WETLAND DELINEATION AND FUNCTIONAL ASSESSMENT

JUNEAU DOUGLAS NORTH CROSSING PEL STUDY

- **February 2024**

DOWL No: 1138.63234.01 **State No: SFHWY00299** **Federal No: 0003259**

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Wetland Delineation and Functional Assessment

Program No: SFHWY00299
Federal No: 0003259

Prepared for:

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ACRONYMS AND ABBREVIATIONS

ADF&G ..... Alaska Department of Fish and Game
APT ..... Antecedent Precipitation Tool
DOT&PF ..... Department of Transportation & Public Facilities
FAC ..... Facultative
FACU ..... Facultative Upland
FACW ..... Facultative Wetland
GIS ..... Geographic information system
HTL ..... high tide line
HUC ..... Hydrologic unit codes
in ..... inches
MHW ..... Mean High Water
mm ..... millimeters
MWGSR ..... Mendenhall Wetlands Game State Refuge
NWI ..... National Wetlands Inventory
NRCS ..... National Resource Conservation Service
OBL ..... Obligate
PEL ..... Planning and Environmental Linkage
PP ..... Photo point
SP ..... Sample Point
USACE ..... United States Army Corps of Engineers
USGS ..... U.S. Geological Survey
WESPAK-SE ..... Wetland Ecosystem Services Protocol for Southeast Alaska
WOTUS ..... Waters of the United States

1.0 INTRODUCTION

The City and Borough of Juneau has partnered with Alaska Department of Transportation and Public Facilities (DOT&PF) to explore a north crossing between Juneau and Douglas Island, north of the existing Douglas Island Bridge. DOT&PF has chosen the Planning and Environmental Linkage (PEL) process to evaluate the purpose and need for a north crossing, identify potential north crossing alternatives, evaluate the alternatives, and identify recommended crossing(s). In support of the evaluation of alternatives environmental data is being collected to understand potential impacts of six proposed alternatives. One study being undertaken to collect current data on proposed alternatives is a wetland delineation.

The approximate 695.5 study area includes the tidally influenced Gastineau Channel between Douglas Island and mainland Juneau, Alaska. The Mendenhall Wetlands State Game Refuge (MWSGR) is located between Juneau and Douglas from the Mendenhall Peninsula to approximately the intersection of Glacier Highway and Channel Drive. The beginning of the project is located 58.341963 North Latitude; -134.628022 West Longitude and the end of the project is located at 58.299292 North Latitude; -134.429609 West Longitude, Copper River Meridian, see Table 1 for Township, Range, Section (Appendix 1; Figure 1).

Table 1: Project Location within the Copper River Meridian

Township	Range	Sections
40 South	65 East	25, 26, 27, 34, 36
40 South	66 East	30, 31, 32, 33, 34
41 South	66 East	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, 17
41 South	67 East	4, 5, 6, 7, 8, 9, 10, 15, 16, 17, 21, 22, 23, 27

DOWL was contracted to conduct a Wetland Delineation and Function and Values assessment (forthcoming) to identify areas that may fall under the United States Army Corps of Engineers (USACE) jurisdiction per Section 404 of the Clean Water Act.

While this report is in support of a planning study, a future recommended alternative may impact jurisdictional Waters of the United States (WOTUS). The data herein is intended to provide a planning level analysis with sufficient information to determine regulatory jurisdiction of aquatic resources subject to Section 404 of the Clean Water Act, and to evaluate the hydrological connectivity of such resources to a traditional navigable waterway, territorial sea, or navigable interstate waterway.

1.1 Environmental Setting

1.1.1 Regional Characteristics

The study area spans between Juneau and Douglas Island, Alaska, which are within two different yet similar United States Department of Agriculture, Natural Resources Conservation Service (NRCS) defined *Major Land Resource Areas*. Juneau is located within the Alaska's

Pacific Coastal Mountains ecoregion, while Douglas Island is located within Alaska's Coastal Western Hemlock-Sitka Spruce Forest ecoregion (NRCS 2022).

The Alaska Pacific Coastal Mountains ecoregion has steep terrain with active glaciers in higher elevations and experiences heavy precipitation. Dwarf and low scrub species dominate the region as slopes are typically barren of vegetation while lower elevations near drainage systems consist of needleleaf forests and dense tickets of low scrub communities (Gallant 1995). The growing season spans from May 29th to September 27th (USACE 2007).

The Alaska Coastal Western Hemlock-Sitka Spruce Forest ecoregion has the mildest winter temperatures in Alaska and receives a large amount of precipitation. Much of the terrain (deep and narrow bays, steep valley walls, irregular coastlines, high sea-cliffs, etc.) resulted from intense glaciation. Surface water is present for extended periods, especially early in the growing season, but is absent towards the end of the growing season in most years. When surface water is absent, the water table is often near the land surface. The abundant precipitation, mild temperatures, and undulating terrain with steep slopes generally restrict the establishment of permafrost. Vegetation is a mixture of needle-leaved evergreen forests, tall-to-mid-level scrub-shrub swamps or peatlands, and saturated emergent bogs (Gallant 1995). The growing season extends from April 29th to September 28th (USACE 2007).

1.1.2 Study Area Characteristics

The study area is approximately 695.5 acres within six potential crossing alignments: Mendenhall Peninsula, Sunny Point West, Sunny Point East, Vanderbilt, Twin Lakes, and Salmon Creek. The study area crosses the MWGSR, expanding the Gastineau Channel separating Douglas Island from mainland Juneau. The majority of the six alignments are within the Salmon Creek-Frontal Gastineau Channel 12-digit Hydrologic Unit watershed (U.S. Geological Survey [USGS] 2023). The southern portion of Mendenhall Peninsula is within Fritz Cove-Frontal Lynn Canal 12-digit Hydrologic Unit watershed (USGS 2023). The western end of Egan Drive crossing Lemon Creek is within Lemon Creek 12-digit Hydrologic Unit watershed (USGS 2023).

The study area has several mapped anadromous stream crossings, depositing freshwater to the Gastineau Channel (Alaska Department of Fish & Game [ADF&G] 2023a). The elevations within the study area range from sea level to 375 feet above sea level. The MWSGR is a large game refuge managed by ADF&G, approximately 4,000 acres and extending approximately nine miles along the shores of the Gastineau Channel, from Salmon Creek to the eastern side of the Mendenhall Peninsula. The airport was constructed in the 1930's and islands within the refuge were formed when the channel was dredged in the 1950's (ADF&G 2023b). The study area was once entirely glaciated which still has a strong influence as silt is deposited from several streams into the Gastineau Channel from the Mendenhall Glacier, Thomas Glacier, and Lemon Glacier. Isostatic rebound is causing the land to rise therefore some wetlands to dry as groundwater moves near the surface.

Federal and state definitions of navigable waters differ. Federal jurisdiction applies to waters subject to the ebb and flow of the tide, and/or are used or have been used for interstate or foreign commerce. State jurisdiction applies to tidally influenced areas and rivers/streams used for commerce or travel. The USACE has jurisdiction for structures constructed in or over navigable WOTUS. Navigable WOTUS are areas below the mean high water (MHW) influenced by the ebb and flow of the tide. Wetlands within the study area include the submerged and

intertidal regions dictated by the ebb and flow of the tides. The high tide line (HTL) for Juneau is 20.6 feet and the MHW is 15.6 feet (DOWL 2022b).

1.2 Precipitation and Climatic Data

The USACE Antecedent Precipitation Tool (APT) was used to evaluate climatic conditions prior to fieldwork. The APT uses global historical climatology network weather stations. The APT accumulates the daily precipitation values over a 30-day period and compares to historic normal range of precipitation to determine if surface hydrology or soil moisture conditions observed are normal, drier than normal, or wetter than normal (USACE 2023). The Coastal Western Hemlock-Sitka Spruce Forest and Pacific Coastal Mountains ecoregions have the mildest winters in the State and receives the most precipitation. The Coastal Western Hemlock-Sitka Spruce Forest approximate mean precipitation is from 1,350 millimeters (mm) (53 inches) to 3,900 mm (153.5 inches) while the Coastal Pacific Mountain receives approximately 2,030 mm (80 inches) to 7,000 mm (575.5 inches) (Gallant et al 1995).

The APT (2023) reported general conditions based on data from the following weather stations:

- Auke Bay
- Juneau 3.0 NW
- Juneau 2.8 NW
- Juneau Forecast Office
- Juneau Airport

Based on the APT, Juneau reported normal conditions for fieldwork conducted on September 18th followed with drier than normal conditions from September 19th through 20th (Appendix 5, Figure 1 and 2). Wetter than normal conditions were reported from September 21st through 22nd (Appendix 5, Figure 3). Douglas Island reported normal conditions from September 18th through 19th (Appendix 5, Figure 4). Wetter than normal conditions were reported from September 20th through 22nd (Appendix 5, Figure 5). During the four field days, Juneau Airport reported approximately 4.33 inches of precipitation. The Juneau area received approximately 13.64 inches of precipitation during the month of September, which exceeds 10.42 inches (threshold for 30 percent chance precipitation is more than for September) (Utah Climate Center 2023).

Observed surface water reflected normal conditions. The week preceding fieldwork Juneau Airport reported 6.03 inches of precipitation and additional precipitation occurred during fieldwork; precipitation exceeded September's monthly average. Areas of the project located where normal conditions were reported, surface and groundwater field observations were typical for this time of year. In areas of the project where wetter than normal conditions were reported, surface and groundwater field observations may be present in uplands as well as marginal wetlands with saturated soils, areas of inundations (surface water), or high groundwater table.

2.0 METHODS

2.1 Existing Data and Preparatory Analysis

The following sources were reviewed for the study area:

- USGS Juneau B-2 SW and SE Quadrangle
- USGS National Hydrography Dataset (2023)
- Aerial imagery (2023)
- Federal Emergency Management Agency Flood Insurance Rate Maps
- ADF&G Alaska Fish Resource Monitor (2023a)
- NRCS Web Soil Survey (NRCS 2021) (Appendix 1, Figure Set 2.1 to 2.7)
    - The NRCS has mapped approximately 309 acres of saline water and 22.2 acres of water within the study area while the remaining 363.9 acres have no digital data available (NRCS 2023).
- City and Borough of Juneau Wetlands Management Plan (2016)
- Geographic Information System (GIS) Mapping for Mendenhall Wetland State Game Refuge (Carstensen 2004)
- Juneau Douglas North Crossing PEL Study Wetlands and Waterways Data Summary (DOWL 2022).
- U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) (USFWS 2023). The NWI has mapped a total of 355.92 acres (51.18 percent) of wetlands within the study area (Appendix 1, Figure Set 3.1 to 3.7).

Table 2: National Wetlands Inventory Mapped Wetlands and Waters of the U.S.

Jurisdictional Type	Habitat Classification	Acres
Wetlands	Palustrine Emergent	31.5
	Palustrine Scrub-shrub	2.4
	Palustrine Forested	19.7
Waters of the U.S.	Estuarine Subtidal	54.4
	Estuarine Intertidal	250.8
	Lacustrine Limnetic	0.7
	Riverine	2.4
Uplands	Non-Labeled Areas	
Total Study Area		**355.92 acres**

2.2 Field Data Collection

2.2.1 Wetland Delineation Methods

DOWL Environmental Specialists Adam Morrill, PWS and Emily Anderson conducted the wetland delineation fieldwork on September 19th to September 22nd, 2023 in accordance with *Part IV of the Corps of Engineers Wetlands Delineation Manual* (USACE 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region [Version 2.0,* (USACE 2007)*]*.

Wetlands were classified and grouped according to guidelines outlined in the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979). Sampling locations were selected to verify the preliminary mapping of proposed paired point locations. Data was collected using the three-parameter approach combining site-specific indicators of hydrophytic vegetation, hydric soils, and wetland hydrology. Field notes were taken to document landscape topography, stream crossings, and general site characteristics. Additionally, photo points were taken to document site conditions, confirm dominant plant species, extrapolate data to similar habitat areas, or to make a wetland/upland determination when soil excavation was not necessary. A Special Area permit was submitted to the ADF&G on September 1, 2023, to conduct ground disturbing activities within the Refuge (i.e., test holes). The agency determined a permit was unnecessary for data collection to conduct the wetland delineation. MWSGR access points were used to enter the Refuge for field surveys.

At each sampling location, soil pits were excavated to a depth of at least 24 inches, or to the presence of a restrictive digging layer. Soil and hydrology characteristics of texture, color, saturation, and depth to water table were recorded on USACE Routine Wetland Determination forms (Appendix 2). Soil color was recorded using *Munsell Soil-Color Charts* (Munsell Color 2012). In the event soil excavation was not necessary to make a wetland/upland determination, a photographic point was taken. Data collected at test holes are prefixed with ‘SP.’ Photo point locations are prefixed with ‘PP.’ Wetland SPs were used to identify the HTL in the field, and aerial interpretation along with few PP to document tidally influenced wetlands.

A Global Positioning System unit with 30-foot accuracy was used to pinpoint sample locations and photo point locations for GIS mapping reference using ESRI FieldMaps while ArcGIS Pro was used to calculate acreages. Final mapping was based on a combination of professional interpretation of aerial and site photos, topographic data, and field observations.

3.0 RESULTS

3.1 Data Summary

The 695.5-acre study area is comprised of approximately 29.3 acres (4.2 percent of the study area) of potentially jurisdictional wetlands and 346.4 acres of WOTUS (49.8 percent of the study area), and 319.8 acres of non-jurisdictional uplands (46 percent of the study area). Table 2 summarizes the results by Cowardin classification and all data sheets are included in Appendix 2 while the photo log is included in Appendix 3.

The following tables and sections describe vegetation, soils, and hydrology observations.

Table 3: Project Location, Wetlands, Waters of the U.S., and Uplands

Proposed Alignment	Habitat Type	Cowardin Classification	Acres	Data Points
Mendenhall Peninsula	Wetland	Palustrine Scrub-Shrub	1.02	SP-7, 8
		Palustrine Forested	11.14	SP-1
	Waters of the U.S.	Estuarine Subtidal	16.17	PP-16
		Estuarine Intertidal	16.18	PP-17, 18, 52
		Marine	35.28	PP-24
		Riverine	0.28	PP-14, 57, 64
	Uplands	N/A	142.35	SP-2-6, 9-11, PP-22, 23 PP-1-15, 19-21, 53, 54, 56, 58-63
Sunny Point East and West	Wetland	Palustrine Emergent	6.95	PP-42
		Palustrine Scrub-Shrub	5.83	SP-15
		Palustrine Forested	0.54	N/A
	Waters of the U.S.	Estuarine Intertidal	86.46	SP-12 PP-27, 44-46
		Riverine	0.8	PP-33
	Uplands	N/A	78.13	SP-13, 14 PP-28-32, 34-36, 43, 47
Vanderbilt, Twin Lakes, and Salmon Creek	Wetland	Palustrine Emergent	2.0	N/A
		Palustrine Scrub-Shrub	1.26	PP-48
		Palustrine Forested	0.17	N/A
		Palustrine Unconsolidated Bottom	0.04	N/A
	Waters of the U.S.	Estuarine Subtidal	31.14	PP-49-51
		Estuarine Intertidal	126.35	PP-25, 26, 37, 38, 50
		Lacustrine Limnetic	27.11	PP-41
		Lacustrine Littoral	0.67	PP-48
		Riverine	5.91	PP-39
	Uplands	N/A	99.28	PP-40,41, 51

Total Wetlands within Project Locations: 695.5

Notes:
N/A – Not Applicable

Table 4: Summary of Wetland Determination Form Data

ID	Hydrophytic Vegetation Present	Hydric Soils Present	Wetland Hydrology Present	Cowardin Type
SP-1	Yes	Yes	Yes	PFO4/SS1B
SP-2	No	No	Yes	Upland
SP-3	Yes	No	Yes	Upland
SP-4	Yes	No	No	Upland
SP-5	No	No	Yes	Upland
SP-6	No	No	No	Upland
SP-7	Yes	Yes	Yes	PSS1/EM1C
SP-8	Yes	Yes	Yes	PSS4/EM1B
SP-9	No	Yes	No	Upland
SP-10	No	Yes	Yes	Upland
SP-11	No	Yes	No	Upland
SP-12	Yes	Yes	Yes	E2EM1N
SP-13	No	No	No	Upland
SP-14	No	Yes	Yes	Upland
SP-15	Yes	Yes	Yes	PSS4/EM1B

Notes: Antecedent precipitation wetter than normal, so upland areas may observe positive wetland hydrology indicators.
E2EM1N: Estuarine intertidal emergent persistent regularly flooded.
PFO4/SS1B: Palustrine forested needle-leaved evergreen/scrub-shrub broad-leaved deciduous saturated
PSS1/EM1C: Palustrine scrub-shrub broad-leaved/emergent persistent seasonally flooded
PSS4/EM1B: Palustrine scrub-shrub needle-leaved/emergent persistent saturated

3.2 Hydrophytic Vegetation, Hydric Soils, and Hydrology

3.2.1 Vegetation

Hydrophytic vegetation was present in seven of fifteen test hole locations. All identified species and indicator status are shown by dominance test and/or prevalence on each data sheet in Appendix 2. The following dominant species were present (USACE 2020).

Table 5: Dominant Plant Species within the Study Area

Scientific Name	Indicator Status	Common Name
Alnus viridis	FAC	Sitka Alder
Andromeda polifolia	FACW	Bog-Rosemary
Athyrium cyclosorum	FAC	Western Lady Fern
Carex livida	OBL	Livid Sedge
Carex lyngbyei	OBL	Lyngbye's Sedge
Carex pauciflora	OBL	Few-Flower Sedge
Cornus canadensis	FAC	Canadian Bunchberry
Deschampsia caespitosa	FAC	Tufted Hair Grass
Dryopteris expansa	FACU	Spreading Wood Fern
Equisetum pratense	FACW	Meadow Horsetail
Gymnocarpium dryopteris	FACU	Northern Oak Fern
Lysichiton americanus	OBL	Yellow-Skunk-Cabbage
Menziesia ferruginea	FACU	Fool's-Huckleberry
Picea sitchensis	FACU	Sitka Spruce
Pinus contorta	FAC	Lodgepole Pine
Potentilla anserina	FACW	Silverweed
Rhododendron tomentosum	FACW	Marsh Labrador-Tea
Rubus idaeus	FACU	Common Red Raspberry
Rubus pedatus	FAC	Strawberry-Leaf Raspberry
Sambucus racemosa	FACU	Red Elder
Tsuga heterophylla	FAC	Western Hemlock
Tsuga mertensiana	FAC	Mountain Hemlock
Vaccinium ovalifoloim	FAC	Oval-Leaf Blueberry

Notes: FAC = Facultative; FACU = Facultative Upland; FACW = Facultative Wetland; OBL = Obligate

3.2.2 Soils

Soils observed within the study area had anywhere from one to twenty-four inches of organic layer. During the four field days, Juneau Airport reported approximately 4.33 inches of precipitation. Table 5 describes observations made in the field.

Table 6: Soil Observations at Full Sample Point within the Study Area

ID	Organic Mat Thickness (inches)	Mineral Soil below Organic Layer	Saturated Organics	Hydric
SP-1	18	Loamy Clay	Yes	Yes
SP-2	2	Sandy Loam	No	No
SP-3	7	Sandy	No	No
SP-4	3	Loamy Clay	No	No
SP-5	1	Loamy Clay	No	No
SP-6	10	Loamy Clay	Yes	No
SP-7	24	None (Peat)	Yes	Yes
SP-8	25	None (Peat)	Yes	Yes
SP-9	24	None (Peat)	Yes	Yes
SP-10	10	Loamy Clay	No	Yes
SP-11	24	None (Peat)	Yes	Yes
SP-12	5	Sandy Loam	No	Yes
SP-13	9	Sandy Loam	No	No
SP-14	24	None (Peat)	Yes	Yes
SP-15	24	None (Peat)	Yes	Yes

Hydric soils were observed at nine out of the fifteen sample points. Over half of the sample points had Histolsol or a Histic Epipedon. Histolsol were the dominant hydric soil type and were observed at seven out of the fifteen sample points. The other hydric soils had either a histic epipedon or Alaska Redox.

3.2.3 Hydrology

Wetland hydrology was present at ten of the fifteen sample points. Due to the antecedent precipitation being wetter than normal it is anticipated positive wetland hydrologic indicators may be present in non-wetland areas. Of the ten test holes with positive wetland hydrologic indicators present, eight exhibited both primary hydrologic indicators of high-water table and saturation.

Wetter than normal climatic conditions with approximately 4.33 inches of precipitation falling during field survey. High water table was observed at five of the fifteen sample points, with groundwater depths between two to nine inches below the ground surface. Soil saturation was observed at nine of the fifteen sample points, with saturation depths between zero and twelve inches below the surface (See Appendix 2). Four of the nine sample points with saturated soils non-hydrophytic vegetation and/or non-hydric soils, positive hydrology observation at these locations is likely due to wetter than normal antecedent precipitation conditions.

Hydrology within estuarine habitats is influenced by tidal fluctuations, with areas either regularly or irregularly flooded or exposed. MHW and HTL data (USACE 2017) were used to determine water regime modifiers. Tidal areas above the MHW were considered *irregularly flooded* and below either *regularly flooded or irregularly exposed*.

3.3 Wetlands

Wetlands consist of areas meeting hydrophytic vegetation, hydric soils, and positive (i.e., primary and/or secondary indicators) wetland hydrology.

The study area spans Gastineau Channel, connecting Juneau area with Douglas Island. The HTL was used to demarcate the extent of estuarine and palustrine habitats. The study area above HTL (20.6 feet in elevation) typically rises quickly from the tidal flats into steep (i.e., 10 to 30 percent) slopes into upland areas (as high as 375 feet in elevation). Areas with zero to five percent slopes and near the toe of steep slopes contain wetlands or have developed bed and bank (i.e., stream) to convey surface water to Gastineau Channel.

3.3.1 Palustrine Emergent Wetland

Palustrine emergent persistent are depressional wetlands associated with nearly flat low areas located above the HTL within the study area. Palustrine emergent wetlands within the study area have a robust herbaceous layer typically over 30 percent aerial cover dominated by grasses and sedges.

Photo Set 1: Typical Palustrine Emergent Wetlands in the Study Area (SP-41, PP-47)

3.3.2 Palustrine Scrub-Shrub Wetland

Photo Set 2: Typical Scrub-shrub Wetlands in the Study Area (SP-8, SP-11)

Palustrine scrub-shrub habitats typically consist of wetlands with less than 30 percent tree cover with a robust shrub and herbaceous stratum typically over 30 percent. Scrub-shrub habitats within the study area are typically dominated by stunted Sitka Spruce *(Picea sitchensis)*, Western Hemlock *(Tsuga heterophylla)*, Fool's-Huckleberry *(Menziesia ferruginea)*, and Oval-leaf Blueberry *(Vaccinium ovalifoloim)* or by stunted Lodgepole Pine (*Pinus contorta*). Soils in this habitat consisted of Histosols and had persistent soil saturation.

3.3.3 Palustrine Forested Wetland

Palustrine forested needle-leaved evergreen with broad-leaved scrub-shrub understory habitats are located in flat areas at the toe of slope typically within the forested Mendenhall Peninsula and outside of the tidally influenced areas of the Gastineau Channel. Hydrology of these wetlands consist of seasonally saturated soils. Vegetation is dominated by Sitka Spruce *(Picea sitchensis)* and Western Hemlock *(Tsuga heterophylla)*.

Photo Set 3: Typical Forested Wetlands in the Study Area (SP-1)

3.4 Waters of the U.S.

WOTUS were identified by ordinary high-water mark through “physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris…” (33 CFR 328.3). WOTUS located in the Study Area consist of upper perennial and lower perennial streams, and tidally influenced areas below the HTL. WOTUS consist of estuarine, lacustrine, riverine, and marine habitats.

3.4.1 Estuarine

Estuarine habitats are typically deep-water habitats partially enclosed by land with freshwater inputs such as the Mendenhall River and other stream tributaries. Estuarine habitats are mapped as wetlands in areas below the HTL. Ocean water is occasionally diluted with fresh water such as from Mendenhall River and other freshwater streams terminating within the Gastineau Channel. The study area’s water regime which influences the estuarine is dominantly through the varying tidal levels with mean range of tide of 13.74 feet and highest astronomical tide of 20.65 feet (NOAA 2024).

Intertidal estuarine is the dominant subsystem in the study area as the substrate is irregularly flooded by the tide. Much of this habitat above MHW is dominated by herbaceous vegetation and has visible flow patterns (i.e., grasses laying down in direction of surface flow).

Photo Set 4: Typical Estuarine Intertidal Irregularly Flooded Wetlands in the Study Area (SP-12, PP-52)

Intertidal estuarine which are regularly flooded or irregularly exposed during tide cycle typically are unvegetated mudflats or rocky shorelines and are located below MHW.

Photo Set 5: Typical Estuarine Intertidal Irregularly Flooded or Exposed Wetlands in the Study Area (PP-16, PP-37)

Subtidal estuarine are permanently flooded areas at low tide.

Photo Set 6: Typical Estuarine Subtidal Wetlands in the Study Area (PP-37, PP-52)

3.4.2 Lacustrine

Lacustrine habitats are associated with a lake or other body of freshwater greater than 20 acres in size which is permanently flooded. The only lacustrine habitat encountered within the study area are Twin Lakes.

Photo Set 7: Typical Lacustrine Habitat in the Study Area (PP-41)

3.4.3 Riverine

Riverine habitats are associated with flowing water and mapped as waterways. Riverine habitats occur within tidally influenced environments and in localized channels which convey water off slopes. Streams which maintain bed and bank characteristics at low tide but are submerged at high tide are labeled R1. These streams were mapped starting at the HTL and end at subtidal estuarine or marine habitats. Streams with low slope, perennial flow, and

unconsolidated bottoms were labeled R2, extending from the HTL upstream. Intermittent steams consist of areas exhibiting bed and bank but lack perennial flow. These streams are labeled R4 and were identified by culverts, topography, and aerial interpretation.

Photo Set 8: Typical Riverine Habitat in the Study Area (R1: PP-39, R2: PP-34)

3.4.4 Marine

Marine habitats are exposed to the waves and currents of the open ocean. Marine habitats in the study area include subtidal deep-water habitats of Fritz Cove.

Photo Set 9: Typical Marine Habitat in the Study Area (PP-52 and a photo taken near North Douglas Boat Launch)

3.5 Uplands

Upland habitats within the study area are classified as areas lacking hydrophytic vegetation, hydric soils, and/or wetland hydrologic indicators. Upland habitats also consist of disturbed/built environment (i.e., roadways and built infrastructure). Vegetation in upland habitats is dominated by Western Hemlock *(Tsuga heterophylla)* and Sitka Spruce *(Picea sitchensis)* with an understory of Fool's Huckleberry *(Menziesia ferruginea)*, Oval-leaf Blueberry *(Vaccinium ovalifoloim)*, and Western Lady Fern *(Athyrium cyclosorum)*. Upland habitats within roadway embankments are dominated by Bluejoint *(Calamagrostis canadensis)*, Cow Parsnip *(Heracleum maximum)*, Narrow-Leaf Fireweed *(Chamaenerion angustifolium)*, and Sitka Alder *(Alnus viridis)*. Soils consist of an organic layer typically between two and ten inches and are underlain by sandy loam or loamy mineral soil. This habitat typically lacked primary wetland hydrologic indicators. However, due to the heavy amount of precipitation within the week preceding fieldwork some areas were observed with pockets of surface inundation or saturated soils. Areas with primary wetland hydrologic indicators typically lacked hydrophytic vegetation and hydric soils.

Photo Set 10: Typical Upland Habitats in the Study Area, (SP-5, SP-6)

4.0 DISCUSSION

The study area mainly consists of areas influenced by the tide (approximately 360 acres) and extends typically 160 feet above HTL, except for on Mendenhall Peninsula where elevations extend up to 375 feet. Steep slopes typically end near Egan Drive or Douglas Highway, where the land flattens out into the tidal flats.

Palustrine wetland habitats within the study area typically connect into a perennial stream and flow into Gastineau Channel or Fritz Cove. There are two wetlands on Mendenhall Peninsula located south of Engineers Cutoff Road which appear to not be connected to a perennial stream and potentially are isolated, totaling approximately 1.4 acres.

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