New Shine Quarry
Wetland Delineation and Inventory

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Executive Summary

This wetland delineation report has been prepared to satisfy the Jefferson County Critical Areas Study report requirements (JCC 18.22) and is being submitted as part of an application for permits and approvals needed to open the New Shine Quarry (NSQ). The proposed NSQ is located within an approximately 142-acre parcel owned by Pope Resources and leased by Iron Mountain Quarry (site). The site is located on the north side of SR-104 approximately four miles west of the Hood Canal Bridge and approximately one mile east of the SR-104/SR-19 intersection in unincorporated Jefferson County. Most of the site is within Section 29, Township 28 North, Range 1 East, Willamette Meridian. Site topography ranges from relatively flat to moderately steep slopes.

A total of 20 wetlands have been delineated within the identified site boundaries using the comprehensive onsite wetland determination methods specified by the Washington State Department of Ecology (Ecology) and U.S. Army Corps of Engineers (Corps). All wetlands have been rated using Ecology's most current version of the rating system for western Washington. All but two of the delineated wetlands on the site are rated Category III and IV. Wetlands D and K are rated Category II. Many of these wetlands are closed depressional hydrogeomorphic types that appear to be isolated and thus not subject to federal jurisdiction. All of the wetlands are broad-leaved deciduous forested systems that have seasonally flooded and/or saturated hydrologic regimes. Two of the wetlands also include broad-leaved deciduous scrub-shrub wetland vegetation classes.

A Joint Aquatic Resources Permit Application is being submitted to the Corps and Ecology to request a jurisdictional determination and confirmation of the delineated wetland boundaries and wetland ratings. As required by JCC and state law, a compensatory wetland mitigation plan will be prepared for unavoidable impacts. Such plans will specify the duration, frequency, and methods used to monitor the mitigation.

1 Introduction

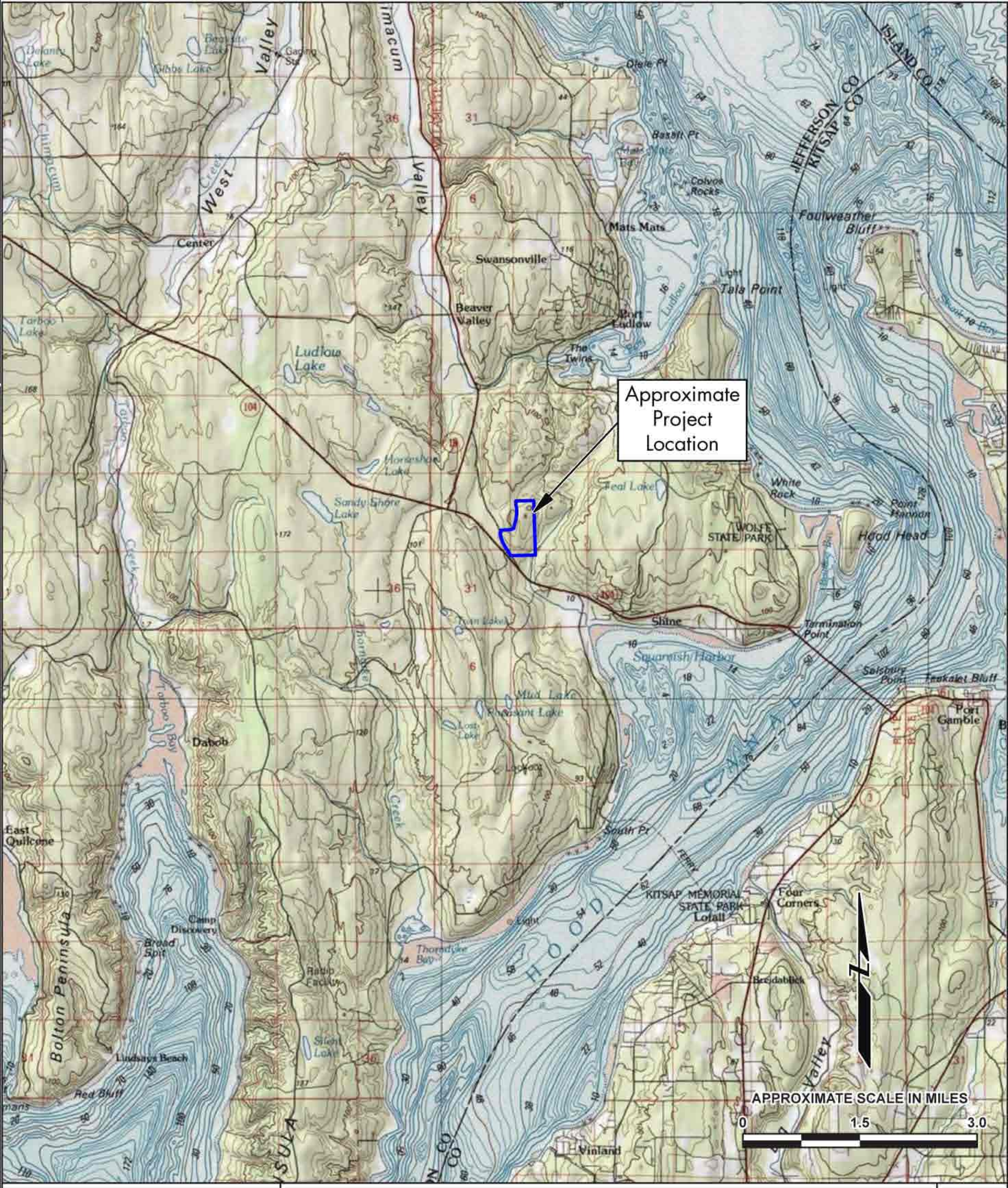
This wetland delineation report has been prepared to satisfy the Jefferson County Critical Areas Study report requirements (JCC 18.22) and is being submitted as part of an application for permits and approvals needed to open the New Shine Quarry (NSQ). The proposed NSQ is located within an approximately 142-acre parcel owned by Pope Resources and leased by Iron Mountain Quarry (site). The site is located on the north side of SR-104 approximately four miles west of the Hood Canal Bridge and approximately one mile east of the SR-104/SR-19 intersection in unincorporated Jefferson County. Most of the site is within Section 29, Township 28 North, Range 1 East, Willamette Meridian. Site topography ranges from relatively flat to moderately steep slopes.

The existing Shine Quarry operates on lands just to the north and west of the site. All of the lands within the site are commercial timberlands that have been harvested several times since European settlement. Most of the area within the site was clear-cut harvested most recently about 20 years ago. Based on review of aerial photographs, only the southeastern portion of the site was not harvested at that time. The short access road off SR 104 to the site and the existing quarry is paved. Beyond the short access road is a well used gravel road that extends to the north northwest along the site boundary to the existing quarry. In addition to this well used road, there is a network of old, infrequently used logging roads. Some of these are overgrown with forest regrowth. A cable gate just off the main road to the existing Shine Quarry prevents unauthorized use of the lands within the site.

1.1 Site Topography and History

Much of the site consists of moderately to steeply sloping hillsides. A rather distinctive drainage-like feature runs more or less due north to south beginning 400 feet from the southwest corner to a topographic saddle near the northwest corner of the site. Most of the site is covered by early seral phases of evergreen upland forest that have regrown following the most recent harvesting a decade or two ago. Young deciduous forest cover types are common in depressions and a more mature, older evergreen forest exists in the valley bottom adjacent to a perennial stream near the southeast corner of the site boundaries shown in Figure 1.

In addition to the existing Shine Quarry off-site, there is an old quarry that has not been active for several years located on-site. This is separated from the existing drainage-like feature described in the preceding paragraph by a small and relatively narrow ridge that is about 35 feet in height. Elevations range from a low of around 60 feet above mean sea level (MSL) in the valley bottom located near the perennial stream in the southeast corner of the site to a high of about 340 above MSL near the northeast corner. Portions of the site that would be mined range in elevation from about 200 feet to 340 feet MSL. It is assumed that the southern portion of the site south of the main access/logging road would not be mined.



ENVIRON

Location of the Proposed New Shine Quarry
Jefferson County, Washington

Figure 1

Drafter: KAR

Date: June 17, 2009

Project Number: 3022731A

2 Methods

The comprehensive onsite determination method set forth in the Washington Wetlands Identification and Delineation Manual (Ecology 1997) was used to make wetland determinations. Data forms from the recently adopted U.S. Army Corps of Engineers (Corps) Interim Supplement for the Western Mountains, Valleys, and Coast Region (2008a) were also used in making wetland determinations. A detailed map showing the approximate site boundaries, topography produced using Light Detection and Ranging (LIDAR) technology, and contemporary color aerial photographs were also used to guide the field investigation. The approximate site boundaries and LIDAR map used as a base for the graphics in this study was produced by Layton and Sell, Inc. Soils maps produced by the National Resource Conservation Service (NRCS), formerly the Soil Conservation Service (Appendix A), National Wetlands Inventory map, U.S. Geological Survey topographic map, Jefferson County GIS maps, and contemporary aerial photographs were used to guide the wetland delineation field work.

Sample plot size was modified in some areas where sampling was completed because standard plot sizes (30-foot radius for trees and shrubs and 5-foot radius for herbs) could not be used to provide an accurate assessment of the dominant species associated with the topographic, edaphic, and hydrologic conditions. Data forms in Appendix B note those instances where sample plot sizes differ from these standards. A total of 40 sample plots were established in wetlands and adjacent uplands representative of the site conditions. Paired wetland and upland plots were used to identify characteristics of wetlands and uplands. All but one sample plot (SP-40) were clearly marked and labeled in the field with blue surveyor flagging, such as "ENVIRON SP-1 4/27/09" and so on. SP-41 is labeled SP-43 in the field. Two sample plots (the original SP-40 and SP-41) were established in a small wetland and adjacent upland just to the east of the proposed project boundaries. It was only after GPS data were imported into the AutoCAD drawings that this became clear and sample plots were relabeled. These data are not included in the report. It was determined that normal circumstances were present on site and use of problem areas or atypical situations methods were not required except for SP-40, which is positioned where the old on-site mine works are located. Problematic soils determination criteria were applied in SP-40 because of their very recent origin. Where positive indicators of all three parameters (hydrophytic vegetation, hydric soils, and wetland hydrology) were present, the sample plot and vegetation community type were determined to be wetland.

Using these methods, 20 wetlands were delineated. The areas delineated included a series of five small wetlands within the old on-site mine quarry works that are counted and collectively described herein as one unit (quarry wetlands). Boundaries of all but the old-mine wetlands are marked by fluorescent orange or pink flagging labeled "wetland boundary" and given a unique alpha-numeric flagging sequence. For example, Wetland A is delineated by a flagging sequence beginning with wetland boundary flag A-1 and ending with wetland boundary flag A-16. Wetland boundaries were based primarily on the absence of one or more parameters. In depressional wetlands, clear and distinct topographic breaks are present. Distinctive ecotones (vegetation boundaries) also are present in these cases and presence or absence of one or more wetland parameters (hydrophytic vegetation, hydric soils, or wetland hydrology) were

relatively easily determined. Whereas for slope hydrogeomorphic (HGM) wetland types, the boundaries were much more challenging to determine, particularly for the wetlands that are mosaics of wetland and upland (mosaics). For the latter, numerous hand auger borings were made to more accurately determine the extent of wetland hydrology and hydric soils and to delineate the wetland boundaries, because vegetation often did not form strong and consistent ecotones.

Wetland vegetation classes were classified according to the U.S. Fish and Wildlife Service's classification system (Cowardin et al. 1979). Plant nomenclature generally follows *Flora of the Pacific Northwest* (Hitchcock and Cronquist 1973) except where there have been recent changes in plant nomenclature. In those instances where plant nomenclature has been recently changed, plant taxonomy follows the NRCS Plants Database (2009).

As required by the JCC, wetlands were rated using the western Washington wetland rating system (Hruby 2004a). This rating form was recently updated by the Washington Department of Ecology (Ecology) (Hruby 2008) to reflect changes in the Washington Department of Fish and Wildlife's priority habitat and species definitions, which apply to habitat question H2.3.

It must be noted that the rating and the estimated functions denoted by the related scores appear to overestimate the potential function of, and is thought to be unreliable for, wetlands <0.1 acre (4,356 sq. ft.). Hruby (2004b) indicates in the annotated version of the rating system that the rating system for wetlands smaller than 4,356 sq. ft. (0.1 acre) "will not work well." A number of wetlands in this report are <0.1 acre and rated Category III. Thus, these appear to be overrated and better fit the Ecology rationale for a Category IV wetland (Hruby 2004a).

Wetland ratings are used to determine and identify standard buffer widths but also influence compensatory mitigation ratios/requirements. Standard wetland buffers were determined using JCC Table 18.22.330(3) Wetland Categories, Rating Scores and Buffer Widths for High Impact Land Uses. Aerial photographs, the National Wetlands Inventory map, on-site observations, and a USGS topographic map were useful in rating the delineated wetlands. Compensatory wetland mitigation requirements were considered using JCC 18.22.

3 Wetland Determination Results

Most of the site is forested. There are two predominant forested plant communities on the site, immature evergreen forest and deciduous forest. In several cases, a mixed forest descriptor was given for immature evergreen forest but this was generally a reflection of the proximity of upland sample plots to delineated wetland boundaries and the transition from deciduous forested wetlands to evergreen forested uplands. Immature evergreen forest cover types are the most widespread and are found on concave slopes throughout the site. Deciduous forest cover types are associated with depressions or a combination of depressions and low gradient hillslopes. A third cover type, mature evergreen forest is associated with the floodplain of the perennial stream that traverses the very southeast corner of the site and covers very little area within the site boundaries. A summary of the dominant species, soils, and hydrologic conditions observed within each of these vegetation or cover types is provided in the following sections.

Photographs in Appendix C show the wetland and upland plant associations in these three primary cover types.

3.1 Immature Evergreen Forest (Upland)

Nineteen sample plots (SP-2, SP-3, SP-4, SP-7, SP-11, SP-13, SP-15, SP-17, SP-19, SP-21, SP-23, SP-25, SP-27, SP-28, SP-31, SP-33, SP-35, SP-38, and SP-41) were established in the immature evergreen forest cover types adjacent to delineated wetlands. Of these 19, eleven were identified as mixed forest (Table 1), but the presence of deciduous trees in these plots is a reflection of their proximity and transition to deciduous forested wetlands as the geomorphology changes from steeper slope to depressional or flatter bench-like landscape positions. Two sample plots, SP-28 and SP-41 are identified as deciduous forest but these small patches in otherwise evergreen forest and thus are included here.

3.1.1 Vegetation

The dominant evergreen tree in this forest type is Douglas fir (*Pseudotsuga menziesii*). Other evergreen species found in this immature forest that are occasionally dominant or co-dominant with Douglas fir include western red cedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*). Cascara (*Frangula purshiana* formerly *Rhamnus purshiana*) is common but generally a minor component of this immature forest. Deciduous trees observed in this cover type include big-leaf maple (*Acer macrophyllum*), bittercherry (*Prunus emarginata*), Pacific willow (*Salix lucida* var. *lasiandra*), and red alder (*Alnus rubra*). These are generally not dominant and only present in disturbed areas, such as gaps caused by recent wind throw or man-made disturbance. The forest canopy is generally closed and stem density is high, composed mostly of smaller trees [typically < 10-inches diameter at breast height (dbh)]. Understory associates vary depending on canopy closure. Diversity is higher and shrub and forb strata (layers) more well developed where there are gaps in the canopy or the canopy is more open. Where the canopy is more closed, shrub and forb strata are poorly developed and few plants are present beneath the forest canopy. Dominant shrubs observed in the sample plots included oceanspray (*Holodiscus discolor*), salmonberry (*Rubus spectabilis*), salal (*Gaultheria shallon*), dull Oregon grape (*Mahonia nervosa*), evergreen huckleberry (*Vaccinium ovatum*), red huckleberry (*V. parvifolium*), and English holly (*Ilex aquifolium*). Few herbaceous plants are dominant. Swordfern (*Polystichum munitum*) is most often the only dominant herbaceous plant and often forms a dense ground cover. Henderson's sedge (*Carex hendersonii*) was a dominant plant in one sample plot. A number of other shrubs and trees observed in this forest type that were common but not dominant, included red elderberry (*Sambucus racemosa*), cascara and bittercherry saplings, Pacific bleeding heart (*Dicentra formosa*), Siberian springbeauty (*Claytonia sibirica*), western trillium (*Trillium ovatum*), catchweed bedstraw (*Galium aparine*), Dewey sedge (*Carex deweyana*), and broadleaf starflower (*Trientalis latifolia*). Only one sample plot met the hydrophytic vegetation criterion, SP-11 with 66% of the dominant plants having a FAC wetland indicator status. All other sample plots did not meet the criterion because most of the dominant plants (> 50%) in these plots had FACU, FAC, and UPL wetland indicator statuses. Therefore, this forest cover type is not

considered hydrophytic. Examples of this forest cover type are shown in Photographs 22, 25, and 30 in Appendix C.

3.1.2 Soils

Not surprisingly, soils that support this non-hydrophytic vegetation are typically non-hydric. Most of the site is mapped as non-hydric Olete very gravelly silt loam, 0-30 percent slopes; Olete very gravelly silt loams, 30-50 percent slopes; or Olete-Alderwood complex, 0-30 percent slopes by the NRCS (Appendix A). A small portion of the site near the south boundary is mapped as Alderwood gravelly sandy loam, 0-15 percent slopes, which is also a non-hydric soil but sometimes contains inclusions of hydric soil. Uplands are generally characterized by coarser textured, more well drained gravelly sandy loam, gravelly loam, and gravelly silt loam soils with higher chromas and lack positive indicators of hydric soils. Most plots had at least a thin layer of duff or leaf litter. In a number of cases, the duff layer was up to 3 or 4 inches thick. Though some redoximorphic features were sometimes present in surface and subsurface horizons, none of the soils in the sample plots met the hydric soil indicators found in the Puget Sound region, including depleted below dark surface (A11), depleted matrix (F3), redox dark surface (F6), or depleted dark surface criteria (F7). In addition, no other hydric soil indicators were observed. Photographs 9, 19, and 26 in Appendix C show examples of typical non-hydric mineral soils observed in these sample plots.

3.1.3 Hydrology

Hydrologic characteristics within the sample plots were typically absent. Most plots had a convex geomorphology and were relatively well drained. Not surprisingly, none of the sample plots exhibited positive evidence of any primary indicators of wetland hydrology, such as saturation, surface water, water marks, sediment deposits, drift deposits, algal mat or crust, iron deposits, surface soil cracks, oxidized rhizospheres around living roots or other primary indicators. Secondary indicators of wetland hydrology, such as shallow aquitard, water-stained leaves, favorable geomorphic position, drainage patterns, and FAC-neutral test, were also absent, except in SP-11.

Two or more secondary indicators are required to meet the hydrology criterion. SP-11 had two secondary indicators of wetland hydrology (geomorphic position and drainage patterns) and met the wetland hydrology criterion. This plot was established in the drainage-like channel. Other than this one exception, the wetland hydrology criterion was not met in any of the sample plots.

3.1.4 Wetland Determination

Because positive indicators of one or more wetland parameter was absent in all sample plots, all were considered to be upland. Most of these sample plots lacked positive indicators of all three parameters. One sample plot, SP-11 met both the hydrophytic vegetation and wetland hydrology criterion. However, there were no positive indicators of hydric soils in the drainage adjacent to the old on-site mine works where SP-11 was located. All three wetland parameters

were absent in all other sample plots. This forest cover type and all sample plots established within it represent and document existing Immature Evergreen Forest upland habitat. A summary of the sample plot data and wetland determinations is provided in Table 1.

3.2 Deciduous Forest (Wetland)

Twenty-one sample plots (SP-1, SP-5, SP-6, SP-8, SP-9, SP-12, SP-14, SP-16, SP-18, SP-20, SP-22, SP-24, SP-26, SP-29, SP-30, SP-32, SP-34, SP-36, SP-37, SP-39, and SP-42) were established in deciduous forested wetland cover types. Of these, six were in depressions, five were in slope, and ten were a combination of depression and slope geomorphic landscape positions. One sample plot (SP-9) established in the floodplain of the perennial stream in the southeast corner of the site on the valley bottom is given a descriptor of mixed broad-leaved deciduous and evergreen forested wetland (PFO1/4C) and is characterized by a more mature forest type. It is included in this cover type because deciduous forest is more typical of the forested wetlands associated with the stream. In addition, SP-41 was established in the quarry wetlands, which are technically persistent emergent and scrub-shrub but lumped in here.

3.2.1 Vegetation

Stand age and composition is somewhat variable but generally characterized by relatively young trees that are less than 12 inches dbh, which would be expected considering that most of the site was harvested a decade or two ago. Dominant trees in the sample plots are most often Pacific willow, red alder, and Scouler willow (*Salix scouleriana*). The latter is most common in mosaics (Wetlands F, H, N, and P). Willows and red alder or a mix of these are often co-dominant. Western red cedar is dominant in the more mature mixed deciduous and evergreen forest associated with the floodplain of the perennial stream in the southeast corner of the site. Canopy structure is variable ranging from more closed to relatively open. Trees that are often present but not dominant include cascara, western hemlock, western red cedar, big-leaf maple, and Sitka spruce (*Picea sitchensis*).

Diversity and dominance in the shrub and forb layers varies as a function of canopy structure. In general, depressional wetlands appear to be more diverse, which may be related to their generally larger size. Dominant shrubs in the sample plots include salmonberry, cascara saplings, black twinberry, spiraea (*Spiraea douglasii*) and willows. Shrubs that are common but not dominant include prickly currant (*Ribes lacustre*), osoberry (*Oemleria cerasiformis*), and red elderberry (*Sambucus racemosa*). Within these sample plots, the dominant herbs included swordfern (*Polystichum munitum*), youth-on-age (*Tolmeia menziesii*), slough sedge (*Carex obnupta*), water parsley (*Oenanthe sarmentosa*), and skunk cabbage (*Lysichiton americanum*). Swordfern was often dominant in the mosaics forming and growing on large hummocks. Other herbaceous species found in these wetland sample plots, which were common but not dominant, included lady fern (*Athyrium filix-femina*), reed mannagrass (*Glyceria* grandis), Cooley's hedge nettle(*Stachys chamisonis* var. *cooleyae*), kneeling angelica (*Angelica genuflexa* [tentative

Table 1. Summary of Sample Plot Data and Wetland Determinations, Classifications, Ratings, and Buffer Requirements.

Sample Plot	Hydrophytic Vegetation	Hydric Soils	Wetland Hydrology	Wetland Determination[1]	Wetland Rating/Buffer[2]	Federal (Corps) Jurisdiction[3]	Rationale for Jurisdictional Call
1	Yes – 80% FAC, FAC+	Yes – Redox dark surface (F6)	Yes – High water table (A2); Drainage patterns (B10)	Wetland A; Slope HGM PFO1BC	Category III; 150-ft buffer	No	No surface water connection or significant nexus.
2	No – 0% FAC or wetter	No indicators	No indicators	Upland evergreen forest			
3	No – 20% FAC	Yes – just meets redox dark surface (F6)	No indicators	Upland mixed forest			
4	No – 0% FAC or wetter	No indicators	No indicators	Upland mixed forest			
5	Yes – 80% FAC, FAC+, FACW+	Yes – Depleted below dark surface (A11) & Depleted matrix (F3)	Yes – High water table (A2) Drainage patterns (B10)	Wetland B; Slope HGM PFO1BC	Category III; 150-ft buffer	Yes	Likely surface water connection to perennial stream
6	Yes – 75% FAC, FAC+	Yes – Depleted below dark surface (A11) & Redox dark surface (F6)	Yes – Saturation (A3), Sediment deposits (B2), & Drainage patterns (B10)	Wetland C; Slope & Riverine HGM PSS1A	Category III; 150-ft buffer	Yes	Surface water connection to perennial stream
7	No – 33% FAC-	No indicators	No indicators	Upland mixed forest			
8	Yes – 100% FACW+, FAC, FAC+, OBL	Yes – Redox dark surface (F6)	Yes – High water table (A2), Sediment deposits (B2), & Drainage patterns (B10)	Wetland C; Slope & Riverine HGM PFO1BC	Category III; 150-ft buffer	Yes	Surface water connection to perennial stream

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Sample Plot	**Hydrophytic Vegetation**	**Hydric Soils**	**Wetland Hydrology**	**Wetland Determination[1]**	**Wetland Rating/Buffer[2]**	**Federal (Corps) Jurisdiction[3]**	**Rationale for Jurisdictional Call**
9	Yes – 100% FAC, FAC+, OBL	Yes – Loamy mucky mineral (F1) & Depleted matrix (F3)	Yes – High water table (A2) Drainage patterns (B10)	Wetland D; Riverine & depressional HGM PFO1/4C	Category II; 300-ft buffer	Yes	Surface water connection to perennial stream
10	No – 17% FAC	No indicators	No indicators within 12 inches	Upland mature evergreen forest			
11	Yes – 66% FAC, FAC+	No indicators	Yes – Drainage patterns (B10) & Geomorphic position (D2)	Upland mixed forest			
12	Yes – 100% FAC, OBL	Yes – Loamy mucky mineral (F1)	Yes – High water table (A2), Surface water (A1) & Drainage patterns (B10)	Wetland E; Slope HGM PFO1C	Category III; 150-ft buffer	Yes	Surface water connection to perennial stream
13	No – 0% FAC or wetter	No indicators	No indicators	Upland mixed forest			
14	Yes – 60% FAC, FAC+, FACW+	Yes – Depleted matrix (F3)	Yes – Saturation (A3)	Wetland F (mosaic); Slope HGM; PFO1B	Category IV; 50-ft buffer	No	No surface water connection or significant nexus.
15	No – 40% FAC, FAC+	No indicators	No indicators	Upland mixed forest			
16	Yes – 75% FAC, FAC+, FACW+	Yes – Depleted below dark surface (A11)	Yes – High water table (A2) & Saturation (A3)	Wetland G; Slope HGM PFO1AB	Category IV; 50-ft buffer	No	No surface water connection or significant nexus.
17	No – 25% FAC+	No indicators	No indicators	Upland evergreen forest			

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Sample Plot	**Hydrophytic Vegetation**	**Hydric Soils**	**Wetland Hydrology**	**Wetland Determination[1]**	**Wetland Rating/Buffer[2]**	**Federal (Corps) Jurisdiction[3]**	**Rationale for Jurisdictional Call**
18	Yes – 75% FAC, FAC+	Yes – Redox dark surface (F6)	Yes – High water table (A2), Saturation (A3), Drainage patterns (B10)	Wetland H(mosaic); Slope HGM PFO1AB	Category IV; 50-ft buffer	No	No surface water connection or significant nexus.
19	No – 0% FAC or wetter	No indicators	No primary indicators; only 1 secondary indicator	Upland evergreen forest			
20	Yes – 100% FAC, FAC+, FACW+, OBL	Yes – Redox dark surface (F6) & 2cm muck (A10)	Yes – High water table (A2) & Hydrogen sulfide odor (C1)	Wetland I; Depressional HGM PFO1C	Category III; 150-ft buffer	No	No surface water connection or significant nexus.
21	No – 14% FAC	No indicators	No indicators	Upland mixed forest			
22	Yes – 100% FAC, FAC+, FACW+, OBL	Yes – Redox dark surface (F6) & Depleted dark surface (F7)	Yes – High water table (A2), Saturation (A3), Drainage patterns (B10)	Wetland J; Slope/Depressional HGM PFO1C	Category III; 150-ft buffer	No	No surface water connection or significant nexus.
23	No – 0% FAC or wetter	No indicators	No indicators	Upland evergreen forest			
24	Yes – 100% FAC+, FACW, OBL	Yes – Histosol (A1)	Yes – Surface water (A1) & High water table (A2)	Wetland K; Depressional HGM PSS1C/PFO1A	Category II; 150-ft buffer	No	No surface water connection or significant nexus.
25	No – 0% FAC or wetter	No indicators	No indicators	Upland mixed forest			
26	Yes – 80% FAC, FAC+, OBL	Yes – Black histic (A3), Thick dark surface (A12), & Redox dark surface	Yes – High water table (A2), Saturation (A3), Drainage patterns (B10)	Wetland L; Depressional HGM PFO1C	Category III; 150-ft buffer	No	No surface water connection or significant nexus.

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Sample Plot	Hydrophytic Vegetation	Hydric Soils	Wetland Hydrology	Wetland Determination[1]	Wetland Rating/Buffer[2]	Federal (Corps) Jurisdiction[3]	Rationale for Jurisdictional Call
		(F6)					
27	No – 29% FAC, FAC+	No indicators	No indicators	Upland mixed forest			
28	No – 25% FAC	No indicators	No primary indicators; only 1 secondary indicator	Upland deciduous forest			
29	Yes – 100% FAC, FAC+, OBL	Yes – Black histic (A3)	Yes – Surface water (A1) & High water table (A2)	Wetland M; Depressional/slope HGM PFO1/PSS1C	Category III; 150-ft buffer	No	No surface water connection or significant nexus.
30	Yes – 100% FAC, FAC+, OBL, FACW	Yes – Redox dark surface (F6)	Yes – Saturation (A3), Oxidized rhizospheres (C3), Water-stained leaves (B9), Shallow aquitard (D3)	Wetland N (mosaic); Depressional HGM PFO1AB	Category IV (mosaic); 50-ft buffer	No	No surface water connection or significant nexus.
31	No – 40% FAC, FAC+	No indicators	No indicators	Upland mixed forest			
32	Yes – 100% FAC, FAC+, FACW+, OBL	Yes – Hydrogen sulfide (A4)	Yes – High water table (A2), Saturation (A3), Hydrogen sulfide odor (C1), Geomorphic position (D2)	Wetland O; Depressional HGM PFO1C	Category III; 80-ft buffer	No	No surface water connection or significant nexus.
33	No – 17% FAC	No indicators	No indicators	Upland mixed forest			
34	Yes – 75% FAC, FAC+, FACW+, OBL	Yes – Redox dark surface (F6) & 2cm muck (A10)	Yes – Saturation (A3)	Wetland P (mosaic); Slope/depressional HGM	Category III; 80-ft buffer	No	No surface water connection or significant nexus.

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Sample Plot	Hydrophytic Vegetation	Hydric Soils	Wetland Hydrology	Wetland Determination[1]	Wetland Rating/Buffer[2]	Federal (Corps) Jurisdiction[3]	Rationale for Jurisdictional Call
				PFO1AB			
35	No – 25% FAC	No indicators	No indicators	Upland evergreen forest			
36	Yes – 100% FAC, FACW+	Yes – Loamy mucky mineral (F1)	Yes – High water table (A2), Saturation (A3), Algal mat (B4)	Wetland Q; Depressional HGM PFO1C	Category III; 80-ft buffer	No	No surface water connection or significant nexus.
37	Yes – 100% FAC-, FAC, FAW+, OBL	Yes – Hydrogen sulfide (A4)	Yes – High water table (A2), Saturation (A3), & Hydrogen sulfide odor (C1)	Wetland R; Depressional HGM PFO1C	Category III; 150-ft buffer	No	No surface water connection or significant nexus.
38	No – 33% FAC	No indicators	No indicators	Upland evergreen forest			
39	Yes – 100% FAC, FAC+, FACW+, OBL	Yes – Histosol (A1)	Yes – High water table (A2), Saturation (A3), & Geomorphic position (D2)	Wetland S Depressional/slope HGM PFO1BC	Category III; 150-ft buffer	No	No surface water connection or significant nexus.
40	Yes – 100% FAC, FACW, OBL	Yes – Prolonged Inundation (Problematic hydric soils)	Yes – Surface water (A1), Saturation (A3), Algal mat or crust (B4), Shallow aquitard (D3)	Quarry wetland; Depressional/slope HGM PEM1/PSS1C	Category III; 80-ft buffer	No	No surface water connection or significant nexus.
41	No – 50% FAC	No indicators	No primary indicators; only 1 secondary indicator	Upland deciduous forest			

[1] Wetland determinations based on presence of hydrophytic vegetation, hydric soils, and wetland hydrology (see sample plot data in Appendix B), hydrogeomorphic (HGM) type.
[2] Wetland ratings and buffers are based on JCC 18.22.300 and JCC Table 18.22.350, respectively. Classification follows Cowardin et al. 1979.
[3] Preliminary assessment of Corps jurisdiction is based upon *Rapanos v. U.S*, 547 U.S. 15 (2006) and December 2, 2008 joint EPA and Corps guidance for determining if wetlands or other waters of the U.S. fall within Clean Water Act jurisdiction.

identification]), Siberian springbeauty, and giant horsetail (*Equisetum telmateia*). Some of these species that were not dominant in the sample plots have a patchy distribution and are locally dominant within at least some of the wetlands. More than 50% of the dominant plants in all sample plots are composed of dominant plants with FAC, FACW, and/or OBL wetland indicator statuses and the vegetation is hydrophytic. Scouler willow is most often present and abundant in the slope and/or slope/depressional systems and is indicative of a drier cover type. Species with FACW and OBL wetland indicator statuses typically drop out or are not found in the drier examples of this cover type, such as those present in the slope HGM types and mosaics. Photographs 2, 8, 15, 20-21, 23-24, 27-29, 31-32, and 34-36 show some of the variants of this cover type.

3.2.2 Soils

Positive indicators of hydric soils vary depending on geomorphology. On slope HGM types, positive indicators of hydric soils included Redox dark surface (F6), depleted below dark surface (A11), and depleted matrix (F3). Loamy mucky mineral (F1), histosol (A1), black histic (A3), and hydrogen sulfide (A4) were among the positive indicators observed in the depressional and combined depressional/slope HGM wetland types. In general, muck soils were observed in depressional wetlands correlating with the mapped soil series running in the north-to-south running depression (see Appendix A). Whereas mineral hydric soil indicators were more commonly observed on slopes. All sample plots possessed one or more positive indicators of hydric soils. Photograph 6 in Appendix C shows a typical hydric mineral soil.

3.2.3 Hydrology

Positive indicators of wetland hydrology likewise varied depending on topographic position and geomorphology. Among the positive indicators of wetland hydrology observed in the slope and combined slope/depressional systems were saturation (A3) at the ground surface, small pockets of shallow inundation (surface water [A1]), high water table (A2), drainage patterns (B10), and shallow aquitard (D3). Deeper surface water, hydrogen sulfide odor, drainage patterns, geomorphic position and high water table were some of the positive indicators observed in depressional wetlands. Photographs 20-21, 29 and 34 in Appendix C show some of these indicators of wetland hydrology.

3.2.4 Wetland Determination

Positive indicators of all three parameters were observed in all sample plots. In many instances, there were multiple primary and secondary indicators of hydric soil and wetland hydrology parameters. Therefore, these sample plots and forest cover type are wetland. Most of the wetlands within the area that may be mined are depressional wetlands or a combination of depressional and slope HGM types. Slope wetland HGM types are found in slightly steeper terrain south of the existing access road and areas where rock quarrying would occur.

3.2.5 Wetland Classification and Rating

All of the various HGM types are classified as palustrine broad-leaved deciduous forested wetlands (PFO). Some of these include more than one wetland system (e.g., riverine and palustrine), such as Wetlands B, C, and D. Wetland B likely becomes a narrow intermittent riverine system farther downslope and south of the site given the steeper topography and signature on recent aerial photographs. A stream corridor signature is apparent on the aerial photograph in Figure 2. This is also supported by the observed, narrow, ephemeral drainage channel at the south end of the delineated wetland at the southern site boundary. The southern end of Wetland C is an intermittent stream. At the beginning of May, the wetted width of the active channel ranged from about 3 to 9 feet. Photograph 13 in Appendix C shows the channel near wetland boundary flag C-59. Wetland E, which is a slope HGM type that is seasonally saturated, also has a stream-like signature on the aerial photograph in Figure 2, but lacks a continuous, clearly defined channel. Seeps saturated the ground surface and occasionally formed channel-like features with shallow (≤0.1 ft) slow-flowing surface water. Wetland E joins the western edge of Wetland D at the toe of the slope and edge of the floodplain of the perennial stream in what looks like an old channel meander. There are no channels with surface water connections between the south end of Wetland E and the active channel of the perennial stream. It is likely that there is hydrologic continuity between these wetlands via a high water table and shallow subsurface groundwater.

Wetland ratings vary primarily in relation to their structural complexity (number of wetland vegetation classes and density) and habitat functions. Water quality improvement and hydrologic support functions are relatively similar for most wetlands. Two of the forested wetlands are rated Category II (Wetlands D and K). Most of these forested wetlands are rated as Category III. Completed rating forms are provided in Appendix E.

Many habitat function components score the maximum amount possible for all wetlands under the habitat rating questions. For example, buffers typically score a maximum (Question H2.1) as there is more than 330 ft of relatively undisturbed vegetated areas, rocky areas, or open water around >95% of the circumference and no structures within the buffer. Similarly, all wetlands score the maximum amount for corridors and connections (Question H2.2) because there is at least a 150-ft wide corridor with at least 30% forest cover that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size. All the wetlands score the maximum for Question H2.4 regarding wetland landscape because there are at least 3 other wetlands within a half mile, and the connections between them are relatively undisturbed. Habitat functions, however, vary between wetlands primarily based on vegetation structure, hydroperiods, plant species richness, interspersion of habitat types, special habitat features, and proximity to other priority habitat types listed by the Washington Department of Fish and Wildlife. Wetland D had a total score for habitat functions of 33. Compare this to Wetland A, which is a fairly typical slope HGM-type, Category III wetland with a total score for habitat functions of 23. Wetland D has several wetland vegetation classes whereas Wetland A has only a single wetland vegetation class (forested). Wetland D scored the maximum for hydroperiods having four or more types, while Wetland A had two (seasonally flooded and saturated). Wetland D has high interspersion of habitats whereas Wetland A has none. There

Legend

- Approximate Mine Lease Boundaries
- Streams (Source: Jefferson County GIS)

Delineated Wetlands

- Category II
- Category III
- Category IV
- Wetland Buffer
- Estimated Boundaries
- Approximate Sample Plot Location and Numbers

Delineated wetland boundaries for Wetlands A through I and L through S were surveyed with a Magellan Mobile Mapper™ CX global positioning system.

The location of the delineated boundaries of Wetlands II, J, and K are estimated based on topographic contours and onsite observations. Following confirmation of wetland boundaries, a licensed land surveyor will survey all delineated and confirmed wetland boundaries.

Base map showing LIDAR topography and mine lease area provided by Layton & Sell, Inc.

Aerial photograph 2006 (Source: USGS)

Existing Shine Quarry

Quarry Wetlands

Western Boundary of Wetland D

0 250 500 1,000

Feet

ENVIRON

Approximate Delineated Wetland Boundaries
New Shine Quarry
Jefferson County, Washington

Figure 2

Drafter: KAR

Date: July 27, 2009

Project Number: 3022731A

are five special habitat features in Wetland D and only two (large, downed woody debris and <25% invasive plant cover) in Wetland A. As shown in the completed rating forms in Appendix E, Wetland D has a total score for all functions of 56. By comparison, Wetland A has a total score for all functions of only 32.

The difference between Category III and IV wetlands is generally a function of lower habitat function and also lower hydrologic function scores (Table 2). The difference in the potential hydrologic functions of Category III and Category IV wetlands is that the higher rated wetlands have denser vegetation over a higher percentage of their total area, which potentially reduces surface water velocities. In addition, the depressional and slope wetlands that rate Category III have more depressions capable of temporarily holding surface water for longer periods of time whereas the lower rated Category IV wetlands lack this characteristic. For example, Wetland A (Category III) had a total hydrologic function score of 5. By contrast, Wetland F, a typical Category IV slope HGM type, had a total hydrologic function score of only one. All of the wetlands lack the opportunity to reduce flooding and erosion because almost the entire watershed is undeveloped and forested for the contributing basin area upstream of SR 104. There is no evidence of flooding or erosion in downstream areas, such as at the culvert crossing under SR 104 (see Photograph 1 in Appendix C). Downstream of this culvert is a relatively large wetland complex and continuum of palustrine and estuarine wetlands and adjacent forested uplands, which ultimately drains to Hood Canal. There is no evidence of any flow capacity limitations, flooding problems, or erosion at either the SR 104 culvert or at bridge abutments or adjacent to the South Point Road prism. In addition, there are no other developments in these downstream areas to protect from flooding or erosion. The only other development consists of a few single-family residences on the north shore of the Hood Canal east of the South Point Road bridge. The combined storage capacity of the wetlands within the site, however, has a negligible potential influence on flood tides in Hood Canal that might affect these residences.

For those small wetlands less than 0.1 acre (Wetlands N, O, Q and quarry wetlands), the rating system appears to overestimate functions and overrate the wetlands. Instead of Category III, these would appear to be more appropriately rated Category IV given their very small sizes disturbed nature, structure, and likely functions.

3.3 Mature Evergreen Forest (Upland)

As noted above, the third major cover type on and in the immediate vicinity of the site is mature evergreen forest. This upland type is relegated to a small portion of the southeast corner of the site, which was not harvested during the most recent logging rotation. One sample plot (SP-10) was established in this area.

3.3.1 Vegetation

Dominant trees in the sample plot were Douglas fir and western red cedar. Other trees present, but not dominant, included western hemlock and red alder. Dominant shrubs were red

Table 2. Summary of western Washington wetland ratings and functions.

Wetland	Classification [1]	Area [2] (acres)	HGM [3] Type	Functions			Total	Rating
				Water Quality	Hydrologic	Habitat		
A	PFO1BC	0.35	Slope	4	5	23	32	III
B	PFO1BC	0.37	Slope	4	5	23	33	III
C	PFOBC PSSA	1.13	Slope Depressional	6	5	27	38	III
D	PFO1/4 PSS1BC	>21 (estimate)	Riverine Depressional	12	11	33	56	II
E	PFO1C	0.92	Slope	4	5	24	33	III
F	PFO1B	0.02	Slope	5	1	20	26	IV
G	PFO1AB	0.02	Slope	4	3	20	27	IV
H	PFO1AB	0.13	Slope	4	3	21	28	IV
I	PFO1C	0.33	Depressional Outflow	11	10	21	42	III
II	PFO1C	0.10	Closed Depressional	8	10	19	37	III
J	PFO1C	0.04	Depressional Slope	6	10	22	38	III
K	PFO1AC	0.15	Closed Depressional	16	12	23	51	II
L	PFO1C	0.48	Depressional Outflow	15	8	25	48	III
M	PFO/SS1C	1.31	Depressional Outflow	15	10	23	48	III
N	PFO1A	0.01	Depressional Slope	6	4	17	27	IV
O	PFO1C	0.02	Closed Depressional	10	10	18	38	III
P	PFO1AB	0.17	Depressional Slope	10	10	19	39	III
Q	PFO1C	0.01	Closed Depressional	8	7	16	31	III

Table 2. Summary of western Washington wetland ratings and functions.

Wetland	Classification [1]	Area [2] (acres)	HGM [3] Type	Functions			Total	Rating
				Water Quality	Hydrologic	Habitat		
R	PFO1BC	0.54	Closed Depressional	14	10	25	49	III
S	PFO1BC	0.88	Closed Depressional	16	10	24	50	III
Quarry	PEM/SS1C	0.07	Depressional Slope	9	2	23	34	III

[1] U.S. Fish and Wildlife Service Classification (Cowardin et al. 1979)
[2] Estimated areas based on the delineated and estimated wetland boundaries shown in Figure 2
[3] Hydrogeomorphic (HGM) type

huckleberry, dull Oregon grape, and salal. Less abundant shrubs were osoberry and salmonberry. Swordfern was the only dominant herbaceous plant in the sample plot. Only 17% of the dominant plants have FAC wetland indicator statuses, and the prevalence index was 4.1. Because <50% of the dominant plants had FAC or wetter wetland indicator statuses, the prevalence index was greater than 3.0, and no other positive indicators of hydrophytic vegetation were observed, this sample plot and community qualify as upland forest. Photograph 16 in Appendix C shows this forest cover type.

3.3.2 Soils

There were no positive indicators of hydric soils in the test pit within this sample plot. Like some of the other upland forest soils, there were a couple of inches of duff on the ground surface. Soils did not match any of the mapped soil series identified by the NRCS. Loam and sandy loam-textured soils were observed throughout the entire test pit profile to a depth of 19 inches. Between a depth of seven and 14 inches, soils consisted of a mixed matrix of mostly brighter materials (10YR 3/3 and 10YR 4/3) with no redoximorphic features. Although there were some redoximorphic concentrations from 14 to 19 inches in a matrix with a chroma of 3 (10YR 3/3), this does not qualify as a hydric soil indicator. Therefore, the hydric soil criterion was not met.

3.3.3 Hydrology

Evidence of hydrology was likewise lacking. Soils at this location appear to be within the 100-year floodplain and have clearly developed in relatively recent alluvial deposits. In addition, it is likely that hydrology is influenced by seasonally high shallow groundwater and dynamics within the hyporheic zone. Nonetheless, there was no evidence of any primary or secondary indicators of wetland hydrology. Consequently, the wetland hydrology criterion was not met.

3.3.4 Wetland Determination

Because the three parameters (hydrophytic vegetation, hydric soils, and wetland hydrology) were not satisfied, the sample plot and this vegetation cover type qualify as upland forest.

4 Regulatory Issues

The preliminary jurisdictional determinations and ratings presented herein are subject to independent verification by the Corps, Ecology, and Jefferson County. In addition, the delineated wetland boundaries are also subject to verification by these agencies. Potential impacts to wetlands from mining activities may be subject to regulation by the Corps under the Clean Water Act (33 U.S.C. § 1344 et. seq.). Ecology independently regulates wetlands pursuant to Chapter 90.48 RCW, and Jefferson County regulates wetlands under JCC 18.22.

All of the closed depressional wetlands and depressional outflow wetlands and at least some of the slope wetlands are hydrologically isolated and do not appear to be subject to Corps jurisdiction under the CWA as determined through application of current guidance reflecting limitations on federal wetland jurisdiction announced in *Rapanos v. U.S*, 547 U.S. 15 (2006) (referred to herein as Rapanos). A few of the slope or combined slope/depressional or depressional/riverine HGM types, including Wetlands B, C, E, and D, are likely subject to Corps jurisdiction because of observed or probable surface water connections to a tributary or a stream that is tributary to a traditionally navigable body of water (Hood Canal). Other slope wetlands, including F, G, and H do not have any surface water connections to tributaries, nor do they appear to meet the significant nexus criteria set forth in the joint Corps and U.S. Environmental Protection Agency guidance memorandum pertaining to application of *Rapanos*, dated December 2, 2008. All of these wetlands are, nevertheless, subject to regulation by Ecology and the Jefferson County Critical Areas Regulations (JCC 18.22).

A Joint Aquatic Permit Application (JARPA) will be prepared and submitted to the Corps and Ecology. Following confirmation of the delineated boundaries, a licensed professional land surveyor will survey the delineated and confirmed wetland boundaries.

As specified at JCC 18.22.350, Jefferson County's stated goal is no net loss of wetland function, value, and acreage. Ecology and the Corps have the same stated goal. As a condition of any permit or other approval that results in the loss or degradation of regulated wetlands, compensatory mitigation is required to offset impacts resulting from the permitted activity (JCC 18.22.350(2)). Once the delineated wetland boundaries have been confirmed and ratings verified, the area of wetland that would be impacted will be determined and a compensatory wetland mitigation plan will be prepared pursuant to the federal law, state law, and the JCC, as applicable. Mitigation plans should include a monitoring plan that identifies the duration, frequency and methods of monitoring. Mitigation options may include advance, concurrent, and post-impact reestablishment or creation of wetlands, or a combination thereof, in accordance with the standards set forth in the JCC. Several possibilities exist for completion of advanced mitigation on-site to minimize temporal loss of function.

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