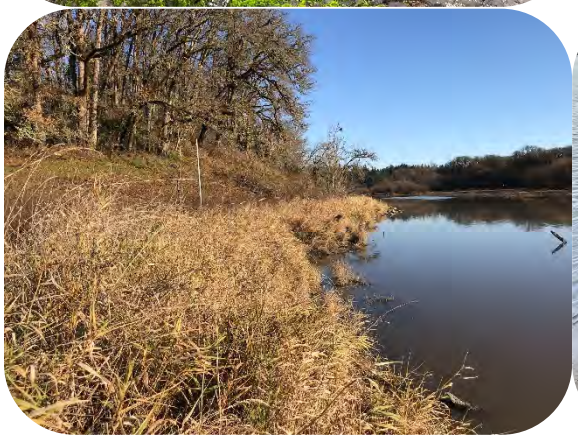
DETERMINING THE ORDINARY HIGH WATER MARK FOR THE WAPATO VALLEY MITIGATION AND CONSERVATION BANK AND PLAS NEWYDD FARM

DECEMBER 2019






PLAS NEWYDD FARM
EST.1941
CONSERVATION PROGRAM

Prepared by
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Conservation Program
Ridgefield, Washington

Prepared for
Clark County, WA & Washington IRT

Cover Photos showing diversity of shoreline conditions, clockwise from upper left:

1. Native basalt outcrop with moss scour line, Gee Creek backwater south of the Narrows Levee, Gee Creek approx. RM 2.33
2. Columbia River shoreline with flattened emergent vegetation, approx. RM 87.1
3. Lewis River shoreline with sandy bank wrack line, approx. RM 0.1
4. Gee Creek shoreline vegetation transition, approx. RM 1.95

Suggested citation:
Plas Newydd, Inc. 2019. Determining the Ordinary High Water Mark for the Wapato Valley Mitigation and Conservation Bank. Ridgefield, Washington.

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1 INTRODUCTION

Plas Newydd LLC proposes to construct and operate a wetland mitigation and habitat conservation bank, the Wapato Valley Mitigation and Conservation Bank (Wapato Valley or Bank), on privately owned land known as Plas Newydd Farm (PN Farm). The purpose of the Bank is to generate mitigation credits for projects that will have an adverse impact on the aquatic and adjacent terrestrial environment, and that need to compensate for those impacts as a condition of their permits or other regulatory requirements resulting from project impacts. The Bank also serves a critical purpose to conserve an important and rare landscape and the ecological processes that shape and define it, as well as promote biodiversity of native vegetation and wildlife through habitat restoration and protection.

The construction of the 876.32-acre Bank will be done in 4 phases due to size and logistics of grading and in-water work. Construction actions include: removing 100 years of farm infrastructure including fencing, gates, roads, duck blinds, and water pipes; levee and water control structure removal and modification for floodplain reconnection, tidal hydrology and fish passage restoration. Fill will be removed to restore tidal and distributary channel morphology, and ditches will be filled. Invasive reed canary grass and other non-native species will be removed, lowering floodplain elevations to increase inundation and promote native plant communities. Elevations will be modified to increase topographic diversity and support native woody and emergent plant communities. Aquatic habitat complexity will be increased through installation of large wood habitat structures. Oregon white oak habitats will be restored by removing competing tree species that are crowding the oak and competing for light and space, and new Oregon white oak habitat will be constructed to increase acreage of oak savannah and wet prairie.

To support permitting of the bank construction and updates to the Clark County Shorelines Master Plan this assessment documents the state and local shoreline jurisdiction of the Washington Department of Ecology (Ecology), Clark County (County) and the separate federal jurisdiction of the U.S. Army Corps of Engineers (Corps) as it relates to the Ordinary High Water Mark (OHWM) for Section 10 of the Rivers and Harbors Act. Wetlands and waterbodies within the Bank property are documented separately in a 2016 report by Cascade Environmental Group, titled "Plas Newydd Farm Wetlands and Other Waters Delineation Report, prepared for Plas Newydd LLC. Plas Newydd LLC received a letter of concurrence in the form of a jurisdictional determination (JD) from the U.S. Army Corps of Engineers (Corps) dated 6 September 2018. The delineation report and JD are provided under separate cover due to size.

The proposed 876-acre Bank is located wholly on privately owned property, Plas Newydd Farm which is owned by Plas Newydd LLC, in north Clark County, Washington (Figure 1). PN Farm and the Wapato Valley Bank are in Water Resource Inventory Area (WRIA) 27, the Lewis River watershed in the Columbia River basin, within the freshwater tidally influenced portion of the lower floodplain

at the confluence of the Lewis River at River Mile (RM) 87. The Bank is located approximately two-thirds of the distance between the mouth of the Columbia River as it enters the Pacific Ocean (RM 0) and Bonneville Dam (RM 146), which is the most downstream of 14 mainstem dams on the Columbia River. The Bank is situated west of U.S. Interstate 5 (I-5), east of the Columbia River, north of the town of Ridgefield, and south of the town of Woodland; in portions of Sections 1, 2, 11, and Donation Land Claim (DLC) 37[1], and Section 12 in Township 4 North, Range 1 West (Clark County 2015; AINW, Inc. 2013). The situs address of PN Farm and Wapato Valley Bank is 33415 NW Lancaster Road, Ridgefield, Washington, 98642. The Bank encompasses 876.32 acres and is comprised of portions of Clark County tax parcel numbers 217593000, 217798000, and 218003000. The Bank is bordered by the BNSF Railway to the east, the Lewis River to the north, the Columbia River to the west, and Gee Creek and the Ridgefield National Wildlife Refuge (RNWR) to the south.

PN Farm is currently managed for sustainable family forestry, agriculture, and leased duck hunting. The land is topographically diverse and ranges in elevation from about 6 to 80 feet NAVD88. The site is hydrologically complex and influenced by the confluence setting, twice-daily backwater tidal influence from the Columbia River, seasonal flooding, and groundwater and hyporheic interactions. The Bank consists of diked and undiked wetlands (including open water lake, stream, and river channel; mudflat; emergent, low, and high marsh; wet pasture; scrub-shrub; and forested wetland), and uplands (including upland pasture, grassland, mixed deciduous/conifer forest, oak woodland, riparian forest, conifer forest, and dike/levee structure). The site supports biologically diverse habitats and native fish and wildlife species, including rare native plant communities and multiple special-status species.

2 METHODS

This assessment was prepared by Plas Newydd LLC staff. Kelley Jorgensen is the Plas Newydd President of Conservation and lead restoration ecologist responsible for the planning, development, and implemention of aquatic and terrestrial habitat restoration projects on 1000+ acres. She is leading the development and approval of the proposed 876-acre Wapato Valley Wetland Mitigation and Conservation Bank. With over 28 years of experience in the Pacific Northwest in applied ecology, Kelley's career to date has spanned the public, private and non-profit sectors. She combines her expertise in Pacific Northwest watershed ecology, field biology, interdisciplinary restoration approaches, environmental project management, permitting and facilitation to lead the Conservation Program in restoring this dynamic, complex and biodiverse landscape.

Chris Watson, a certified GISP, is Plas Newydd's GIS analyst, field geologist and data manager. His background includes over 20 years in the Pacific Northwest

[1] Sometimes shown as DLC 57, which varies by data source due to Donation Land Claim origin.

permitting and regulatory consulting environments. Chris provides the Conservation Program team with hydrologic and other modeling as well as GIS analytical capabilities. Chris is adept at bringing to bear the correct spatial data and analyses to solve complex and often multifaceted problems. He has a skillset that includes project management, GIS analysis, geologic evaluation and exploration, technical writing, public education support, litigation support, computer simulations and modeling, and database design. Mr. Watson has spent the last six years working on river and habitat restoration projects in the lower Columbia. Chris has been part of over 20 NEPA project teams in Oregon, Washington, Idaho, and Utah.

Sophie Ernst is a field biologist and is a Certified Erosion and Sediment Control Lead, and certified in ArcGIS, with 4 years of environmental data collection and analysis. She is skilled in Real-Time Kinematic (RTK) Global Positioning System (GPS) and other remote sensing data collection and analysis, biotic and abiotic field data collection and analysis, identification of flora and fauna, collection and interpretation of hydrologic data, and use of Python, Bad Elf and Excel. Sophie has a Bachelor of Arts in Environmental Studies from the University of Washington, and a Geographic Information System (GIS) Certificate from Portland Community College.

Hannah Mortensen is a field biologist, is GIS-certified and a licensed Unmanned Aerial Vehicle (UAV, or drone) pilot, with over 4 years of environmental data collection and analysis. She is skilled in Real-Time Kinematic (RTK) Global Positioning System (GPS) and other remote sensing data collection and analysis, 3D modeling, biotic and abiotic field data collection and analysis, identification of flora and fauna, collection and interpretation of hydrologic data, and use of Python, Bad Elf and Excel. Hannah has a Bachelor of Science in Ecology from The Evergreen State College, and a Geographic Information System (GIS) Certificate from Portland Community College.

Karen Adams is a senior wetland ecologist and monitoring lead. She has over 25 years of experience in monitoring the health and status of watershed conditions, specializing in wetlands and aquatic habitats. Her work has focused on developing monitoring plans and protocols, statistical analysis of environmental and experimental data, and reporting. Karen has earned degrees in Environmental Science, Wetlands Biology, and Ecology and Evolutionary Biology, investigating the effects of channel modification for flood management on forested wetlands, and the interactions between native and invasive wetland plant species. She has worked in and around Washington State's salmon bearing ecosystems for the last 10 years for the Washington State Department of Ecology, the Lower Columbia Fish Recovery Board and Plas Newydd LLC.

Documentation, field data collection and hydrologic assessment methods for the OHWM determination are based on from "Determining the Ordinary High Water Mark for Shoreline Management Act Compliance in Washington State" (Ecology 2016). Extensive office and field assessments have been conducted

(many are ongoing) over a period of 5+ years (2014-2019) collecting biotic and abiotic data to document pre-project conditions on the 876.32 acre Bank and portions of the roughly 800 acres of Plas Newydd property in forestry outside the Bank. The data provided here is a summary of relevant information helpful to understand the OHWM determination and includes a combination of field indicators and a hydrologic (stream and tidal) assessment conducted for the Lewis River using the stream methodology, field indicators for Lancaster Lake, and a combination for the Columbia River using the marine or tidal methodology of mean higher high water and more traditional fluvial or stream field indicators Lewis River and Gee Creek; both stream and tidal methods in combination are the most useful for delineating tidal fresh waters.
The office assessment provided is focused on the hydrologic assessment, detailed in the next section. PN Conservation Program staff identified 9.2 miles (48,630 lineal feet) of shoreline areas along 4 waterbodies located on or adjacent to PN Farm for delineation of OHWM including the Columbia River, Lewis River, Gee Creek, and Lancaster Lake (Table 1, Figure 2). Additional shoreline areas are located along Allen Creek (aka Allen Canyon Creek) and Lake Rosannah that are within the property boundary, however those areas were not identified for delineation as there are no proposed construction projects that could affect them at this time, nor do they appear to require updates or changes in the current 2019/2020 Clark County Shoreline Masterplan update process.

Table 1. Waterbodies and Shoreline Areas included in Delineation of OHWM

Waterbody	River Miles	Miles of Shoreline	Lineal Feet of Shoreline
Columbia River	87 – 87.3	0.45	2,405
Lewis River	0 – 2.75	4.55	24,045
Gee Creek	0 – 2.4	2.71	14,327
Lancaster Lake	N/A	1.49	7,853
Total	**5.45**	**9.2**	**48,630**

3 FIELD ASSESSMENT

Field visits focused on OHWM data collection were made at multiple locations along the above mentioned shorelines for the purpose of recording field indicators (vegetation, scour lines, wrack lines, flatted vegetation, soil markers, etc.) on the following dates:

- 1/9/2018
- 1/12/2018
- 1/15/2018
- 7/11/2019
- 7/12/2019
- 7/15/2019
- 7/16/2019
- 11/18/2019
- 11/19/2019

- 11/20/2019
- 12/2/2019
- 12/3/2019
- 12/4/2019

Plas Newydd technical staff collected field indicator and topographic elevation data at over 95 points scattered along 9.2 miles of shoreline. Field data points were concentrated in locations where Wapato Valley Bank proposed construction would overlap or approach OHW areas or where field indicators were the most easily discerned. Attachment A includes the field data forms and an overview map showing the locations of the RTK GPS data collection. Species (Latin) names and common names for vegetation discussed here are presented in tabular form in Attachment B. Vegetation, scour lines, bank erosion/channel scour, flattened vegetation from "drainage patterns" (tidal surge or fluvial flows), top of bank, overbank deposits and wrack lines were evident in various locations. Elevations were taken of OHWM features and analysis found patterns indicative of fluvial and/or tidal hydrologic influence, described further in the hydrologic assessment discussion and conclusions. Due to the large size of the shoreline area being delineated, patterns were found during field indicator and elevation data analysis and averages were used to create the OHWM across long stretches of shoreline.

3.1 COLUMBIA RIVER OHWM

Field indicators are ephemeral, dynamic and highly variable in this mainstem lower Columbia River location, influenced by complex hydrodynamics including heavily-managed flows and regulated spill of the Columbia River hydropower system, tidal influence and backwater effects, and confluence effects from the Lewis River (also hydromodified by 3 channels-spanning hydroelectric dams upstream) and the Willamette River and Multnomah channel which enter the Columbia just upstream and across from the PN Farm property. The Columbia River is influenced by snow-melt driven spring freshet flows fed by the Rocky and Cascade mountain ranges which create short term but extreme rises in water surface elevation, sometimes on the order of 15 feet or more of fluctuation during a water year. High water on the Columbia is not typically in winter (which is the average high water for most west Cascade streams and rivers) but instead occurs between April and June.

The PN Farm property along the Columbia River is a rare low-elevation intact tidal surge plain with active erosion and accretion patterns and sand-dominated sediment transport. The shoreline is affected by fluvial flood flows, tidal backwater/slack tide conditions, fetch, and erosive wave action driven by wakes generated from a wide variety of vessel types ranging from very large ocean-going vessels with a deep draft to smaller fishing, pleasure and speed craft (including jet skis) which travel much closer to the shore and generate waves at a much higher frequency. To further complicate matters, soils are very sandy along the Columbia, groundwater hydrology is largely hyporheic and

wetlands have a high degree of upland plants depending upon the microclimate. Combined these elements serve to create a lot of "noise" and variation in elevation in the identification of field indicators.

The Columbia River (Clark County, WA side) shoreline on the western edge of the PN Farm property between approximately RM 87 and 87.3 (and the contiguous open sandy shoreline of the Lewis River confluence area) was surveyed over multiple site visits between January 2018 and December 2019. Field indicators were identified readily during both winter and summer (both seasons with prolonged low water conditions and strong tidal signal) that represent the lower limit of the OHWM including toe of lowest terrace, drainage patterns as shown by flattened vegetation, aquatic plants, and aquatic animals. Lower limit indicators fell within about one vertical foot of each other and were easily averaged. Field indicators for the upper limits were more difficult to discern and varied greatly in elevation due to lack of fixed objects, a site with little topographic relief and heavy wave action from vessel wakes. Upper limit indicators varied by 3 vertical feet and were more difficult to average as a result. See the hydrologic assessment for a discussion of mean higher high water, a datum relevant for this tidally dominated setting. Table 2 lists the dominant species of vegetation identified and their distribution across the OHWM gradient. The list identifies the dominant species identifiable at the time of survey but is not exhaustive.

Table 2. Plant Distribution across Columbia River OHWM Gradient

Below OHWM	At/Straddling OHWM	Above OHWM
Needle Spikerush, OBL	Reed canarygrass, FACW	Oregon ash, FACW
Softstem Bulrush, OBL	Willow sp., FACW (colonizing)	Willow sp, FACW (mature)
Slough Sedge, OBL	False indigo bush, FAC	Black cottonwood, FAC
Woolgrass, OBL	Red-osier dogwood, FACW	Himalayan blackberry FAC
	Rough cocklebur, FAC	Black hawthorn, FAC

3.2 LEWIS RIVER OHWM

The south shore of the Lewis River between RM 0 and 2.75 along PN Farm property was surveyed at 40 data points in 6 locations between January 2018 and December 2019. Much of shoreline of the Lewis River in the lower 3 miles is dominated by a persistent erosion-resistant clay with naturally steep banks and overlays of intermittent sandy benches. Some shoreline armoring (native basalt – ballast to 1-man rock in size) is also present in patches along the toe of the Lewis River levee between RM 1 up to RM 2 where Allen Creek flows into the Lewis River through twin culverts. Field indicators identified include scour/moss line on rocks, sediment lines on rocks, lack of soil horizons, aquatic plants, aquatic animals, vegetation changes, stain lines on fixed objects, depositional sediment changes, well developed soil horizons, relic floodplain surface, exposed

roots/root scour, bank erosion, wrack lines and benches. Field indicators generally fell within 12-18 inches of each other and were logical when averaged across the 4.5 miles of shoreline surveyed.

Table 3. Plant Distribution across Lewis River OHWM Gradient

Below OHWM	At/Straddling OHWM	Above OHWM
Sedge sp, OBL	Reed canarygrass, FACW	Oregon ash, FACW
Rush sp, OBL	Red-osier dogwood, FACW	Oregon white oak, FACU/UPL
	Western goldenrod, FACW	Black cottonwood, FAC
		Himalayan blackberry, FAC

3.3 GEE CREEK OHWM

The north shore of Gee Creek between RM 0 and 2.4 along PN Farm property was surveyed at 24 data points in 4 locations between January 2018 and December 2019. The shoreline of Gee Creek is dominated by either a persistent erosion-resistant clay with naturally steep banks or naturally occurring native basalt outcrops. A narrow rock wall canyon also exists about halfway along the surveyed length. Field indicators identified include scour/moss line on rocks, sediment lines on rocks, lack of soil horizons, clean cobbles/boulders, aquatic plants, aquatic animals, vegetation changes, stain lines on fixed objects, depositional sediment changes, well developed soil horizons, relic floodplain surface, exposed roots/root scour, bank erosion, wrack lines and benches. Field indicators generally fell within 12-18 inches of each other and made sense when averaged across the 2.7 miles of shoreline surveyed.

Table 4. Plant Distribution across Gee Creek OHWM Gradient

Below OHWM	At/Straddling OHWM	Above OHWM
Sedges, OBL	Reed canarygrass, FACW	Oregon ash, FACW
Needle spikerush, OBL	Red-osier dogwood, FACW	Oregon white oak, FACU/UPL
Wapato, OBL	Western goldenrod, FACW	Black cottonwood, FAC
	Moss sp., UPL	Douglas-fir, FACU
	Stonecrop, UPL	Himalayan blackberry FAC
	Willow sp. FACW	Snowberry, FACU

3.4 LANCASTER LAKE OHWM

Lancaster Lake is a perennially ponded impounded area created by a channel spanning dike (the Narrows dike) that isolates a large historic floodplain area

from Gee Creek to the south, and the Lewis River to the north is separated by another levee system. The dike has one small tide gate with a flapper valve that prevents Gee Creek from backwatering into the floodplain and Lancaster Lake, but allows some discharge out of the lake through the tidegate when water surface elevations in Lancaster Lake are higher than Gee Creek. The lake is largely fed by hyporheic groundwater because it is in the Columbia and Lewis River floodplains, and from precipitation and seeps. Water level monitoring inside and outside the levee has demonstrated that Lancaster Lake generally tracks the water levels in the Columbia during spring freshet fluctuations and flood flows from floodplain recharge with delays in both runup and flood recession. The unique floodplain setting creates a challenging location to determine the upper limit of the OHWM towards the extensive associated wetlands within the broad flat floodplain to the north of the lake. The lake is bounded to the east and west by naturally occurring basalt outcrops and bounded to the south by the Narrows levee, which is also armored with native locally sourced basalt levee rock, that show more obvious field indicators for the upper limit of the OHWM.

Twenty-two data points were taken in 4 locations along 1.5 miles of Lancaster Lake shoreline between July and December 2019. Field indicators documented include vegetative changes, sediment deposits, clean cobbles/bedrock, lack of soil horizon, aquatic plants, aquatic animals, and water marks on the shoreline and downed large wood, and a review of time series imagery that captured annual highwater events. From the documented field indicators, the OHWM is a relatively vertically and horizontally wide zone that spans across a gradation of more than four feet between the upper and lower limits. The OHWM was averaged across the upper limit indicator elevations, which generally fell within12 – 18 inches of each other. Table 5 lists the dominant species of vegetation and their distribution across the OHWM gradient. The list identifies the dominant species recorded at the time of survey but is not exhaustive. Attachment A includes a map of locations of the data points and field data forms.

Table 5. Plant Distribution across Lancaster Lake OHWM Gradient

Below OHWM	At/Straddling OHWM	Above OHWM
Wapato, OBL	Reed Canarygrass, FACW	Oregon White Oak, FACU
Polygonum Species, OBL	Salix Sp, FACW	Douglas-Fir, FACU
Reed Canarygrass, FACW	Douglas Spirea, FACW	Vine Maple, FAC
Bull Rush, OBL	Oregon Ash, FACW	Himalayan blackberry, FAC
Rough cocklebur, FAC	Herb Robert, FACU	Scot's Broom, NI
Sparganium sp., OBL	Birdsfoot trefoil, FACU	Licorice fern, NI
		Camas, FACW

4 HYDROLOGIC ASSESSMENT METHODS

This section summarizes the methods, data, and results used in hydrologic assessments of the Wapato Valley project and PN Farm shorelines areas. As the location has both stream (fluvial) and tidal freshwater shoreline areas, this report includes hydrologic assessments of each. The hydrologic assessments were performed in conjunction with and supplementary to OHWM field assessment of the same shorelines, described above.

Wapato Valley lies in the floodplain at the confluence of the Lewis River WRIA 27 with the mainstem Columbia River at RM 87. Wapato Valley is located in the freshwater tidal zone and experiences a daily tidal range of 2–4 feet on average (NOAA 2011). Due to the complexity of the hydrologic conditions at Wapato Valley, it cannot be classified as simply "high energy" or "low energy." PN Farm includes 9.2 miles of shoreline (Wapato Valley includes subset of that) (Table 1). Lancaster Lake has no fluvial in-flow with shorelines mainly affected by a subdued reflection in water surface level of that in the Columbia River. Gee Creek has shorelines with both a backwater area that is open and punctuated with abrupt hard-rock islands and a constricted channel bounded by mostly erosion-resistant consolidated clay or bedrock shore. Flow in Gee Creek is in both directions up and downstream depending mainly on the Columbia River WSL and tides. The Columbia River shoreline within Wapato Valley transitions from an aggrading shore near the mouth of Gee Creek to an eroding shoreline at the mouth of the Lewis River. Shores on the Lewis River portion of Wapato Valley exhibit high energy erosion characteristics near the mouth with lower energy chrematistics upstream.

WRIA 27 encompasses over 1,300 square miles and drains the western slope of the Cascade Mountain range, emptying into the Columbia River at river mile 87 (Corps 2014). Downstream flow on the Lewis River is regulated by the three upstream hydroelectric dams and reservoir systems, fish protection instream flow rules, and various water management strategies (Ecology 2016a).

The Columbia River is approximately 1,243 miles in length and drains over 258,000 square miles in seven states, and one Canadian province. Flow in the Columbia River is regulated by 14 major dams in the main stem and 46 in its tributaries (NRC 2004). Flows in the lower Columbia River are highly modified by the upstream water control structures, the geographic extent and complexity of its basin, water management practices, power generation, and other factors. Columbia River shorelines within Wapato Valley are directly affected by dynamically changing WSL and flows dictated by daily tides, commercial ship traffic, and upriver spill control facilitating power generation, agriculture needs, flood control, and fish migration. Fluctuations also occur from year to year based on snow pack, precipitation levels, and local climate changes.

5 STREAM HYDROLOGIC ASSESSMENT

The stream and tidal hydrology assessment methods provided by the Washington Department of Ecology in Publication no. 16-06-029 (Ecology 2016) analyze stream flow data from proximal or surrogate stream gages. The goal of these analyses is to provide context and to capture the flow range also referred to as "bookend" values. Context can be useful in spotting trends or events that may otherwise obscure the indicators in the field, as is the case along the shorelines of the rivers and streams within Wapato Valley. Conversely, analyzing the recent and historic flows can help in planning field efforts around a time when indicators are most likely to be found. The flow range or "bookend" data is useful in bracketing elevation ranges to inform on-site OHWM field assessments and cross-checking field-driven determination results.

5.1 STEP 1 AND 2: USE GAGE DATA TO APPROXIMATE UPPER AND LOWER EXTREMES FOR OHW FLOWS AND CORRELATE TO STAGE

The nearest gage on the Lewis River is USGS 14220500 located in Ariel, WA at 45.95194° N, 122.5628° W. The Ariel, WA gage is approximately 18 miles upstream from Wapato Valley and has been recording from July 1,1909 until the present (USGS 2019) (Figure 3). The channel at the gage location is approximately 235 feet wide at a stage of 10 feet. The upstream dams were finalized in 1958; consequently, the analysis uses data from 1958 to present as it most accurately reflects current flow conditions.

5.1.1 Generate the upper bookends by estimating the two-year peak and minimum peak flow

Using the downloaded dataset, the calculated median is 24,800 cubic feet per second (cfs) corresponding to a stage of 11.8 feet. The minimum peak flow is 9,670 cfs corresponding to a stage of 6.54 feet. The chart method results were cross-checked with the spreadsheet method and found to match (Figure 4 and Table 6).

Table 6. Maximum peak annual discharge data 1958–2017 Lewis River (aka "spreadsheet method").

Date	cfs	Stage (ft)
1958-02-12	18,300	10.52
1959-01-24	32,800	15.12
1959-10-12	21,400	11.33
1960-11-24	48,200	19.3
1961-12-20	11,900	7.72
1962-11-20	75,500	25.7
1964-01-25	17,700	9.98
1964-12-22	44,000	17.49
1966-08-01	11,900	7.76
1966-12-13	50,500	19.12

Date	cfs	Stage (ft)
1968-02-23	31,100	14.02
1968-11-11	21,000	11.03
1970-01-23	41,800	16.96
1971-01-25	23,300	11.76
1972-03-13	36,400	15.55
1972-12-24	18,000	9.99
1974-01-15	59,600	21.13
1975-01-14	22,400	11.46
1975-12-04	64,500	22.63
1976-12-02	11,800	7.61
1977-12-02	71,900	24.38
1978-11-15	11,800	7.62
1980-01-12	12,000	7.71
1980-12-26	53,700	19.93
1982-02-20	40,700	16.67
1983-01-07	27,000	12.78
1983-11-17	17,100	9.5
1985-06-07	22,100	11.29
1986-02-24	27,700	13.06
1986-11-24	12,100	7.53
1987-12-10	12,300	7.61
1989-02-06	11,700	7.51
1990-01-10	42,000	16.85
1990-11-25	39,600	16.23
1992-01-30	12,600	7.68
1993-04-03	12,000	7.49
1994-01-08	11,800	7.45
1995-02-20	26,600	12.56
1996-02-08	86,400	27.38
1997-01-01	34,100	14.92
1997-11-21	12,200	7.63
1998-12-29	35,900	15.43
1999-12-15	35,700	15.37
2001-05-14	9,670	6.54
2001-12-17	14,700	8.6
2003-01-31	49,300	18.98
2004-01-29	11,700	7.44
2005-01-17	16,500	9.3
2006-01-11	29,900	13.68
2006-11-06	39,900	16.54

Date	cfs	Stage (ft)
2007-12-04	18,200	9.89
2009-01-07	40,300	16.63
2010-01-05	12,700	7.79
2011-01-16	35,400	15.22
2011-12-29	17,900	9.66
2012-11-20	22,900	11.4
2014-03-09	26,400	12.53
2014-11-27	16,700	9.25
2015-12-11	31,700	14.14
2017-03-16	26,300	12.48
Peak High (median)	**2,4800**	**--**
Peak Low (minimum)	**9,670**	**--**

5.1.2 Refine the Range

To refine the vertical range, the upper limit or "bookend" flow is reduced to a flow value that is exceeded at least once each year in 60 percent of years. A plot and table of the daily mean discharge and stage were pulled for 2002–2017 with 16 years represented. The calculated value using the iterative method in the spreadsheet was 16,400 cfs. A flow 16,400 cfs meets the criteria of being exceeded in 60% of the years in the analysis data set. The 16,400 cfs peak flow, which corresponds to a stage of 9.15 feet, was exceeded 10 out of the 16 years or 62.5% of the years in the analysis dataset (Table 3 and Figure 3).

Table 7. Number of times 16,400 cfs was exceeded in each year 2002–2017.

Year	Exceedance Count
2002	0
2003	3
2004	0
2005	0
2006	9
2007	1
2008	1
2009	4
2010	0
2011	349
2012	4
2013	0
2014	5
2015	12
2016	0
2017	6

The lower limit or "bookend" value was raised slightly to 10,900 cfs corresponding to a stage of 6.95 feet. This adjustment was made to reduce the number of long duration exceedance events of previous value. The correlation of discharge to stage was done in both the spreadsheet and graphically. A correlation of discharge and stage is shown in Figure 5.

5.1.3 Step 3: Compare recent events to OHWM bookends

To identify recent discharge or flow events that may have left fresh indicators on the Wapato Valley site, daily gage data for the last 12 months was reviewed. It was determined that the lower bookend value was exceeded twice in the last 12 months with a stage of approximately 7.75 feet (Figure 6).

5.1.4 Stream assessment conclusions

Given the location of the Wapato Valley at the confluence of the Columbia and Lewis rivers, the distance (18 miles) downstream from the Ariel, WA gage, and the dynamic and complex nature of the site, the hydrologic stream assessment in this case is useful only as context for upstream basin contributions, but is not indicative of the holistic picture of the hydrologic conditions or influences on shoreline OHW conditions. In addition, the Lewis River hydrology at the Wapato Valley location is dominated and obscured by flood flows and tidal backwater flows from the mainstem Columbia River. The stream assessment does however clearly give a couple of windows of time (December 19–21 and 30–31, 2018) that we can use to correlate with tidal station data from the tidal assessment to focus the field assessment on the most probable local elevations.

6 TIDAL HYDROLOGIC ASSESSMENT

This hydrologic assessment is intended to be used in conjunction with the stream hydrologic assessment above to inform the OHWM determination at Wapato Valley. The tidal hydrology assessment methods provided in Ecology (2016b) help focus the field assessment by providing a range of elevations on the ground where field indicators are most likely to be found. The OHWM in most cases is based on observable field indicators and is always above the mean higher high water (MHHW). Tidal information should not be the sole basis for an OHWM determination; however, in locations where field indicators are missing or cannot be found at certain times of year, tidal data (MHHW) may be the only option for establishing the OHWM reliably and consistently (Ecology 2016; RCW 90.58.030(2)(c)). The OHW delineation document is conspicuously missing guidance on the very large area of freshwater tidal influence on the lower Columbia River.

6.1 STEPS 1–3: LOCATE AN APPROPRIATE STATION AND IDENTIFY TIDAL DATUMS

Wapato Valley is located at RM 87 on the Columbia River. The St. Helens, OR tidal station, ID 9439201, is located at RM 86. For the purposes of this assessment, all elevations from the St. Helens station will be given in Columbia River Datum (CRD) which is 4.28 feet less than NAVD 88 at this location. The MHHW at the St. Helens station is reported as 5.28 feet, which equates to 9.56 feet NAVD 88. The vertical offset of Wapato Valley from the St. Helens station is +0.2 feet, giving Wapato Valley a MHHW elevation of 9.76 feet NAVD 88 (NOAA 2011) (Table 4).

Table 8. Local Datum Comparisons to MHHW at St. Helens Tidal Station.

CRD (ft)	NAVD 88 +4.28 (ft)	Wapato Valley Upriver Offset +0.2 (ft NAVD 88)
5.28	9.56	9.76

It should be noted that MHHW is calculated on tidal epochs. A tidal epoch is the specific 19-year period adopted by the National Ocean Service as the official time segment over which tide observations are taken and reduced to obtain mean values (e.g., mean lower low water, etc.) for tidal datums. The present National Tidal Datum Epoch (NTDE) is 1983 through 2001 and is actively considered for revision every 20–25 years. The MHHW listed above for Wapato Valley is based on an epoch that ended in 2001 (NOAA 2011).

In the stream assessment, periods of peak flow were identified that have a higher probability of corresponding with the formation of OHWM indicators. When the St. Helens station data is correlated with the peak flow periods (December 19–21 and 30–31, 2018) identified in the stream assessment, water surface elevations from the St. Helens station are shown to peak from 5.5–8.3 feet CRD (9.98–12.78 feet NAVD 88). These hybrid bookends prove useful in identifying the OHWM on the Columbia and Lewis River shorelines at the Wapato Valley location.

6.2 TIDAL ASSESSMENT CONCLUSIONS

Given the hybridized fluvial-tidal nature and complex riverine setting at the confluence of the Columbia and Lewis rivers, and the tidal epoch date range from which the published MHHW was derived, the tidal assessment places the bookends between 5.5–8.3 feet CRD (9.98–12.78 feet NAVD 88) on the Lewis River shoreline portions of the Wapato Valley and between 2.05–5.28 feet CRD (6.53–9.76 feet NAVD 88) on the Columbia River shoreline sections of the site. As noted previously, the tidal assessment is meant to guide and supplement the field indicators assessment of the OHWM determination.

Table 9. Hydrologic assessment "bookend" OHWM elevation ranges.

Shoreline Location	Probable Low (CRD)	Probable Low (NAVD 88)	Probable High (CRD)	Probable High (NAVD 88)
Lewis River	**5.5**	**9.98**	**8.3**	**12.78**
Columbia River	**2.05**	**6.53**	**5.28**	**9.76**

7 CONCLUSIONS

The OHWM determination for the following four waterbodies located on or adjacent to the Plas Newydd LLC property pertaining to Plas Newydd Farm and Wapato Valley Bank, based on the analysis documented in this report through field indicators and hydrologic assessment are as follows:

Table 10. OHWM Results for Plas Newydd Farm/Wapato Valley in NAVD88

Columbia River	Lewis River	Gee Creek	Lancaster Lake
9.76 (MHHW)	**11.8**	**11.8**	**10.57**

8 REFERENCES

Corps (U.S. Army Corps of Engineers). 2014. CAD data: Oregon_North_Channel_RM_NAD83_USft_2014.dxf. U.S. Army Engineer District, Portland, Operations Division.

Ecology (Washington State Department of Ecology). 2016a. Focus on water availability: Lewis River Watershed, WRIA 27, Publication no. 11-11-031. https://fortress.wa.gov/ecy/publications/documents/1111031.pdf [Accessed 26 November 2019]

Ecology. 2016b. Determining the ordinary high water mark for Shoreline Management Act compliance in Washington State. Publication no. 16-06-029. https://fortress.wa.gov/ecy/publications/SummaryPages/1606029.html [Accessed 26 November 2019]

NOAA (National Oceanic and Atmospheric Administration). 2011. Tides and Currents: Tidal Datums at Columbia River, St. Helens, OR. https://tidesandcurrents.noaa.gov/datums.html?id=9439201 [Accessed 26 November 2019]

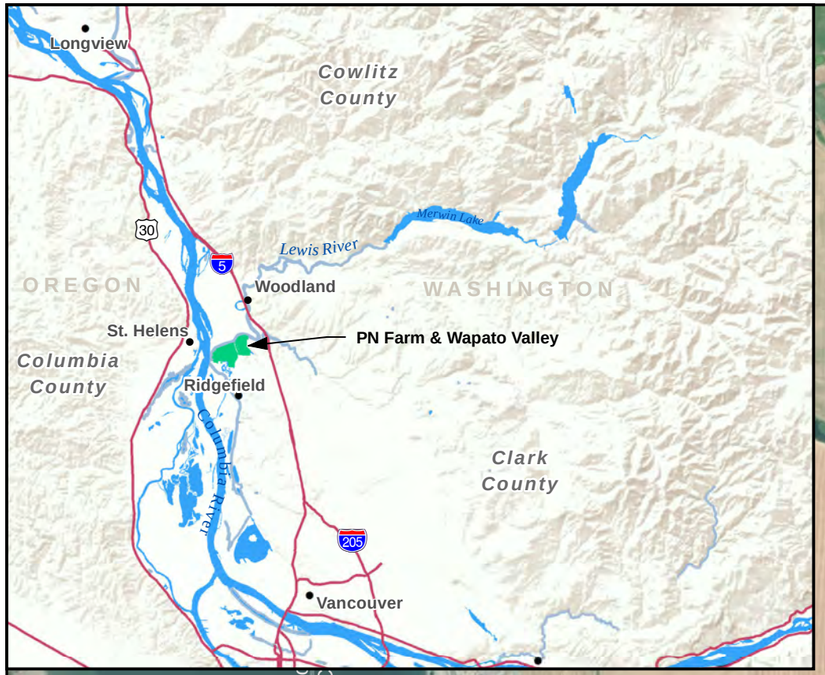
NRC (National Research Council). 2004. Managing the Columbia River: Instream flows, water withdrawals, and salmon survival. Chapter 3. Hydrology and Water Management. The National Academies Press, Washington, D.C. https://doi.org/10.17226/10962 [Accessed 26 November2019]

USGS [United States Geologic Survey]. 2019. National Water Information System: Stream gage data for USGS 14220500 Lewis River at Ariel, Washington. https://waterdata.usgs.gov/nwis/inventory?agency_code=USGS&site_no=14220500 [Accessed 26 November 2019]

FIGURES

Figure 1. Property Overview & Vicinity

Plas Newydd, LLC
Conservation Program



Data Source: PN Farm, Clark County

Document Path: D:\GIS\Projects\PlasNewydd_Mxds\OHWM\Figure 1 Vicinity Map.mxd

N
W E
S

- Property Boundary
- Wapato Valley Mitigation and Conservation Bank
- Dike or Levee
- River Mile Marker

0 1,500 3,000
Feet

0 250 500
Meters

PLAS NEWYDD FARM
EST. 1941
CONSERVATION PROGRAM

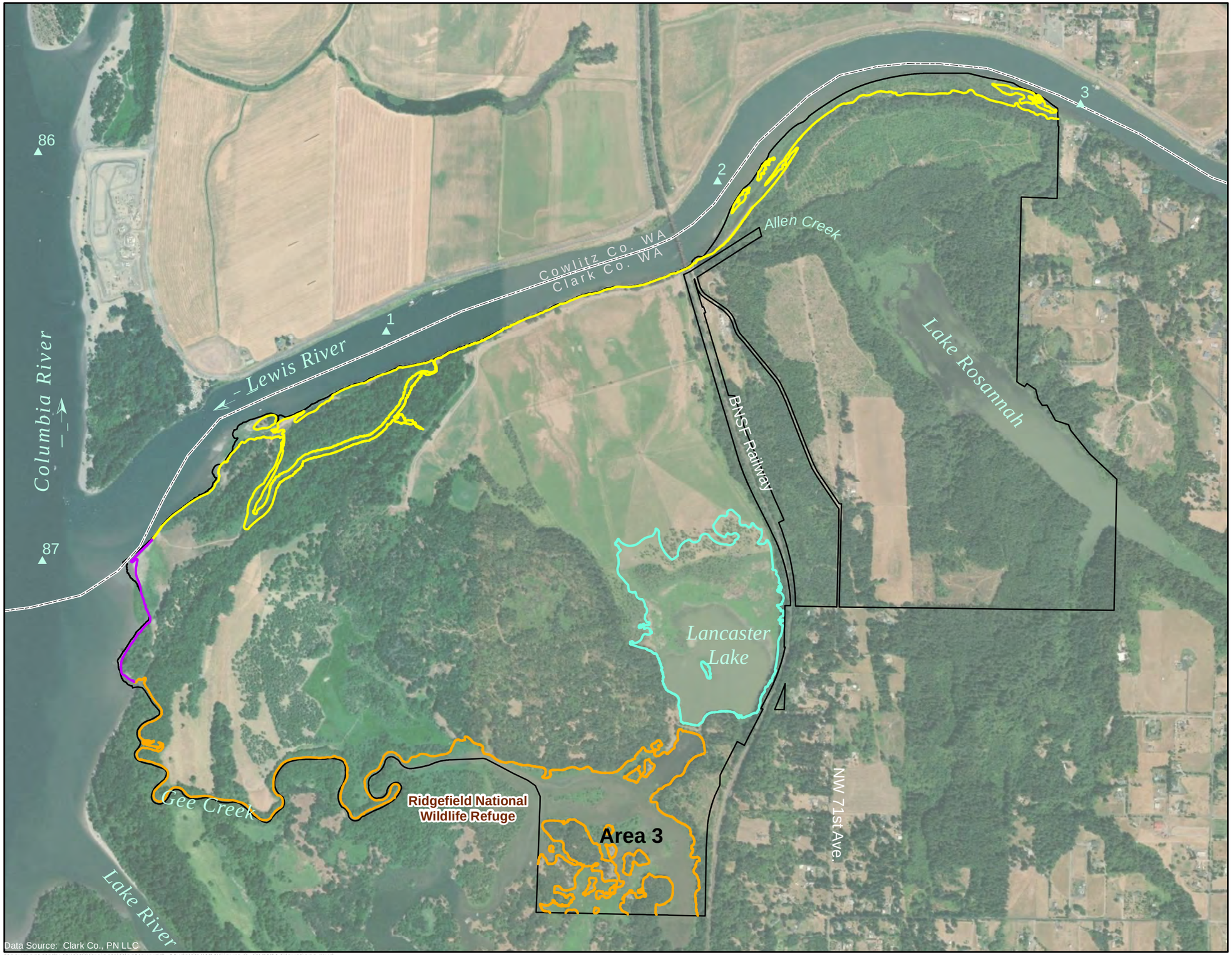
OHWM Determination

Photo: GeoTerra, 8/16/2015
River Stage: ~7.25' NAVD 88

Date: 12/5/2019

Figure 2. OHWM Elevations

Wapato Valley
Mitigation and Conservation Bank



N
W E
S

OHWM Elevation (NAVD 88)

- 9.76 - Columbia River
- 11.8 - Lewis River
- 11.8 - Gee Creek
- 10.57 - Lancaster Lake

0 1,000 2,000
Feet

0 250 500
Meters

PLAS NEWYDD FARM
EST. 1941
CONSERVATION PROGRAM

OHWM Determination

Data Source: Clark Co., PN LLC

Photo: Digital Globe, 8/01/2018
River Stage: ~9.0' NAVD 88

Date: 12/5/2019

Document Path: D:\GIS\Projects\PlasNewydd_Mxds\OHWM\Figure 2_OHWM Elevations.mxd

Figure 3.
Location of the nearest tidal station and stream gage to Plas Newydd Farm and Wapato Valley.

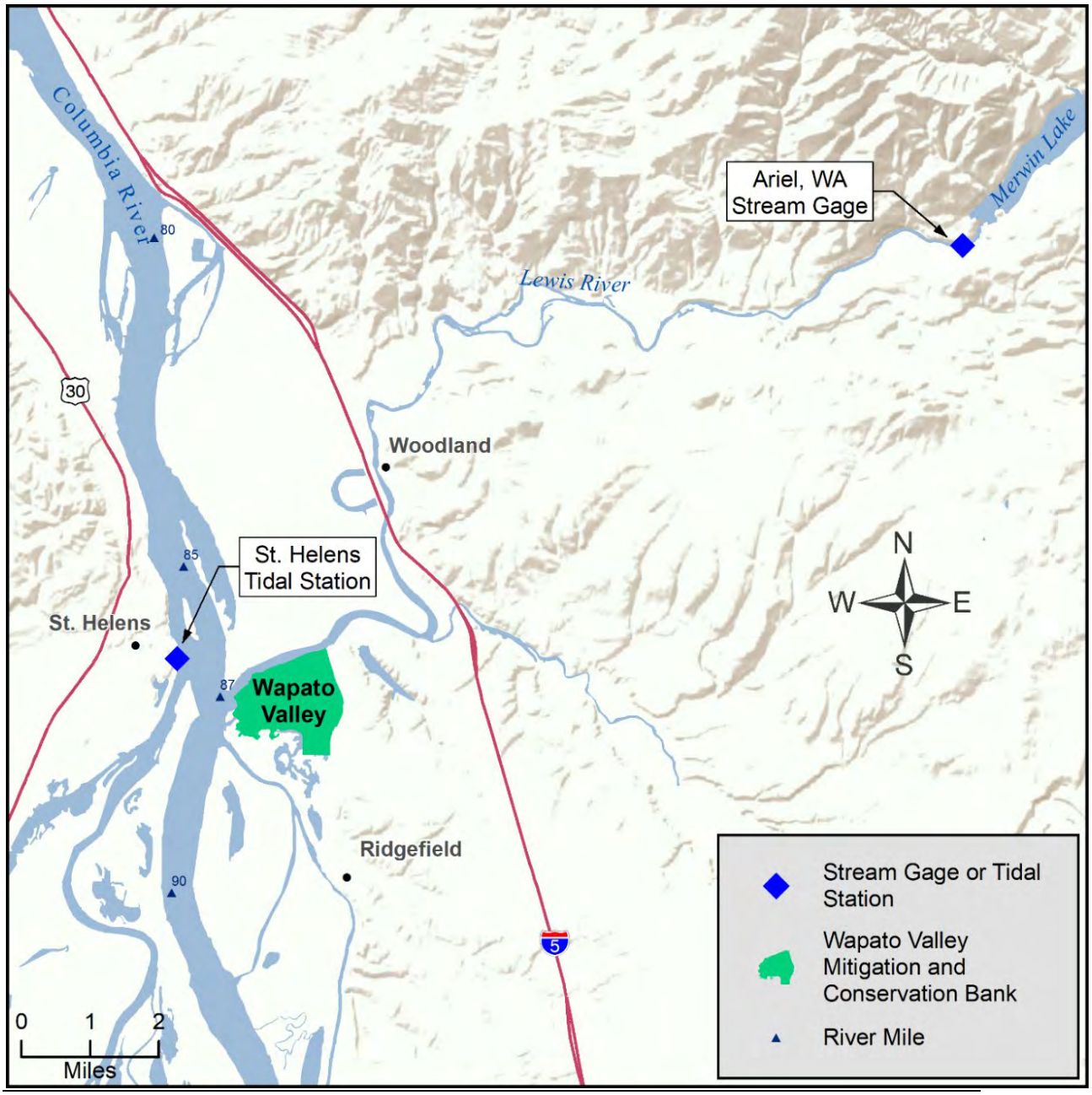


Figure 4.
Hydrograph of the maximum peak annual discharge data for the Lewis River 2-year and 1.01-year peak flows depicted (aka "chart method".

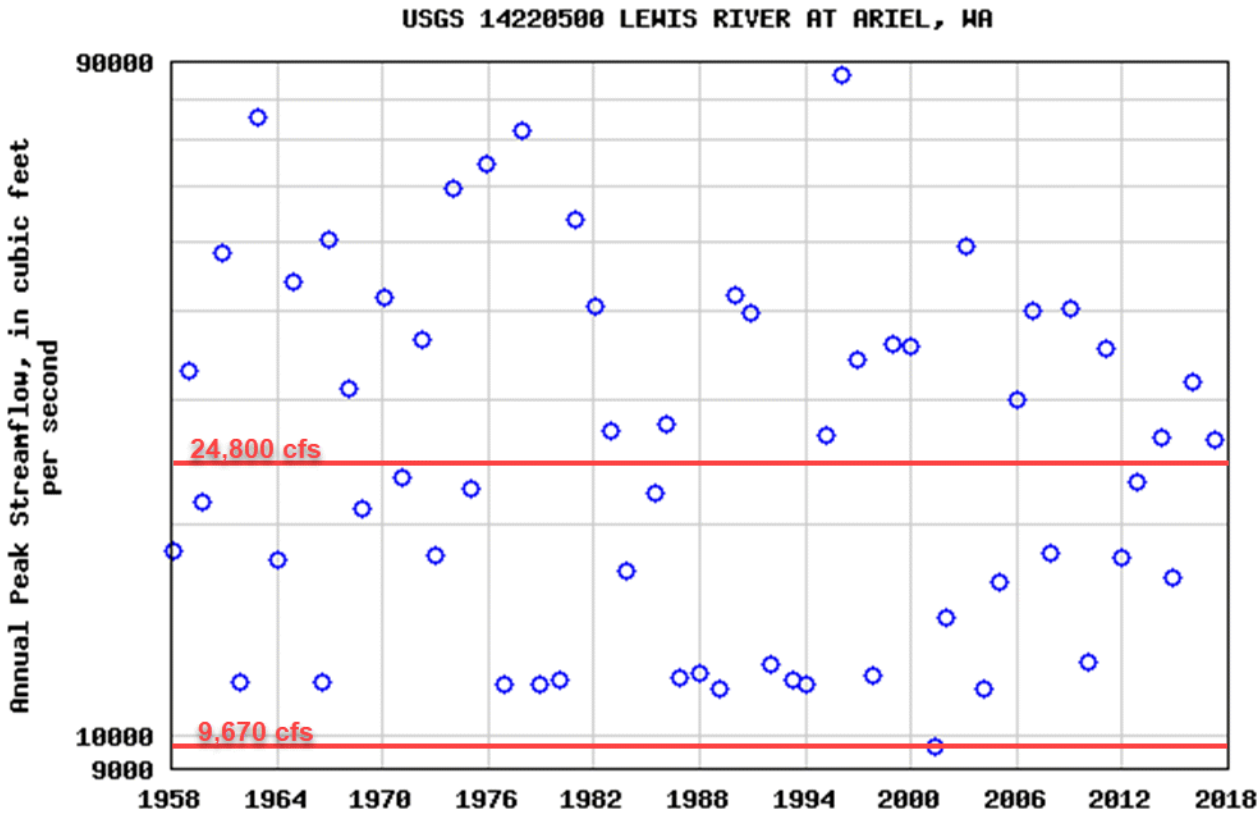


Figure 5.
Stage for the determined flow range values plotted on aligned discharge and stage graphs.

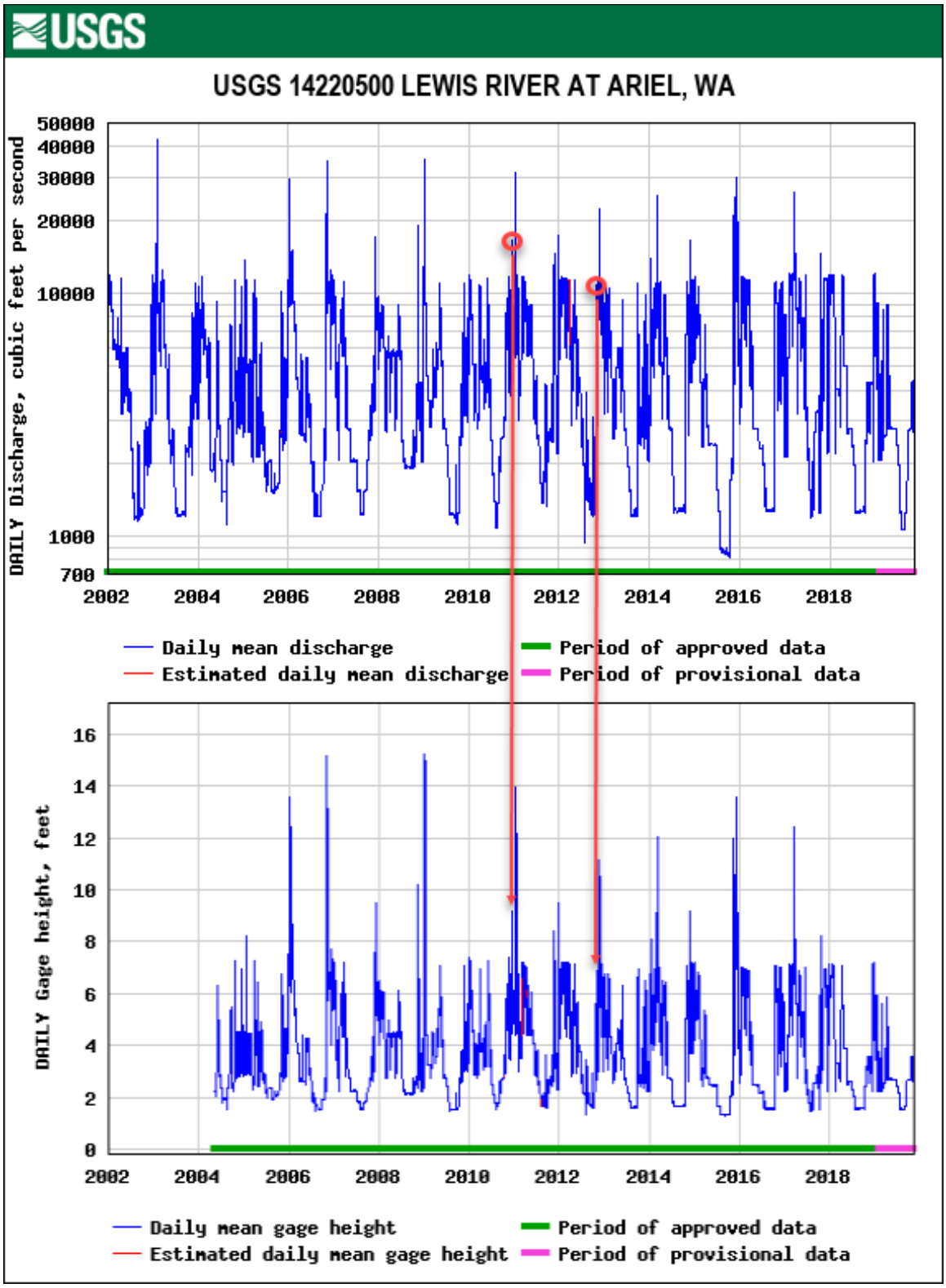
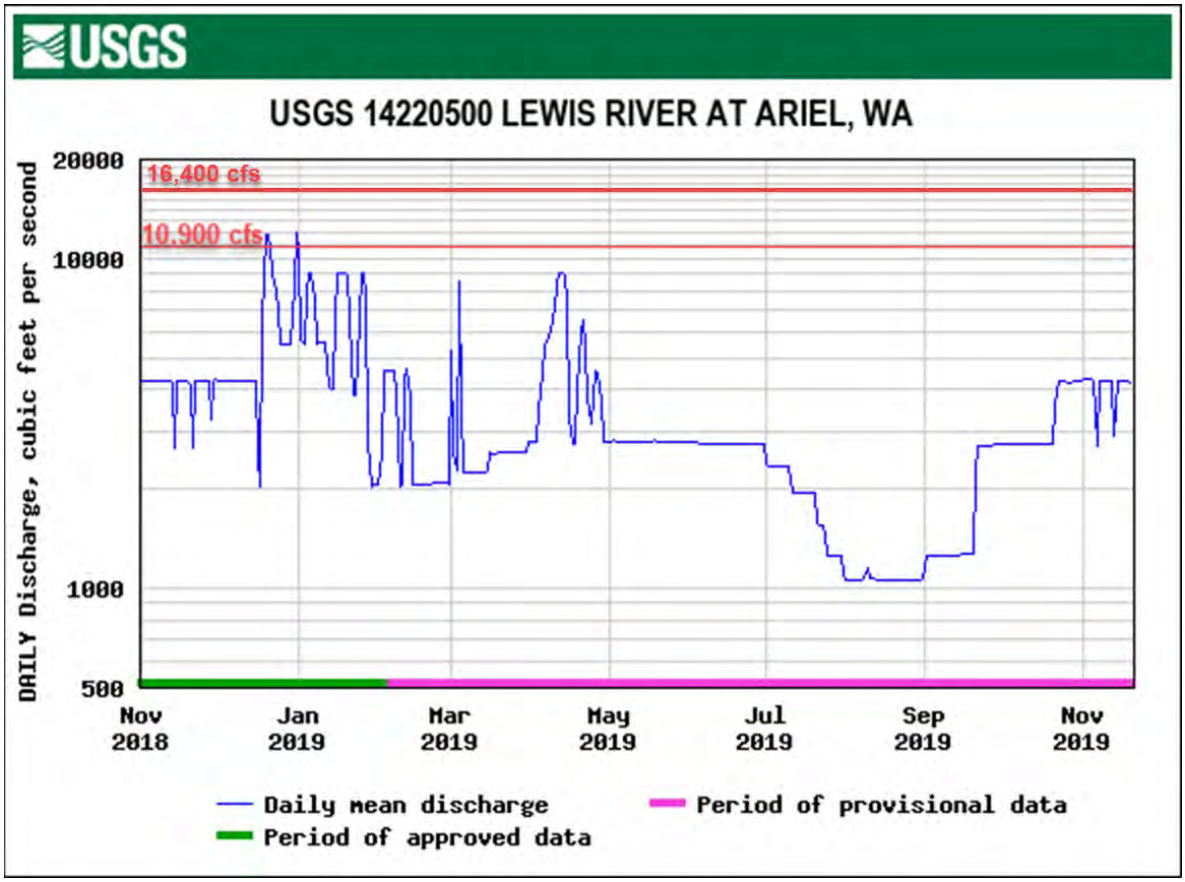


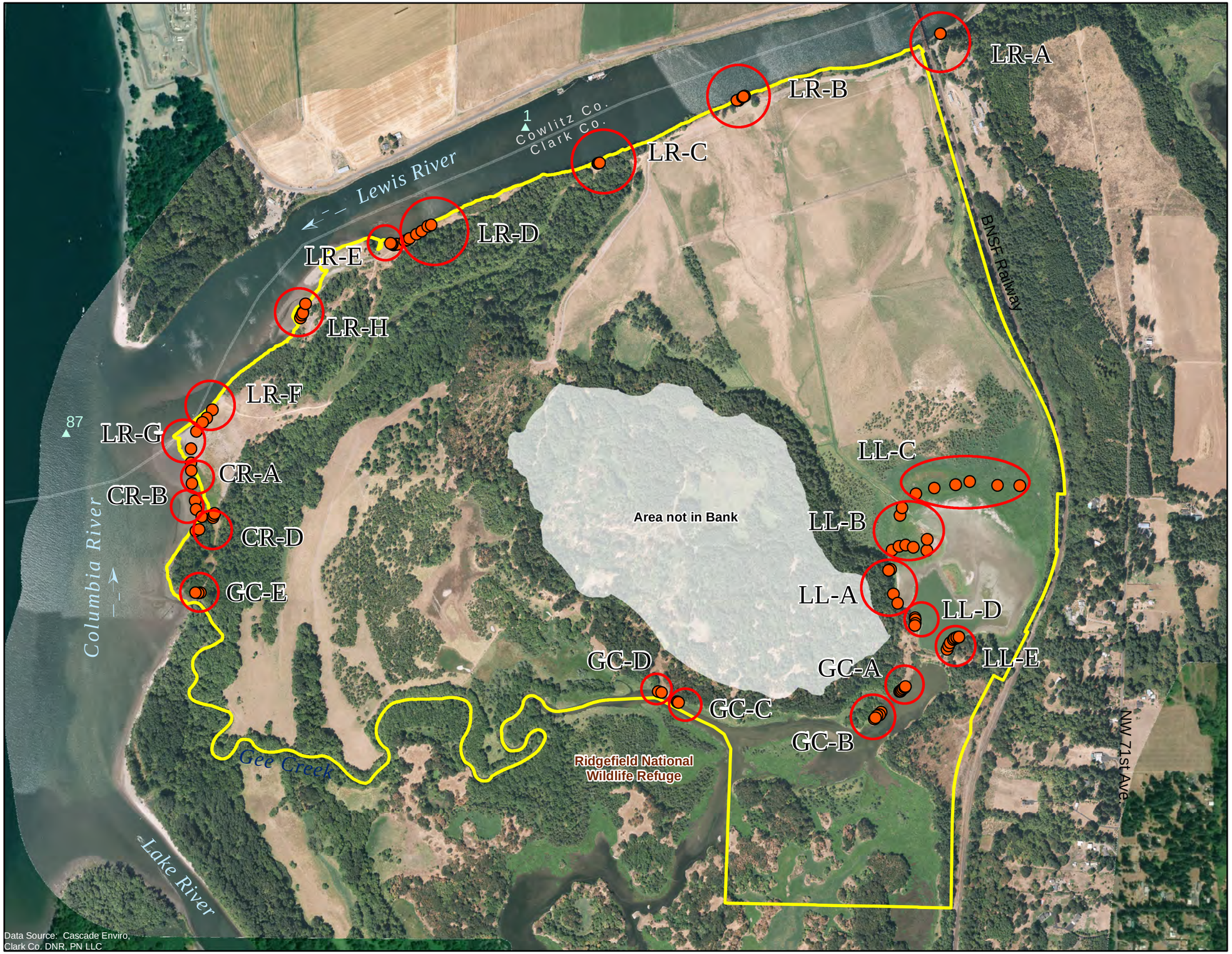
Figure 6.
Daily discharge plotted with refined OHWM bookend limits from refined analysis.



ATTACHMENTS

ATTACHMENT A

FIELD DATA FORMS AND MAPS



Data Source: Cascade Enviro, Clark Co. DNR, PN LLC

Ordinary High Water Locations

Wapato Valley
Mitigation and Conservation Bank

N
W E
S

Field Data Points

Bank Area

LL - Lancaster Lake
GC - Gee Creek
LR - Lewis River
CR - Columbia River

0 1,000 2,000
Feet

0 250 500
Meters

PLAS NEWYDD FARM
EST. 1941
CONSERVATION PROGRAM

Photo: GeoTerra, 8/16/2015
River Stage: ~7.25' NAVD 88

Date: 12/5/2019

Appendix A: Field data form

General Information

Site/Project Name/Owner:	Wapato Valley Plas Newydd Farm
Location:	Columbia River
Description:	45.85184, -122.777552 points: CR-A-(1-3)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

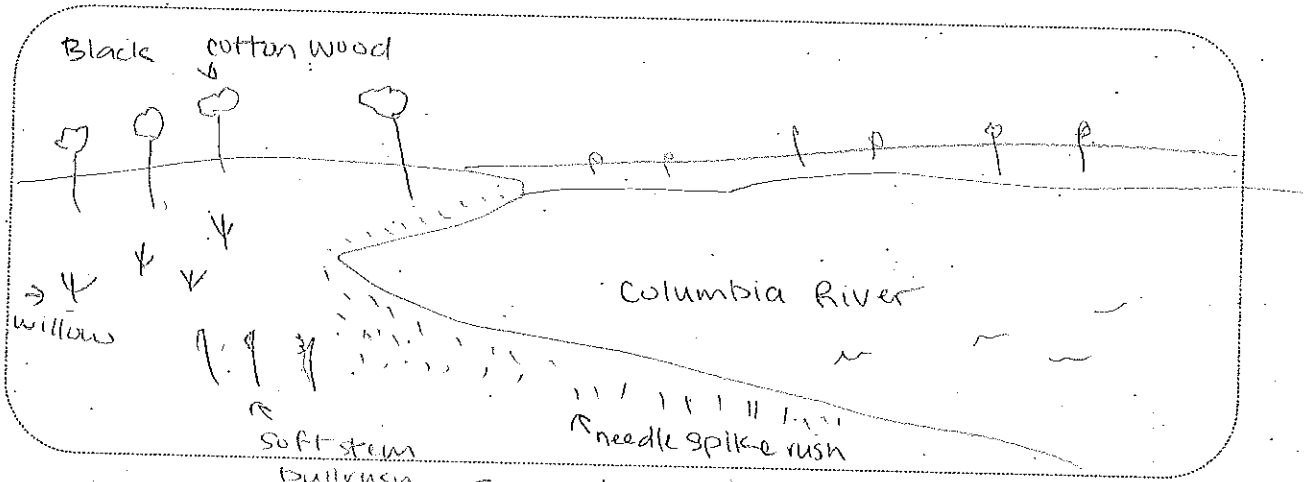
Date of site visit:	20 Nov 2019			
Time of site visit:	11:10			
Weather conditions:	Full Sun			
Watershed development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Reach development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Recent site disturbance?	No ⊗	Yes ○	Describe:	
Upstream flow control devices?	No ○	Yes ⊗	Describe: Bonneville Dam	
Bank armoring at the site?	No ○	Yes ⊗	Describe: Opposite side on Oregon side	
Bank armoring up or downstream?	No ○	Yes ⊗	Describe: upstream	
Observable tidal backwater?	No ○	Yes ⊗		
In-water structures? (i.e. bridge pilings, railroad embankments)	No ○	Yes ⊗	Describe: Pilings	
Animals grazing in riparian zone?	No ⊗	Yes ○	Describe:	
Observable beaver activity?	No ○	Yes ⊗	Describe: Beaver chews	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



The spike rush is flatten, the edge of OHWM is the soft stem bull rush

Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	o Sediment bars o Scour line o Clean cobbles/boulders. o Bank erosion/scour o Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage ✓ Aquatic plants	o Exposed roots/root scour ✓ Drainage patterns, as shown by flattened vegetation ✓ Aquatic animals o Algal mats o Iron staining

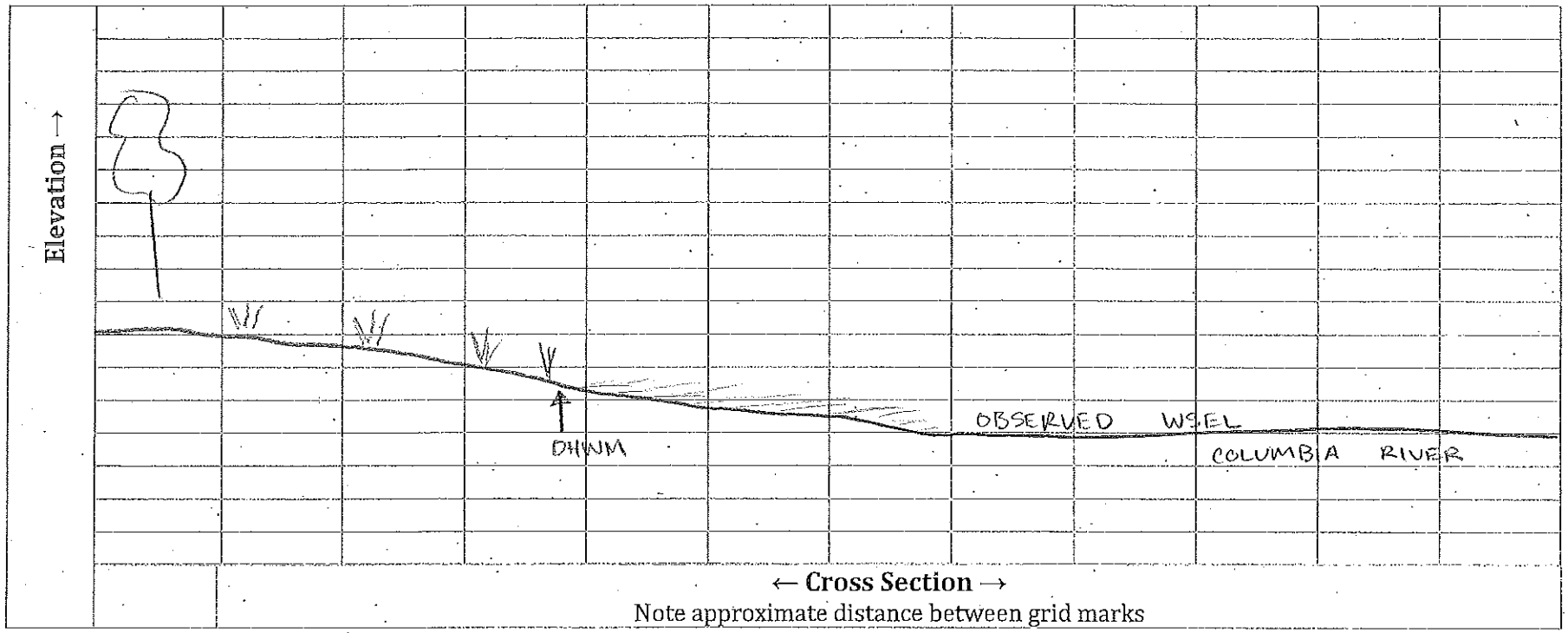
[24] Refer to Chapter 4 for a more complete description of indicators.

[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank x Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) o Benches	x Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder o Salmonberry (Red canary) o Nootka rose o Maidenhair and lady fern o Blackberries soft stem o Dunegrasses bull rush	o Sediment lines on vegetation or other fixed objects o Change from channel deposits to older alluvium. x Darker stain lines on fixed objects o Exposed roots/root scour. x Drainage patterns, as evidenced by flattened vegetation x Weathered and buried driftwood
Above OHWM	o Hillslope toe x Terraces or alluvium with an organic horizon or other developed soil horizons x Relic floodplain surface x Well developed soil A andB horizons/duff layer	o Indian plum o Red alder o Western red cedar o Douglas fir o Western hemlock o Ponderosa pine o Oregon white oak o Coast pine willow o Quaking aspen o Vine maple (lakes) o Blackberries Black cottonwood	o Lighter or no staining on fixed objects o Overbank deposits

Notes

The needle spikerush is flatted. The soft stem bull rush is the edge of the OHWM.



Below	Plant Distribution Across OHWM Gradient				
~~Above~~ OHWM		At/Straddling OHWM		Above OHWM	
needle spikerush	OBL	reed canarygrass	FACW	sand bar willow	FACW
wapato	OBL	willow sp.	FACW	Oregon ash	FACW
woolsedge	OBL			reed canarygrass	FACW
rice cutgrass	OBL				


20 Nov 2019
Photo Direction: S
WSEL: 8.51ft NAVD88
CR-A-(1-3)
OHWM: Flattened vegetation

Appendix A: Field data form

General Information

Site/Project Name/Owner:	Wapato Valley / Plas Newydd Farm
Location:	Columbia River
Description:	45.850831, -122.777069 points: CR-B-(1-3)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

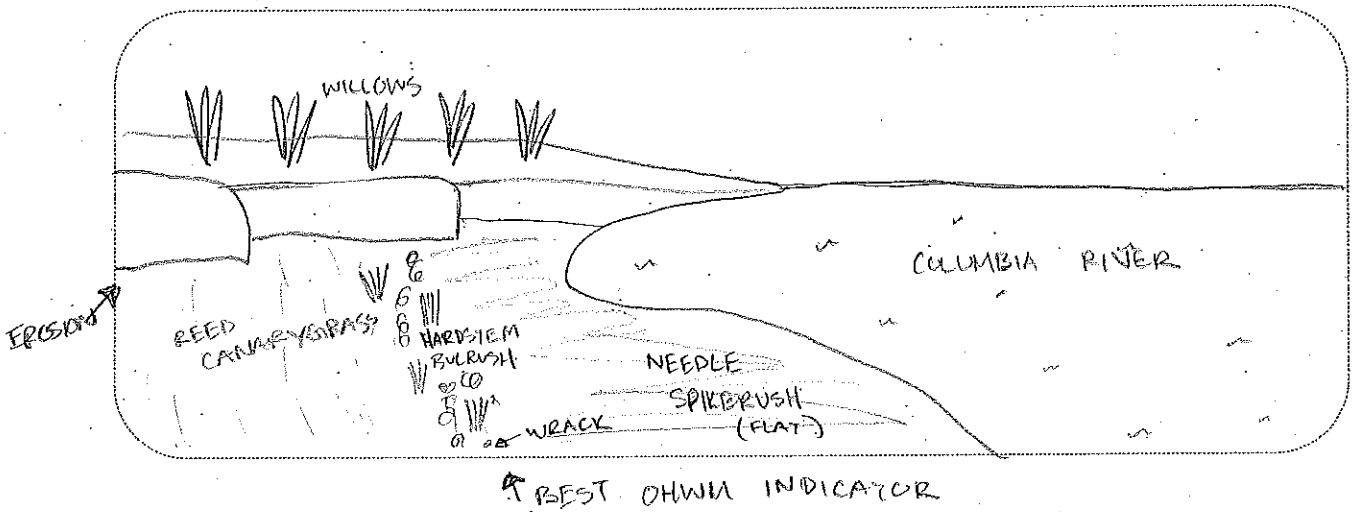
Date of site visit:	11-20-2019			
Time of site visit:	11:30			
Weather conditions:	full sun			
Watershed development:	Highly developed ○		Mod. Developed ⊗	Undeveloped ○
Reach development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Recent site disturbance?	No ⊗	Yes ○	Describe:	
Upstream flow control devices?	No ○	Yes ⊗	Describe: Bonneville Dam	
Bank armoring at the site?	No ○	Yes ⊗	Describe: opposite shore	
Bank armoring up or downstream?	No ○	Yes ⊗	Describe:	
Observable tidal backwater?	No ○	Yes ⊗		
In-water structures? (i.e. bridge pilings, railroad embankments)	No ○	Yes ⊗	Describe: pilings	
Animals grazing in riparian zone?	No ⊗	Yes ○	Describe:	
Observable beaver activity?	No ○	Yes ⊗	Describe: fresh chewed sticks	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	o Sediment bars o Scour line o Clean cobbles/boulders. o Bank erosion/scour o Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage ø Aquatic plants	o Exposed roots/root scour ø Drainage patterns, as shown by flattened vegetation ø Aquatic animals o Algal mats o Iron staining

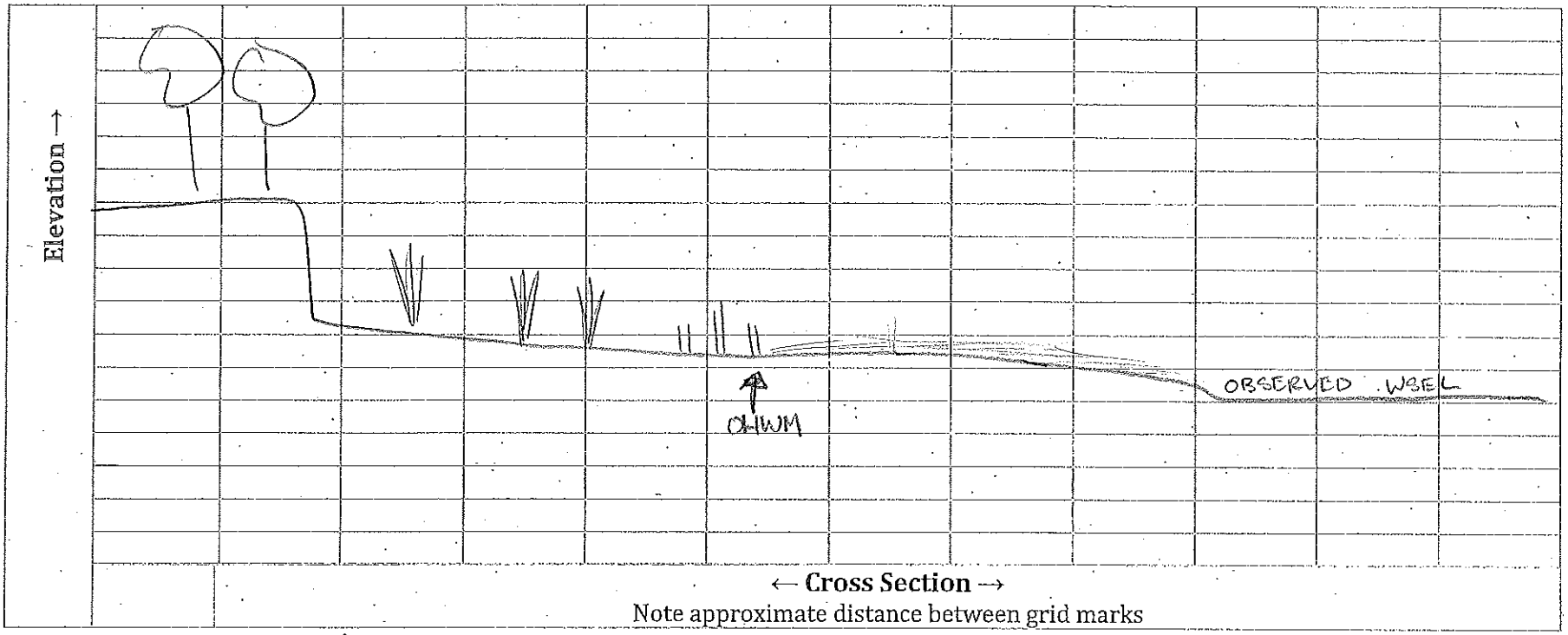
[24] Refer to Chapter 4 for a more complete description of indicators.

[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	○ Top of bank ✓ Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) ✓ Benches	○ Willows ○ Western red cedar ○ Vine maple (streams) ○ Black cottonwood ○ Red alder • reed canarygrass ○ Salmonberry ○ Nootka rose ○ Maidenhair and lady fern ○ Blackberries ○ Dunegrasses • wool sedge	✓ Sediment lines on vegetation or other fixed objects ○ Change from channel deposits to older alluvium. ✓ Darker stain lines on fixed objects ○ Exposed roots/root scour. ✓ Drainage patterns, as evidenced by flattened vegetation ✓ Weathered and buried driftwood
Above OHWM	✓ Hillslope toe ✓ Terraces or alluvium with an organic horizon or other developed soil horizons ✓ Relic floodplain surface ✓ Well developed soil A andB horizons/duff layer	○ Indian plum ○ Red alder • willows ○ Western red cedar ○ Douglas fir • Oregon ash ○ Western hemlock ○ Ponderosa pine ○ Oregon white oak ○ Coast pine ○ Quaking aspen ○ Vine maple (lakes) ○ Blackberries	✓ Lighter or no staining on fixed objects ✓ Overbank deposits

Notes

The best OHWM is the wool sedge. The needle spike rush is flatten and below the OHWM



Below ~~Above~~ OHWM		At/Straddling OHWM		Above OHWM	
needle spikerush	OBL	woolsedge	OBL	sand bar willow	FACW
wapato	OBL	rice cutgrass	OBL	black cottonwood	NI
				reed canarygrass	FACW
				rough cocklebur	FAC


20 Nov 2019
Photo Direction: N
WSEL: 8.51ft NAVD88
CR-B-(1-3)
OHWM: Flattened vegetation

Appendix A: Field data form

General Information

Site/Project Name/Owner: Wapato Valley/ Plas Nelsydd Farm
Location: Columbia River
Description: 45.849933, -122.777538
points: CR - D - (1-5)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

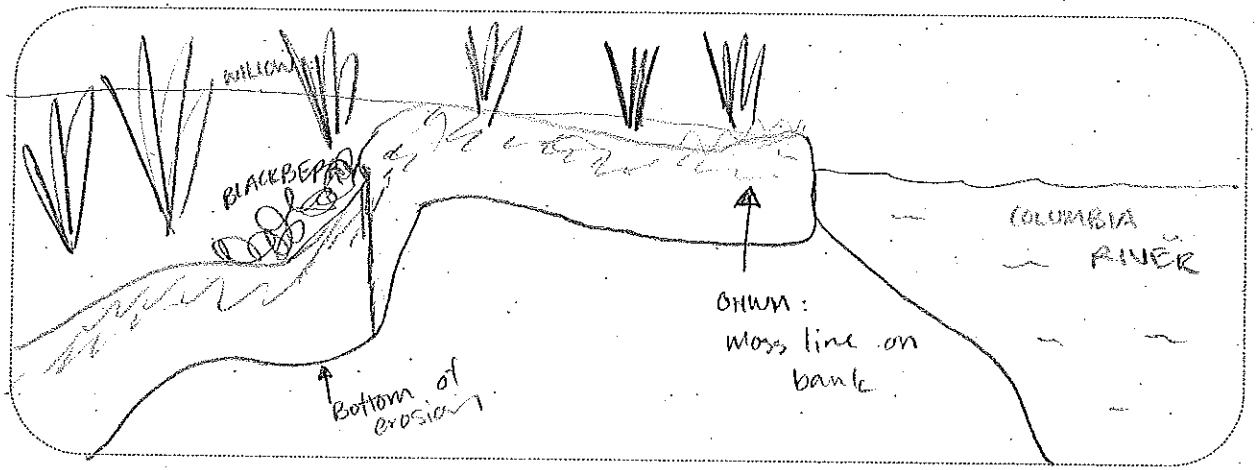
Date of site visit:	12-4-2019			
Time of site visit:	12:25			
Weather conditions:	sun			
Watershed development:	Highly developed O		Mod. Developed ⊗	Undeveloped O
Reach development:	Highly developed ⊗		Mod. Developed O	Undeveloped O
Recent site disturbance?	No ⊗	Yes O	Describe:	
Upstream flow control devices?	No O	Yes ⊗	Describe: Bonneville Dam	
Bank armoring at the site?	No ⊗	Yes O	Describe: opposite shore	
Bank armoring up or downstream?	No O	Yes ⊗	Describe:	
Observable tidal backwater?	No O	Yes ⊗		
In-water structures? (i.e. bridge pilings, railroad embankments)	No O	Yes ⊗	Describe: pilings	
Animals grazing in riparian zone?	No ⊗	Yes O	Describe:	
Observable beaver activity?	No ⊗	Yes O	Describe:	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	o Sediment bars ⊗ Scour line o Clean cobbles/boulders. ⊗ Bank erosion/scour ⊗ Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage ⊗ Aquatic plants	⊗ Exposed roots/root scour o Drainage patterns, as shown by flattened vegetation o Aquatic animals o Algal mats o Iron staining

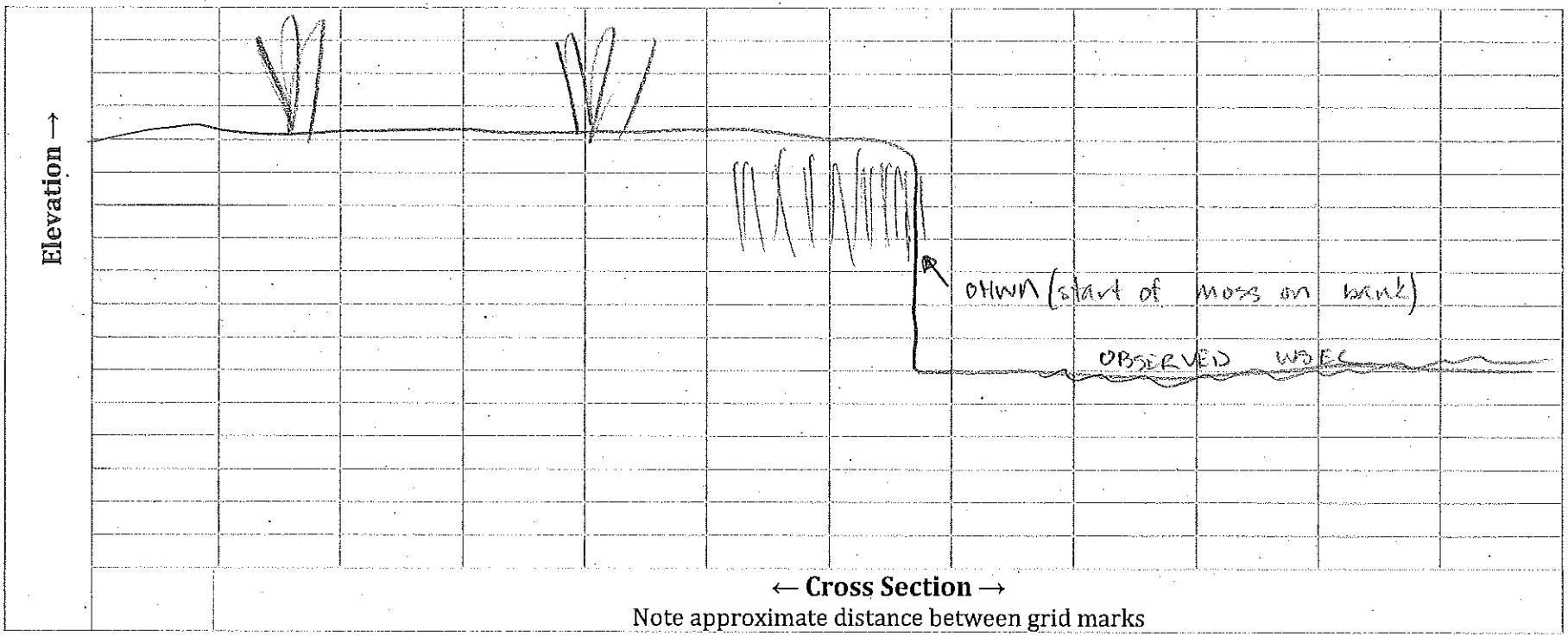
[24] Refer to Chapter 4 for a more complete description of indicators.

[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank o Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) ☒ Benches	o Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder o Salmonberry moss o Nootka rose o Maidenhair and lady fern o Blackberries o Dunegrasses	o Sediment lines on vegetation or other fixed objects o Change from channel deposits to older alluvium. ☒ Darker stain lines on fixed objects ☒ Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation o Weathered and buried driftwood
Above OHWM	o Hillslope toe ☒ Terraces or alluvium with an organic horizon or other developed soil horizons ☒ Relic floodplain surface ☒ Well developed soil A andB horizons/duff layer	o Indian plum dogwood o Red alder o Western red cedar o Douglas fir o Western hemlock willow o Ponderosa pine o Oregon white oak o Coast pine o Quaking aspen o Vine maple (lakes) ☒ Blackberries	☒ Lighter or no staining on fixed objects o Overbank deposits

Notes

The best indicator of the OHWM at this location is the extent that moss can grow on the steeply eroded riverbanks.



Plant Distribution Across OHWM Gradient

Below ~~Above~~ OHWM		At/Straddling OHWM		Above OHWM	
reed canarygrass	FACW	moss sp.	NI	Pacific willow	FACW
needle spikerush	OBL	himalaya blackberry	FACU	red-osier dogwood	FACW
				reed canarygrass	FACW
				himalaya blackberry	FACU
				black hawthorne	FAC


4 Dec 2019
Photo Direction: E
WSEL: 8.61ft NAVD88
CR-D-(1-5)
OHWM: Moss on upper limit

Appendix A: Field data form

General Information

Site/Project Name/Owner:	Wapato Valley / Mas Nguyen Farm
Location:	Gee Creek
Description:	45.84164168, -122.75082
	points: GC-A-(1-9)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

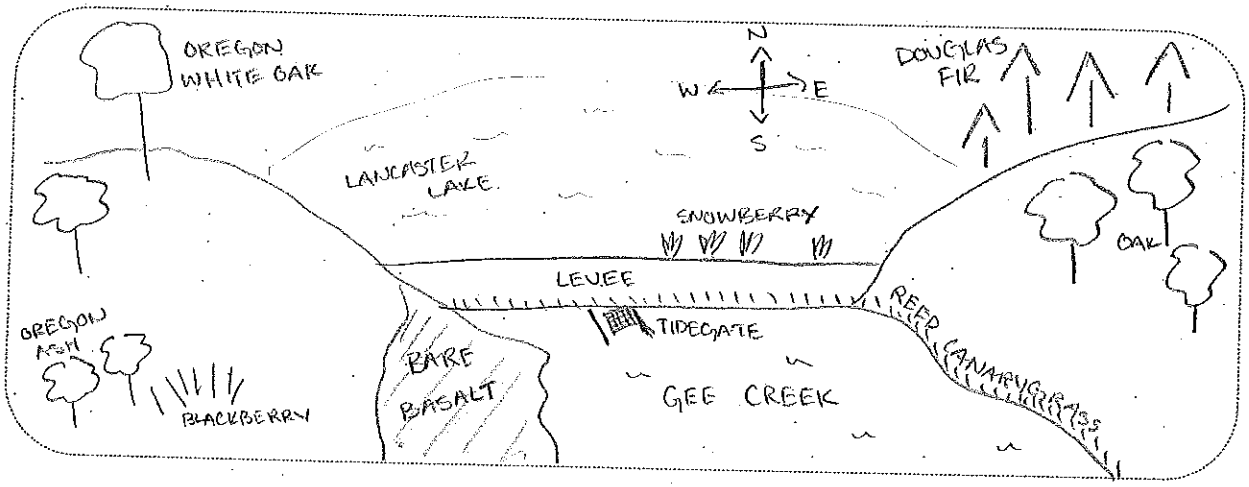
Date of site visit:	11-18-2019			
Time of site visit:	15:50			
Weather conditions:	light rain			
Watershed development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Reach development:	Highly developed ○		Mod. Developed ⊗	Undeveloped ○
Recent site disturbance?	No ○	Yes ○	Describe:	
Upstream flow control devices?	No ○	Yes ⊗	Describe: Gee Creek bridge construction	
Bank armoring at the site?	No ○	Yes ⊗	Describe: Basalt bluffs act as natural armoring.	
Bank armoring up or downstream?	No ○	Yes ⊗	Describe: Gee Creek upstream of site	
Observable tidal backwater?	No ○	Yes ⊗		
In-water structures? (i.e. bridge pilings, railroad embankments)	No ○	Yes ⊗	Describe: Levee w/ tidegate to north blocks tide to Lancaster Lake	
Animals grazing in riparian zone?	No ⊗	Yes ○	Describe:	
Observable beaver activity?	No ○	Yes ⊗	Describe: Channels and lodges.	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	o Sediment bars o Scour line ø Clean cobbles/boulders. o Bank erosion/scour ø Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage ø Aquatic plants	o Exposed roots/root scour o Drainage patterns, as shown by flattened vegetation ø Aquatic animals o Algal mats o Iron staining

[24] Refer to Chapter 4 for a more complete description of indicators.

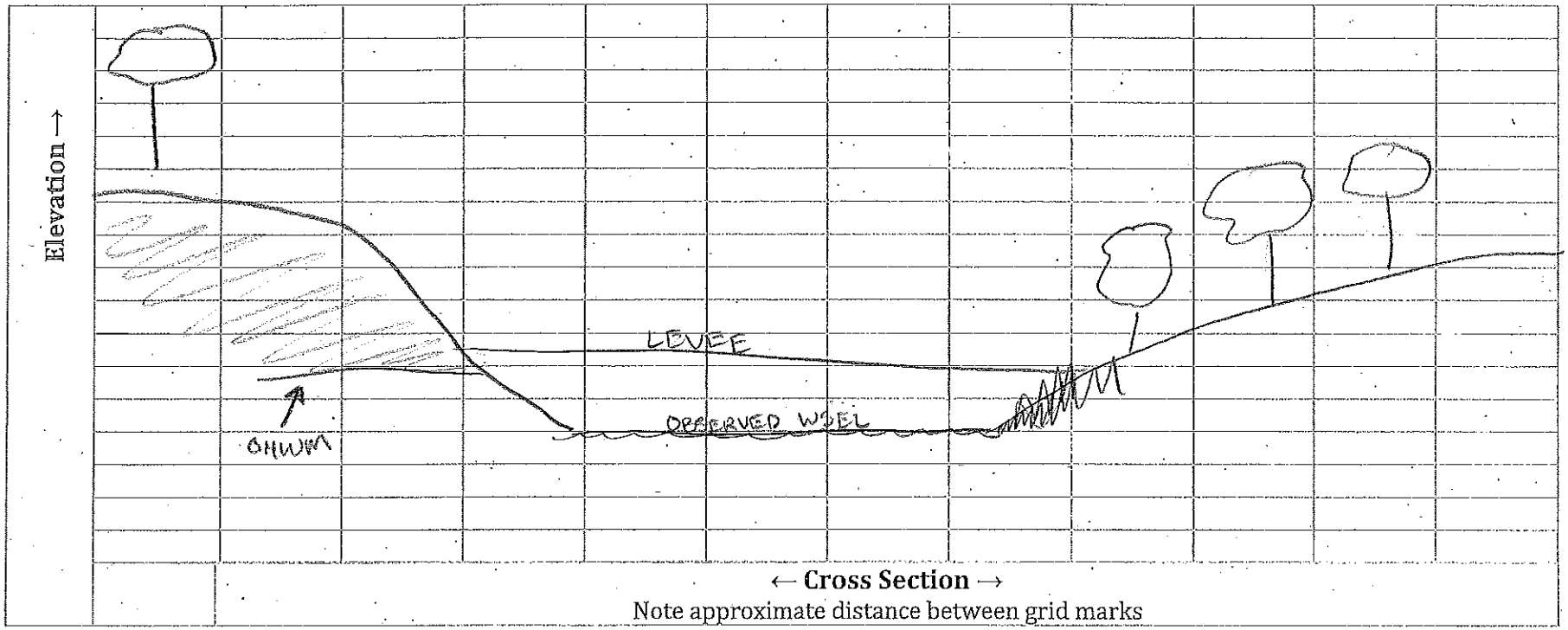
[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank o Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) o Benches	o Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder ⊠ break in o Salmonberry moss/stonecrop o Nootka rose to bare rock on o Maidenhair and lady fern bluffs o Blackberries o Dunegrasses	☒ Sediment lines on vegetation or other fixed objects o Change from channel deposits to older alluvium. ☒ Darker stain lines on fixed objects o Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation o Weathered and buried driftwood
Above OHWM	o Hillslope toe o Terraces or alluvium with an organic horizon or other developed soil horizons o Relic floodplain surface ☒ Well developed soil A andB horizons/duff layer	o Indian plum ⊠ Oregon o Red alder ash o Western red cedar ☒ Douglas fir o Western hemlock o Ponderosa pine ☒ Oregon white oak o Coast pine o Quaking aspen o Vine maple (lakes) ☒ Blackberries	o Lighter or no staining on fixed objects o Overbank deposits

Notes

The basalt rocks below the OHWM have very little to no vegetation on them

GC-A



Note approximate distance between grid marks

Plant Distribution Across OHWM Gradient

Below ~~Above~~ OHWM		At/Straddling OHWM		Above OHWM	
coon's tail	OBL	bare basalt		moss sp.	not listed
Eurasian watermilfoil	OBL	reed canarygrass	FACW	wormleaf stonecrop	not listed
				reed canarygrass	FACW
				hairy cat's ear	FACU
				cheatgrass	not listed
				camas	FACW
				Oregon ash	FACW
				Oregon white oak	FACU


18 Nov 2019
Photo Direction: N
WSEL: 7.01ft NAVD88
GC-A-(1-9)
OHWM: Break in stonecrop/moss

Appendix A: Field data form

General Information

Site/Project Name/Owner:	Wapato Valley/ Plas Newydd Farm
Location:	Gee Creek
Description:	45.845491, -122.751942 points: GC-B-(1-7)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

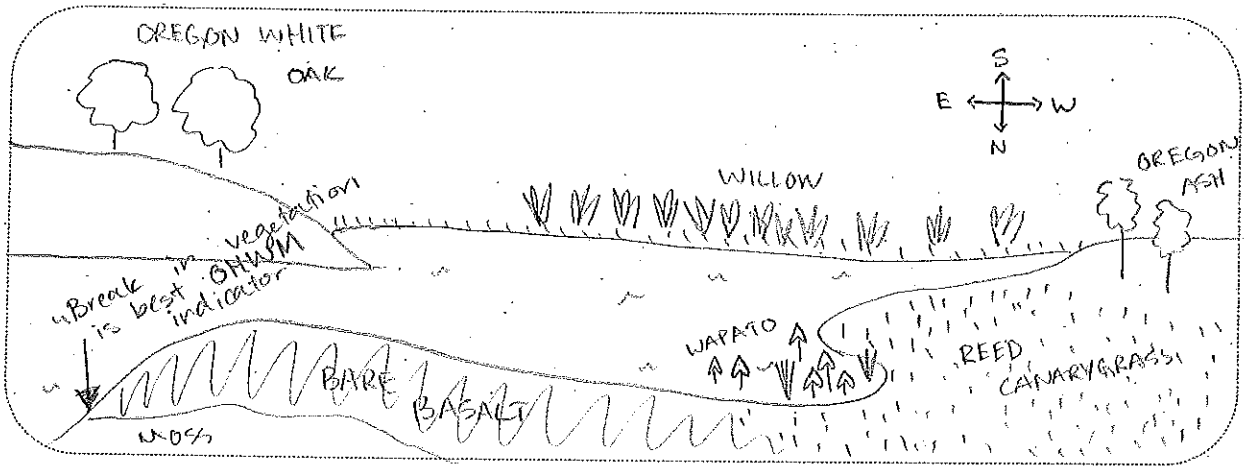
Date of site visit:	11-19-2009			
Time of site visit:	10:00			
Weather conditions:	overcast			
Watershed development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Reach development:	Highly developed ○		Mod. Developed ⊗	Undeveloped ○
Recent site disturbance?	No ⊗	Yes ○	Describe:	
Upstream flow control devices?	No ○	Yes ⊗	Describe: Gee Creek bridge construction	
Bank armoring at the site?	No ○	Yes ⊗	Describe: Basalt bluffs act as natural armoring.	
Bank armoring up or downstream?	No ○	Yes ⊗	Describe: Gee Creek upstream of site	
Observable tidal backwater?	No ○	Yes ⊗		
In-water structures? (i.e. bridge pilings, railroad embankments)	No ○	Yes ⊗	Describe: Levee w/ tidegate to north blocks tide to Lancaster Lake.	
Animals grazing in riparian zone?	No ⊗	Yes ○	Describe:	
Observable beaver activity?	No ○	Yes ⊗	Describe: Channels and lodges.	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	o Sediment bars o Scour line ⊗ Clean cobbles/boulders. o Bank erosion/scour ⊗ Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage ⊗ Aquatic plants	o Exposed roots/root scour o Drainage patterns, as shown by flattened vegetation ⊗ Aquatic animals ⊗ Algal mats o Iron staining

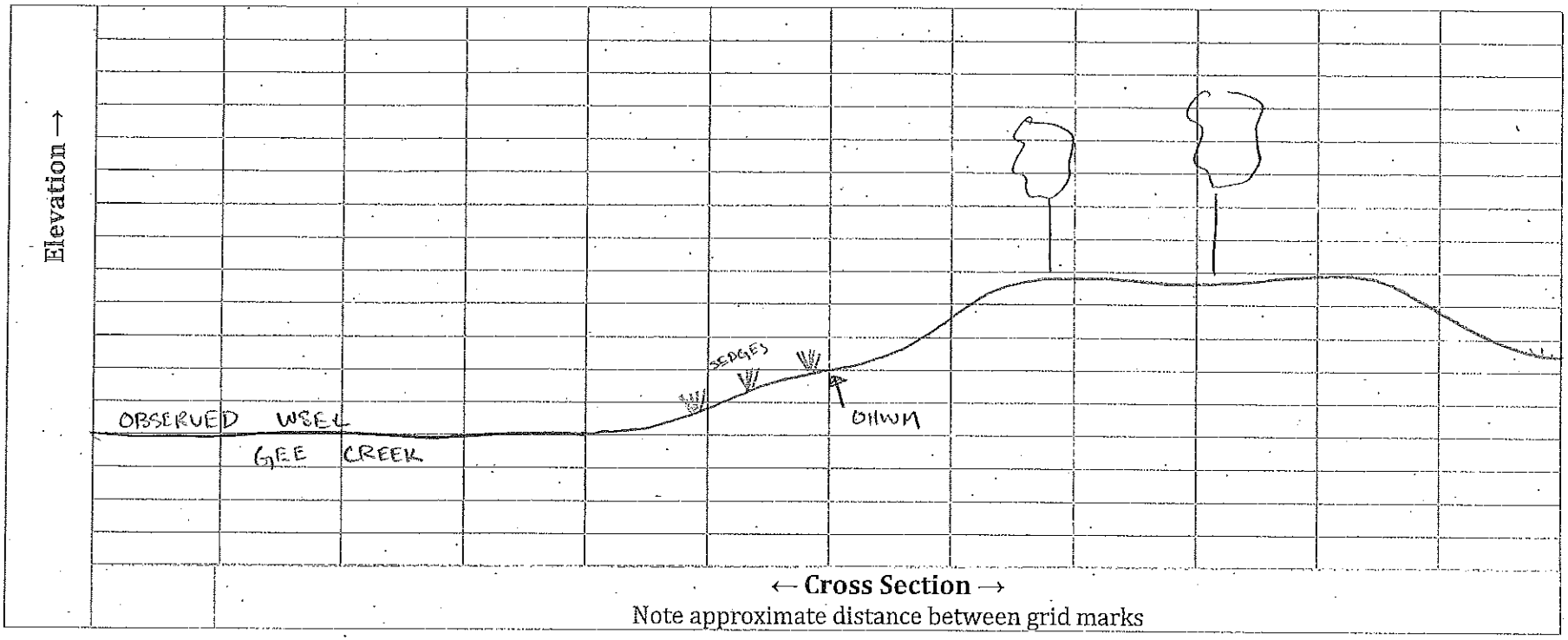
[24] Refer to Chapter 4 for a more complete description of indicators.

[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank o Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) o Benches	o Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder o Salmonberry o Nootka rose o Maidenhair and lady fern o Blackberries o Dunegrasses	☒ Sediment lines on vegetation or other fixed objects o Change from channel deposits to older alluvium. ☒ Darker stain lines on fixed objects o Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation o Weathered and buried driftwood
Above OHWM	o Hillslope toe ☒ Terraces or alluvium with an organic horizon or other developed soil horizons ☒ Relic floodplain surface ☒ Well developed soil A andB horizons/duff layer	o Indian plum o Red alder ☒ Oregon ash o Western red cedar o Douglas fir o Western hemlock o Ponderosa pine o Oregon white oak o Coast pine o Quaking aspen o Vine maple (lakes) ☒ Blackberries	o Lighter or no staining on fixed objects o Overbank deposits

Notes

The high water line is visible on basalt bluffs where there is a break in moss growth. The nearby backwater area of Gee Creek is slightly higher and has filled in with sediment. It contains Oregon ash trees and a thick herb layer of reed canarygrass and native sedges. The top of the basalt bluff has very little soil and contains patches of Himalaya blackberry and snowberry. Upstream of the project site a construction project has Gee Creek dewatered for culvert replacement.



Plant Distribution Across OHWM Gradient

Below OHWM		At/Straddling OHWM		Above OHWM	
wapato	OBL	reed canarygrass	FACW	Oregon ash	FACW
needle spikerush	OBL			snowberry	FACU
hardstem bulrush	NI			himalaya blackberry	FACU
slough sedge	OBL				


19 Nov 2019
Photo Direction: W
WSEL: 8.87ft NAVD88
GC-B-(1-7)
OHWM: Vegetation change from wapato and sedge to upland vegetation

Appendix A: Field data form

General Information

Site/Project Name/Owner:	Wapato Valley Plas Wemyss Farm
Location:	Lee Creek
Description:	45.845924, -122.759277 points: GC-C-(1-2)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

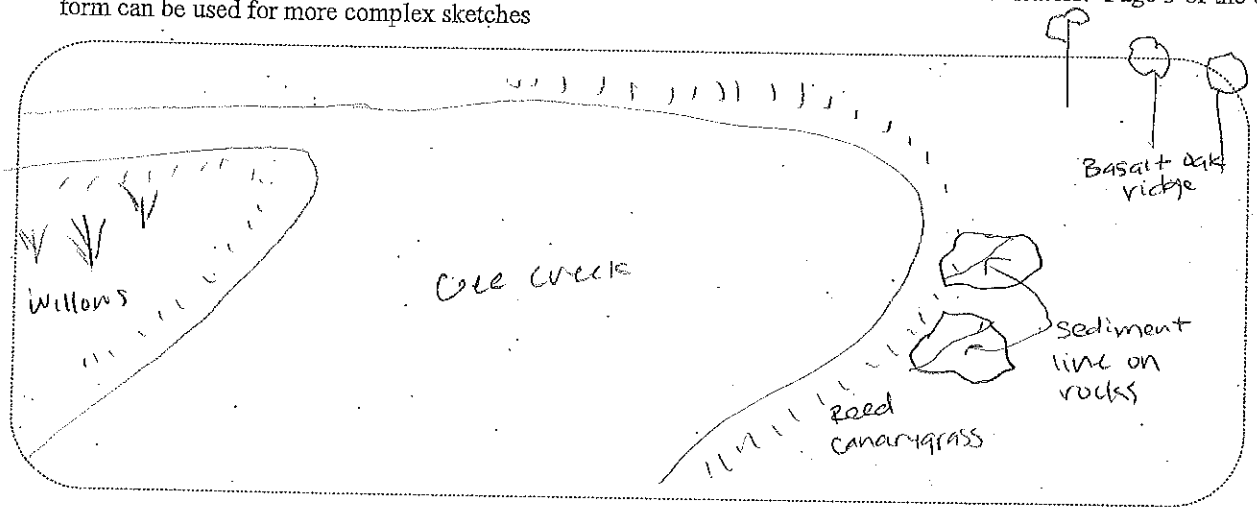
Date of site visit:	20 Nov 2019			
Time of site visit:	14:50			
Weather conditions:	Full Sun			
Watershed development:	Highly developed O		Mod. Developed ⊗	Undeveloped O
Reach development:	Highly developed O		Mod. Developed ⊗	Undeveloped O
Recent site disturbance?	No ⊗	Yes O	Describe:	
Upstream flow control devices?	No O	Yes ⊗	Describe: culverts	
Bank armoring at the site?	No ⊗	Yes O	Describe:	
Bank armoring up or downstream?	No ⊗	Yes O	Describe:	
Observable tidal backwater?	No O	Yes ⊗		
In-water structures? (i.e. bridge pilings, railroad embankments)	No O	Yes ⊗	Describe:	
Animals grazing in riparian zone?	No ⊗	Yes O	Describe:	
Observable beaver activity?	No O	Yes ⊗	Describe: Beaver Chews	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	o Sediment bars o Scour line o Clean cobbles/boulders. o Bank erosion/scour x Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage x Aquatic plants Reed canarygrass	o Exposed roots/root scour x Drainage patterns, as shown by flattened vegetation x Aquatic animals o Algal mats o Iron staining

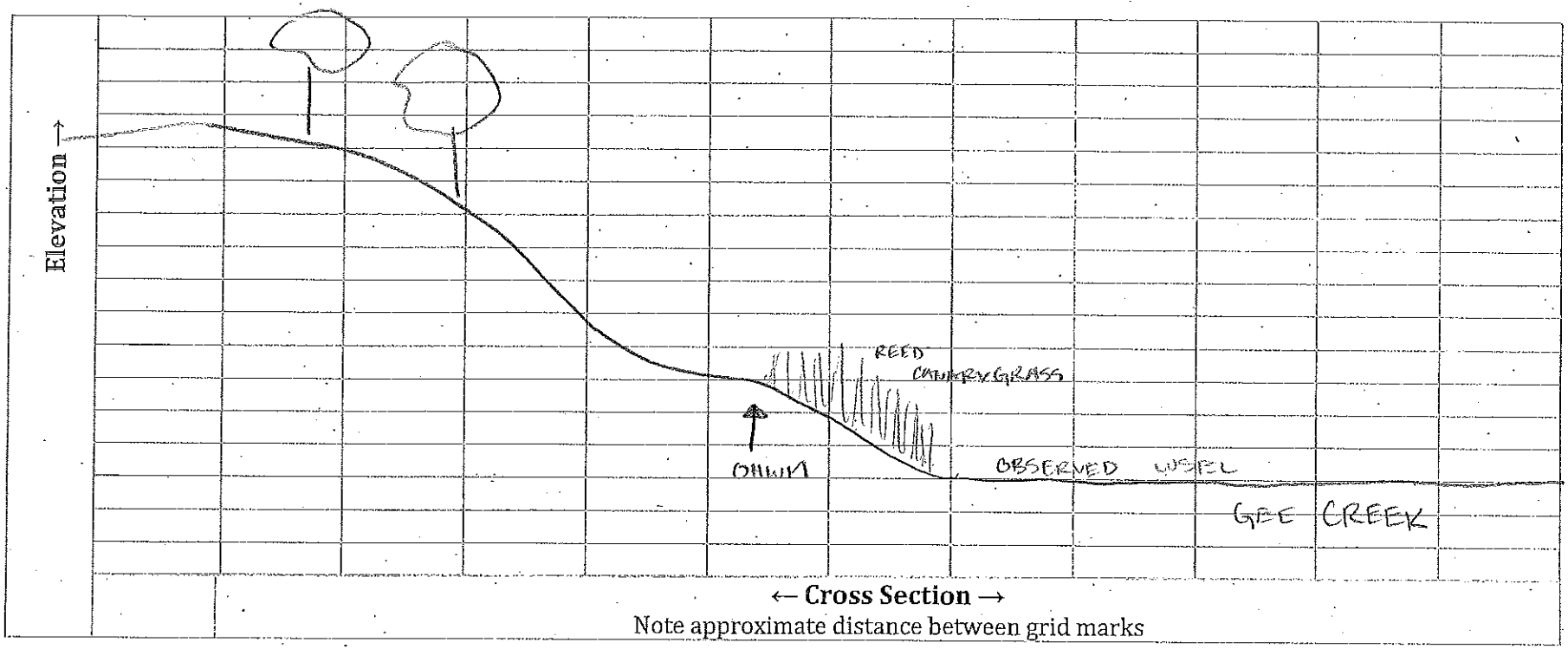
[24] Refer to Chapter 4 for a more complete description of indicators.

[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	☒ Top of bank ☒ Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) o Benches	o Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder reed o Salmonberry canary o Nootka rose o Maidenhair and lady fern o Blackberries Oregon o Dunegrasses ash	☒ Sediment lines on vegetation or other fixed objects ☒ Change from channel deposits to older alluvium. o Darker stain lines on fixed objects o Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation o Weathered and buried driftwood
Above OHWM	o Hillslope toe ☒ Terraces or alluvium with an organic horizon or other developed soil horizons o Relic floodplain surface ☒ Well developed soil A andB horizons/duff layer	o Indian plum o Red alder o Western red cedar o Douglas fir o Western hemlock o Ponderosa pine ☒ Oregon white oak o Coast pine Oregon o Quaking aspen ash o Vine maple (lakes) o Blackberries	o Lighter or no staining on fixed objects o Overbank deposits

Notes

Rocks on the edge of creek have a sediment line at the OHWM



Below		Plant Distribution Across OHWM Gradient			
~~Above~~ OHWM		At/Straddling OHWM		Above OHWM	
Wapato	OBL	reed canarygrass	FACW	Oregon white oak	FACU
hardstem bulrush	N1			Oregon ash	FACW
reed canarygrass	FACW			snowberry	FACU


20 Nov 2019
Photo Direction: E
WSEL: 7.49ft NAVD88
GC-C-(1-2)
OHWM: Sediment line on rocks

Appendix A: Field data form

General Information

Site/Project Name/Owner: Wapato Valley Pigs Newgold Farm
Location: Gee Creek
Description: 45.8460163, -122.7600009
points: GC-D-(1-3)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

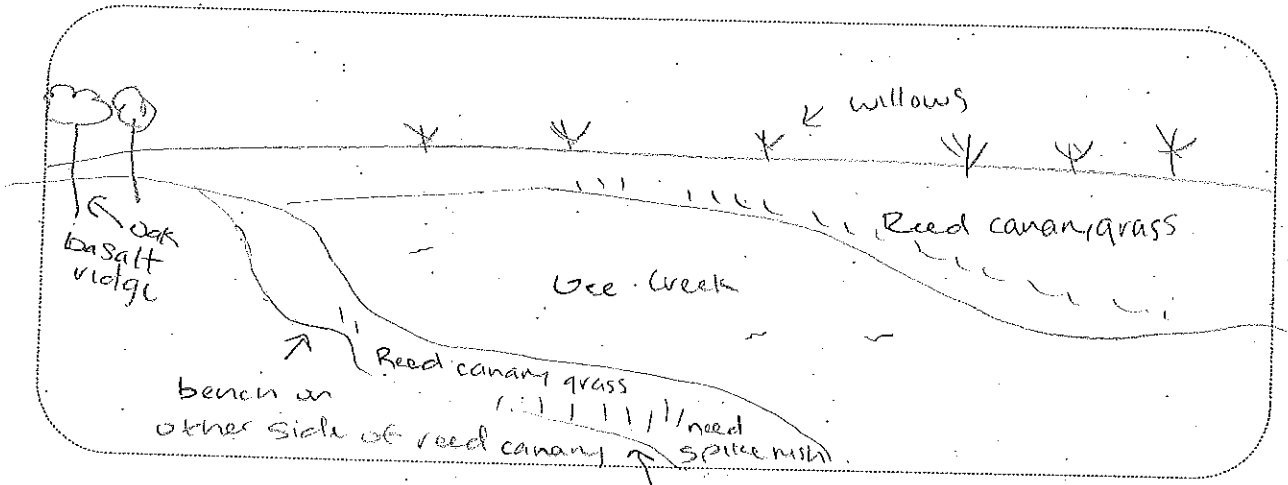
Date of site visit:	20 Nov 2019			
Time of site visit:	14:37			
Weather conditions:	Full Sun			
Watershed development:	Highly developed O		Mod. Developed ⊗	Undeveloped O
Reach development:	Highly developed O		Mod. Developed ⊗	Undeveloped O
Recent site disturbance?	No ⊗	Yes O	Describe:	
Upstream flow control devices?	No O	Yes ⊗	Describe: culverts	
Bank armoring at the site?	No ⊗	Yes O	Describe:	
Bank armoring up or downstream?	No ⊗	Yes O	Describe:	
Observable tidal backwater?	No O	Yes ⊗		
In-water structures? (i.e. bridge pilings, railroad embankments)	No O	Yes ⊗	Describe: Pilings	
Animals grazing in riparian zone?	No ⊗	Yes O	Describe:	
Observable beaver activity?	No O	Yes ⊗	Describe: Beaver chews	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	o Sediment bars o Scour line ☒ Clean cobbles/boulders. o Bank erosion/scour ☒ Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage ☒ Aquatic plants reed canary grass needle spikerush	o Exposed roots/root scour o Drainage patterns, as shown by flattened vegetation ☒ Aquatic animals o Algal mats o Iron staining

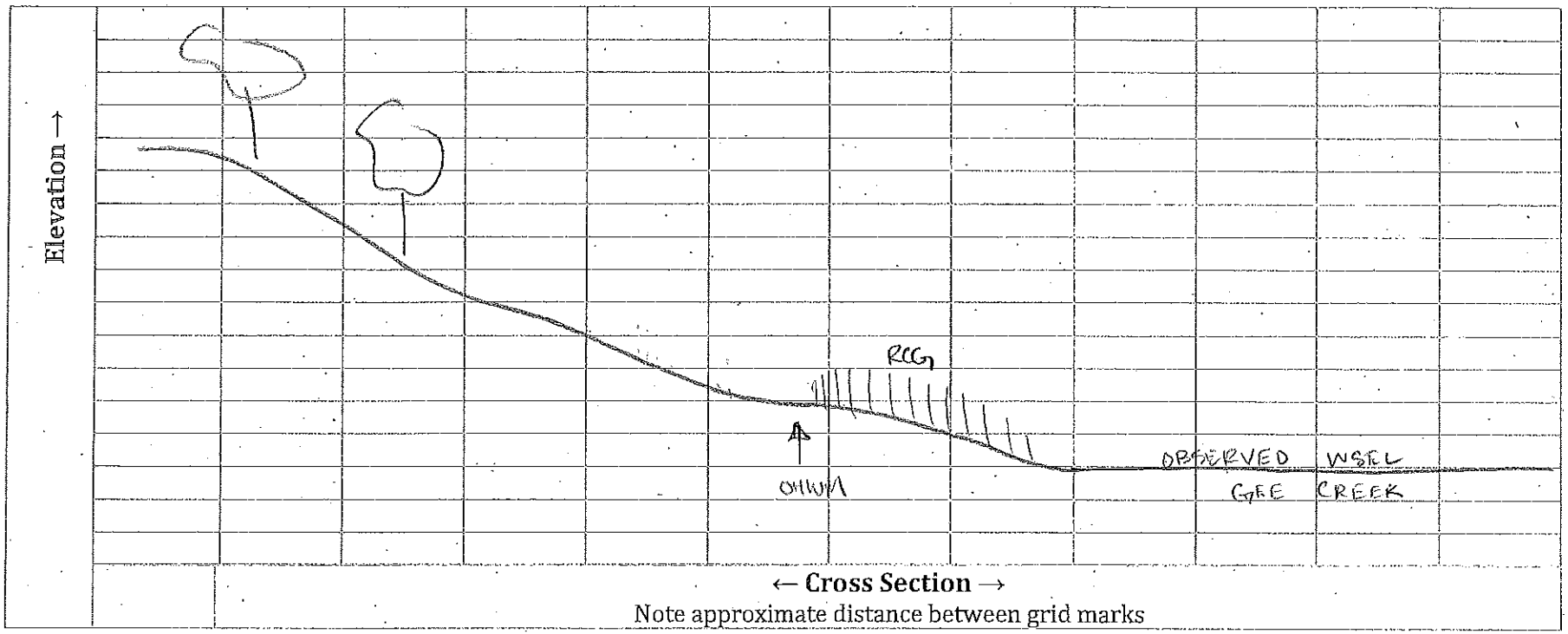
[24] Refer to Chapter 4 for a more complete description of indicators.

[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

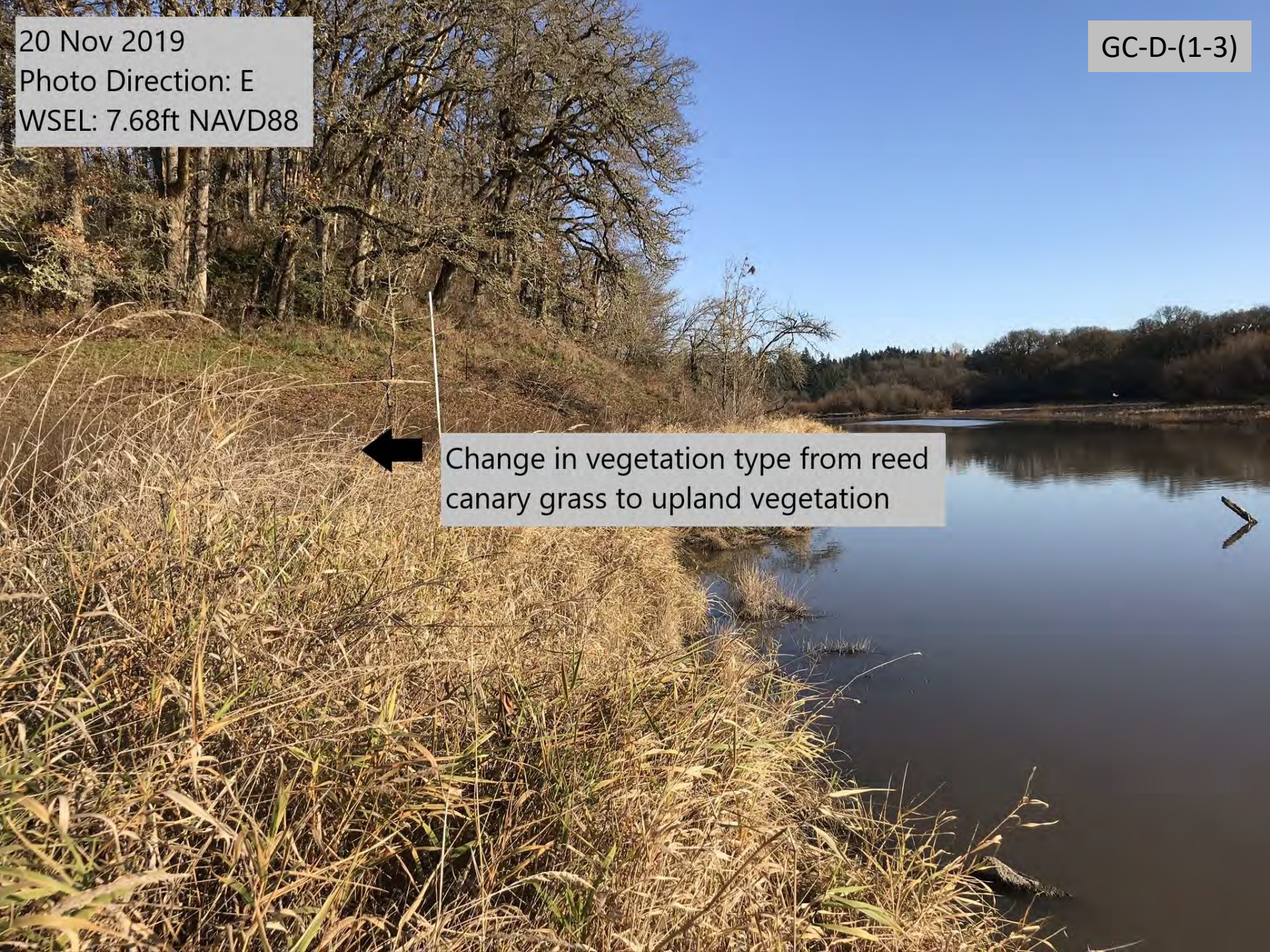
	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	☒ Top of bank ☒ Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) ☒ Benches	○ Willows ○ Western red cedar ○ Vine maple (streams) ○ Black cottonwood ○ Red alder ○ Salmonberry ○ Nootka rose oregon ash ○ Maidenhair and lady fern ○ Blackberries ○ Dunegrasses reed canarygrass	○ Sediment lines on vegetation or other fixed objects ☒ Change from channel deposits to older alluvium. ○ Darker stain lines on fixed objects ○ Exposed roots/root scour. ○ Drainage patterns, as evidenced by flattened vegetation ○ Weathered and buried driftwood
Above OHWM	☒ Hillslope toe ☒ Terraces or alluvium with an organic horizon or other developed soil horizons ○ Relic floodplain surface ☒ Well developed soil A andB horizons/duff layer	○ Indian plum ○ Red alder ○ Western red cedar ○ Douglas fir ○ Western hemlock ○ Ponderosa pine ☒ Oregon white oak ○ Coast pine oregon ○ Quaking aspen ash ○ Vine maple (lakes) ○ Blackberries	○ Lighter or no staining on fixed objects ○ Overbank deposits

Notes

There is vegetation below the OHWM such as reed canary grass and needle spikerush. The edge of the OHWM has a clear area of less vegetation



Below	Plant Distribution Across OHWM Gradient				
~~Above~~ OHWM		At/Straddling OHWM		Above OHWM	
reed canarygrass	FACW	Oregon ash	FACW	Oregon ash	FACW
needle spikerush	OBL	reed canarygrass	FACW	Oregon white oak	FACU


20 Nov 2019
Photo Direction: E
WSEL: 7.68ft NAVD88
GC-D-(1-3)
Change in vegetation type from reed canary grass to upland vegetation

Appendix A: Field data form

General Information

Site/Project Name/Owner:	Wapato Valley/ Plas Newydd Farm
Location:	Gee Creek
Description:	45.848399 - 122.777329 points: GJC - E - (1-3)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

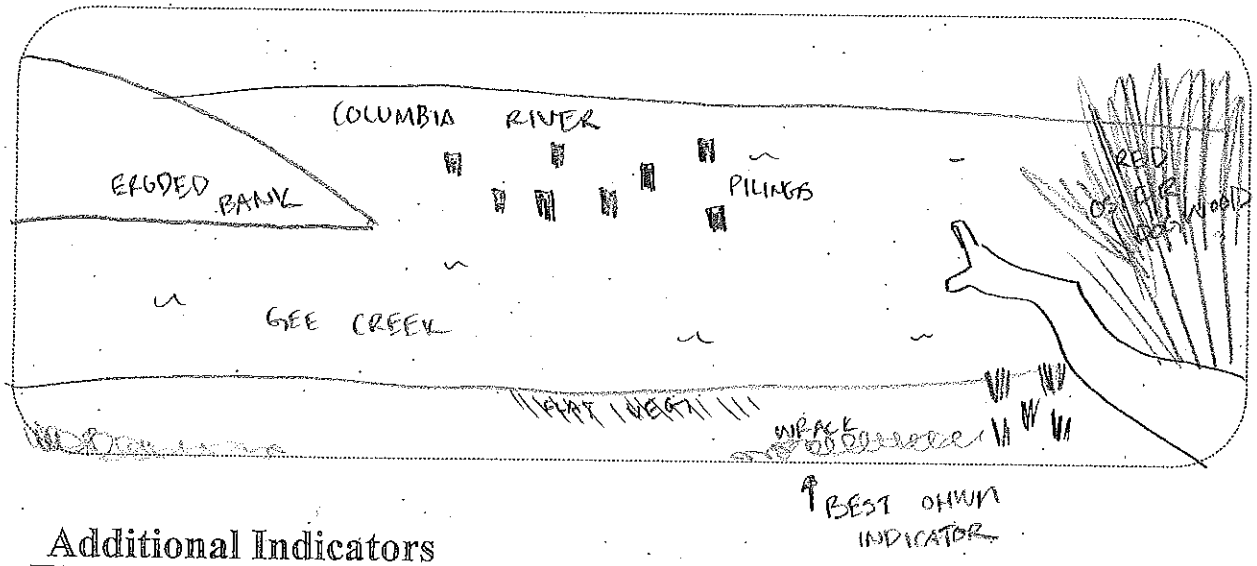
Date of site visit:	12 - 3 - 2019			
Time of site visit:	10:00			
Weather conditions:	full sun			
Watershed development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Reach development:	Highly developed ○		Mod. Developed ⊗	Undeveloped ○
Recent site disturbance?	No ⊗	Yes ○	Describe:	
Upstream flow control devices?	No ○	Yes ⊗	Describe:	
Bank armoring at the site?	No ⊗	Yes ○	Describe:	
Bank armoring up or downstream?	No ○	Yes ⊗	Describe:	
Observable tidal backwater?	No ○	Yes ⊗		
In-water structures? (i.e. bridge pilings, railroad embankments)	No ○	Yes ⊗	Describe: pilings in Columbia River	
Animals grazing in riparian zone?	No ⊗	Yes ○	Describe:	
Observable beaver activity?	No ⊗	Yes ○	Describe:	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

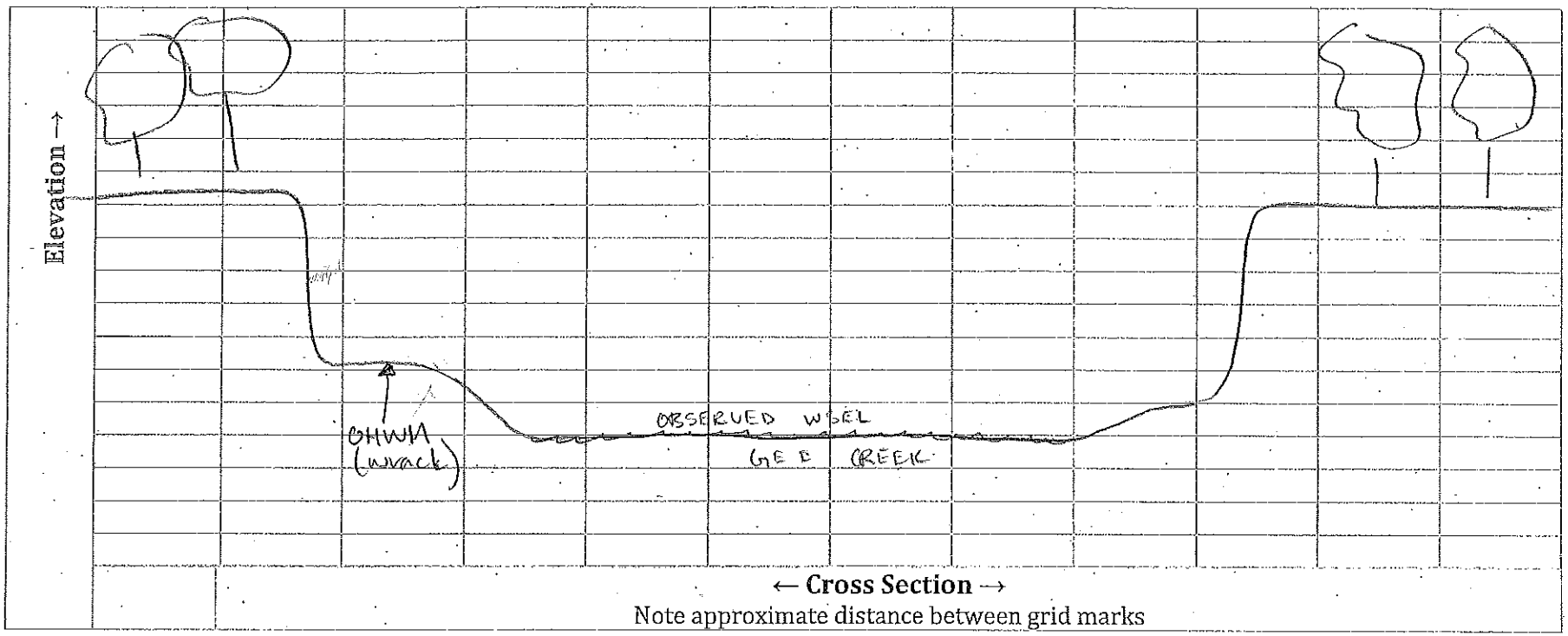
	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	o Sediment bars o Scour line o Clean cobbles/boulders. ø Bank erosion/scour o Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage o Aquatic plants	o Exposed roots/root scour ø Drainage patterns, as shown by flattened vegetation ø Aquatic animals o Algal mats o Iron staining

[24] Refer to Chapter 4 for a more complete description of indicators.

[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank o Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) x Benches	o Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder x (very abundant) o Salmonberry o Nootka rose o Maidenhair and lady fern o Blackberries o Dunegrasses	o Sediment lines on vegetation or other fixed objects o Change from channel deposits to older alluvium. o Darker stain lines on fixed objects o Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation x Weathered and buried driftwood
Above OHWM	o Hillslope toe x Terraces or alluvium with an organic horizon or other developed soil horizons x Relic floodplain surface x Well developed soil A andB horizons/duff layer	o Indian plum x Oregon ash o Red alder o Western red cedar o Douglas fir o Western hemlock o Ponderosa pine o Oregon white oak o Coast pine o Quaking aspen o Vine maple (lakes) x Blackberries	x Lighter or no staining on fixed objects o Overbank deposits

Notes



Plant Distribution Across OHWM Gradient

Below ~~Above~~ OHWM		At/Straddling OHWM		Above OHWM	
none		slough sedge	OBL	Oregon ash	FACW
		reed canarygrass	FACW	himalaya blackberry	FACW
				reed canarygrass	FACW
				red-osier dogwood	FACW


3 Dec 2019
Photo Direction: S
WSEL: 8.39ft NAVD88
GC-E-(1-3)
OHWM: Wrack line

Appendix A: Field data form

General Information

Site/Project Name/Owner: Wapato Valley/Pias Newfield LLC
Location: Lancaster Lake
Description: 45.8489606, -122.751122 points: LL-A-(1-4)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

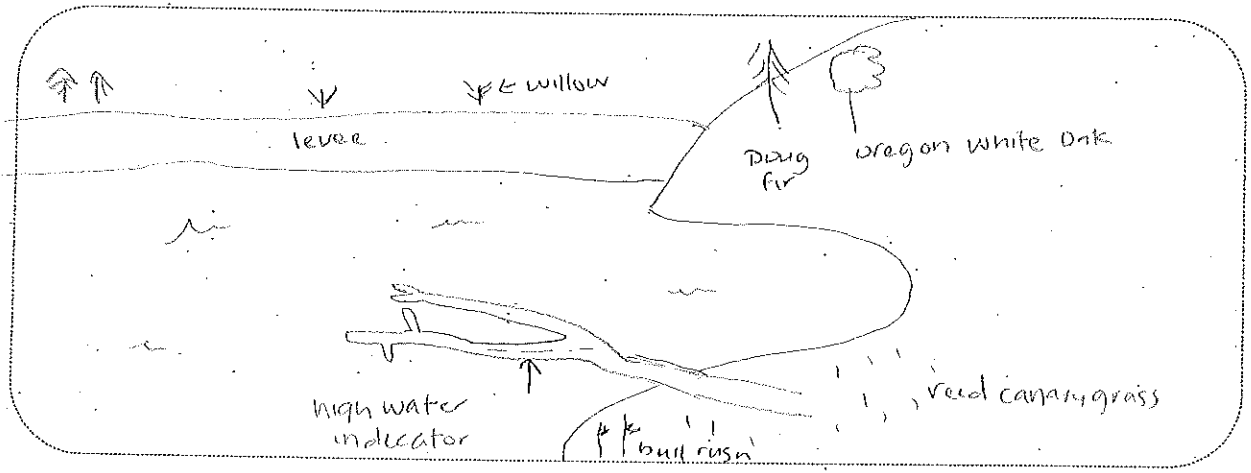
Date of site visit:	Nov 19 2019			
Time of site visit:	11:23			
Weather conditions:	Over cast			
Watershed development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Reach development:	Highly developed ○		Mod. Developed ⊗	Undeveloped ○
Recent site disturbance?	No ⊗	Yes ○	Describe:	
Upstream flow control devices?	No ○	Yes ⊗	Describe: levee with tide gate	
Bank armoring at the site?	No ○	Yes ⊗	Describe: levee	
Bank armoring up or downstream?	No ⊗	Yes ○	Describe: lake is impounded	
Observable tidal backwater?	No ⊗	Yes ○		
In-water structures? (i.e. bridge pilings, railroad embankments)	No ○	Yes ⊗	Describe: levee and tide gate	
Animals grazing in riparian zone?	No ⊗	Yes ○	Describe:	
Observable beaver activity?	No ○	Yes ⊗	Describe: Beaver channels	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	o Sediment bars o Scour line o Clean cobbles/boulders. o Bank erosion/scour o Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage o Aquatic plants	o Exposed roots/root scour o Drainage patterns, as shown by flattened vegetation o Aquatic animals o Algal mats o Iron staining

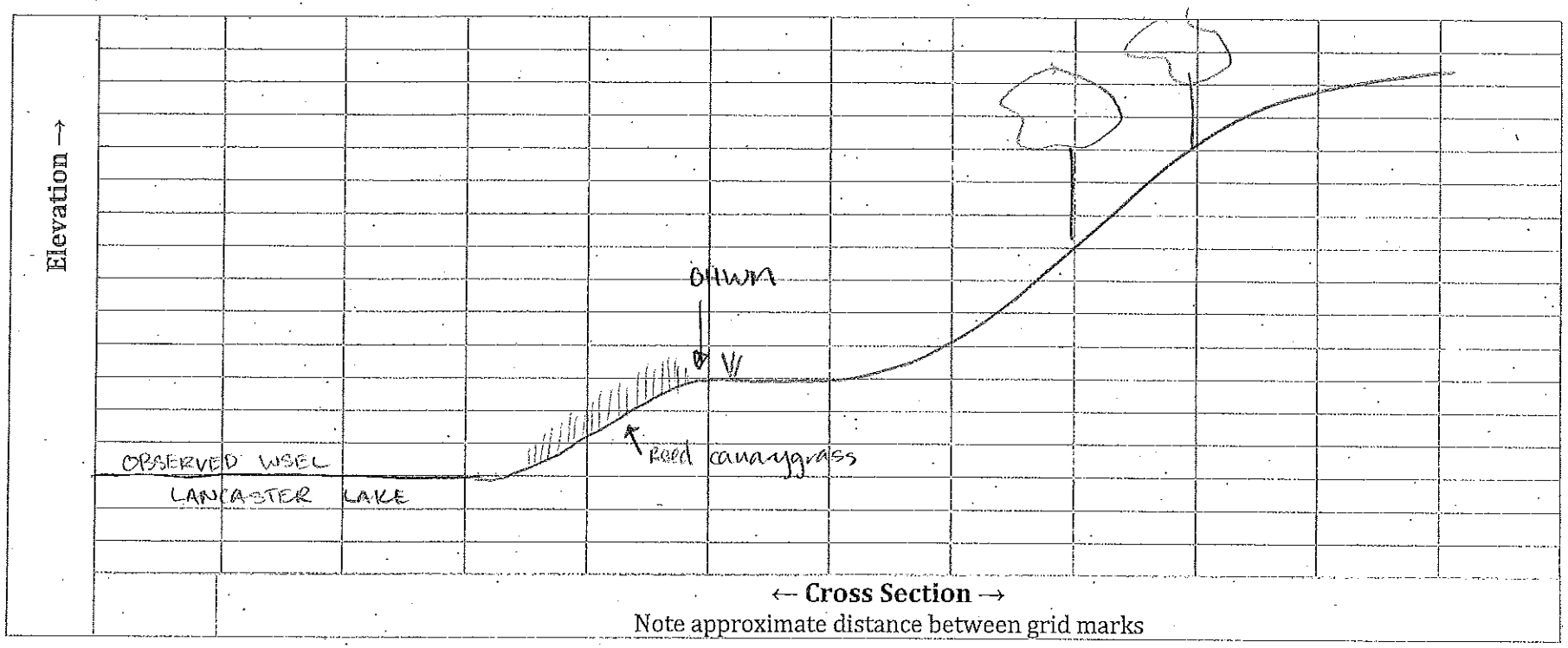
[24] Refer to Chapter 4 for a more complete description of indicators.

[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank x Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) o Benches	o Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder o Salmonberry o Nootka rose o Maidenhair and lady fern o Blackberries o Dunegrasses reed canary grass	x Sediment lines on vegetation or other fixed objects o Change from channel deposits to older alluvium. x Darker stain lines on fixed objects o Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation o Weathered and buried driftwood
Above OHWM	x Hillslope toe x Terraces or alluvium with an organic horizon or other developed soil horizons o Relic floodplain surface x Well developed soil A andB horizons/duff layer	o Indian plum o Red alder o Western red cedar x Douglas fir o Western hemlock o Ponderosa pine x Oregon white oak o Coast pine o Quaking aspen x Vine maple (lakes) x Blackberries	o Lighter or no staining on fixed objects o Overbank deposits

Notes

Impounded lake. A tree fell over and there is sediment staining at OHWM. Vegetation consists of reed canarygrass and soft rush



Note approximate distance between grid marks

Plant Distribution Across OHWM Gradient

Below ~~Above~~ OHWM		At/Straddling OHWM		Above OHWM	
reed canarygrass	FACW	reed canarygrass	FACW	Oregon white oak	FACU
slough sedge	OBL			Oregon ash	FACW
				Scott's broom	NI
				licorice fern	NI


19 Nov 2019
Photo Direction: S
WSEL: 8.70ft NAVD88
LL-A-(1-4)
OHWM: Sediment line on tree

Appendix A: Field data form

General Information

Site/Project Name/Owner: Wapato Valley/Plas Nwydd LLC
Location: Lancaster Lake
Description: 45.850023 -122.750232
points: LL-B-(1-8)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

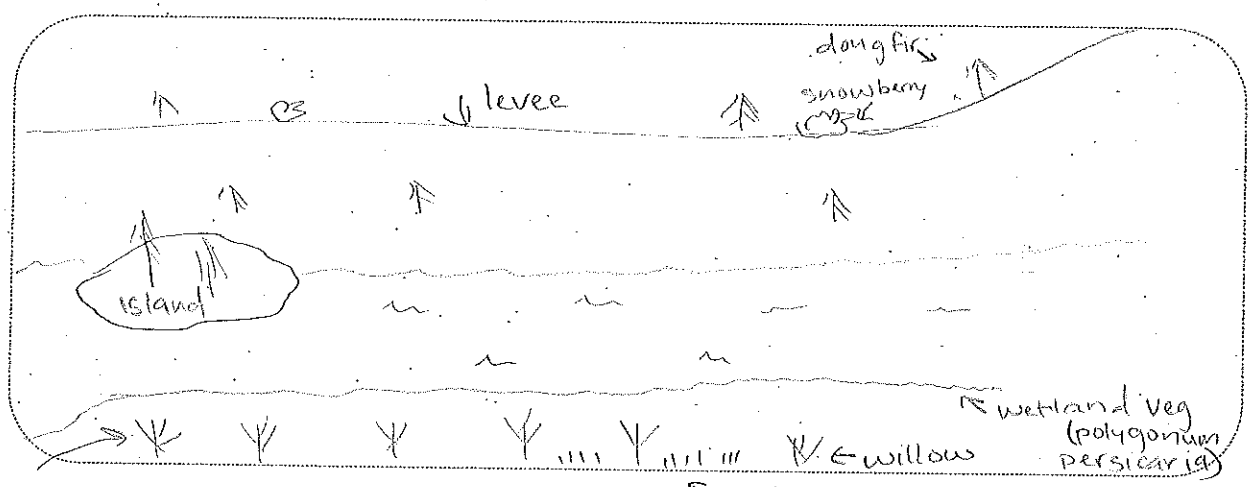
Date of site visit:	Nov 19 2019			
Time of site visit:	10:43			
Weather conditions:	overcast			
Watershed development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Reach development:	Highly developed ○		Mod. Developed ⊗	Undeveloped ○
Recent site disturbance?	No ⊗	Yes ○	Describe:	
Upstream flow control devices?	No ○	Yes ⊗	Describe: tide gate	
Bank armoring at the site?	No ○	Yes ⊗	Describe: Levee with tide gate	
Bank armoring up or downstream?	No ⊗	Yes ○	Describe: lake is impounded	
Observable tidal backwater?	No ⊗	Yes ○		
In-water structures? (i.e. bridge pilings, railroad embankments)	No ○	Yes ⊗	Describe: levee and tide gate	
Animals grazing in riparian zone?	No ⊗	Yes ○	Describe:	
Observable beaver activity?	No ○	Yes ⊗	Describe: Beaver channel	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



willows are site OHWM indicators

Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	o Sediment bars o Scour line o Clean cobbles/boulders. o Bank erosion/scour o Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage x Aquatic plants	o Exposed roots/root scour o Drainage patterns, as shown by flattened vegetation x Aquatic animals o Algal mats o Iron staining

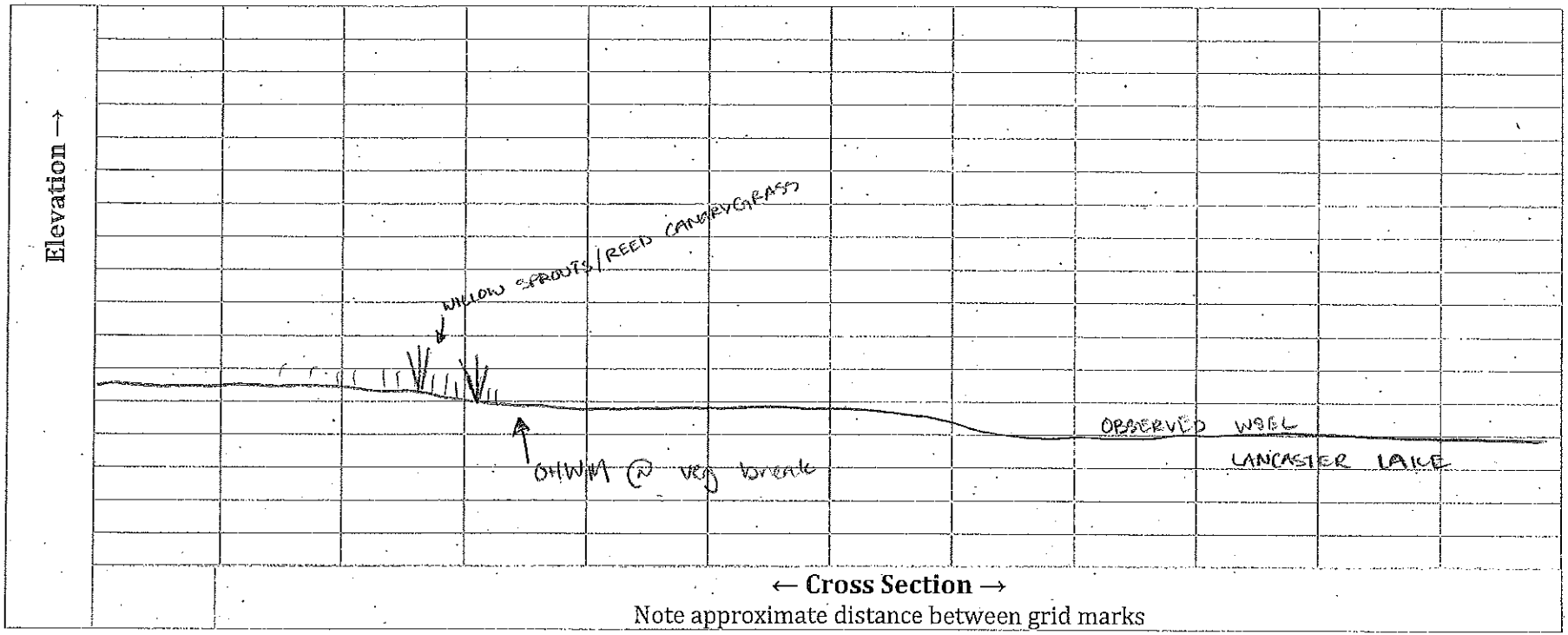
[24] Refer to Chapter 4 for a more complete description of indicators.

[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank o Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) o Benches	Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder o Salmonberry o Nootka rose o Maidenhair and lady fern o Blackberries o Dunegrasses	o Sediment lines on vegetation or other fixed objects o Change from channel deposits to older alluvium. o Darker stain lines on fixed objects o Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation o Weathered and buried driftwood
Above OHWM	Hillslope toe o Terraces or alluvium with an organic horizon or other developed soil horizons Relic floodplain surface Well developed soil A andB horizons/duff layer	o Indian plum o Red alder o Western red cedar Douglas fir o Western hemlock o Ponderosa pine Oregon white oak o Coast pine o Quaking aspen Vine maple (lakes) Blackberries	o Lighter or no staining on fixed objects o Overbank deposits

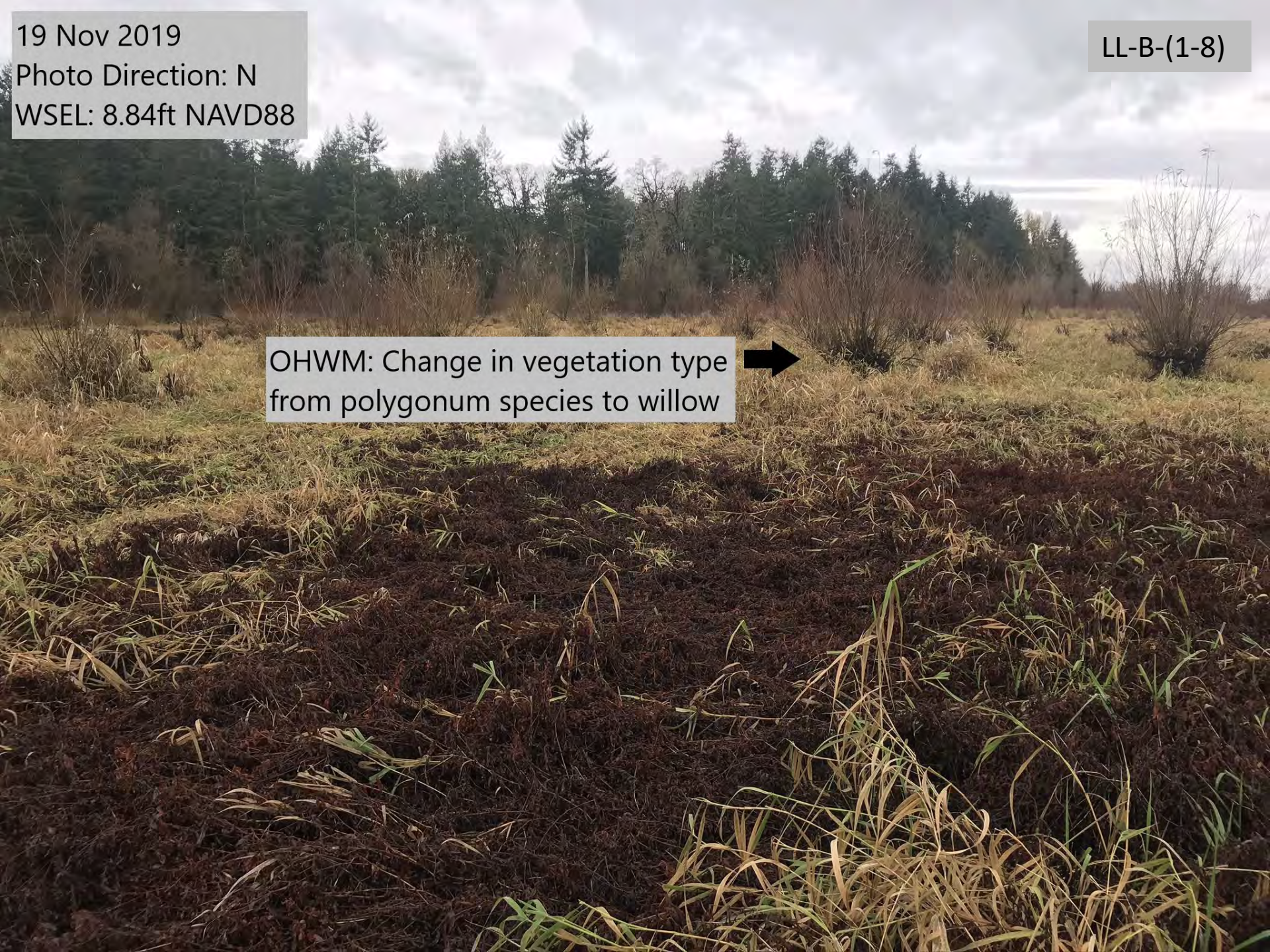
Notes

This is an impounded lake. There is a break in vegetation habitats. Polygonums is at lower elevation and reed canary grass and willows are at higher elevations indicating OHWM



Plant Distribution Across OHWM Gradient

Below OHWM		At/Straddling OHWM		Above OHWM	
spotted ladysthumb	FACW	reed canarygrass	FACW	willows (mature)	FACW
nodding beggarstick	OBL	willow (sprouts)	FACW	reed canarygrass	FACW
wapato	OBL				


19 Nov 2019
Photo Direction: N
WSEL: 8.84ft NAVD88
LL-B-(1-8)
OHWM: Change in vegetation type
from polygonum species to willow

Appendix A: Field data form

General Information

Site/Project Name/Owner:	Wapato Valley / Plas Newydd Farm
Location:	Lancaster Lake
Description:	45.85181, -122.7480898
	points: LL-C-(1-6)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

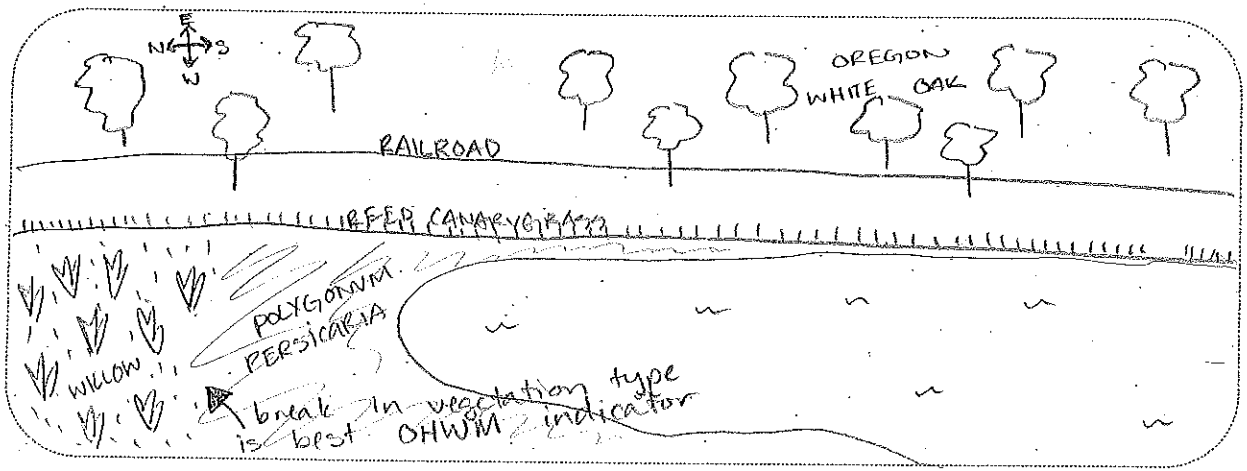
Date of site visit:	11-19-2019			
Time of site visit:	11:05			
Weather conditions:	overcast			
Watershed development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Reach development:	Highly developed ○		Mod. Developed ⊗	Undeveloped ○
Recent site disturbance?	No ⊗	Yes ○	Describe:	
Upstream flow control devices?	No ○	Yes ⊗	Describe: Levee w/ tidegate water control structure that block tidal influence.	
Bank armoring at the site?	No ○	Yes ⊗	Describe: Levee is armored	
Bank armoring up or downstream?	No ○	Yes ⊗	Describe: Levee and parts of Gee Creek upstream	
Observable tidal backwater?	No ⊗	Yes ○		
In-water structures? (i.e. bridge pilings, railroad embankments)	No ○	Yes ⊗	Describe: Levee w/ tidegate	
Animals grazing in riparian zone?	No ⊗	Yes ○	Describe:	
Observable beaver activity?	No ○	Yes ⊗	Describe: Several channels, lodges and a small dam.	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	○ Sediment bars ○ Scour line ○ Clean cobbles/boulders. ○ Bank erosion/scour ○ Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: ○ Willows ☒ Polygonum ○ Black cottonwood persicaria ○ Japanese knotweed + other ○ Skunk cabbage wetland ☒ Aquatic plants species	○ Exposed roots/root scour ○ Drainage patterns, as shown by flattened vegetation ☒ Aquatic animals ○ Algal mats ○ Iron staining

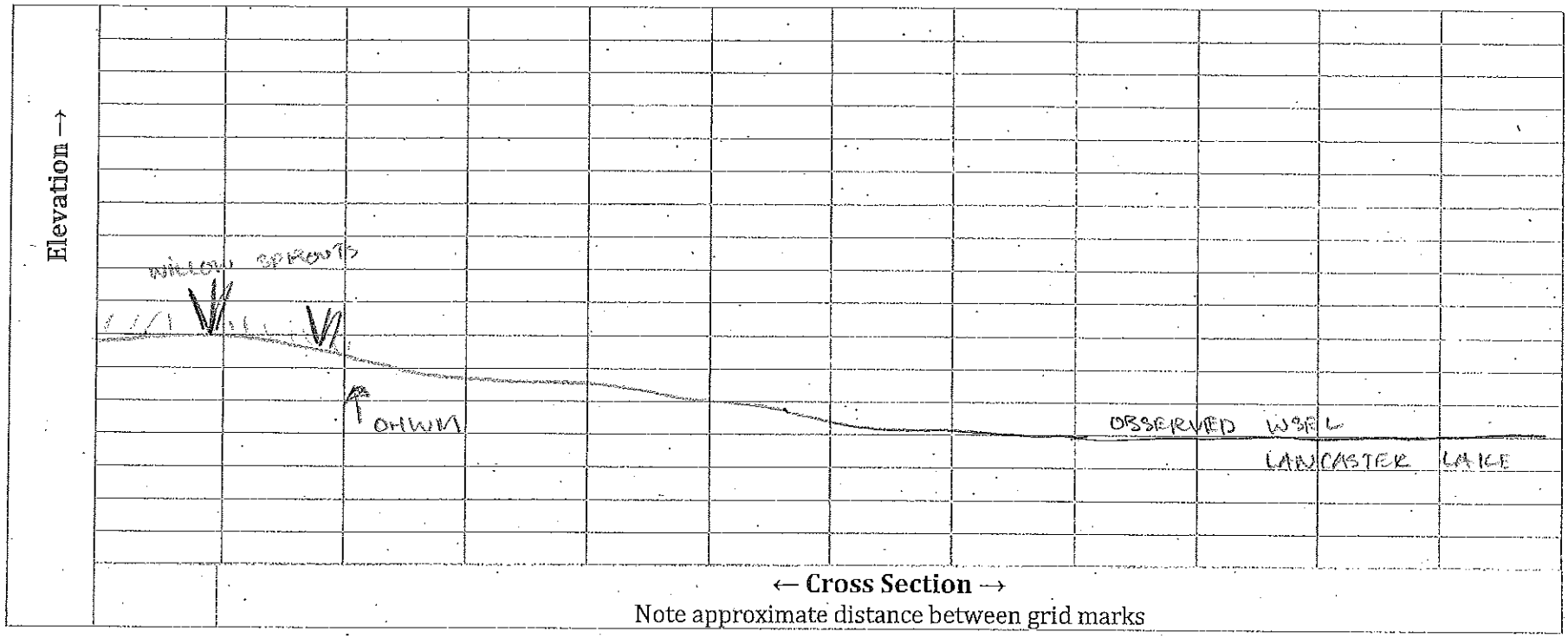
[24] Refer to Chapter 4 for a more complete description of indicators.

[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank o Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) o Benches	⊗ Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder * Reed canarygrass o Salmonberry o Nootka rose o Maidenhair and lady fern o Blackberries o Dunegrasses	o Sediment lines on vegetation or other fixed objects o Change from channel deposits to older alluvium. o Darker stain lines on fixed objects o Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation o Weathered and buried driftwood
Above OHWM	⊗ Hillslope toe o Terraces or alluvium with an organic horizon or other developed soil horizons o Relic floodplain surface ⊗ Well developed soil A andB horizons/duff layer	o Indian plum o Red alder * Oregon ash o Western red cedar o Douglas fir o Western hemlock o Ponderosa pine ⊗ Oregon white oak o Coast pine o Quaking aspen ⊗ Vine maple (lakes) ⊗ Blackberries	o Lighter or no staining on fixed objects o Overbank deposits

Notes

Lancaster Lake is impounded at its southern end where it drains into Gee Creek but is blocked from tidal influence. Beaver have created many channels, lodges and a dam. Water from adjacent farm fields drains into the lake via ditches on the northeast and northwest points of the lake.



Plant Distribution Across OHWM Gradient

Below OHWM		At/Straddling OHWM		Above OHWM	
spotted ladysthumb	FACW	reed canarygrass	FACW	willow (mature)	FACW
nodding beggarstick	OBL	willow (sprouts)	FACW	reed canarygrass	FACW
wapato	OBL				


19 Nov 2019
Photo Direction: E
WSEL: 8.72ft NAVD88
LL-C-(1-6)
OHWM: Change in vegetation type
from polygonum species to willow

LL

Appendix A: Field data form

General Information

Site/Project Name/Owner:	Wapato Valley / Plas Newydd Farm
Location:	Lancaster Lake
Description:	45.8480893, -122.7504188
points:	LL-D-(1-4)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

Date of site visit:	12-4-2019			
Time of site visit:	11:30			
Weather conditions:	sun			
Watershed development:	Highly developed ○		Mod. Developed ○	Undeveloped ○
Reach development:	Highly developed ○		Mod. Developed ○	Undeveloped ○
Recent site disturbance?	No ⊗	Yes ○	Describe:	
Upstream flow control devices?	No ○	Yes ⊗	Describe:	tidegate between lake and Gee Creek
Bank armoring at the site?	No ○	Yes ⊗	Describe:	levee w/ tidegate
Bank armoring up or downstream?	No ⊗	Yes ○	Describe:	lake is impounded
Observable tidal backwater?	No ⊗	Yes ○		
In-water structures? (i.e. bridge pilings, railroad embankments)	No ○	Yes ⊗	Describe:	levee and tidegate
Animals grazing in riparian zone?	No ⊗	Yes ○	Describe:	
Observable beaver activity?	No ○	Yes ⊗	Describe:	beaver lodges and channel

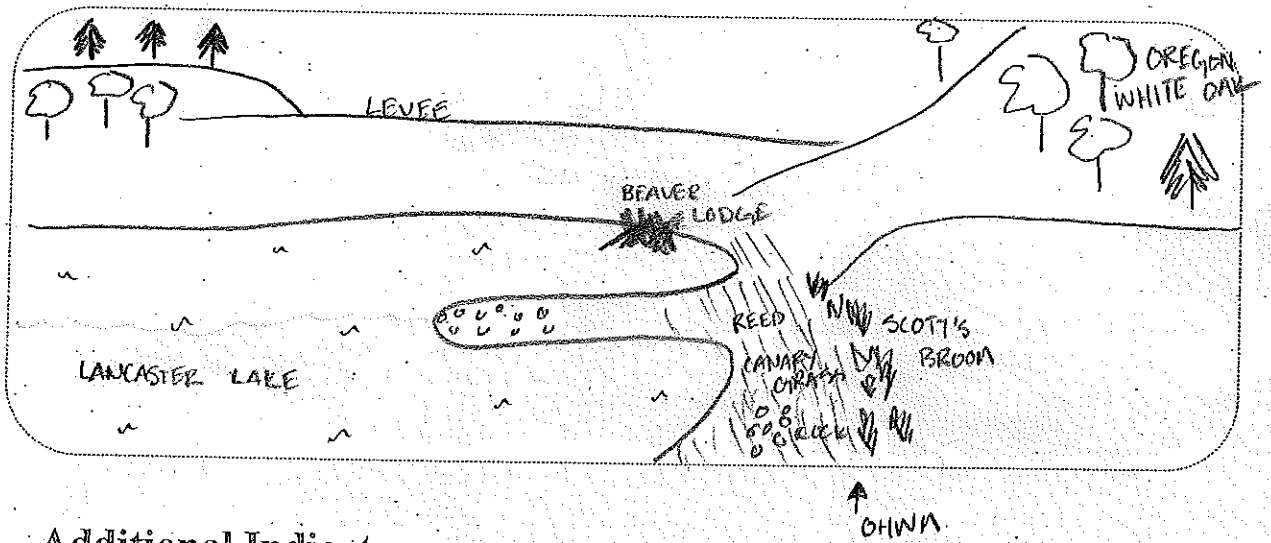
Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

LL

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	o Sediment bars o Scour line ☒ Clean cobbles/boulders. o Bank erosion/scour ☒ Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage ☒ Aquatic plants	o Exposed roots/root scour o Drainage patterns, as shown by flattened vegetation ☒ Aquatic animals o Algal mats o Iron staining

[24] Refer to Chapter 4 for a more complete description of indicators.

[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

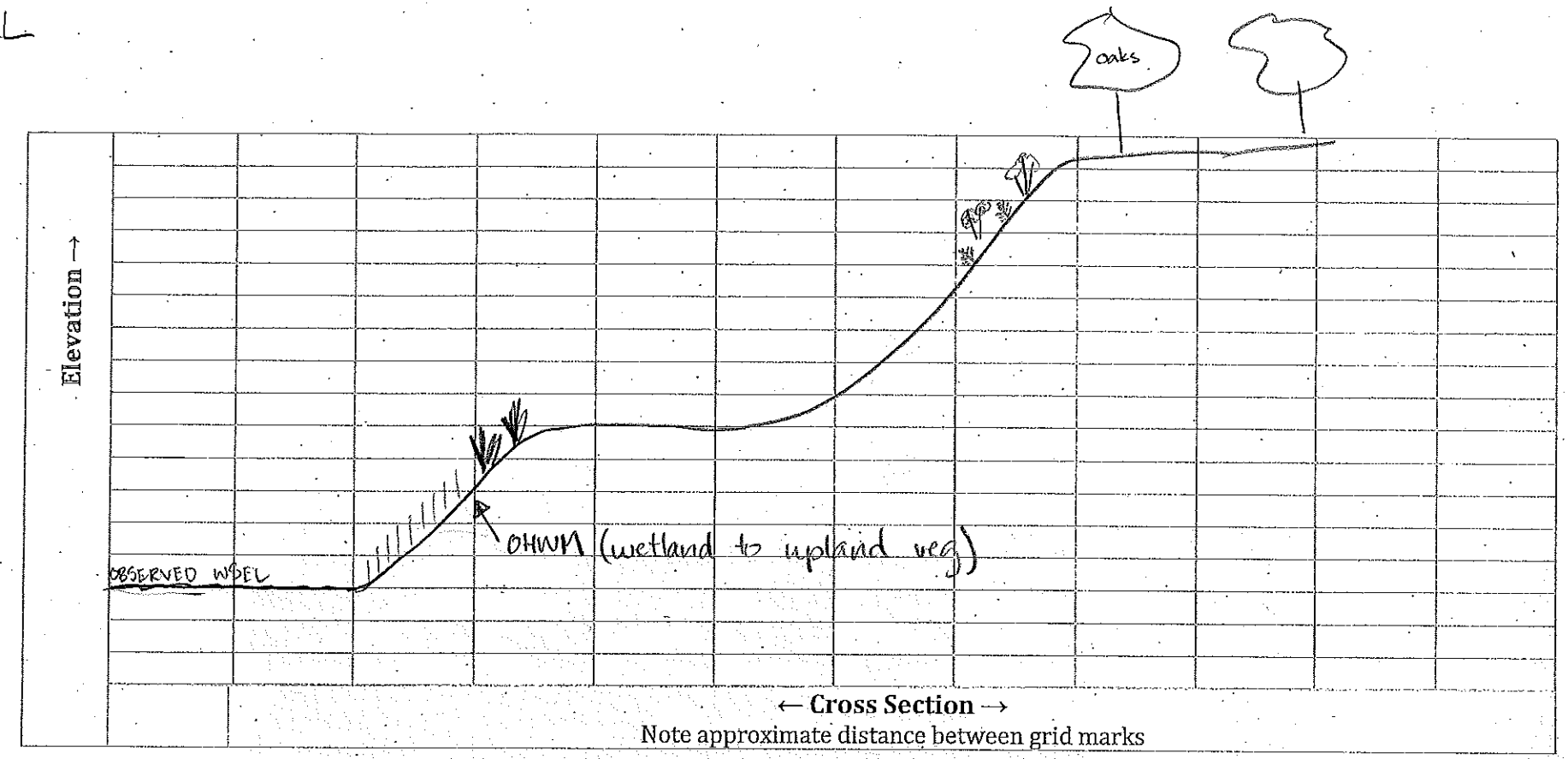
LL

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank o Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) o Benches	o Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder * reed o Salmonberry canarygrass o Nootka rose o Maidenhair and lady fern o Blackberries o Dunegrasses	o Sediment lines on vegetation or other fixed objects o Change from channel deposits to older alluvium. o Darker stain lines on fixed objects o Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation o Weathered and buried driftwood
Above OHWM	ø Hillslope toe o Terraces or alluvium with an organic horizon or other developed soil horizons o Relic floodplain surface o Well developed soil A andB horizons/duff layer	o Indian plum *Scotb o Red alder o Western red cedar broom o Douglas fir o Western hemlock * cans o Ponderosa pine ø Oregon white oak o Coast pine o Quaking aspen o Vine maple (lakes) ø Blackberries	o Lighter or no staining on fixed objects o Overbank deposits

Notes

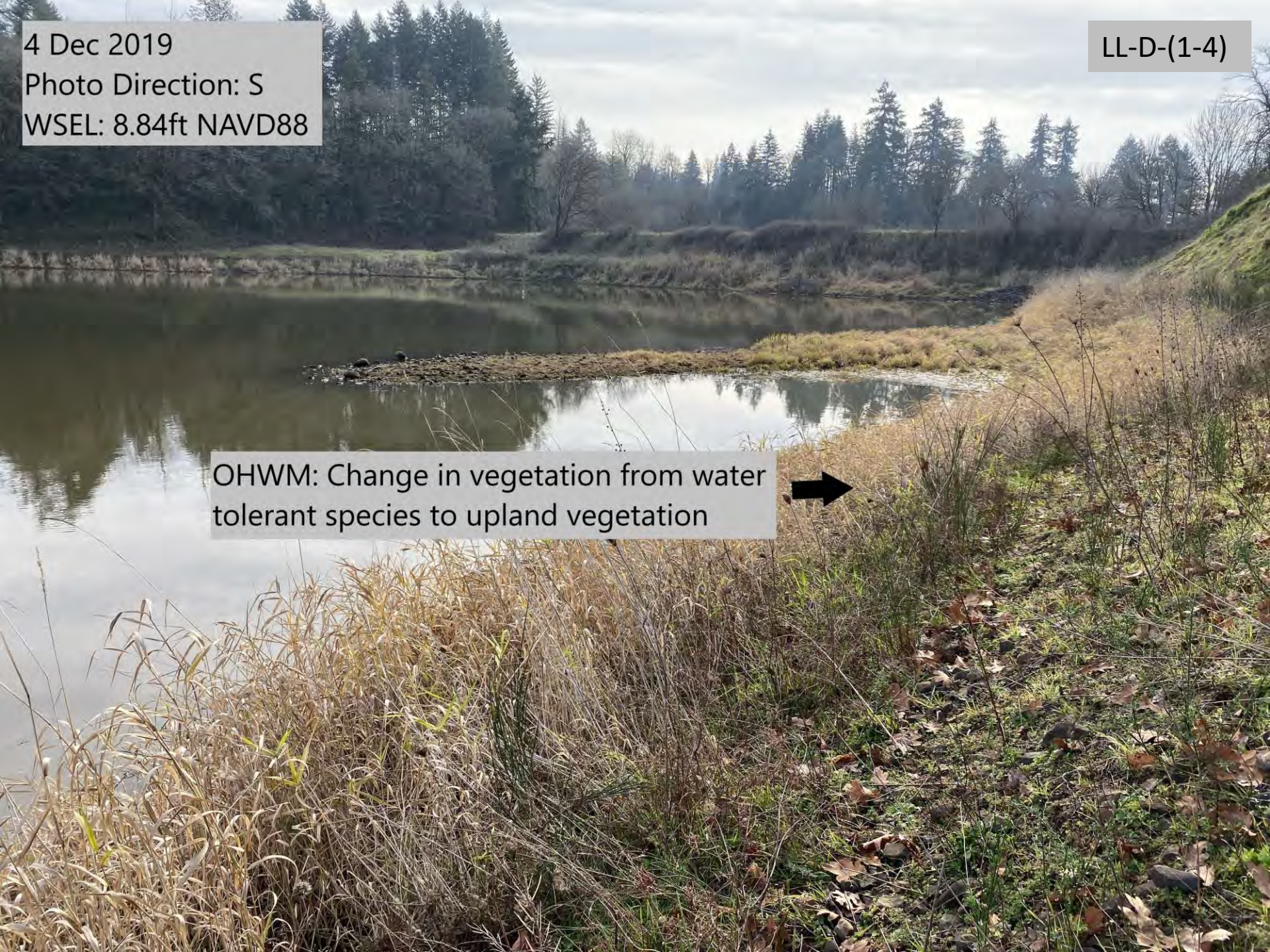
The best indicator here is the break between more water tolerant reed canarygrass and upland Scott's broom.

LL



Plant Distribution Across OHWM Gradient

Below OHWM		At/Straddling OHWM		Above OHWM	
rough cocklebur	FAC	reed canarygrass	FACW	Scott's broom	NI
reed canarygrass	FACW	Robert geranium	FACU	queen Anne's lace	UPL
		birdsfoot trefoil	FACU	licorice fern	NI
		Scott's broom	NI	Oregon white oak	FACU
				Douglas fir	FACU
				oxeye daisy	FACU
				camas	FACW
				snowberry	FACU
				shiny geranium	NI
				barnyard grass	FAC


4 Dec 2019
Photo Direction: S
WSEL: 8.84ft NAVD88
LL-D-(1-4)
OHWM: Change in vegetation from water tolerant species to upland vegetation

Appendix A: Field data form

General Information

Site/Project	Wapato Valley
Name/Owner:	Plas Newpald Farm
Location:	Lewis River
Description:	45.8636632, -122.7508188
	points: LR-A-(1-2)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

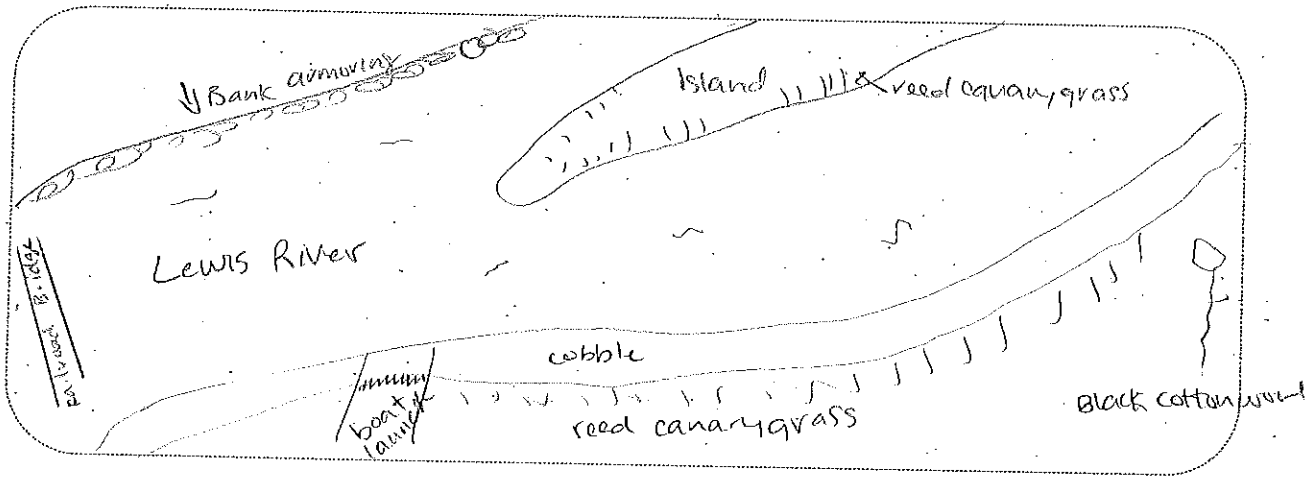
Date of site visit:	20 Nov 2019			
Time of site visit:	15:39			
Weather conditions:	Full Sun			
Watershed development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Reach development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Recent site disturbance?	No ⊗	Yes ○	Describe:	
Upstream flow control devices?	No ○	Yes ⊗	Describe: Merwin Dam/Bonneville Dam	
Bank armoring at the site?	No ○	Yes ⊗	Describe: rock armoring	
Bank armoring up or downstream?	No ○	Yes ⊗	Describe: Both up and down stream	
Observable tidal backwater?	No ○	Yes ⊗		
In-water structures? (i.e. bridge pilings, railroad embankments)	No ○	Yes ⊗	Describe: Railroad embankments/ pilings	
Animals grazing in riparian zone?	No ⊗	Yes ○	Describe:	
Observable beaver activity?	No ○	Yes ⊗	Describe: beaver chews	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	o Sediment bars o Scour line o Clean cobbles/boulders. o Bank erosion/scour Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage Aquatic plants	o Exposed roots/root scour o Drainage patterns, as shown by flattened vegetation Aquatic animals o Algal mats o Iron staining

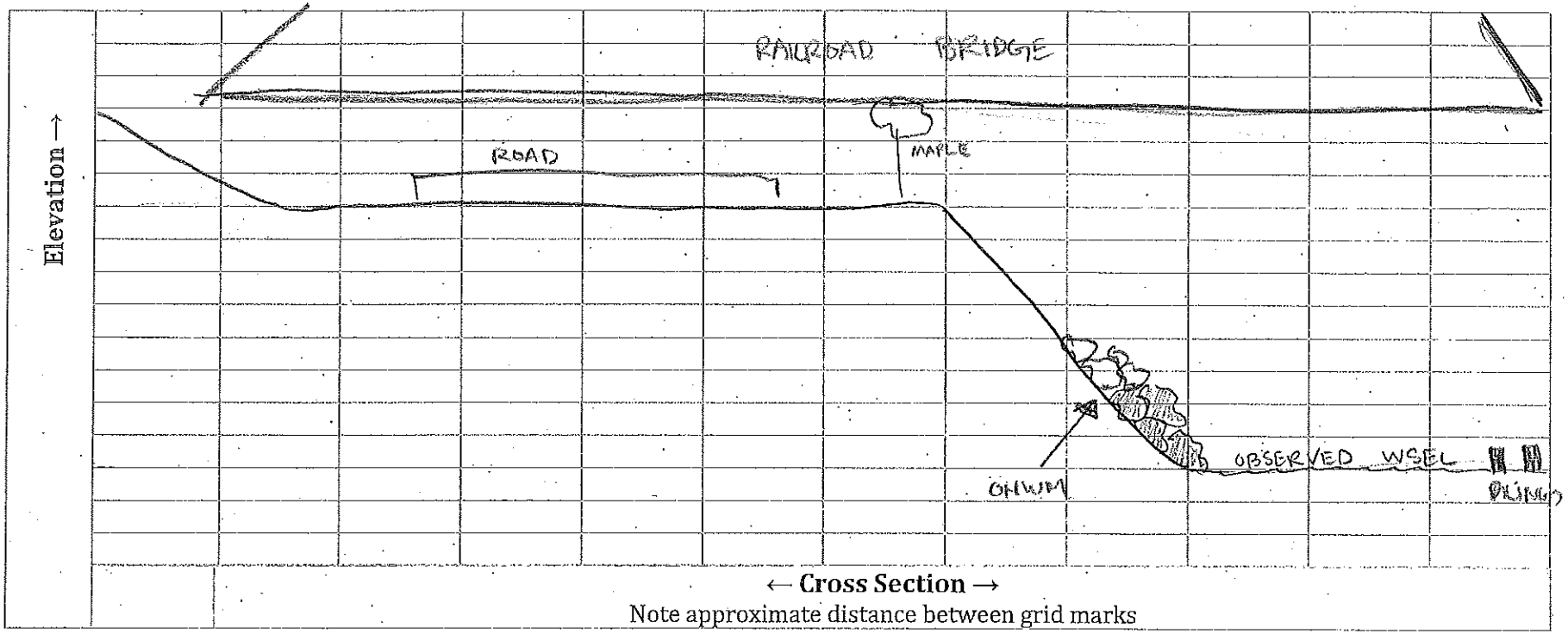
[24] Refer to Chapter 4 for a more complete description of indicators.

[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank ☒ Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) o Benches	o Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder o Salmonberry o Nootka rose o Maidenhair and lady fern o Blackberries *red* o Dunegrasses *cannygrass*	☒ Sediment lines on vegetation or other fixed objects ☒ Change from channel deposits to older alluvium. ☒ Darker stain lines on fixed objects o Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation o Weathered and buried driftwood
Above OHWM	o Hillslope toe o Terraces or alluvium with an organic horizon or other developed soil horizons o Relic floodplain surface o Well developed soil A andB horizons/duff layer	o Indian plum o Red alder o Western red cedar o Douglas fir o Western hemlock o Ponderosa pine o Oregon white oak o Coast pine *black cottonwood* o Quaking aspen o Vine maple (lakes) ☒ Blackberries	o Lighter or no staining on fixed objects o Overbank deposits

Notes

At this site the vegetation break along the shoreline and sediment deposits on riprap and a boat launch were used as the best OHWM indicators.



Below	Plant Distribution Across OHWM Gradient				
~~Above~~ OHWM		At/Straddling OHWM		Above OHWM	
reed canarygrass	FACW	red-osier dogwood	FACW	himalaya blackberry	FACU
slough sedge	OBL	willow sp.	FACW	black cottonwood	NI
purple loosestrife	OBL	spirea	FACW	moss sp.	NI
woolly sedge	OBL	pennyroyal	OBL	western dock	FACW
sneezeweed	FACW			bigleaf maple	FACU
				queen Anne's lace	FACU


20 Nov 2019
Photo Direction: W
WSEL: 7.16ft NAVD88
LR-A-(1-2)
OHWM: Sediment line on rocks

Appendix A: Field data form

General Information

Site/Project Name/Owner:	Wapato Valley/ Plas Newydd Farm
Location:	Lewis River
Description:	45.8619055, -122.757252
	points: LR-B-(1-6)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

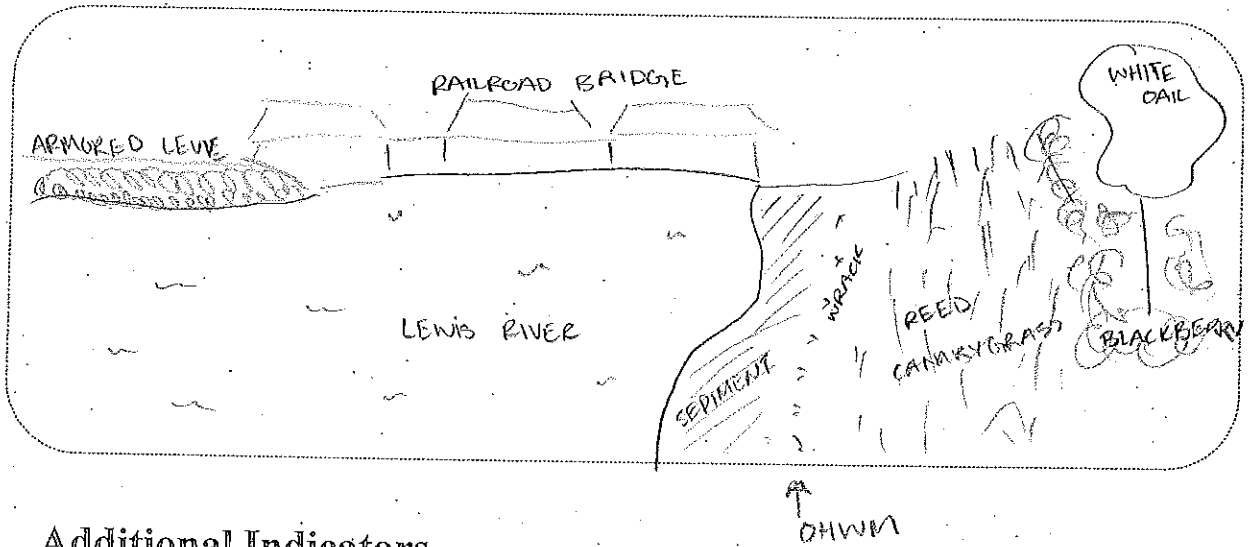
Date of site visit:	11-20-2019			
Time of site visit:	15:30			
Weather conditions:	full sun			
Watershed development:	Highly developed ⊘		Mod. Developed O	Undeveloped O
Reach development:	Highly developed ⊘		Mod. Developed O	Undeveloped O
Recent site disturbance?	No ⊘	Yes O	Describe:	
Upstream flow control devices?	No O	Yes ⊘	Describe: Merwin Dam	
Bank armoring at the site?	No O	Yes ⊘	Describe: Riprap on both sides	
Bank armoring up or downstream?	No O	Yes ⊘	Describe: both sides up and down	
Observable tidal backwater?	No O	Yes ⊘		
In-water structures? (i.e. bridge pilings, railroad embankments)	No O	Yes ⊘	Describe: railroad bridge, pilings	
Animals grazing in riparian zone?	No ⊘	Yes O	Describe:	
Observable beaver activity?	No ⊘	Yes O	Describe:	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	o Sediment bars o Scour line o Clean cobbles/boulders. o Bank erosion/scour ø Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage o Aquatic plants	o Exposed roots/root scour o Drainage patterns, as shown by flattened vegetation ø Aquatic animals o Algal mats o Iron staining

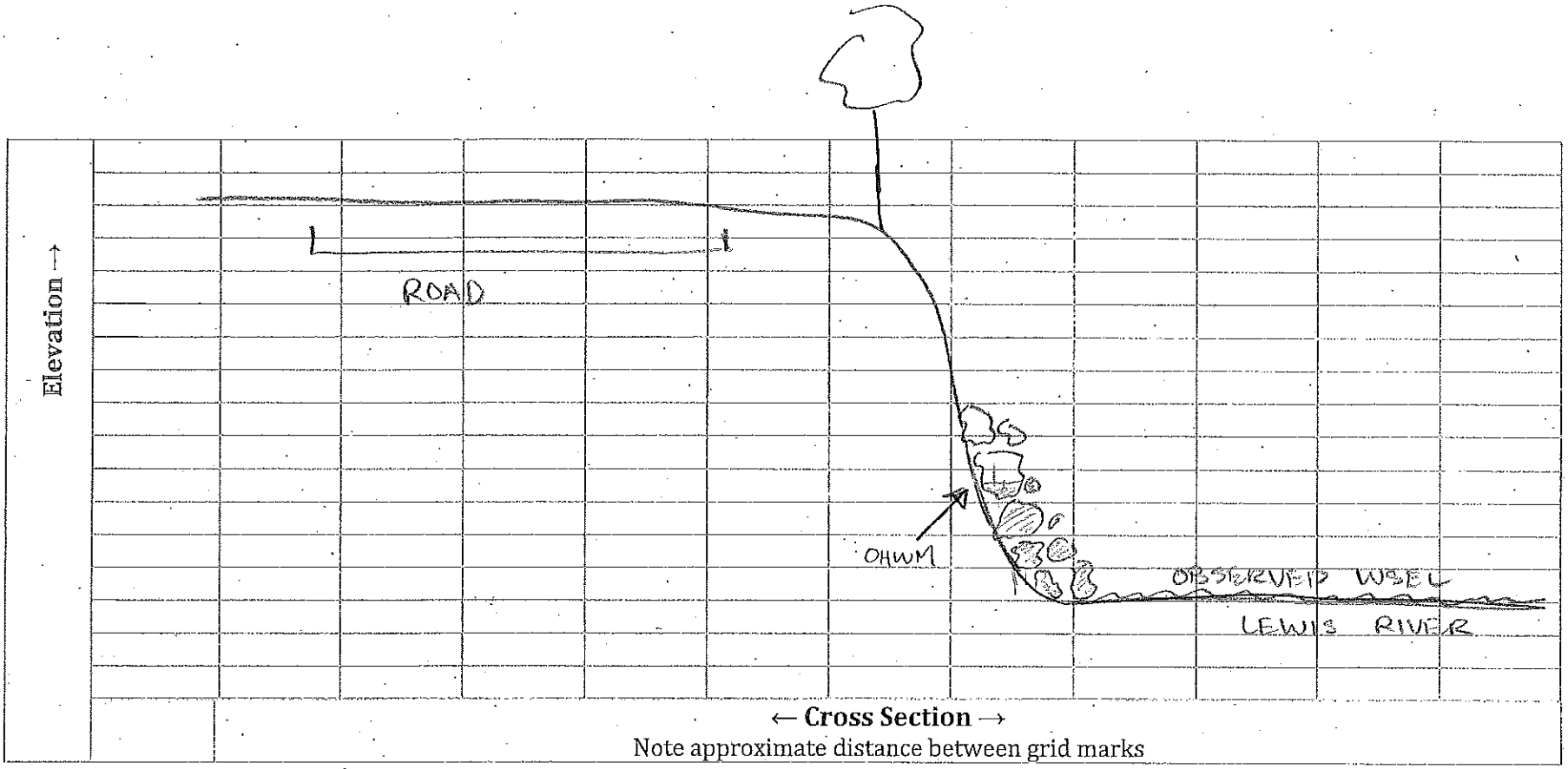
[24] Refer to Chapter 4 for a more complete description of indicators.

[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank o Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) o Benches	o Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder * reed canarygrass? o Salmonberry o Nootka rose o Maidenhair and lady fern o Blackberries o Dunegrasses	☒ Sediment lines on vegetation or other fixed objects o Change from channel deposits to older alluvium. ☒ Darker stain lines on fixed objects o Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation o Weathered and buried driftwood
Above OHWM	o Hillslope toe o Terraces or alluvium with an organic horizon or other developed soil horizons ☒ Relic floodplain surface ☒ Well developed soil A andB horizons/duff layer	o Indian plum o Red alder o Western red cedar o Douglas fir o Western hemlock o Ponderosa pine ☒ Oregon white oak o Coast pine o Quaking aspen o Vine maple (lakes) ☒ Blackberries	☒ Lighter or no staining on fixed objects o Overbank deposits

Notes

At this site sediment deposits on cobble and riprap were used, along with wrack on the sandy parts of the shoreline and the lowest extent of some native sedges.



Below	Plant Distribution Across OHWM Gradient				
~~Above~~ OHWM		At/Straddling OHWM		Above OHWM	
bare cobble or riprap		reed canarygrass	FACW	black cottonwood	NI
				Oregon white oak	FACU
				himalaya blackberry	FACU


20 Nov 2019
Photo Direction: SW
WSEL: 7.24ft NAVD88
LR-B-(1-6)
OHWM: Sediment line on rocks

Appendix A: Field data form

General Information

Site/Project Name/Owner:	Wapato Valley / Plas Newydd Farm
Location:	Lewis River
Description:	45.800006, -122.762723
	points: LR-C-(1-3)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

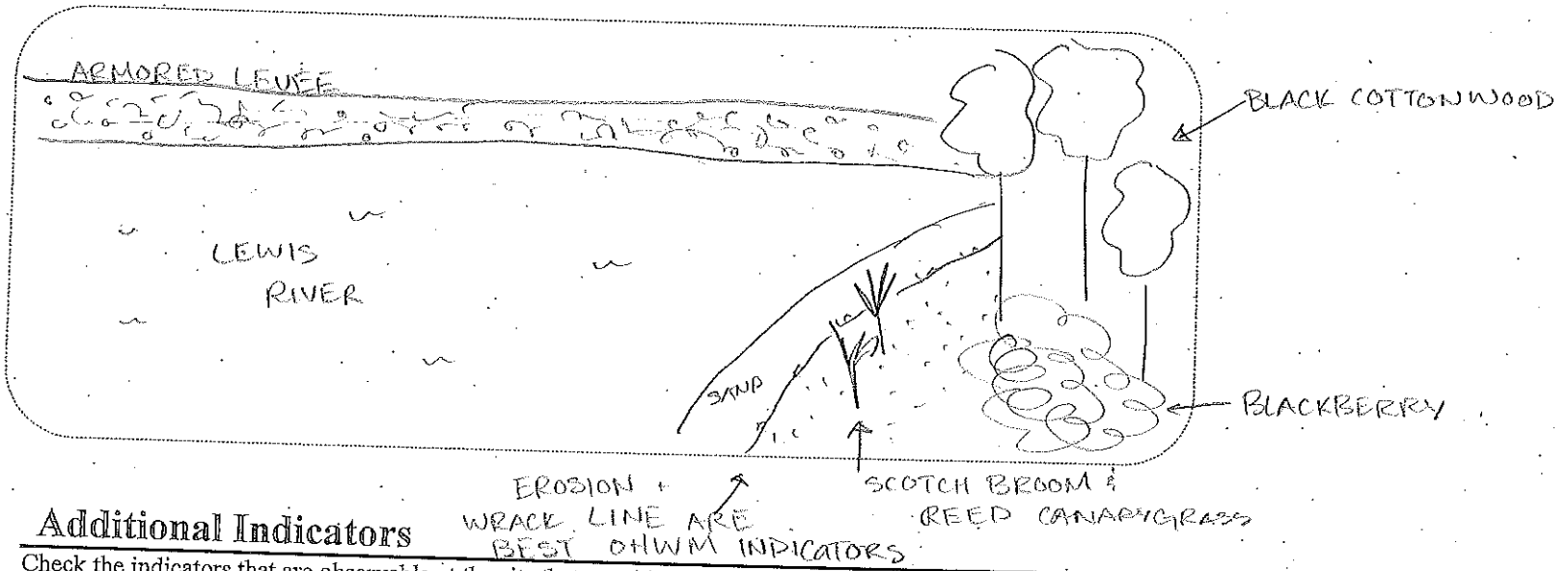
Date of site visit:	11-19-2019			
Time of site visit:	15:35			
Weather conditions:	Overcast			
Watershed development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Reach development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Recent site disturbance?	No ○	Yes ⊗	Describe:	
Upstream flow control devices?	No ○	Yes ⊗	Describe: Merwin Dam	
Bank armoring at the site?	No ○	Yes ⊗	Describe: opposite (north) shoreline	
Bank armoring up or downstream?	No ○	Yes ⊗	Describe: north shoreline	
Observable tidal backwater?	No ○	Yes ⊗		
In-water structures? (i.e. bridge pilings, railroad embankments)	No ○	Yes ⊗	Describe: Railroad bridge, wood habitat structures, pilings	
Animals grazing in riparian zone?	No ⊗	Yes ○	Describe:	
Observable beaver activity?	No ○	Yes ⊗	Describe: fresh beaver chewed logs	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	○ Sediment bars ☒ Scour line ○ Clean cobbles/boulders. ☒ Bank erosion/scour ☒ Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: ○ Willows ○ Black cottonwood ○ Japanese knotweed ○ Skunk cabbage ☒ Aquatic plants	☒ Exposed roots/root scour ○ Drainage patterns, as shown by flattened vegetation ☒ Aquatic animals ○ Algal mats ○ Iron staining

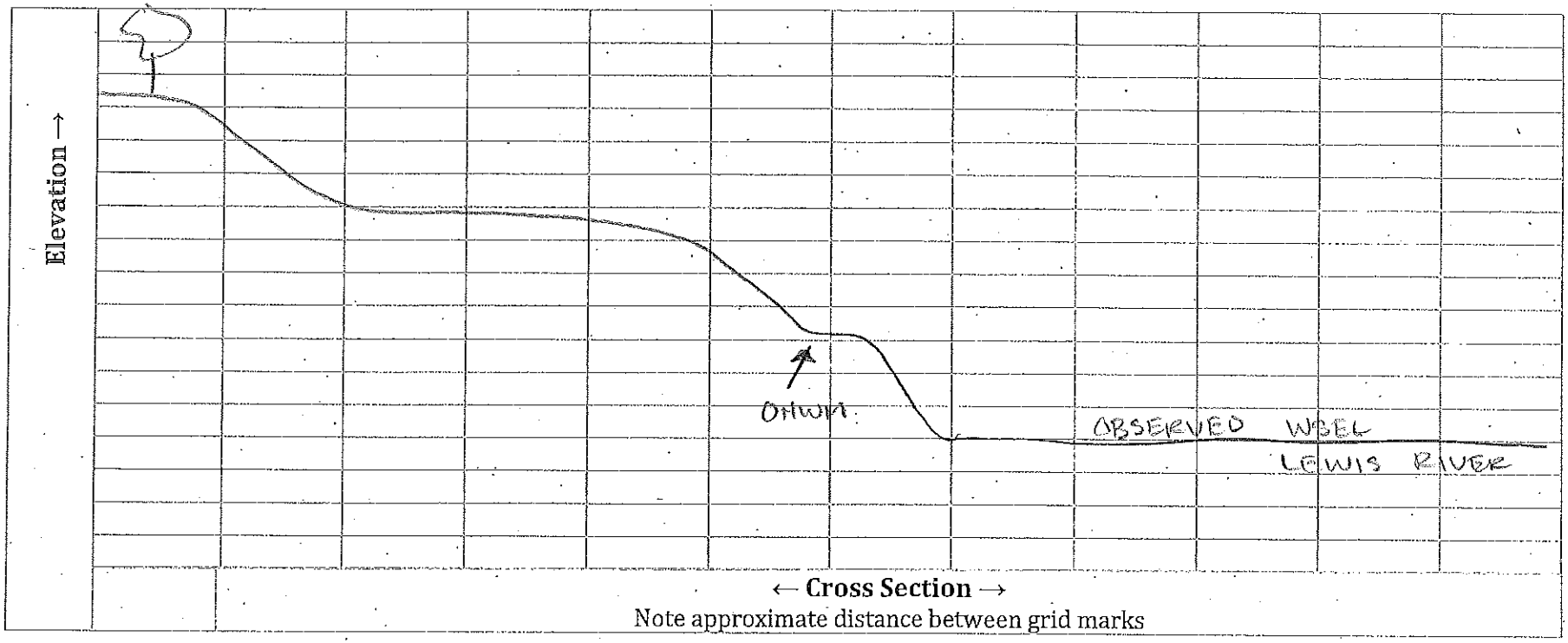
[24] Refer to Chapter 4 for a more complete description of indicators.

[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank ø Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) ø Benches	o Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder ø Red osier o Salmonberry dogwood o Nootka rose o Maidenhair and lady fern o Blackberries o Dunegrasses	ø Sediment lines on vegetation or other fixed objects o Change from channel deposits to older alluvium. ø Darker stain lines on fixed objects ø Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation ø Weathered and buried driftwood
Above OHWM	ø Hillslope toe ø Terraces or alluvium with an organic horizon or other developed soil horizons ø Relic floodplain surface ø Well developed soil A andB horizons/duff layer	o Indian plum ø Oregon o Red alder ash o Western red cedar ø Black o Douglas fir cottonwood o Western hemlock o Ponderosa pine o Oregon white oak o Coast pine o Quaking aspen o Vine maple (lakes) ø Blackberries	ø Lighter or no staining on fixed objects o Overbank deposits

Notes

This survey site was along the Lewis shoreline at the inlet of a side channel. OHWM indicators included bank erosion lines and wrack buildup along the base of the eroded shore.



Plant Distribution Across OHWM Gradient

Below OHWM		At/Straddling OHWM		Above OHWM	
veed canarygrass	FACW	veed canarygrass	FACW	veed canarygrass	FACW
				himalaya blackberry	FACU
				black cottonwood	N1


19 Nov 2019
Photo Direction: SW
WSEL: 7.34ft NAVD88
LR-C-(1-3)
OHWM: Wrack buildup and benches

Appendix A: Field data form

General Information

Site/Project Name/Owner:	Wapato Valley / Plas Newydd Farm
Location:	Lewis River
Description:	45.857777, -122.760953 points: LR-D-(1-7)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

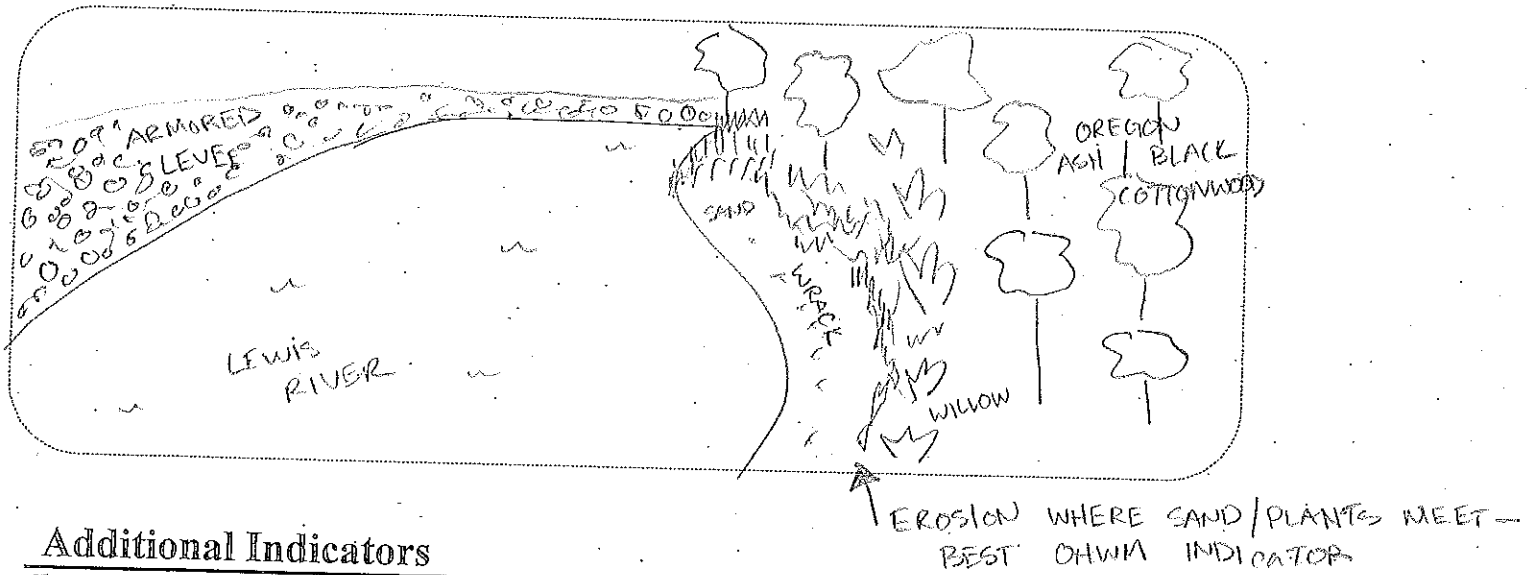
Date of site visit:	11-19-2019			
Time of site visit:	15:00			
Weather conditions:	overcast			
Watershed development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Reach development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Recent site disturbance?	No ⊗	Yes ○	Describe:	
Upstream flow control devices?	No ○	Yes ⊗	Describe: Merwin Dam / Bonneville Dam	
Bank armoring at the site?	No ○	Yes ⊗	Describe: On opposite (north) shoreline.	
Bank armoring up or downstream?	No ○	Yes ⊗	Describe: upstream both sides	
Observable tidal backwater?	No ○	Yes ⊗		
In-water structures? (i.e. bridge pilings, railroad embankments)	No ○	Yes ⊗	Describe: Railroad bridge, wood habitat structures, pilings	
Animals grazing in riparian zone?	No ⊗	Yes ○	Describe:	
Observable beaver activity?	No ○	Yes ⊗	Describe: Beaver chewed sticks	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	o Sediment bars o Scour line o Clean cobbles/boulders. ☒ Bank erosion/scour ☒ Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage ☒ Aquatic plants	☒ Exposed roots/root scour o Drainage patterns, as shown by flattened vegetation ☒ Aquatic animals o Algal mats o Iron staining

[24] Refer to Chapter 4 for a more complete description of indicators.

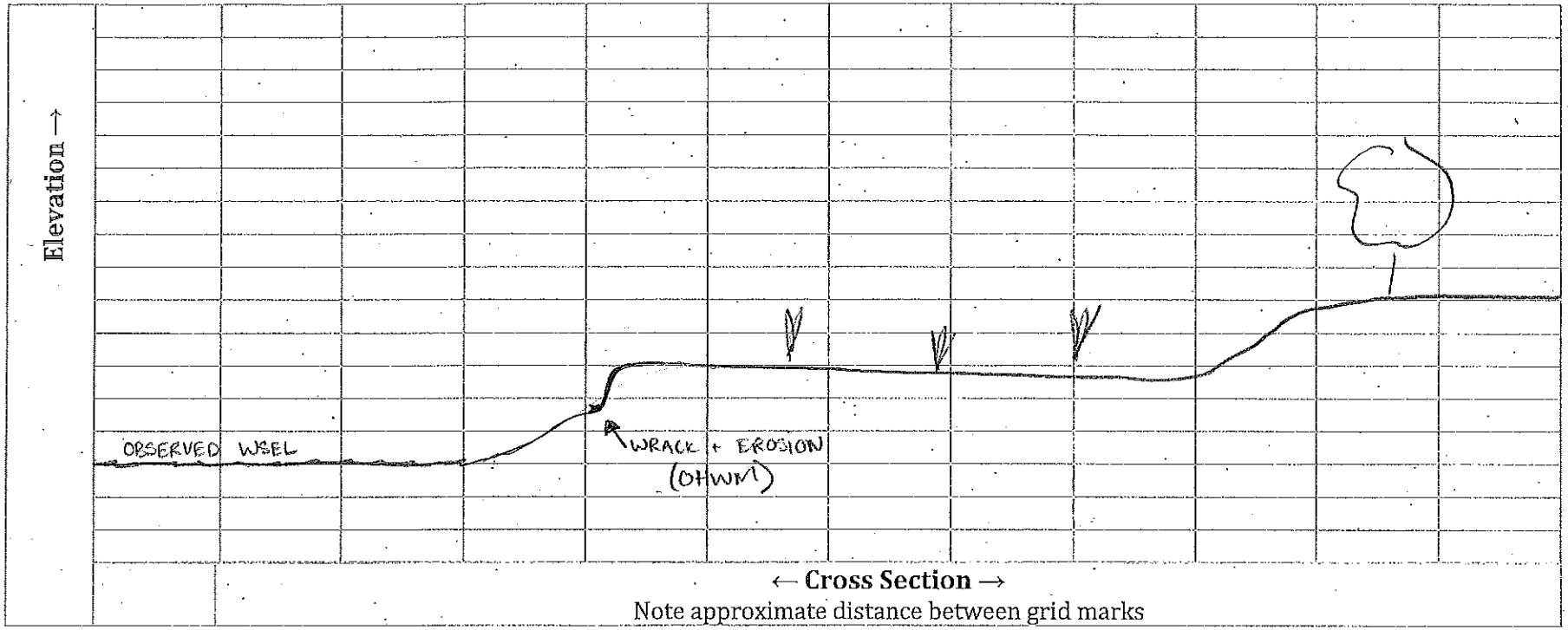
[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank ☒ Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) ☒ Benches	o Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder ☒ reed canarygrass o Salmonberry o Nootka rose o Maidenhair and lady fern o Blackberries ☒ Western o Dunegrasses goldentop	☒ Sediment lines on vegetation or other fixed objects → wrack deposited on sand ☒ Change from channel deposits to older alluvium. ☒ Darker stain lines on fixed objects ☒ Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation ☒ Weathered and buried driftwood
Above OHWM	o Hillslope toe ☒ Terraces or alluvium with an organic horizon or other developed soil horizons ☒ Relic floodplain surface ☒ Well developed soil A andB horizons/duff layer	o Indian plum ☒ Oregon ash o Red alder o Western red cedar o Douglas fir o Western hemlock ☒ Black cottonwood o Ponderosa pine o Oregon white oak o Coast pine o Quaking aspen o Vine maple (lakes) o Blackberries	☒ Lighter or no staining on fixed objects o Overbank deposits

Notes

The best OHWM indicator at this site was where there was a break due to erosion between the sandy shoreline and native sedges.

LR-D



Plant Distribution Across OHWM Gradient

Below ~~Above~~ OHWM		At/Straddling OHWM		Above OHWM	
reed canarygrass	FACW	reed canarygrass	FACW	bentgrass sp.	FAC
western goldentop	FACW	western goldentop	FACW	western goldentop	FACW
		slough sedge	OBL	sand bar willow	FACW
				sneezeweed	FACW
				Oregon ash	FACW
				black cottonwood	NI
				sheep sorrel	FACU


19 Nov 2019
Photo Direction: NE
WSEL: 7.57ft NAVD88
LR-D-(1-7)
OHWM: Erosion and wrack buildup

Appendix A: Field data form

General Information

Site/Project Name/Owner:	Wapato Valley Plas Newydd Farm
Location:	Lewis River
Description:	45.857695, -122.770411 points: LR-E-(1-7)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

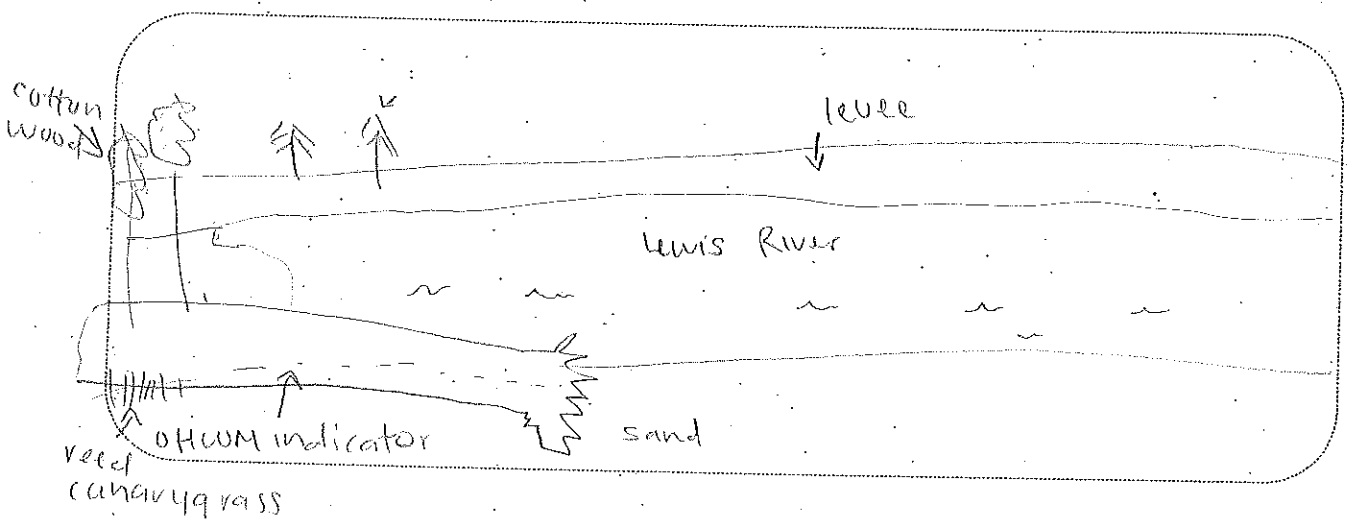
Date of site visit:	NOV 19 2019			
Time of site visit:	15:13			
Weather conditions:	Overcast			
Watershed development:	Highly developed ⊗		Mod. Developed O	Undeveloped O
Reach development:	Highly developed ⊗		Mod. Developed O	Undeveloped O
Recent site disturbance?	No ⊗	Yes O	Describe:	
Upstream flow control devices?	No O	Yes ⊗	Describe: Merwin Dam/Bonneville Dam	
Bank armoring at the site?	No O	Yes ⊗	Describe: on opposite (North) shoreline	
Bank armoring up or downstream?	No O	Yes ⊗	Describe: upstream both sides	
Observable tidal backwater?	No O	Yes ⊗		
In-water structures? (i.e. bridge pilings, railroad embankments)	No O	Yes ⊗	Describe: Railroad bridge, wood habitat structures, piling	
Animals grazing in riparian zone?	No ⊗	Yes O	Describe:	
Observable beaver activity?	No O	Yes ⊗	Describe: Beaver chewed stnks	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	☒ Sediment bars ☒ Scour line o Clean cobbles/boulders. ☒ Bank erosion/scour ☒ Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage ☒ Aquatic plants	☒ Exposed roots/root scour o Drainage patterns, as shown by flattened vegetation ☒ Aquatic animals o Algal mats o Iron staining

[24] Refer to Chapter 4 for a more complete description of indicators.

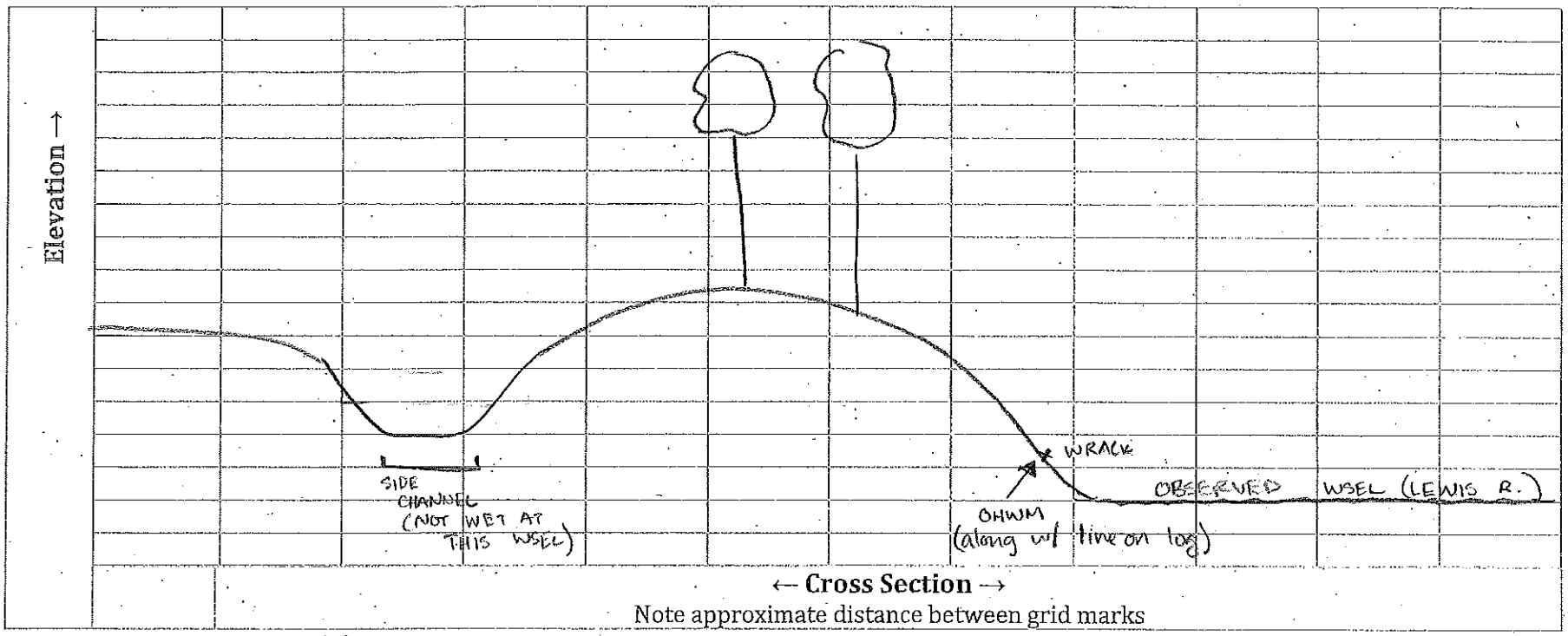
[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank ☒ Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) ☒ Benches	o Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder o Salmonberry reed canary o Nootka rose grass o Maidenhair and lady fern o Blackberries o Dunegrasses goldenrod	☒ Sediment lines on vegetation or other fixed objects ☒ Change from channel deposits to older alluvium. ☒ Darker stain lines on fixed objects ☒ Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation ☒ Weathered and buried driftwood
Above OHWM	o Hillslope toe ☒ Terraces or alluvium with an organic horizon or other developed soil horizons ☒ Relic floodplain surface ☒ Well developed soil A andB horizons/duff layer	o Indian plum o Red alder o Western red cedar o Douglas fir willow o Western hemlock o Ponderosa pine o Oregon white oak o Coast pine oregon Ash o Quaking aspen o Vine maple (lakes) o Blackberries	o Lighter or no staining on fixed objects o Overbank deposits

Notes

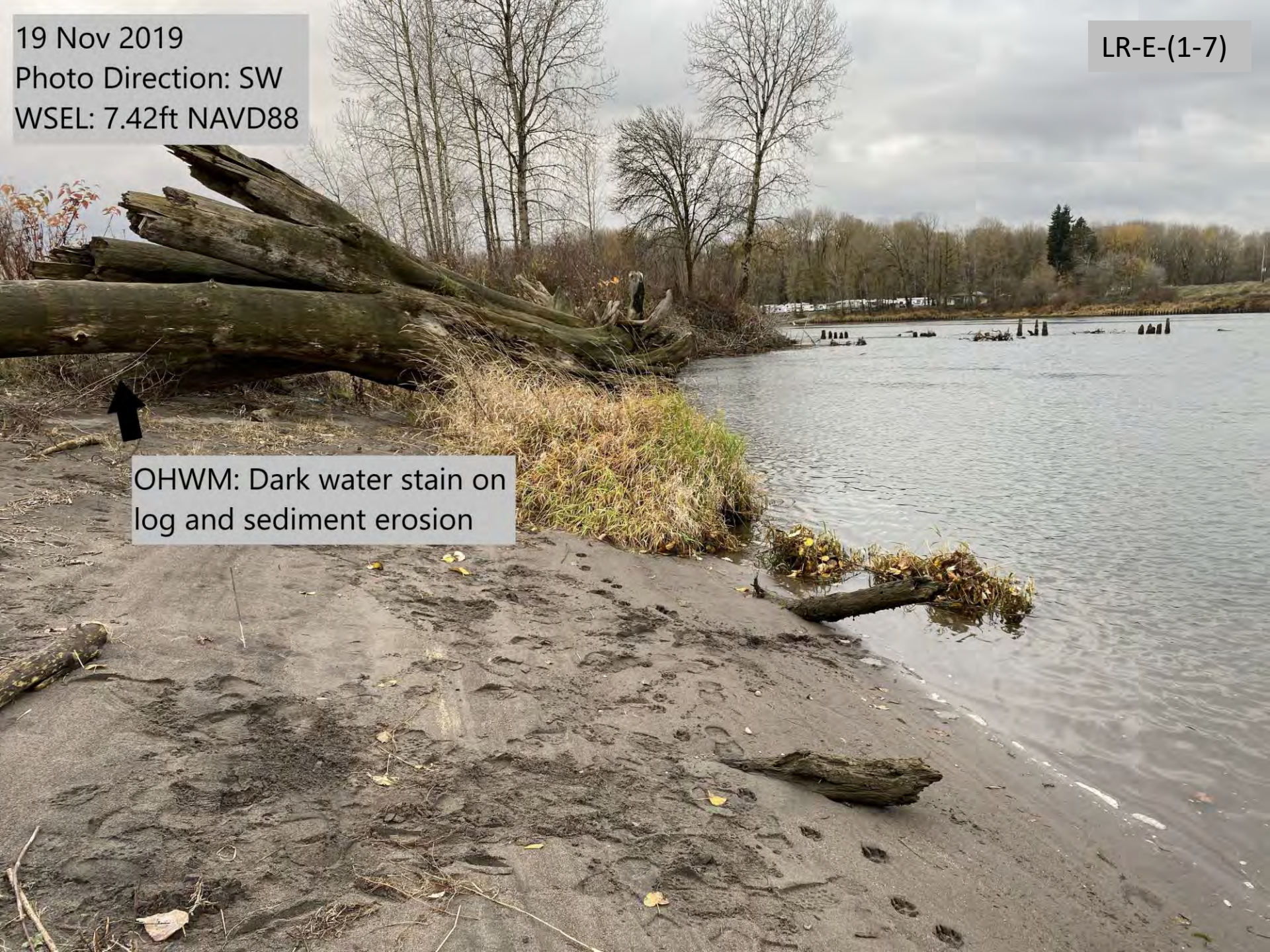
OHWM indicators at this site included dark water stains on a large log and erosion along the river shoreline.

LR - E



Below OHWM		At/Straddling OHWM		Above OHWM	
reed canarygrass	FACW	sheep sorrel	FACU	sand bar willows	FACW
		bentgrass spp.	FAC	Oregon ash	FACW
		red-osier dogwood	FACW	Himalayan blackberry	FACU
		spirea	FACW	black cottonwood	
		western goldentop	FACW	dovefoot geranium	
		reed canarygrass	FACW	slough sedge	OBL
		slough sedge	OBL		

Plant Distribution Across OHWM Gradient


19 Nov 2019
Photo Direction: SW
WSEL: 7.42ft NAVD88
LR-E-(1-7)
OHWM: Dark water stain on log and sediment erosion

Appendix A: Field data form

General Information

Site/Project Name/Owner:	Wapato Valley / Plas Newydd Farm
Location:	Lewis River
Description:	45.85357, -122.776643
	points: LR - F - (1-3)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

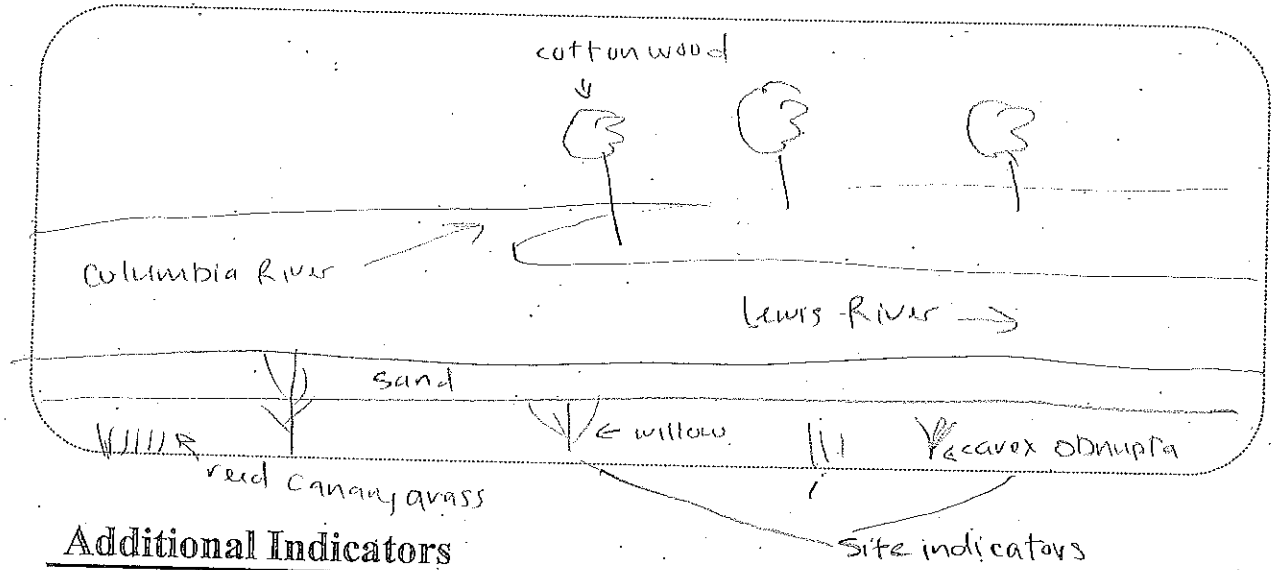
Date of site visit:	20 Nov 2019			
Time of site visit:	10:42			
Weather conditions:	Full Sun			
Watershed development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Reach development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Recent site disturbance?	No ⊗	Yes ○	Describe:	
Upstream flow control devices?	No ○	Yes ⊗	Describe: Merwin Dam / Bonneville Dam	
Bank armoring at the site?	No ⊗	Yes ○	Describe:	
Bank armoring up or downstream?	No ○	Yes ⊗	Describe: upstream	
Observable tidal backwater?	No ○	Yes ⊗		
In-water structures? (i.e. bridge pilings, railroad embankments)	No ○	Yes ⊗	Describe: Pilings upstream	
Animals grazing in riparian zone?	No ⊗	Yes ○	Describe:	
Observable beaver activity?	No ○	Yes ⊗	Describe: Beaver chews	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	o Sediment bars o Scour line o Clean cobbles/boulders. x Bank erosion/scour x Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: o Willows o Black cottonwood o Japanese knotweed o Skunk cabbage x Aquatic plants	x Exposed roots/root scour o Drainage patterns, as shown by flattened vegetation x Aquatic animals o Algal mats o Iron staining

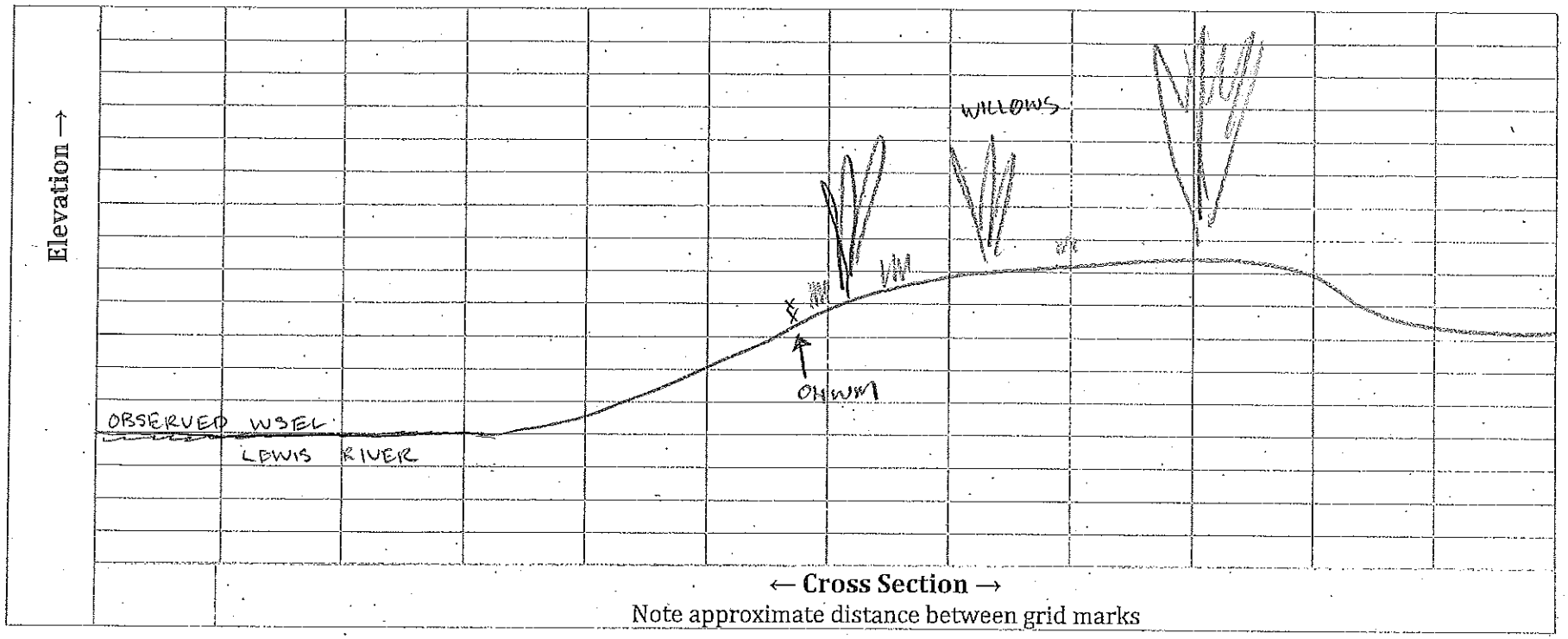
[24] Refer to Chapter 4 for a more complete description of indicators.

[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank o Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) x Benches	x Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder o Salmonberry o Nootka rose o Maidenhair and lady fern o Blackberries reed canarygrass o Dunegrasses	o Sediment lines on vegetation or other fixed objects x Change from channel deposits to older alluvium. o Darker stain lines on fixed objects x Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation x Weathered and buried driftwood
Above OHWM	o Hillslope toe x Terraces or alluvium with an organic horizon or other developed soil horizons x Relic floodplain surface x Well developed soil A andB horizons/duff layer	o Indian plum o Red alder o Western red cedar o Douglas fir Willow o Western hemlock o Ponderosa pine Oregon ash o Oregon white oak o Coast pine Black cottonwood o Quaking aspen o Vine maple (lakes) o Blackberries	x Lighter or no staining on fixed objects o Overbank deposits

Notes

This survey site was at the confluence of the Lewis and Columbia Rivers. The OHWM here was not clear on any fixed objects so we used the lowest elevations of the native willows and slough sedge. Reed canarygrass was present but tolerates wet and dry conditions so it was not a useful indicator species.



Below		Plant Distribution Across OHWM Gradient			
~~Above~~ OHWM		At/Straddling OHWM		Above OHWM	
Canadian waterweed	OBL	slough sedge	OBL	willow	FACW
		willows	FACW	black cottonwood	NI
				rough cocklebur	FAC


20 Nov 2019
Photo Direction: N
WSEL: 8.42ft NAVD88
LR-F-(1-3)
OHWM: Start of sedge and willow species

Appendix A: Field data form

General Information

Site/Project Name/Owner:	Wapato Valley / Plas Newydd Farm
Location:	Lewis River
Description:	45.85255, -122.7771056 points: LR-Cy-(1-2)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

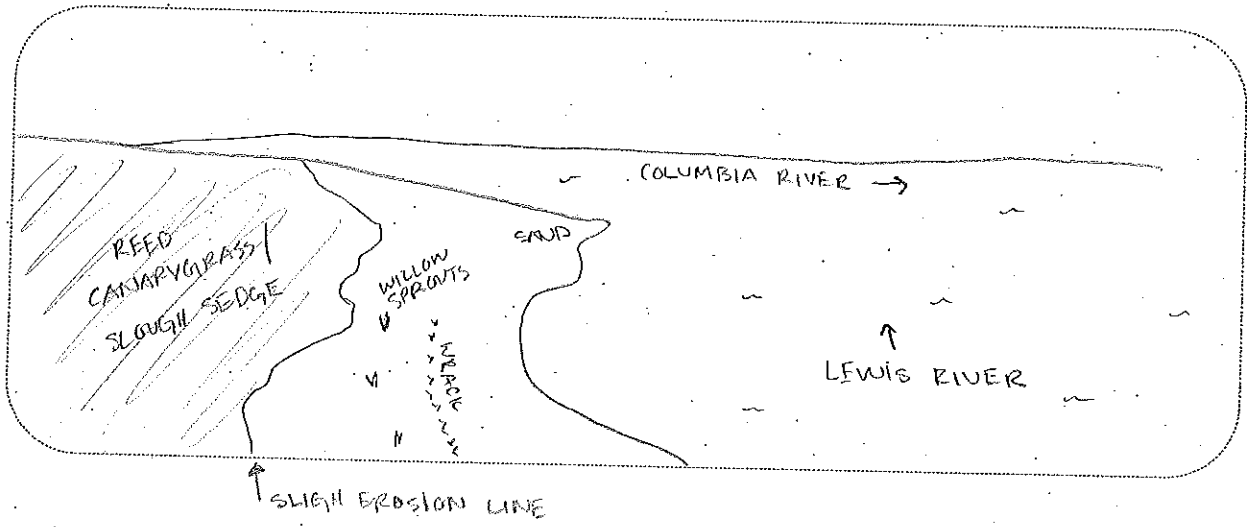
Date of site visit:	11-20-2019			
Time of site visit:	10:55			
Weather conditions:	full sun			
Watershed development:	Highly developed O		Mod. Developed Ø	Undeveloped O
Reach development:	Highly developed Ø		Mod. Developed O	Undeveloped O
Recent site disturbance?	No Ø	Yes O	Describe:	
Upstream flow control devices?	No O	Yes Ø	Describe: Merwin and Bonneville Dam	
Bank armoring at the site?	No Ø	Yes O	Describe:	
Bank armoring up or downstream?	No O	Yes Ø	Describe: upstream on both sides	
Observable tidal backwater?	No O	Yes Ø		
In-water structures? (i.e. bridge pilings, railroad embankments)	No O	Yes Ø	Describe: pilings upstream	
Animals grazing in riparian zone?	No Ø	Yes O	Describe:	
Observable beaver activity?	No O	Yes Ø	Describe: fresh chewed sticks	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper and lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	⊘ Sediment bars ○ Scour line ○ Clean cobbles/boulders. ⊘ Bank erosion/scour ⊘ Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: ○ Willows ○ Black cottonwood ○ Japanese knotweed ○ Skunk cabbage ⊘ Aquatic plants	○ Exposed roots/root scour ○ Drainage patterns, as shown by flattened vegetation ⊘ Aquatic animals ○ Algal mats ○ Iron staining

[24] Refer to Chapter 4 for a more complete description of indicators.

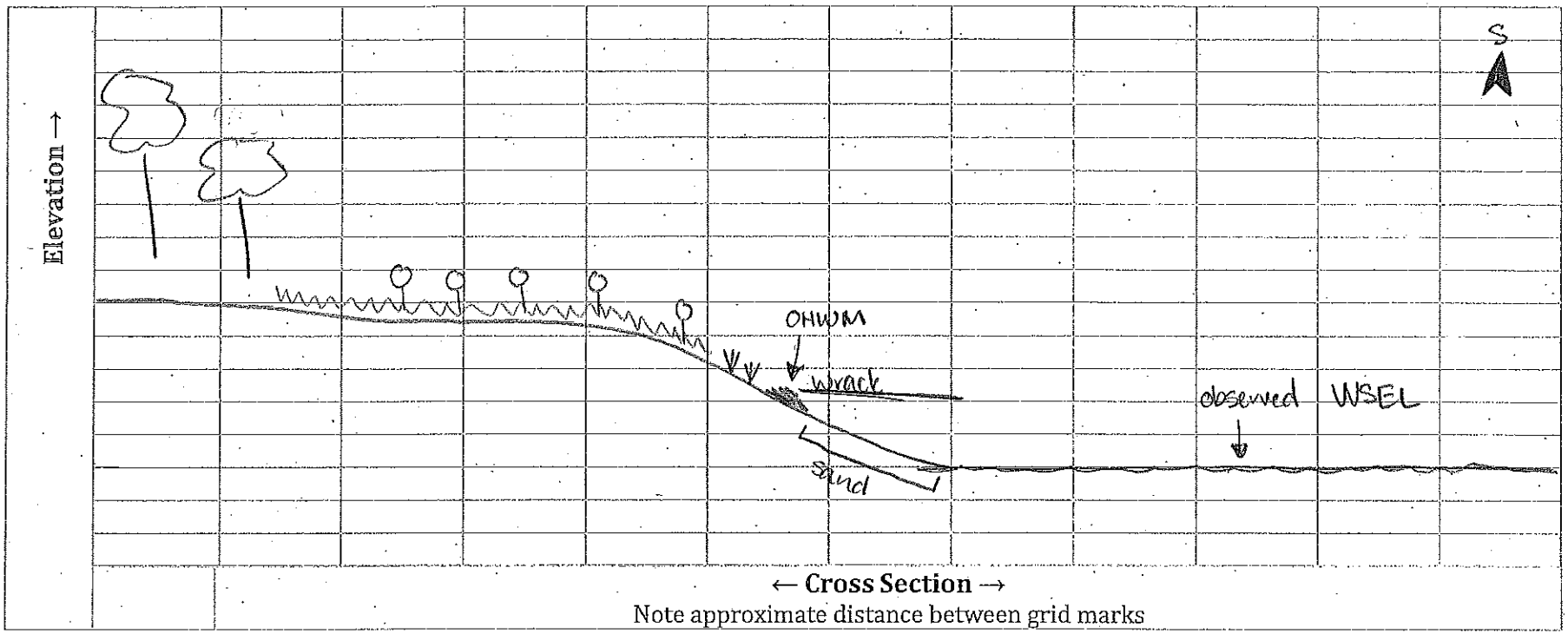
[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank ø Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) ø Benches	ø Willows - sprouts o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder ø reed o Salmonberry cattail/grass o Nootka rose o Maidenhair and lady fern o Blackberries ø slough o Dunegrasses sedge	ø Sediment lines on vegetation or other fixed objects o Change from channel deposits to older alluvium. ø Darker stain lines on fixed objects ø Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation ø Weathered and buried driftwood
Above OHWM	o Hillslope toe ø Terraces or alluvium with an organic horizon or other developed soil horizons ø Relic floodplain surface ø Well developed soil A andB horizons/duff layer	o Indian plum o Red alder ø willows (larger/mature) o Western red cedar o Douglas fir o Western hemlock o Ponderosa pine o Oregon white oak o Coast pine o Quaking aspen o Vine maple (lakes) o Blackberries	o Lighter or no staining on fixed objects ø Overbank deposits

Notes

This survey site was at the confluence of the Lewis and Columbia Rivers. Water levels here are highly variable as evidenced by lines of washed up debris/wrack at multiple elevations on the beach. Elevations were taken at larger wrack lines and where willows were sprouting a little higher on the beach.

LR-G



Below OHWM		At/Straddling OHWM		Above OHWM	
non-vegetated sand		sand bar willow	FACW	sitka willow	FACW
Eurasian watermilfoil	OBL	reed canarygrass	FACW	sand bar willow	FACW
		slough sedge	OBL	reed canarygrass	FACW
		rough cocklebur	FAC	Oregon ash	FACW
		western goldentop	FACW	black cottonwood	not listed
				western goldentop	FACW
				Robert geranium	FACU


20 Nov 2019
Photo Direction: S
WSEL: 8.42ft NAVD88
LR-G-(1-2)
OHWM: Change from sand to vegetation such as sedge and willow species

Appendix A: Field data form

General Information

Site/Project Name/Owner:	Wapato Valley Pigs Newgold Farm
Location:	Lewis River
Description:	45.85581, -122.773755 Points LR-H-(1-5)

The following field form is for use in the field to help in making ordinary high water mark delineations on streams. The form should be used as a guide. A team consisting of a hydrologist/ geomorphologist and a biologist may be needed to accurately determine the ordinary high water mark.

General Observations: Day of Site Visit

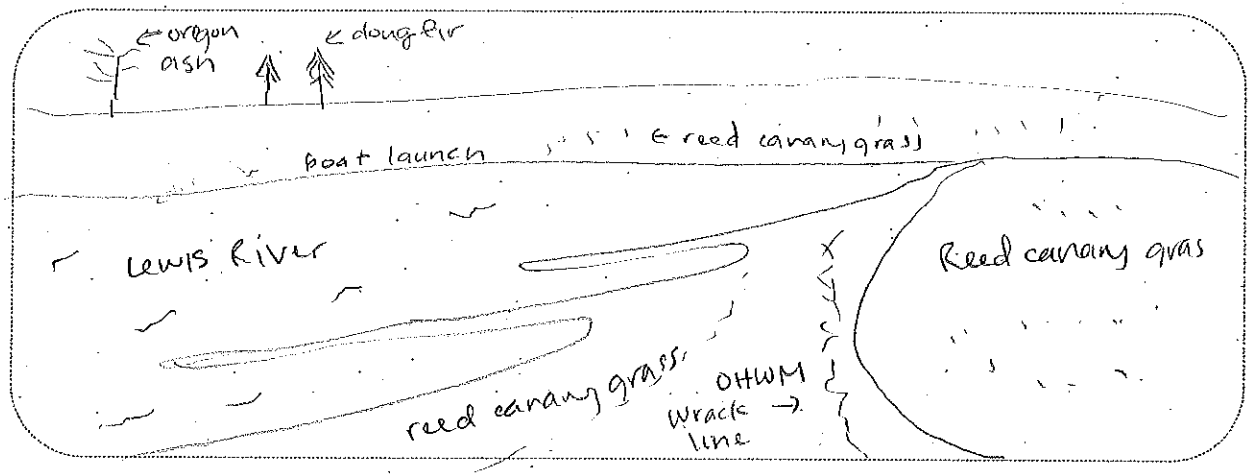
Date of site visit:	3 Dec 2019			
Time of site visit:	10:21			
Weather conditions:	Overcast			
Watershed development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Reach development:	Highly developed ⊗		Mod. Developed ○	Undeveloped ○
Recent site disturbance?	No ⊗	Yes ○	Describe:	
Upstream flow control devices?	No ○	Yes ⊗	Describe: Bonival	
Bank armoring at the site?	No ○	Yes ◐	Describe: across the river	
Bank armoring up or downstream?	No ○	Yes ⊗	Describe:	
Observable tidal backwater?	No ○	Yes ○		
In-water structures? (i.e. bridge pilings, railroad embankments)	No ○	Yes ⊗	Describe: boat dock on other side of river	
Animals grazing in riparian zone?	No ⊗	Yes ○	Describe:	
Observable beaver activity?	No ⊗	Yes ○	Describe:	

Complete Vegetation Transects

- Use guidelines in Chapter 4 to complete vegetation transects.
- Determine upper and lower bounds of the OHWM from vegetation transects.
- After completing vegetation transects, look for more field indicators near the upper aud lower bounds of the OHWM. Use the checklist as guidance.

Sketch

If a simple site, sketch a cross-sectional diagram of the site below. Include location of the waterway and upper and lower bounds of the OHWM defined by the vegetation communities or other OHWM indicators. Page 3 of the data form can be used for more complex sketches



Additional Indicators

Check the indicators that are observable at the site that provide rationale for establishing the OHWM at this location. The rationale should be described in detail in the report and should be supported with photographs taken during the site visit.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
Below OHWM	☒ Sediment bars ○ Scour line ○ Clean cobbles/boulders. ☒ Bank erosion/scour ☒ Lack of soil horizons	Vegetation tolerant of inundation or high flow disturbances such as: ○ Willows ○ Black cottonwood ○ Japanese knotweed ○ Skunk cabbage ☒ Aquatic plants	○ Exposed roots/root scour ☒ Drainage patterns, as shown by flattened vegetation ☒ Aquatic animals ○ Algal mats ○ Iron staining

reed canarygrass

[24] Refer to Chapter 4 for a more complete description of indicators.

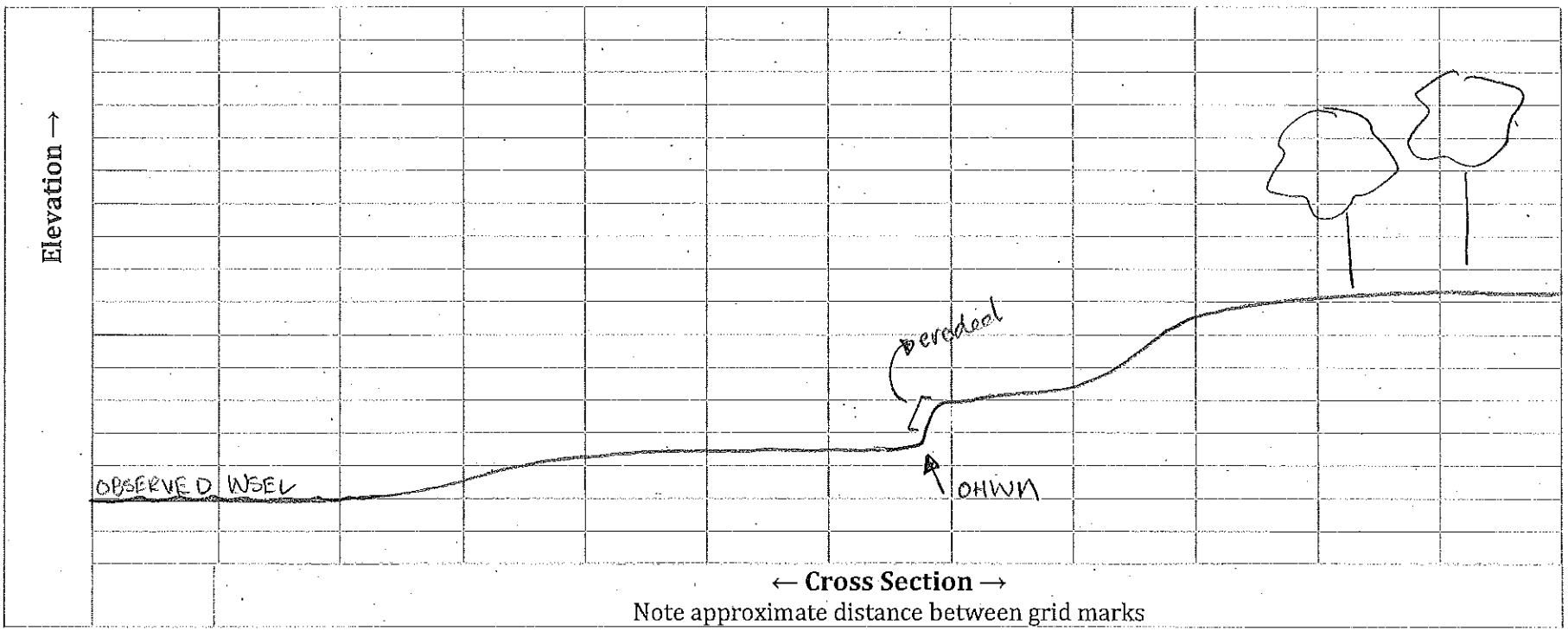
[25] Species are provided as examples. Refer to Appendix B for a more complete listing of plant species and their distribution across the OHWM gradient. Some species occur in more than one category depending on site conditions. For example Indian plum and red alder may straddle the OHWM where soil drainage is high. They may occur above OHWM were soil drainage is low to moderate.

	Soil and geomorphic indicators [24]	Vegetative indicators [25]	Other indicators
At or straddling OHWM	o Top of bank Toe of lowest terrace (if terrace has developed horizons which may include a duff layer and A and B horizons versus freshly deposited alluvium) Benches	o Willows o Western red cedar o Vine maple (streams) o Black cottonwood o Red alder o Salmonberry o Nootka rose o Maidenhair and lady fern o Blackberries o Dunegrasses	o Sediment lines on vegetation or other fixed objects o Change from channel deposits to older alluvium. o Darker stain lines on fixed objects o Exposed roots/root scour. o Drainage patterns, as evidenced by flattened vegetation Weathered and buried driftwood
Above OHWM	o Hillslope toe Terraces or alluvium with an organic horizon or other developed soil horizons Relic floodplain surface Well developed soil A andB horizons/duff layer	o Indian plum o Red alder o Western red cedar o Douglas fir o Western hemlock o Ponderosa pine o Oregon white oak o Coast pine o Quaking aspen o Vine maple (lakes) o Blackberries	o Lighter or no staining on fixed objects o Overbank deposits

Oregon ash and Black cottonwood

Notes

There is a wrack line that is an OHWM indicator.



Note approximate distance between grid marks

Plant Distribution Across OHWM Gradient

Below OHWM		At/Straddling OHWM		Above OHWM	
Canadian waterweed	OBL	reed canarygrass	FACW	reed canarygrass	FACW
reed canarygrass	FACW	slough sedge	OBL	Oregon ash	FACW
needle spikerush	OBL			sand bar willow	FACW
				Pacific willow	FACW
				bentgrass sp.	FAC


3 Dec 2019
Photo Direction: NE
WSEL: 8.31ft NAVD88
LR-H-(1-5)
OHWM: Wrack line

ATTACHMENT B

SPECIES AND COMMON NAMES OF PLANTS

Common Camas	Species Name
Bird's Foot Trefoil	*Lotus corniculatus*
Black Cottonwood	*Populus balsamifera trichocarpa*
Black Hawthorn	*Crataegus douglasii*
Bur-reed	*Sparganium sp*
Common Camas	*Camassia quamish*
Douglas Fir	*Pseudotsuga douglasii*
Douglas Spirea	*Spirea douglasii*
False Indigo Bush	*Amorpha fruticosa*
Herb Robert	*Geranium robertianum*
Himalayan Blackberry	*Rubus armeniascus*
Licorice Fern	*Polypodium glycerrhiza*
Needle Spikerush	*Eleocharis acicularis*
Oregon Ash	*Fraxinus latifolia*
Oregon White Oak	*Quercus garryana*
Red-Osier Dogwood	*Cornus alba*
Reed Canarygrass	*Phalaris arundinancea*
Rough Cocklebur	*Xanthium strumarium*
Scot's Broom	*Cystisus scoparius*
Slough Sedge	*Carex obnupta*
Smartweed	*Polygonum sp*
Snowberry	*Symphoricarpos albus*
Softstem Bulrush	*Schoenoplectus tabernaemontanii*
Wapato	*Sagittaria latifolia*
Western Goldenrod	*Euthamia occidentalis*
Willows	*Salix sp*
Woolgrass	*Scirpus cyperinus*
Wormleaf Stonecrop	*Sedum stenopelatum*