EXECUTIVE SUMMARY

The State of Alaska Department of Transportation and Public Facilities in cooperation with the Federal Highway Administration are proposing improvements on the Seward Highway along Turnagain Arm in the Municipality of Anchorage. The 741-acre study area is located on the Seward Highway, from the communities of Bird to Indian, and at MP 99 to MP 105. This report describes the classification and mapping of wetlands, an assessment of wetland habitat functions and values, and an assessment of wildlife habitat within the study area.

The results of the mapping include the following:

- 1.2 percent of the study area is classified as palustrine wetlands;
- Nearly 60 percent of the study area is composed of the intertidal mudflats of Turnagain Arm;
- The highway and other developed areas comprise 17 percent of the study area; and
- Upland habitat, not including developed or disturbed areas, such as broadleaf forest comprises 23 percent of the study area.

The wet sedge meadow is the most common palustrine wetland habitat in the study area and broadleaf forest is the most common upland habitat. Of the 12 acres classified as palustrine wetlands, none were of low value and 8.3 acres were ranked as having high value.

Waters of the United States comprised the largest percentage of the study area (59.1 percent), which includes the intertidal mudflats of Turnagain Arm, Bird and Indian Creek, four perennial streams and several intermittent drainages.

1.0 INTRODUCTION

The State of Alaska Department of Transportation and Public Facilities (DOT&PF) in cooperation with the Federal Highway Administration (FHWA), is proposing improvements on the Seward Highway along Turnagain Arm in the Municipality of Anchorage. This report describes the classification and mapping of wetlands using aerial photography, a field survey verifying wetland and upland boundaries, functional assessments of each wetland type, mapping vegetation and habitats, and an evaluation of values for selected wildlife species of the study area.

1.1 Project Location

This project is located on the Seward Highway, from the communities of Bird to Indian, and at MP 99 to MP 105. The approximate location is 60°58'38" North Latitude and 149°28'57" West Longitude (Sections 5, 6, 8, 9, 10 and 15, T10N, R01W, Seward Meridian) (United States Geological Survey Quadrangle Seward D-7 NW) (Refer to Figure 1, Appendix B).

1.2 Project Description

This proposed project is currently in the Preliminary Design and Environmental phase of development. The primary purpose of this project is to upgrade the highway to current design standards and to enhance the safety for motorized and non-motorized users.

2.0 BACKGROUND INFORMATION

The study area is situated within the Turnagain Arm ecoregion, at the northern terminus of the coastal temperate rainforest system.

2.1 Biological Resources in the Project Area

Since the study area contains anadromous waterways, a variety of wetland habitats, and intertidal areas, the area supports wildlife such as moose, black bears, beavers, and muskrats (Nowacki et al 2000).

2.1.1 Vegetation

The study area is in a zone characterized by both the interior boreal forest and the coastal temperate rain forest bioregions. Diverse vegetation and habitat types mark the zone where

these two bioregions meet, including mixed forests of conifers and deciduous trees, marshy bogs of emergent and herbaceous vegetation, and alpine tundra communities of mosses, lichens, and wildflowers. Some bogs are rich in mosses, grasses, and sedges. Shorelines in the study area are narrow and sea cliffs and rocky shores are common. Between the beach and forest lies a dense zone of shrubs, where alder (*Alnus Crispa*) and devils club (*Oplopanax horridus*) is common.

Forests in the study area are typically composed of balsam poplar (*Populus balsamifera*), paper birch (*Betula papyrifera*), and white (*Picea glauca*) or Sitka spruce (*Picea Sitcensis*). Common tall shrubs in forests include alder and elderberry (*Sambucus racemosa*), with low shrubs such as Labrador tea (*Ledum groenlandicum*), squashberry (*Viburnum edule*), red currant (Ribes triste), and prickly rose (*Rosa acicularis)*. Smaller herbaceous species include bunchberry (*Cornus canadensis*), horsetail (*Equisetum ssp*.), and bedstraw (*Gallium ssp*.).

Bogs in the study area are characterized by both dwarf shrubs, including dwarf birch (*Betula nana*) and black spruce (*Picea mariana*) and herbaceous species such as bluejoint (*Calamagrostis canadensis*) and various sedges (*Carex ssp*.). For a list of all plant species observed in the project area, refer to Table 1.

Table 1: Plant Species Observed in Project Area

Scientific Name	Common Name	Indicator
Achillea millefolium	Yarrow, Common	FACULTATIVE UPLAND
Aconitum delphinifolium	Monkshood, Larkspur-Leaf	FACULTATIVE
Actaea rubra	Baneberry, Red	NO INDICATOR
Alnus crispa	Alder, Green	FACULTATIVE
Andromeda polifolia	Rosemary, Bog	OBLIGATE WETLAND
Angelica lucida	Angelica, Seawatch	FACULTATIVE UPLAND
Athyrium distentifolium	Fern, Alpine Lady	FACULTATIVE
Athyrium filix-femina	Fern, Subarctic Lady	FACULTATIVE
Betula nana	Birch, Swamp	FACULTATIVE
Betula papyrifera	Birch, Paper	FACULTATIVE UPLAND
Calamagrostis canadensis	Reedgrass, Blue-Joint	FACULTATIVE
Calamagrostis purpurascens	Reedgrass, Purple	NO INDICATOR
Carex aquatilis	Sedge, Water	OBLIGATE WETLAND
Carex canescens	Sedge, Hoary	OBLIGATE WETLAND
Carex lyngbyei	Sedge, Lyngbye's	OBLIGATE WETLAND
Carex microchaeta	Sedge, Small-Awned	FACULTATIVE UPLAND
Chamaedaphne calyculata	Leatherleaf	FACULTATIVE WETLAND

Table 1: Plant Species Observed in Project Area (con't)

Scientific Name	Common Name	Indicator
Chamerion angustifolium	Fireweed	FACULTATIVE UPLAND
Cicuta mackenziana	Water-Hemlock, Mackenzie	OBLIGATE WETLAND
Cornus canadensis	Bunchberry, Canada	FACULTATIVE UPLAND
Empetrum nigrum	Crowberry, Black	FACULTATIVE
Equisetum arvense	Horsetail, Field	FACULTATIVE UPLAND
Equisetum fluviatile	Horsetail, Water	OBLIGATE WETLAND
Equisetum hyemale	Horsetail, Rough	FACULTATIVE WETLAND
Equisetum pratense	Horsetail, Meadow	FACULTATIVE WETLAND
Equisetum sylvaticum	Horsetail, Woodland	FACULTATIVE UPLAND
Eriophorum angustifolium	Cotton-Grass, Narrow-Leaf	OBLIGATE WETLAND
Eriophorum vaginatum	Cotton-Grass, Tussock	FACULTATIVE WETLAND
Galeopsis tetrahit	Nettle, Hemp	NO INDICATOR
Galium boreale	Bedstraw, Northern	FACULTATIVE UPLAND
Galium triflorum	Bedstraw, Sweet-Scent	FACULTATIVE UPLAND
Geocaulon lividum	Toadflax, Northern Red-Fruit	FACULTATIVE UPLAND
Gymnocarpium dryopteris	Fern, Oak	FACULTATIVE UPLAND
Heracleum lanatum	Cow-Parsnip	FACULTATIVE UPLAND
Ledum decumbens	Labrador-Tea, Narrow-Leaf	FACULTATIVE WETLAND
Ledum groenlandicum	Labrador-Tea, Greenland	FACULTATIVE WETLAND
Lycopodium annotinum	Clubmoss, Stiff	FACULTATIVE
Menyanthes trifoliata	Buckbean	OBLIGATE WETLAND
Menziesia ferruginea	Mock-Azalea	UPLAND
Myrica gale	Sweetgale	OBLIGATE WETLAND
Oplopanax horridus	Devil's-Club	FACULTATIVE UPLAND
Osmorhiza purpurea	Sweetcicely, Purple	FACULTATIVE UPLAND
Parnassia palustris	Grass-Of-Parnassus, Northern	FACULTATIVE WETLAND
Picea glauca	Spruce, White	FACULTATIVE UPLAND
Picea mariana	Spruce, Black	FACULTATIVE WETLAND
Picea sitchensis	Spruce, Sitka	FACULTATIVE UPLAND
Populus balsamifera	Poplar, Balsam	FACULTATIVE UPLAND
Potentilla anserina	Silverweed	FACULTATIVE WETLAND
Potentilla fruticosa	Cinquefoil, Shrubby	FACULTATIVE
Pteridium aquilinum	Fern, Bracken	FACULTATIVE UPLAND
Rhinanthus arcticus	Yellow-Rattle, Arctic	FACULTATIVE
Ribes triste	Currant, Swamp Red	FACULTATIVE
Rosa acicularis	Rose, Prickly	FACULTATIVE UPLAND
Rubus chamaemorus	Cloudberry	FACULTATIVE WETLAND
Rubus stellatus	Berry, Nagoon	FACULTATIVE
Rumex occidentalis	Dock, Western	OBLIGATE WETLAND
Salix commutata	Willow, Under-Green	FACULTATIVE
Salix monticola	Willow, Mountain	FACULTATIVE
Salix planifolia	Willow, Diamond-Leaf	FACULTATIVE WETLAND
Sambucus racemosa	Elder, European Red	FACULTATIVE UPLAND
Sorbus scopulina	Mountain-Ash, Greene's	NO INDICATOR
Spiraea beauverdiana	Spiraea, Beauvered	FACULTATIVE
Taraxacum officinale	Dandelion, Common	FACULTATIVE UPLAND

Table 1: Plant Species Observed in Project Area (con't)

Scientific Name	Common Name	Indicator
Trientalis arctica	Starflower, Arctic	FACULTATIVE
Trifolium pratense	Clover, Red	FACULTATIVE
Vaccinium cespitosum	Blueberry, Dwarf	FACULTATIVE WETLAND
Vaccinium oxycoccos	Cranberry, Small	OBLIGATE WETLAND
Vaccinium uliginosum	Blueberry, Bog	FACULTATIVE
Vaccinium vitis-idaea	Cranberry, Mountain	FACULTATIVE
Viburnum edule	Squashberry	FACULTATIVE UPLAND
Viola adunca	Violet, Hooked-Spur	FACULTATIVE
Viola palustris	Violet, Marsh	NO INDICATOR

OBLIGATE WETLAND - Found in wetlands >99% of the time
FACULTATIVE WETLAND - Found in wetlands 66 to 99% of the time
FACULTATIVE - Found in wetlands 33 to 66% of the time
FACULTATIVE UPLAND - Found in wetlands >33% of the time
UPLAND - Found in wetlands <1% of the time

2.1.2 Mammals

Although cliffs and rocky shores characterize the area, Bird and Indian creek both drain to intertidal mudflats in the study area, which may support muskrats *(Ondatra zibethicus*), beaver (*Castor canadensis*), otters (*Lutra lutra*), and mink (*Mustela vison*). Large mammals such as moose (*Alces alces*), lynx (*Felis lynx*), black (*Ursus americanus*) and brown bear (*Ursus arctus*), dall sheep (*Ovis dalli dalli*), and mountain goat (*Oreamnos americanus*) are common to the area.

The most numerous marine mammal commonly found to inhabit the Turnagain Arm area is the beluga whale (*Delphinapterus leucas*). Over the last 15 years, killer whales (*Orcinus orca*) and gray whales (*Eschrichtius robustus*) have been found to inhabit this area atypically.

2.1.3 Birds

The study area lies on a major migration route of Pacific Flyway birds during their seasonal transits between nesting areas in Alaska and their southern wintering areas. Potter's Marsh, a large protected wetland complex close to the study area, hosts a large number of waterfowl and other birds, including bald eagles (*Haliaeetus leucocephalus*), spruce grouse (*Falcipennis canadensis*), northern harriers (*Circus cyaneus*), greater yellowlegs (*Tringa melanoleuca*), lesser yellowlegs (*Tringa flavipes*), Arctic terns (*Sterna paradisaea*), savannah sparrow (*Passerculus sandwichensis*), pintails (*Anas acuta*), Canada geese (*Branta canadensis*), red-necked grebes (*Podiceps grisegena*), and Pacific loons (*Gavia pacifica*).

2.1.4 Fish

There are two known anadromous fish streams within the study area. Indian Creek (247-60-10290) located at mile point 103 supports Chinook (*Oncorhynchus tshawytscha*), coho (*Oncorhynchus kisutch*), and pink salmon (*Oncorhynchus gorbuscha*); and Bird Creek (247-60-10280) located at mile point 101.5 supports Chinook, coho, chum (*Oncorhynchus keta*), and pink salmon.

2.1.5 Amphibians

The wood frog (*Bufo boreas*) is the most widely distributed frog in Alaska and the only known amphibian in the world to live north of the Arctic Circle. It is presumed to be present in the study area.

2.2 Wetland Functions and Values

Wetland functions are the physical, chemical, and biological processes that take place within a wetland system. Wetland functions are considered valuable because they provide ecological, hydrological, and social benefits. However, different wetlands perform different functions and not all wetlands perform all the functions to the same degree.

2.2.1 Hydrology

Hydrology is the primary and critical driving force underlying the creation and maintenance of wetlands. Wetlands provide four basic hydrologic functions.

- Ground Water Discharge: Discharge is the portion of the drainage basin in which the net saturated flow of groundwater is directed away from the water table. Discharge creates and maintains wetlands, maintains stream flow, supports plant and animal populations, and provides water for multiple uses (Sather, 1984).

- Ground Water Recharge: Recharge is the portion of the drainage basin in which the net saturated flow of ground water is directed toward the water table. Recharge replenishes the local or regional ground water system or municipal use or may be discharged again to maintain other more or less valuable wetlands (Sather, 1984).

- Flow Regulation: Flow regulation occurs when wetlands interact with precipitation, surface runoff, and stream flow to modify the magnitude, timing, and duration of downstream flows. Permafrost, seasonal frost, and high water tables limit the storage capacities of these wetlands and change the runoff responses of associated watersheds (Post, 1996).

- Erosion Control: Wetlands control erosion by stabilizing soil surfaces or dissipating energy of waves and currents (Post, 1996).

2.2.2 Water Quality

Water quality functions remove sediments, nutrients, and anthropogenic contaminants from the water column, and serve as a dispersal mechanism of organic matter. Wetlands provide the following water quality functions.

- Nutrient Removal and Retention: The hydrophytic vegetation of wetlands assists in the removal of toxic substances and excess nutrients from surface waters. Settling and "filtering" by near-surface flow through organic material retains sediment in wetlands. The combination of peat barriers and depressions retains water and impedes rapid runoff (Post, 1996).

- Processing of chemical and organic materials: Wetland processes remove suspended and dissolved solids and nutrients from the surface and ground waters and convert them into plant or animal biomass and organic sediment. Mosses act as filters that intercept nutrient inputs to the forest floor due to their position above the root zone of vascular plants. In addition, mosses are nutrient sinks due to their rapid uptake of nutrients and their ability to retain them until the moss tissue decomposes (Post, 1996).

- Sediment/Toxicant Retention: Contaminants including heavy metals and organic compounds enter long-term sinks, reside for shorter periods in plant tissues or sediments, or degrade to less toxic forms via processes such as adsorption, precipitation, microbial metabolism, and plant uptake. These processes often reduce contaminant concentrations in wetland outflows (Post, 1996).

2.2.3 Ecology

All wetland functions are, in a holistic sense, ecologic functions because wetland ecosystems encompass all physical, chemical, and biological phenomena occurring within ecosystem boundaries (Post, 1996).

- Nutrient Cycling: Nutrients pass through both grazing and detrital food chains in the processes of primary and secondary production and decomposition and thus provide resources to fish and wildlife populations using wetlands and adjacent ecosystems (Post, 1996). In addition, wetlands are exporters of nutrients to adjacent or downstream ecosystems.

- Food Chain Support: Food chain support includes, or is closely related to the primary production and functions of nutrient cycling and nutrient export. Highly productive wetlands provide more support to food chains than do upland ecosystems or nutrient-poor wetlands (Post, 1996).

- Habitat: Wetlands provide valuable habitat to a wide range of wildlife species. Many waterfowl, passerines, birds of prey, and non-passerines depend on wetlands at some point in their life cycles. Wetland habitats also support a diverse array of mammalian species and can provide beneficial habitats (i.e., rearing habitats) to fish species.

2.2.4 Social

There are two categories in which wetlands are useful to humans: consumptive uses and non-consumptive uses. Consumptive uses include harvest of wetland resources whereas non-consumptive uses include recreation and aesthetic or cultural appreciation (Post, 1996).

- Consumptive: Subsistence and personal uses of wetland resources include harvests of fuel, food, and other plant and animal materials largely for direct consumption, distribution, or barter (Post, 1996).

- Non-consumptive: Active and passive recreation, nature education, appreciation of unique geomorphic features, and preservation of scarce species provide non-consumptive value to humans.

3.0 METHODOLOGY

3.1 Mapping and Classification

3.1.1 Field Survey

Initially, aerial photograph contact print (May 2006, color) was studied to classify and map the various plant community types within the study area. Research was performed to identify previous wetland delineation attempts in the area, including:

- a search of National Wetlands Inventory (NWI) mapping available from the United States Fish and Wildlife Service (USFWS), and
- datasets available from the Alaska Geospatial Data Clearinghouse.

Next, field reconnaissance was conducted during August 2006 to verify the preliminary maps and to identify and characterize all major plant community types within the study area.

Field delineation of wetlands was performed according to the three-parameter approach using vegetative, pedologic, and hydrologic characteristics, as described in the *United States Army Corps of Engineers (USACE) Wetlands Delineation Manual* (USACE, 1987) and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region* (USACE, 2006). The Environmental Analysts who conducted the delineation have taken the delineation course through the USACE. During the field survey, the preliminary maps were reviewed to assess the accuracy of mapping and to identify changes that needed to be made in wetland and plant community boundary delineations. For each vegetation community observed, sampling points were chosen based on the total area of that community in relation to other communities. Larger tracts of a particular plant community received more data points than smaller communities, ensuring accurate mapping information.

For the wetlands delineation, a USACE routine wetlands delineation data sheet was completed to document observed vegetation, soil, and hydrology characteristics at each sample site (Appendix A). Percent aerial cover for each species was estimated and the type of vegetation layer (tree, shrub, and herbaceous layers) for each species was recorded. Hydrophytic vegetation was identified through a "Prevalence Index," which is a more comprehensive weighted-average wetland indicator than the previous '50/20' rule. The

Prevalence Index is useful in communities with only one or two dominants and in highly diverse communities where many species may be present at roughly equal coverage. The prevalence index was calculated in accordance with the *2006 Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual*, and communities with a prevalence index less than, or equal to 3.0 were considered to meet the hydrophytic vegetation parameter. Taxonomic nomenclature for plant species followed Hultén (1968).

Additionally, at each location where standing water or complete saturation of the ground was not observed, a soil pit was excavated to a depth of at least 20 inches to determine soil saturation and to describe soil characteristics. Soil color was determined using *Munsell Soil Color Charts* (2000). Photographs were taken at each sampling site to document vegetation and soil profiles (where applicable).

In upland areas, sample points were established in a similar manner to the wetland areas for each different plant community that was encountered. Dominant plant species were recorded for each vegetation layer (tree, shrub, and herbaceous layers) and percent cover for each dominant species was estimated. Photographs were taken at each sampling site to document the vegetation (Appendix A: Sites 1 through 24). In addition, to document areas where complete sampling was determined unnecessary due to similarities with areas already sampled, confirmation photographs were taken at many locations, refer to Appendix A: Sites 25 through 36.

3.1.2 Final Mapping

Using ArcMap Geographic Information System, an ortho-rectified aerial photograph was used as a basemap to digitally map wetland and vegetation boundaries and to calculate their areas. Global Positioning System points of the sample sites and photograph locations were taken in the field.

Both wetland and upland plant communities were classified using Level III of the *Alaska Vegetation Classification* system (Viereck et al., 1992), which is a hierarchical system based on dominant growth forms (tree, shrub, herbaceous), canopy height and closure, general soil moisture and salinity, and dominant plant species. Classification to Level III of the Viereck system provides the detail necessary to characterize the plant communities for the purpose of

assessing the habitat in the study area. The Viereck classifications were then used to produce a vegetation map. In addition, the vegetation types were classified into habitat based on landscape position, (e.g., upland, lowland, riparian), plant community structure cohesion, and characteristics that form habitat functional units. The habitat types were then used to produce a habitat map.

Wetlands were classified according to the system guidelines outlined in the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979). The mapping codes for each wetland type follow the USFWS NWI mapping convention, which is a modified version of the Cowardin System for use in producing a wetland map.

3.2 Wetland Function and Values Assessment

Wetland functions are self-sustaining properties of a wetlands ecosystem that exist in the absence of society. Functions result from both biotic and abiotic components of a specific wetlands and include all processes necessary for the self-maintenance of the wetlands ecosystem, such as primary production and nutrient cycling. Functions relate to the ecological significance of wetland properties without regard to subjective human values. Wetland values are benefits to society that derive from one or more wetland functions. The value of a particular wetlands function is based on human use or human judgment of the worth, merit, quality, or importance attributed to those functions (USACE, 1999).

DOWL assessed the functions and values of each palustrine wetlands system sampled following *The Highway Methodology Workbook Supplement: Wetland Functions and Values; A Descriptive Approach* (USACE, 1999). This methodology identifies the presence or absence of eight wetland functions and five wetland values, and was designed by the USACE to give regulatory specialists a tool to:

- describe site characteristics,
- compare project alternatives,
- avoid and minimize project impacts,
- determine the significance of impacts,
- weigh environmental impacts against project benefits, and

- design and monitor compensatory mitigation.

This methodology was specifically designed to avoid the use of subjective weightings (i.e., high, moderate, low) that implies a more quantifiable database than actually exists.

3.3 Habitat Evaluation

Existing literature was evaluated prior to the field investigation to identify wildlife-habitat relationships along the Seward Highway. During the field study, evidence of animal activity (i.e., animal dens, birds' nest, animal tracks, droppings/scat) and species observed in the field was correlated with information from the office-based research. Wildlife values that were considered in this assessment include important foraging habitats, nesting or denning areas, escape cover from predators, and seasonal food sources, such as berry patches.

3.4 Preliminary Jurisdictional Determination

Wetlands and Waters of the U.S. were analyzed to determine if they are subject to the Clean Water Act Jurisdiction. To determine the jurisdictional status of wetlands and Waters of the U.S. in the study area, continuous wetland and/or Waters of the U.S. polygons were grouped into Review Areas (Appendix D, Figure 5a-5j). The Review Areas were then analyzed under the USACE 2007 CWA guidance. A Jurisdictional Form was completed for each Review Area and is located in Appendix D.

The original field work was completed under a broad study area in order to encompass multiple alternatives. The preliminary jurisdictional determination was completed under a smaller study area that encompasses alternatives that have not been eliminated and are still under consideration (Appendix D).

4.0 RESULTS

4.1 Mapping and Classifications

The Seward Highway MP 99-105 study area includes approximately 741 acres. Wetlands and Waters of the United States comprise 450.7 acres (61 percent) of the study area. A total of nine wetland habitats were documented in the study area and four habitats were identified as Waters of the United States. Wet Sedge Meadow was the most common wetland type, comprising approximately 38 percent of the wetland area. Intertidal mudflats comprised the vast majority (99 percent) of habitats identified as Waters of the United States.

Upland areas comprise 39 percent of the study area. Three upland habitats were documented in the study area and two non-habitat upland areas were identified. Broadleaf forest is the most common upland type, comprising 46 percent of all uplands in the study area.

Figures of wetlands and upland habitats can be found in Appendix B (Figures 4a through j); vegetation types in Appendix B (Figures 2a through j) and NWI types in Appendix B (Figures 3a through j). All wetlands in the study area are preliminarily determined to be jurisdictional or Waters of the United States, pending USACE approval of this report.

Plant species observed in the project area are listed in Table 1. All habitat types and associated NWI and vegetation classifications have been cross-referenced in Table 2. Table 3 summarizes all functions and values for each wetland habitat type. Table 4 lists sample points by their corresponding figure.

Table 2: Habitat Acreage and Associated NWI and Vegetation Classifications

Habitat	Acres	Cowardin	Vegetation Code	Point
Waters of the United States				
Intertidal Mudflats	437.4	M2US3	W	36
Anadromous Waterways	1.1	R1UB1, R2SB3	W	25, 31
Perennial Streams	0.01	R2UB1	W	32
Intermittent Drainages	<0.01	R4OW, R5OW	W	NA
Jurisdictional Wetlands				
Wet Sedge Meadow	4.7	PEM1A, PEM1H	Hgm, Hgw	17, 19
Buckbean Sedge Meadow	0.05	PEM1B	Hgm	8
Bluejoint Meadow	3.3	PEM2B	Hgm	11
Spruce Forest	0.7	PF04B	Fnc	20
Mixed Forest	1.0	PFO1/4A	Fmc	12
Birch Woodland	0.092	PFO1B	Fbw	22
Pond	0.3	POW	W	29
Dwarf Spruce Bog	1.0	PSS1/4B	Swo	16
Shrub Swamp	2.6	PSS1A, PSS1E, PSS1H	Slc	3, 4, 33
Non-Jurisdictional Upland				
Broadleaf Forest	134.5	Upland	Fbc, Fbo	1, 5, 7, 10, 13, 21
Broadleaf Shrub	9.8	Upland	Stc	2, 9, 18, 23
Mixed Forest	19.2	Upland	Fmc, Fmo	6, 14, 15, 24, 30
Non-Habitat Upland Areas				
Disturbed Forest	11.6	Upland	Fmo	34
Developed/disturbed	115.2	Upland	Dd	26,27,28, 35

Table 3: Functions and Values of Wetlands in Study Area

	Wetland Habitat Type												
Function/ Values	**Birch Woodland**	**Bluejoint Meadow**	**Buckbean Sedge Meadow**	**Dwarf Spruce Bog**	**Mixed Forest**	**Pond**	**Shrub Swamp**	**Spruce Forest**	**Wet Sedge Meadow**	**Anadromous Streams**	**Perennial Streams**	**Intermittent Drainages**	**Intertidal Mudflats**
Groundwater Recharge and Discharge	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Floodflow Alteration	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No
Fish and Shellfish Habitat	No	No	No	No	No	No	No	No	No	Yes	Yes	No	Yes
Sediment/ Toxicant Retention	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes
Nutrient Removal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	Yes
Production Export	No	No	No	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Sediment - Shoreline Stabilization	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes
Wildlife Habitat	No	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recreation	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes
Educational - Scientific Value	No	No	Yes	No	No	No	No	Yes	No	Yes	No	No	Yes
Uniqueness - Heritage	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No	Yes
Visual Quality - Aesthetics	No	No	No	Yes	No	No	No	Yes	No	Yes	No	No	Yes
% of Study Area	0.01	0.4	0.006	0.1	0.14	0.04	0.003	0.09	0.6	0.14	0.001	>.0001	59

*Yes or No refers to the presence or absence of the function/value.

Table 4: Sample Points and Corresponding Figures

Sample Points	Corresponding Figures 2 to 4
35	a
1,2, 4, 9, 10, 12, 31-33	d
2, 3, 11, 24	e
25-28	f
5-8, 13, 14, 30, 34, 36	g
15-20, 22	h
23	i
21, 29	j

4.2 Palustrine Wetland Habitat Types

The palustrine system includes all wetlands dominated by trees, shrubs, persistent emergent, emergent mosses, and lichens that are not influenced by ocean-derived salinity. Wetland types commonly referred to as bogs, muskegs, fens, marshes, and swamps are grouped in the palustrine system. Lakes and ponds, less than 20 acres in size, are also a part of the palustrine system (Cowardin, 1979).

4.2.1 Birch Woodland

4.2.1.1 Mapping Classifications and Description

The birch woodland habitats comprise 0.09 acres of the study area and 0.75 percent of palustrine wetlands. The NWI classification for this wetland habitat is PFO1B (Palustrine, Forested, Broadleaved Deciduous, Saturated) (Sample Site 22). The Alaska Vegetation Classification code is Fbw (Forest, broadleaved, woodland). The dominant species include paper birch and bluejoint reedgrass. The birch in this area show signs of stress.

4.2.1.2 Wetland Functions and Values Assessment

The birch woodland habitat has an overall moderate rating. The wetlands provide nutrient removal and sediment and toxicant removal. Additionally, the area serves as a sink for water storage. It is suspected that the construction of the bike path has caused this particular area to transition from a dryer to a wetter environment. Soil saturation and surface water are present. The wetland values of the Birch woodland wetland is valuable as it is only found in a small area in the study area.

4.2.1.3 Wildlife Habitat Evaluation

Birch woodland habitat provides cover and a winter food source for moose. Snowshoe hare and porcupine also feed on paper birch. Birds that use paper birch as a food source include redpoll, pine siskin, and chickadee. Many birds also nest in paper birch trees such as woodpeckers, sapsucker, and vireos. However, due to habitat transition and the signs of stress shown by the paper birch this habitat may not be preferred by larger mammals.

4.2.2 Bluejoint Meadow

4.2.2.1 Mapping Classifications and Description

The bluejoint meadow habitat comprises 3.3 acres of the study area and 27 percent of Palustrine wetlands. The NWI classification for this wetland habitat is PEM2B (Palustrine, Emergent, Non-Persistent, Saturated) (Sample Site 11). The Alaska Vegetation Classification code is Hgm (Herbacious, graminoid, moist). This habitat is dominated by bluejoint, red clover, field horse tail, and fireweed and occurs along the highway.

4.2.2.2 Wetland Functions and Values Assessment

The bluejoint meadow habitat has an overall moderate rating. This is a transition zone where it appears roadside weeds have dominated the vegetation. The habitat provides flow regulation, nutrient cycling, and food web support; however, it does not rank high for social values.

4.2.2.3 Wildlife Habitat Evaluation

The bluejoint meadow may provide habitat for small mammals such as muskrats, voles, mice, weasels, and snowshoe hare. Larger mammals such as moose may visit the area due to the availability of browse. This habitat is also important to a variety of bird species. However, the bluejoint meadow is in close proximity to the Seward Highway without tall shrubs to provide shelter and security. Therefore, use of the habitat may be limited.

4.2.3 Buckbean Sedge Meadow

4.2.3.1 Mapping Classifications and Description

The buckbean sedge meadow habitat comprises 0.05 acres of the study area and 0.41 percent of palustrine wetlands. The NWI classification for this wetland habitat is PEM1B

(Palustrine, Emergent, Persistent, Saturated) (Sample Site 8). The Alaska Vegetation Classification code is Hgm (Herbacious, graminoid, moist). This habitat is dominated by buckbean, bluejoint, and lyngbye's sedge.

4.2.3.2 Wetland Functions and Values Assessment

The buckbean sedge meadow habitat has an overall moderate rating. The wetland provides ground water recharge and serves as a storage basin for high precipitation events. Based on the characteristics of Site 8, it appears that the environment has been wetter in the past. The ground was covered in water stained leaves showing signs of water saturation. The construction of the bike path may be causing this area to transition from wet to dry. The buckbean wetland is valuable for its educational/scientific value because it is a good example of a problematic wetland and for demonstrating the varied results from trail construction.

4.2.3.3 Wildlife Habitat Evaluation

The buckbean sedge meadow habitat is surrounded by Broadleaf Forest and intersected by the bike path. Therefore, the buckbean sedge meadow supports the same wildlife as the Broadleaf Forest. Smaller mammals such as muskrats, voles, mice, weasels, and snowshoe hare may use this area. Larger mammals such as moose and bear may visit the area due to the availability of browse. This habitat is also important to a variety of bird species.

4.2.4 Dwarf Spruce Bog

4.2.4.1 Mapping Classifications and Description

The dwarf spruce bog habitat comprises 1.0 acres of the study area and 8.3 percent of palustrine wetlands. The NWI classification for this wetland habitat is PSS1/4B (Palustrine, Scrub-Shrub, Broad-Leaved/Needle-Leaved Saturated) (Sample Site 16). The Alaska Vegetation Classification code is Swo (Scrub, dwarf tree, open). This habitat is dominated by black spruce, swamp birch, narrow-leaf cotton-grass, and black crowberry.

4.2.4.2 Wetland Functions and Values Assessment

The dwarf spruce bog habitat has an overall high rating. The wetlands provide sediment retention and nutrient removal and performs its water quality functions well.

4.2.4.3 Wildlife Habitat Evaluation

Migratory and resident bird species inhabit dwarf spruce bogs. Moose use this area in order to access the wet sedge meadow habitat that borders the dwarf spruce bog. Small mammals that inhabit dwarf spruce bog habitat include shrews, voles, squirrels, snowshoe hares, and mink. The dwarf spruce bog is valuable for its visual quality and aesthetics as during fall it is usually very colorful.

4.2.5 Mixed Forest

4.2.5.1 Mapping Classifications and Description

The mixed forest habitat comprises 1.04 acres of the study area and 8.5 percent of palustrine wetlands. The NWI classification for this wetland habitat is PFO1/4A (Palustrine, Forested, Broad-Leaved Deciduous/Needle-Leaved Evergreen, Temporarily Flooded) (Sample Site 12). The Alaska Vegetation Classification code is Fmc (Forested, mixed, closed). This habitat is dominated by white and Sitka spruce, paper and dwarf birch, and green alder. Other shrubs include sweet gale and shrubby cinquefoil. Field horsetail was the only plant in the herbaceous layer.

4.2.5.2 Wetland Functions and Values Assessment

The mixed forest habitat has an overall moderate rating and is important for sediment, nutrient, and toxicant retention. This habitat is located in a low-lying area between mountains and the roadbed of the Seward Highway and adjacent to a perennial stream. This habitat functions well with regards to groundwater and flood flow alterations. The mixed forest has low values.

4.2.5.3 Wildlife Habitat Evaluation

The mixed forest habitat may provide habitat for small mammals such as muskrats, voles, shrews, and weasels. This habitat is also important to a variety of bird species. Moose and bear are suspected to use the area for foraging purposes.

4.2.6 Pond

4.2.6.1 Mapping Classifications and Description

The pond habitat comprises 0.03 acres of the study area and 2.4 percent of palustrine wetlands. The NWI classification for this wetland habitat is POW (Palustrine, Open Water) (Sample Site 29). The Alaska Vegetation Classification code is W (Water [open]).

Pond habitats are located between steep sloped mountainsides and the embankment of the railroad tracks located near MP 100 of the Seward Highway. These ponds are relatively small, appear to be man-made, and have filled with water over time. Alga growth covers some of the surface of the pond indicating the water is stagnant and thus is not likely to support fish habitat.

4.2.6.2 Wetland Functions and Values Assessment

The pond habitat has an overall moderate rating. This wetland does not perform groundwater quality functions well; it does provide flood flow alteration for high precipitation events and provides sediment and toxicant retention.

4.2.6.3 Wildlife Habitat Evaluation

Generally, pond habitats provide excellent opportunities for waterfowl foraging and rearing. Ducks passing through the area may rest on the pond. If large mammals such as bear or moose are in this area they may use the pond as a water source. However, the train runs twice a day and may discourage the use of the area by wildlife. Small mammals that may also use pond habitats include lemmings and muskrats.

4.2.7 Shrub Swamp

4.2.7.1 Mapping Classifications and Description

The shrub swamp habitat comprises 2.6 acres of the study area and 2.1 percent of palustrine wetlands. The NWI classifications for this wetland habitat are PSS1A (Palustrine, Scrub-Shrub, Broad-Leaved Deciduous, Temporarily Flooded), PSS1E (Palustrine, Scrub-Shrub, Broad-Leaved Deciduous, Seasonally Flooded Saturated), PSS1H (Palustrine, Scrub-Shrub, Broad-Leaved Deciduous, Permanently Flooded) (Sample Sites 3, 4, 33). The Alaska Vegetation Classification code is Slc (Shrub, low, closed). This habitat is dominated

by shrubby cinquefoil, sweet gale, green alder, swamp birch, rough horsetail, and water sedge.

4.2.7.2 Wetland Functions and Values Assessment

Shrub swamp habitat has an overall high ranking. Shrub swamps performs nutrient cycling, sediment and toxicant retention; and performs its hydrological and water quality functions well. The shrub swamp has low values.

4.2.7.3 Wildlife Habitat Evaluation

This habitat is important to a variety of bird species, and moose and bear use shrub swamps habitat to forage. Small mammals, such as shrews, likely inhabit this environment and may burrow in the hummocks. The shrub swamp habitat is located adjacent to the Seward Highway. Therefore, the use of this habitat by wildlife may be compromised.

4.2.8 Spruce Forest

4.2.8.1 Mapping Classifications and Description

The spruce forest habitat comprises 0.7 acres of the study area and 5.7 percent of palustrine wetlands. The NWI classification for this wetland habitat is PFO4B (Palustrine, Forested, Needle-Leaved Evergreen, Saturated) (Sample Site 20). The Alaska Vegetation Classification code is Fnc (Forest, Needle-Leaf, closed). Both Sitka and white spruce composed this habitat, with the shrub layer characterized by rusty menziezia and devils club. The herbaceous layer is dominated by field horsetail. This area has a stream that runs through the center and drains into the inlet. The area is similar to a bowl, with a steep side slope to the creek. Water drains down the hillside and side slopes into a stream that empties into the inlet.

4.2.8.2 Wetland Functions and Values Assessment

Spruce forest habitat has an overall moderate ranking. The spruce forest performs sediment and toxicant retention well and because of its proximity to the creek, it also provides groundwater recharge. The spruce forest wetland is valuable for its uniqueness since it is a true coastal wetland and a good example of the coastal temperate rainforest at the northern edge of its range.

4.2.8.3 Wildlife Habitat Evaluation

The spruce forest habitat may provide habitat for small mammals such as muskrats, voles, shrews, and weasels. This habitat is also important to a variety of bird species. Moose and bear are suspected to use the area for foraging purposes.

4.2.9 Wet Sedge Meadow

4.2.9.1 Mapping Classifications and Description

The wet sedge meadow habitat comprises 4.7 acres of the study area and 38 percent palustrine wetlands. The NWI classifications for this wetland habitat are PEM1A (Palustrine, Emergent, Persistent, Temporarily Flooded) and PEM1H (Palustrine, Emergent, Persistent, Permanently Flooded) (Sample Sites 17, 19). The Alaska Vegetation Classification codes are Hgm (Herbaceous, graminoid, moist) and Hgw (Herbaceous, graminoid, wet).

4.2.9.2 Wetland Functions and Values Assessment

The wet sedge meadow habitat has an overall high rating and is important for sediment, nutrient, and toxicant retention. This wetland also has a high value for groundwater discharge capability and flood flow alteration. The wet sedge meadow does not have any moderate or high values.

4.2.9.3 Wildlife Habitat Evaluation

This habitat is important for a variety of bird species. The wet sedge meadow may provide habitat for small mammals such as muskrats, voles, shrews, and weasels. Moose and bear, and porcupine are suspected to use the area for foraging purposes.

4.3 Waters of the United States

Waters of the United States incorporates both deep-water aquatic habitats and special aquatic sites, including wetlands and all other Waters of the United States such as isolated wetlands and lakes, intermittent streams, prairie potholes, and other waters that are not a part of a tributary system to interstate waters or navigable Waters of the United States (USACE, 1987). The Alaska Vegetation Code for all Waters of the United States is W (water).

4.3.1 Anadromous Waterways

4.3.1.1 Mapping Classifications and Description

The anadromous waterways habitat comprises 1.1 acres of the study area. The NWI classifications for these wetland habitats are R1UB1 (Riverine, Tidal, Unconsolidated Bottom, Cobble-Gravel) and R2SB3 (Riverine, Lower Perennial, Streambed, Cobble-Gravel). Sample Sites 25 and 31 show this habitat and are Bird and Indian Creeks.

The anadromous waterways habitat includes all waterways catalogued as anadromous by Alaska Department of Fish and Game and includes Bird and Indian Creek.

4.3.1.2 Wetland Functions and Values Assessment

The anadromous waterways habitat has an overall high rating. This habitat is important as a sediment and nutrient sink and functions well with regards to groundwater recharge and discharge. Additionally, both Bird and Indian Creek are used for social values and provide fish habitat.

4.3.1.3 Wildlife Habitat Evaluation

This habitat is important to the spawning and rearing of anadromous fish species including Chinook, coho, pink, and chum salmon. This habitat also provides an open water source to wildlife.

4.3.2 Perennial Streams

4.3.2.1 Mapping Classifications and Description

The perennial streams habitat comprises 0.01 acres of the study area and is composed of streams in the project area that are not considered anadromous. The NWI classification for this wetland habitat is R2UB1 (Riverine, Lower Perennial, Unconsolidated Bottom, Cobble-Gravel). Sample site 32 shows this habitat.

Except for Bird and Indian Creek, a total of four perennial streams were identified in the study area, and each varied in width from approximately two feet to ten feet. These streams flow through thickly vegetated birch and alder forests and have reaches to the east and west of the highway, draining into Cook Inlet. Potential fish habitat was identified at two streams.

4.3.2.2 Wetland Functions and Values Assessment

The perennial streams habitat has an overall high rating. Since each perennial flows through varied habitats, and each contain pools, runs and riffles, it is expected that these perennial streams perform water quality functions well, are important as sediment and nutrient sinks, and provide habitat for variety of wildlife. Perennial streams has low values.

4.3.2.3 Wildlife Habitat Evaluation

Perennial streams provide an open water source to large mammals, such as bear, as well as smaller mammals and birds. Additionally, the diversity of habitat features and presence of cobbles suggests microbiotic habitat availability. Additionally, some perennial streams provide habitat for fish, resulting in a high habitat value.

4.3.3 Intermittent Drainages

All intermittent streams were identified through mapping provided by Inter-Fluve, Inc, and as a result no sample points are referenced (Inter-Fluve Inc., 2007).

4.3.3.1 Mapping Classifications and Description

The intermittent drainage habitat comprise less than 0.01 acres of the study area and includes all drainages and channels that contain flowing water for part of the year. The NWI classification for this wetland habitat is R4OW (Riverine, Intermittent, Open Water, *Unknown Bottom*) and R5OW (Riverine, Unknown Perennial, Open Water, Unknown Bottom).

Dozens of drainages cross the study area and are dry most of the year, and have only partly defined channels, with little or no associated riparian vegetation. During high precipitation events and during breakup, these channels fill with fast-moving water.

4.3.3.2 Wetland Functions and Values Assessment

The intermittent drainage habitat has an overall low rating. Since water flows only part of the year, this habitat does not function as a sediment and nutrient sink, nutrient cycling, or food web support. It does, however, provide flood flow alteration. Intermittent drainages are moderately valuable for the waterfalls they create along the Seward Highway.

4.3.3.3 Wildlife Habitat Evaluation

This habitat contains flowing water for only part of the year, acting as drainage for the steep cliffs of the Chugach where the Chugach meet Turnagain Arm. Dall Sheep have been known to use these areas for feeding and resting.

4.3.4 Intertidal Mudflats

4.3.4.1 Mapping Classifications and Description

The intertidal mudflats habitat comprise 437 acres, over 99 percent of all habitats identified as Waters of the United States. This habitat includes all intertidal areas between the subtidal areas of Turnagain Arm and either the shore or the ordinary high water line of anadromous streams. The NWI classification for this wetland habitat is M2US3 (Marine, Intertidal, Unconsolidated Shore, Mud). Sample Site 36 represents this habitat.

Intertidal mudflats, as the name suggests, are subject to very strong tidal currents and tidal bores. Tidelands along Turnagain Arm provide habitat for hooligan smelt.

4.3.4.2 Wetland Functions and Values Assessment

Intertidal mudflats have an overall high functional value and is important for food web support, fish habitat, and subsistence and passive recreation; however, it does not perform water quality functions well. Intertidal mudflats are highly valued for both aesthetic values and their uniqueness. Additionally, they provide fisherman with access to anadromous streams.

4.3.4.3 Wildlife Habitat Evaluation

This wetland supports beluga and killer whales as well as a number of anadromous fish species. Migratory birds use the area to forage when salmon runs are heavy.

4.4 Upland Habitat Types

4.4.1 Broadleaf Forest

4.4.1.1 Mapping Classifications and Description

The broadleaf forest habitat comprises 134.5 acres, 18 percent of the study area. Both birch and cottonwood forests are described under this habitat classification, and the Alaska

Vegetation Classification Codes for this habitat type are Fbc (Forest broadleaf closed) and Fbo (Forest, broadleaf, open). Sample sites within this habitat include 1, 5, 7, 10, 13, and 21.

The study area is dominated by large stands of birch or cottonwood forests. Cottonwood forests are dominated by cottonwood in the tree layer and the shrub layer is characterized by high-bush cranberry, and red baneberry. Birch forests are dominated by birch in the tree layer and the shrub layer is characterized by prickly rose, high-bush cranberry, and alder. Bluejoint reedgrass and cow parsnip are common herbaceous plants in broadleaf forests. The forests are underlain by three to six inches of a tight root wad, and soils are typically loamy, with gravel and cobble.

4.4.1.2 Wildlife Habitat Evaluation

The broadleaf forest habitat provides cover for moose and with birch forests, a winter food source for them as well. Small mammals such as the snowshoe hare and porcupine may inhabit these forests and birds such as the redpoll, pine siskin, woodpeckers, sapsucker, and vireos may be found also. Raptors that are found in this habitat may include sharp-shinned hawk, goshawk, great-horned owl, boreal owl, red-tailed hawk, osprey, and great gray owl.

4.4.2 Broadleaf Shrub

4.4.2.1 Mapping Classifications and Description

The broadleaf shrub habitat comprises 9.8 acres, 1.3 percent of the study area. The Alaska Vegetation Classification code for this habitat type is Stc (Shrub, tall, closed). Sample sites within this habitat include 2, 9, 18, and 23.

In the study area, broadleaf shrub habitats are dominated by either elderberry, alder, or highbush cranberry. Mountain ash might also co-dominate. Bedstraw is common to this habitat and other herbaceous species may include devil's club, cow parsnip, and oak fern. Soils are loamy, and are underlain by impervious layers such as bedrock or cobbles and gravel.

4.4.2.2 Wildlife Habitat Evaluation

Black bear may use this habitat to bed in and seek cover; and squirrels and smaller predatory mammals (i.e. fox, martin, lynx) may use this habitat for cover. Migratory and resident bird

species would likely use this variety habitat because the dense canopy would provide safe nesting and staging areas.

4.4.3 Mixed Forest

4.4.3.1 Mapping Classifications and Description

Mixed forests comprise 19.2 acres, 2.5 percent of the study area. The Alaska Vegetation Classification codes for this habitat type are Fmc (Forest, mixed, closed) and Fmo (Forest, mixed, open). Sample sites within this habitat include 6, 14, 15, 24, and 30.

The mixed forest habitat is typically composed of spruce (white, Sitka and/or black) and birch. The shrub layer tends to be marginal; however, Site 15 contained a sizeable shrub layer composed of rusty menziesia and devil's club. The herbaceous layer typically contains dwarf dogwood, woodland horsetail, and bluejoint. Soils typically have a small root wad underlain by sandy loam.

4.4.3.2 Wildlife Habitat Evaluation

The mixed forest habitat provides diverse habitat structure. The presence or absence of most shrub and forest bird species depends on the tree species present (coniferous or deciduous), density of woody plants, and density of taller trees. A variety of mammals are known to use this habitat as well, such as shrews, voles, mice, lemmings, bats, squirrels, moose, porcupine, marten, mink, wolverine, lynx, wolves, coyotes, red foxes, and bears (Magoun and Dean 2000 as cited in USFWS, no date).

4.5 Preliminary Jurisdictional Determination

All wetlands and Waters of the U.S. that were analyzed under the USACE 2007 CWA guidance were determined to be jurisdictional (Appendix D). The analysis indicates that the following categories of water bodies are found in the review areas:

- Relatively Permanent Waters (RPW) that flow directly or indirectly into a Traditional Navigable Waterway (TNW).
- Wetlands adjacent to a TNW.

- Wetlands directly abutting a RPW that flows directly or indirectly in a TNW.

- Wetlands adjacent to but not directly abutting a RPW that flow directly or indirectly into a TNW.

5.0 DISCUSSION

According to NWI mapping available from the USFWS, the study area contained eight wetland habitat types. With the exception of a few isolated areas as well as the Bird Creek mouth, the NWI mapping classified the study area as uplands. NWI mapping identified six palustrine types and one estuarine type, and none matched the types identified by DOWL.

This can be attributed to three factors. First, improvements to the areas, including the bike trail have occurred since the NWI mapping was completed. Numerous areas and wetlands typed have been affected by these developments. Second, the scale at which NWI mapping occurs is at an inch to the mile, with no known ground truthing. Third, the NWI maps were produced as topical overlays using USGS topographic maps as the base. Therefore, the data is intended for use in publications at a scale of 1:24,000 or smaller and is intended for use at a regional scale. The Anchorage Wetlands Management Plan was consulted, but no wetlands mapping was available for comparison.

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