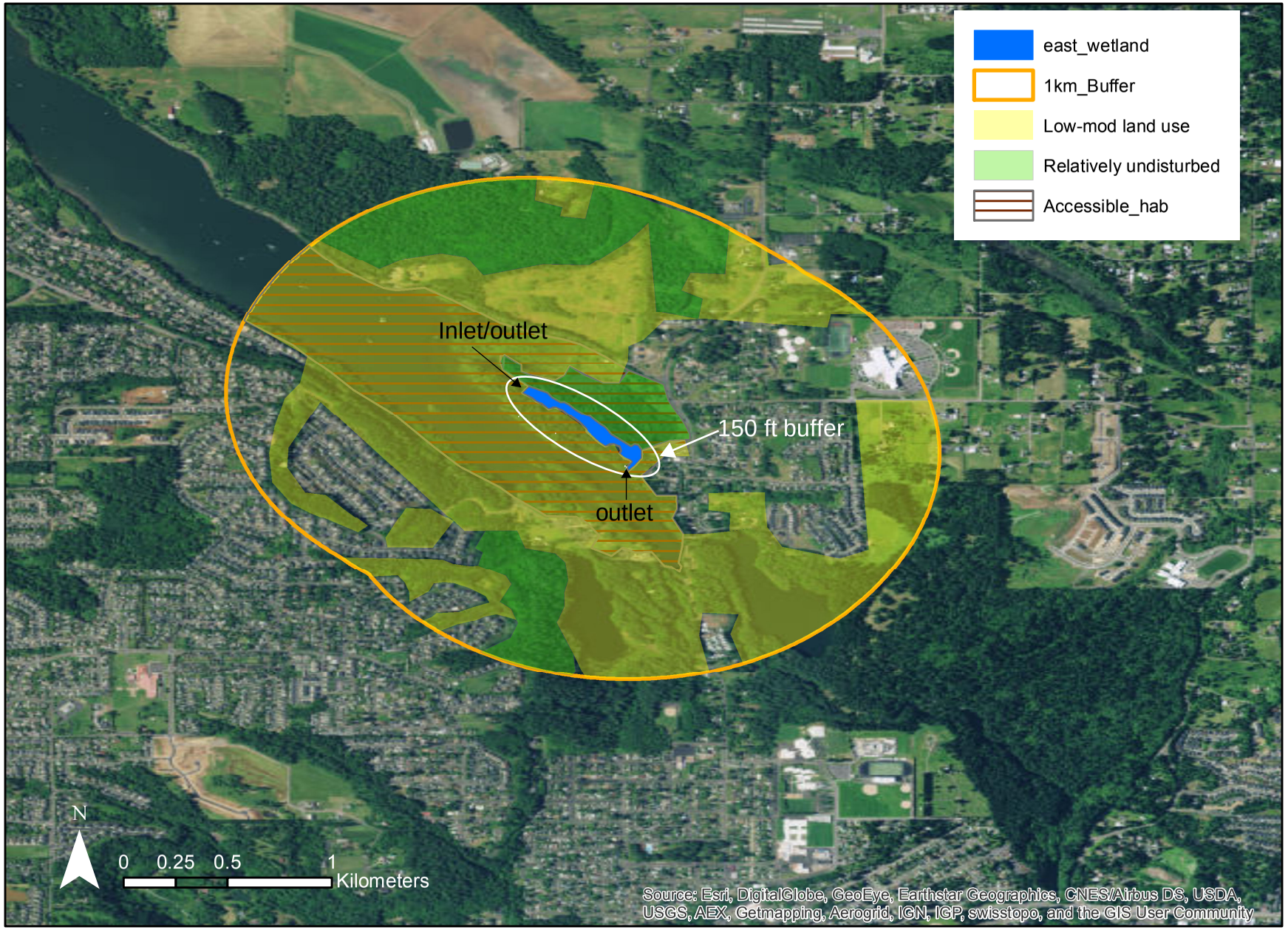
— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **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.

X **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

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


east_wetland
1km_Buffer
Low-mod land use
Relatively undisturbed
Accessible_hab
Inlet/outlet
150 ft buffer
outlet
N
0 0.25 0.5 1
Kilometers
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

StreamStats Report

Region ID:
WA
Workspace ID:
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Clicked Point (Latitude, Longitude):
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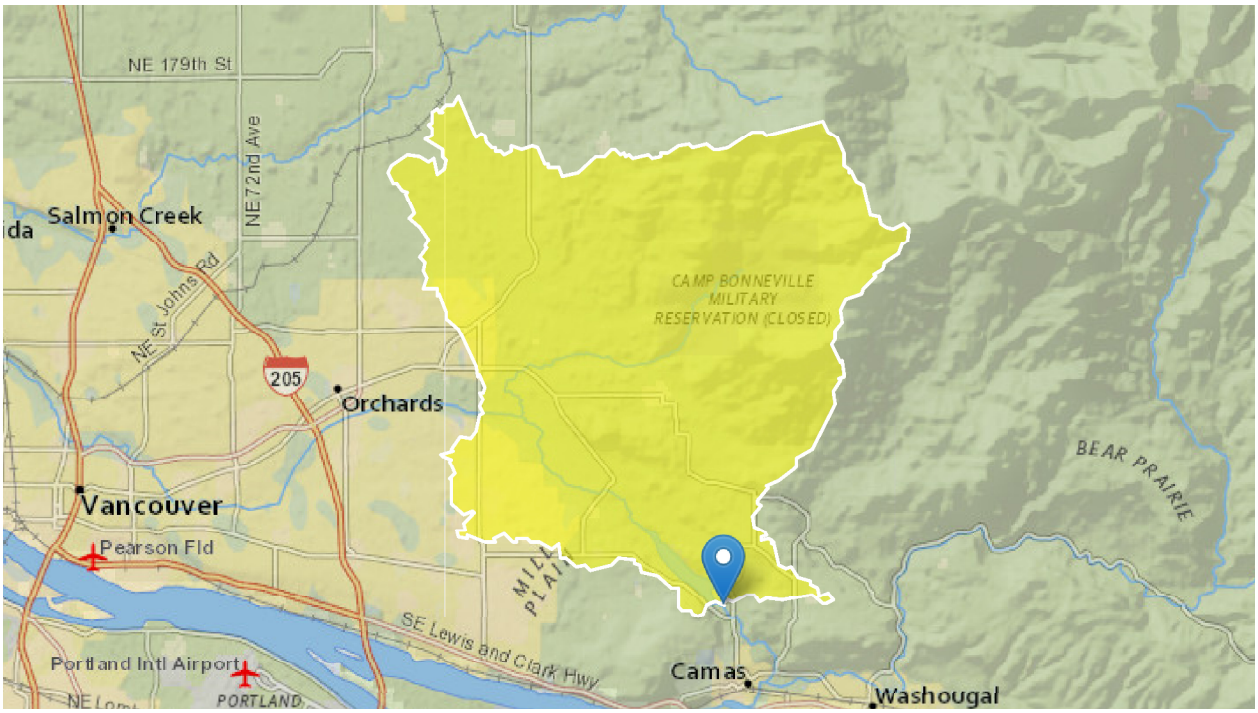
Time:
2017-07-07 11:57:40 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	58.69	square miles

DEPARTMENT OF ECOLOGY State of Washington

Washington State Water Quality Atlas

Home | Add Map Data | Clear Map Data

Legend | Filter Data | Zoom To | Tools

Add or remove map data

Assessed Waters/Sediment

Water

- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

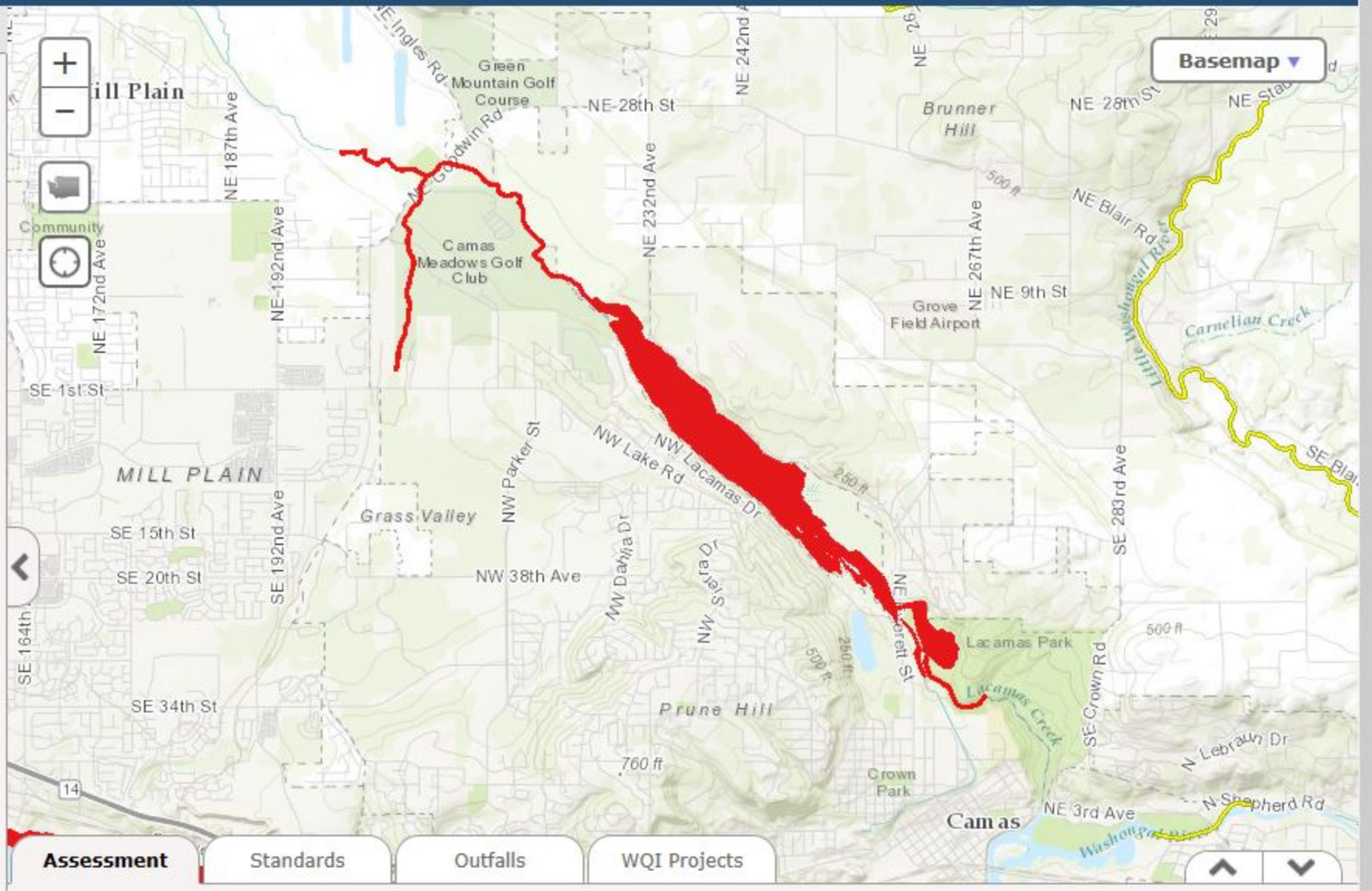
Sediment

- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Change map data transparency

10%

0 0.5 1mi



Assessment | Standards | Outfalls | WQI Projects

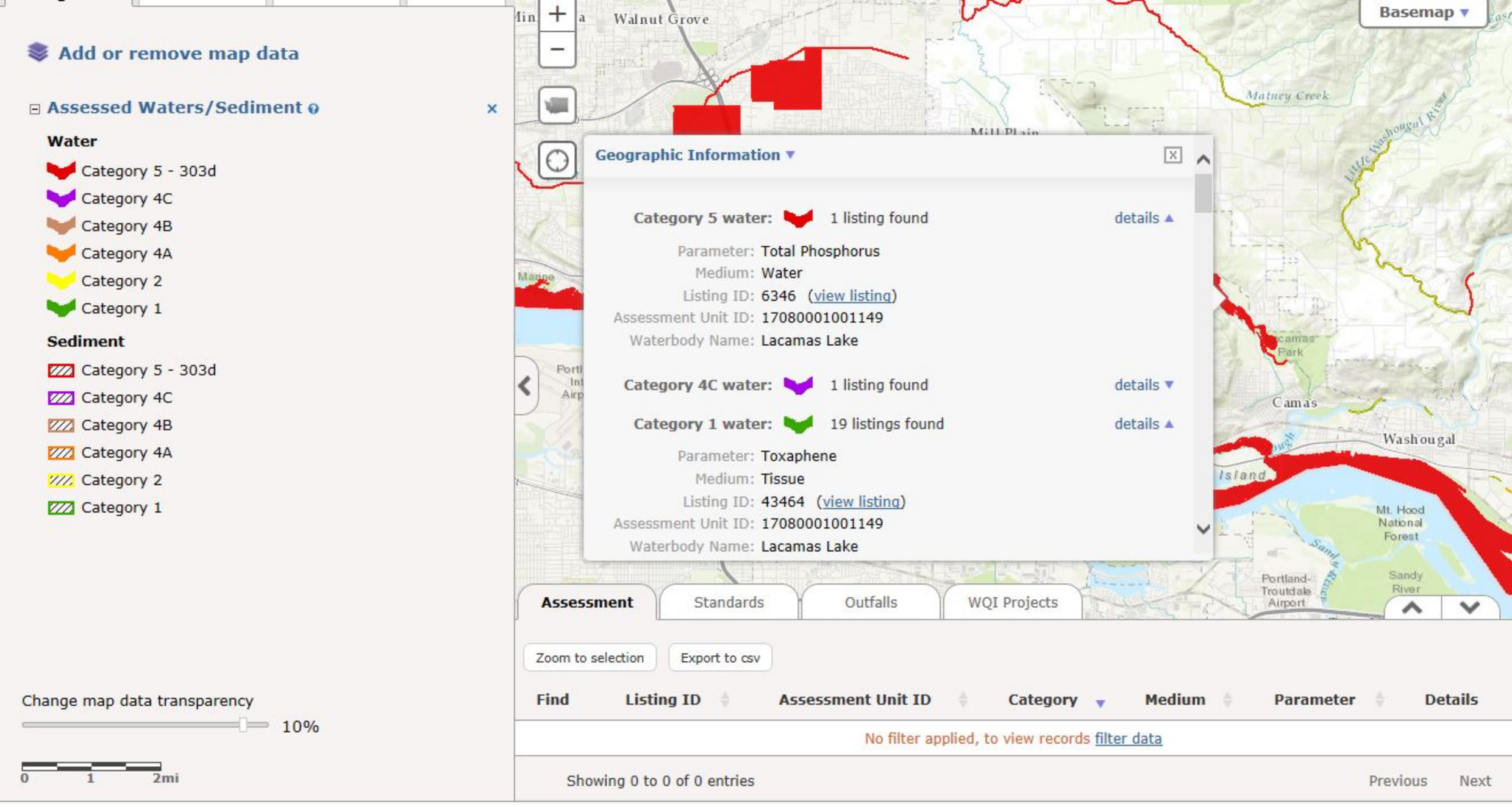
Zoom to selection | Export to csv

Find	Listing ID	Assessment Unit ID	Category	Medium	Parameter	Details

No filter applied, to view records filter data

Showing 0 to 0 of 0 entries

Previous Next



DEPARTMENT OF ECOLOGY
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Washington State Water Quality Atlas

Home | Add Map Data | Clear Map Data

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Add or remove map data

Assessed Waters/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

WQ Improvement Projects

- Approved
- In Development

Change map data transparency

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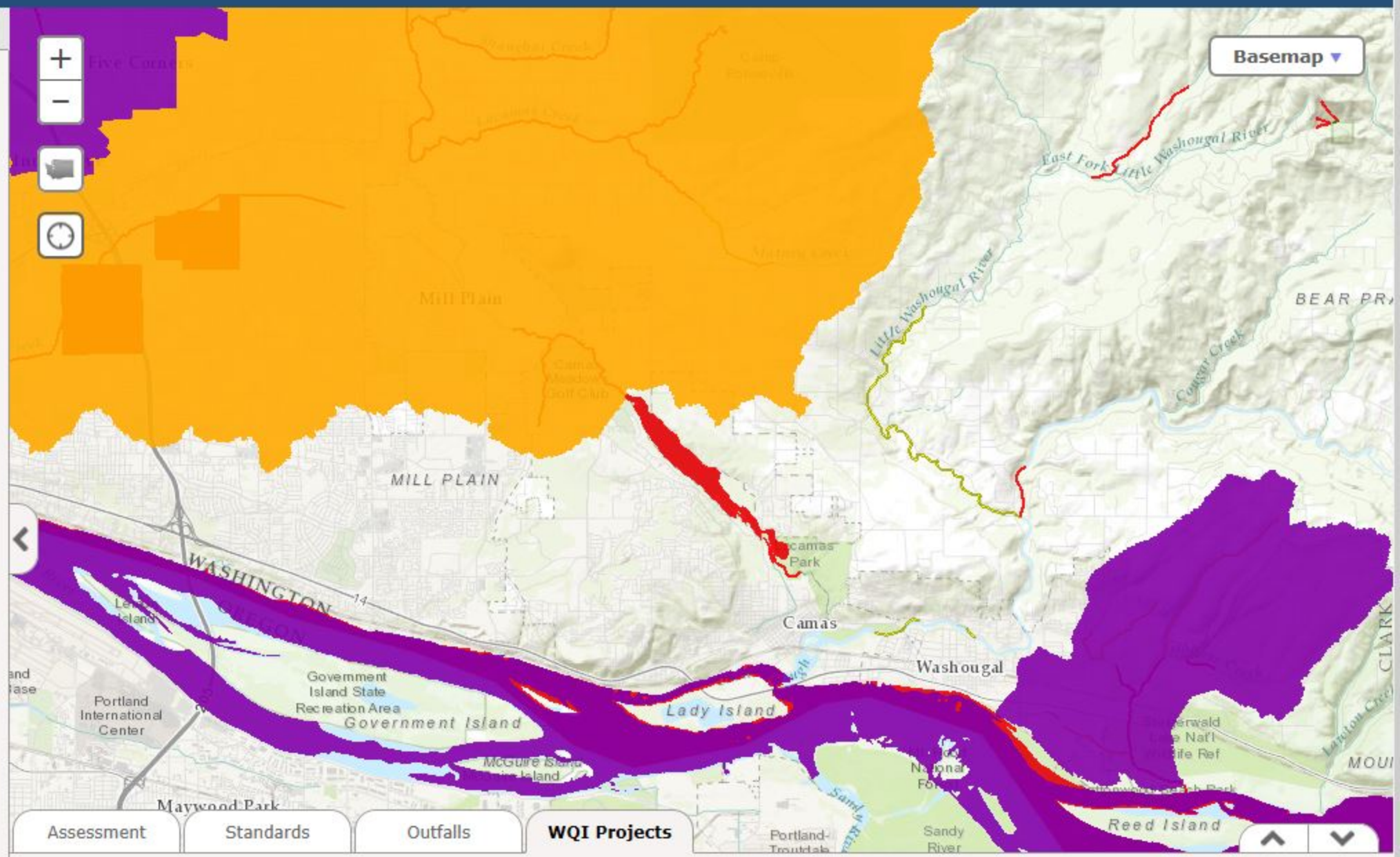


Assessment | Standards | Outfalls | **WQI Projects**

Zoom to selection | Export to csv

Find	Name	Type	Status	Parameters	Webpage	Report
No filter applied, to view records filter data						

Showing 0 to 0 of 0 entries

Previous Next

Wetland name or number Lake

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Lake wetland Date of site visit: 12/1/16 & 10/30/17

Rated by Ivy Watson Trained by Ecology? __ Yes _x_ No Date of training 11/8-9/16

HGM Class used for rating Lake Fringe Wetland has multiple HGM classes? ___Y _x_N

NOTE: **Form is not complete without the figures requested** *(figures can be combined)*.

Source of base aerial photo/map ESRI

OVERALL WETLAND CATEGORY II (based on functions x 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			
	Circle the appropriate ratings									
Site Potential	H	(M)	L	H	(M)	L	H	(M)	L	
Landscape Potential	(H)	M	L	H	(M)	L	H	(M)	L	
Value	(H)	M	L	H	(M)	L	(H)	M	L	**TOTAL**
Score Based on Ratings	8			6			7			21

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

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

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	**I II**
Wetland of High Conservation Value	**I**
Bog	**I**
Mature Forest	**I**
Old Growth Forest	**I**
Coastal Lagoon	**I II**
Interdunal	**I II III IV**
None of the above	

Wetland name or number Lake

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	
Hydroperiods	D 1.4, H 1.2	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 4.3, D 5.3	
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)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	

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 figure above)*	S 4.1	
Boundary of 150 ft buffer (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	

Wetland name or number Lake

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

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

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

   NO – go to 2 x **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 x **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?
   x 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;
   x 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) x

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.

Wetland name or number Lake

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.*

Wetland name or number Lake

LAKE FRINGE WETLANDS

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

L 1.0. Does the site have the potential to improve water quality?	
L 1.1. Average width of plants along the lakeshore *(use polygons of Cowardin classes)*: Plants are more than 33 ft (10 m) wide points = 6 Plants are more than 16 ft (5 m) wide and <33 ft points = 3 Plants are more than 6 ft (2 m) wide and <16 ft points = 1 Plants are less than 6 ft wide points = 0	6
L 1.2. Characteristics of the plants in the wetland: Choose the appropriate description that results in the highest points, and do not include any open water in your estimate of coverage. The herbaceous plants can be either the dominant form or as an understory in a shrub or forest community. *These are not Cowardin classes. Area of cover is total cover in the unit, but it can be in patches. Herbaceous does not include aquatic bed.* Cover of herbaceous plants is >90% of the vegetated area points = 6 Cover of herbaceous plants is >$^{2}/_{3}$ of the vegetated area points = 4 Cover of herbaceous plants is >$^{1}/_{3}$ of the vegetated area points = 3 Other plants that are not aquatic bed > $^{2}/_{3}$ unit points = 3 Other plants that are not aquatic bed in > $^{1}/_{3}$ vegetated area points = 1 Aquatic bed plants and open water cover > $^{2}/_{3}$ of the unit points = 0	1
Total for L 1 Add the points in the boxes above	7

Rating of Site Potential If score is: ___ **8-12 = H** _X_ **4-7 = M** ___ **0-3 = L** *Record the rating on the first page*

L 2.0. Does the landscape have the potential to support the water quality function of the site?	
L 2.1. Is the lake used by power boats? Yes = 1 No = 0	1
L 2.2. Is > 10% of the area within 150 ft of wetland unit on the upland side in land uses that generate pollutants? Yes = 1 No = 0	0
L 2.3. Does the lake have problems with algal blooms or excessive plant growth such as milfoil? Yes = 1 No = 0	1
Total for L 2 Add the points in the boxes above	2

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

L 3.0. Is the water quality improvement provided by the site valuable to society?	
L 3.1. Is the lake on the 303(d) list of degraded aquatic resources? Yes = 1 No = 0	1
L 3.2. Is the lake in a sub-basin where water quality is an issue (at least one aquatic resource in the basin is on the 303(d) list)? Yes = 1 No = 0	1
L 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 lake or basin in which the unit is found.* Yes = 2 No = 0	2
Total for L 3 Add the points in the boxes above	4

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

Wetland name or number Lake

LAKE FRINGE WETLANDS

Hydrologic Functions - Indicators that the wetland unit functions to reduce shoreline erosion

L 4.0. Does the site have the potential to reduce shoreline erosion?	
L 4.1. Distance along shore and average width of Cowardin classes along the lakeshore (**do not** include Aquatic bed): *Choose the highest scoring description that matches conditions in the wetland.*	
> ¾ of distance is Scrub-shrub or Forested at least 33 ft (10 m) wide — points = 6	6
> ¾ of distance is Scrub-shrub or Forested at least 6 ft (2 m) wide — points = 4	
> ¼ distance is Scrub-shrub or Forested at least 33 ft (10 m) wide — points = 4	
Plants are at least 6 ft (2 m) wide (any type except Aquatic bed) — points = 2	
Plants are less than 6 ft (2 m) wide (any type except Aquatic bed) — points = 0	

Rating of Site Potential: If score is: X **6 = M** ___ **0-5 = L** *Record the rating on the first page*

L 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
L 5.1. Is the lake used by power boats with more than 10 hp?	Yes = 1 No = 0	1
L 5.2. Is the fetch on the lake side of the unit at least 1 mile in distance?	Yes = 1 No = 0	0
Total for L 5	Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___ **2 = H** X **1 = M** ___ **0 = L** *Record the rating on the first page*

L 6.0. Are the hydrologic functions provided by the site valuable to society?	
L 6.1. Are there resources along the shore that can be impacted by erosion? If more than one resource is present, choose the one with the highest score.	
There are human structures or old growth/mature forests within 25 ft of OHWM of the shore in the unit — points = 2	1
There are nature trails or other paths and recreational activities within 25 ft of OHWM — points = 1	
Other resources that could be impacted by erosion — points = 1	
There are no resources that can be impacted by erosion along the shores of the unit — points = 0	

Rating of Value: If score is: ___ **2 = H** X **1 = M** ___ **0 = L** *Record the rating on the first page*

NOTES and FIELD OBSERVATIONS:

L.6.1. There are some large fir trees (>50 dbh) at the edge of the wetland. They are part of a younger forest, rather than part of a old growth/mature forest, so 1 point rather than 2.

L.5.2. There is one small window to the northwest with a 1 mile fetch. Most of the wind from this direction is blocked from the wetland by a small point of land.

Wetland name or number Lake

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

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 type present: points = 0
____Permanently flowing stream or river in, or adjacent to, the wetland	
____Seasonally flowing stream in, or adjacent to, the wetland	
____**Lake Fringe wetland**	**2 points**
____**Freshwater tidal wetland**	**2 points**

H 1.3. Richness of plant species

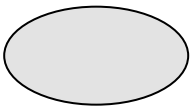
Count the number of plant species in the wetland that cover at least 10 ft^2.

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***

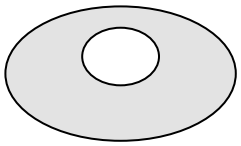
If you counted: > 19 species	points = 2
5 - 19 species	points = 1
< 5 species	points = 0

H 1.4. Interspersion of habitats

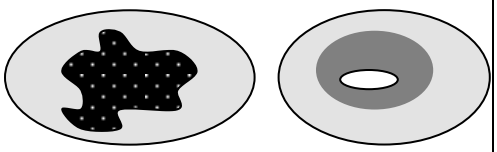
Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always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



None = 0 points

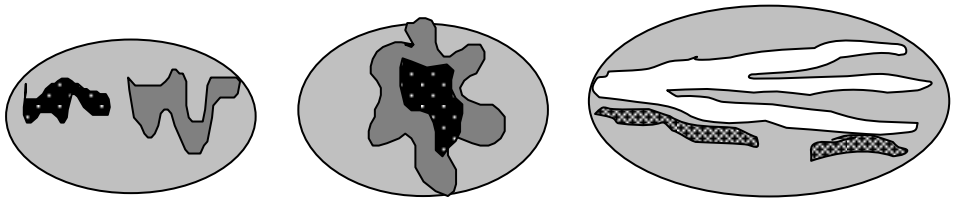


Low = 1 point



Moderate = 2 points

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



Wetland name or number Lake

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*)	
Total for H 1 Add the points in the boxes above	

Rating of Site Potential If score is:___**15-18 = H** _X_**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 functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat___ **+** [(% moderate and low intensity land uses)/2]___ **=** __13__% 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	
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* % undisturbed habitat___ **+** [(% moderate and low intensity land uses)/2]___ **=** __44__% 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	
H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 1 km Polygon is high intensity points = 0	
Total for H 2 Add the points in the boxes above	3

Rating of Landscape Potential If score is:___**4-6 = H** _X_**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) _X_ It is mapped as a location for an individual WDFW priority species (residential cutthroat trout in Lacamas Lake) — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats (listed on next page) within 100 m points = 1 Site does not meet any of the criteria above points = 0	

Rating of Value If score is: _X_ **2 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number Lake

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).*

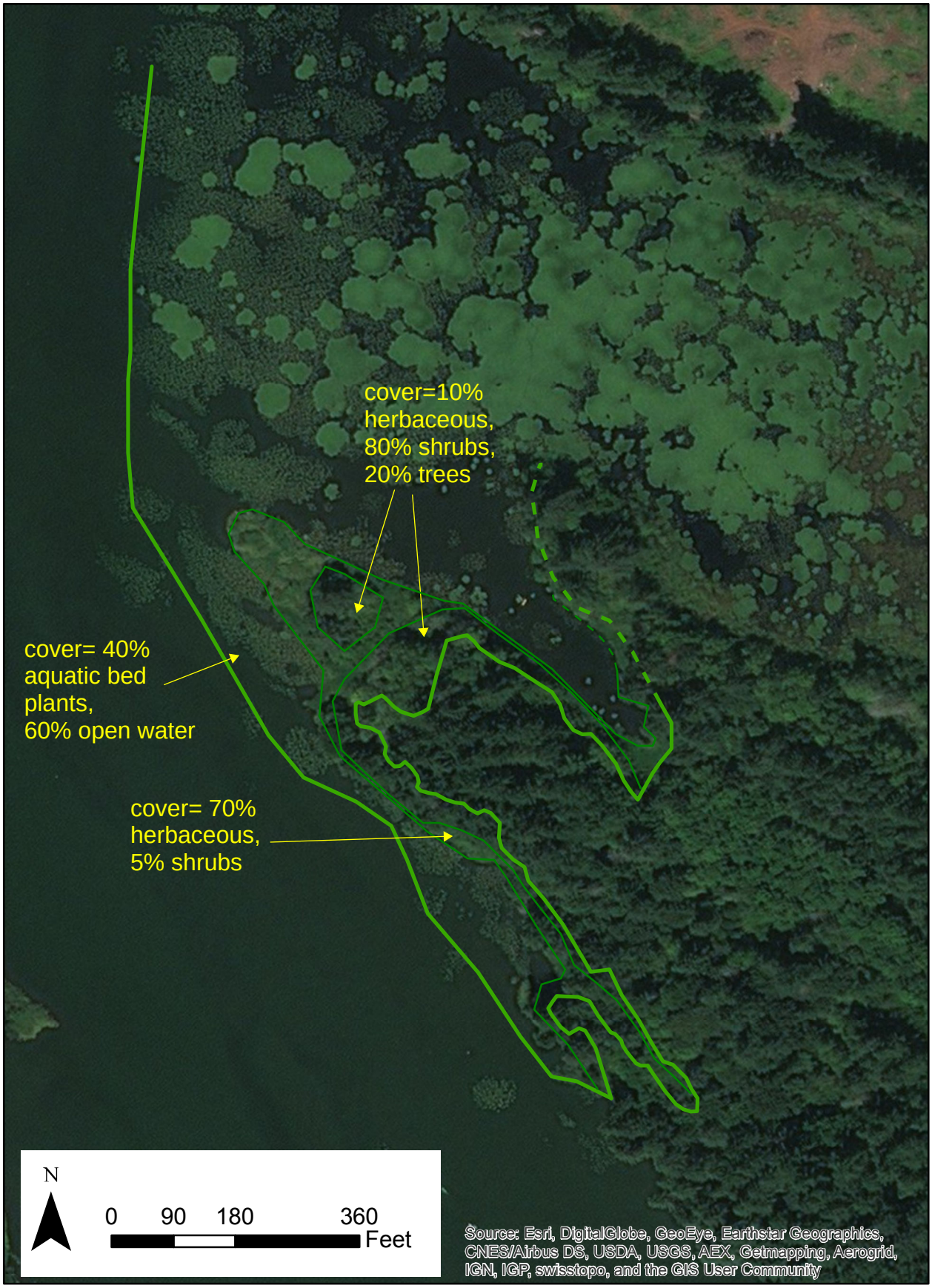
— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **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.

X **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

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


cover=10%
herbaceous,
80% shrubs,
20% trees
cover= 40%
aquatic bed
plants,
60% open water
cover= 70%
herbaceous,
5% shrubs
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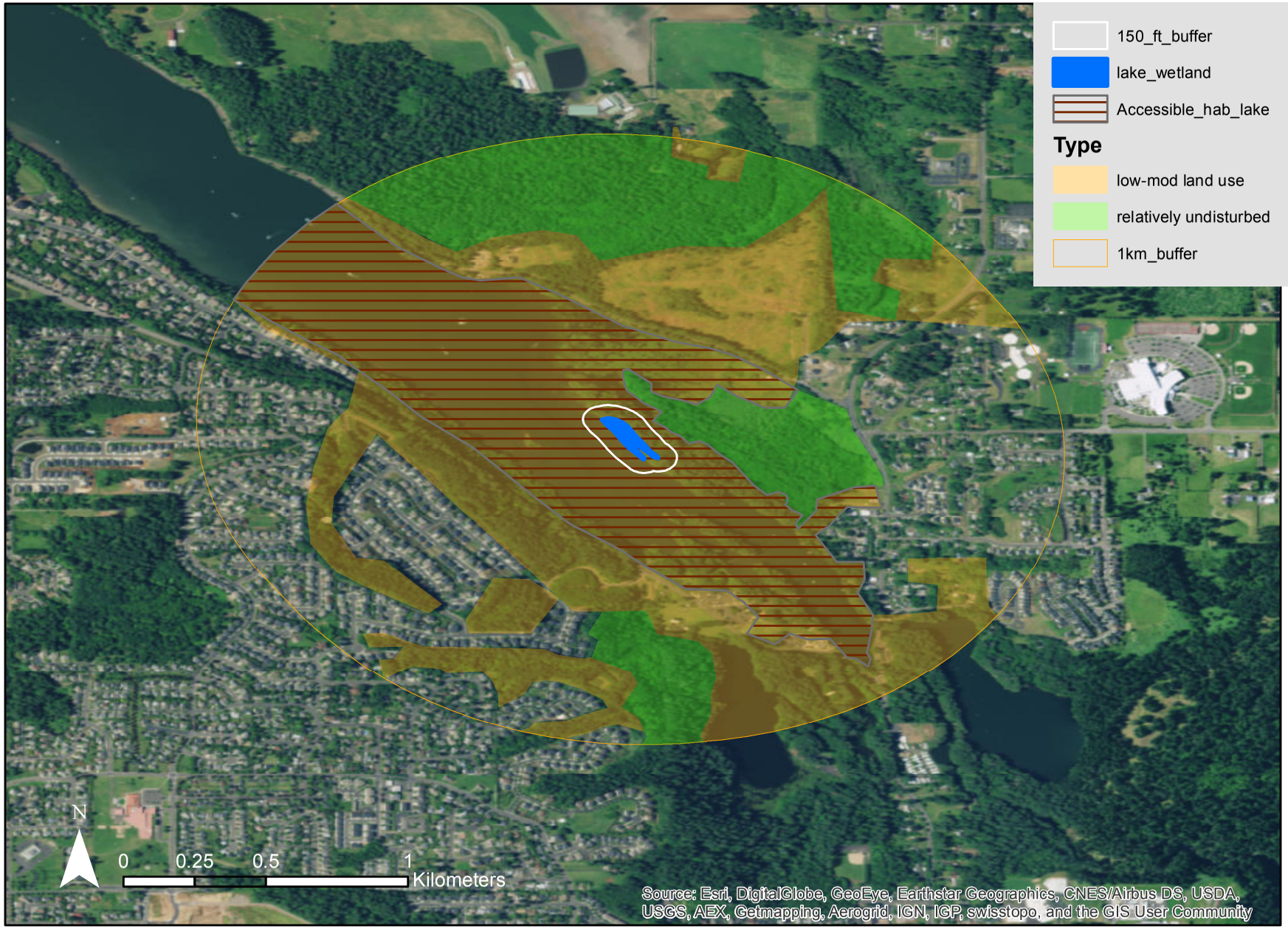
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community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lake_wetland
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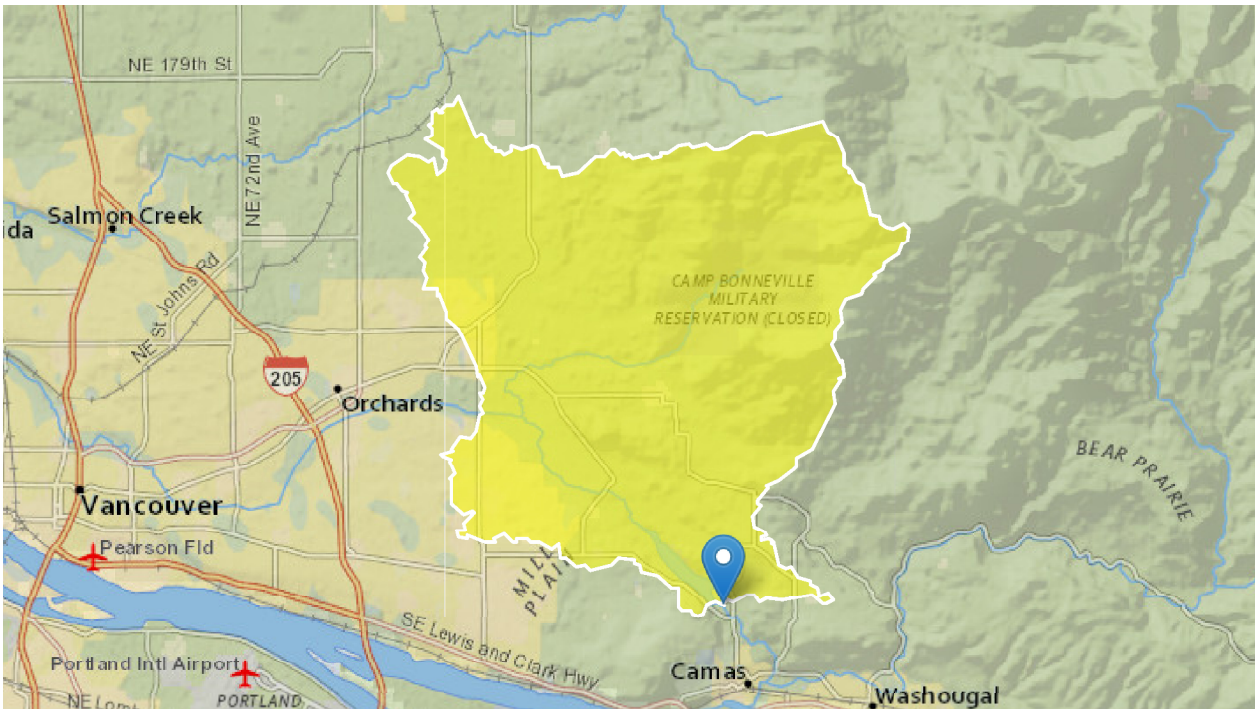
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

StreamStats Report

Region ID:
WA
Workspace ID:
WA20170707145648864000
Clicked Point (Latitude, Longitude):
45.60763, -122.41103
Time:
2017-07-07 11:57:40 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	58.69	square miles

DEPARTMENT OF ECOLOGY State of Washington

Washington State Water Quality Atlas

Home | Add Map Data | Clear Map Data

Legend | Filter Data | Zoom To | Tools

Add or remove map data

Assessed Waters/Sediment

Water

- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment

- Category 5 - 303d
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- Category 4B
- Category 4A
- Category 2
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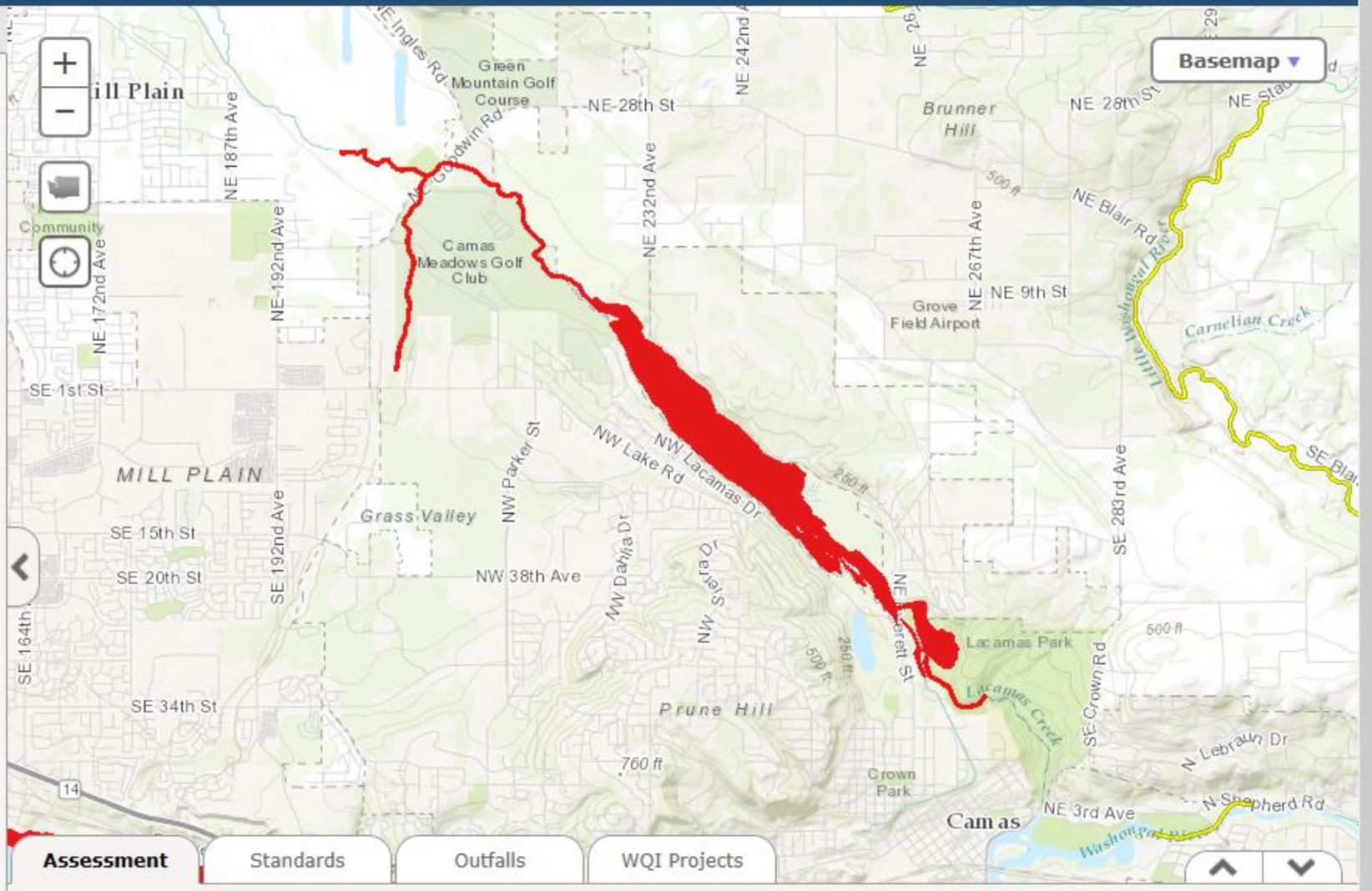

Assessment | Standards | Outfalls | WQI Projects

Zoom to selection | Export to csv

Find	Listing ID	Assessment Unit ID	Category	Medium	Parameter	Details

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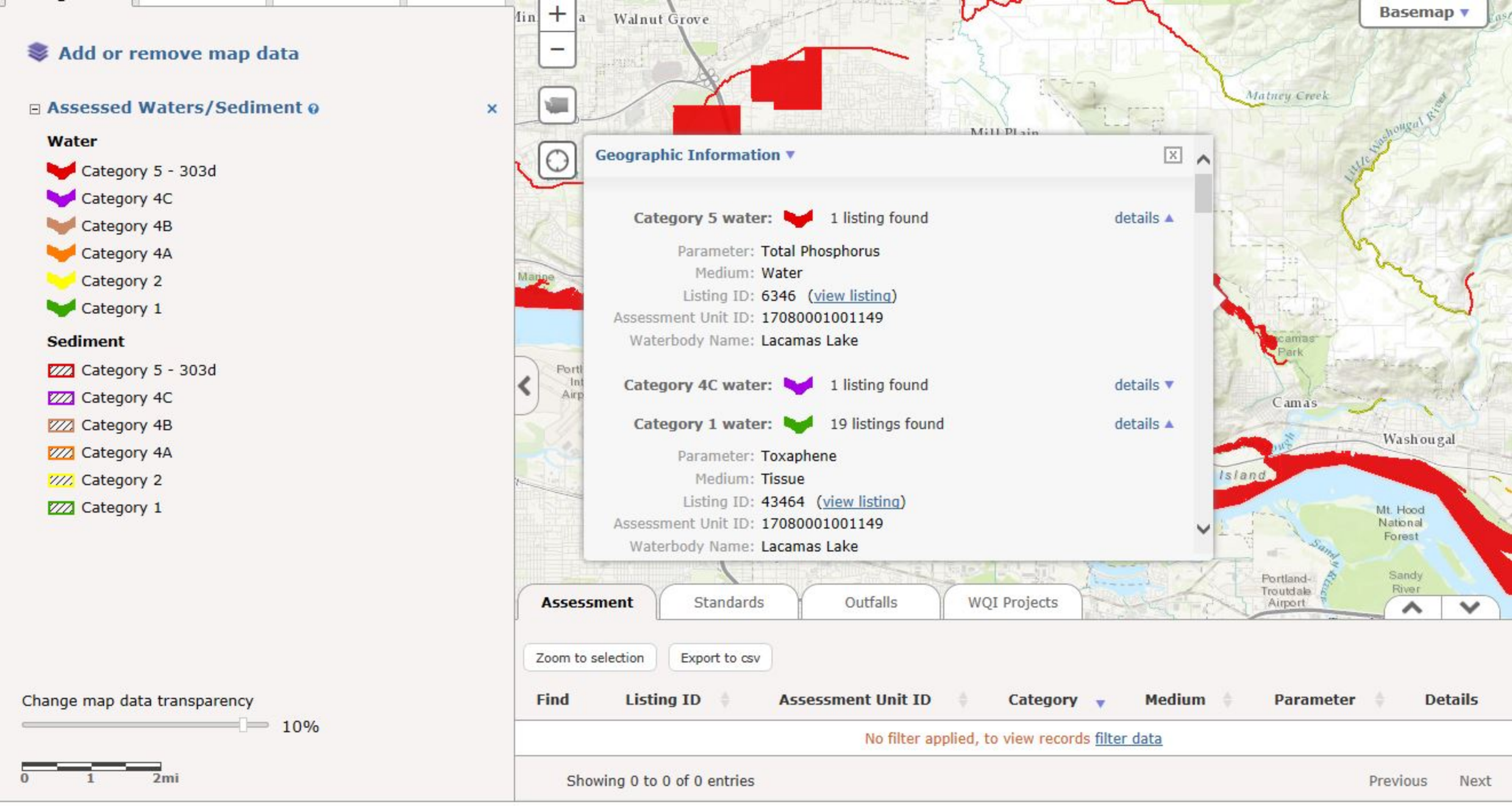

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Add or remove map data

Assessed Waters/Sediment

Water

- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment

- Category 5 - 303d
- Category 4C
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- Category 4A
- Category 2
- Category 1

WQ Improvement Projects

- Approved
- In Development

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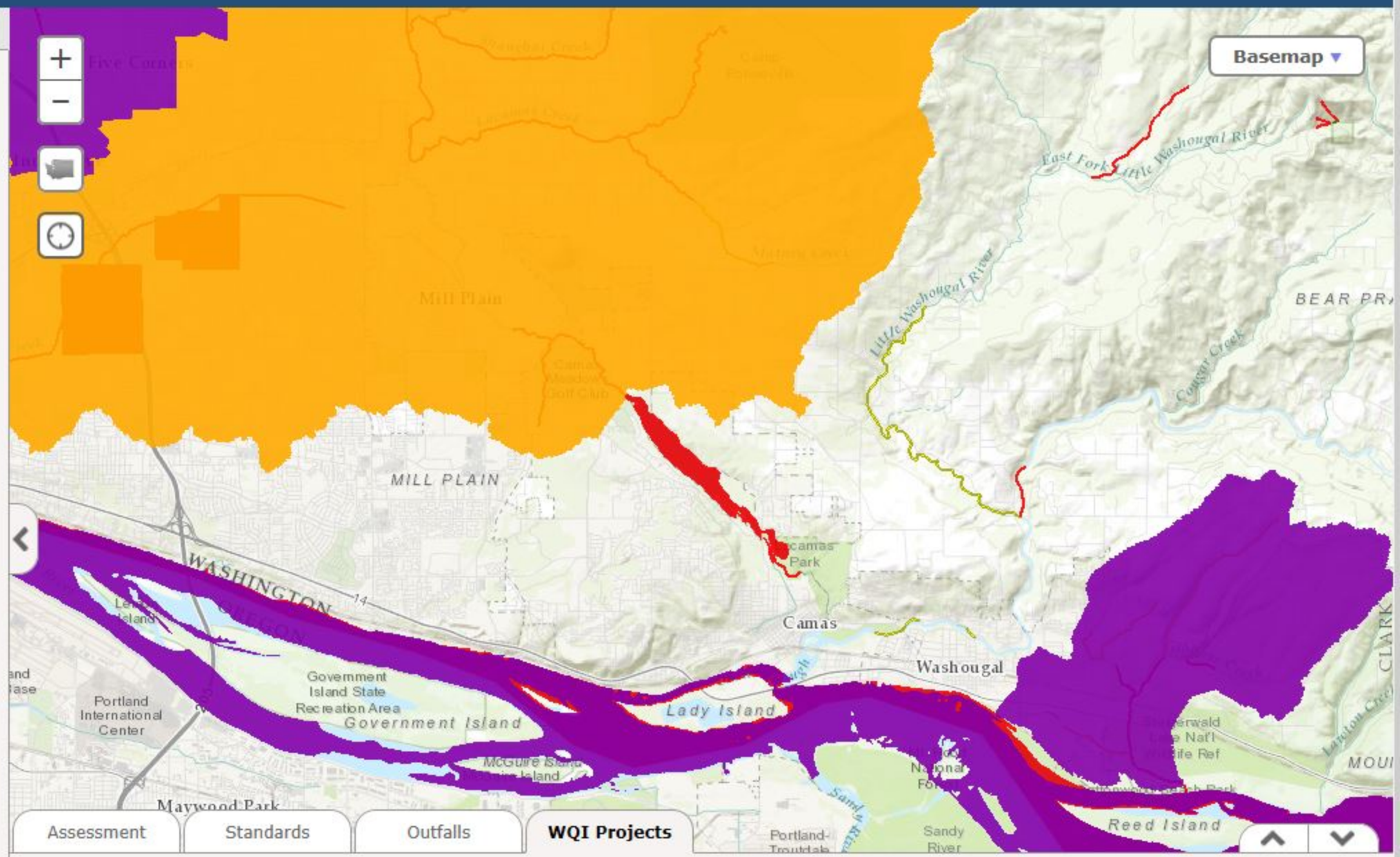

Assessment | Standards | Outfalls | **WQI Projects**

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February 26, 2018

Mr. James Carsner
US Army Corps of Engineers – Seattle District
CENWS-OD-RG
PO Box 3755
Seattle, WA 98124-3755

Subject: Endangered Species Act No-effect Letter;
City of Camas Lacamas North Shore Trail Project P1005

Dear Mr. Carsner,

The City of Camas (City) proposes to extend the existing trail system at the south end of Lacamas Lake (Figures 1 and 2). The new trails would be located within City property on the northeast side of Lacamas Lake, from the Round Lake Loop Trail east of NE Everett Street (State Route 500) to a natural area on the lakeshore. The main trail, approximately 3,300 feet, would traverse northwest from NE Everett Street, following the alignment of an abandoned access road. The main trail would include a 75-foot-long boardwalk, 25 feet of which would lie above a wetland. This is the only portion of the trail system that would be within wetland or Ordinary High Water Mark (OHWM) boundaries. The boardwalk would be supported on sixteen pin piers (six within wetland) aligned in eight pairs. Each pin pier would require excavation of 1 cubic foot of soil from the abandoned access road.

A shorter loop trail, approximately 1,120 feet in length, would connect to the main trail to create a loop in the natural area. A spur trail, approximately 180 feet in length, would follow the path of an existing packed dirt trail from the south end of the loop trail to a Lacamas Lake viewpoint. The surface of the main trail would be 8-feet wide and constructed of impervious material (geotextile and a gravel cover); the spur and loop trails would be 4-feet wide and pervious (wood chips).

Construction of the trails (including boardwalk) is scheduled for summer or fall of 2018.

Location and Site Character

The trails would be in the NW ¼ of Section 02 of Township 1 North, Range 3 East; SW ¼ of Section 35 of Township 2 North, Range 3 East; and SE ¼ of Section 34 of Township 2 North, Range 3 East. The project area is within Water Resource Inventory Area (WRIA) 28 (Salmon-Washougal). Lacamas Lake, a man-made lake, lies to the west of the proposed trail alignment.

The lake is listed as fish habitat for resident fish (Washington Department of Fish and Wildlife [WDFW] Priority Habitat Species [PHS] 2018)[1].

The route is typically through upland Douglas fir forest (Photograph 1), except for a 450-foot-long segment that passes through mowed lawns (Photograph 2). The southerly portion, from NE Everett Street northward for approximately 1,200 feet, traverses City property abutting single family residences. This area is dominated by open grass (a mix of non-native pasture and lawn species) with scattered trees, primarily Douglas fir (*Pseudotsuga menziesii*), bigleaf maple (*Acer macrophyllum*), and Oregon white oak (*Quercus garryana*). North of this, the alignment enters a forested peninsula of upland between Lacamas Lake to the west, a forested wetland to the east (East wetland), and a scrub-shrub wetland to the north (Lake wetland).

Tree canopy in the upland (riparian) forest is dominated by Douglas fir and bigleaf maple, interspersed with occasional western hemlock (*Tsuga heterophylla*). The majority of the overstory trees are approximately 12 to 24 inches diameter breast height (dbh), though some Douglas fir are much larger (one measured greater than 50 inches dbh). There is a diverse shrub layer—including vine maple (*Acer circinatum*), beaked hazelnut (*Corylus cornuta*), Pacific ninebark (*Physocarpus capitatus*), salmonberry (*Rubus spectabilis*), common snowberry (*Symphoricarpos albus*), salal (*Gaultheria shallon*), and mock orange (*Philadelphus lewisii*)—with sword fern (*Polystichum munitum*), dull Oregon grape (*Mahonia nervosa*), fringe cup (*Tellima grandiflora*), threeleaf foamflower (*Tiarella trifoliata*), and other herbs in the understory. Invasive upland species, including English holly (*Ilex aquifolium*), ivy (*Hedera spp.*), periwinkle (*Vinca sp.*), and shiny geranium (*Geranium lucidum*), are well established in some locations, but generally not dominant.

Patches of red alder (*Alnus rubra*) and Oregon ash (*Fraxinus latifolia*) occur in moist areas along the edge of the lake, backwaters, and in wetlands, with an understory of redosier dogwood (*Cornus alba*), salmonberry, elderberry (*Sambucus sp.*), slough sedge (*Carex obnupta*), skunk cabbage (*Lysichiton americanus*), and Western lady fern (*Athyrium cyclosorum*). Invasive plant species in these areas include Himalayan blackberry (*Rubus armeniacus*), reed canarygrass (*Phalaris arundinacea*), and creeping buttercup (*Ranunculus repens*).

The core of the East wetland is dominated by a dense canopy of Oregon ash, with occasional red alder, and an understory of slough sedge (Photograph 3). At the northwest and southeast ends, the tree canopy thins and a shrub understory is present (Photograph 4), composed of salmonberry, twinberry (*Lonicera involucrata*), redosier dogwood, Douglas spirea (*Spiraea douglasii*), Pacific ninebark, and occasional Himalayan blackberry. In these areas, Western lady fern, piggyback plant (*Tolmiea menziesii*), tall mannagrass (*Glyceria elata*), skunk cabbage, and reed canarygrass join slough sedge in herbaceous openings and understory.

[1] WDFW. 2018. Priority Habitat and Species on the Web. Olympia, Washington. http://apps.wdfw.wa.gov/phsontheweb. Accessed January 5, 2018.

The Lake wetland contains a scrub-shrub area along the upland boundary, above the OHWM. Vegetation in this area, sometimes heavily shaded by Douglas fir in adjacent uplands, is composed of a variety of shrub species, including salmonberry, redosier dogwood, Pacific ninebark, and Himalayan blackberry. Waterward of the scrub-shrub vegetation, the wetland often includes a strip of reed canarygrass along the OHWM. Below the OHWM, aquatic bed vegetation, dominated by yellow pond lily (*Nuphar polysepala*), extends into the lake (Photograph 5). Backwater areas, where water is shallow and vegetation is shaded by fir trees and protected from the fetch of the lake, are dominated by emergent species, including skunk cabbage, lady fern, reed canarygrass, slough sedge, and water parsley (*Oenanthe sarmentosa*) (Photograph 6).

Assessment

This assessment has been prepared to address potential impacts of the proposed trail system on federally listed threatened, endangered, and proposed species under the jurisdiction of the US Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries). Pedestrian evaluations (November 10 and December 1, 2016; October 26 and 30, 2017; January 14, 2018) assessed site conditions, determined presence of wetland, conducted non-protocol plant surveys, conducted habitat assessment, and evaluated potential impacts of proposed project actions.

There are no Endangered Species Act (ESA)-listed fish species or associated Critical Habitat in Lacamas Lake, Round Lake, or their tributaries above Lacamas Dam[2]. The nearest location of listed fish species (including bull trout [*Salvelinus confluentus*]) is approximately 1 mile below Lacamas Lake Dam (which is a total passage barrier) in Lacamas Creek.

Lacamas Lake is within the Lower Columbia/Sandy basin (USGS HUC 170800010606) and thus, based on historical presence (pre-Lacamas Dam), is considered Essential Fish Habitat (EFH) for Chinook (*Oncorhynchus tshawytscha*) and coho (*O. kisutch*) salmon.[3] The project would have no impacts on waters or substrate of Lacamas Lake for spawning, breeding, feeding, or maturation of Chinook or coho salmon.

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[2] National Oceanic and Atmospheric Administration (NOAA) Fisheries. Status of ESA Listings & Critical Habitat Designations for West Coast Salmon & Steelhead. http://www.westcoast.fisheries.noaa.gov/publications/protected_species/salmon_steelhead/status_of_esa_salmon_listings_and_ch_designations_map.pdf. Accessed January 5, 2018.

US Fish and Wildlife Service (USFWS). GeoFin. Geospatial Fisheries Information Network. https://ecos.fws.gov/ipac/ Accessed January 11, 2018.

Washington Department of Fish and Wildlife (WDFW). 2018. Priority Habitat and Species on the Web. Olympia, Washington. http://apps.wdfw.wa.gov/phsontheweb. Accessed January 5, 2018.

[3] NOAA Fisheries. Essential Fish Habitat. http://www.westcoast.fisheries.noaa.gov/maps_data/essential_fish_habitat.html

An official ESA species list for the project area was obtained from the USFWS IPaC service (Table 1), indicates the potential presence of four federally listed terrestrial species: Oregon spotted frog (threatened), streaked horned lark (threatened), yellow-billed cuckoo (threatened), and golden paintbrush (threatened). The possible presence of federally listed species in the project area was evaluated through site visits and review of WDFW PHS data (January 5, 2018) and WDNR Natural Heritage Program (WNHP) rare plant data (WNHP Rare Plants and High Quality Ecosystems Dataset, updated February 2017).

Table 1. Potential US Fish and Wildlife Service listed species within the project area.

Species	ESU/DPS	Federal Status	Critical Habitat Designated
Oregon spotted frog *(Rana pretiosa)*	NA	Threatened	Yes
Streaked horned lark *(Eremophila alpestris strigata)*	NA	Threatened	Yes
Yellow-billed Cuckoo *(Coccyzus americanus)*	Western DPS	Threatened	Proposed
Golden paintbrush *(Castilleja levisecta)*	NA	Threatened	No

Habitat for Oregon spotted frogs is "an expansive meadow/wetland with a continuum of vegetation densities along edges and in pools and an absence of introduced predators."[4] No Critical Habitat was designated in Clark County for this species.[5]

Streaked horned larks nest and winter in flat, open areas with sparse low-stature vegetation and substantial areas of bare ground.[6] The closest reported Critical Habitat is at Portland International Airport[7], approximately 9 miles west.

Western yellow-billed cuckoos require relatively large (>50 acres) and contiguous patches of riparian habitat for nesting; cottonwood-willow forests (*Populus* spp. - *Salix* spp.) are typically used. No Critical Habitat is proposed for designation in either Washington or Oregon.[8]

[4] Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Oregon Spotted Frog. Federal Register 81:29335 – 29396. May 11, 2016.
[5] Ibid.
[6] Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Taylor's Checkerspot Butterfly and Streaked Horned Lark. Federal Register 78: 61506-61589. October 3, 2013.
[7] Proposed Habitat Conservation Plan and Draft Environmental Assessment for Streaked Horned Lark; Port of Portland Properties, Portland, Oregon. Federal Register 81:83865-83867. November 22, 2016.
[8] Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Western Distinct Population Segment of the Yellow-billed Cuckoo; Proposed Rule. Federal Register 79:48548-48652. August 15, 2014.

Golden paintbrush occurs in upland prairies, on generally flat grasslands, including some characterized by mounded topography. All extant populations are located in the Puget Sound Lowlands.[9] No Critical Habitat has been designated for this species.

During the pedestrian site visits it was established that none of the necessary habitat conditions for these four listed species exist within the project action area. Additionally, the WDFW PHS database and WNHP dataset do not show the presence of these species within or near the project action area.

Conclusions

Based on this review, the project would have no effect on Oregon spotted frog, streaked horned lark, yellow-billed cuckoo, or golden paintbrush. The project would have no effect on previously mentioned fish or their critical habitat under jurisdiction of USFWS and NOAA Fisheries. The project would have no effect on EFH of Chinook or coho salmon as identified in the Magnuson Stevens Fishery Conservation and Management Act.

It is our understanding that this letter satisfies the City's responsibilities under Section 7(c) of the ESA at this time. We are sending you this copy of our assessment for your files. We will continue to remain aware of any change in status of these and other species and will be prepared to re-evaluate potential project impacts if necessary.

Sincerely,

Harper Houf Peterson Righellis Inc.

Ivy Watson

Natural Resources Scientist

Enclosures: figures, photographs, and federal species list

[9] Caplow, F. 2004. Reintroduction Plan for Golden Paintbrush (*Castilleja levisecta*). Washington Natural Heritage Program, Washington Department of Natural Resources. Prepared for US Fish and Wildlife Service (USFWS). https://www.fws.gov/oregonfwo/Species/Data/GoldenPaintbrush/Documents/DNRpaintbrushreintroduction.pdf

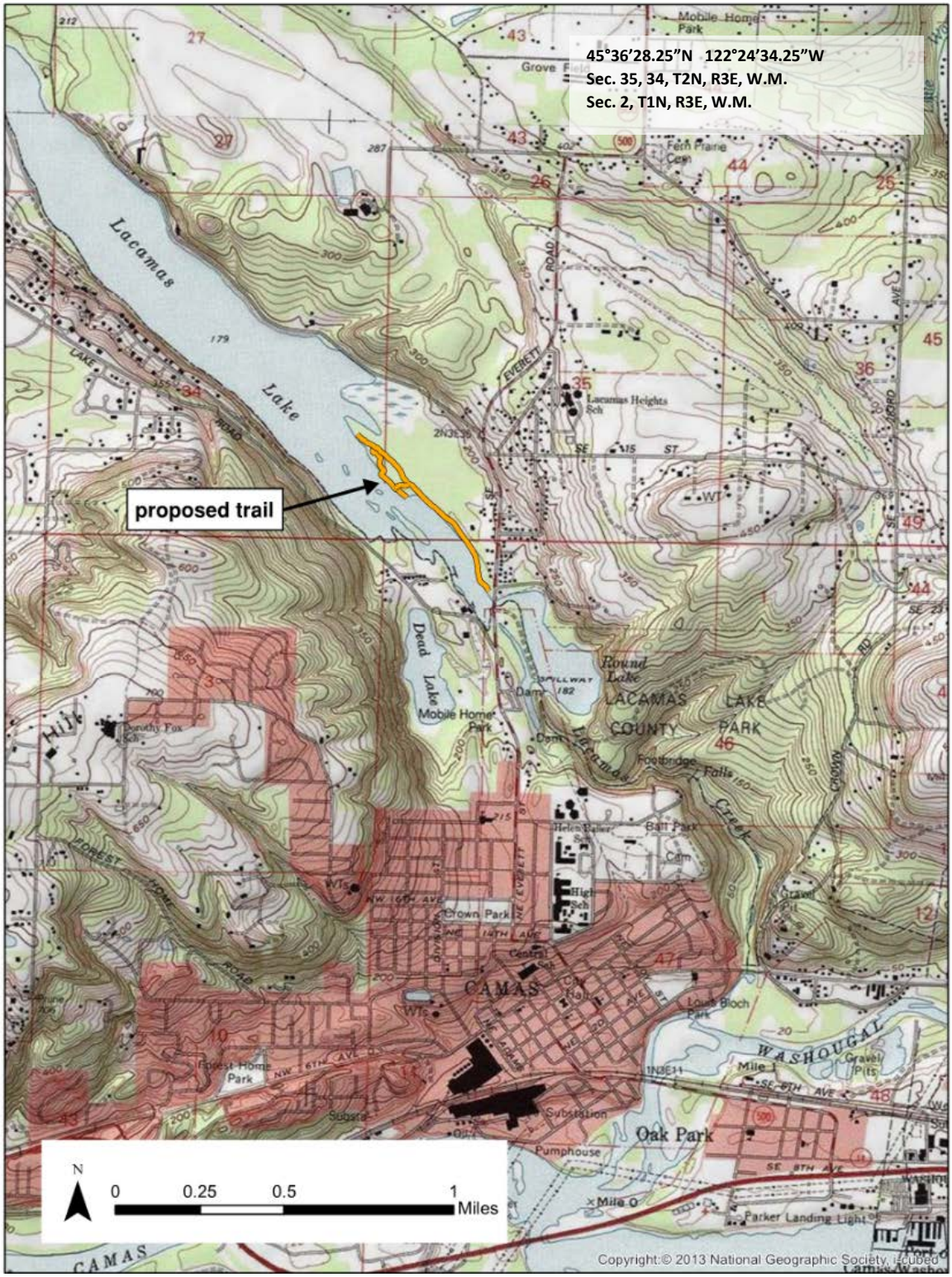


FIGURE 1. General location of Lacamas North Shore Trail Project, Camas Washington.

FIGURE 2. Location of proposed trails along the north shore of Lacamas Lake.

Photograph 1: View looking north along abandoned access road (at the northern junction of proposed Main and Loop trails) and typical Douglas fir forest present along the majority of the proposed trail alignment. Photograph taken January 14, 2018.

Photograph 2: View looking south where the proposed alignment crosses mowed lawns. In this area, private residences (left) are close to the shore. Photograph taken January 14, 2018.

Photograph 3: View looking south, showing typical forest in core of East wetland: dense Oregon ash canopy and slough sedge understory, with areas of ponded water. Photograph taken October 30, 2017.

Photograph 4: View looking north, showing typical vegetation at the north and south ends of East wetland: thinner tree canopy and thickets of shrubs intermixed with patches of bare ground/open water and herbaceous vegetation. Photograph taken October 26, 2017.

Photograph 5: View looking northwest, showing exposed aquatic bed plants in the Lake wetland when Lacamas Lake is drawn down. Photograph taken October 30, 2017.

Photograph 6: View looking northwest along one of the backwaters, showing areas of bareground/open water and patches of herbaceous vegetation below the OHWM of Lacamas Lake. Photograph taken December 1, 2016.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Washington Fish And Wildlife Office
510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263
Phone: (360) 753-9440 Fax: (360) 753-9405
http://www.fws.gov/wafwo/

In Reply Refer To: January 05, 2018
Consultation Code: 01EWFW00-2018-SLI-0443
Event Code: 01EWFW00-2018-E-00781
Project Name: Lacamas northshore trail

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, and proposed species, designated and proposed critical habitat, and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. The species list is currently compiled at the county level. Additional information is available from the Washington Department of Fish and Wildlife, Priority Habitats and Species website: http://wdfw.wa.gov/mapping/phs/ or at our office website: http://www.fws.gov/wafwo/species_new.html. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether or not the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species, and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:
http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.). You may visit our website at http://www.fws.gov/pacific/eagle/for information on disturbance or take of the species and information on how to get a permit and what current guidelines and regulations are. Some projects affecting these species may require development of an eagle conservation plan: (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Also be aware that all marine mammals are protected under the Marine Mammal Protection Act (MMPA). The MMPA prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas. The importation of marine mammals and marine mammal products into the U.S. is also prohibited. More information can be found on the MMPA website: http://www.nmfs.noaa.gov/pr/laws/mmpa/.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Related website:
National Marine Fisheries Service:
http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Washington Fish And Wildlife Office
510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263
(360) 753-9440

Project Summary

Consultation Code: 01EWFW00-2018-SLI-0443

Event Code: 01EWFW00-2018-E-00781

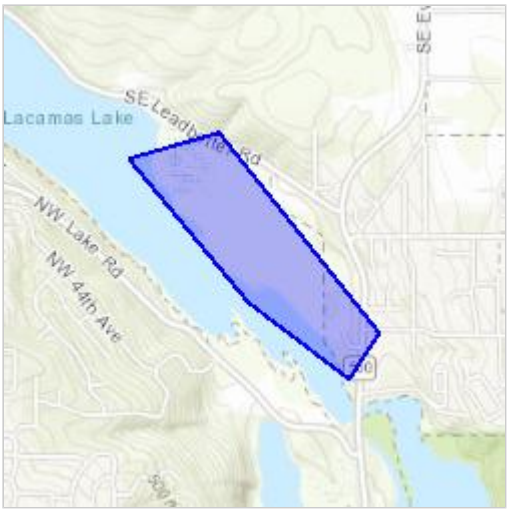
Project Name: Lacamas northshore trail

Project Type: RECREATION CONSTRUCTION / MAINTENANCE

Project Description: recreational trail

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/45.609954532676724N122.4119956647102W



Counties: Clark, WA

Endangered Species Act Species

There is a total of 5 threatened, endangered, or candidate species on this species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

Birds

NAME	STATUS
Streaked Horned Lark *Eremophila alpestris strigata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7268	Threatened
Yellow-billed Cuckoo *Coccyzus americanus* Population: Western U.S. DPS There is **proposed** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened

Amphibians

NAME	STATUS
Oregon Spotted Frog *Rana pretiosa* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6633	Threatened

Fishes

NAME	STATUS
Bull Trout *Salvelinus confluentus* Population: U.S.A., conterminous, lower 48 states There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8212	Threatened

Flowering Plants

NAME	STATUS
Golden Paintbrush *Castilleja levisecta* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7706	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.