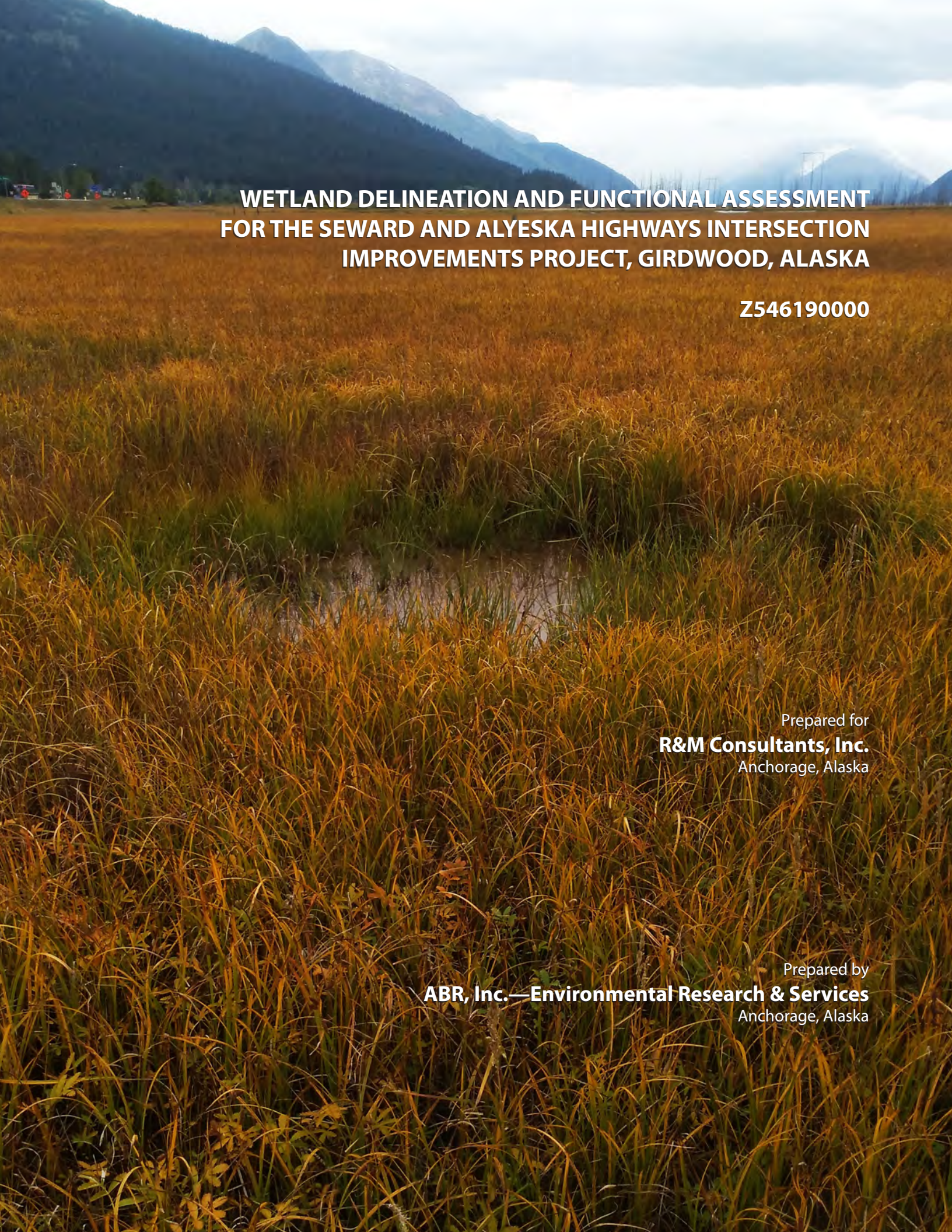

WETLAND DELINEATION AND FUNCTIONAL ASSESSMENT FOR THE SEWARD AND ALYESKA HIGHWAYS INTERSECTION IMPROVEMENTS PROJECT, GIRDWOOD, ALASKA

Z546190000

Prepared for
R&M Consultants, Inc.
Anchorage, Alaska

Prepared by
ABR, Inc.—Environmental Research & Services
Anchorage, Alaska

Cover: Girdwood estuary. Photograph by Robert McNown, ABR.

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Prepared for

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December 2020

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INTRODUCTION

The Alaska Department of Transportation and Public Facilities (DOT&PF) is proposing to improve the intersection of the Seward and Alyeska highways, at approximately Seward Highway milepost (MP) 90. To support environmental permit compliance and the National Environmental Policy Act (NEPA) document for this project, R&M Consultants, Inc. (R&M) contracted ABR, Inc.—Environmental Research & Services (ABR) to delineate wetlands and assess the functions of wetlands within an approximately 87-acre study area surrounding the intersection of the Seward and Alyeska highways. The study area for the wetland survey encompasses the preliminary project footprints for various alternatives.

STUDY AREA

The study area is in Girdwood, Alaska, surrounding the intersection of the Seward and Alyeska highways, and encompasses 86.65 acres along the shoreline of Turnagain Arm (Figure 1). The center point coordinates are 60.9403, -149.1733 (NAD83); and the legal description is Seward Meridian, Township 10N, Range 1E, Section 24 and Township 10N, Range 2E, Section 19. Land ownership is a combination of municipal, state, Alaska Railroad Corporation right-of-way and private property. The terrain surrounding Turnagain Arm consists of broad, wetland-rich, glacial outwash plains bounded by steep, rocky, glaciated side slopes (USFS 2004). Vegetation in the Turnagain Arm area ranges from alpine dwarf scrub to mature mixed coniferous-deciduous forests in valley bottoms, with halophytic sedge and sedge-grass meadows along the coast. The study area includes portions of an estuarine meadow on the coastal side of the Seward Highway; palustrine, toe-slope wetlands inland of the Seward Highway; and disturbed areas surrounding the Tesoro gas station pad and highway and railroad corridors along the Alyeska Highway. The climate is transitional from temperate maritime to subarctic continental (Kautz and Taber 2004).

Figure 1. Seward and Alyeska Highways Intersection Wetland Study Area, (Centroid: -149.1733, 60.9403) Girdwood, Alaska.

map prepared by:
ABR, Inc. — Environmental Research & Services

Project Proponent: Alaska Department of Transportation and Public Facilities
Project Number: Z546190000

METHODS

DATA SOURCES

The following data sources were used to inform the field survey and wetland mapping efforts:

- High-resolution ortho-corrected satellite imagery provided by the Municipality of Anchorage (MOA; 0.15-m resolution, acquired 4 May 2015).
- Federal Emergency Management Agency (FEMA 2011) digital terrain model (DTM).
- MOA (2020) mapping of wetlands, streams, drainageways, and drainageway nodes.
- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) mapping (USFWS 2019). Mapping for this area was conducted at a scale of 1:65,000 using imagery acquired in August 1978.
- Existing wetland and waters mapping for the Seward Highway Milepost 75–90 Road and Bridge Rehabilitation Project (HDR 2013 and 2008a).
- Natural Resources Conservation Service (NRCS), Soil survey mapping (NRCS 2020)'
- United States Geological Service (USGS0 National Hydrography Dataset (USGS 2020)

FIELD SURVEY

ABR wetland scientists Wendy Davis (Professional Wetland Scientist, PWS #2091) and Robert McNown collected wetland field data on 16 September 2020. The survey date was selected to occur between the median dates for the onset of vegetation green-up in spring and vegetation senescence in fall, as specified by the USACE (2007).

Digital data-collection forms (Android tablet applications) were used to record data on vegetation, soils, hydrology, and landscape features in the field. The applications allowed for data to be uploaded wirelessly from the field to a PostgreSQL project database housed and managed at ABR offices. ABR's photo app developed for use with Android devices was used to collect geotagged photos and automatically rename them to include the field plot name, the photo element, and the date. In addition to providing streamlined data collection and QC protocols, the wetland apps produce PDF data sheets in the format required by the USACE (USACE 2007).

ESRI's ArcGIS Collector was used as a mobile-map tool in the field, facilitating real-time image interpretation and the ability to take detailed notes for points, lines, and polygons placed on an electronic map on an Android tablet computer. Collector was used to place track logs on streams obscured by vegetation canopy, to mark the location of wetland boundaries that were difficult to interpret on satellite imagery alone, and to note vegetation communities and wetland types for areas not documented with formal wetland determination plots or field verification plots.

WETLAND DETERMINATIONS

Field surveys entailed collecting wetland data according to standard methods outlined in the U.S. Army Corps of Engineers (USACE) *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region, Version 2.0* (USACE 2007). Routine wetland determinations were performed following the USACE three-parameter approach (Environmental Laboratory 1987; USACE 2007). To be classified as a wetland, a site must be dominated by hydrophytic plants, have hydric soils, and show evidence of a wetland hydrologic regime. Each wetland determination plot consisted of an area of homogenous vegetation approximately 33-foot radius. Size and dimensions were modified where necessary to accurately characterize the plant community (e.g., narrow, oblong plots were used in linear riparian areas).

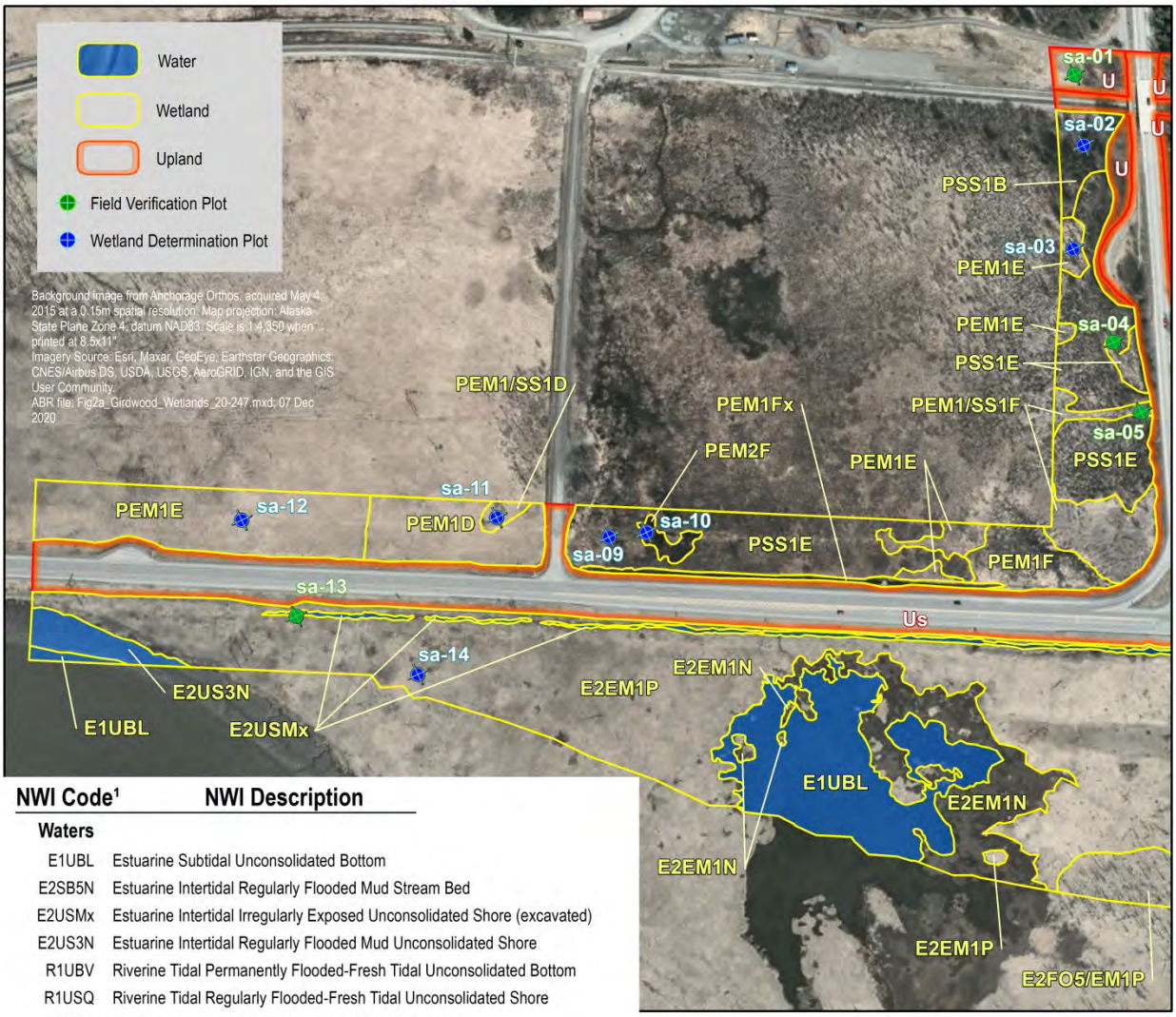
In general, hydrophytic vegetation is considered present when the plant community is dominated by species that can tolerate prolonged inundation or soil saturation during the growing season. The absolute cover of each vascular plant species within the 33-foot radius at each plot was visually estimated and the presence of hydrophytic vegetation was determined using the Dominance Test (ratio of wetland versus upland dominant plants), and/or the Prevalence Index (weighted average of all species present) using the wetland indicator status per the *2018 National Wetland Plant List v.3.4: Alaska* (USACE 2018). The indicator status rates how likely a species is to occur in a wetland. Obligate wetland (OBL) plants occur in wetlands >99% of the time; facultative wetland (FACW) plants usually occur in wetlands (67–99%), but may occur in non-wetlands; facultative (FAC) plants are equally likely to occur in wetlands (34–66%) and non-wetlands; facultative upland (FACU) plants usually occur in non-wetlands, but are occasionally

found in wetlands (1–33%); and Upland (UPL) plants occur almost always under natural conditions in non-wetlands (they are found in wetlands <1% of the time).

Hydric soils form under conditions of saturation, flooding, or ponding that persist long enough during the growing season to cause anaerobic conditions to develop in the upper 12 inches of the soil. Hydric soils often have thick organic deposits (histosols, histels, or histic epipedons) or a low-chroma mineral soil matrix color with redoximorphic features, indicating a reducing environment. Soil pits were excavated to approximately 20 inches and the soil profile was described. Key characteristics, including color (Munsell Color 2010) and the occurrence and abundance of redoximorphic features were recorded. Soil profile descriptions also were compared with hydric soil criteria in the current version of the *Field Indicators of Hydric Soils in the United States* (USDA NRCS 2018).

Wetland hydrology is defined as the presence of flooded or ponded surface water or saturation within the upper 12 inches of the soil profile that persists for at least 14 consecutive days during the growing season, in at least 5 years out of 10. Surface and subsurface direct and indirect indicators of wetland hydrology were recorded at each site when present; these included surface water, saturated soils, presence of and depth to water table, drift or sediment deposits, drainage patterns, and geomorphic position, as noted on the standard USACE wetland determination data form (USACE 2007).

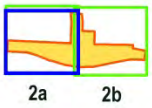
In addition to the data required for a standard USACE wetland determination data form (USACE 2007), the Viereck et al. (1992) Level IV vegetation class, hydrogeomorphic (HGM) class (Brinson 1993), and NWI wetland code (FGDC 2013) were recorded at each wetland determination plot. Global Positioning System (GPS) coordinates and photographs of soil and landscape features were taken at each wetland determination plot. Wetland determination plot data and photographs are presented in Appendix A and locations are depicted on Figure 2.



NWI Code[1]	NWI Description
Waters	
E1UBL	Estuarine Subtidal Unconsolidated Bottom
E2SB5N	Estuarine Intertidal Regularly Flooded Mud Stream Bed
E2USMx	Estuarine Intertidal Irregularly Exposed Unconsolidated Shore (excavated)
E2US3N	Estuarine Intertidal Regularly Flooded Mud Unconsolidated Shore
R1UBV	Riverine Tidal Permanently Flooded-Fresh Tidal Unconsolidated Bottom
R1USQ	Riverine Tidal Regularly Flooded-Fresh Tidal Unconsolidated Shore
PUBH	Palustrine Permanently Flooded Unconsolidated Bottom
Wetlands	
E2EM1N	Estuarine Intertidal Regularly Flooded Persistent Emergent Marsh
E2EM1P	Estuarine Intertidal Irregularly Flooded Persistent Emergent Meadow
E2FO5/EM1P	Estuarine Intertidal Irregularly Flooded Dead Forest/Persistent Emergent Meadow
E2SS1P	Estuarine Intertidal Irregularly Flooded Broad-leaved Deciduous Shrub Scrub
PEM1F	Palustrine Semipermanently Flooded Persistent Emergent Meadow
PEM1Fx	Palustrine Semipermanently Flooded Persistent Emergent Meadow (excavated)
PEM2F	Palustrine Semipermanently Flooded Nonpersistent Emergent Meadow
PEM1/SS1F	Estuarine Intertidal Irregularly Flooded Dead Forest/Persistent Emergent Meadow
PEM1E	Palustrine Seasonally Flooded-Saturated Persistent Emergent Meadow
PSS1E	Palustrine Seasonally Flooded-Saturated Broad-leaved Deciduous Shrub Scrub
PEM1/SS1D	Palustrine Continuously Saturated Persistent Emergent/Broad-leaved Deciduous Shrub Scrub
PEM1D	Palustrine Continuously Saturated Persistent Emergent Meadow
PSS1C	Palustrine Seasonally Flooded Broad-leaved Deciduous Shrub Scrub
PSS1B	Palustrine Seasonally Saturated Broad-leaved Deciduous Shrub Scrub
Uplands	
U	Upland
Us	Upland (fill)
Ux	Upland (excavated)

[1] National Wetland Inventory (NWI) nomenclature based on FGDC 2013.

Tile Location



Approximate Scale
1: 4,350

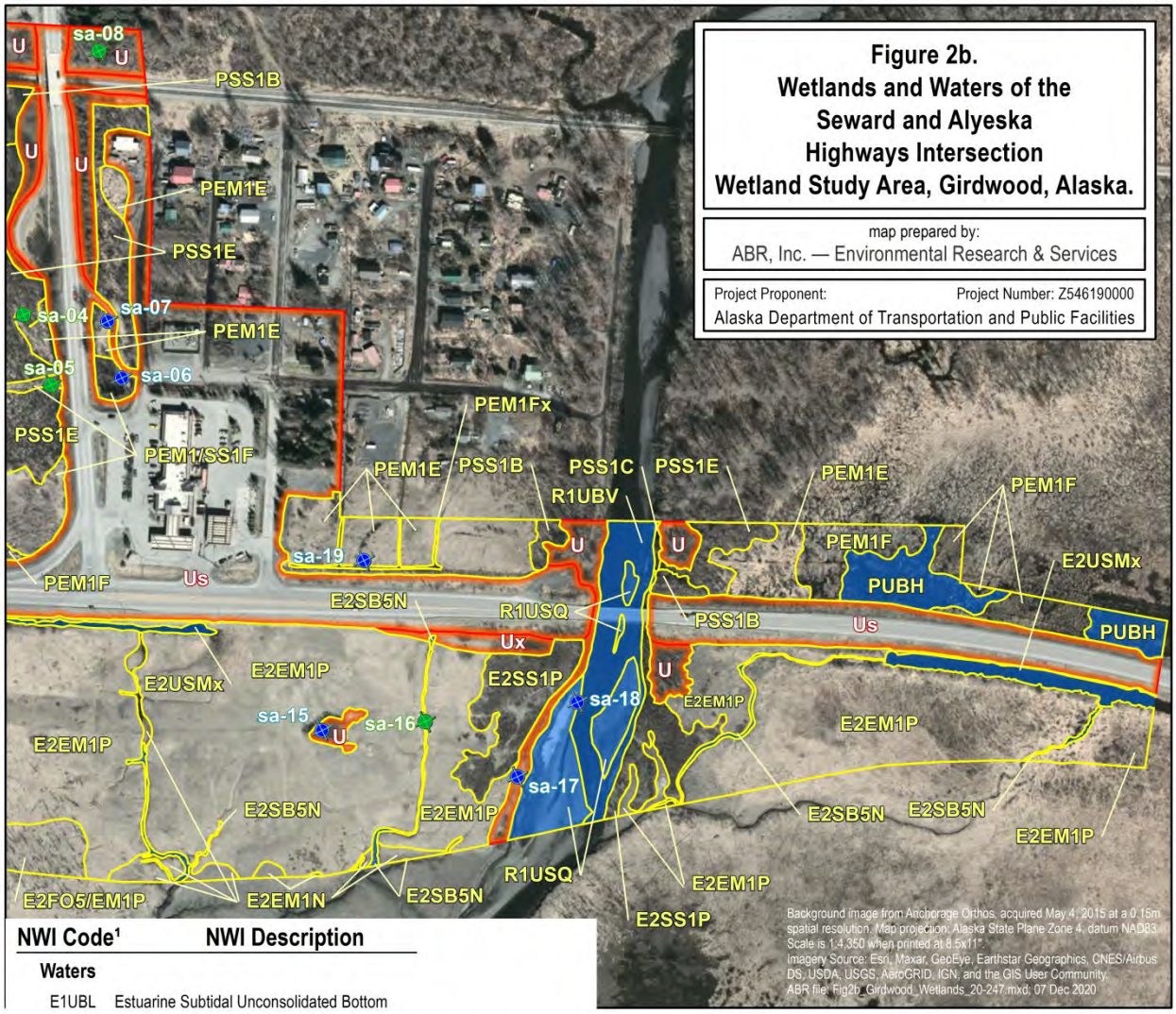
0 25 50 75 100 Meters

0 100 200 300 400 Feet

Figure 2a.
Wetlands and Waters of the Seward and Alyeska Highways Intersection Wetland Study Area, Girdwood, Alaska.

map prepared by:
ABR, Inc. — Environmental Research & Services

Project Proponent: Alaska Department of Transportation and Public Facilities
Project Number: Z546190000



NWI Code[1]	NWI Description
Waters	
E1UBL	Estuarine Subtidal Unconsolidated Bottom
E2SB5N	Estuarine Intertidal Regularly Flooded Mud Stream Bed
E2USMx	Estuarine Intertidal Irregularly Exposed Unconsolidated Shore (excavated)
E2US3N	Estuarine Intertidal Regularly Flooded Mud Unconsolidated Shore
R1UBV	Riverine Tidal Permanently Flooded-Fresh Tidal Unconsolidated Bottom
R1USQ	Riverine Tidal Regularly Flooded-Fresh Tidal Unconsolidated Shore
PUBH	Palustrine Permanently Flooded Unconsolidated Bottom
Wetlands	
E2EM1N	Estuarine Intertidal Regularly Flooded Persistent Emergent Marsh
E2EM1P	Estuarine Intertidal Irregularly Flooded Persistent Emergent Meadow
E2FO5/EM1P	Estuarine Intertidal Irregularly Flooded Dead Forest/Persistent Emergent Meadow
E2SS1P	Estuarine Intertidal Irregularly Flooded Broad-leaved Deciduous Shrub Scrub
PEM1F	Palustrine Semipermanently Flooded Persistent Emergent Meadow
PEM1Fx	Palustrine Semipermanently Flooded Persistent Emergent Meadow (excavated)
PEM2F	Palustrine Semipermanently Flooded Nonpersistent Emergent Meadow
PEM1/SS1F	Estuarine Intertidal Irregularly Flooded Dead Forest/Persistent Emergent Meadow
PEM1E	Palustrine Seasonally Flooded-Saturated Persistent Emergent Meadow
PSS1E	Palustrine Seasonally Flooded-Saturated Broad-leaved Deciduous Shrub Scrub
PEM1/SS1D	Palustrine Continuously Saturated Persistent Emergent/Broad-leaved Deciduous Shrub
PEM1D	Palustrine Continuously Saturated Persistent Emergent Meadow
PSS1C	Palustrine Seasonally Flooded Broad-leaved Deciduous Shrub Scrub
PSS1B	Palustrine Seasonally Saturated Broad-leaved Deciduous Shrub Scrub

Uplands

U	Upland
Us	Upland (fill)
Ux	Upland (excavated)

[1] National Wetland Inventory (NWI) nomenclature based on FGDC 2013.

Water
Wetland
Upland
Field Verification Plot
Wetland Determination Plot

Tile Location

2a 2b

Approximate Scale
1: 4,350

0 25 50 75 100 Meters

0 100 200 300 400 Feet

In some cases, rapid field verification plots also were sampled to help map wetland boundaries. At field verification plots, the dominant vascular plant species, NWI type (FGDC 2013), and Viereck et al. (1992) Level IV vegetation class were recorded, as well as site photographs and GPS coordinates. Verification plots were typically sampled in areas where the field team had already documented wetland or upland status with full wetland determination plots. The data from verification plots were used to improve map accuracy by increasing the number of documented wetland areas associated with particular image-signatures. Information collected at field verification plots are presented in Appendix B and locations are depicted on Figure 2.

WETLAND CLASSIFICATION AND MAPPING

Existing wetland and waters mapping for the Seward Highway Milepost 75–90 Road and Bridge Rehabilitation Project (HDR 2013 and 2008a) was modified to reflect current conditions by revising boundaries on-screen at a scale of 1:2,000 using ArcGIS software, which is the approach typically used by the U.S. Fish and Wildlife Service's NWI program to map wetlands (Dahl et al. 2015). Digital, high-resolution, ortho-corrected satellite imagery acquired on 4 May 2015 (see Data Sources above) was used as the geographic basis for the identification of wetland boundaries. Wetland boundaries were identified by using the field ground-reference data and photo-interpreting vegetation types, HGM classes, local topography from the DTM, and surface freshwater and estuarine water connections evident on the satellite imagery. Wetlands and waters were categorized into NWI types, which describe the dominant vegetation structure and water regime for each wetland type (FGDC 2013).

WETLAND FUNCTIONAL ASSESSMENT AND RELATIVE ECOLOGICAL VALUES

The MOA maintains wetland mapping throughout the entire municipality with the goal of providing management guidance for developers. The Anchorage Wetland Management Plan (AWMP) uses wetland functional scores based on field investigations to assign development classes (Class A, B, C and D) to individually numbered wetlands (MOA 2014). The functional scores are based on field investigation and are provided for all numbered wetlands except for some private lands and estuarine wetlands. The numbered wetlands represent complexes composed of a variety of NWI wetland types. Instead of providing a new functional assessment,

the results of the 2020 wetland survey of proposed alternatives for the Seward and Alyeska highways Intersection Improvement project were compared with the MOA wetland mapping and functional assessment scores to determine whether the wetlands in the study area have been significantly degraded over time and/or if the wetland extent has changed.

The goal of functional assessment is to determine which wetlands are the most valuable to guide avoidance and minimization measures to impact the least valuable wetlands. If mitigation is required, the project will also need to calculate project debits to determine compensatory mitigation to offset unavoidable impacts. The current method used by the MOA to determine the value of wetlands within a proposed development area is the Anchorage Debit Credit Method (ADCM; Dean 2011). The process of calculating project debits and credits involves assigning Relative Ecological Value (REV) scores to wetlands and waters, which express the overall level of ecological function performed by each mapped wetland and water. The ADCM uses four REV levels, with REV1 areas having the highest ecological value and REV4 areas the lowest. The guidance in Tables 1 and 2 of the ADCM was used, in conjunction with the field identification and photointerpretation of wetland and upland areas within broad landform categories, to assign REV scores within the study area. REV scores were further adjusted according to position within setbacks and buffers surrounding the highest-value REV1 and REV2 waters. The REV mapping provided in GIS format for this project can be used directly in the ADCM worksheets to calculate debits once the project footprint boundaries are finalized. Debits were not calculated as part of this report.

PROPOSED JURISDICTIONAL DETERMINATION

Wetlands and waters within the study area were assessed to determine whether they met the definition of a water of the U.S., subject to jurisdiction under Section 404 of the Clean Water Act (CWA), and/or a navigable water of the U.S., subject to jurisdiction under Section 10 of the Rivers and Harbors Act. The Navigable Waters Protection Rule (Clean Water Act 33 CFR Part 328) recently came into effect and clarifies the scope of jurisdictional waters of the U.S. in light of three U.S. Supreme Court cases: *U.S. v. Riverside Bayview Homes* (*Bayview*), *Solid Waste Agency of Northern Cook County v. U.S.* (*SWANCC*), and *Rapanos v. U.S.* (*Rapanos*).

Jurisdiction under the Navigable Waters Protection Rule is applied to four categories of waters of the U.S.: (1) the territorial seas and traditional navigable waters; (2) perennial and intermittent tributaries to those waters; (3) certain lakes, ponds, and impoundments; and (4) adjacent wetlands, as defined by 33 CFR Parts 328 and 120—Definition of Waters of the United States. To classify wetlands and waters within the study area into jurisdictional categories and to establish connectivity to traditional navigable waters, the EPA Training and Implementation Materials were also consulted (EPA 2020). Traditional navigable waters are defined as "all waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide" [33 C.F.R. Section 328 3(a)]. In this assessment, the USACE navigable waters list (USACE 2020) was used to determine navigability.

RESULTS AND DISCUSSION

FIELD SURVEY

Standard USACE wetland determinations were completed at 13 sites and field verifications were completed at 6 sites (Figure 2a and 2b; Appendices A and B, respectively). GPS accuracy for the field plot locations ranged from 1 m to 4 m, with a median accuracy of 2 m. Characteristics of each mapped wetland and water are listed in Appendix C, including the NWI type, HGM class, waters connectivity characteristics used to determine likely jurisdictional status, size (acres), and the centroid latitude and longitude of each mapped polygon.

To assess climatic conditions during the field survey, especially as this relates to wetland hydrology, we performed a precipitation analysis for the study area similar to the USACE's Antecedent Precipitation Tool. This analysis involves summarizing precipitation data (Menne et al. 2012) from the nearest meteorological stations and filling in any missing records with data from the next nearest station. The Alyeska station, located approximately 2.5 miles from the study area, provided 99% of the data used in the analysis. Current-year 30-day rolling precipitation sums were compared with 30 years of 30-day rolling precipitation sums at the 30 and 70th percentiles, which are interpreted as normal conditions (Figure 3). Figure 3 suggests that with the exception of July, much of the 2020 growing season was drier than normal.

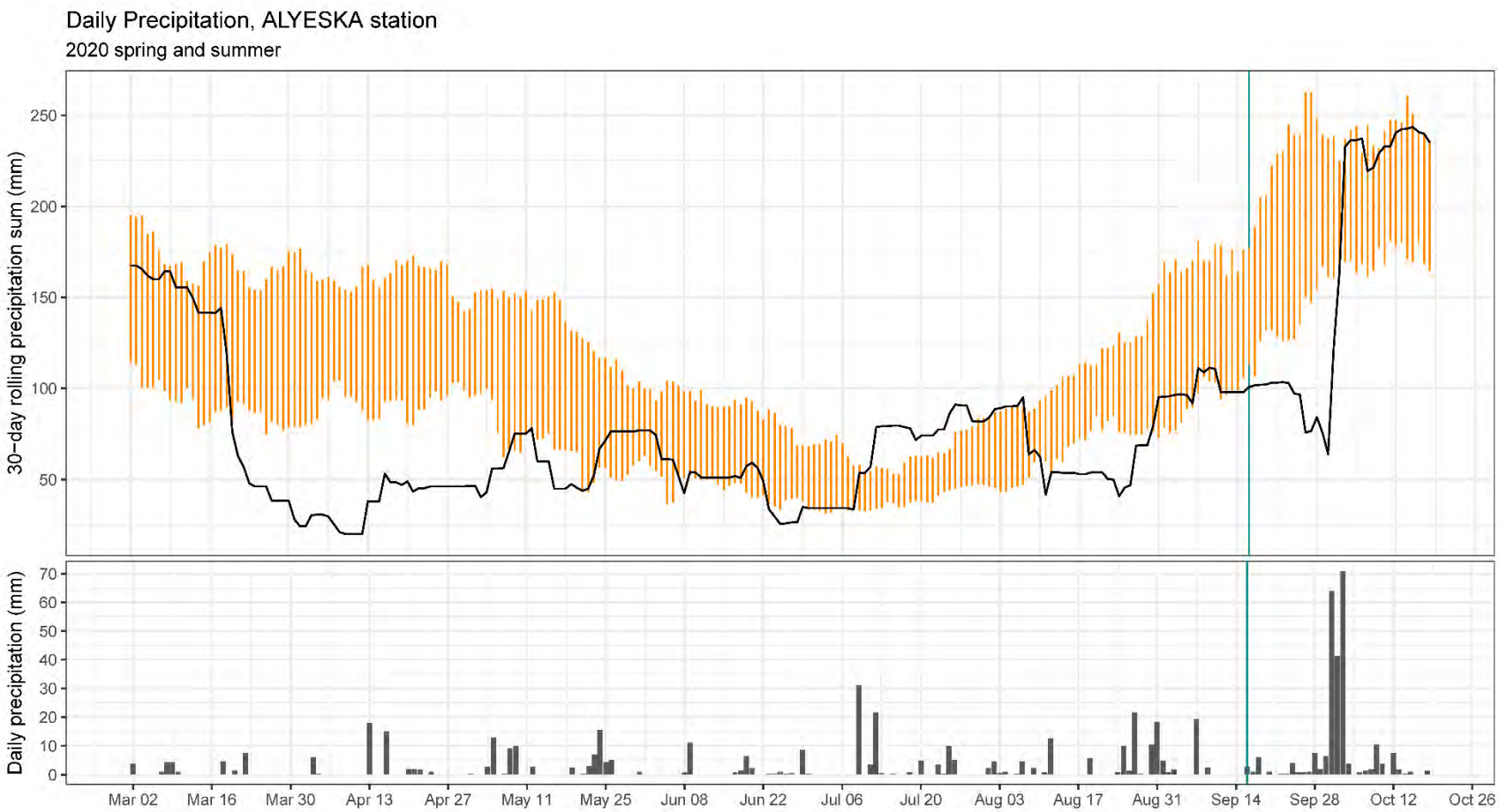


Figure 3. Antecedent Precipitation chart for the Alyeska meterological station showing the 30-year precipitation normal, the 30-day rolling precipitation average for the current growing season and daily precipitation.

Conditions were slightly below normal at the time of the field survey but were within the normal range for the prior two weeks.

WETLAND CLASSIFICATION AND MAPPING

Twenty-four NWI classes were identified in the study area (Table 1, Figures 2a and 2b); these included seven waters, fourteen wetlands, and three non-wetlands (uplands).

WATERS

Waters in the Estuarine system of FGDC (2013) were documented south of the Seward Highway, where the study area extends out towards Turnagain Arm. Estuarine Subtidal Unconsolidated Bottom (E1UBL) waters, covering 3.42 acres or 4.0% of the study area (Table 1), were mapped where a small portion of Turnagain Arm occurs in the study area and within a larger matrix of vegetated Estuarine wetlands south of the Seward Highway (Figure 2a). Estuarine Intertidal Regularly Flooded Mud Unconsolidated Shore (E2US3N) waters occur immediately shoreward of E1UBL waters (Figure 2a) and encompass 0.48 acres or 0.55% of the study area.

Estuarine Intertidal Regularly Flooded Mud Stream Bed (E2SB5N) waters, covering 0.33 acres or 0.4% of the study area (Table 1), were documented in tidal influenced drainages (Figure 2b). As characterized by plot sa-16 (Appendix B), E2SB5N waters are 12–16 inches wide with water depths up to 30 inches. Banks are well-vegetated with nearly monotypic stands of *Carex lyngbyei* (Lyngbey's sedge, OBL). In the Anadromous Waters Catalog, ADF&G (2020) documents Coho salmon (*O. kisutch*) in the two E2SB5N tidal guts west of Glacier Creek (AWC 247-60-10250-2001 and AWC 247-60-10250-2003; Figure 2b).

Estuarine Intertidal Irregularly Exposed Unconsolidated Shore (excavated) waters (E2USMx) cover 0.98 acres or 1.1% of the study area (Table 1); this type occurs in ditches south of the Seward Highway (Figures 2a, b). As documented by plot sa-13 (Appendix B), these are inundated ditches surrounded by salt-tolerant vegetation (*Carex lyngbyei*) and met the primary wetland hydrology indicators Surface Water (A1) and Iron Deposits (B5). Electrical conductivity (EC) at plot sa-14 (a non-waters estuarine wetland; Appendix A), which occurs about 300 feet southeast of sa-13, was 4,400 µS/cm. Conductivity is likely lower in the E2USMx ditches because they receive a high volume of fresh water as runoff from the adjacent Seward Highway. This runoff also has the potential to contain pollutants.

Table 1. Areal extent (acres and percent of study area) of waters, wetlands, and non-wetlands in the Seward and Alyeska highways intersection wetland study area, Girdwood, Alaska, 2020.

NWI code	NWI Description	Areal Extent	
		acres	% of Study Area
Waters			
E1UBL	Estuarine Subtidal Unconsolidated Bottom	3.42	3.95
E2SB5N	Estuarine Intertidal Regularly Flooded Mud Stream Bed	0.33	0.38
E2USMx	Estuarine Intertidal Irregularly Exposed Unconsolidated Shore (excavated)	0.98	1.13
E2US3N	Estuarine Intertidal Regularly Flooded Mud Unconsolidated Shore	0.48	0.55
R1UBV	Riverine Tidal Permanently Flooded-Fresh Tidal Unconsolidated Bottom	1.32	1.52
R1USQ	Riverine Tidal Regularly Flooded-Fresh Tidal Unconsolidated Shore	1.20	1.38
PUBH	Palustrine Permanently Flooded Unconsolidated Bottom	1.10	1.28
	Total Waters	8.83	10.19
Wetlands			
E2EM1N	Estuarine Intertidal Regularly Flooded Persistent Emergent Marsh	2.99	3.45
E2EM1P	Estuarine Intertidal Irregularly Flooded Persistent Emergent Meadow	29.09	33.58
E2FO5/EM1P	Estuarine Intertidal Irregularly Flooded Dead Forest/Persistent Emergent Meadow	0.65	0.75
E2SS1P	Estuarine Intertidal Irregularly Flooded Broad-leaved Deciduous Shrub	1.82	2.10
PEM1F	Palustrine Semipermanently Flooded Persistent Emergent Meadow	2.00	2.31
PEM1Fx	Palustrine Semipermanently Flooded Persistent Emergent Meadow (excavated)	0.35	0.40
PEM2F	Palustrine Semipermanently Flooded Nonpersistent Emergent Meadow	0.15	0.17
PEM1/SS1F	Palustrine Semipermanently Flooded Persistent Emergent/Broad-leaved Deciduous Shrub	1.15	1.32
PEM1E	Palustrine Seasonally Flooded-Saturated Persistent Emergent Meadow	5.60	6.46
PSS1E	Palustrine Seasonally Flooded-Saturated Broad-leaved Deciduous Shrub	5.77	6.66
PEM1/SS1D	Palustrine Continuously Saturated Persistent Emergent/Broad-leaved Deciduous Shrub	0.11	0.13
PEM1D	Palustrine Continuously Saturated Persistent Emergent Meadow	1.22	1.41
PSS1C	Palustrine Seasonally Flooded Broad-leaved Deciduous Shrub	0.03	0.03
PSS1B	Palustrine Seasonally Saturated Broad-leaved Deciduous Shrub	0.73	0.84
	Total Wetlands	51.66	59.61
Uplands			
U	Upland	2.86	3.30
Us	Upland (fill)	23.02	26.57
Ux	Upland (excavated)	0.29	0.33
	Total Uplands	26.17	30.20
	Grand Total	86.66	100.00

Glacier Creek, which flows north to south through the study area, was mapped as a combination of Riverine Tidal Permanently Flooded-Fresh Tidal Unconsolidated Bottom (R1UBV) and Riverine Tidal Regularly Flooded-Fresh Tidal Unconsolidated Shore (R1USQ) waters (Figure 2b). R1UBV covers 1.32 acres (1.5% of the study area) and R1USQ covers 1.20 acres (1.4%; Table 1). As documented by plot sa-18 (Appendix A), R1UBV and R1USQ lotic waters are low-gradient and low-velocity. No obvious indications of tidal influence (e.g.,drift deposits, wrack lines) were observed, but the landscape position and proximity to Turnagain Arm strongly suggests (and local observations indicate) these waters are tidally influenced on a regular basis. EC at sa-18 indicated that waters were fresh (220 µS/cm) and thus appropriate to include in the Riverine system. ADF&G (2020) documents Chinook (*Oncorhynchus tshawytscha*), Chum (*O. keta*), Coho (*O. kisutch*), Pink (*O. gorbuscha*), and Sockeye (*O. nerka*) salmon in Glacier Creek (AWC 247-60-10250).

Palustrine Permanently Flooded Unconsolidated Bottom (PUBH) ponds, covering 1.11 acres or 1.3% of the study area (Table 1), were documented in two locations in the eastern portion of the study area (Figure 2b). Located north of the Seward Highway, these two ponds appear to be impounded to some degree and are presumably freshwater systems with little to no tidal influence.

WETLANDS

Four wetlands in the Estuarine system were documented in the study area (Table 1). Located south of the Seward Highway (Figures 2a, b), these Estuarine wetlands are influenced by the tides of Turnagain Arm. The 1964 Good Friday earthquake caused land in this area to drop by several feet and the subsequent saltwater intrusion, tidal flooding, and sediment deposition have changed the landscape from uplands and freshwater wetlands in the Palustrine system to tidally-influenced wetlands in the Estuarine system (USFS 2004). During the September 2020 field survey, EC was measured at 4,400 µS/cm in these Estuarine wetlands, well above the 0.5 parts per thousand (approximately 1,000 µS/cm) salinity levels specified by FGDC (2013) for inclusion in the Estuarine system. This change in salinity has dramatically altered the vegetation since 1964, with what were once healthy spruce and cottonwood forests now replaced by a dense cover of the salt-tolerant herbs *Carex lyngbyei* (Lyngbye's sedge, OBL), *Potentilla egedii*

(Pacific silverweed, NI), and *Poa eminens* (large-flower bluegrass, FAC) amid standing dead spruce trees. As characterized by sa-14 (Appendix A) and sa-16 (Appendix B), these wetlands met multiple primary wetland hydrology indicators, including High Water Table (A2), Saturation (A3), and Hydrogen Sulfide Odor (C1). A thick surface organic layer met the hydric soil indicator Histic Epipedon (A2), and the underlying silt loam mineral soil met the requirements of Alaska Gleyed (A13).

Estuarine Intertidal Irregularly Flooded Persistent Emergent Meadow (E2EM1P), covering 29.10 acres or 33.6% of the study area (Table 1), was the most abundant these tidally influenced wetland. Estuarine Intertidal Regularly Flooded Persistent Emergent Marsh (E2EM1N, 2.99 acres or 3.45% of the study area), Estuarine Intertidal Irregularly Flooded Dead Forest/Persistent Emergent Meadow (EFO5/EM1P, 0.65 acres or 0.75% of the study area) and Estuarine Intertidal Irregularly Flooded Broad-leaved Deciduous Shrub Scrub (E2SS1P, 1.82 acres or 2.10% of the study area) were not directly sampled during the field survey and previous mapping from HDR 2008a and 2013 was preserved. E2EM1N is a fringe of obligate persistent sedges surrounding the E1UBL pond, EFO5/EM1P was coding used to describe the ghost forest and PSS1B is a saturated shrubby transition zone between the estuarine meadow and banks of the tidal mouth of Glacier Creek (Figures 2a and b).

Ten wetlands in the Palustrine system were documented in the study area (Table 1). Located north of the Seward Highway (Figures 2a, b), these are freshwater wetlands, although culverts do allow for surface water connections to Turnagain Arm. Salt-tolerant vegetation is present, but not in the dense stands observed south of the Seward Highway, and salinity was consistently below 0.5 ppt (approximately 1,000 µS/cm).

Palustrine Seasonally Flooded-Saturated Persistent Emergent Meadow (PEM1E) and Palustrine Seasonally Flooded-Saturated Broad-leaved Deciduous Shrub (PSS1E) were the most abundant Palustrine wetlands in the study area, covering 5.60 and 5.77 acres (6.5% and 6.7% of the study area, respectively; Table 1). Located on level terrain (Figures 2a, b), PEM1E wetlands are characterized by field plots sa-03, sa-07, sa-12, and sa-19; and PSS1E wetlands by field plot sa-09 in Appendix A. These seasonally flooded wetlands all have thick surface organic layers, meeting the hydric soil indicator Histic Epipedon (A2). Two plots, sa-09 and sa-12, have surface organic layers thick enough to meet the hydric soil indicator Histosol or Histel (A1). These plots

also had hydrogen sulfide odors when excavating the soil pit, indicating that that soils are saturated long enough to become highly reduced, meeting the hydric soil indicator Hydrogen Sulfide (A4) and the primary wetland hydrology indicator Hydrogen Sulfide Odor (C1). All PEM1E and PSS1E plots met the primary wetland hydrology indicators High Water Table (A2) and Saturation (A3), and Surface Water (A1) was observed at some seasonally flooded wetlands. Vegetation in both of these wetland types is generally dominated by the herbs *Calamagrostis canadensis* (FAC), *Carex lyngbyei* (OBL), and *Equisetum arvense* (FAC), and a high cover of the shrub *Myrica gale* (OBL) is present in the PSS1E types (see plot sa-09 in Appendix A).

Semipermanently Flooded Nonpersistent Emergent Meadow (PEM2F) wetlands cover only 0.15 acres or 0.2% of the study area (Table 1) and were located in one small depression north of the Seward Highway (Figure 2a). As characterized by sa-10 in Appendix A, PEM2F wetlands at the time of sampling had 10 inches of standing water and hydrogen sulfide odors when walking through the area, meeting the primary wetland hydrology indicators Surface Water (A1) and Hydrogen Sulfide Odor (C1), and the hydric soil indicator Hydrogen Sulfide (A4). Vegetation was dominated by the herb *Menyanthes trifoliata* (buck-bean, OBL).

Palustrine Semipermanently Flooded Persistent Emergent Meadow/Broad-leaved Deciduous Shrub Scrub (PEM1/SS1F) wetlands cover 1.15 acres or 1.3% of the study area (Table 1). As characterized by plots sa-06 in Appendix A and sa-05 in Appendix B, PEM1/SS1F wetlands had 5 inches of standing water at the time of sampling, iron deposits on the substrate, and hydrogen sulfide odors when probing soils, meeting the primary wetland hydrology indicators Surface Water (A1), Iron Deposits (B5), and Hydrogen Sulfide Odor (C1), and the hydric soil indicator Hydrogen Sulfide (A4). Vegetation is dominated by the shrub *Alnus incana* (speckled alder, FAC) and the herbs *Calamagrostis canadensis* (FAC) and *Equisetum fluviatile* (water horsetail, OBL).

Palustrine Semipermanently Flooded Persistent Emergent Meadow and Palustrine Semipermanently Flooded Persistent Emergent Meadow (excavated) wetlands (PEM1F and PEM1Fx, respectively) are nearly identical to PEM1/SS1F wetlands, but with a lower cover of shrubs. PEM1F wetlands cover 2.00 acres or 2.3% of the study area (Table 1) and are located on level landscape positions adjacent to PEM1/SS1F wetlands (Figures 2a, b). PEM1Fx wetlands cover only 0.35 acres or 0.4% of the study area (Table 1) and are located in open-channel

excavated ditches on the north side of the Seward Highway (Figures 2a, b). PEM1Fx ditches receive a large volume of runoff from the Seward Highway, which is likely to contain pollutants. The E2SB5N tidal gut closest to Glacier Creek transitions to an open-channel ditch that extends beneath the Seward Highway and continues north as a PEM1Fx wetland. ADF&G (2020) shows this PEM1Fx ditch (AWC 247-60-10250-2003) and an adjacent connecting ditch (AWC 247-60-10250-2003-3005) north of the Seward Highway as continuing to support Coho salmon.

Palustrine Seasonally Flooded Broad-leaved Deciduous Shrub Scrub (PSS1C) wetlands cover only 0.03 acres or <0.1% of the study area. Located along the banks of Glacier Creek (Figure 2b), this wetland type is characterized by a relatively narrow band of riparian shrubs typical of active floodplains.

Two types of continuously saturated wetlands were observed in the study area: Palustrine Continuously Saturated Persistent Emergent/Broad-leaved Deciduous Shrub Scrub (PEM1/SS1D) and Palustrine Continuously Saturated Persistent Emergent Meadow (PEM1D). Located just north of the intersection of the Seward and Alyeska highways (Figure 2a), these wetlands combined cover 1.33 acres or 1.5% of the study area (Table 1). As characterized by sa-11, PEM1/SS1D wetlands have thick surface organic layers meeting the hydric soil indicators Histosol or Histel (A1) and Histic Epipedon (A2). Hydrogen sulfide was detected when excavating the soil pit, indicating prolonged periods of near-surface saturation and strongly reducing environments, meeting the hydric soil indicator Hydrogen Sulfide (A4) and the primary wetland hydrology indicator Hydrogen Sulfide Odor (C1). At the time of sampling, soils were saturated at the surface with a water table at 4 inches, meeting the primary wetland hydrology indicators High Water Table (A2) and Saturation (A3). Vegetation is dominated by the shrub *Alnus incana* (FAC) and the herb *Calamagrostis canadensis* (FAC). PEM1D wetlands are distinguished from PEM1/SS1D wetlands by their lack of shrub cover.

Palustrine Seasonally Saturated Broad-leaved Deciduous Shrub Scrub (PSS1B) wetlands cover 0.73 acres or 0.8% of the study area (Table 1). Located in level landscape positions (Figures 2a, b), PSS1B wetlands are characterized by plot sa-02 in Appendix A. Soils have thick surface organic layers meeting the hydric soil indicators Histosol or Histel (A1) and Histic Epipedon. Soils were saturated at the surface at the time of sampling with a water table at 6 inches, meeting the primary wetland hydrology indicators High Water Table (A2) and Saturation

(A3). Vegetation is dominated by the trees *Betula kenaica* (Kenai birch, FACU) and *Picea glauca* (white spruce, FACU) occurring on raised microtopographic areas, the shrub *Alnus incana* (FAC), and the herbs *Athyrium filix-femina* (common lady fern, NI) and *Calamagrostis canadensis* (FAC).

UPLANDS

Upland fill (Us) is located throughout the study area (Figures 2a, b). Covering 23.02 acres or 26.6% of the study area (Table 1), Us includes the Seward and Alyeska highways, associated pullouts, and fill for commercial and residential development. Us was mapped to include highway shoulders to the toe of the fill.

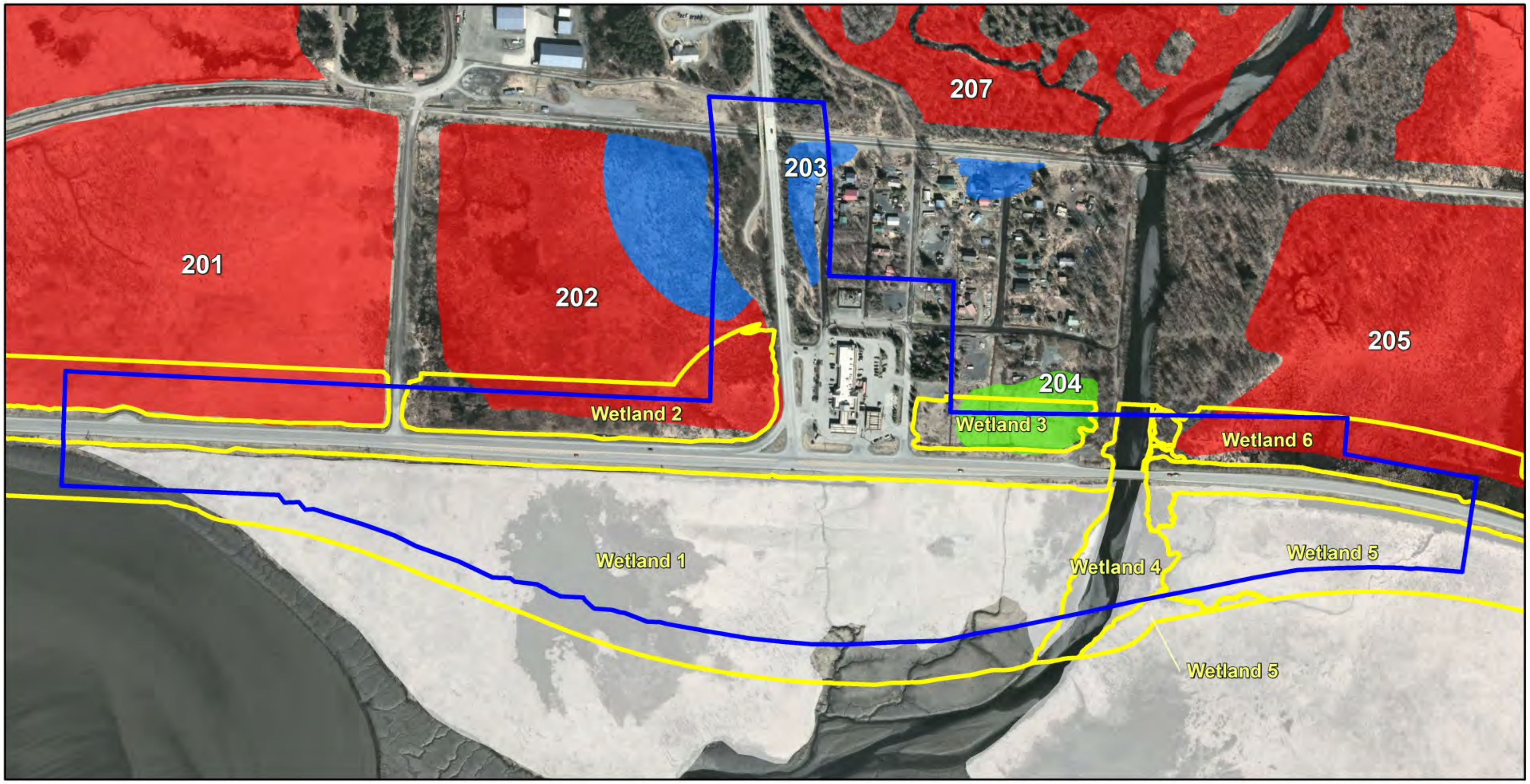
Naturally occurring uplands (U) cover 2.86 acres or 3.3% of the study area (Table 1). These uplands were located along the banks of Glacier Creek (Figure 2b), on a topographic high point surrounded by Estuarine wetlands (Figure 2b), and surrounding the Alyeska Highway (Figures 2a, b). As characterized by plot sa-17 in Appendix A, the naturally occurring uplands along the banks of Glacier Creek were shrub thickets with grass meadow openings. The well-drained sandy soils met no hydric soil indicators and only one secondary wetland hydrology indicator, FAC_Neutral Test (D5), was met. Dominant vegetation included the shrubs *Alnus incana* (FAC) and *Myrica gale* (sweetgale, OBL), and the grass *Leymus mollis* (America lyme grass, FAC). Uplands on the topographic high point amidst Estuarine wetlands were characterized by plot sa-15 in Appendix A. Dominated by the shrub *Alnus incana* (FAC) and the herbs *Calamagrostis canadensis* (FAC) and *Equisetum arvense* (FAC), this is a gravel mound of unknown provenance. The very gravelly silt loam soils met no hydric soil indicators, and the site met no wetland hydrology indicators. Naturally occurring uplands surrounding the Alyeska Highway are characterized by plots sa-01 and sa-08 in Appendix B. Vegetation is dominated by the trees *Populus balsamifera* (balsam poplar, FACU) and *Picea sitchensis* (Sitka spruce, FACU); the shrubs *Alnus viridis* (Sitka alder, FAC); the herbs *Calamagrostis canadensis* (FAC) and *Gymnocarpium dryopteris* (Northern oak fern, FACU), and various invasive species including *Linaria vulgaris* (butter and eggs, NI), *Phalaris arundinacea* (reed canary grass, OBL), *Phleum pratense* (common timothy, FACU), *Poa pratensis* (Kentucky bluegrass, FACU), *Taraxacum officinale* (common dandelion, FACU), *Trifolium repens* (white clover, FACU), and *Vicia cracca* (bird vetch, NI).

Excavated uplands (Ux) are in a single area adjacent to the Seward Highway (Figure 2b) and cover 0.29 acres or 0.3% of the study area (Table 1). This area was recently graded during the Glacier Creek bridge reconstruction work and the alteration is not captured in the 2015 imagery used for mapping. The boundaries of the area were delineated in the field using the GPS tracking feature in Collector.

WETLAND FUNCTIONAL ASSESSMENT

According to the AWMP, the largely Palustrine wetlands system inland of the Seward Highway are classed as A (high value), B (moderate value) or C (low value) wetlands. These classifications represent wetland functional value scores calculated through field observations and indicate required site-specific management strategies. These wetland designations provided in the AWMP are primarily for the management of freshwater wetlands; intertidal wetlands are mapped on the seaward side of the Seward Highway, but they have not been scored for wetland function and ranked by the MOA.

Class A wetlands in the study area are located adjacent to the Seward Highway on the inland side (wetland ID #201, #202 and #205; MOA 2014, MOA 2020, Figure 4). Functional scores per evaluated function are excerpted from the AWMP and presented in Table 2. Wetland #201 is located northwest of Toadstool Drive where the portions closest to Tidewater Slough have tidal influences. The EC values measured in the field at plot sa-02 (which occurs within wetland #201; Appendix A) indicate that the Class A wetlands in the study area are primarily freshwater wetlands. In the AWMP, wetland #201 ranks highest for wildlife habitat and water quality functions, and development is to be limited to existing easements and outside the 100-ft setbacks from Tidewater Slough. Wetland #202 is located between Toadstool Drive and Alyeska Highway and may have very limited tidal influence at the highest tides. However, according to EC data collected at plots sa-09 and sa-10 (Appendix A), the area is functioning as a freshwater wetland. This wetland also ranks highest in wildlife habitat and water quality functions. Wetland #205 is located to the east of Glacier Creek and extends to the Virgin Creek Floodplain. The area is primarily composed of wet meadows and marshes with fresh groundwater that appears to be at least partially impounded by the Seward Highway. The area ranks highest of all Class A wetlands in the study area for avian and fish habitat (Table 2).



Functional Assessment Units

MOA Wetlands¹

A | B | C | Estuarine, no designation

Wetland Functional Assessment 2013²

2020 Wetland Study Area

ADCM data are reproduced from the Municipality of Anchorage¹ https://moa-muniorg.hub.arcgis.com/pages/data (accessed 2020-06-12), and wetland FA numbers reproduced based on Maps 1 and 2 in HDR, 2013².

Background image from Anchorage Orthos, Aqcuired May 4, 2015 at a 0.15m spatial resolution. Scale is 1:6,650 when printed at 8.5x11".
Imagery Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.
ABR file: Fig4_Girdwood_Wetlands_AWMP_20-247.mxd; 07 Dec 2020

0 50 100 150 200 Meters

0 250 500 750 Feet

Figure 4.
Wetland Index Numbers for MOA and HDR 2008b in the Seward and Alyeska Highways Intersection Wetland Study Area, Girdwood Alaska.

map prepared by:
ABR, Inc. — Environmental Research & Services

Project Proponent: Project Number: Z546190000
Alaska Department of Transportation and Public Facilities

Table 2. Wetland functional scores for wetlands within the Seward and Alyeska highways study area, excerpted from the Anchorage Wetland Management Plan (MOA 2014).

Wetland number (See Figure 5)	Wetland Name	Hydrology	Habitat	Species Occurrence	Social Function	Ownership
201	Girdwood: Tidewater Slough	97	106	85	50	Public
202	Northeast Seward Highway and Alyeska Highway	94	108	42	57	Public
203	Old Girdwood Townsite	N/A	N/A	N/A	N/A	Private
204	South of Gold Avenue, West of Glacier Creek	69	73	28	56	Private
205	East of Glacier Creek: Virgin Creek Floodplain	77	126	82	58	Public

Wetland #204 is a Class B wetland and is located west of Glacier Creek inland of the Seward Highway. This is a seasonally flooded saturated graminoid meadow that is likely fed primarily by freshwater sources based on the EC reading at plot sa-19 (Appendix A). The area includes at least 2 open-channel constructed ditches connecting to a tidal gut on the seaward side of the Seward Highway through a culvert. As noted in the Wetlands subsection above, Coho salmon have been observed in the constructed open channels and as such the drainageways are subject to a 100-ft setback (Figure 4). Wetland #204 is in private ownership and is rated moderate to high functioning for storm and floodwater attenuation, groundwater recharge, water quality, and fish and avian habitat (Table 2).

Class C wetlands are designated by the AWMP as a small portion of wetland #202, and wetland #203. The Class C portion of wetland #202 is located in the northeast section near the intersection of the railroad and the Alyeska Highway. Although the area is better drained than the wet meadows and marshes within the abutting Class A wetland, groundwater is still very close to the surface (see plots sa-02 and sa-03 in Appendix A). Wetland #203 is within private ownership in the Old Girdwood Townsite, no scores were assessed for this wetland but is assumed to have the highest values for floodwater attenuation based on its position in the watershed (Figure 4, Table 2, MOA 2014).

Intertidal wetlands such as those mapped on the seaward side of the Seward Highway within the study area (Figures 2a and b) are not managed or scored under the AWMP. The *Final Wetlands Functional Assessment for the Seward Highway MP 75-90 Project* (HDR 2008a) discusses functions provided by groups of wetland types in the area. The intertidal wetland complexes within the study area are defined in HDR 2013 and 2008a as wetland 1 and wetland 5 and are depicted in Figure 4. The functional assessment does not provide numerical scores for functions but does assess whether individual wetlands perform various functions. The intertidal wetlands in the study area provide groundwater discharge, shoreline, streambank and soil stabilization, water quality and nutrient cycling, and fish and wildlife habitat functions (HDR 2008b, HDR 2013). Both intertidal and freshwater systems within the study area do not seem to be significantly altered since the last assessment in 2008 and are likely to be performing similar functions.

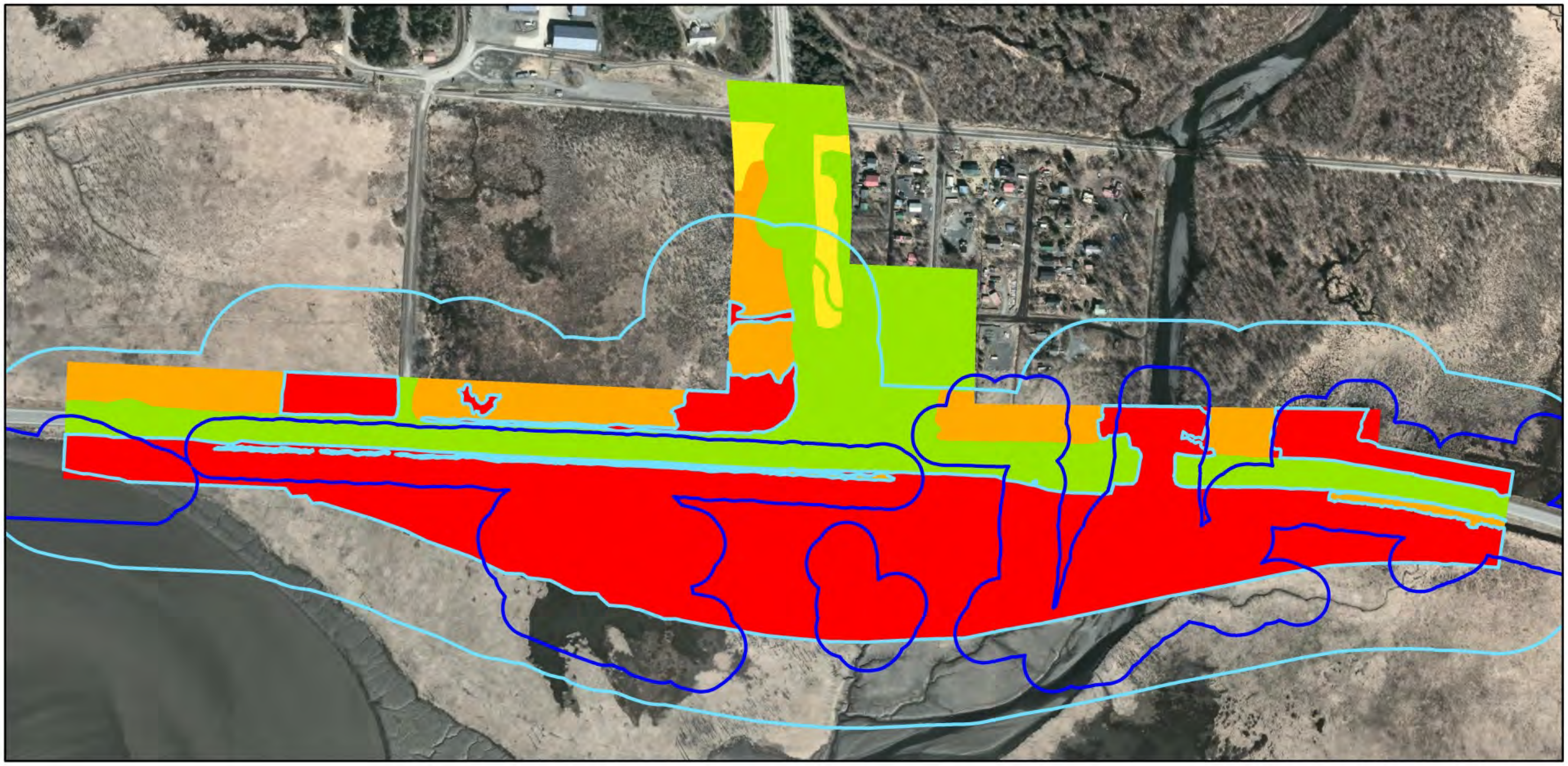
RELATIVE ECOLOGICAL VALUES AND WETLAND DEBITS

The ADCM is used to establish project wetland debits by comparing wetland function scoring for pre-construction condition to the predicted post-construction condition. For this study, each mapped wetland, waters, and upland polygon was assigned a REV score for the pre-construction condition. REV scores were assigned based on the observed biological characteristics within the broad landform categories listed in Table 1 of the ADCM. This assessment was conducted using wetland function information compiled from the AWMP, data from the 2020 field survey, photointerpretation of the 2015 satellite imagery, and the results of the 2008 functional assessment prepared by HDR (2008b).

Most of the pre-construction REV scores for wetlands in the study area were classified as REV1 (Figure 5, Table 3). REV1 wetlands have the following characteristics:

- vegetated intertidal wetlands (the AWMP does not provide functional information for intertidal wetlands but the ADCM does provide criteria for assigning REV scores within estuaries)
- unvegetated intertidal wetlands providing high-quality waterbird habitat
- shallow subtidal waters within 100-ft setback of a REV1 water
- freshwater quaking bogs
- natural freshwater wetlands inundated through June
- non-inundated wetlands that are small inclusions within a surrounding REV1 mosaic
- seasonally inundated wetlands within a 100-ft setback of a REV1 water
- natural permanently flooded waterbodies
- natural open-channel waterways that support salmonids
- small undeveloped upland inclusions within larger REV1 mosaics

REV2 wetlands in the study area include natural, non-inundated or seasonally flooded wetlands. Degraded or disturbed wetlands were classified as REV3, and the REV4 class was limited to disturbed uplands (Table 3).



Relative Ecological Value[1]

1

2

3

4

Buffers and Setbacks

100ft setback around waterbodies/ waterways supporting salmonids

300ft buffer around REV1 aquatic areas

[1] Follows the Anchorage Debit-Credit Method (ADCM, Dean 2011)

Background image from Anchorage Orthos, Aqcuired May 4, 2015 at a 0.15m spatial resolution. Scale is 1:6,650 when printed at 8.5x11".
Imagery Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.
ABR file: Fig5_Girdwood_Wetlands_REV_20-247.mxd; 07 Dec 2020

0 50 100 150 200 Meters

0 250 500 750 Feet

Figure 5. Relative Ecological Value in the Seward and Alyeska Highways Intersection Wetland Study Area, Girdwood, Alaska.

map prepared by:
ABR, Inc. — Environmental Research & Services

Project Proponent: Project Number: Z546190000
Alaska Department of Transportation and Public Facilities

Table 3. REV classifications and classification characteristics for wetlands and uplands within the Seward and Alyeska highways intersection wetland study area.

REV Class	NWI code	Wetland characteristics for REV determination	Total
REV1	E1UBL	Intertidal, unvegetated, waterbird habitat	3.3
		subtidal, shallow, within 100-ft setback of REV1 water	0.1
	E2SB5N	Intertidal, vegetated	0.3
	E2US3N	unvegetated, intertidal Turnagain Arm	0.5
	R1UBV	waterway, open channel, perennial, natural, salmonids	1.3
	R1USQ	waterway, open channel, perennial, natural, salmonids	1.2
	PUBH	waterbody, persistent, natural, mosaic	1.1
	E2EM1N	Intertidal, vegetated	3.0
	E2EM1P	Intertidal, vegetated	29.1
	E2FO5/EM1P	Intertidal, vegetated	0.6
	E2SS1P	Intertidal, vegetated	1.8
	PEM1F	wetlands, inundated through June, mosaic, natural	1.2
		wetlands, inundated, through June, mosaic, natural	0.8
	PEM1Fx	wetlands, inundated, through June, mosaic, natural	0.3
	PEM2F	wetlands, inundated, through June, mosaic, natural	0.1
	PEM1/SS1F	wetlands, inundated, through June, mosaic, natural	1.0
	PEM1E	wetlands, inundated spring and fall, mosaic, natural, within 100-ft setback of REV1 water	0.0
	PSS1E	wetlands, inundated spring and fall, mosaic, natural, within 100-ft setback of REV1 water	0.1
	PEM1/SS1D	wetlands, rarely inundated, quaking bog	0.1
	PEM1D	wetlands, rarely inundated, quaking bog	1.2
	PSS1B	wetlands, not inundated, inclusion	0.1
		wetlands, rarely inundated, inclusion	0.1
	PSS1C	wetlands, rarely inundated, inclusion	0.0
	U	upalnds, undeveloped, inclusion	0.2
		uplands, not developed, inclusion	0.1
		uplands, undeveloped, inclusion	0.9

Table 3. Continued.

REV Class	NWI code	Wetland characteristics for REV determination	Total
REV2	E2USMx	tidal, unvegetated, other	1.0
	PEM1Fx	waterway, open channel, ditch, supports salmonids	0.1
	PEM1E	wetlands, inundated spring and fall, mosaic, natural	0.1
	PSS1E	wetlands, inundated spring and fall, mosaic, natural	5.0
REV3	PEM1/SS1F	wetlands, inundated, small, non-naturalized	0.2
	PEM1E	wetlands, inundated through June, small, non-naturalized	0.1
		wetlands, inundated, small, non-naturalized, within 300-ft buffer of REV1/2 aquatic area truncated by Us	0.1
	PSS1E	wetlands, inundated through June, small, non-naturalized, within 300-ft of REV1/2 buffer truncated by Us	0.3
		wetlands, inundated through June, small, non-naturalized	0.4
	PSS1B	wetlands, rarely inundated, natural	0.5
REV4	U	uplands, developed	1.6
	Us	uplands, developed	23.0
	Ux	uplands, developed	0.3

As noted in Table 3, some REV values were adjusted based on overlaps with required buffers and setbacks (Dean 2011). Setbacks of 100 feet were created for all waters classified as REV1 or REV2; this included E1UBL, E2USMx, R1UBV, R1USQ, PUBH and PEM1Fx waters (Figure 5). All wetlands falling within the 100-ft setback were assigned the equivalent REV as the adjacent buffered water. A 300-ft buffer was also applied to all REV1 or REV2 aquatic areas both inside and outside the study area. Wetlands considered to meet the criteria of an aquatic area included PEM1F, PEM1Fx, PEM2F, PEM1/SS1F, PEM1/SS1D, and PEM1D because they are inundated through the end of June in most years or are floating bogs.

PROPOSED JURISDICTIONAL STATUS

The Seward and Alyeska highways wetland study area crosses 2 watersheds:

1. Glacier Creek (HUC 190203020702), which comprises 37,827 acres and flows to Turnagain Arm
2. Turnagain Arm (HUC190203020705), which comprises 122,542 acres

Navigable waters as defined in the Proposed Jurisdictional Determination section in Methods above include the territorial seas and traditional navigable waters. Neither Turnagain Arm nor Glacier Creek are listed on the USACE list of navigable waters but they are subject to interstate or foreign commerce and the ebb and flow of the tide. All navigable waters are subject to regulation under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act (USACE 2020). Within the Seward and Alyeska highways wetland study area, waters that meet the navigable waters definition are Turnagain Arm (E1UBL), associated Estuarine waters (E2US3N), which both fall beneath the mean high water line, and the tidally influenced mouth of Glacier Creek (R1UBV and R1USQ). One exception is the E1UBL pond mapped as W-01, which does not receive daily tidal saltwater influx and should be considered a jurisdictional pond (Appendix C). For the purposes of this assessment, the mean high water line was considered to be the visible transition between unvegetated surfaces receiving daily tidal water input and the adjacent vegetated estuarine wetlands.

Estuarine wetlands and waters below the maximum high tide line (see below) but above the mean high water line are subject to regulation under Section 404 of the Clean Water Act. Within the study area, this includes the tributaries E2SB5N and E2USMx and the adjacent wetlands E2EM1N, E2EM1P, E2FO5/EM1P, and E2SS1P. For the purposes of this assessment, the maximum high tide line was the transition between wetlands with salinity levels below the NWI limit for estuarine wetlands. In very general terms, this estuarine boundary appears to be at the Seward Highway except where connected tributaries cross the road via a culvert or bridged waterway.

All Palustrine wetlands within the study area either abut a navigable water (Turnagain Arm or the mouth of Glacier Creek), or have surface water connections to a navigable water through culverts beneath the Seward Highway or open-channel ditches (see the Appendix C index map) as mapped by the MOA (2020). Thus, all wetlands within the study area are likely to be considered jurisdictional adjacent wetlands by the USACE (Appendix C), subject to regulation under Section 404 of the Clean Water Act. This includes the following NWI types: PEM1F, PEM1Fx, PEM2F, PEM1/SS1F, PEM1E, PSS1E, PEM1/SS1D, PEM1D, PSS1C, and PSS1B. The PUBH waters in the study area are likely to be considered jurisdictional ponds, with likely surface water connections to navigable waters through adjacent wetlands.

USE OF THIS REPORT

In accordance with the Navigable Waters Protection Rule, the preliminary jurisdictional determination prepared for this report is that all wetlands and waters of the U.S. within the study area are jurisdictional and therefore will require permitting under Section 404 of the Clean Water Act. A small portion of waters are also considered navigable and subject to the ebb and flow of the tide, and are thus considered jurisdictional under Section 10 of the Navigable Waters Act. The findings in this report should be reviewed by USACE personnel prior to application of any permits for concurrence on the mapped wetland boundaries, the included wetland determination forms, and the preliminary jurisdictional determination.

This report also finds little evidence that the wetlands within the study area have been significantly degraded since the original functional assessments were made in the AWMP (MOA 2014) and the Environmental Analysis by HDR (2008b and 2013). Some of the wetlands,

particularly the estuarine wetlands, are relatively undisturbed and likely still provide high-value functions within the watersheds impacted by this proposed project. Wetlands and waters in the study area are likely to be performing similar functions today, and the management specifications contained in the AWMP are likely still valid.

Once the USACE concurs with the preliminary findings, a preferred alternative footprint must be developed to assess the need for compensatory mitigation for unavoidable losses due to placement of fill. Use of the approved mapping and functional assessment results may guide the selection of the preferred alternative and also provide opportunities for avoidance and minimization strategies to reduce impacts to the highest value wetlands. Avoidance and minimization measures may also qualify as part of a compensatory mitigation plan.

The REV mapping portion of this report may be used if compensatory mitigation is required and the applicant selects the in-lieu fee (ILF) method of purchasing wetland credits from an approved wetland mitigation bank. Most banks in the MOA area use the ADCM to calculate preservation or restoration credits available for purchase. In this case, the Alaska District USACE requires that proposed projects use similar functional assessment methods to the selected bank to calculate project debits (USACE 2016). The REV mapping and GIS buffer zone layers included as part of this study would be used in conjunction with the preferred project footprint to calculate wetland debits using worksheets provided with the ADCM.

LITERATURE CITED

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Appendix A. Wetland Determination Data Forms

Plot	NWI Code	Hydrogeomorphic (HGM) Class
sa-02	PSS1B	Slope HGM
sa-03	PEM1E	Slope HGM
sa-06	PEM1/SS1F	Slope HGM
sa-07	PEM1E	Slope HGM
sa-09	PSS1E	Slope HGM
sa-10	PEM2F	Slope HGM
sa-11	PEM1/SS1D	Slope HGM
sa-12	PEM1E	Slope HGM
sa-14	E2EM1P	Estuarine Fringe HGM
sa-15	U	Not Applicable (Upland)
sa-17	U	Not Applicable (Upland)
sa-18	R1UBV	Riverine HGM
sa-19	PEM1E	Slope HGM

Wetland Determination Data Form - Alaska Region

Project/Site: Seward and Alyeska Highways Intersection Wetlands and FA Borough/City: Anchorage Sampling Date: 2020-09-16
Applicant/Owner: AKDOT & PF Sampling Point: sa-02
Investigator(s): WAD, RWM Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 64
Subregion: Alaska Lat.: 60.9433 Long.: -149.1717 Datum: WGS84
Soil Map Unit Name: NWI classification: PSS1B
Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✓
Are Vegetation ✓, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

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

Remarks: Low-lying mixed forest with white spruce and Kenai birch on raised hummocks, low saturated areas at bases of hummocks.

Vegetation - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.	Betula kenaica	30.0	✓	FACU
2.	Picea glauca	10.0	✓	FACU
	Total Cover:	40.0		
	50% of total cover: 20.0		20% of total cover: 8.0	
	Sapling/Shrub Stratum			
1.	Alnus incana	75.0	✓	FAC
2.	Vaccinium ovalifolium	3.0		FAC
	Total Cover:	78.0		
	50% of total cover: 39.0		20% of total cover: 15.6	
	Herb Stratum			
1.	Calamagrostis canadensis	25.0	✓	FAC
2.	Athyrium filix-femina	15.0	✓	
3.	Equisetum arvense	5.0		FAC
4.	Cicuta virosa	2.0		OBL
5.	Cornus suecica	1.0		FAC
	Total Cover:	48.0		
	50% of total cover: 24.0		20% of total cover: 9.6	

Dominance Test worksheet:
Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across all Strata: 5 (B)
Percent of Dominant Species That are OBL, FACW, or FAC: 40.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	2.0	× 1 =	2.0
FACW Species	0.0	× 2 =	0.0
FAC Species	109.0	× 3 =	327.0
FACU Species	40.0	× 4 =	160.0
UPL Species	0.0	× 5 =	0.0
Column Totals:	151.0 (A)		489.0 (B)

Prevalence Index = B/A = 3.238

Hydrophytic Vegetation Indicators:
____ Dominance Test is > 50%
____ Prevalence Index is ≤ 3.0
✓ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
✓ Problematic Hydrophytic Vegetation[1] (Explain)
[1] Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width)	5m radius
% Cover of Wetland Bryophytes (Where applicable)	0.0
% Bare Ground	10.0
Total Cover of Bryophytes	25.0

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: Non-live cover is leaf litter and bare soil. Vegetation does not meet the prevalence index or dominance test but soils are histosols with a high water table. Facultative and upland plants are growing on raised hummocks at the base of mature trees. Obligates colonize the low areas.Typical problematic vegetation in Anchorage area.

SOIL

Sampling Point: sa-02

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Mod	Remarks
0-2	10YR 2/1	100			A		peat		
2-12	10YR 2/1	100			A		mucky peat		Positive alpha alpha at 8
12-17	10YR 2/1	100			A		mucky peat		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix

Hydric Soil Indicators:

- ✓ Histosol or Histel (A1)
- ✓ Histic Epipedon (A2)
- Hydrogen Sulfide (A4)
- Thick Dark Surface (A12)
- Alaska Gleyed (A13)
- Alaska Redox (A14)
- Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- Alaska Color Change (TA4)[4]
- Alaska Alpine Swales (TA5)
- Alaska Redox With 2.5Y Hue
- Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- Other (Explain in Remarks)

[3]One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: Unknown

Depth (inches):

Hydric Soil Present? Yes ✓ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Surface Soil Cracks (B6)
- Inundation Visible on Aerial Imagery (B7)
- Sparsely Vegetated Concave Surface (B8)
- Marl Deposits (B15)
- Hydrogen Sulfide Odor (C1)
- Dry-Season Water Table (C2)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Stained Leaves (B9)
- Drainage Patterns (B10)
- Oxidized Rizospheres along Living Roots (C3)
- ✓ Presence of Reduced Iron (C4)
- Salt Deposits (C5)
- Stunted or Stressed Plants (D1)
- Geomorphic Position (D2)
- Shallow Aquitard (D3)
- ✓ Microtopographic Relief (D4)
- FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes		No	✓	Depth (inches):	
Water Table Present?	Yes	✓	No		Depth (inches):	6
Saturation Present? (includes capillary fringe)	Yes	✓	No		Depth (inches):	0

Wetland Hydrology Present? Yes ✓ No

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:

Remarks: White spruce and Kenai birch on 75cm hummocks, low areas saturated to the surface with a high water table. pH 6.6. ec 360

Sampling Point: sa-02
NWI classification: PSS1B

Hydric Soil Indicators: Histosol or Histel (A1), Histic Epipedon (A2)
Wetland Hydrology Indicators: Saturation (A3), High Water Table (A2), Microtopographic Relief (D4), Presence of Reduced Iron (C4)

Wetland Determination Data Form - Alaska Region

Project/Site: Seward and Alyeska Highways Intersection Wetlands and FA Borough/City: Anchorage Sampling Date: 2020-09-16
Applicant/Owner: AKDOT & PF Sampling Point: sa-03
Investigator(s): RWM, WAD Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 59
Subregion: Cook Inlet Lowlands Lat.: 60.9427 Long.: -149.1724 Datum: WGS84
Soil Map Unit Name: NWI classification: PEM1E
Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ____
Hydric Soil Present? Yes ✓ No ____
Wetland Hydrology Present? Yes ✓ No ____

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ____

Remarks: Canopy opening with thick herbaceous cover. Surface water present at the time of sampling.

Vegetation - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.	Betula kenaica	5.0		FACU
	Total Cover:	5.0		
	50% of total cover: 2.5		20% of total cover: 1.0	
	Sapling/Shrub Stratum			
1.	Alnus incana	2.0		FAC
	Total Cover:	2.0		
	50% of total cover: 1.0		20% of total cover: 0.4	
	Herb Stratum			
1.	Calamagrostis canadensis	65.0	✓	FAC
2.	Equisetum fluviatile	15.0		OBL
3.	Cicuta douglasii	10.0		OBL
4.	Comarum palustre	5.0		OBL
	Total Cover:	95.0		
	50% of total cover: 47.5		20% of total cover: 19.0	

Dominance Test worksheet:
Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across all Strata: 1 (B)
Percent of Dominant Species That are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	30.0	× 1 =	30.0
FACW Species	0.0	× 2 =	0.0
FAC Species	67.0	× 3 =	201.0
FACU Species	5.0	× 4 =	20.0
UPL Species	0.0	× 5 =	0.0
Column Totals:	102.0 (A)		251.0 (B)

Prevalence Index = B/A = 2.461

Hydrophytic Vegetation Indicators:
✓ Dominance Test is > 50%
✓ Prevalence Index is ≤ 3.0
____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophytic Vegetation[1] (Explain)
[1] Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width) 5m radius
% Cover of Wetland Bryophytes (Where applicable) 0.0
% Bare Ground 0.0
Total Cover of Bryophytes 0.0

Hydrophytic Vegetation Present? **Yes** ✓ **No** ____

Remarks:

Soil

Sampling Point: sa-03

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Mod	Remarks
0-1					A		peat		
1-8					A		mucky peat		
8-13	n	100			A		silt loam		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix

Hydric Soil Indicators:

- ____Histosol or Histel (A1)
- _✓_ Histic Epipedon (A2)
- ____Hydrogen Sulfide (A4)
- ____Thick Dark Surface (A12)
- ____Alaska Gleyed (A13)
- ____Alaska Redox (A14)
- ____Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ____Alaska Color Change (TA4)[4]
- ____Alaska Alpine Swales (TA5)
- ____Alaska Redox With 2.5Y Hue
- ____Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ____Other (Explain in Remarks)

[3]One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: Unknown

Depth (inches):

Hydric Soil Present? Yes _✓_ No ____

Remarks: Histic epipedon. Positive reaction to alpha, alpha-dipyridol.

Hydrology

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- _✓_ Surface Water (A1)
- _✓_ High Water Table (A2)
- _✓_ Saturation (A3)
- ____Water Marks (B1)
- ____Sediment Deposits (B2)
- ____Drift Deposits (B3)
- ____Algal Mat or Crust (B4)
- ____Iron Deposits (B5)
- ____Surface Soil Cracks (B6)
- ____Inundation Visible on Aerial Imagery (B7)
- ____Sparsely Vegetated Concave Surface (B8)
- ____Marl Deposits (B15)
- ____Hydrogen Sulfide Odor (C1)
- ____Dry-Season Water Table (C2)
- ____Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ____Water Stained Leaves (B9)
- ____Drainage Patterns (B10)
- ____Oxidized Rizospheres along Living Roots (C3)
- ____Presence of Reduced Iron (C4)
- ____Salt Deposits (C5)
- ____Stunted or Stressed Plants (D1)
- ____Geomorphic Position (D2)
- ____Shallow Aquitard (D3)
- ____Microtopographic Relief (D4)
- ____FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	✓	No		Depth (inches):	1
Water Table Present?	Yes	✓	No		Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes	✓	No		Depth (inches):	0

Wetland Hydrology Present? Yes _✓_ No ____

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:

Remarks:

Sampling Point: sa-03
NWI classification: PEM1E

Hydric Soil Indicators: Histic Epipedon (A2)
Wetland Hydrology Indicators: High Water Table (A2), Saturation (A3), Surface Water (A1)

Wetland Determination Data Form - Alaska Region

Project/Site: Seward and Alyeska Highways Intersection Wetlands and FA Borough/City: Anchorage Sampling Date: 2020-09-16
Applicant/Owner: AKDOT & PF Sampling Point: sa-06
Investigator(s): WAD Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
Local relief (concave, convex, none): _____ Slope: 0.0 % / 0.0 ° Elevation: 75
Subregion: Cook Inlet Lowlands Lat.: 60.9414 Long.: -149.1717 Datum: WGS84
Soil Map Unit Name: _____ NWI classification: PEM1/SS1F
Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

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

Remarks: site inundated, no soil pit.

Vegetation - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
	Total Cover:	0.0		
	50% of total cover: 0.0		20% of total cover: 0.0	
	Sapling/Shrub Stratum			
1.	Alnus incana	50.0	✓	FAC
2.	Salix bebbiana	10.0		FAC
	Total Cover:	60.0		
	50% of total cover: 30.0		20% of total cover: 12.0	
	Herb Stratum			
1.	Calamagrostis canadensis	65.0	✓	FAC
2.	Equisetum fluviatile	40.0	✓	OBL
3.	Cicuta douglasii	5.0		OBL
	Total Cover:	110.0		
	50% of total cover: 55.0		20% of total cover: 22.0	

Dominance Test worksheet:
Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across all Strata: 3 (B)
Percent of Dominant Species That are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	45.0	× 1 =	45.0
FACW Species	0.0	× 2 =	0.0
FAC Species	125.0	× 3 =	375.0
FACU Species	0.0	× 4 =	0.0
UPL Species	0.0	× 5 =	0.0
Column Totals:	170.0 (A)		420.0 (B)

Prevalence Index = B/A = 2.471

Hydrophytic Vegetation Indicators:
✓ Dominance Test is > 50%
✓ Prevalence Index is ≤ 3.0
____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophytic Vegetation[1] (Explain)
[1] Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width)	5m radius
% Cover of Wetland Bryophytes (Where applicable)	0.0
% Bare Ground	0.0
Total Cover of Bryophytes	0.0

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

Soil

Sampling Point: sa-06

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Mod	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix

Hydric Soil Indicators:

- ____ Histosol or Histel (A1)
- ____ Histic Epipedon (A2)
- _✓_ Hydrogen Sulfide (A4)
- ____ Thick Dark Surface (A12)
- ____ Alaska Gleyed (A13)
- ____ Alaska Redox (A14)
- ____ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ____ Alaska Color Change (TA4)[4]
- ____ Alaska Alpine Swales (TA5)
- ____ Alaska Redox With 2.5Y Hue
- ____ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ____ Other (Explain in Remarks)

[3]One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: None

Depth (inches):

Hydric Soil Present? Yes _✓_ No ____

Remarks: see site remarks, area inundated, no soil pit dug. H2S odor when walking through wetland.

Hydrology

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- _✓_ Surface Water (A1)
- _✓_ High Water Table (A2)
- _✓_ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- _✓_ Iron Deposits (B5)
- ____ Surface Soil Cracks (B6)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Marl Deposits (B15)
- _✓_ Hydrogen Sulfide Odor (C1)
- ____ Dry-Season Water Table (C2)
- ____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ____ Water Stained Leaves (B9)
- ____ Drainage Patterns (B10)
- ____ Oxidized Rizospheres along Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Salt Deposits (C5)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- _✓_ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	_✓_	No	____	Depth (inches):	5
Water Table Present?	Yes	_✓_	No	____	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes	_✓_	No	____	Depth (inches):	0

Wetland Hydrology Present? Yes _✓_ No ____

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:

Remarks: H2S odor and iron floc

Sampling Point: sa-06
NWI classification: PEM1/SS1F

Hydric Soil Indicators: Hydrogen Sulfide (A4)
Wetland Hydrology Indicators: Iron Deposits (B5), Surface Water (A1), Hydrogen Sulfide Odor (C1), FAC-Neutral Test (D5), High Water Table (A2), Saturation (A3)

No Soil Pit Photo Taken

Wetland Determination Data Form - Alaska Region

Project/Site: Seward and Alyeska Highways Intersection Wetlands and FA Borough/City: Anchorage Sampling Date: 2020-09-16
Applicant/Owner: AKDOT & PF Sampling Point: sa-07
Investigator(s): RWM, WAD Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 67
Subregion: Cook Inlet Lowlands Lat.: 60.9418 Long.: -149.1716 Datum: WGS84
Soil Map Unit Name: NWI classification: PEM1E
Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ____
Hydric Soil Present? Yes ✓ No ____
Wetland Hydrology Present? Yes ✓ No ____

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ____

Remarks: Saturated meadow at base of Alyeska hwy berm.

Vegetation - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.	Populus balsamifera	5.0	✓	FACU
2.	Betula kenaica	5.0	✓	FACU
	Total Cover:	10.0		
	50% of total cover: 5.0		20% of total cover: 2.0	
	Sapling/Shrub Stratum			
1.	Alnus incana	5.0	____	FAC
	Total Cover:	5.0		
	50% of total cover: 2.5		20% of total cover: 1.0	
	Herb Stratum			
1.	Calamagrostis canadensis	75.0	✓	FAC
2.	Equisetum arvense	30.0	✓	FAC
3.	Equisetum fluviatile	15.0	____	OBL
4.	Cicuta douglasii	5.0	____	OBL
5.	Heracleum maximum	2.0	____	FACU
	Total Cover:	127.0		
	50% of total cover: 63.5		20% of total cover: 25.4	

Dominance Test worksheet:
Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across all Strata: 4 (B)
Percent of Dominant Species That are OBL, FACW, or FAC: 50.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	20.0	× 1 =	20.0
FACW Species	0.0	× 2 =	0.0
FAC Species	110.0	× 3 =	330.0
FACU Species	12.0	× 4 =	48.0
UPL Species	0.0	× 5 =	0.0
Column Totals:	142.0 (A)		398.0 (B)

Prevalence Index = B/A = 2.803

Hydrophytic Vegetation Indicators:
____ Dominance Test is > 50%
✓ Prevalence Index is ≤ 3.0
____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophytic Vegetation[1] (Explain)
[1] Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width) 1m radius
% Cover of Wetland Bryophytes (Where applicable) 0.0
% Bare Ground 0.0
Total Cover of Bryophytes 0.0

Hydrophytic Vegetation Present? **Yes** ✓ **No** ____

Remarks: Saturated bluejoint meadow

SOIL

Sampling Point: sa-07

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Mod	Remarks
0-4	/		/		A		peat		
4-9	5y 3/1		/		A		mucky peat		
9-16	5y 3/1		/		A		silt loam		Positive alpha alpha.

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix

Hydric Soil Indicators:

- ____Histosol or Histel (A1)
- _✓_ Histic Epipedon (A2)
- ____Hydrogen Sulfide (A4)
- ____Thick Dark Surface (A12)
- ____Alaska Gleyed (A13)
- ____Alaska Redox (A14)
- ____Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ____Alaska Color Change (TA4)[4]
- ____Alaska Alpine Swales (TA5)
- ____Alaska Redox With 2.5Y Hue
- ____Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ____Other (Explain in Remarks)

[3]One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: None

Depth (inches): 0.0

Hydric Soil Present? Yes _✓_ No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- ____Surface Water (A1)
- _✓_ High Water Table (A2)
- _✓_ Saturation (A3)
- ____Water Marks (B1)
- ____Sediment Deposits (B2)
- ____Drift Deposits (B3)
- ____Algal Mat or Crust (B4)
- ____Iron Deposits (B5)
- ____Surface Soil Cracks (B6)
- ____Inundation Visible on Aerial Imagery (B7)
- ____Sparsely Vegetated Concave Surface (B8)
- ____Marl Deposits (B15)
- ____Hydrogen Sulfide Odor (C1)
- ____Dry-Season Water Table (C2)
- ____Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ____Water Stained Leaves (B9)
- ____Drainage Patterns (B10)
- ____Oxidized Rizospheres along Living Roots (C3)
- _✓_ Presence of Reduced Iron (C4)
- ____Salt Deposits (C5)
- ____Stunted or Stressed Plants (D1)
- ____Geomorphic Position (D2)
- ____Shallow Aquitard (D3)
- ____Microtopographic Relief (D4)
- ____FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	____	No	_✓_	Depth (inches):	
Water Table Present?	Yes	_✓_	No	____	Depth (inches):	7
Saturation Present? (includes capillary fringe)	Yes	_✓_	No	____	Depth (inches):	3

Wetland Hydrology Present? Yes _✓_ No ____

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:

Remarks: C4--positive reaction to alpha, alpha-dipyridol

Sampling Point: sa-07
NWI classification: PEM1E

Hydric Soil Indicators: Histic Epipedon (A2)
Wetland Hydrology Indicators: High Water Table (A2), Saturation (A3), Presence of Reduced Iron (C4)

Wetland Determination Data Form - Alaska Region

Project/Site: Seward and Alyeska Highways Intersection Wetlands and FA Borough/City: Anchorage Sampling Date: 2020-09-16
Applicant/Owner: AKDOT & PF Sampling Point: sa-09
Investigator(s): RWM, WAD Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 62
Subregion: Cook Inlet Lowlands Lat.: 60.9423 Long.: -149.1794 Datum: WGS84
Soil Map Unit Name: NWI classification: PSS1E
Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ____
Hydric Soil Present? Yes ✓ No ____
Wetland Hydrology Present? Yes ✓ No ____

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ____

Remarks: Disturbed myrica meadow previously mapped as PSS1B, suggest the entire area is PSS1E. Disturbance from development encroachment and runoff from the highway, but not considered significant because you can still determine wetland status without using a reference site.

Vegetation - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
	Total Cover:	0.0		
	50% of total cover: 0.0		20% of total cover: 0.0	
	Sapling/Shrub Stratum			
1.	Myrica gale	85.0	✓	OBL
	Total Cover:	85.0		
	50% of total cover: 42.5		20% of total cover: 17.0	
	Herb Stratum			
1.	Carex lyngbyei	20.0	✓	OBL
2.	Calamagrostis canadensis	10.0	✓	FAC
3.	Potentilla egedii	5.0	____	____
	Total Cover:	35.0		
	50% of total cover: 17.5		20% of total cover: 7.0	

Dominance Test worksheet:
Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across all Strata: 3 (B)
Percent of Dominant Species That are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	105.0	× 1 =	105.0
FACW Species	0.0	× 2 =	0.0
FAC Species	10.0	× 3 =	30.0
FACU Species	0.0	× 4 =	0.0
UPL Species	0.0	× 5 =	0.0
Column Totals:	115.0 (A)		135.0 (B)

Prevalence Index = B/A = 1.174

Hydrophytic Vegetation Indicators:
✓ Dominance Test is > 50%
✓ Prevalence Index is ≤ 3.0
____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophytic Vegetation[1] (Explain)
[1] Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width) 5m radius
% Cover of Wetland Bryophytes (Where applicable) 0.0
% Bare Ground 0.0
Total Cover of Bryophytes 0.0

Hydrophytic Vegetation Present? **Yes** ✓ **No** ____

Remarks: disturbed myrica meadow

Soil

Sampling Point: sa-09

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Mod	Remarks
0-12	/		/		A		peat		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix

Hydric Soil Indicators:

- ✓ Histosol or Histel (A1)
- ✓ Histic Epipedon (A2)
- ✓ Hydrogen Sulfide (A4)
- ____ Thick Dark Surface (A12)
- ____ Alaska Gleyed (A13)
- ____ Alaska Redox (A14)
- ____ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ____ Alaska Color Change (TA4)[4]
- ____ Alaska Alpine Swales (TA5)
- ____ Alaska Redox With 2.5Y Hue
- ____ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ____ Other (Explain in Remarks)

[3]One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: Unknown

Depth (inches):

Hydric Soil Present? Yes ✓ **No** ____

Remarks: Assuming Histosol, dense myrica roots make a 16 inch plug unfeasible to remove.

Hydrology

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Surface Soil Cracks (B6)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Marl Deposits (B15)
- ✓ Hydrogen Sulfide Odor (C1)
- ____ Dry-Season Water Table (C2)
- ____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ____ Water Stained Leaves (B9)
- ____ Drainage Patterns (B10)
- ____ Oxidized Rizospheres along Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Salt Deposits (C5)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ✓ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	✓	No		Depth (inches):	1
Water Table Present?	Yes	✓	No		Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes	✓	No		Depth (inches):	0

Wetland Hydrology Present? Yes ✓ **No** ____

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:

Remarks:

Sampling Point: sa-09
NWI classification: PSS1E

Hydric Soil Indicators: Hydrogen Sulfide (A4), Histosol or Histel (A1), Histic Epipedon (A2)
Wetland Hydrology Indicators: Surface Water (A1), Hydrogen Sulfide Odor (C1), FAC-Neutral Test (D5), High Water Table (A2), Saturation (A3)

Wetland Determination Data Form - Alaska Region

Project/Site: Seward and Alyeska Highways Intersection Wetlands and FA Borough/City: Anchorage Sampling Date: 2020-09-16
Applicant/Owner: AKDOT & PF Sampling Point: sa-10
Investigator(s): WAD Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
Local relief (concave, convex, none): concave Slope: 0.0 % / 0.0 ° Elevation: 65
Subregion: Cook Inlet Lowlands Lat.: 60.9422 Long.: -149.1790 Datum: WGS84
Soil Map Unit Name: NWI classification: PEM2F
Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

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

Remarks: Based on comparisons to older imagery this meadow has developed over time, previously mapped as PSS1C

Vegetation - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
	Total Cover:	0.0		
	50% of total cover: 0.0		20% of total cover: 0.0	
	Sapling/Shrub Stratum			
1.	Myrica gale	5.0	____	OBL
	Total Cover:	5.0		
	50% of total cover: 2.5		20% of total cover: 1.0	
	Herb Stratum			
1.	Menyanthes trifoliata	65.0	✓	OBL
	Total Cover:	65.0		
	50% of total cover: 32.5		20% of total cover: 13.0	

Dominance Test worksheet:
Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across all Strata: 1 (B)
Percent of Dominant Species That are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	70.0	× 1 =	70.0
FACW Species	0.0	× 2 =	0.0
FAC Species	0.0	× 3 =	0.0
FACU Species	0.0	× 4 =	0.0
UPL Species	0.0	× 5 =	0.0
Column Totals:	70.0 (A)		70.0 (B)

Prevalence Index = B/A = 1.000

Hydrophytic Vegetation Indicators:
✓ Dominance Test is > 50%
✓ Prevalence Index is ≤ 3.0
____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophytic Vegetation[1] (Explain)
[1] Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width)	1m radius
% Cover of Wetland Bryophytes (Where applicable)	0.0
% Bare Ground	0.0
Total Cover of Bryophytes	0.0

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: small buckbean meadow, plants senescing.

SOIL

Sampling Point: sa-10

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Mod	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix

Hydric Soil Indicators:

- ____ Histosol or Histel (A1)
- ____ Histic Epipedon (A2)
- _✓_ Hydrogen Sulfide (A4)
- ____ Thick Dark Surface (A12)
- ____ Alaska Gleyed (A13)
- ____ Alaska Redox (A14)
- ____ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ____ Alaska Color Change (TA4)[4]
- ____ Alaska Alpine Swales (TA5)
- ____ Alaska Redox With 2.5Y Hue
- ____ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ____ Other (Explain in Remarks)

[3]One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes _✓_ No ____

Remarks: No soil pit, site inundated

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- _✓_ Surface Water (A1)
- _✓_ High Water Table (A2)
- _✓_ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Surface Soil Cracks (B6)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Marl Deposits (B15)
- _✓_ Hydrogen Sulfide Odor (C1)
- ____ Dry-Season Water Table (C2)
- ____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ____ Water Stained Leaves (B9)
- ____ Drainage Patterns (B10)
- ____ Oxidized Rizospheres along Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Salt Deposits (C5)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- _✓_ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	_✓_	No	____	Depth (inches):	10
Water Table Present?	Yes	_✓_	No	____	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes	_✓_	No	____	Depth (inches):	0

Wetland Hydrology Present? Yes _✓_ No ____

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:

Remarks: Hydrology in the area changing over time with water tables potentially rising due to urban encroachment.

Sampling Point: sa-10
NWI classification: PEM2F

Hydric Soil Indicators: Hydrogen Sulfide (A4)
Wetland Hydrology Indicators: High Water Table (A2), Saturation (A3), FAC-Neutral Test (D5), Hydrogen Sulfide Odor (C1), Surface Water (A1)

NO SOIL PIT PHOTO TAKEN

Wetland Determination Data Form - Alaska Region

Project/Site: Seward and Alyeska Highways Intersection Wetlands and FA Borough/City: Anchorage Sampling Date: 2020-09-16
Applicant/Owner: AKDOT & PF Sampling Point: sa-11
Investigator(s): WAD, RWM Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
Local relief (concave, convex, none): none Slope: 631.4 % / ___ ° Elevation: 63
Subregion: Cook Inlet Lowlands Lat.: 60.9427 Long.: -149.1806 Datum: WGS84
Soil Map Unit Name: NWI classification: PEM1/SS1D
Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ____
Hydric Soil Present? Yes ✓ No ____
Wetland Hydrology Present? Yes ✓ No ____

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ____

Remarks: Surface a springy, floating bog with significant recent shrub colonization based on comparison to older imagery.

Vegetation - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
	Total Cover:	0.0		
	50% of total cover: 0.0		20% of total cover: 0.0	
	Sapling/Shrub Stratum			
1.	Alnus incana	35.0	✓	FAC
	Total Cover:	35.0		
	50% of total cover: 17.5		20% of total cover: 7.0	
	Herb Stratum			
1.	Calamagrostis canadensis	85.0	✓	FAC
2.	Carex saxatilis	5.0		FACW
3.	Cicuta douglasii	5.0		OBL
4.	Potentilla egedii	5.0		
5.	Vicia cracca	1.0		
6.	Athyrium filix-femina	1.0		
7.	Puccinellia nuttalliana	1.0		FACW
8.	Carex lyngbyei	1.0		OBL
	Total Cover:	104.0		
	50% of total cover: 52.0		20% of total cover: 20.8	

Dominance Test worksheet:
Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across all Strata: 2 (B)
Percent of Dominant Species That are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	6.0	× 1 =	6.0
FACW Species	6.0	× 2 =	12.0
FAC Species	120.0	× 3 =	360.0
FACU Species	0.0	× 4 =	0.0
UPL Species	0.0	× 5 =	0.0
Column Totals:	132.0 (A)		378.0 (B)

Prevalence Index = B/A = 2.864

Hydrophytic Vegetation Indicators:
✓ Dominance Test is > 50%
✓ Prevalence Index is ≤ 3.0
____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophytic Vegetation[1] (Explain)
[1] Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width)	5m radius
% Cover of Wetland Bryophytes (Where applicable)	0.0
% Bare Ground	0.0
Total Cover of Bryophytes	0.0

Hydrophytic Vegetation Present? **Yes** ✓ **No** ____

Remarks: New shrubs since 2008 image, missing some sedges due to advanced plant phenology

SOIL

Sampling Point: sa-11

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Mod	Remarks
0-5					A		peat		
5-10					A		mucky peat		
10-16	2.5y 4/1				A		mucky peat		Positive alpha alpha

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix

Hydric Soil Indicators:

- ✓ Histosol or Histel (A1)
- ✓ Histic Epipedon (A2)
- ✓ Hydrogen Sulfide (A4)
- ____ Thick Dark Surface (A12)
- ____ Alaska Gleyed (A13)
- ____ Alaska Redox (A14)
- ____ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ____ Alaska Color Change (TA4)[4]
- ____ Alaska Alpine Swales (TA5)
- ____ Alaska Redox With 2.5Y Hue
- ____ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ✓ Other (Explain in Remarks)

[3]One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: Unknown

Depth (inches):

Hydric Soil Present? Yes ✓ No ____

Remarks: Positive reaction to alpha, alpha-dipyridol

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- ____ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Surface Soil Cracks (B6)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Marl Deposits (B15)
- ✓ Hydrogen Sulfide Odor (C1)
- ____ Dry-Season Water Table (C2)
- ____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ____ Water Stained Leaves (B9)
- ____ Drainage Patterns (B10)
- ____ Oxidized Rizospheres along Living Roots (C3)
- ✓ Presence of Reduced Iron (C4)
- ____ Salt Deposits (C5)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	____	No	✓	Depth (inches):	
Water Table Present?	Yes	✓	No	____	Depth (inches):	4
Saturation Present? (includes capillary fringe)	Yes	✓	No	____	Depth (inches):	0

Wetland Hydrology Present? Yes ✓ No ____

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:

Remarks: C4--positive reaction to alpha, alpha-dipyridol

Sampling Point: sa-11
NWI classification: PEM1/SS1D

Hydric Soil Indicators: Histosol or Histel (A1), Hydrogen Sulfide (A4), Histic Epipedon (A2), Other (explain in remarks)
Wetland Hydrology Indicators: Hydrogen Sulfide Odor (C1), Presence of Reduced Iron (C4), Saturation (A3), High Water Table (A2)

Wetland Determination Data Form - Alaska Region

Project/Site: Seward and Alyeska Highways Intersection Wetlands and FA Borough/City: Anchorage Sampling Date: 2020-09-16
Applicant/Owner: AKDOT & PF Sampling Point: sa-12
Investigator(s): RWM, WAD Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 66
Subregion: Cook Inlet Lowlands Lat.: 60.9434 Long.: -149.1836 Datum: WGS84
Soil Map Unit Name: NWI classification: PEM1E
Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

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

Remarks: Right on border between palustrine and estuarine on 2008 map, EC is only 330, which indicates that salt water input is relatively minimal.

Vegetation - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
	Total Cover:	0.0		
	50% of total cover: 0.0		20% of total cover: 0.0	
	Sapling/Shrub Stratum			
	Total Cover:	0.0		
	50% of total cover: 0.0		20% of total cover: 0.0	
	Herb Stratum			
1.	Carex lyngbyei	50.0	✓	OBL
2.	Calamagrostis canadensis	25.0	✓	FAC
3.	Potentilla egedii	5.0		
4.	Puccinellia nuttalliana	1.0		FACW
5.	Galium triflorum	1.0		FAC
6.	Vicia cracca	1.0		
7.	Taraxacum officinale	1.0		FACU
	Total Cover:	84.0		
	50% of total cover: 42.0		20% of total cover: 16.8	

Dominance Test worksheet:
Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across all Strata: 2 (B)
Percent of Dominant Species That are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	50.0	× 1 =	50.0
FACW Species	1.0	× 2 =	2.0
FAC Species	26.0	× 3 =	78.0
FACU Species	1.0	× 4 =	4.0
UPL Species	0.0	× 5 =	0.0
Column Totals:	78.0 (A)		134.0 (B)

Prevalence Index = B/A = 1.718

Hydrophytic Vegetation Indicators:
✓ Dominance Test is > 50%
✓ Prevalence Index is ≤ 3.0
____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophytic Vegetation[1] (Explain)
[1] Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width) -
% Cover of Wetland Bryophytes (Where applicable) 0.0
% Bare Ground 0.0
Total Cover of Bryophytes 0.0

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: Viccra and taroff invasives

SOIL

Sampling Point: sa-12

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Mod	Remarks
0-12	/		/		A		peat		
12-18	/		/		A		mucky peat		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix

Hydric Soil Indicators:

- ✓ Histosol or Histel (A1)
- ✓ Histic Epipedon (A2)
- ✓ Hydrogen Sulfide (A4)
- ____ Thick Dark Surface (A12)
- ____ Alaska Gleyed (A13)
- ____ Alaska Redox (A14)
- ____ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ____ Alaska Color Change (TA4)[4]
- ____ Alaska Alpine Swales (TA5)
- ____ Alaska Redox With 2.5Y Hue
- ____ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ____ Other (Explain in Remarks)

[3]One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: Unknown

Depth (inches):

Hydric Soil Present? Yes ✓ No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Surface Soil Cracks (B6)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Marl Deposits (B15)
- ✓ Hydrogen Sulfide Odor (C1)
- ____ Dry-Season Water Table (C2)
- ____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ____ Water Stained Leaves (B9)
- ____ Drainage Patterns (B10)
- ____ Oxidized Rizospheres along Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Salt Deposits (C5)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ✓ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	✓	No	____	Depth (inches):	2
Water Table Present?	Yes	✓	No	____	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes	✓	No	____	Depth (inches):	0

Wetland Hydrology Present? Yes ✓ No ____

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:

Remarks:

Sampling Point: sa-12
NWI classification: PEM1E

Hydric Soil Indicators: Histic Epipedon (A2), Histosol or Histel (A1), Hydrogen Sulfide (A4)
Wetland Hydrology Indicators: Saturation (A3), High Water Table (A2), Surface Water (A1), Hydrogen Sulfide Odor (C1), FAC-Neutral Test (D5)

Wetland Determination Data Form - Alaska Region

Project/Site: Seward and Alyeska Highways Intersection Wetlands and FA Borough/City: Anchorage Sampling Date: 2020-09-16
Applicant/Owner: AKDOT & PF Sampling Point: sa-14
Investigator(s): WAD, RWM Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 58
Subregion: Cook Inlet Lowlands Lat.: 60.9421 Long.: -149.1823 Datum: WGS84
Soil Map Unit Name: NWI classification: E2EM1P
Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ____
Hydric Soil Present? Yes ✓ No ____
Wetland Hydrology Present? Yes ✓ No ____

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ____

Remarks: Estuarine meadow, E2EMP was mapped in 2008.

Vegetation - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
	Total Cover:	0.0		
	50% of total cover: 0.0		20% of total cover: 0.0	
	Sapling/Shrub Stratum			
	Total Cover:	0.0		
	50% of total cover: 0.0		20% of total cover: 0.0	
	Herb Stratum			
1.	Carex lyngbyei	65.0	✓	OBL
2.	Potentilla egedii	35.0	✓	
3.	Poa eminens	4.0		FAC
	Total Cover:	104.0		
	50% of total cover: 52.0		20% of total cover: 20.8	

Dominance Test worksheet:
Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across all Strata: 2 (B)
Percent of Dominant Species That are OBL, FACW, or FAC: 50.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	65.0	× 1 =	65.0
FACW Species	0.0	× 2 =	0.0
FAC Species	4.0	× 3 =	12.0
FACU Species	0.0	× 4 =	0.0
UPL Species	0.0	× 5 =	0.0
Column Totals:	69.0 (A)		77.0 (B)

Prevalence Index = B/A = 1.116

Hydrophytic Vegetation Indicators:
____ Dominance Test is > 50%
✓ Prevalence Index is ≤ 3.0
____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophytic Vegetation[1] (Explain)
[1] Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width) 5m radius
% Cover of Wetland Bryophytes (Where applicable) 0.0
% Bare Ground 0.0
Total Cover of Bryophytes 0.0

Hydrophytic Vegetation Present? **Yes** ✓ **No** ____

Remarks: Definitely a shift to exclusively salt tolerant plants.

Soil

Sampling Point: sa-14

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Mod	Remarks
0-6			/		A		peat		
6-17	n	100	/		A		silt loam		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix

Hydric Soil Indicators:

- ____ Histosol or Histel (A1)
- ____ Histic Epipedon (A2)
- ✓ Hydrogen Sulfide (A4)
- ____ Thick Dark Surface (A12)
- ✓ Alaska Gleyed (A13)
- ____ Alaska Redox (A14)
- ____ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ____ Alaska Color Change (TA4)[4]
- ____ Alaska Alpine Swales (TA5)
- ____ Alaska Redox With 2.5Y Hue
- ____ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ✓ Other (Explain in Remarks)

[3]One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: None

Depth (inches): 0.0

Hydric Soil Present? Yes ✓ No ____

Remarks: positive reaction to alpha, alpha-dipyridol

Hydrology

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- ____ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Surface Soil Cracks (B6)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Marl Deposits (B15)
- ✓ Hydrogen Sulfide Odor (C1)
- ____ Dry-Season Water Table (C2)
- ____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ____ Water Stained Leaves (B9)
- ____ Drainage Patterns (B10)
- ____ Oxidized Rizospheres along Living Roots (C3)
- ✓ Presence of Reduced Iron (C4)
- ____ Salt Deposits (C5)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ✓ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	____	No	✓	Depth (inches):
Water Table Present?	Yes	✓	No	____	Depth (inches): 2
Saturation Present? (includes capillary fringe)	Yes	✓	No	____	Depth (inches): 0

Wetland Hydrology Present? Yes ✓ No ____

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:

Remarks:

Sampling Point: sa-14
NWI classification: E2EM1P

Hydric Soil Indicators: Other (explain in remarks), Alaska Gleyed (A13), Hydrogen Sulfide (A4)
Wetland Hydrology Indicators: Saturation (A3), High Water Table (A2), Presence of Reduced Iron (C4), FAC-Neutral Test (D5), Hydrogen Sulfide Odor (C1)

Wetland Determination Data Form - Alaska Region

Project/Site: Seward and Alyeska Highways Intersection Wetlands and FA Borough/City: Anchorage Sampling Date: 2020-09-16
Applicant/Owner: AKDOT & PF Sampling Point: sa-15
Investigator(s): WAD, RWM Landform (hillside, terrace, hummocks, etc.): Human modified mounds
Local relief (concave, convex, none): convex Slope: 0.0 % / 0.0 ° Elevation: 49
Subregion: Cook Inlet Lowlands Lat.: 60.9389 Long.: -149.1715 Datum: WGS84
Soil Map Unit Name: NWI classification: U
Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ____
Hydric Soil Present? Yes ____ No ✓
Wetland Hydrology Present? Yes ____ No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks: Previously mapped as E2SS1P, not sure if this is a natural or man made mound of gravel but the substrate is coarse material and well drained and the surface is high enough above the water table to create an upland.

Vegetation - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
	Total Cover:	0.0		
	50% of total cover: 0.0		20% of total cover: 0.0	
	Sapling/Shrub Stratum			
1.	Alnus incana	70.0	✓	FAC
2.	Salix bebbiana	10.0		FAC
	Total Cover:	80.0		
	50% of total cover: 40.0		20% of total cover: 16.0	
	Herb Stratum			
1.	Equisetum arvense	40.0	✓	FAC
2.	Calamagrostis canadensis	30.0	✓	FAC
3.	Heracleum maximum	15.0		FACU
4.	Angelica lucida	4.0		FACU
	Total Cover:	89.0		
	50% of total cover: 44.5		20% of total cover: 17.8	

Dominance Test worksheet:
Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across all Strata: 3 (B)
Percent of Dominant Species That are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0.0	× 1 =	0.0
FACW Species	0.0	× 2 =	0.0
FAC Species	150.0	× 3 =	450.0
FACU Species	19.0	× 4 =	76.0
UPL Species	0.0	× 5 =	0.0
Column Totals:	169.0 (A)		526.0 (B)

Prevalence Index = B/A = 3.112

Hydrophytic Vegetation Indicators:
✓ Dominance Test is > 50%
____ Prevalence Index is ≤ 3.0
____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophytic Vegetation[1] (Explain)
[1] Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width) 1m radius
% Cover of Wetland Bryophytes (Where applicable) 0.0
% Bare Ground 0.0
Total Cover of Bryophytes 0.0

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: Alder willow thicket on a convex mound of gravels

Soil

Sampling Point: sa-15

Depth	Matrix		Redox Features						
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Mod	Remarks
0-3					A		fibric		
3-12	10yr 2/1				A		silt loam	v. gravelly	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix

Hydric Soil Indicators:

- _____Histosol or Histel (A1)
- _____Histic Epipedon (A2)
- _____Hydrogen Sulfide (A4)
- _____Thick Dark Surface (A12)
- _____Alaska Gleyed (A13)
- _____Alaska Redox (A14)
- _____Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- _____Alaska Color Change (TA4)[4]
- _____Alaska Alpine Swales (TA5)
- _____Alaska Redox With 2.5Y Hue
- _____Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- _____Other (Explain in Remarks)

[3]One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes _____ No ✓

Remarks: No hydric soil indicators

Hydrology

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- _____Surface Water (A1)
- _____High Water Table (A2)
- _____Saturation (A3)
- _____Water Marks (B1)
- _____Sediment Deposits (B2)
- _____Drift Deposits (B3)
- _____Algal Mat or Crust (B4)
- _____Iron Deposits (B5)
- _____Surface Soil Cracks (B6)
- _____Inundation Visible on Aerial Imagery (B7)
- _____Sparsely Vegetated Concave Surface (B8)
- _____Marl Deposits (B15)
- _____Hydrogen Sulfide Odor (C1)
- _____Dry-Season Water Table (C2)
- _____Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____Water Stained Leaves (B9)
- _____Drainage Patterns (B10)
- _____Oxidized Rizospheres along Living Roots (C3)
- _____Presence of Reduced Iron (C4)
- _____Salt Deposits (C5)
- _____Stunted or Stressed Plants (D1)
- _____Geomorphic Position (D2)
- _____Shallow Aquitard (D3)
- _____Microtopographic Relief (D4)
- _____FAC-neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches):

Water Table Present? Yes _____ No ✓ Depth (inches):

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches):

Wetland Hydrology Present? Yes _____ No ✓

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:

Remarks: No wetland hydrology indicators

Sampling Point: sa-15
NWI classification: U

Hydric Soil Indicators: None
Wetland Hydrology Indicators: None

Wetland Determination Data Form - Alaska Region

Project/Site: Seward and Alyeska Highways Intersection Wetlands and FA Borough/City: Anchorage Sampling Date: 2020-09-16
Applicant/Owner: AKDOT & PF Sampling Point: sa-17
Investigator(s): RWM, WAD Landform (hillside, terrace, hummocks, etc.): Bluffs or Banks
Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 54
Subregion: Cook Inlet Lowlands Lat.: 60.9381 Long.: -149.1695 Datum: WGS84
Soil Map Unit Name: NWI classification: U
Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ____
Hydric Soil Present? Yes ____ No ✓
Wetland Hydrology Present? Yes ____ No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks: Emergent meadow within closed shrub thicket, right on the edge of Glacier creek bank. Somewhat disturbed from foot traffic, fishermen.

Vegetation - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
	Total Cover:	0.0		
	50% of total cover: 0.0		20% of total cover: 0.0	
	Sapling/Shrub Stratum			
1.	Myrica gale	10.0	✓	OBL
2.	Alnus incana	5.0	✓	FAC
3.	Salix barclayi	2.0		FAC
	Total Cover:	17.0		
	50% of total cover: 8.5		20% of total cover: 3.4	
	Herb Stratum			
1.	Leymus mollis	60.0	✓	FAC
2.	Puccinellia nuttalliana	20.0		FACW
3.	Potentilla egedii	10.0		
4.	Equisetum arvense	5.0		FAC
5.	Angelica lucida	5.0		FACU
6.	Sanguisorba canadensis	5.0		FACW
7.	Achillea millefolium	2.0		FACU
8.	Taraxacum officinale	1.0		FACU
	Total Cover:	108.0		
	50% of total cover: 54.0		20% of total cover: 21.6	

Dominance Test worksheet:
Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across all Strata: 3 (B)
Percent of Dominant Species That are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	10.0	× 1 =	10.0
FACW Species	25.0	× 2 =	50.0
FAC Species	72.0	× 3 =	216.0
FACU Species	8.0	× 4 =	32.0
UPL Species	0.0	× 5 =	0.0
Column Totals:	115.0 (A)		308.0 (B)

Prevalence Index = B/A = 2.678

Hydrophytic Vegetation Indicators:
✓ Dominance Test is > 50%
✓ Prevalence Index is ≤ 3.0
____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophytic Vegetation[1] (Explain)
[1] Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width) 5m radius
% Cover of Wetland Bryophytes (Where applicable) 0.0
% Bare Ground 0.0
Total Cover of Bryophytes 0.0

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: leymol opening in closed shrub canopy

SOIL

Sampling Point: sa-17

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Mod	Remarks
0-0					A		fibric		
0-17	10yr 4/1				A		very fine sandy loam		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix

Hydric Soil Indicators:

- _____Histosol or Histel (A1)
- _____Histic Epipedon (A2)
- _____Hydrogen Sulfide (A4)
- _____Thick Dark Surface (A12)
- _____Alaska Gleyed (A13)
- _____Alaska Redox (A14)
- _____Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- _____Alaska Color Change (TA4)[4]
- _____Alaska Alpine Swales (TA5)
- _____Alaska Redox With 2.5Y Hue
- _____Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- _____Other (Explain in Remarks)

[3]One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: None

Depth (inches):

Hydric Soil Present? Yes _____ No ✓

Remarks: Well drained sands, with little organic development.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- _____Surface Water (A1)
- _____High Water Table (A2)
- _____Saturation (A3)
- _____Water Marks (B1)
- _____Sediment Deposits (B2)
- _____Drift Deposits (B3)
- _____Algal Mat or Crust (B4)
- _____Iron Deposits (B5)
- _____Surface Soil Cracks (B6)
- _____Inundation Visible on Aerial Imagery (B7)
- _____Sparsely Vegetated Concave Surface (B8)
- _____Marl Deposits (B15)
- _____Hydrogen Sulfide Odor (C1)
- _____Dry-Season Water Table (C2)
- _____Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____Water Stained Leaves (B9)
- _____Drainage Patterns (B10)
- _____Oxidized Rizospheres along Living Roots (C3)
- _____Presence of Reduced Iron (C4)
- _____Salt Deposits (C5)
- _____Stunted or Stressed Plants (D1)
- _____Geomorphic Position (D2)
- _____Shallow Aquitard (D3)
- _____Microtopographic Relief (D4)
- ✓ FAC-neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches):

Water Table Present? Yes _____ No ✓ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): 0

Wetland Hydrology Present? Yes _____ No ✓

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:

Remarks:

Sampling Point: sa-17
NWI classification: U

Hydric Soil Indicators: None
Wetland Hydrology Indicators: FAC-Neutral Test (D5)

Wetland Determination Data Form - Alaska Region

Project/Site: Seward and Alyeska Highways Intersection Wetlands and FA Borough/City: Anchorage Sampling Date: 2020-09-16
Applicant/Owner: AKDOT & PF Sampling Point: sa-18
Investigator(s): WAD Landform (hillside, terrace, hummocks, etc.): Channel
Local relief (concave, convex, none): concave Slope: 0.0 % / 0.0 ° Elevation: 56
Subregion: Cook Inlet Lowlands Lat.: 60.9384 Long.: -149.1684 Datum: WGS84
Soil Map Unit Name: NWI classification: R1UBV
Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✓
Are Vegetation ✓, Soil ✓, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

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

Remarks: Glacier creek, unvegetated, unknown depth, plot just above a short riffle, banks are river cobble, few if any indications of tidal fluctuations.

Vegetation - Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
Total Cover:	0.0		
50% of total cover: 0.0		20% of total cover: 0.0	
Sapling/Shrub Stratum			
Total Cover:	0.0		
50% of total cover: 0.0		20% of total cover: 0.0	
Herb Stratum			
Total Cover:	0.0		
50% of total cover: 0.0		20% of total cover: 0.0	

Dominance Test worksheet:
Number of Dominant Species That are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across all Strata: 0 (B)
Percent of Dominant Species That are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0.0	× 1 =	0.0
FACW Species	0.0	× 2 =	0.0
FAC Species	0.0	× 3 =	0.0
FACU Species	0.0	× 4 =	0.0
UPL Species	0.0	× 5 =	0.0
Column Totals:	0.0 (A)		0.0 (B)

Prevalence Index = B/A = 0.000

Hydrophytic Vegetation Indicators:
____ Dominance Test is > 50%
____ Prevalence Index is ≤ 3.0
____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
✓ Problematic Hydrophytic Vegetation[1] (Explain)
[1] Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width)	2x10m
% Cover of Wetland Bryophytes (Where applicable)	0.0
% Bare Ground	0.0
Total Cover of Bryophytes	0.0

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: Unvegetated waters

SOIL

Sampling Point: sa-18

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Mod	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix

Hydric Soil Indicators:

- _____Histosol or Histel (A1)
- _____Histic Epipedon (A2)
- _____Hydrogen Sulfide (A4)
- _____Thick Dark Surface (A12)
- _____Alaska Gleyed (A13)
- _____Alaska Redox (A14)
- _____Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- _____Alaska Color Change (TA4)[4]
- _____Alaska Alpine Swales (TA5)
- _____Alaska Redox With 2.5Y Hue
- _____Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___✓___Other (Explain in Remarks)

[3]One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ___✓___ No _____

Remarks: No soil pit, unvegetated water

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- ___✓___Surface Water (A1)
- _____High Water Table (A2)
- _____Saturation (A3)
- _____Water Marks (B1)
- _____Sediment Deposits (B2)
- _____Drift Deposits (B3)
- _____Algal Mat or Crust (B4)
- _____Iron Deposits (B5)
- _____Surface Soil Cracks (B6)
- _____Inundation Visible on Aerial Imagery (B7)
- _____Sparsely Vegetated Concave Surface (B8)
- _____Marl Deposits (B15)
- _____Hydrogen Sulfide Odor (C1)
- _____Dry-Season Water Table (C2)
- _____Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____Water Stained Leaves (B9)
- _____Drainage Patterns (B10)
- _____Oxidized Rizospheres along Living Roots (C3)
- _____Presence of Reduced Iron (C4)
- _____Salt Deposits (C5)
- _____Stunted or Stressed Plants (D1)
- _____Geomorphic Position (D2)
- _____Shallow Aquitard (D3)
- _____Microtopographic Relief (D4)
- _____FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	___✓___	No	_____	Depth (inches): 48
Water Table Present?	Yes	_____	No	___✓___	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes	_____	No	___✓___	Depth (inches):

Wetland Hydrology Present? Yes ___✓___ No _____

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:

Remarks: Estimated depth approximately 4'

Sampling Point: sa-18
NWI classification: R1UBV

Hydric Soil Indicators: Other (explain in remarks)
Wetland Hydrology Indicators: Surface Water (A1)

No Soil Pit Photo Taken

Wetland Determination Data Form - Alaska Region

Project/Site: Seward and Alyeska Highways Intersection Wetlands and FA Borough/City: Anchorage Sampling Date: 2020-09-16
Applicant/Owner: AKDOT & PF Sampling Point: sa-19
Investigator(s): WAD, RWM Landform (hillside, terrace, hummocks, etc.): Flat or fluvial related
Local relief (concave, convex, none): none Slope: 0.0 % / 0.0 ° Elevation: 65
Subregion: Cook Inlet Lowlands Lat.: 60.9397 Long.: -149.1700 Datum: WGS84
Soil Map Unit Name: NWI classification: PEM1E
Are climatic/hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ____
Hydric Soil Present? Yes ✓ No ____
Wetland Hydrology Present? Yes ✓ No ____

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ____

Remarks: Dense graminoid meadow, no surface water at time of sampling but iron floc and sediment deposits are present at base of calcan hummocks. possibly rethink the estuary call from 2008 due to relatively low EC value. Some aerial image evidence of constructed drainage channels in the area, hydrology may have been significantly altered here.

Vegetation - Use scientific names of plants. List all species in the plot.

	Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
	Total Cover:	0.0		
	50% of total cover: 0.0		20% of total cover: 0.0	
	Sapling/Shrub Stratum			
1.	Salix bebbiana	2.0	____	FAC
	Total Cover:	2.0		
	50% of total cover: 1.0		20% of total cover: 0.4	
	Herb Stratum			
1.	Calamagrostis canadensis	70.0	✓	FAC
2.	Carex lyngbyei	20.0	____	OBL
3.	Equisetum fluviatile	10.0	____	OBL
4.	Vicia cracca	1.0	____	____
	Total Cover:	101.0		
	50% of total cover: 50.5		20% of total cover: 20.2	

Dominance Test worksheet:
Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across all Strata: 1 (B)
Percent of Dominant Species That are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL Species	30.0	× 1 =	30.0
FACW Species	0.0	× 2 =	0.0
FAC Species	72.0	× 3 =	216.0
FACU Species	0.0	× 4 =	0.0
UPL Species	0.0	× 5 =	0.0
Column Totals:	102.0 (A)		246.0 (B)

Prevalence Index = B/A = 2.412

Hydrophytic Vegetation Indicators:
✓ Dominance Test is > 50%
✓ Prevalence Index is ≤ 3.0
____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophytic Vegetation[1] (Explain)
[1] Indicators or hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Plot size (radius, or length × width) _
% Cover of Wetland Bryophytes (Where applicable) 0.0
% Bare Ground 5.0
Total Cover of Bryophytes 0.0

Hydrophytic Vegetation Present? **Yes** ✓ **No** ____

Remarks: Carlyn present but the remaining vegetation is more representative of freshwater plant communities.

SOIL

Sampling Point: sa-19

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Mod	Remarks
0-10	/		/		A		peat		
10-18	5y 4/1		/		A		mucky peat		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, A=Absent [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix

Hydric Soil Indicators:

- ✓ Histosol or Histel (A1)
- ✓ Histic Epipedon (A2)
- ✓ Hydrogen Sulfide (A4)
- ____ Thick Dark Surface (A12)
- ____ Alaska Gleyed (A13)
- ____ Alaska Redox (A14)
- ____ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ____ Alaska Color Change (TA4)[4]
- ____ Alaska Alpine Swales (TA5)
- ____ Alaska Redox With 2.5Y Hue
- ____ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ____ Other (Explain in Remarks)

[3]One indicator or hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: Unknown

Depth (inches):

Hydric Soil Present? Yes ✓ No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one is sufficient)

- ____ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Surface Soil Cracks (B6)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Marl Deposits (B15)
- ✓ Hydrogen Sulfide Odor (C1)
- ____ Dry-Season Water Table (C2)
- ____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ____ Water Stained Leaves (B9)
- ____ Drainage Patterns (B10)
- ____ Oxidized Rizospheres along Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Salt Deposits (C5)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	____	No	✓	Depth (inches):
Water Table Present?	Yes	✓	No	____	Depth (inches): 3
Saturation Present? (includes capillary fringe)	Yes	✓	No	____	Depth (inches): 0

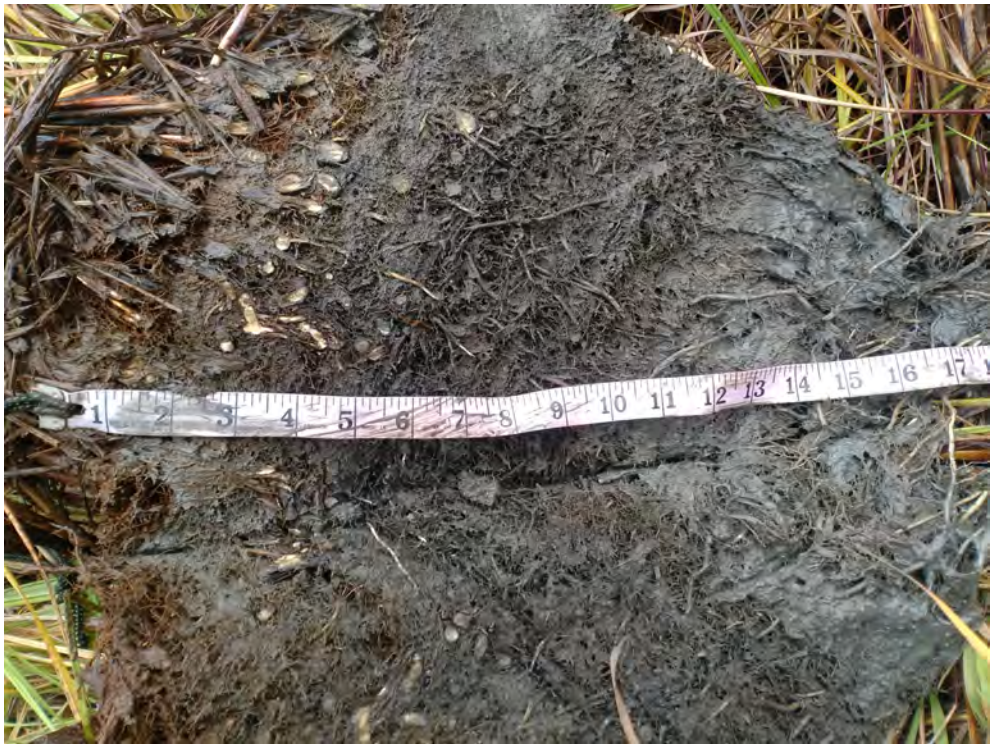
Wetland Hydrology Present? Yes ✓ No ____

Recorded Data (stream gauge, monitor well, aerial photo, previous inspection) if available:

Remarks:

Sampling Point: sa-19
NWI classification: PEM1E

Hydric Soil Indicators: Hydrogen Sulfide (A4), Histosol or Histel (A1), Histic Epipedon (A2)
Wetland Hydrology Indicators: Hydrogen Sulfide Odor (C1), High Water Table (A2), Saturation (A3)



Appendix B. Photo Verification Plots

Plot	NWI Code	Hydrogeomorphic (HGM) Class
sa-01	U	Not Applicable (Upland)
sa-04	PEM1E	Slope HGM
sa-05	PEM1/SS1F	Slope HGM
sa-08	U	Not Applicable (Upland)
sa-13	E2USMx	Estuarine Fringe HGM
sa-16	E2SB5N	Estuarine Fringe HGM

Sampling Point: sa-01

Site: Seward and Alyeska Highways Intersection Wetlands and FA

Date: 2020-09-16

NWI classification: U

Viereck code:

Species: *Achillea millefolium, Vicia cracca, Trifolium repens, Taraxacum officinale, Poa pratensis, Phleum pratense, Phalaris arundinacea, Linaria vulgaris, Chamaenerion angustifolium*

Notes: Revegetated fill at the base of trail berm, next to railroad. Dry, with no evidence of seasonal flooding, substrate well drained.

Sampling Point: sa-04

Site: Seward and Alyeska Highways Intersection Wetlands and FA

Date: 2020-09-16

NWI classification: PEM1E

Viereck code:

Species: *Betula kenaica, Alnus incana, Salix barclayi, Viola sp., Equisetum fluviatile*

Notes: Calamagrostis-Alder wetland, 2 inches of surface water and saturation to surface.

Sampling Point: sa-05

Site: Seward and Alyeska Highways Intersection Wetlands and FA

Date: 2020-09-16

NWI classification: PEM1/SS1F

Viereck code:

Species: *Salix barclayi, Salix pulchra, Cicuta virosa, Equisetum fluviatile, Comarum palustre, Calamagrostis canadensis*

Notes: Plot within small upland mapped in HDR map. At least 6 inches of surface water throughout which drives the hydrologic regime shift from E to F. Definitely not an upland.

Sampling Point: sa-08

Site: Seward and Alyeska Highways Intersection Wetlands and FA

Date: 2020-09-16

NWI classification: U

Viereck code:

Species: *Populus balsamifera, Picea sitchensis, Alnus viridis, Gymnocarpium dryopteris, Calamagrostis canadensis*

Notes: Disturbed uplands at base of steep slope next to tracks. Unvegetated walking trail through evergreen forest.

Sampling Point: sa-13

Site: Seward and Alyeska Highways Intersection Wetlands and FA

Date: 2020-09-16

NWI classification: E2USMx

Viereck code:

Species: *Carex lyngbyei*

Notes: Inundated ditches next to Seward highway, bordered by monotypic stands of carlyn. Orange iron floc on pond bottom.

Sampling Point: sa-16

Site: Seward and Alyeska Highways Intersection Wetlands and FA

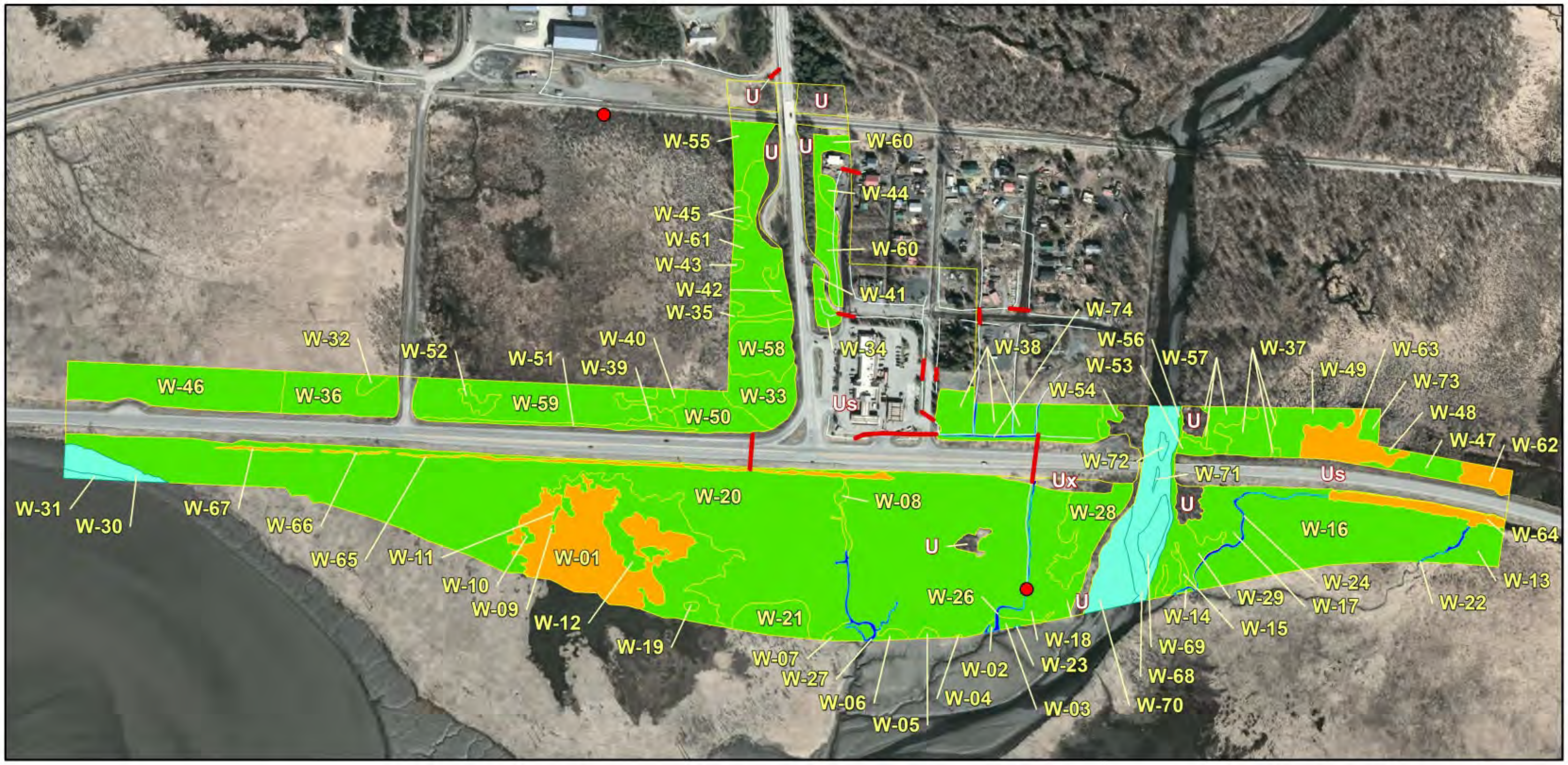
Date: 2020-09-16

NWI classification: E2SB5N

Viereck code:

Species: *Vicia cracca, Carex lyngbyei, Potentilla egedii*

Notes: A drainage feature (tidal gut) with iron deposits and surface water. Not as much water as in esri imagery. In places very deep about 30 inches. Deep and 12-16 inches wide. Banks are monotypic stands of carlyn.



Connectivity Characteristics[1]

- Navigable water
- Tributaries to traditional navigable waters
- Lakes, ponds, and impoundments of jurisdictional waters
- Adjacent wetlands
- Non-jurisdictional (uplands)
- W-2 Mapped Wetlands and Waters[2]
- Outfall[3]
- Culvert[3]
- Open Channel[3]

[1] Jurisdiction under the Navigable Waters Protection Rule is applied to four categories of waters of the U.S.: (1) the territorial seas and traditional navigable waters; (2) perennial and intermittent tributaries to those waters; (3) certain lakes, ponds, and impoundments; and (4) adjacent wetlands, as defined by 33 CFR Parts 328 and 120—Definition of Waters of the United States. The USACE is responsible for the final jurisdictional determinations.
[2] The mapped wetlands and waters are displayed with an identification number per mapped polygon, which can be used to view each polygon's associated attributes in Table C-1.
[3] Watershed and storm drain network datadownloaded from the Municipality of Anchorage: https://moa-muniorg.hub.arcgis.com/pages/data, accessed 2020-10-16.

Background image from Anchorage Orthos, Aqcuired May 4, 2015 at a 0.15m spatial resolution. Scale is 1:6,650 when printed at 8.5x11".
Imagery Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.
ABR file: AppC_Girdwood_Wetlands_20-247.mxd; 07 Dec 2020

0 50 100 150 200 Meters

0 250 500 750 Feet

Appendix C. Mapped Wetlands and Waters in the Seward and Alyeska Highways Intersection Wetland Study Area, Girdwood, Alaska.

map prepared by:
ABR, Inc. — Environmental Research & Services

Project Proponent: Project Number: Z546190000
Alaska Department of Transportation and Public Facilities

Table C-1. Attributes of mapped wetlands and waters within the Seward and Alyeska highways intersection wetland study area, Girdwood, Alaska, 2020.

Wetland Number	NWI Code	HGM Code	Jurisdictional Category	Area (acres)	Centroid Longitude (NAD83)	Centroid Latitude (NAD83)	Centroid Longitude (WGS84)	Centroid Latitude (WGS84)
W-01	E1UBL	Estuarine Fringe HGM	Ponds	3.331589562	-149.1779544	60.94039534	-149.1779772	60.94039711
W-02	E2EM1N	Estuarine Fringe HGM	Adjacent wetlands	0.020824308	-149.1716584	60.9380498	-149.1716812	60.93805158
W-03	E2EM1N	Estuarine Fringe HGM	Adjacent wetlands	0.094985186	-149.1711385	60.93797413	-149.1711614	60.93797591
W-04	E2EM1N	Estuarine Fringe HGM	Adjacent wetlands	0.004425137	-149.1723062	60.93810371	-149.172329	60.93810548
W-05	E2EM1N	Estuarine Fringe HGM	Adjacent wetlands	0.045293345	-149.1728177	60.93824954	-149.1728406	60.93825131
W-06	E2EM1N	Estuarine Fringe HGM	Adjacent wetlands	0.080056615	-149.1734849	60.93839372	-149.1735078	60.93839549
W-07	E2EM1N	Estuarine Fringe HGM	Adjacent wetlands	0.179644297	-149.174189	60.93858489	-149.1742119	60.93858666
W-08	E2EM1N	Estuarine Fringe HGM	Adjacent wetlands	0.103556222	-149.1732719	60.93963203	-149.1732948	60.93963381
W-09	E2EM1N	Estuarine Fringe HGM	Adjacent wetlands	0.010427315	-149.1785286	60.94072744	-149.1785515	60.94072921
W-10	E2EM1N	Estuarine Fringe HGM	Adjacent wetlands	0.04673694	-149.1790294	60.94077332	-149.1790523	60.9407751
W-11	E2EM1N	Estuarine Fringe HGM	Adjacent wetlands	0.018350415	-149.1783239	60.9408522	-149.1783468	60.94085397
W-12	E2EM1N	Estuarine Fringe HGM	Adjacent wetlands	2.388418059	-149.1768095	60.94011206	-149.1768324	60.94011384
W-13	E2EM1P	Estuarine Fringe HGM	Adjacent wetlands	0.531179964	-149.1624424	60.93668924	-149.1624652	60.93669101
W-14	E2EM1P	Estuarine Fringe HGM	Adjacent wetlands	0.011015201	-149.1679108	60.93753607	-149.1679337	60.93753784
W-15	E2EM1P	Estuarine Fringe HGM	Adjacent wetlands	0.142696599	-149.1680069	60.93771328	-149.1680298	60.93771506
W-16	E2EM1P	Estuarine Fringe HGM	Adjacent wetlands	4.22200866	-149.1649954	60.9374108	-149.1650182	60.93741257
W-17	E2EM1P	Estuarine Fringe HGM	Adjacent wetlands	0.865699534	-149.166231	60.93799932	-149.1662538	60.9380011
W-18	E2EM1P	Estuarine Fringe HGM	Adjacent wetlands	1.467380859	-149.17008	60.93837547	-149.1701028	60.93837725
W-19	E2EM1P	Estuarine Fringe HGM	Adjacent wetlands	0.031847051	-149.1767488	60.93948226	-149.1767716	60.93948404
W-20	E2EM1P	Estuarine Fringe HGM	Adjacent wetlands	21.82380299	-149.1762665	60.94026558	-149.1762893	60.94026735
W-21	E2FO5/EM1P	Estuarine Fringe HGM	Adjacent wetlands	0.647424638	-149.1753974	60.93902106	-149.1754203	60.93902283
W-22	E2SB5N	Estuarine Fringe HGM	Tributary	0.035838073	-149.1628445	60.93681502	-149.1628673	60.93681679
W-23	E2SB5N	Estuarine Fringe HGM	Tributary	0.000714361	-149.1711864	60.93793913	-149.1712093	60.93794091
W-24	E2SB5N	Estuarine Fringe HGM	Tributary	0.108803396	-149.1665676	60.93781375	-149.1665904	60.93781552
W-26	E2SB5N	Estuarine Fringe HGM	Tributary	0.08109011	-149.1708045	60.93837485	-149.1708274	60.93837663
W-27	E2SB5N	Estuarine Fringe HGM	Tributary	0.103353475	-149.1737907	60.93875855	-149.1738135	60.93876032

Table C-1. Continued.

Wetland Number	NWI Code	HGM Code	Jurisdictional Category	Area (acres)	Centroid Longitude (NAD83)	Centroid Latitude (NAD83)	Centroid Longitude (WGS84)	Centroid Latitude (WGS84)
W-28	E2SS1P	Estuarine Fringe HGM	Adjacent wetlands	1.059569256	-149.1691014	60.93849188	-149.1691243	60.93849366
W-29	E2SS1P	Estuarine Fringe HGM	Adjacent wetlands	0.763688191	-149.1676429	60.9379173	-149.1676658	60.93791907
W-30	E2US3N	Estuarine Fringe HGM	Navigable water	0.478491055	-149.1859155	60.94316372	-149.1859383	60.9431655
W-31	E1UBL	N/A (Estuarine Waters)	Navigable water	0.090682488	-149.1862703	60.94313366	-149.1862932	60.94313544
W-32	PEM1/SS1D	Slope HGM	Adjacent wetlands	0.109918837	-149.1804896	60.94274252	-149.1805125	60.94274429
W-33	PEM1/SS1F	Slope HGM	Adjacent wetlands	0.823565774	-149.1736564	60.94098214	-149.1736793	60.94098391
W-34	PEM1/SS1F	Slope HGM	Adjacent wetlands	0.157314843	-149.1718522	60.94141841	-149.1718751	60.94142019
W-35	PEM1/SS1F	Slope HGM	Adjacent wetlands	0.165768583	-149.1731284	60.94170722	-149.1731512	60.94170899
W-36	PEM1D	Slope HGM	Adjacent wetlands	1.220750649	-149.1811636	60.94277479	-149.1811865	60.94277656
W-37	PEM1E	Slope HGM	Adjacent wetlands	0.023588952	-149.1651318	60.93834583	-149.1651547	60.9383476
W-37	PEM1E	Slope HGM	Adjacent wetlands	0.001099064	-149.1648922	60.93859598	-149.164915	60.93859775
W-37	PEM1E	Slope HGM	Adjacent wetlands	0.528537081	-149.1654114	60.93860194	-149.1654343	60.93860371
W-38	PEM1E	Slope HGM	Adjacent wetlands	1.218186222	-149.1693653	60.93969579	-149.1693881	60.93969756
W-38	PEM1E	Slope HGM	Adjacent wetlands	0.196825634	-149.1692656	60.93968425	-149.1692885	60.93968603
W-38	PEM1E	Slope HGM	Adjacent wetlands	0.327495504	-149.1698076	60.9398124	-149.1698305	60.93981417
W-39	PEM1E	Slope HGM	Adjacent wetlands	0.074368019	-149.175941	60.94124242	-149.1759639	60.94124419
W-40	PEM1E	Slope HGM	Adjacent wetlands	0.239088424	-149.1755672	60.9413945	-149.17559	60.94139627
W-41	PEM1E	Slope HGM	Adjacent wetlands	0.097863679	-149.1717152	60.94171956	-149.1717381	60.94172134
W-42	PEM1E	Slope HGM	Adjacent wetlands	0.161171433	-149.1724423	60.94187942	-149.1724652	60.9418812
W-43	PEM1E	Slope HGM	Adjacent wetlands	0.037272084	-149.1730072	60.94221431	-149.17303	60.94221608
W-44	PEM1E	Slope HGM	Adjacent wetlands	0.123609033	-149.1707489	60.94248027	-149.1707718	60.94248204
W-45	PEM1E	Slope HGM	Adjacent wetlands	0.096211252	-149.1723954	60.94272231	-149.1724182	60.94272408
W-45	PEM1E	Slope HGM	Adjacent wetlands	0.051592801	-149.1725261	60.94256559	-149.172549	60.94256737
W-46	PEM1E	Slope HGM	Adjacent wetlands	2.42082366	-149.183896	60.94352372	-149.1839188	60.9435255
W-47	PEM1F	Lacustrine Fringe HGM	Adjacent wetlands	0.413430635	-149.162618	60.93759361	-149.1626409	60.93759539
W-48	PEM1F	Lacustrine Fringe HGM	Adjacent wetlands	0.023968168	-149.1630946	60.93787674	-149.1631174	60.93787852
W-49	PEM1F	Lacustrine Fringe HGM	Adjacent wetlands	0.65051511	-149.1643913	60.93845043	-149.1644141	60.9384522

Table C-1. Continued.

Wetland Number	NWI Code	HGM Code	Jurisdictional Category	Area (acres)	Centroid Longitude (NAD83)	Centroid Latitude (NAD83)	Centroid Longitude (WGS84)	Centroid Latitude (WGS84)
W-50	PEM1F	Slope HGM	Adjacent wetlands	0.75121272	-149.1746956	60.94103035	-149.1747185	60.94103212
W-51	PEM1Fx	Slope HGM	Adjacent wetlands	0.26132342	-149.177443	60.94157642	-149.1774658	60.94157819
W-52	PEM2F	Slope HGM	Adjacent wetlands	0.148901236	-149.1787294	60.94213471	-149.1787523	60.94213648
W-53	PSS1B	Slope HGM	Adjacent wetlands	0.121576788	-149.1665511	60.9387287	-149.166574	60.93873047
W-54	PSS1B	Slope HGM	Adjacent wetlands	0.129195943	-149.1677878	60.93933189	-149.1678107	60.93933367
W-55	PSS1B	Slope HGM	Adjacent wetlands	0.474395084	-149.1717928	60.94318229	-149.1718157	60.94318406
W-56	PSS1C	Riverine HGM	Adjacent wetlands	0.030239513	-149.1665539	60.93899396	-149.1665768	60.93899573
W-57	PSS1E	Slope HGM	Adjacent wetlands	0.052897236	-149.1663659	60.93879389	-149.1663887	60.93879567
W-57	PSS1E	Slope HGM	Adjacent wetlands	0.01102431	-149.1659942	60.93901299	-149.166017	60.93901477
W-57	PSS1E	Slope HGM	Adjacent wetlands	0.344963661	-149.1657706	60.93879267	-149.1657935	60.93879445
W-58	PSS1E	Slope HGM	Adjacent wetlands	0.939917323	-149.1732877	60.94140171	-149.1733106	60.94140348
W-59	PSS1E	Slope HGM	Adjacent wetlands	2.443704456	-149.1777316	60.94188264	-149.1777544	60.94188441
W-60	PSS1E	Slope HGM	Adjacent wetlands	0.325912901	-149.1713438	60.94183876	-149.1713667	60.94184053
W-60	PSS1E	Slope HGM	Adjacent wetlands	0.413132074	-149.1706801	60.94257538	-149.170703	60.94257716
W-61	PSS1E	Slope HGM	Adjacent wetlands	1.237983561	-149.1725999	60.94222314	-149.1726228	60.94222491
W-62	PUBH	Depressional HGM	Ponds	0.31976517	-149.1616273	60.93724232	-149.1616502	60.9372441
W-63	PUBH	Depressional HGM	Ponds	0.785929834	-149.163841	60.93812069	-149.1638639	60.93812247
W-64	E2USMx	Estuarine Fringe HGM	Ponds	0.473783209	-149.1630682	60.93726666	-149.1630911	60.93726844
W-65	E2USMx	Estuarine Fringe HGM	Ponds	0.38986518	-149.1758068	60.94073947	-149.1758296	60.94074124
W-66	E2USMx	Estuarine Fringe HGM	Ponds	0.040123203	-149.18136	60.94221946	-149.1813829	60.94222123
W-67	E2USMx	Estuarine Fringe HGM	Ponds	0.074569892	-149.1828905	60.94261738	-149.1829134	60.94261915
W-68	R1UBV	Riverine HGM	Navigable water	1.318806061	-149.1676496	60.93852883	-149.1676724	60.93853061
W-69	R1USQ	Riverine HGM	Navigable water	0.321752018	-149.1679673	60.93816672	-149.1679902	60.9381685
W-70	R1USQ	Riverine HGM	Navigable water	0.804996198	-149.1690311	60.93800023	-149.1690539	60.938002
W-71	R1USQ	Riverine HGM	Navigable water	0.016506631	-149.1674522	60.93863047	-149.167475	60.93863225
W-72	R1USQ	Riverine HGM	Navigable water	0.05335701	-149.16707	60.93887189	-149.1670929	60.93887367
W-73	PEM1F	Lacustrine Fringe HGM	Adjacent wetlands	0.159293894	-149.1632315	60.93817348	-149.1632544	60.93817526
W-74	PEM1Fx	Riverine HGM	Adjacent wetlands	0.089251787	-149.1697942	60.93971516	-149.1698171	60.93971693