APPENDIX H

WETLAND VERIFICATION REPORT

	Page
Wetland Verification Report, 09/14/17	1-190

Kivalina Evacuation and School Site Access Road

Wetland Verification Report



Prepared for: State of Alaska Department of Transportation & Public Facilities Northern Region 2301 Peger Road Fairbanks, Alaska 99709

Prepared by: Stantec Consulting Services, Inc. 725 E Fireweed Lane, Suite 200 Anchorage, AK 995003

September 14, 2017

Table of Contents

EXECU	ITIVE SUMMARY	I
ABBRE	VIATIONS	. II
1.0 1.1 1.2	INTRODUCTION	I.1 I.1 I.1
2.02.12.22.32.4	BACKGROUND INFORMATION2EXISTING WETLAND INFORMATION2EXISTING VEGETATION INFORMATION2EXISTING SOILS INFORMATION2EXISTING HYDROLOGY INFORMATION2	2.1 2.2 2.2 2.3
3.0 3.1 3.2	METHODOLOGY	3.1 3.1 3.2
4.0 4.1 4.2	RESULTS AND DISCUSSIONAWETLANDS AND WATERSACOWARDIN CLASSIFICATIONSA4.2.1Palustrine Saturated & Seasonally Flooded4.2.2Palustrine Flooded4.2.3Soils Discussion4.2.4Marine and Estuarine4.2.5Riverine4.2.6Lacustrine and Ponds4.2.7Uplands	1.1 1.1 1.2 1.3 1.4 1.4 1.5 1.5 1.5 1.6
4.3	WILDLIFE (VIERECK) HABITAT44.3.1II.C.1 (Closed Low Scrub)4.3.2II.D.2 (Willow Dwarf Shrub)4.3.3III.A.2 (Mesic Graminoid Herbaceous)4.3.4III.A.3 (Wet Graminoid Herbaceous)4.3.5W (Water)	1.6 1.7 1.7 1.7 1.7
4.4	FUNCTIONAL ASSESSMENT 4 4.4.1 Category I+ 4 4.4.2 Category I 4 4.4.3 Category II 4 4.4.4 Bird Habitat 4	1.7 1.8 1.9 1.9 1.9
4.5 5.0	REFERENCES	⊧.9 5.1

LIST OF APPENDICES

APPENDIX A	SITE MAPSA	1
APPENDIX B	STANDARD WETLAND DELINEATION DATA SHEETS B	5.1
APPENDIX C	PHOTO POINTS	.1

Executive Summary

The Alaska Department of Transportation and Public Facilities (DOT&PF) and the Federal Highway Administration (FHWA), in partnership with the Northwest Arctic Borough (NAB), Native Village of Kivalina, and the City of Kivalina, propose community safety improvements in Kivalina, Alaska by constructing an evacuation road between Kivalina Island and a site on Kisimigiuqtuq Hill (K-Hill) where a school planned for construction by the NAB would also serve as a safe emergency evacuee assembly site.

A desktop Wetland Delineation and Functions & Values Assessment was conducted by Arctic Slope Regional Corporation (ASRC) Energy Services in 2015 (ASRC 2015). This report updates that desktop delineation and functional assessment with ground observations and other information gathered during the following efforts:

- March/April 2015 Golder Associates geotechnical investigations (Golder Associates 2015)
- September 2016 Stantec site reconnaissance (Stantec 2016)
- October 2016 Stantec cultural resources investigation (Stantec 2017)
- August 2017 USACE wetland determination (USACE 2017)
- August 2017 Stantec site reconnaissance (this report)
- 2011 aerial imagery, updated LIDAR (Light Detection and Ranging)
- Agency coordination

The Study Area is a large wetland complex with a variety of emergent, dwarf, and low shrub habitat. Rivers, lakes, and ponds are common defining characteristics. Most of the subsurface data gathered found at least shallow soil saturation, and many field observations described seasonal or permanently flooded regimes.

There are a limited number of uplands scattered throughout the Study Area. K-Hill dominates the eastern end of the Study Area, and provides elevated upland topography with wetlands surrounding its base.

Vegetation consists of low and dwarf shrub, and wet and mesic herbaceous polygons. These provide a variety of wildlife habitat. Most importantly, in consultation with the US Fish and Wildlife Service (USFWS), low scrub habitat was identified as important bird nesting habitat.

Wetlands in the Study Area are high functioning and common. They are largely undisturbed, and operating in their natural state. Rivers, lakes, ponds, estuaries, ocean, and bird nesting habitat was increased to the highest functional value to aid project planners in avoiding these important features.

All wetlands and Waters of the United States were determined to be hydrologically connected to the Kivalina River, Wulik River, or Kivalina Lagoon, which are connected to the Chukchi Sea, a traditional navigable Water of the U.S. For this reason, wetlands and Waters of the U.S. in the Study Area are presumed jurisdictional by the USACE under Section 404 of the CWA and Section III.D.2 of the Jurisdictional Determination Form.

Abbreviations

ANSRAM	Arctic North Slope Rapid Assessment Method
ASRC	Arctic Slope Regional Corporation
AVC	Alaska Vegetation Classification
cm	centimeter
DOT&PF	Department of Transportation and Public Facilities
E1UB	Estuarine, Subtidal, Unconsolidated Bottom
E2US	Estuarine, Intertidal, Unconsolidated Shore
FHWA	Federal Highway Administration
GPS	Global Positioning System
K-Hill	Kisimigiuqtuq Hill
L1UB	Lacustrine, Limnetic, Unconsolidated Bottom
Lidar	Light Detection and Ranging
m	meter
M1UB	Marine, Subtidal, Unconsolidated Bottom
M2US	Marine, Intertidal, Unconsolidated Shore
NA	Not Applicable
NAB	Northwest Arctic Borough
NWI	National Wetlands Inventory
OFS	Overall Functional Score
PEM1/SS1B	Palustrine Persistent Emergent/ Broad-Leaved Deciduous Scrub Shrub, Saturated
PEM1/SS1C	Palustrine Persistent Emergent/ Broad-Leaved Deciduous Scrub Shrub, Seasonally Flooded
PEM1/SS1F	Palustrine Persistent Emergent/Broad-Leaved Deciduous Scrub Shrub, Semi- permanently Flooded
PEM1C	Palustrine Persistent Emergent, Seasonally Flooded
PEM1F	Palustrine Persistent Emergent, Semi-permanently Flooded
PSS1/EM1B	Palustrine Broad-Leaved Deciduous Scrub Shrub/ Persistent Emergent, Saturated
PSS1/EM1C	Palustrine Broad-Leaved Deciduous Scrub Shrub/ Persistent Emergent, Seasonally Flooded
PSS1/EM1E	Palustrine Broad-Leaved Deciduous Scrub Shrub/ Persistent Emergent, Seasonally Flooded/Saturated
PSS1C	Palustrine Broad-Leaved Deciduous Scrub Shrub, Seasonally Flooded
PSS1J	Palustrine Broad-Leaved Deciduous Scrub Shrub, Intermittently Flooded
PUBH	Palustrine, Unconsolidated Bottom, Permanently Flooded
R2UB	Riverine, Lower Perennial, Unconsolidated Bottom
R2US	Riverine, Lower Perennial, Unconsolidated Shore
R3UB	Riverine, Upper Perennial, Unconsolidated Bottom
USACE	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service

USGS US Geological Survey W Water

1.0 INTRODUCTION

1.1 **PROJECT DESCRIPTION**

The Alaska Department of Transportation and Public Facilities (DOT&PF) and the Federal Highway Administration (FHWA), in partnership with the Northwest Arctic Borough (NAB), Native Village of Kivalina, and the City of Kivalina, propose community safety improvements in Kivalina, Alaska, by constructing an evacuation road between Kivalina Island and a site on Kisimigiuqtuq Hill (K-Hill) where a school planned for construction by the NAB would also serve as a safe emergency evacuee assembly site. Figure 1 (Appendix A) displays the location and vicinity of the proposed project.

1.2 SITE LOCATION

The proposed project origin is at the City of Kivalina, located on the southeast tip of the barrier island located between the Chukchi Sea (Arctic Ocean) and Kivalina Lagoon (Figure 1). The project terminus is located on the mainland across the Kivalina Lagoon approximately six -miles northeast at a community selected evacuation site on Kisimigiuqtuq Hill (K-Hill). The Study Area encompasses the Kivalina barrier island, the southern portion of Kivalina Lagoon, and the lower Wulik and Kivalina River drainages.

2.0 BACKGROUND INFORMATION

A proposed inland access route in the Kivalina region has been the subject for study for many years. This wetland verification report is the compilation of at least three years of effort evaluating wetlands for the access alternatives. The intent of this report is to integrate the previous desktop and field efforts to provide one comprehensive wetlands resource.

A desktop only wetland delineation was conducted in 2015 (ASRC 2015) for a smaller Study Area, commissioned by the Northwest Arctic Borough (NAB). Subsequently, at least four field efforts (March/April 2015 [Golder Associates 2015], September 2016 [Stantec 2016], October 2016 [Stantec 2017], August 2017 [USACE 2017 and this report]) were conducted and provide on the ground verification for the initial desktop delineation.

This report updates and expands the ASRC (2015) desktop effort by compiling the field efforts, and generating USACE Wetland Datasheets and photo points. These points document the vegetation, soil, and hydrology characteristics of the area. This report also provides an updated functional assessment using the same method (updated with field data) as the previous desktop assessment. By compiling the previous efforts, this wetland verification report provides the best available information on wetlands in the Study Area.

2.1 EXISTING WETLAND INFORMATION

A desktop Wetland Delineation and Functions & Values Assessment was conducted in 2015 by ASRC Energy Services (ASRC 2015). ASRC conducted aerial photography interpretation, using information from:

- National Wetlands Inventory (NWI);
- U.S. Geological Survey (USGS) topographic maps;
- Kivalina Evacuation and School Access Road Reconnaissance Study (WHPacific 2014);
- Kivalina Evacuation Road Preliminary Environmental Report (WHPacific 2012a); and
- Kivalina Evacuation Route Significant Biotic Resources Baseline Report and Preliminary, Essential Fish Habitat Analysis (WHPacific 2012b).

ASRC produced wetland pdf maps with polygons classified by the *Classification of Wetlands* and *Deepwater Habitats of the United States* (Cowardin et al. 1979). ASRC also conducted a desktop Functions and Values Assessment using a method they developed, ANSRAM (Arctic North Slope Rapid Assessment Method).

The ASRC wetland report found that the area was composed almost exclusively of high quality wetlands, and that little to no disturbance has taken place on the mainland. The wetlands were of such uniformly high quality, that certain features (e.g. waters and rivers) were elevated from a Category I to a Category I+. This allowed project planners to avoid features of inherent elevated importance when planning features across the landscape.

The lack of field data to support this desktop effort was addressed by at least four field efforts (March/April 2015 [Golder Associates 2015], September 2016 [Stantec 2016], October 2016 [Stantec 2017], August 2017 [USACE 2017 and this report]).

2.2 EXISTING VEGETATION INFORMATION

The Study Area has National Wetland Inventory Cowardin classification mapping available, which was used as a guide in classifications. The previous desktop Wetland Delineation effort also used the Alaska Vegetation Classification (AVC) System (Viereck 1992) to Level III. The Viereck classification system is an Alaskan specific habitat classification system, particularly useful for evaluating wildlife habitat. It is subtly different than Cowardin, and provides a greater level of detail in habitat classifications (e.g. tall, short, dwarf shrubs).

The Stantec site reconnaissance field efforts included vegetation photographs. This involved taking GPS-linked site photographs, and brief notes on wetlands, hydrology, and plant cover. These photographs provide key vegetation cover information for this wetland report. The photographs and notes allow vegetation to be classified on the Cowardin and Viereck systems. Species composition and percent cover can also be assigned from this effort, allowing the completion of USACE Wetland Datasheets.

2.3 EXISTING SOILS INFORMATION

The USDA Soil Survey does not have information available for the Study Area and no such information has been reported on in previous wetland reports.

We developed key soil information from multiple sources. The first soil field effort occurred in March and April of 2015. Golder Associates conducted spring geotechnical investigations primarily around gravel source exploration in the Study Area (Golder Associates 2015). The profiles provide evidence of deep organics and high levels of water content in the soils. This supports both wetland soil and hydrology characteristics.

Second, in October 2016 and August 2017, Stantec and the USACE conducted a cultural and wetland field efforts (Stantec 2016, 2017, USACE 2017). These efforts conducted site testing at multiple sites, providing logs of soil profiles. These soil profiles do not have Munsell color notations (Munsell 2010), but do provide valuable soil information (e.g. organic depths, colors, texture, saturation) about the organic layers in the Study Area.

Cultural resource investigations typically focus on rises, ridges, and uplands; which are common historic gathering places. Areas of standing water and similar polygonal tundra are not high probability landforms to find cultural materials within the region. As a result, soil profiles available from these efforts are most likely upland sites. This underscores their importance, as the relatively rare upland sites the wetland delineation is seeking are the most likely to have soil information available.

2.4 EXISTING HYDROLOGY INFORMATION

Hydrology information in the ASRC report was limited and interpreted solely from aerial photography and online databases. The subsequent field efforts provided important additional hydrology insights needed to map wetlands more accurately.

Site photographs and notes from the Stantec and USACE field efforts made evident that most of the Study Area is seasonally or permanently flooded, and provided evidence of subtle, but critical, hydrological differences (e.g. saturation, seasonally flooded, standing water). This information allowed aerial signatures to be groundtruthed, particularly on flooded low centered polygon complexes which are surrounded by seasonally flooded wetlands.

The Golder Geotechnical field effort (Golder Associates 2015) also had valuable hydrology notations collected during soil profiling (e.g. saturation, ice wedges). These notations allowed the USACE Standard Forms to be completed. Often a shallow water table was not specifically noted (this information is not typically collected during cultural and geotechnical investigations), and had to be assumed.

This report also uses new Light Detection and Ranging (LiDAR) and aerial imagery to understand the important topography and hydrology changes. These allow the tracing of topographic features that were not evident in the ASRC report.

3.0 METHODOLOGY

The wetland verification efforts compiled data from the ASRC wetland report (ASRC 2015); and field datasets: March/April 2015 [Golder Associates 2015], September 2016 [Stantec 2016], October 2016 [Stantec 2017], August 2017 [USACE 2017 and this report]. The data analysis was conducted and report written by Professional Wetland Scientists to provide a comprehensive groundtruthed analysis of wetlands in the Study Area.

Methodology for this wetland verification do not follow the transect methods outlined in 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). Instead, this verification uses the general guidance of the regional supplement to provide a best available information compilation of knowledge of the Study Area.

Mapping in the Study Area is divided into two categories. National Wetlands mapping boundaries was used for the entire Study Area, and classifications were updated with results from the field efforts. Inside the core Study Area (the region studied by the NAB), mapping boundaries and classification was updated in fine scale resolution. This method allowed broad scale alternative evaluation on the entire Study Area, and fine scale mapping for proposed impacts.

3.1 WETLAND VERIFICAITON

<u>Digitizing Existing ASRC Data:</u> The wetland shapefiles from the ASRC report were not available. but the pdfs in the ASRC wetland map had location information electronically embedded in them, allowing the creation of a mosaic of geoTiffs. These were brought into ArcGIS, and wetland polygons were digitized and attributed at 1:3,000 scale. While digitizing the maps, wetland boundaries and Cowardin classifications were updated for polygons as needed, using more recent and high resolution aerial imagery. In addition, field data (photos and soil profiles) were reviewed to further verify wetland boundaries and classifications where available.

<u>Data Compilation:</u> Standard USACE Wetland Determination Data Forms were completed at all locations where sufficient vegetation, soils, and hydrology information could be extrapolated from ground observations. Data forms were completed at 11 locations within the Study Area and are included in Appendix B. Each data form fully documents which field effort the vegetation, soils, and hydrology data came from.

Photo points (Appendix C) allow best professional judgment to apply wetland designations to specific habitats and were completed where vegetation, soils, and hydrology data were partially available, but did not give enough detail to complete full determination forms. Photo points are intended to provide ground observations to confirm desktop mapping for wetland indicators such as saturation, restrictive layers, and hydrophytic vegetation. Each standard and photo point location sampled during the field investigation was collected in a handheld global

positioning system (GPS) unit. Photo point forms were completed at 37 locations within the Study Area.

Wetland delineation data form and photo point locations are shown on maps included in Appendix A.

3.2 FUNCTIONAL ASSESSMENT

The ASRC (2015) methodology used a rapid desktop functional assessment (ANSRAM). The methodology and previous datasheets are included in the previous wetland report (ASRC 2015). The ASRC report found that almost all wetlands were Category I, with a few Category II saturated wetlands. For that report, under best professional judgement; all riverine, tidal, estuarine, and lacustrine water bodies, as well as flooded palustrine wetlands were elevated to Category I+. This was done to aid project planners in avoiding important wetlands.

For this report's analysis, we had additional consultation with agencies to determine the functional rankings. Similar to the ASRC report; all ponds, riverine, tidal, estuarine, and lacustrine water bodies were elevated to the Category I+. All saturated wetlands (PSS1/EM1B) were ranked as a Category II, also similar to ASRC.

For this project, the USFWS has indicated that high quality shrub areas are important migratory bird habitat. This habitat was mapped and identified in this report as Closed Low Scrub habitat (II.C.I). This 'low scrub' habitat is the highest vegetation habitat in the region (taller than 'dwarf shrub'). To accommodate this important function, all Closed Low Scrub habitat (II.C.I) was promoted one functional level. PSS1/EM1B wetlands that were bird habitat were upgraded to Category I, the rest of bird habitat was elevated to Category I+. The primary difference between the ASRC (2015) report and this method, was that we did not find all flooded palustrine wetlands to be I+. This value was overstated, when compared to the bird habitat.

4.0 **RESULTS AND DISCUSSION**

4.1 WETLANDS AND WATERS

Table 1 below summarizes the standard and photo data points.

Table 1: Summary of Standard and Photo Data Points

Туре	Point	
Standard (Appendix B)	HP40, P7, P12, P14, P16, P20, P27, P32, P37, P45, P56	
Photo (Appendix C)	HP1, HP4, HP11, HP15, HP19, HP21, HP22, HP24, HP36, HP37, HP38, HP39, JAJ-17-009, JRH-17-12, P1, P2, P3, P4, P22, P24, P25, P30, P34B, P35, P36, P41A, P41B, P42, P48, P50, P54, P58, P59, USACE1, USACE2, USACE3, WCP1	

The majority of habitat within the Study Area is comprised of wetlands (74%) or waters (23%) within the Wulik and Kivalina River drainages (Figure 2). K-Hill, an isolated hill in the northeastern section of the Study Area, is upland. Other uplands are scattered throughout the Study Area, including pingos, relic river banks, and large ice wedges that have been elevated above the surrounding topography.

In general, vegetation and hydrology determined key wetland characteristics. The Study Area is a mostly a pristine ecosystem (99.9% undeveloped lands) with a variety of emergent, dwarf, and low shrub habitats. Rivers, lakes, and ponds are common throughout the Study Area and are defining characteristics of the general landscape. The test pits found shallow saturation, and observations described saturated, seasonal, or permanently flooded regimes. It is important to note that field data were mostly collected in September and October.

4.2 COWARDIN CLASSIFICATIONS

Table 2 summarizes the different wetlands, Waters of the U.S., and upland habitat types found within the Study Area.

Habitat Type		Cowardin	Acres	% Study Area
		PEM1C	580.9	1.6%
		PEM1/SS1B	296.2	0.7%
		PEM1/SS1C	13,559.8	36.7%
	Palustrine	PSS1/EM1B	6,023.8	16.3%
	Saturated &	PSS1/EM1C	2,042.0	5.5%
	Flooded	PSS1C	1,391.3	3.8%
		PEM1F	1,296.6	3.5%
		PEM1/SS1F	581.0	1.6%
	Palustrine	PSS1/EM1E	1,430.6	3.9%
Wetlands	Flooded	PSS1J	231.9	0.6%
Total Wetlands			27434.1	74.2%
			•	
Waters of the U.S.				
		E1UB	3,686.9	10.0%
Estuarine		E2US	135.1	0.4%
Lacustrine		L1UB	1,164.3	3.2%
		M1UB	109.1	0.3%
Marine		M2US	73.7	0.2%
Pond		PUBH	949.5	2.6%
		R2UB	1,378.4	3.7%
		R2US	737.8	2.0%
Riverine		R3UB	176.0	0.5%
Total Wate	rs of the US		8,410.8	22.9%
Uplands		Upland	1071.5	2.9%
Total Stu	udy Area		36,916.4	100.0%

Table 2: Summary of Wetlands, Waters of the U.S., and Uplands

4.2.1 Palustrine Saturated & Seasonally Flooded

Palustrine Saturated & Seasonally Flooded areas consisted of saturated and seasonally flooded wetlands. Cowardin classification within this type include:

- PEM1C: Palustrine Persistent Emergent, Seasonally Flooded
- PEM1/SS1B: Palustrine Persistent Emergent/ Broad-Leaved Deciduous Scrub Shrub, Saturated

- PEM1/SS1C: Palustrine Persistent Emergent/ Broad-Leaved Deciduous Scrub Shrub, Seasonally Flooded
- PSS1/EM1B: Palustrine Broad-Leaved Deciduous Scrub Shrub/ Persistent Emergent, Saturated
- PSS1/EM1C: Palustrine Broad-Leaved Deciduous Scrub Shrub/ Persistent Emergent, Seasonally Flooded
- PSS1C: Palustrine Broad-Leaved Deciduous Scrub Shrub, Seasonally Flooded

Vegetation in saturated wetlands include both shrub and emergent vegetation. Shrub species, such as cranberry (*Vaccinium vitis-idaea*), Labrador Tea (*Rhododendron tomentosum*), Blueberry (*Vaccinium uliginosum*), and small willows, provide limited structure in tundra ecosystems. Grasses and sedges are present, particularly on low centered polygons scattered through the area. Soils consists of Histic Epipedons, with shallow organic layers underlain by dark mineral soils (which have dense roots intermixed in the horizons).

Throughout the Study Area, saturated wetlands can be found on slight rises that border the lagoon or ponds, or are underlain by elevated ice wedges. Hydrology is the key characteristic for this wetland type, controlling the species present and relative ratios of shrubs and emergent plants.

Seasonally flooded wetlands usually have more emergent species (e.g. grasses, sedges, herbaceous plants) due to the soil conditions. Shrubs grow only on local high reliefs, with low points having grasses and sedges growing in standing water. Shrubs include blueberry and willows growing up to a few feet high. The topographic differences driving the hydrologic regime can be traced back to the braided nature of the Wulik and Kivalina River, and the interactions of relic channels and sediment deposits.

4.2.2 Palustrine Flooded

Palustrine flooded wetlands were grouped based on a gradient between permanently flooded and seasonally flooded/saturated Cowardin classifications, including:

- PEM1F: Palustrine Persistent Emergent, Semi-permanently Flooded
- PEM1/SS1F: Palustrine Persistent Emergent/Broad-Leaved Deciduous Scrub Shrub, Semipermanently Flooded
- PSS1/EM1E: Palustrine Broad-Leaved Deciduous Scrub Shrub/ Persistent Emergent, Seasonally Flooded/Saturated
- PSS1J: Palustrine Broad-Leaved Deciduous Scrub Shrub, Intermittently Flooded

Palustrine flooded wetlands are dominated during the growing season by surface water and grass/sedge interspersion. Often tussocks have developed to elevate root zones above the water level. These can be important habitat for wildlife, providing forage and nesting habitat for shorebirds. Shrubs are rarer in these areas, and typically are the results of periodic flooding, as can be seen in the PEE1/EM1E and PSS1J habitats.

The intermittently flooded scrub shrub (PSS1J) habitat plays a unique ecosystem role in the Study Area, as they generally contain river sloughs that provide habitat for juvenile fishes. These wetlands border riverine areas, and are composed of low shrub as opposed to dwarf shrub species. These areas often have little emergent vegetation, and appear to be willow species of similar age classes. These habitats appear to be subject to spring seasonal floods, which scour the emergent vegetation.

4.2.3 Soils Discussion

For both *Palustrine Saturated & Seasonally Flooded* and *Palustrine Flooded* wetlands, soil profiles were the most difficult to evaluate for primary and secondary wetland characteristics. Munsell colors were not collected for any of the profiles; but descriptions on depth, organics, and texture were available. Soil profiles demonstrated a shallow layer of organics, underlain by a saturated mixture of 'brown...loam' and organic mixture. We interpreted these to be histic epipedons.

While the definition of a histic epipedon is '8-16 inches of organics, underlain by dark mineral soil with chroma of 2 or less;' we included plots with only a few inches of organics. Our observation was that the cultural investigators often defined layers as 'mineral with roots' where wetland biologists would call them 'organic' (extending the thickness to 8 inches).

These wetlands determinations were also supported by the saturation observations. Due to the fact that shallow layers of saturation were described in October (well outside the June – August window), we believe these wetlands are at least saturated throughout the growing season. The USACE Alaska Supplement defines a hydric soil " as a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part." It further states "a soil that meets the definition of a hydric soil is hydric whether or not it exhibits indicators" specifically described in the USACE Alaska Supplement. Because of this, we believe these shallower organics meet the definition of a hydric soil.

4.2.4 Marine and Estuarine

There are many types of Waters of the United States in the Study Area; consisting of Marine, Estuary, Lacustrine, Ponds, and Riverine habitat. Cowardin classifications include:

- E1UB: Estuarine, Subtidal, Unconsolidated Bottom
- E2US: Estuarine, Intertidal, Unconsolidated Shore

- M1UB: Marine, Subtidal, Unconsolidated Bottom
- M2US: Marine, Intertidal, Unconsolidated Shore

The Chukchi Sea provides the marine habitat west of Kivalina. The Chukchi Sea is listed as a traditional navigable water of the United States by the USACE. Separating Kivalina and the mainland is the estuarian habitat of the Kivalina Lagoon. The lagoon, adjacent estuarine wetlands, and Chukchi Sea are frequently used by local residents to engage in subsistence activities and to travel to other villages.

4.2.5 Riverine

Moving inland, the dominate feature within the Study Area is the Wulik and Kivalina River. The Wulik provides an important subsistence transportation route inland for local residents. The Wulik drains the western Brooks Range, and is a listed ADF&G Anadromous Water for Chum Salmon, Coho Salmon, King Salmon, Pink Salmon, Sockeye Salmon, Dolly Varden, and Whitefish (ADFG 2017). Riverine Cowardin classifications include:

- R2UB: Riverine, Lower Perennial, Unconsolidated Bottom
- R2US: Riverine, Lower Perennial, Unconsolidated Shore
- R3UB: Riverine, Upper Perennial, Unconsolidated Bottom

4.2.6 Lacustrine and Ponds

As the Wulik and Kivalina Rivers have meandered throughout the landscape, they have formed many oxbow lakes and relic sloughs, which span the Study Area. These lacustrine environments are scattered throughout the Study Area, and provide important buffering of flood flows.

Lakes and ponds have also developed from the permafrost/ice wedge cycle. This cycle consists of water freezing and expanding cracks in the permafrost during the winter, and water filling in the cracks during the summer. If the ice wedges become exposed, they hold the summer heat, and cause ponds to form. These are present throughout the landscape in various stages of development, and provide important habitat heterogeneity.

Lacustrine and pond Cowardin classifications include:

Cowardin classifications include:

- L1UB: Lacustrine, Limnetic, Unconsolidated Bottom
- PUBH: Palustrine, Unconsolidated Bottom, Permanently Flooded

4.2.7 Uplands

There are a limited number of uplands (3% of the area) scattered throughout the Study Area. K-Hill is the most visually significant to the project, as the adjacent area is the destination for the road. This large cropping dominates the eastern end of the Study Area.

Outside of K-Hill, uplands are isolated, topographic rises above the surrounding wetlands with dryer soil regimes, often bordering lake or riverine systems. These uplands could be the result of relic depositions from the Wulik or Kivalina River, or geologic formations.

Other isolated uplands are scattered throughout the Study Area; including small pingos, which have risen above the surrounding wetlands, elevating the plant communities above the water table. Vegetation differences among uplands/compared to wetlands included larger shrub species, and visible outcroppings or ridgelines. Confirmation of pingos was greatly improved through the LiDAR datasets now available.

4.3 WILDLIFE (VIERECK) HABITAT

Wildlife habitat within the Study Area, as defined by Viereck (1992), is summarized below. In addition, the USFWS found that II.C.1 (Closed Low Scrub) habitat is likely to hold important bird habitat.

Habitat Type	Acres	% Study area
Developed	64.8	0.2%
II.C.1 (Closed Low Scrub)	3,228.7	8.7%
II.D.2 (Willow Dwarf Shrub)	9,057.3	24.5%
III.A.2 (Mesic Graminoid Herbaceous)	14,348.7	38.9%
III.A.3 (Wet Graminoid Herbaceous)	1,877.6	5.1%
W (Water)	8,339.3	22.6%
Total Study area	36,916.4	100.0%

Table 3: Summary of wildlife habitat

4.3.1 II.C.1 (Closed Low Scrub)

Closed Low Scrub is the classification for all important bird shrub habitat (Figure 3 and 4. Appendix A). These shrubs are 20 cm (centimeter) to 1.5 m (meter) tall, and are often found bordering waterways. They are the highest canopy vegetation available in the Study Area, and provide some of the only perching locations for birds in the area. These provide nesting habitat, elevated above predators, and locations for surveillance. Morning and evening song behavior from perching locations helps to establish territories, and attract mates. This habitat is less common in the Study Area, and was promoted from previous reports/assessments by one functional value (e.g. II to I or I to I+) to account for its local importance.

4.3.2 II.D.2 (Willow Dwarf Shrub)

Willow Dwarf Shrub is shrub dominated habitat (>25% shrub cover), with heights below 20 cm. Willows are the dominant species evident in the field data, although other species such and blueberry are present. The areas tend to have slightly dryer hydrologic regimes compared to emergent habitat allowing the growth of additional species. They can provide important ground nesting bird habitat, along with berry species to support omnivores.

4.3.3 III.A.2 (Mesic Graminoid Herbaceous)

Mesic Graminoid Herbaceous habitat has up to 25% shrub cover, and are moist sites, usually with seasonal flooding but without standing water. Tussocks are present, along with high centered polygons. This microtopographic relief can be used for nesting by shorebirds, and supports important sedges and grasses for herbivores. This habitat is common both in the Study Area and in the region as a whole.

4.3.4 III.A.3 (Wet Graminoid Herbaceous)

Wet Graminoid Herbaceous habitat has standing water present for most of the year, with up to 25% shrub cover. It tends to be dominated by obligate sedges and grasses. The sedges and grasses can provide important forage habitat for herbivores, and shorebirds often feed on invertebrates present in the standing water.

4.3.5 W (Water)

Viereck summarizes all ponds, lakes, rivers, estuaries, and ocean habitat as Water. This habitat comprises about 22% of the Study Area. Water habitats are important fish and wildlife habitat. In particular, deep pools provide overwintering locations for resident fish species.

4.4 FUNCTIONAL ASSESSMENT

This report's functional assessment mirrored the methodology presented in ASRC (2015) to maintain a consistent approach. Similar to the last assessment, wetlands were found to be high ranking (Figure 5, Table 4). Waters of the United States (ponds, riverine, tidal, estuarine, and lacustrine) were promoted to Category I+ to indicate their intrinsic importance. Saturated wetlands (PSS1/EM1B) were ranked as Category II.

Important bird habitat was found to consist of Closed Low Scrub habitat (II.C.I). Upon consultation with the USFWS, all Closed Low Scrub (II.C.I) was promoted one functional level (e.g. II to I or I to I+).

Habitat Type	Acres	USFWS Bird Shrub Habitat? (II.C.I)	Functional Value/Category	
Wetlands	Wetlands			
PEM1/SS1B	296.2	No	II	
PEM1/SS1C	71.1	Yes	+	
	13488.7	No	I	
PEM1/SS1F	581.0	No	l	
DEM1C	17.1	Yes	+	
PEM1C	563.8	No		
PEM1F	1296.6	No		
DCC1/EM1D	150.3	Yes	I	
F331/LIMIB	5873.5	No	II	
DSC1/EM1C	857.7	Yes	+	
F331/LIMIC	1184.3	No	I	
DSS1/EM1E	587.4	Yes	+	
F331/LIVIIL	843.2	No	I	
DSS1C	1301.7	Yes	+	
F331C	89.6	No	I	
DCC11	172.0	Yes	+	
F331J	59.9	No	I	
Total Wetlands	27434.1	-	-	
Waters of the U.S.				
E1UB	3686.9	No	+	
E2US	135.1	No	+	
L1UB	1164.3	No	l+	
M1UB	109.1	No	+	
M2US	73.7	No	+	
PUBH	949.5	No	+	
R2UB	1378.4	No	+	
R2US	737.8	No	+	
R3UB	176.0	No	+	
Total Waters	8410.8			
Uplands				
Upland	1071.5	-	-	
Total Study Area	36916.4	-	-	

Table 4: Final Functional Assessment Acreage

4.4.1 Category I+

Category I+ polygons were reserved for ponds, rivers, lakes, oceans, estuaries, and elevated bird habitat (discussed below). These landscape features have a higher intrinsic value than neighboring wetlands due to their roles in the environment. To aid in project planning, it was determined to be important to raise these features above Category I.

4.4.2 Category I

67% of wetlands (which are not Waters of the US) in the Study Area are Category I. This is due to the low level of disturbance in the ecosystem. Wetlands are relatively pristine, and fully functioning within their natural environment. Few wetlands are providing unique functions or services, and instead work as a large interrelated network extending far beyond the Study Area boundaries.

4.4.3 Category II

Category II habitats comprised the smallest functional category. These were saturated shrub habitat, which provide relatively low levels of flood flow alteration and sediment removal. Saturated wetlands are the least wet, and it is common for them to be the lowest ranked due to their similarities with uplands. These often are on small ridges or pingos, bordering uplands and wetter wetlands.

4.4.4 Bird Habitat

The USFWS has indicated that Low Scrub Habitat (II.C.I) provides important bird habitat in the Study Area. The functional assessment promoted all Low Scrub Habitat one functional level (e.g. II to I, or I to I+) to incorporate these comments. These habitats tended to be near riverine systems.

Due to the slight differences in Viereck and Cowardin Classification systems, bird habitat (II.C.1) is found in a variety of wetland classifications (PEM1/SS1C, PEM1C, PSS1/EM1B, PSS1/EM1C, PSS1/EM1E, PSS1C, PSS1J).

This is particularly important to note, because not all Low Scrub Habitat is ranked as Category I+. The important bird habitat was elevated one level, which depending on the Cowardin classification elevated polygons from II to I or I to I+ (Table 4).

4.5 CONCLUSION AND JURISDICTION

Development activities from construction of the proposed project would likely impact wetlands and/or Waters of the U.S. under the jurisdiction of USACE. Based on the review of existing hydrology information, drainage within the Study Area flows into the Kivalina River, Wulik River, or directly into the Chukchi Sea, a traditional navigable Water of the U.S. The Kivalina River and Wulik River also flows into the Kivalina Lagoon, a tidal estuary of the Chukchi Sea.

Wetlands in the Study Area have a clear direct surface connection to the Kivalina River, Wulik River, Kivalina Lagoon, or Chukchi Sea. For this reason, wetlands and Waters of the U.S. in the Study Area are presumed jurisdictional by the USACE under Section 404 of the CWA and Section III.D.2 of the Jurisdictional Determination Form.

5.0 **REFERENCES**

- ADFG. 2017. Anadromous Waters Catalog. https://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?ADFG=main.home
- ASRC. 2015. Wetland Delineation and Functions & Values Assessment. Prepared for Northwest Arctic Borough, Office 163 Lagoon Street, Kotzebue, AK 99752
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. United States Department of the Interior. US Fish and Wildlife Service. Office of Biological Services. Washington D.C. 20240
- Golder Associates. 2015. Kivalina Evacuation Road Geotechnical Report, Kivalina, Alaska. Submitted to: Northwest Arctic Borough c/o Chase Nelson, DOWL, 164 Lagoon Street, Kotzebue, AK 99752
- Munsell Color (Firm). (2010). Munsell soil color charts: with genuine Munsell color chips. Grand Rapids, MI: Munsell Color,
- Stantec. 2017. Kivalina Evacuation and School Site Access Road. Cultural Resources Assessment Report. Prepared for Remote Solutions, LLC
- Stantec. 2016. Kivalina Evacuation and School Site Access Road. September 2016 Stantec site reconnaissance. Unpublished Data.
- United States Army Corps of Engineers. 2017. *Kivalina Evacuation Route Wetland Delineation*. Prepared by Jeremy Grauf.
- United States Army Corps of Engineers. 2007. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region (Version 2.0)*. United States Army Engineer Research and Development Center, Vicksburg MS.
- United States Army Corps of Engineers. 1987. Corps of Engineers Wetlands Delineation Manual. Environmental Laboratory, Waterways Experiment Station, Vicksburg MS.
- Viereck, L.A., C.T. Dyrness, A.R. Batten, and K.J. Wenzlick. 1992. *The Alaska Vegetation Classification*. United States Department of Agriculture, Forest Service.
- WHPacific. 2012a. Kivalina Evacuation Road Project, Preliminary Environmental Report. Prepared for Maniilaq Association on behalf of Native Village of Kivalina.
- WHPacific. 2012b. Native Village of Kivalina Evacuation Route Significant Biotic Resources Baseline Report and Preliminary Essential Fish Habitat Analysis. Prepared for Manillaq Association on behalf of Native Village of Kivalina.

WHPacific. 2014. Evacuation and School Access Road Project, Kivalina, Alaska. Route Reconnaissance Study. Prepared for Native Village of Kivalina. Appendix A SITE MAPS



2047055102\G iS\mxd\We tiand Report Figs\Fg_1_Vicinty_ct aft.mxd Revked: 2017-09-14 By: cpar

Appendix H Page 31









- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 3 of 87





- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



t

Page 4 of 87





- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 5 of 87






Project Location Project Origin: Kivalina, Alaska Section 21, Township 27N, Range 26W Kateel River Meridian

002(384)/NFHWYP00162 REVA Prepared by CDP on 2017-06-23 Technical Review by ABC on 2017-0X-XX Independent Review by ABC on 2017-0X-XX

Client/Project State of Alaska, DOT & PF Northern Region Wetlands Verification Report

Kivalina Evacuation and School Site Access Road Figure No.

2 - B2 Title

Kivalina Evacuation and School Site Access Road - Wetlands

Page 6 of 87





- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 7 of 87







- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 113000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 8 of 87







- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 9 of 87







Access Road - Wetlands

Page 10 of 87





- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 11 of 87







Legend

Project Location Project Origin: Kivalina, Alaska Section 21, Township 27N, Range 26W Kateel River Meridian 002(384)/NFHWYP00162 REVA Prepared by CDP on 2017-06-23 Technical Review by ABC on 2017-0X-XX Independent Review by ABC on 2017-0X-XX

Client/Project State of Alaska, DOT & PF Northern Region Wetlands Verification Report

Kivalina Evacuation and School Site Access Road Figure No.

2 - D2 Title

Kivalina Evacuation and School Site Access Road - Wetlands

Page 12 of 87

t





- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 13 of 87





- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 14 of 87



1	þ	\$	
)			





Data Points (2016)

- Standard Data Point
- Photo Point

Wetland Type

Estuarine
Lacustrine
Marine
Palustrine_Flooded
Palustrine_Saturated
Pond
Riverine
Upland
Study Area

Notes

- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 113000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013







- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 16 of 87



Page 17 of 87







Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL,

Project Location Project Origin: Kivalina, Alaska Section 21, Township 27N, Range 26W Kateel River Meridian Client/Project 002(384)/NFHWYP00162 REVA Prepared by CDP on 2017-06-23 Technical Review by ABC on 2017-0X-XX Independent Review by ABC on 2017-0X-XX

State of Alaska, DOT & PF Northern Region Wetlands Verification Report

Kivalina Evacuation and School Site Access Road Figure No.

2 - E4 Title

Kivalina Evacuation and School Site Access Road - Wetlands

Page 18 of 87

t





- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 19 of 87





- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 20 of 87





- were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 21 of 87





- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 22 of 87







Estuarine
Lacustrine
Marine
Palustrine_Flooded
Palustrine_Saturated
Pond
Riverine
Upland

Study Area

Notes

- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013







3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 24 of 87





- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 25 of 87







Legend

Data Points (2016)Standard Data Point

Photo Point

Kivalina Evacuation and School Site Access Road - Wetlands

State of Alaska, DOT & PF Northern Region

Kivalina Evacuation and School Site Access Road

Project Location Project Origin: Kivalina, Alaska Section 21, Township 27N, Range 26W Kateel River Meridian

Wetlands Verification Report

Client/Project

Figure No. 2 - F4

Page 26 of 87

002(384)/NFHWYP00162 REVA Prepared by CDP on 2017-06-23 Technical Review by ABC on 2017-0X-XX Independent Review by ABC on 2017-0X-XX

t





- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 27 of 87





- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 28 of 87





- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 113000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013





^{1:6,500 (}At original document size of 11x17)



- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 30 of 87







Kivalina Evacuation and School Site Access Road - Wetlands

State of Alaska, DOT & PF Northern Region

Kivalina Evacuation and School Site Access Road

Project Location Project Origin: Kivalina, Alaska Section 21, Township 27N, Range 26W Kateel River Meridian

Wetlands Verification Report

Client/Project

Figure No. 2 - G1

Page 31 of 87

002(384)/NFHWYP00162 REVA Prepared by CDP on 2017-06-23 Technical Review by ABC on 2017-0X-XX Independent Review by ABC on 2017-0X-XX





Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Project Location Project Origin: Kivalina, Alaska Section 21, Township 27N, Range 26W Kateel River Meridian 002(384)/NFHWYP00162 REVA Prepared by CDP on 2017-06-23 Technical Review by ABC on 2017-0X-XX Independent Review by ABC on 2017-0X-XX Client/Project State of Alaska, DOT & PF Northern Region Wetlands Verification Report Kivalina Evacuation and School Site Access Road Figure No. 2 - G2 Title Kivalina Evacuation and School Site Access Road - Wetlands

Page 32 of 87





- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 33 of 87







Legend

Data Points (2016) • Standard Data Point

Palustrine_Flooded Palustrine_Saturated

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 113000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they

3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013

G6

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN,

J3 J4 J5 J6

Pond Riverine Upland Study Area

were refined as appropriate.

G2 G3 G4

J2

К2 К3

Notes

Photo Point Wetland Type Estuarine Lacustrine Marine

Page 34 of 87





- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 35 of 87





Page 36 of 87





Client/Project State of Alaska, DOT & PF Northern Region Wetlands Verification Report

Kivalina Evacuation and School Site Access Road Figure No.

2 - G7 Title

Kivalina Evacuation and School Site Access Road - Wetlands

Page 37 of 87





- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 38 of 87







Legend

Data Points (2016) • Standard Data Point

Palustrine_Flooded Palustrine_Saturated

> Pond Riverine Upland

Photo Point Wetland Type Estuarine Lacustrine Marine





3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



0

Page 40 of 87







Legend

Data Points (2016) • Standard Data Point

Photo Point Wetland Type Estuarine Lacustrine Marine






Project Location Project Origin: Kivalina, Alaska Section 21, Township 27N, Range 26W Kateel River Meridian 002(384)/NFHWYP00162 REVA Prepared by CDP on 2017-06-23 Technical Review by ABC on 2017-0X-XX Independent Review by ABC on 2017-0X-XX

Client/Project State of Alaska, DOT & PF Northern Region Wetlands Verification Report

Kivalina Evacuation and School Site Access Road Figure No.

2 - H5 Title

Kivalina Evacuation and School Site Access Road - Wetlands

Page 43 of 87













- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 46 of 87





3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 47 of 87





Stantec Legend Data Points (2016) • Standard Data Point Photo Point

Wetland Type

51	
	Estuarine
	Lacustrine
	Marine
	Palustrine_Flooded
	Palustrine_Saturated
	Pond
	Riverine
	Upland
	Study Area

Notes

- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 48 of 87



DeLorme, Intermap, increment

002(384)/NFHWYP00162 REVA Prepared by CDP on 2017-06-23 Technical Review by ABC on 2017-0X-XX Independent Review by ABC on 2017-0X-XX

Page 49 of 87





Page 50 of 87





J3 J4 J5 J6 К3 Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Project Location Project Origin: Kivalina, Alaska Section 21, Township 27N, Range 26W Kateel River Meridian 002(384)/NFHWYP00162 REVA Prepared by CDP on 2017-06-23 Technical Review by ABC on 2017-0X-XX Independent Review by ABC on 2017-0X-XX Client/Project State of Alaska, DOT & PF Northern Region Wetlands Verification Report Kivalina Evacuation and School Site Access Road Figure No. 2 - i5 Title Kivalina Evacuation and School Site Access Road - Wetlands

Page 51 of 87











Kivalina Evacuation and School Site Access Road Figure No.

2 - 18 Title

Kivalina Evacuation and School Site Access Road - Wetlands

Page 54 of 87







Riverine Upland

Study Area

Pond

Notes

- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 55 of 87







Stantec

Legend

Data Points (2016)

Photo Point Wetland Type Estuarine Lacustrine Marine

• Standard Data Point

Palustrine_Flooded Palustrine_Saturated

Pond

Access Road - Wetlands

Page 56 of 87







Stantec

Legend

Data Points (2016) • Standard Data Point

Palustrine_Flooded Palustrine_Saturated

> Pond Riverine

Photo Point Wetland Type Estuarine Lacustrine Marine

- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they





- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTilfs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 113000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 58 of 87







Stantec

Legend

Data Points (2016)

Photo Point Wetland Type Estuarine Lacustrine Marine

• Standard Data Point

Page 59 of 87





- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 60 of 87





State of Alaska, DOT & PF Northern Region

Kivalina Evacuation and School Site

Kivalina Evacuation and School Site Access Road

Wetlands Verification Report

Access Road - Wetlands

Figure No. 2 - J7 Title

Page 61 of 87



Access Road - Wetlands

002(384)/NFHWYP00162 REVA Prepared by CDP on 2017-06-23 Technical Review by ABC on 2017-0X-XX Independent Review by ABC on 2017-0X-XX

Palustrine_Saturated

G3 G4

J4 J5 J6

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL,

Pond Riverine Upland

Page 62 of 87









Legend

Data Points (2016)

• Standard Data Point

Stantec

Photo Point

Wetland Type

Estuarine
Lacustrine
Marine
Palustrine_Flooded
Palustrine_Saturated
Pond
Riverine
Upland
Study Area

Notes

- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013





Page 65 of 87







State of Alaska, DOT & PF Northern Region

Kivalina Evacuation and School Site Access Road

Stantec

Legend

Data Points (2016) • Standard Data Point

Palustrine_Flooded Palustrine_Saturated

1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet

2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they

3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013

J3 J4 J5 J6

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS,

FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL,

002(384)/NFHWYP00162 REVA Prepared by CDP on 2017-06-23 Technical Review by ABC on 2017-0X-XX Independent Review by ABC on 2017-0X-XX

Photo Point Wetland Type

Estuarine Lacustrine Marine

Pond Riverine Upland Study Area

were refined as appropriate.

G2 G3

Project Location Project Origin: Kivalina, Alaska Section 21, Township 27N, Range 26W Kateel River Meridian

Wetlands Verification Report

Client/Project

Figure No. 2 - K4 K2 K3 K4

Notes

Page 66 of 87







Pond Riverine Upland Study Area

Notes

- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 67 of 87















Page 70 of 87







- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 71 of 87



DeLorme, Intermap, increment

002(384)/NFHWYP00162 REVA Prepared by CDP on 2017-06-23 Technical Review by ABC on 2017-0X-XX Independent Review by ABC on 2017-0X-XX

Page 72 of 87





- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 73 of 87









Access Road - Wetlands

Page 74 of 87





State of Alaska, DOT & PF Northern Region Wetlands Verification Report

Kivalina Evacuation and School Site Access Road Figure No.

2-L7 Title

Kivalina Evacuation and School Site Access Road - Wetlands

Page 75 of 87





Access Road - Wetlands

Page 76 of 87





- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate:
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 77 of 87








- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 79 of 87





- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 113000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 80 of 87





- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Page 81 of 87





Stantec

Legend

Data Points (2016) • Standard Data Point

Photo Point Wetland Type Estuarine

Notes

- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 82 of 87





- 1. Coordinate System: NAD 1983 2011 StatePlane Alaska 8 FIPS 5008 Feet
- 2. Wetland mapping protocol: NWI boundaries were imported for the entire project. The geoTiffs of the November 2015 ASRC wetland report were brought into GIS, and wetland polygons were hand traced to replace the NWI mapping at 1:3000 scale. Then Stantec used field data to updated the wetland classifications for the entire area. NWI boundaries were retained, except for the smaller ASRC area where they were refined as appropriate.
- 3. Orthoimagery: Combination ©Kodiak Mapping Inc., 2011, ©AeroMetric Inc., 2013



Access Road - Wetlands

Page 83 of 87







State of Alaska, DOT & PF Northern Region

Kivalina Evacuation and School Site

Kivalina Evacuation and School Site Access Road

Wetlands Verification Report

Access Road - Wetlands

Figure No. 2 - 08 Title

Stantec

Legend

Data Points (2016)

Page 84 of 87













Appendix B STANDARD WETLAND DELINEATION DATA SHEETS

Project/Site:	Kivalina		Borough/City	: N	W Arctic	Sampling Date:	Sept/Oct 2016
Applicant/Owner:		DOT	&PF			Sampling Point	HP40
Investigator(s):	Stantec		Landform (hil	lside, terrace	, hummocks, etc	Slight te	errace
Local relief (concave,	convex, none):	convex	Slope (%):	0			
Subregion: Western I	Brooks Range Mts Foo	othills Lat: 67.	803448	Long:	-164.409217	Datum:	NAD83
Soil Map Unit Name:		Not Availabl	е		NWI classifi	cation: PSS	S1/EM1E
Are climatic / hydrolog	gic conditions on the s	te typical for this tin	ne of year? Ye	x No	(If no, explain	in Remarks.)	
Are Vegetation	Soil, or Hydrold	ogysignificant	ly disturbed?	Are "No	rmal Circumstance	es" present? Yes	x No
Are Vegetation	Soil, or Hydrold	ogy naturally p	problematic?	(If neede	ed, explain any an	swers in Remarks	3.)
SUMMARY OF FIND	INGS – Attach site ma	ap showing sampl	ing point loca	tions, transe	cts, important fe	atures, etc.	
Hydrophytic Vegetatio	on Present? Yes	x No					
Hydric Soil Present?	Yes	x No	Is the Sam	oled Area			
Wetland Hydrology P	resent? Yes	x No	within a W	etland?	Yes <u>x</u> No		
Remarks Larger willow	ws along northeast sid	e of large lake at ba	ase of K-hill we	st. Drainage a	apparant along pat	ths between willow	vs. This point
combines	the soil information (fro	om an Oct 2016 cult	ural investigati	on) with the s	ite photos of vege	tation during a Se	pt 2016 site
visit, conduc	cted by Stantec. We have	ave determined that	t there was end	ugh informati	on from these invo	estigations to info	rm the status
			of the sit	e.			

3/3 Abbrev.	Species Name	Absolute Do	ominant	Indicator	Dominance Test worksheet:
Tree Stratum		% Cover S	pecies?	Status	Number of Dominant Species
1					That Are OBL, FACW, or FAC: 2 (A)
<u>2</u>					Total Number of Dominant
4					Species Across All Strata: 2 (B)
· — –	Total Cover:	0			
	50% of total cover: 0	20% of tot	tal cover	: 0	Percent of Dominant Species
		-			That Are OBL, FACW, or FAC: 1 (A/B)
Sapling/Shrub Str	atum				
1	Salix, Unidentified	80	YES	FAC	
2 vaculi	Vaccinium uliginosum	10	NO	FAC	Prevalence Index worksheet:
3					Total % Cover of: Multiply by:
4					OBL species $0 \times 1 = 0$
5					FACW species $0 \times 2 = 0$
°	Tatal Oscar	- <u>-</u> -			FAC species $190 \times 3 = 570$
	I otal Cover:	90		. 10	FACU species $0 \times 4 = 0$
	50% of total cover: 45	20% of to	ai cover	18	$\begin{array}{c} \text{OPL species} & 0 & \text{X 5} = & 0 \\ \text{Colump Totala:} & 100 & (\text{A}) & 570 & (\text{P}) \end{array}$
Horb Stratum					Column rotals. 190 (A) 570 (B)
	Unidentified Grass	100	VES	FAC	Prevalence Index – $B/A - 3$
2	Childentined Chass	100		TAU	
3					Hydrophytic Vegetation Indicators:
4					Yes Dominance Test is >50%
5					Yes Prevalence Index is ≤3.0
6					Morphological Adaptations ¹ (Provide
7					supporting data in Remarks or on a separate
8					Problematic Hydrophytic Vegetation ¹ (Explain)
9					
10					¹ Indicators of hydric soil and wetland hydrology must
	Total Cover:	100			be present unless disturbed or problematic
	50% of total cover: 50	20% of tot	tal cover	20	
					Hydrophytic
Plot size (radius,	or length x width)	% Bare G	round		Vegetation
% Cover of Wetla	Ind Bryophytes Total Co	ver of Bryoph	nytes		Present? Yes x No
Remarks:					

SO	I	I

Profile Descr	ription: (Describe Matrix	to the depth	needed to docum	n ent the i dox Featu	i ndicator d ures	or confirn	n the absence	of indicators.)
(inches)	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²	Texture	Remarks
0-6							Sod	DME-16-008
			_		_	_	Brown silty	
6-26						·	clay loam	no roots; DME-16-008
								DME-16-008 is the
				<u> </u>				Stantec Cultural Point
<u> </u>								
· · · · ·								
				<u> </u>				
¹ Type: C=Concentr	ration, D=Depletio	n, RM=Reduc	ed Matrix, CS=Cov	ered or C	Coated Sar	nd Grains.	² Location: P	PL=Pore Lining, M=Matrix.
Hydric Soil Indica	itors:	Indicators for	or Problematic Hyd	dric Soils	s ³ :			
Histosol or Histosol or Histosol	stel (A1)	Alaska C	Color Change (TA4))4	Alaska	Gleyed W	ithout Hue 5Y c	or Redder
x Histic Epipedo	on (A2)	Alaska A	Alpine Swales (TA5))	Unde	rlying Lay	er	
Hydrogen Sult	fide (A4) urface (A12)	Alaska F	tedox With 2.5Y Hι	ne	Other (E	Explain in	Remarks)	
Alaska Gleve	Δ12)	³ One indicat	or of hydrophytic ve	retation	one nrima	ny indicate	or of wetland	
Alaska Redox	α (A14) « (A14)	hvdrology, ar	nd an appropriate la	andscape	nosition m	nust be pr	esent unless di	sturhed
Alaska Gleve	d Pores (A15)	⁴ Give details	of color change in	Remarks		1001 00 p.	550m unicoo a.c	stabea
Restrictive Laver	(if present):	••••			- -			
Type:	Pe	rmafrost			Hydric	Soil		
Depth (inches	3):	72			Presen	t?	Yes x I	No
Remarks Oct 2016	⁶ Stantec Cultural	Point DME-16	6-008 was used for	soils. Wł	nile Munse	Il colors w	ere not identifie	ed. we interpreted 0-6 inches
as being	organics, 6-26 inc	ches as being	a layer of organic/r	nineral so	oil mix mee	eting the d	efinition of a Hi	stic Epipedon ('brown' being
chrom	a 2 or less, 'dense	eroots' as or exp	ganics). Saturation bect the organics to	was note be satura	ed at below ated during	v 5 inches g June – A	. As the site wa	s sampled in October, we
HYDROLOGY								
Wetland Hyd	rology Indicators	s:				Seconda	ary Indicators (2	2 or more required)
Primary Indicators	(any one indicator	r is sufficient)				Wa	ter-stained Leav	ves (B9)
Surface Wate	r (A1)	Inundatio	on Visible on Aerial	Imagery	(B7)	x Dra	inage Patterns	(B10)
x High Water Ta	able (A2)	Sparsely	/ Vegetated Concav	ve Surfac	e (B8)	Oxio	dized Rhizosph	eres along Living Roots (C3)
x Saturation (A:	3)	Marl Dep	posits (B15)			Pre	sence of Reduc	ed Iron (C4)
Water Marks	(B1)	Hydroge	n Sulfide Odor (C1))		San	Deposits (U5)	
Sediment Dep	DOSITS (B2)	Dry-Sea	son Water Table (C	;2)			Ated or Stresse	d Plants (D1)
Algel Mat or ((B3) Sruct (B4)		xpiain in Remaiks)			Get	Morphic Fosia	00 (U2) ופח
	/R5)					Mic	rotopographic F	JS) Paliaf (NA)
Surface Soil (Cracks (B6)						-Neutral Test ((D5)
Field Observation	IS:				٦		, , , , , , , , , , , , , , , , , , ,	,00)
Surface Water Pre	sent? Yes	No x	Depth (inches):		Wetlan	d		
Water Table Prese	ent? Yes x	No	Depth (inches):	8	Hydrold	ogy		
Saturation Present	? Yes <u>x</u>	No	Depth (inches):	6	Presen	t?	Yes x	No
(includes capi	illary fringe)							
Describe Recorded	J Data (stream gar	uge, monitorin	ig well, aerial photo	s, previou	us inspecti	ons), if av	ailable:	
Remarks: The Or	ct 2016 Stantec C	ultural Point D)ME-16-008 found {	50-75% w	ater satura	ation at 6 i	inches. There is	s no note of a water table, as
this	s information is no	ot typically recr	orded in a cultural in	nvestigati	ion. In our	experienc	e in the region,	saturation of this degree
pro	obably means the	water table is	near the 8 inch ma	ark during	June - Au	igust. It is	also important	to review the secondary
			chara	acteristics	of this site	э.		

Project/Site: Kivalina	Site No HP40
Applicant/Owner: DOT&PE	Investigator(s): Stantec
Date: 9/14/2017	Cowardin: PSS1/EM1E
Notes: Larger willows along northeast side of la	rge lake at base of K-hill west
Overview of Lake looking south	Overview of Lake looking south

Project/Site:	Kivalina		Borough/Cit	y:	NW Arctic	Sampling Date:	Sept/Oct 2016
Applicant/Owner:			DOT&PF			Sampling Point	P7
Investigator(s):	Stantec		Landform (h	illside, terrac	ce, hummocks, etc	Old Te	rrace
Local relief (concave, cor	nvex, none):	None	Slope (%):	0			
Subregion: Western Bro	oks Range Mts Foo	thills Lat:	67.778212	Long:	-164.460604	Datum:	NAD83
Soil Map Unit Name:		Not Av	railable		NWI classifi	cation: PEN	/1/SS1C
Are climatic / hydrologic	conditions on the si	te typical for t	his time of year? Ye	e <u>x</u> No	(If no, explain	in Remarks.)	
Are Vegetation, So	il, or Hydrolo	gy sign	ificantly disturbed?	Are "N	Iormal Circumstance	es" present? Yes	<u>x</u> No
Are Vegetation, So	il, or Hydrolo	gy natu	rally problematic?	(If nee	eded, explain any an	swers in Remark	s.)
SUMMARY OF FINDING	S – Attach site ma	p showing s	ampling point loc	ations, trans	sects, important fe	atures, etc.	
Hydrophytic Vegetation F	resent? Yes	x No					
Hydric Soil Present?	Yes	x No	Is the San	npled Area			
Wetland Hydrology Prese	ent? Yes	x No	within a V	Netland?	Yes x No		
	-						
Remarks Old channel cultural invest data was not t	and gravel bars with igation with the site aken specifically, at	n standing wa photos of veg this location	ter adjacent to sout getation during a Se we have determine	h. This point ept 2016 site d that there v	combines the soil ir visit, both conducte was enough informa	nformation from a d by Stantec. Wh tion from these ir	n Oct 2016 ile wetlands ivestigations
			to morn the state	us of the site	-		

3/3 Abbrev. Tree Stratum	Species Name	Absolute Dominant Indicator % Cover Species? Status	Dominance Test worksheet: Number of Dominant Species
1			That Are OBL, FACW, or FAC:(A)
2 3 4		$\equiv \equiv \equiv$	Total Number of Dominant Species Across All Strata: <u>2</u> (B)
	Total Cover:	0 20% of total cover: 0	Percent of Dominant Species That Are OBL, FACW, or FAC:(A/B)
Sapling/Shrub S	Stratum		
1 vacvit 2 rhotom 3 betnan	Vaccinium vitis-idaea Rhododendron tomentosum Betula nana	$\begin{array}{c c} 50 & YES & FAC \\ \hline 50 & YES & FACW \\ \hline 10 & NO & FAC \end{array}$	Prevalence Index worksheet: Total % Cover of: Multiply by:
4 5			OBL species 0 $x 1 = 0$ FACW species 50 $x 2 = 100$ FAC species 60 $x 3 = 180$
0	Total Cover: 50% of total cover: 55	110 20% of total cover: 22	FACU species 0 $x = 100$ FACU species 0 $x = 0$ UPL species 0 $x = 0$ Column Totals: 110 (A) 280 (B)
Herb Stratum 1 2			Prevalence Index = $B/A = 2.5455$
3 4 5 6 7 8			Hydrophytic Vegetation Indicators: Yes Dominance Test is >50% Yes Prevalence Index is ≤3.0 Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate Problematic Hydrophytic Vegetation ¹ (Explain)
10	Total Cover:	0	¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
Plot size (radius % Cover of Wet	50% of total cover: , or length x width) land BryophytesTotal Cov	20% of total cover: 0 % Bare Ground ver of Bryophytes	Hydrophytic Vegetation Present? Yes x No
Remarks: SI	hrubs were present on the microt were identified in cultural ir	topographic 'highs'. Also un-ide nvestigation notes. BetNan app	entified grasses and sedges are present. VacVit and RhoTom bears present in the background of the closeup photo.

S	0	I	I
_	_	-	-

Profile Desc	ription: (Describe	e to the dept	h needed to docum	ent the	indicator o	or confirm	n the absence	of indicators.)
(inches)	Color (moist)) %	Color (moist)	%	Type ¹	1 oc^2	Texture	Remarks
(incres)) /0		70	турс	LOC	Texture	Remarks
0-2							Moss	JAJ-16-048
							Brown silty	dense fine to medium
2-4							clay loam	roots; JAJ-16-048
							Gray clay	
4-10							no gravels	No roots; JAJ-16-048
								JAJ-16-048 is the
								Stantec Cultural Point
1								
'Type: C=Concen	tration, D=Depletic	on, RM=Redu	ced Matrix, CS=Cov	ered or C	Coated San	d Grains.	² Location: P	L=Pore Lining, M=Matrix.
Hydric Soil Indic	ators:	Indicators	for Problematic Hyd	dric Soil	s°:			
Histosol or H	listel (A1)	Alaska	Color Change (TA4)	4	Alaska	Gleyed W	ithout Hue 5Y c	or Redder
x Histic Epiped	don (A2)	Alaska	Alpine Swales (TA5))	Unde	rlying Lay	er	
Hydrogen Su	ulfide (A4)	Alaska	Redox With 2.5Y Hu	ie	Other (E	Explain in	Remarks)	
Thick Dark S	Surface (A12)							
Alaska Gleye	ed (A13)	³ One indica	tor of hydrophytic ve	getation,	one prima	ry indicate	or of wetland	
Alaska Redo	ox (A14)	hydrology, a	and an appropriate la	ndscape	position m	lust be pr	esent unless dis	sturbed
Alaska Gleye	ed Pores (A15)	⁴ Give detail	s of color change in	Remarks	•			
Restrictive Layer	r (if present):							
Туре:		None			Hydric	Soil		
Depth (inche	es):				Present	1?	Yes x I	No
Remarks Soils i	nformation is take	n from a Oct	2016 cultural resourc	ces inves	tigation. 25	5-50% sat	turation was not	ed at 5-11". While Munsell
colors v	vere not identified,	we interprete	ed a 2" layer of moss	s, at 2-4"	a layer of s	aturated	organics (prima	rily due to the 'dense roots')
meetii	ng the definition of	a Histic Epip	edon, and at 4-10" a	a layer of	mineral so	il meeting	g the definition of	of a Histic Epipedon ('gray'
	being chroma 2 o	r less). This i	nterpretation has bee	en booste	ed by the s	ite photog	graphs and our r	regional experience.
HYDROLOGY								
Wetland Hyd	drology Indicator	s:				Second	ary Indicators (2	2 or more required)
Primary Indicators	s (any one indicato	r is sufficient)			Wa	ter-stained Leav	ves (B9)
Surface Wate	er (A1)	Inunda	tion Visible on Aerial	Imagery	(B7)	Dra	inage Patterns	(B10)
x High Water 1	Table (A2)	Sparse	ly Vegetated Concav	e Surfac	e (B8)	Oxi	dized Rhizosph	eres along Living Roots (C3)
x Saturation (A	\ 3)	Marl De	eposits (B15)			Pre	sence of Reduc	ced Iron (C4)
Water Marks	s (B1)	Hydrog	en Sulfide Odor (C1))		Sal	t Deposits (C5)	
Sediment De	eposits (B2)	Dry-Se	ason Water Table (C	2)		Stu	nted or Stresse	d Plants (D1)
Drift Deposits	s (B3)	Other (Explain in Remarks)			Ge	omorphic Positio	on (D2)
Algal Mat or	Crust (B4)					Sha	allow Aquitard (I	D3)
Iron Deposits	s (B5)					<u> </u>	rotopographic F	Relief (D4)
Surface Soil	Cracks (B6)				_	FA	C-Neutral Test (D5)
Field Observation	ns:					•		
Surface Water Pre	esent? Yes	<u>No x</u>	Depth (inches):		wetian	a		
Water Table Pres	ent? Yes x	No	Depth (inches):	~5	Hydroid	ogy	¥	
Saturation Presen	nt? Yes <u>x</u>	N0	Depth (inches):	5	Present	17	Yes x I	NO
(includes con								
(includes cap	oillary fringe)			o or	un increst'	ana) :	(allahla)	
(includes cap Describe Recorde	oillary fringe) ed Data (stream ga	luge, monitor	ing well, aerial photo	s, previo	us inspecti	ons), if av	/ailable:	
(includes cap Describe Recorde	oillary fringe) ed Data (stream ga	luge, monitor	ng well, aerial photo	s, previo	us inspecti	ons), if av	vailable:	
(includes cap Describe Recorde	oillary fringe) ed Data (stream ga	luge, monitor	ing well, aerial photo	s, previo	tion at 5.1	ons), if av	vailable:	a of a water table, as this
(includes cap Describe Recorde Remarks: Th	billary fringe) ed Data (stream ga ne Oct 2016 cultura mation is not turio	uge, monitor al investigatio	ng well, aerial photo	s, previo er satura	tion at 5-1	ons), if av	railable: There is no note	e of a water table, as this
(includes car Describe Recorde Remarks: Th	billary fringe) ad Data (stream ga ne Oct 2016 cultura mation is not typic	uge, monitor al investigatic ally recorded	ng well, aerial photo n notes 25-50% wat in a cultural investig means the wate	s, previo er satura ation. In	tion at 5-1 our experie	ons), if av 1 inches. ence in the	/ailable: There is no note e region, satura	e of a water table, as this tion of this degree probably
(includes car Describe Recorde Remarks: Th infor	billary fringe) ad Data (stream ga ne Oct 2016 cultura mation is not typic	uge, monitor al investigatic ally recorded	ing well, aerial photo in notes 25-50% wat in a cultural investig means the wate	s, previo er satura ation. In er table is	us inspecti tion at 5-1 ² our experie near the 5	ons), if av 1 inches. ence in the 5 inch ma	/ailable: There is no note e region, satura rk.	e of a water table, as this tion of this degree probably

Project/Site:	Kivalina	Site No.:	P7
Applicant/Ow	vner: DOT&PF	Investigator(s):	Stantec
Date: 9/1	15/2016	Cowardin:	PEM1/SS1C
Notes:	Old channel and gravel bars with stand (Low bush cranberry, Labrador tea)	ing water adjacent to south	a. P7 site vegetation



South



East



North



Plant Closeup



Hovering Over P7 (in field notes as HP14)

Project/Site:	Kivalina	Borough/City:	NW Arctic	Sampling Date: Sept/Oct 2016
Applicant/Owner:		DOT&PF		Sampling Point P12
Investigator(s):	Stantec	Landform (hillside, te	errace, hummocks, etc	Flat transition of habitat
Local relief (concave, con	vex, none): Flat	Slope (%): 0	-	
Subregion: Western Broo	ks Range Mts Foothills Lat:	67.76341 Long:	-164.473383	Datum: NAD83
Soil Map Unit Name:	Not	Available	NWI classifi	cation: PSS1/EM1B
Are climatic / hydrologic c	onditions on the site typical fo	r this time of year? Ye: x	No (If no, explain	in Remarks.)
Are Vegetation, Soi	I, or Hydrologysig	gnificantly disturbed? A	re "Normal Circumstance	es" present? Yes <u>x</u> No
Are Vegetation, Soi	I, or Hydrologyna	turally problematic? (If	needed, explain any an	swers in Remarks.)
SUMMARY OF FINDING	S – Attach site map showing	sampling point locations, t	transects, important fe	atures, etc.
Hydrophytic Vegetation P	resent? Yes <u>x</u> No			
Hydric Soil Present?	Yes x No	Is the Sampled Are	ea	
Wetland Hydrology Prese	nt? Yes x No	within a Wetland	? Yes <u>x</u> No	·
Remarks Edge of geo	morphic change. Up raised or	south side to less vegetated	plateau, shrubs diminisł	ning to the south grading to
tussock/grass	sy. Point combines soil information	ation from an Oct 2016 cultura	al investigation (point JA	J-16-009) with site photos of
vegetation duri	ng a Sept 2016 site visit (P12)	, both conducted by Stantec.	While wetlands data was	s not taken specifically, at this
location we	have determined that there w	as enough information from th	nese investigations to int	form the status of the site.

3/3 Abbrev.	Species Name	Absolute	Dominant	Indicator	Dominance Test worksheet:
1		% Cover	Species?	Status	That Are OBL, FACW, or FAC: 1 (A)
2					
3		·			I otal Number of Dominant Species Across All Strata: 1 (B)
4	Total Cover:	0			
	50% of total cover: 0	20% of	total cove	r: 0	Percent of Dominant Species
					That Are OBL, FACW, or FAC: <u>1</u> (A/B)
Sapling/Shrub S	Stratum	00	VEO	540	
1 salsp	Salix sp (unknown)	80	YES	FAC	
2 betnan		25	NO	FAC	Prevalence Index worksneet:
3 Vacuii	Phododondron tomontosum	25			$\frac{10 \text{ lat } \% \text{ Cover ol.}}{\text{OPL species}} \qquad 0 \qquad \times 1 = 0$
4 motom 5	Ribdodendron tomentosum		NO	TAGW	FACW species $25 \times 2 = 50$
6		·			FAC species $130 \times 3 = 390$
°	Total Cover:	155			FACU species $0 \times 4 = 0$
	50% of total cover: 77.5	20% of	total cove	r: 31	UPL species $0 \times 5 = 0$
					Column Totals: 155 (A) 440 (B)
Herb Stratum					
1					Prevalence Index = $B/A = 2.8387$
2					
3					Hydrophytic Vegetation Indicators:
4					Yes Dominance Test is >50%
5					Yes Prevalence Index is ≤3.0
6					Morphological Adaptations ¹ (Provide
7					supporting data in Remarks or on a separate
8					Problematic Hydrophytic Vegetation ¹ (Explain)
9					
10					¹ Indicators of hydric soil and wetland hydrology must
	Total Cover:	0			be present unless disturbed or problematic.
	50% of total cover: 0	20% of	total cove	r: <u>0</u>	The described in
		0/ D	0		Hydropnytic Venetation
Plot size (radius	s, or length x width)	% Bare	Ground		Vegetation
% Cover or wer	liand Bryophyles Total Co		privies		Present? res x No
Remarks: Hid	to be will	ow species	Detailed	nhoto eva	mination also show BetNan, VacI IIi, and Labrador Tea. Herbs
Remarks. The	are present but	are too dis	stant to ide	entify and o	do not appear to be FACU or UPL species

s	ο	I	I

Profile Desc	ription: (Describ	e to the depth	n needed to docum	ent the i	ndicator	or confirr	n the absence	of indicators.)
Depth	Matrix	×	Red	ox Featu	res			
(inches)	Color (moist) %	Color (moist)	%	Type ¹	Loc ²	Texture	Remarks
0-2							Sod	JAJ-16-009
							Brown silty	dense fine to medium
2-16							clay loam	roots; JAJ-16-009
								JAJ-16-009 is the
								Stantec Cultural Point
_						—		
	tration D-Depletic	on PM-Reduc	and Matrix CS-Cove	arod or C	'ooted Sa	-d Grains	² Location: P	-Boro Lining M-Matrix
				sted of C	Joaleu Sai	10 Grains.		
Hydric Soil Indica	ators:	Indicators for	or Problematic Hyd	ric Soils	s ³ :			
Histosol or H	istel (A1)	Alaska (Color Change (TA4)⁴	•	Alaska	Gleyed W	ithout Hue 5Y o	r Redder
x Histic Epiped	lon (A2)	Alaska A	Alpine Swales (TA5)		Unde	rlying Lay	er	
Hydrogen Su	llfide (A4)	Alaska I	Redox With 2.5Y Hu	e	Other (Explain in	Remarks)	
I NICK DARK S	urface (A12)	³ Or a ladiest	(here here here the second				- f Slavad	
Alaska Gleye	ed (A13) $(A13)$	"Une indicate	of of nyarophytic veg	jetation,	one prima	ify indicat	or or wetiand	turbad
	X (A 14)	⁴ Give details	of color change in F	Pemarks	position n	iust be pr	esent uniess uit	sturbeu
AldSha Gieye	(if present)	Cive detaile	of oolor offange	Contantes				
	(II present). Pe	ermafrost			Hydric	Soil		
Depth (inche	s):	53	·······		Presen	t?	Yes x I	No
Remarks Soils ir	nformation is taker	n from a Oct 2	016 cultural resource	es invest	igation. 50)-75% sat	uration was not	ed at 2 to 16 inches in Oct.
While M	unsell colors were	e not identified	, we interpreted there	e to be a	2 inch lay	ver of orga	nics, which is p	robably saturated during the
grow	ing season. At 5-4	0 inches a mi	xture of organics (du	e to the	'dense roo	ots') and m	nineral loam. W	e assume this meets the
defini	ition of a Histic Ep	ipedon, ('brow	n' being chroma 2 o	r less). T	his interp	etation ha	is been boosted	I by the site photographs.
HYDROLOGY								
Wetland Hyd	drology Indicator	s:				Seconda	ary Indicators (2	or more required)
Primary Indicators	(any one indicato	or is sufficient)				Wa	ter-stained Leav	/es (B9)
Surface Wate	er (A1)	Inundati	on Visible on Aerial	Imagery	(B7)	x Dra	inage Patterns	(B10)
x High Water T	able (A2)	Sparsel	y Vegetated Concav	e Surfac	e (B8)	Oxi	dized Rhizosph	eres along Living Roots (C3)
x Saturation (A	.3)	Marl De	posits (B15)			Pre	sence of Reduc	ed Iron (C4)
Water Marks	(B1)	Hydroge	n Sulfide Odor (C1)			Sal	t Deposits (C5)	
Sediment De	posits (B2)	Dry-Sea	Ison Water Table (C	2)		Stu	nted or Stresse	d Plants (D1)
Drift Deposits	S (B3)	Other (E	Explain in Remarks)			Geo	omorphic Position	on (D2)
Iron Denosits	Clusi (D4)					One	rotopographic R	D3) Poliof (DA)
Surface Soil	Cracks (B6)					FA(C-Neutral Test (D5)
Field Observatio	ns:							55)
Surface Water Pre	esent? Yes	No x	Depth (inches):		Wetlan	d		
Water Table Prese	ent? Yes x	No	Depth (inches):	5	Hydrol	ogy		
Saturation Presen	t? Yes x	No	Depth (inches):	2	Presen	t?	Yes x	No
(includes cap	oillary fringe)							
Describe Recorde	d Data (stream ga	uge, monitorir	ng well, aerial photos	s, previou	us inspect	ions), if av	ailable:	
Domorko: Th				ar ooturoi	tion at 2.1	e inchoe	Thora is no not	a f a watar tabla, as this
Kemarks. infor	motion is not typic	al investigation	1 NOLES DU-1070 wate	of Salura	11011 at 2-1	b mones.	There is no note	tion of this degree probably
mea	manon is not typic	ally recorded i	inch mark We also	note mic	rotopo rel	ief and dra	e legion, satura	in the "South" site photos
				1000 11.0			anago patonio	

Project/Site: Kivalina	Site No P12
Applicant/Owner: DOT&PF	Investigator(s): Stantec
Date: 9/15/2016	Cowardin: <u>PSS1/EM1B</u>
Notes: Edge of geomorphic change. Up raised diminishing to the south grading to tuse	d on south side to less vegetated plateau, shrubs sock/grassy.
Looking North	Looking East

Looking South

Looking West

Project/Site:	Kivalina	Boroug	h/City:	NW Arctic	Sampling Date:	Sept/Oct 2016				
Applicant/Owner:		DOT&PF			Sampling Point	P14				
Investigator(s):	Stantec	Landfo	rm (hillside, terra	ace, hummocks, etc	Terrace above	wetter area				
Local relief (concave, c	convex, none): Convex	onvex Slope (%): 0	—						
Subregion: Western B	rooks Range Mts Foothill	Lat: 67.755301	Long:	-164.477827	Datum:	NAD83				
Soil Map Unit Name:		Not Available		NWI classifi	cation: PSS	S1/EM1E				
Are climatic / hydrologi	c conditions on the site ty	pical for this time of yea	r? Ye: x No	(If no, explain	in Remarks.)					
Are Vegetation,	Soil, or Hydrology	significantly disture	oed? Are "	Normal Circumstance	es" present? Yes	<u>x</u> No				
Are Vegetation,	Soil, or Hydrology	naturally problema	tic? (If ne	eded, explain any an	swers in Remark	s.)				
SUMMARY OF FINDIN	NGS – Attach site map s	howing sampling poin	t locations, trar	nsects, important fe	atures, etc.					
Hydrophytic Vegetatior Hydric Soil Present? Wetland Hydrology Pre	Present? Yes x Yes x esent? Yes x	No Is the with	Sampled Area	Yes <u>x</u> No						
Remarks Edge of secc	Remarks Edge of second side channel to east. Standing ponds chain. Elat elevated tundra between two side channels. Point combines soil									
information (vegetation du	from an Oct 2016 cultura uring a Sept 2016 site vis ave determined that there	l investigation and a Mar it, conducted by Stantec was enough information	rch/April 2015 Go While wetlands	older geotechnical in s data was not taken estigations to inform tl	vestigation) with s specifically, at thi he status of the s	site photos of s location we ite.				

VEGETATION – Use scientific names of plants. List all species in the plot. MUST LIST COVER IN DESECENDING ORDER

3/3 Abbrev. Tree Stratum	Species Name	Absolute Dominant Indicator % Cover Species? Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>4</u> (A)
2 3 4	Total Cover:	<u> </u>	Total Number of Dominant Species Across All Strata: <u>4</u> (B)
	50% of total cover: 0	20% of total cover: 0	Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)
Sapling/Shrub S	Stratum		
1 rhotom 2 vacvit 3 salsp	Rhododendron tomentosum Vaccinium vitis-idaea Salix sp (unknown species)	75 YES FACW 75 YES FAC 50 YES FAC	Prevalence Index worksheet: Total % Cover of: Multiply by:
4 betnan 5	Betula nana	10 NO FAC	OBL species 0 $x 1 = 0$ FACW species 77 $x 2 = 154$ FAC species 135 $x 3 = 405$
°	Total Cover: 50% of total cover: <u>105</u>	210 20% of total cover: 42	FACU species $0 \times 4 = 0$ UPL species $0 \times 5 = 0$ Column Totals: 212 (A) 559 (B)
Herb Stratum 1 erivag 2	Eriophorum vaginatum	2 YES FACW	Prevalence Index = $B/A = 2.6368$
3 4 5 6 7 8			Hydrophytic Vegetation Indicators: Yes Dominance Test is >50% Yes Prevalence Index is ≤3.0 Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate Problematic Hydrophytic Vegetation ¹ (Explain)
10	Total Cover:	2	¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
Plot size (radius % Cover of We	50% of total cover: <u>1</u> s, or length x width) tland BryophytesTotal Co	20% of total cover: 0.4 % Bare Ground wer of Bryophytes	Hydrophytic Vegetation Present? Yes x No
Remarks: Sh	nrubs are present throughout the	site photos. Small numbers of l cover, which appears to be R	EriVag seed heads are visible. There is apparent dense shrub hoTom/VacVit or similar.

SOIL

Profile Desc	cription: (Describe	to the depth	n needed to docum	nent the	indicator	or confirn	n the absence	of indicators.)
Depth (inches)						12	Tauduma	Demerles
(inches)	Color (moist)	%	Color (moist)	%	Туре	LOC	Texture	Remarks
0-4							Organics	DME-16-023
4.05	Dressure						Silty Sand	DME 10 000
4-25	Brown						no gravei	DME-16-023
								DME-16-023 IS the Stanton Cultural Boint
								Stantec Cultural Point
							ORGANIC	10-20% visible ice;
0-35	Frozen, brown						SILT	Golder K15-13
¹ Type: C=Concen	tration, D=Depletion	, RM=Reduc	ced Matrix, CS=Cov	rered or C	Coated Sa	nd Grains.	² Location: P	L=Pore Lining, M=Matrix.
Hydric Soil Indic	ators:	ndicators for	or Problematic Hyd	dric Soil	s ³ :			
Histosol or H	listel (A1)	Alaska (Color Change (TA4)	4	Alaska	Gleyed W	ithout Hue 5Y o	or Redder
x Histic Epiped	don (A2)	Alaska A	Alpine Swales (TA5))	Unde	erlying Lay	er	
Hydrogen Su	ulfide (A4)	Alaska F	Redox With 2.5Y Hu	Je	Other (Explain in	Remarks)	
Thick Dark S	Surface (A12)							
Alaska Gleve	ed (A13)	³ One indicate	or of hydrophytic ve	getation,	one prima	ary indicato	or of wetland	
Alaska Redo	x (A14)	nydrology, ai	nd an appropriate la	ndscape	position r	nust be pre	esent unless dis	sturbed
Alaska Gleye	ed Pores (A15)	Give details	of color change in	Remarks				
Restrictive Laver	(if present):							
Type:	Peri	nafrost			Hydric	Soil		
Depth (inche	es):	25			Presen	it?	Yes x I	No
Remarks Oct 20	016 Stantec Cultural	Point DME-	16-023 and a Marcl	h/April 20	15 Golder	geotechni	ical investigatio	n was used for soils (point
K15-	13). While Munsell of	olors were r	ot identified, we into	erpreted	0-4 inches	as being	organics, 4-25 i	inches as being a layer of
mine	eral soil meeting the	definition of	a Histic Epipedon ('	brown' b	eing chron	na 2 or les	s). Saturation w	as noted at 4 inches and
	below. As the	site was sar	npled in October, w	e expect	the organ	ics to be s	aturated during	June - August
Wotland Hv	drology Indicators					Seconda	ny Indicatore (2	ar more required)
Primony Indicators	(any one indicators.	ic cufficient)				Mot	ary mulcators (2	
Surface Wat	or (A1)	Inundati	on Visible on Aerial	Imagen	(B7)	Vrai	inade Patterne	(B10)
Unace Wat	$\Gamma_{able}(\Delta 2)$	Inunuali	Vegetated Conca	nnagery ve Surfac	(D7) (B8)		hized Rhizosph	eres along Living Roots (C3)
x Saturation (A	(A2)	Marl De	nosits (R15)	ve ounac	С (ВО)	Pre	sence of Reduc	closed light 2000 constants (CO)
Water Marks	(B1)	Hydroge	en Sulfide Odor (C1))		Salt	Deposits (C5)	
Sediment De	enosits (B2)	Drv-Sea	son Water Table (C	, :2)		Stu	nted or Stresse	d Plants (D1)
Drift Deposit	s (B3)	Other (F	xplain in Remarks)	-)		Geo	morphic Positio	on $(D2)$
Algal Mat or	Crust (B4)					Sha	llow Aquitard (D3)
Iron Deposits	s (B5)					x Mici	rotopographic F	Relief (D4)
Surface Soil	Cracks (B6)					FAC	C-Neutral Test (D5)
Field Observatio	ns:						,	,
Surface Water Pr	esent? Yes	No x	Depth (inches):		Wetlan	d		
Water Table Pres	ent? Yes x	No	Depth (inches):	4	Hydrol	ogy		
Saturation Preser	nt? Yes x	No	Depth (inches):	4	Presen	it?	Yes x	No
(includes cap	oillary fringe)							
Describe Recorde	ed Data (stream gau	ge, monitorir	ng well, aerial photo	s, previo	us inspect	ions), if av	ailable:	
	· •		•	-				
Remarks: The	Oct 2016 Stantec C	ultural Point	DME-16-023 found	75-100%	water sat	uration at	4 inches. There	e is no note of a water table,
as t	this information is no	ot typically re	corded in a cultural	investiga	ation. In ou	ur experien	ce in the regior	n, saturation of this degree
		probably me	eans the water table	e is near	the 4 inch	mark durir	ng June - Augus	st.



Appendix H Page 131

Project/Site:	Kivalina Boroug		Borough/City	/: 1	NW Arctic	Sampling Date:	Sept/Oct 2016
Applicant/Owner:		DC	ĴT&PF			Sampling Point	P16
Investigator(s):	Stant	tec	Landform (hi	Ilside, terrace	, hummocks, etc	Fla	it
Local relief (concav	/e, convex, none):	Concave	Slope (%):	0			
Subregion: Wester	n Brooks Range Mts	Foothills Lat: 6	37.774894	Long:	-164.422309	Datum:	NAD83
Soil Map Unit Name	e:	Not Availa	able	• <u> </u>	NWI classifi	cation: F	'SS1J
Are climatic / hydro	logic conditions on th	e site typical for this	time of year? Ye	<u>x No</u>	(If no, explain i	in Remarks.)	
Are Vegetation	_, Soil, or Hyd	Irologysignifica	antly disturbed?	Are "No	ormal Circumstance	es" present? Yes	x_No
Are Vegetation	, Soil, or Hyd	Irology naturally	y problematic?	(If need	ied, explain any an	swers in Remark	3.)
	-						
SUMMARY OF FIN	DINGS – Attach site	map showing sam	pling point loca	itions, transe	ects, important fe	atures, etc.	
Hydrophytic Vegeta	ation Present?	7es <u>x</u> No					
Hydric Soil Present	? }	/es No	Is the Sam	pled Area			
Wetland Hydrology	Present?	res x No	within a V	Vetland?	Yes x No		
			-				Ì
Remarks This poir	it combines the soil ir	nformation (from an C	Oct 2016 cultural	investigation)) with the site phote	os of vegetation c	luring a Sept
2016 site	visit, conducted by S	stantec. We have det	ermined that the	re was enoug	h information from	these investigati	ons to inform
the stat	tus of the site. Our hy	pothesis is that thes	e riverine wetlan	ds experience	e regular flooding d	luring spring high	water. This
4	would prov	ide the wetland hydro	ology and the sc	ouring force t	o prevent a dense	herb laver	

3/3 Abbrev. Tree Stratum	Species Name	Absolute Dominant Indic % Cover Species? Stat	ator Dominance Test worksheet: us Number of Dominant Species
1			That Are OBL, FACW, or FAC: 1 (A)
3		·	Total Number of Dominant
4	Total Cover:	0	
	50% of total cover: 0	20% of total cover:	0 Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)
Sapling/Shrub S	Stratum		
1 salsp	Salix sp (unknown species)	75 YES FA	
2		·	Prevalence Index worksheet:
3		·	$\frac{10 \text{ cover ol.}}{\text{OBL species}} = 0 \text{ x 1} = 0$
5		·	FACW species $0 \times 1 = 0$
6			FAC species $75 \times 3 = 225$
	Total Cover:	75	FACU species 0 x 4 = 0
	50% of total cover: 37.5	20% of total cover:	15 UPL species 0 x 5 = 0
			Column Totals: <u>75</u> (A) <u>225</u> (B)
Herb Stratum			Drovelence Index - P/A - 2
2		·	$= B/A = \frac{3}{3}$
3		·	Hydrophytic Vegetation Indicators:
4		·	Yes Dominance Test is >50%
5		·	Yes Prevalence Index is ≤3.0
6			Morphological Adaptations ¹ (Provide
7			supporting data in Remarks or on a separate
8			Problematic Hydrophytic Vegetation ¹ (Explain)
9			
10			¹ Indicators of hydric soil and wetland hydrology must
	Total Cover:	0	be present unless disturbed or problematic.
	50% of total cover: 0	20% of total cover:	<u>0 </u>
	and a settle second d(b.)	0/ David Original	Hydrophytic Venetation
Plot size (radius	s, or length x width)	% Bare Ground	Prosent? Vos V
78 COVEL OF WE			
Remarks:	The vegetation consists of tall	unidentified willow species	Some unidentified grasses are present in the herb layer. Our
h	ypothesis is that these riverine w	etlands experience regula	r flooding during spring highwater. This would provide the wetland
	hyc	Irology, and the scouring f	orce to prevent a dense herb layer.

S	0	I	I
_	_	-	-

Profile Desc	ription: (Describe to	the depth	needed to docum	ent the	indicator	or confirr	n the absence	of indicators.)
Uepth (inchoo)	Color (moint)	0/	Color (moiot)	0/		$1 cc^2$	Toxturo	Pomorko
(inches)	Color (moist)	70	COIOI (MOIST)	70	туре	LUC	rexture	remarks
0-2							Moss/Sod	JAJ-16-013
							Brown siltv	dense fine to medium
2-16							clay loam	roots; JAJ-16-013
16-17							Clay	No roots; JAJ-16-013
								JAJ-16-013 is the
								Stantec Cultural Point
				—				
¹ Type: C=Concen	tration, D=Depletion, R	M=Reduc	ed Matrix, CS=Cov	ered or	Coated Sa	nd Grains.	² Location: P	L=Pore Lining, M=Matrix.
					<u>^</u>			
Hydric Soil Indic	ators: Ind	icators fo	or Problematic Hyd	dric Soil	s ³ :			
Histosol or H	istel (A1)	Alaska C	Color Change (TA4)	4	Alaska	Gleyed W	ithout Hue 5Y o	r Redder
Histic Epiped	lon (A2)	Alaska A	Ipine Swales (TA5)	Unde	erlying Lay	er	
Hydrogen Su	Ilfide (A4)	Alaska F	Redox With 2.5Y Hu	le	Other (Explain in	Remarks)	
Thick Dark S	Surface (A12)						·	
Alaska Gleye	ed (A13) °Or	ne indicato	or of hydrophytic ve	getation	, one prima	ary indicate	or of wetland	.tula a al
Alaska Redo	x (A14) hyc	rology, ar	a an appropriate la	ndscape	e position n	nust be pr	esent unless dis	bediut
Alaska Gleye	ea Pores (A15) G	ve uetalis	or color change in	Nemarks	».			
Tupo:	(ii present):	0			Hudeia	Soil		
Type. Depth (inche	s).	C			Preser	3011	Yes	
Remarks Oct 20		nt JA.I-16	-013 was used for s	soils Wr	nile Munsel	I colors we	ere not identified	we interpreted 0-2 inches
as being	organics, 2-16 inches	as being	a laver of organic/r	ninerals	oil mix me	etina the c	lefinition of a Hi	stic Epipedon ('brown' being
chroma	2 or less).We interpre	ted 'dense	eroots' as being e	vidence	of organics	s. Saturatio	on was noted at	below 2 inches. As the site
	was sar	npled in C	ctober, we expect	he orga	nics to be s	saturated of	during June - Au	igust.
				-				
Wetland Hv	drology Indicators:					Second	arv Indicators (2	or more required)
Primary Indicators	any one indicator is s	ufficient)				Wa	ter-stained I eav	/es (B9)
Surface Wat	er (A1)	Inundati	on Visible on Aerial	Imager	/ (B7)	x Dra	inage Patterns	(B10)
x High Water T	Table (A2)	Sparsely	Vegetated Concav	/e Surfa	ce (B8)	Oxi	dized Rhizosphe	eres along Living Roots (C3)
x Saturation (A	(3)	Marl De	oosits (B15)		. ,	Pre	sence of Reduc	ed Iron (C4)
Water Marks	(B1)	Hydroge	n Sulfide Odor (C1))		Sal	Deposits (C5)	
Sediment De	eposits (B2)	Dry-Sea	son Water Table (C	(2)		Stu	nted or Stresse	d Plants (D1)
Drift Deposits	s (B3)	Other (E	xplain in Remarks)			x Geo	omorphic Positio	on (D2)
Algal Mat or	Crust (B4)					Sha	llow Aquitard (E	03)
Iron Deposits	S (B5) Creaks (B6)					Mic	rotopographic R	cellet (D4)
Surface Soil	Uracks (Bb)				_	FA0	-neutral Test (U0)
	na. Asont? Vac N		Depth (inchas):		Wotlan	d		
Water Table Pres	ent? Yes y		Depth (inches).	8	Hvdrol	oav		
Saturation Presen	t? Yes x		Depth (inches):	2	Presen	- 3 7 ht?	Yes x M	No
(includes cap	pillary fringe)	···		-	-			
Describe Recorde	d Data (stream gauge.	monitorir	g well, aerial photo	s, previc	us inspect	ions), if av	ailable:	
	, J-3-,					,,		
Remarks: Oct 20	016 Stantec Cultural P	oint DME-	16-013 found 25-50	0% wate	r saturatior	n at 2". No	note of a water	table, this information is not
typic	ally recorded in a cultu	ral investi	gation. In our expe	rience in	the region	, saturatio	n of this degree	probably means the water
table	is near the 8" mark dur	ing June-	Aug. It is also impo	rtant to r	eview the	secondary	characteristics	of this site. We find that this
	site likely experiences	seasona	I flooding during sp	ring high	water (not	e lack of d	ense herb layer	, indicating scouring).

Project/Site:	Kivalina	Site No.: P16	
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date: 9/15/2016	<u>) </u>	Cowardin: PSS1	IJ
Notes: Groun off 500	d vegetation at P16 (sedge and) ft. to east	moss). Water slough from Wulik	River. Tapers

Looking North



Looking South

Looking East



Looking West

Project/Site:	Kivalina		Borough/City	/: N	√W Arctic	Sampling Date:	Sept/Oct 2016
Applicant/Owner:		DC	T&PF			Sampling Point	P20
Investigator(s):	Stantec	;	Landform (hi	Ilside, terrace	, hummocks, etc	Tunc	Jra
Local relief (concave, co	onvex, none):	Concave	Slope (%):	0			
Subregion: Western Br	ooks Range Mts Fo	othills Lat: 6	7.762042	Long:	-164.422233	Datum:	NAD83
Soil Map Unit Name:		Not Availat	ole		NWI classifi	cation: PSS	S1/EM1B
Are climatic / hydrologic	conditions on the s	site typical for this t	ime of year? Ye	x No	(If no, explain i	in Remarks.)	
Are Vegetation, S	oil, or Hydrol	logysignifica	ntly disturbed?	Are "No	rmal Circumstance	es" present? Yes	<u>x</u> No
Are Vegetation, S	ioil, or Hydrol	logy naturally	problematic?	(If need	ed, explain any an	swers in Remark	s.)
SUMMARY OF FINDIN	GS – Attach site m	nap showing sam	pling point loca	ations, transe	ects, important fe	atures, etc.	
Hydrophytic Vegetation	Present? Yes	s x No					
Hydric Soil Present?	Yes	s x No	Is the Sam	pled Area			
Wetland Hydrology Pres	sent? Yes	s x No	within a V	Vetland?	Yes x No	I.	
			•				
Remarks Largest gra areas saturate an Oct 2016 c	avel material site alc ed at surface, sedge cultural investigatior	ong Wulik River. Lit es, moss covered s ו) with the site phot	tle bit higher gro surface, 20% gra tos of vegetatior	ວund - no stan ass, 30% mos າ during a Sep	ding water. Soil pr s. This point comb t 2016 site visit, cr	obe sample satur ones the soil infor onducted by Stan	rated. Low rmation (from tec. We have
(determined that the	re was enough info	rmation from the	ese investigat [;]	ions to inform the	status of the site	

3/3 Abbrev.	Species Name	Absolute Dominant Indicator	Dominance Test worksheet:
1		% Cover Species? Status	That Are OBL, FACW, or FAC: <u>3</u> (A)
3		:	Total Number of Dominant
4	Total Cover:	<u> </u>	Species Across All Strata: <u>3</u> (B)
	50% of total cover: 0	20% of total cover: 0	Percent of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A/B)
Sapling/Shrub Str	atum Salix Unidentified		
2 vacvit 3 4	Vaccinium vitis-idaea	30 123 1AC 5 NO FAC	Total % Cover of: Multiply by: OBL species 0 x 1 = 0
5 6		:	FACW species 0 $x 2 =$ 0 FAC species95 $x 3 =$ 285
	Total Cover: 50% of total cover: 27.5	55 20% of total cover: 11	FACU species0 $x 4 =$ 0UPL species0 $x 5 =$ 0Column Totals:95(A)285
Herb Stratum			
2	Grass, Unidentified	20 YES FAC	Prevalence Index = $B/A = 3$
3	eedge, erndertaned		Hydrophytic Vegetation Indicators:
4			Yes Dominance Test is >50%
5			Yes Prevalence Index is ≤3.0
6		·	Morphological Adaptations ¹ (Provide
/ <u></u>			supporting data in Remarks or on a separate
8		·	
10		·	¹ Indicators of hydric soil and wetland hydrology must
	Total Cover:	40	be present unless disturbed or problematic.
	50% of total cover: 20	20% of total cover: 8	
			Hydrophytic
Plot size (radius, o % Cover of Wetla	or length x width)	% Bare Ground 0 ver of Bryophytes 30	Vegetation Present? Yes x No
Remarks:			

SO	I	I

Profile Desc	ription: (Describe to t	he dept	h needed to docum	ent the	indicator	or confirm	n the absence	of indicators.)
(inches)	Color (moist)	%	Color (moist)	%		1 oc^2	Texture	Remarks
(incries)		70		70	туре	LUC	Texture	Remarks
0-2							Moss	JAJ-16-46
		•					Brown/gray	dense fine to small
2-3							clay silt	roots; JAJ-16-46
3-10							Grey clay	No roots, JAJ-16-46
								JAJ-16-46 is the
								Stantec Cultural Point
		·						
		·						
¹ Type: C=Concent	tration, D=Depletion, R	M=Redu	ced Matrix, CS=Cov	ered or (Coated Sa	nd Grains.	² Location: P	L=Pore Lining, M=Matrix.
Hydric Soil Indica	ators: Ind	cators f	or Problematic Hyd	Iric Soil	s ³ :			
Histosol or H	istel (A1)	Alaska	Color Change (TA4)	4	Alaska	Gleyed W	ithout Hue 5Y o	r Redder
x Histic Epiped	on (A2)	Alaska	Alpine Swales (TA5)		Unde	erlying Lay	rer	
Hydrogen Su	lfide (A4)	Alaska	Redox With 2.5Y Hu	ie	Other (Explain in	Remarks)	
Thick Dark S	urface (A12)							
Alaska Gleye	ed (A13) °On	e indicat	or of hydrophytic veg	getation	one prima	ary indicate	or of wetland	to other all
Alaska Redo	x (A14) hyd	rology, a	nd an appropriate la	ndscape	e position n	nust be pr	esent unless dis	sturbed
Alaska Gleye	d Pores (A15) Giv	e details	s of color change in r	Remarks	ò.			
Restrictive Layer	(if present):	root			Lludria	Call		
Type. Depth (incher	s).	10			Proson	5011 +2	Yes x	
Remarks Oct 2010	6 Stantec Cultural Poin	t.IA.I-16	-466 While Munsell	colors v	vere not ide	entified w	e interpreted 0-2	" as moss/organics 2-3" as
organic	/mineral soil mix meeti	na the d	efinition of a Histic F	pipedor	('brown' b	eina interr	preted as chrom	a 2 or less). We interpreted
'dense	roots' as being evide	nce of o	ganics. 3-10" as cla	y withou	t organics.	50-75% s	saturation was n	oted at 2". As the site was
	-	samp	led in Oct. we expec	t satura	ted organic	s during J	lune–Aug.	
Wetland Hvo	Irology Indicators:					Second	arv Indicators (2	or more required)
Primary Indicators	(any one indicator is s	ufficient)				Wa	ter-stained Leav	ves (B9)
Surface Wate	er (A1)	Inundat	ion Visible on Aerial	Imagery	/ (B7)	Dra	inage Patterns ((B10)
x High Water T	able (A2)	Sparsel	y Vegetated Concav	e Surfa	ce (B8)	Oxi	dized Rhizosphe	eres along Living Roots (C3)
x Saturation (A	3)	Marl De	posits (B15)			Pre	sence of Reduc	ed Iron (C4)
Water Marks	(B1)	Hydrog	en Sulfide Odor (C1)			Sal	t Deposits (C5)	
Sediment De	posits (B2)	Dry-Sea	ason Water Table (C	2)		Stu	nted or Stressed	d Plants (D1)
Drift Deposits	s (B3)	Other (I	Explain in Remarks)			Ge	omorphic Positic	on (D2)
Algal Mat or (Crust (B4)					x Sha	allow Aquitard (L	03)
Iron Deposits	(BD) Cracke (B6)						C Noutral Tast (Celler (D4)
Field Observation	ns.					TA		D3)
Surface Water Pre	sent? Yes N	o x	Depth (inches):		Wetlan	d		
Water Table Prese	ent? Yes x N	0	Depth (inches):	8	Hydrol	oqy		
Saturation Presen	t? Yes x N	o <u> </u>	Depth (inches):	2	Presen	it?	Yes x N	10
(includes cap	illary fringe)				-			
Describe Recorde	d Data (stream gauge,	monitori	ng well, aerial photos	s, previc	ous inspect	ions), if av	/ailable:	
Domoriko: The C	at 2016 Stantas Outline	al Deint			untor anti-	otion at C	inches The Ole	atao 0/15/17 field sist a - (
Remarks: The C	tion at the surface ln a	ai Point	JAJ-10-406 TOUND 5	U-15% V	vater satur	ation at 2	inches. The Stat	water table is above or page
saiura	inch mark Micro relief	is evider	t and we belive the	normatio	n ur unis de	ent abovo	24" during the	water table is above of near
		S CYIUCI	n, and we berre the perch wa	ater to w	ithin 12 inc	ches.		growing season, and able to
			P.0.0.1 III					

Project/Site:	Kivalina	Site No.: P20	
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date: 9/15/201	7	Cowardin: PSS1	/EM1B
Notes: Large water cover	est gravel material site along Wul . Soil probe sample saturated. Lo ed surface, 20% grass, 30% mo	ik River. Little bit higher ground - n ow areas saturated at surface, sed ss	o standing ges, moss
Looking Nort	th	Looking East	

Looking South

Looking West

Project/Site:	Kivalir	ıa	Borough/City	/: N	IW Arctic	Sampling Date:	Sept/Oct 2016
Applicant/Owner:			DOT&PF			Sampling Point	P27
Investigator(s):	Stant	ec	Landform (h	llside, terrace,	hummocks, etc	Terra	ace
Local relief (concave,	convex, none):	Convex	Slope (%):		_		
Subregion: Western	Brooks Range Mts	Foothills Lat:	67.78784	Long:	-164.406934	Datum:	NAD83
Soil Map Unit Name:		Not A	vailable	_	NWI classifi	cation: PSS	S1/EM1B
Are climatic / hydrolog	gic conditions on th	e site typical for	this time of year? Ye	<u>x No</u>	(If no, explain	in Remarks.)	
Are Vegetation	, Soil, or Hyd	rologysig	nificantly disturbed?	Are "Nor	mal Circumstance	es" present? Yes	_x_No
Are Vegetation	, Soil, or Hyd	rology nat	urally problematic?	(If neede	ed, explain any an	swers in Remark	s.)
SUMMARY OF FIND	INGS – Attach site	map showing	sampling point loca	ations, transe	cts, important fe	atures, etc.	
Hydrophytic Vegetation	on Present?	′es <u>x</u> No					
Hydric Soil Present?	١	′es <u>x</u> No	Is the Sam	pled Area			
Wetland Hydrology P	resent?	′es x No	within a W	Vetland?	Yes x No	1	
Remarks Just south	of cluster of 3 pon	ds. Elevated to r	north of ponds, on ed	ge of elevated	ridge that wraps	to the east of the	ponds. This
point comb	ines the soil inform	ation (from an O	ct 2016 cultural invest	stigation) with	the site photos of	vegetation during	a Sept 2016
site visit, c	onducted by Stante	c. We have det	ermined that there wa	as enough info	ormation from thes	se investigations t	o inform the
			status of th	e site.		-	

VEGETATION – Use scientific names of plants. List all species in the plot. MUST LIST COVER IN DESECENDING ORDER

3/3 Abbrev.	Species Name	Absolute Dominant Indicator	Dominance Test worksheet:
1			That Are OBL, FACW, or FAC: 1 (A)
2 3		: <u> </u>	Total Number of Dominant
4	Total Cover	<u> </u>	Species Across All Strata: <u>1</u> (B)
	50% of total cover: 0	20% of total cover: 0	Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)
Sapling/Shrub S	Stratum		
1 rhotom	Rhododendron tomentosum	50 YES FACW	
2 vaculi 3	Salix Unidentified	5 NO FAC	Total % Cover of: Multiply by:
4 arcrub	Arctous ruber	5 NO FAC	OBL species $0 \times 1 = 0$
5			FACW species $50 \times 2 = 100$
6			FAC species $20 \times 3 = 60$
	Total Cover:	70	FACU species $0 x 4 = 0$
	50% of total cover: <u>35</u>	20% of total cover: <u>14</u>	UPL species $0 \times 5 = 0$
Harb Stratum			Column Lotals: 70 (A) 160 (B)
12			Prevalence Index = B/A = 2.2857
3		·	Hydrophytic Vegetation Indicators:
4		·	Yes Dominance Test is >50%
5			Yes Prevalence Index is ≤3.0
6			Morphological Adaptations ¹ (Provide
7			supporting data in Remarks or on a separate
8		·	Problematic Hydrophytic Vegetation ¹ (Explain)
10			¹ Indicators of hydric soil and wetland hydrology must
	Total Cover:	0	be present unless disturbed or problematic.
	50% of total cover: 0	20% of total cover: 0	Hydrophytic
Plot size (radius	s, or length x width)	% Bare Ground	Vegetation
% Cover of Wet	tland Bryophytes Total Co	ver of Bryophytes	Present? Yes x No
Remarks:	The point is taken on a slight co	onvex rise. It primarily consists	s of grass/sedge (unid) and low shrubs, with a few scattered
	moder	ate height willow. Grass tusso	cks are evident in regular patterns.

SOIL

Profile Desc	ription: (Describ	e to the dept	n needed to docum	ent the i	ndicator o	r confiri	m the absence	of indicators.)
Depth	Matri	x	Rec	lox Featu	res			
(inches)	Color (moist) %	Color (moist)	%	Туре	Loc ²	Texture	Remarks
0-2							Sod	JAJ-16-020
0.40							Org and	few fine to small roots;
2-12							Brown loam	JAJ-16-020
								JAJ-16-020 IS the Stantec Cultural Point
								Stantec Culturar Foint
·								
¹ Type: C=Concent	tration, D=Depletion	on, RM=Reduc	ced Matrix, CS=Cov	ered or C	oated San	d Grains	. ² Location: P	PL=Pore Lining, M=Matrix.
Hydric Soil Indica	ators:	Indicators for	or Problematic Hyd	Iric Soils	3			
Histosol or H	istel (A1)	Alaska	Color Change (TA4)	4	Alaska C	Bleyed W	/ithout Hue 5Y o	or Redder
x Histic Epiped	on (A2)	Alaska /	Alpine Swales (TA5))	Under	lying Lay	/er	
Hydrogen Su	ITIDE (A4)	Alaska	Redox With 2.5Y HU	ie	_Other (E	xpiain in	Remarks)	
Alaska Glove	$d(\Delta 13)$	³ One indicat	or of hydrophytic ve	netation	ono nrimar	v indicat	or of wetland	
Alaska Gleye	x (A14)	hydrology, a	nd an appropriate la	ndscape	position m	ust be pr	esent unless dis	sturbed
Alaska Gleve	d Pores (A15)	⁴ Give details	of color change in	Remarks.				
Restrictive Laver	(if present):		0		1			
Type:	()	None			Hydric S	Soil		
Depth (inche	s):				Present	?	Yes x I	No
Remarks Oct 2	016 Stantec Cultu	ral Point JAJ-	16-020 was used for	r soils. W	nile Munse	ll colors	were not identifi	ied, we interpreted 0-2" as
orga	nics, 2-12" as a la	yer of mineral	with organics inter	mixed ('br	own' being	chroma	2 or less).We in	nterpreted 'few roots' as
organics	evidence. Satura	tion was noted	d below 2". As the si	te was sa	impled in C	Oct., orga	anics will be satu	urated during June – August.
	vvnie	the organic is	slightly less than typ	lical of a v	wettand, we	e interpre	et this as histic e	epipedon.
HYDROLOGY								
Wetland Hyd	Irology Indicator	S:				Second	ary Indicators (2	2 or more required)
Primary Indicators	(any one indicato	r is sufficient)	an Visible on Asriel	Imagani		Wa	iter-stained Leav	ves (B9)
Unace wate	-1 (A1) -2610 (A2)		Vegetated Concav	magery	(D7) > (B8)		inage Pallems	(DIU) eres along Living Roots (C3)
x Saturation (A	3)	Marl De	posits (B15)	C Ounact	, (DO)	Pre	sence of Reduc	ced Iron (C4)
Water Marks	(B1)	Hydroge	en Sulfide Odor (C1)			Sal	t Deposits (C5)	
Sediment De	posits (B2)	Dry-Sea	son Water Table (C	2)		Stu	inted or Stresse	d Plants (D1)
Drift Deposits	s (B3)	Other (E	Explain in Remarks)			Ge	omorphic Positi	on (D2)
Algal Mat or	Crust (B4)					Sha	allow Aquitard (I	D3)
Iron Deposits	(B5) Creatia (DC)						crotopographic F	Relief (D4)
Surface Soli					-	FA	C-ineutral Test ((D5)
Surface Water Pre	nsent? Yes	No x	Depth (inches):		Wetland			
Water Table Prese	ent? Yes x		Depth (inches):	8	Hvdrolo	av		
Saturation Presen	t? Yes x	No	Depth (inches):	2	Present	?	Yes x	No
(includes cap	illary fringe)		/				<u></u>	
Describe Recorde	d Data (stream ga	auge, monitorii	ng well, aerial photo	s, previou	is inspectio	ons), if av	vailable:	
Domarka: The	Oct 2016 Stants -			(wotor c	aturation of	2 inche	o Thoro io no n	oto of a water table as this
rtemarks: The	nation is not tunio	Sultural Point	. JAJ-10-020 25-50%	o water Si ation In c	aturation al	L∠INCNE	s. There is no h	tion of this degree probably
mean	s the water table i	s near the 8 ir	ich mark during .lun	e - Aunus	t. It is also	importa	nt to review the	secondary characteristics of
				this si	te.			

Project/Site	Kivalina	Site No.:	P27
Applicant/O	wner: DOT&PF	Investigator(s):	Stantec
Date: 9/	/16/2017	Cowardin:	PSS1/EM1B
Notes:	Just south of cluster of 3 ponds. Elevated that wraps to the east of the ponds	I to north of ponds, on ec	lge of elevated ridge
Looki	ng North	Looking E	East

Looking South

1 - M.

Looking West

Project/Site:	Kivalina		Borough/City	/:	NW Arctic	Sampling Date:	Sept/Oct 2016
Applicant/Owner:		[DOT&PF			Sampling Point	P32
Investigator(s):	Stante	С	Landform (h	illside, terrace	e, hummocks, etc	Fla	ıt
Local relief (concav	e, convex, none):	Flat	Slope (%):	0	_		
Subregion: Western	n Brooks Range Mts F	oothills Lat:	67.777731	Long:	-164.438397	Datum:	NAD83
Soil Map Unit Name):	Not Avai	lable	_	NWI classifi	cation: PEN	/1/SS1C
Are climatic / hydrol	ogic conditions on the	site typical for thi	s time of year? Ye	<u>x No</u>	(If no, explain	n Remarks.)	
Are Vegetation	_, Soil, or Hydro	ologysignifi	cantly disturbed?	Are "No	ormal Circumstance	es" present? Yes	x No
Are Vegetation	, Soil, or Hydro	ology natura	ally problematic?	(If need	led, explain any an	swers in Remarks	3.)
SUMMARY OF FIN	DINGS – Attach site	map showing sa	mpling point loca	ations, trans	ects, important fe	atures, etc.	
Hydrophytic Vegeta	tion Present? Ye	es <u>x</u> No					
Hydric Soil Present	? Ye	es x No	Is the Sam	pled Area			
Wetland Hydrology	Present? Ye	es x No	within a W	Vetland?	Yes x No		
Remarks Standing	water at surface in cu	rent location. Spo	oradic shrubs, see	ding grasses/	sedges. This point	combines the so	il information
(from	an Oct 2016 cultural i	nvestigation and a	a March/April 2015	5 Golder geot	echnical investigati	on) with the site p	photos of
vegetat	tion during a Sept 201	6 site visit, conduc	cted by Stantec. V	/e have deter	mined that there w	as enough inform	ation from
, s		these inve	stigations to inform	n the status o	of the site.	5	

3/3 Abbrev.	Species Name	Absolute Dominant	Indicator	Dominance Test worksheet:
Tree Stratum		% Cover Species?	Status	Number of Dominant Species That Are OBL, FACW, or FAC: <u>2</u> (A)
3 4				Total Number of Dominant Species Across All Strata: <u>2</u> (B)
	Total Cover: 50% of total cover:0	0 20% of total cove	r: <u>0</u>	Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)
Sapling/Shrub St	ratum			
1	Salix Unidentified	50 YES	FAC	
2				Prevalence Index worksheet:
3		·		OPL appealer 0 v 1 0
5		·		$\begin{array}{c c} \text{OBL Species} & 0 & x \ 1 = & 0 \\ \text{EACW species} & 5 & x \ 2 = & 10 \\ \end{array}$
6		·		FAC species $150 \times 3 = 450$
	Total Cover:	50		FACU species $0 \times 4 = 0$
	50% of total cover: 25	20% of total cove	r: 10	UPL species $0 \times 5 = 0$
		•		Column Totals: 155 (A) 460 (B)
Herb Stratum				
1	Carex sp (unidentified)	100 YES	FAC	Prevalence Index = $B/A = 2.9677$
2 erivag	Eriophorum vaginatum	5 NO	FACW	
3				Hydrophytic Vegetation Indicators:
4				Yes Dominance Test is >50%
5		·		Yes Prevalence Index is ≤3.0
6				Morphological Adaptations ¹ (Provide
7				supporting data in Remarks or on a separate
8				Problematic Hydrophytic Vegetation ¹ (Explain)
9				
10				¹ Indicators of hydric soil and wetland hydrology must
	Total Cover:	105		be present unless disturbed or problematic.
	50% of total cover: 52.5	20% of total cove	r: 21	
				Hydrophytic
Plot size (radius,	or length x width)	% Bare Ground		Vegetation
% Cover of wella	and Bryophyles Total Co	ver of Bryophytes		
Remarks: The	e vegetation consists primarily	of sedges and grasse	es with sor	me interspersed willows. Cottongrass is evident, and standing
in the first state of the state	water was reported. Wh	ile identifyina specifi	ic species i	is difficult, indicators are likely to be FAC or wetter.

SOIL

Profile Desc	ription: (Describ	e to the dept	h needed to docum	ient the	indicator o	or confirm	n the absence	of indicators.)
(inches)	Color (moist	<u> </u>	Color (moist)	%	Type ¹	\log^2	Texture	Remarks
(110100)		<u> </u>			-76-	200	10/10/	Romanie
0-2							Moss	JAJ-16-30
							Brown silty	dense fine to medium
2-12							clay loam	roots; JAJ-16-30
								JAJ-16-30 is the
								Stantec Cultural Point
	Frazan brown							10.200/ Jack Colder K15
0-240	Frozen, prown	to						10-30% ICe; Golder K 15- 24
	tration D-Depleti	on PM-Redu	and Matrix CS-Cov	ored or (Costed San	d Grains	² l ocation: F	-Dore Lining M-Matrix
Type. C=Concern				ereu or c	Judieu Jam	u Grains.	LUCAUUT. I	'L=FUIE LIIIIIY, IVI–IVIAUIA.
Hvdric Soil Indic	ators:	Indicators f	or Problematic Hy	dric Soil	s ³ :			
Histosol or H	listel (A1)	Alaska	Color Change (TA4)	4	Alaska (Gleved W	/ithout Hue 5Y of	or Redder
x Histic Epiped	lon (A2)	Alaska	Alpine Swales (TA5))	Under	lying Lay	er	
Hydrogen Su	Ilfide (A4)	Alaska	Redox With 2.5Y Hi	Je	Other (E	xplain in	Remarks)	
Thick Dark S	urface (A12)				_	•		
Alaska Gleye	∋d (A13)	³ One indicat	tor of hydrophytic ve	getation,	, one primar	ry indicate	or of wetland	
Alaska Redo	x (A14)	hydrology, a	ind an appropriate la	indscape	position m	ust be pre	esent unless di	sturbed
Alaska Gleye	ed Pores (A15)	⁴ Give details	s of color change in I	Remarks	i			
Restrictive Layer	(if present):				T			
Type:	· · · · · · · · · · · · · · · · · · ·	None			Hydric S	Soil		
Depth (inches	s):		0.00 Manah /An	" 004 F C	Present	?	Yes x	
Remarks Oct 20	16 Stantec Cultur	al Point JAJ-1	6-30 and March/Api	11 2015 G	joider geole	Chnical II	nvestigation wa	IS USED FOR SOIIS (DOINT KTD-
∠ı). vvi the defir	nile muriseli colora	S were not lue	ntifieu, we interprete	:00-2 aa ∩rless '(3 Olyanics, 1 danca root	Z-12 do : te' as heir	a layer or organ	aturation was noted at below
the dom	2 inches. As t	he site was sa	ampled in October, v	Ve expec	t the organi	ics to be	saturated during	a lune – August.
	Linonosti is			10 Gr.p	1 110 0.5	00 10	Jacanated 22.	gouno ragaon
HYDROLOGY	Indicator					Croond	· la d'actore ((
Wetland nyd	Irology indicator	S:	ι.			Secona	ary Indicators (2	2 or more requirea)
v Surface Wat		Inundat	tion Visible on Aerial	Imagery	(R7)	VVa Dra	inade Patterns	Ves (D9) (R10)
 X Sunace Water T Y High Water T 	31 (M1) Fahla (A2)	Sparse	Iv Vegetated Concav	Surfac	(D/) ~~ (R8)	Oxi	dized Rhizosph	(DTU) Peres along Living Roots (C3)
x Saturation (A	abic (72)	Marl De	nosits (B15)	0 Ounao		Pre	sence of Reduc	ced Iron (C4)
Water Marks	(B1)	Hydrog	en Sulfide Odor (C1))		Sal	t Deposits (C5)	
Sediment De	posits (B2)	Dry-Sea	ason Water Table (C	2)		Stu	nted or Stresse	ed Plants (D1)
Drift Deposits	s (B3)	Other (f	Explain in Remarks)			Ger	omorphic Positi	on (D2)
Algal Mat or (Crust (B4)					Sha	allow Aquitard (D3)
Iron Deposits	s (B5)					x Mic	rotopographic F	Relief (D4)
Surface Soil	Cracks (B6)					FA(C-Neutral Test	(D5)
Field Observation	AS:	Nia	Death (noboo)	~	Wotland			
Sufface water Fie	Sent? Yes x		Depth (inches):	0	Hydrolo			
Valer Table Fless	301: 105 A		Depth (inches).	0	Drosont	gy .2	Vec	
(includes car	nillarv fringe)			0	-	ſ		
Describe Recorde	d Data (stream g	auge. monitori	ng well. aerial photo	s. previo	us inspectio	ons), if av	/ailable:	
	<u> </u>		······································	o , F		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
Remarks: The	Sept site visit no	tes standing v	vater. The Oct 2016	Stantec	Cultural Po	int JAJ-1	6-30 found 75-1	100% water saturation at 2
inche	s. There is no not	e of a water ta	able, as this informa	tion is no	ot typically re	ecorded i	n a cultural inve	estigation. In our experience
in th	ne region, saturati	on of this deg	ree probably means	the wate	er table is no	ear the 8	inch mark durir	ng June - August. It is also
		imi	portant to review the	seconda	ary characte	eristics or	this site.	

			Doo
Project/Site:	Kivalina	Site No.:	<u>P32</u>
Applicant/Ov	wner: DOT&PF	Investigator(s):	Stantec
Date: 9/	16/2016	Cowardin:	PEM1/SS1C
Notes:	Dry surface conditions from upper edge ~500 ft to south. Standing water at surfa grasses/sedges.	of last feature to current l ace in current location. Spo	ocation. Short pond oradic shrubs, seeding
Lookir	ng North	Looking E	East

Looking South

Looking West
WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site:	Kivalina Borough/City:			: N	W Arctic	Sampling Date:	Sept/Oct 2016
Applicant/Owner:		DOT	T&PF			Sampling Point	P37
Investigator(s):	Stantec	·	Landform (hil	lside, terrace,	, hummocks, etc	Meac	wot
Local relief (concave, c	convex, none):	Flat	Slope (%):	0	—		
Subregion: Western B	rooks Range Mts Foot	nills Lat: 67	.759108	Long:	-164.46516	Datum:	NAD83
Soil Map Unit Name:		Not Availabl	e		NWI classifi	cation: PSS	S1/EM1E
Are climatic / hydrologi	ic conditions on the site	e typical for this tir	ne of year? Yes	x No	(If no, explain	in Remarks.)	
Are Vegetation,	Soil, or Hydrolog	Jy significan'	tly disturbed?	Are "Nor	mal Circumstance	es" present? Yes	<u>x</u> No
Are Vegetation	Soil, or Hydroloç	jy naturally r	problematic?	(If neede	ed, explain any an	swers in Remark	s.)
	NGS – Attach site ma	p showing samp	ling point loca	tions, transe	cts, important fe	atures, etc.	
Hydrophytic Vegetatior	n Present? Yes	x No	T			· · · ·	
Hydric Soil Present?	Yes	x No	Is the Sam	oled Area			
Wetland Hydrology Pre	esent? Yes	x No	within a W	/etland?	Yes x No)	
	_						
Remarks Standing w sedges and	/ater with small open w d taller grasses. This p	ater areas. Base opinit combines the	of medium size soil information	d elongated ri n (from an Oc	ise. Hydrologically t 2016 cultural inv	connected to port vestigation and a	nd, near by March/April
2015 Golder	geotechnical investiga	tion) with the site	photos of veget	ation during a	a Sept 2016 site v	isit, conducted by	Stantec. We
ha	ive determined that the	re was enough int	formation from	these investic	ations to inform th	ne status of the s	ite.

VEGETATION – Use scientific names of plants. List all species in the plot. MUST LIST COVER IN DESECENDING ORDER

2/2 Abbrov	Species Name	Abachita Dominant Indiantar	Dominance Test worksheet:
J/J ADDIEV.	Species Marile	Absolute Dominant Indicator	Number of Dominant Species
		% Cover Species? Status	That Are OBL EACW or EAC: $1 (A)$
			That Ale OBL, FACW, OF FAC. (A)
2 <u> </u>			Total Number of Deminert
3			Total Number of Dominant
4			Species Across All Strata: <u>1</u> (B)
	I otal Cover:	0	
	50% of total cover: 0	20% of total cover: 0	Percent of Dominant Species
			That Are OBL, FACW, or FAC: 1 (A/B)
Sapling/Shrub St	ratum		
1			
2			Prevalence Index worksheet:
3			Total % Cover of: Multiply by:
4			OBL species 0 x 1 = 0
5			FACW species 100 x 2 = 200
6			FAC species $0 \times 3 = 0$
	Total Cover:	0	FACU species 0 x 4 = 0
	50% of total cover: 0	20% of total cover: 0	UPL species $0 \times 5 = 0$
			Column Totals: 100 (A) 200 (B)
Herb Stratum			、,
1 Carsp	Carex sp (unidentified)	100 YES FACW	Prevalence Index = $B/A = 2$
2			
3			Hydrophytic Vegetation Indicators
4			Yes Dominance Test is >50%
5			Ves Prevalence Index is <3.0
<u> </u>			Merphological Adoptationa ¹ (Dravida
7			worphological Adaptations (Flovide
·			
8		·	Problematic Hydrophytic Vegetation (Explain)
9		·	
10			¹ Indicators of hydric soil and wetland hydrology must
	Total Cover:	100	be present unless disturbed or problematic.
	50% of total cover: 50	20% of total cover: 20	
			Hydrophytic
Plot size (radius,	or length x width)	% Bare Ground	Vegetation
% Cover of Wetla	and Bryophytes Total Co	ver of Bryophytes	Present? Yes x No
Remarks: The	e site has standing water and s	edge monoculture. While the s	specific species is not evident, it is likely to be FACW or OBL.
	5	Ç	

|--|

Sampling Point: P37

Profile Desc	cription: (Describe	to the dept	n needed to docum	ent the i	ndicator	or confirm	n the absence	of indicators.)
Depth				lox Featu	res	. 2	- <i>i</i>	
(inches)	Color (moist)	%	Color (moist)	%	Туре	Loc	Texture	Remarks
0-2				_		_	Sod	JAJ-16-006
							Silty clay	
2-21	Brown, no grave	els					loam	Fine to small roots
								JAJ-16-006 is the
				·				Stantec Cultural Point
				<u> </u>				
								Organics: Golder K15-
0-18							Frozen peat	15
	Frozen, dark grav	vish	·				ORGANIC	40-50% Ice: Golder K15-
18-84	brown	10					SILT	15
¹ Tvpe: C=Concer	ntration, D=Depletio	n. RM=Redu	ced Matrix, CS=Cov	ered or C	coated Sar	nd Grains.	² Location: F	L=Pore Lining, M=Matrix.
1,100, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,		·, · · · · · · · ·	, , , , , , , , , , , , , , , , , , ,	0.02				L=1 010 L
Hvdric Soil Indic	ators:	Indicators f	or Problematic Hyd	Iric Soils	s ³ :			
Histosol or F	Histel (A1)	Alaska	Color Change (TA4)	4	Alaska	Gleved Wi	ithout Hue 5Y o	or Redder
x Histic Epiper	don (A2)	Alaska	Alpine Swales (TA5))	Unde	rlving Lave	er	
Hydrogen Si	ulfide (A4)	Alaska	Redox With 2.5Y Hi	le	Other (I	Explain in I	Remarks)	
Thick Dark S	Surface (A12)						,	
Alaska Gley	ed (A13)	³ One indicat	or of hvdrophytic ve	detation,	one prima	rv indicato	or of wetland	
Alaska Redo	ox (A14)	hydrology, a	nd an appropriate la	ndscape	position n	nust be pre	esent unless di	sturbed
Alaska Gley	ed Pores (A15)	⁴ Give details	of color change in f	Remarks				
Restrictive Laye	r (if present):							
Туре:		None			Hydric	Soil		
Depth (inche	es):				Presen	t?	Yes x	No
Remarks Gold	er found peat/organ	ics from 0-18	3". Oct 2016 Stantec	: Cultural	Point JAJ	-16-006 ar	nd March/April	2015 Golder geotechnical
investig	gation was used for	soils (point k	<-15-15). While Mun	sell color	rs were no	t identified	l, we interprete	d 0-2" as organics, 2-21" as
organi	cs (roots) and a lay	er of mineral	soil meeting the def	inition of	a Histic E	pipedon ('b	orown' being ch	roma 2 or less). Saturation
1			was r	noted at I	pelow 2".			
HYDROLOGY								
Wetland Hy	drology Indicators	5:				Seconda	ary Indicators (2	2 or more required)
Primary Indicators	s (any one indicator	is sufficient)				Wat	ter-stained Lea	ves (B9)
x Surface Wat	ter (A1)	Inundati	on Visible on Aerial	Imagery	(B7)	Drai	inage Patterns	(B10)
x High Water	Table (A2)	Sparsel	y Vegetated Concav	/e Surfac	e (B8)	Oxic	dized Rhizosph	eres along Living Roots (C3)
x Saturation (A	A3)	Marl De	posits (B15)			Pres	sence of Reduc	ced Iron (C4)
Water Marks	s (B1)	Hydroge	en Sulfide Odor (C1))		Salt	Deposits (C5)	
Sediment De	eposits (B2)	Dry-Sea	ison Water Table (C	;2)		Stur	nted or Stresse	d Plants (D1)
Drift Deposit	ιs (B3)	Other (E	Explain in Remarks)			Geo	morphic Positi	on (D2)
Algal Mat or	Crust (B4)					Sha	llow Aquitard (I	D3)
Iron Deposits	s (B5)					Micr	rotopographic H	Relief (D4)
Surface Soli	Cracks (B6)				-	FAU	2-Neutral Test ((D5)
Field Observatio	ins:			~	Watlan			
Surface water Pro	esent? Yes x		Depth (inches):	0	Wettan	a 		
Water Table Fies	res_x		Depth (inches):	0	Broson	bgy	Yoo Y	NI
Saturation Freser		. INO	Depth (inches).	0	Presen	τ.	res x	
Describe Records	od Doto (stream dai	ugo monitori	na woll perial photo	o previou	us inspect	ione) if av	ailabla:	
Describe Recorde	a Data (Stream yat	lge, monitorii	ig well, aeriai prioto-	s, previou	is inspeci	10115), 11 av	allable.	
1								
Remarks: The	Oct 2016 Stantec /	Cultural Point	t 14.1-16-006 found (25-50% s	eturation :	at 2 inches	There is no n	ote of a water table, as this
infor	rmation is not typics	ally recorded	in a cultural investio	ation In (ance in the		ation of this degree probably
	means the wa	ter table is no	ear the 8 inch mark	during Ju	ine - Augu	st The Se	nt site visit four	nd standing water.
i				20111-9-0-2	10 7.09-	01. 11.0 0.2	prono nen rem	id oldrang materi

Project/Site	:: Kivalina	Site No.:	P37					
Applicant/O	wner: DOT&PF	Investigator(s):	Stantec					
Date: 9	/16/2016	Cowardin:	PSS1/EM1E					
Notes: Standing water with small open water areas. Base of medium sized elongated rise. Hydrologically connected to pond, near by sedges and taller grasses.								



Looking North



Looking East



Looking South



Looking West

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site:	Kivalina	Borouç	gh/City:	NW Arctic	Sampling Date:	Sept/Oct 2016
Applicant/Owner:		DOT&PF			Sampling Point	P45
Investigator(s):	Stantec	Landfo	orm (hillside, te	errace, hummocks, etc	Hillsic	de
Local relief (conc	ave, convex, none):	lope Slope	(%): 5			
Subregion: West	ern Brooks Range Mts Foothil	<u>s</u> Lat: 67.773729	Long:	-164.478786	Datum:	NAD83
Soil Map Unit Nar	.me:	Not Available		NWI classific	cation: PSS	J/EM1C
Are climatic / hyd	rologic conditions on the site t	pical for this time of yea	ar? Ye: x	No (If no, explain i	n Remarks.)	
Are Vegetation	, Soil, or Hydrology	significantly distur	bed? Ar	e "Normal Circumstance	es" present? Yes	<u>x</u> No
Are Vegetation	, Soil, or Hydrology	naturally problema	atic?(If	needed, explain any any	swers in Remarks	š.)
				.		
SUMMARY OF F	INDINGS – Attach site map s	howing sampling poin	it locations, tr	ransects, important fea	atures, etc.	
Hydrophytic Vege	station Present? Yes x					
Hydric Soil Prese	nt? Yes x	No Is the	e Sampled Are	∌a		
Wetland Hydrolog	gy Present? Yes y	No with	hin a Wetland?	Yes <u>x</u> No		
		L				
Remarks						
Drain	hage feature towards lake. This	point combines the soil	l information (f	rom an Oct 2016 cultura	al investigation) wi	ith the site
photos	of vegetation during a Sept 20	16 site visit, conducted	by Stantec. W	e have determined that	there was enough	1 information
	f	om these investigations	to inform the	status of the site.		
VEGETATION -	Use scientific names of plan	ts. List all species in th	ne plot. MUST	i LIST COVER IN DESF	ECENDING ORDF	<i>E</i> R
						<u> </u>
3/3 Abbrev.	Species Name	Absolute Dominant In	dicator Dom	inance Test workshee	:	
Tree Stratum		% Cover Species? S	Status Nu	umber of Dominant Spec	cies	
1			Th	at Are OBL, FACW, or I	FAC: (A`	.)
2						
3			Тс	tal Number of Dominan	t	
4			Sp	pecies Across All Strata:	. <u>4</u> (B`	,)
	Total Cover:	0				
	50% of total cover: 0	20% of total cover:	0 Pe	ercent of Dominant Spec	cies	

Percent of Dominant Species		
That Are OBL, FACW, or FAC:	1	(A/B)

			That Are OBL EACW or EAC' $1 (A/B)$
Sapling/Shrub S	Stratum		
1 vaculi	Vaccinium uliginosum	75 YES FAC	
2 salsp	Salix sp (unidentified)	50 YES FAC	Prevalence Index worksheet:
3 vacvit	Vaccinium vitis-idaea	40 YES FAC	Total % Cover of: Multiply by:
4 rhotom	Rhododendron tomentosum	10 NO FACW	OBL species 0 $x 1 = 0$
5			FACW species 10 x 2 = 20
6			FAC species 170 x 3 = 510
	Total Cover:	175	FACU species 0 x 4 = 0
	50% of total cover: 87.5	20% of total cover: 35	UPL species $0 x 5 = 0$
			Column Totals: <u>180</u> (A) <u>530</u> (B)
Herb Stratum			Developer la la P/A 0.0444
1	Unidentified Grass	5 YES FAC	Prevalence index = $B/A = 2.9444$
2			Undrankstia Variation Indiantara
3		<u> </u>	Non-Dominance Test is $> 50\%$
4			Ves Prevalence Index is <3.0
6			Morphological Adaptations ¹ (Provide
7			supporting data in Remarks or on a separate
8			Problematic Hydrophytic Vegetation ¹ (Explain)
9			
10			¹ Indicators of hydric soil and wetland hydrology must
10	Total Cover:	5	be present unless disturbed or problematic
	50% of total cover: 2.5	20% of total cover: 1	
			Hydrophytic
Plot size (radius	s, or length x width)	% Bare Ground	Vegetation
% Cover of We	tland Bryophytes Total Cov	ver of Bryophytes	Present? Yes x No
Remarks:	A shrub sloping hillside, v	with dense layers of VacVit and	VacUli, and a covering chest high layer of willows.

SOIL

Sampling Point: P45

Profile Desc	ription: (Describe Matrix	to the depth	needed to docum	ent the i	ndicator of res	or confirm	n the absence	of indicators.)
(inches)	Color (moist)	%	Color (moist)	<u>%</u>	Type ¹	Loc ²	Texture	Remarks
0-2							Sod	JAJ-16-016
							Brown/gray	few fine to small roots;
2-16				<u> </u>			clay silty	JAJ-16-016
								JAJ-16-016 is the Stanted Cultural Point
								Stantes Sutura - Sint
				<u> </u>				
¹ Type: C=Concent	tration, D=Depletior	n, RM=Reduc	ed Matrix, CS=Cov	ered or C	oated Sar	nd Grains.	² Location: P	L=Pore Lining, M=Matrix.
Hydric Soil Indica	ators:	Indicators for	or Problematic Hyd	Iric Soils	3 ³			
Histosol or Hi	istel (A1)	Alaska (Color Change (TA4)	4	Alaska	Gleyed W	ithout Hue 5Y o	or Redder
x Histic Epiped	lon (A2)	Alaska /	Alpine Swales (TA5)) - ~	Unde	rlying Lay	er Domorko)	
Thick Dark S	llide (A4) urface (A12)	Alaska r		.e		=xpiain in	Remarks	
Alaska Gleye	ed (A13)	³ One indicat [/]	or of hydrophytic ve	aetation,	one prima	ary indicate	or of wetland	
Alaska Redo	x (A14)	hydrology, ar	nd an appropriate la	ndscape	position m	nust be pr	esent unless dis	sturbed
Alaska Gleye	d Pores (A15)	⁴ Give details	of color change in F	Remarks.				
Restrictive Layer	(if present):				dei o	2-11		
Type: Depth (inches	<i>c)</i> .	Vone			Hyaric Presen	S011 +2	Yes x	
Remarks Oct 20	016 Stantec Cultura	al Point JAJ-'	16-016 was used for	r soils. W	hile Muns	ell colors	were not identifi	ed, we interpreted 0-2" as
organi	cs, 2-16" as a layer	r of organic/m	nineral soil mix mee	ting the d	efinition o	f a Histic I	Epipedon ('brow	n' being chroma 2 or less,
'few	roots' as organics) saturated durin). Saturation v 1g June – Aug	was noted at below gust. Shallow organ	2". As the ic layers	e site was for histic e	sampled pipedons	in October, we are common in	expect the organics to be Arctic Regions.
HYDROLOGY								
Wetland Hyd	Irology Indicators	:				Seconda	ary Indicators (2	2 or more required)
Surface Wate	(any one indicator	IS SUTTICIENU Inundati	on Visible on Aerial	Imagery	(B7)	vva Dra	ter-stained Leav	√es (B9) (R10)
High Water T	able (A2)	Sparsel	y Vegetated Concav	/e Surfac	(B8)	Oxi	dized Rhizosph	eres along Living Roots (C3)
x Saturation (A	.3)	Marl De	posits (B15)		· ·	Pre	sence of Reduc	ced Iron (C4)
Water Marks	(B1)	Hydroge	n Sulfide Odor (C1))		Sal	t Deposits (C5)	
Drift Deposits	posits (B2)	Dry-Sea	Son Water Table (C	-2)		Stu	nted or Stresse	d Plants (D1)
Algal Mat or (Crust (B4)	Outor (1				Sha	allow Aquitard ([D3)
Iron Deposits	s (B5)					x Mic	rotopographic F	Relief (D4)
Surface Soil	Cracks (B6)					FAC	C-Neutral Test (,D5)
Field Observation	1S: Normet? Vec	No v	Danth (inches):		Wetlan	7		
Water Table Prese	ent? Yes x	No <u> </u>	Depth (inches):	8	Hydrole	oqv		
Saturation Present	t? Yes x	No	Depth (inches):	2	Presen	t?	Yes x	No
(includes cap	villary fringe)						<u> </u>	
Describe Recorde	d Data (stream gau	ige, monitorir	ng well, aerial photos	s, previou	us inspecti	ions), if av	/ailable:	
Remarks: The C	Oct 2016 Stantec Cr	ultural Point .	JAJ-16-016 found 2!	5-50% wa	ater satura	ation at 2 i	nches. There is	no note of a water table, as
thi	s information is not	typically rec	orded in a cultural ir	vestigati	on. In our	experienc	e in the region,	saturation of this degree
pr	robably means the	water table is	inear the 8 inch ma	irk during	June - Au	igust. It is	also important	to review the secondary
			Ulara	Clensuos	UI IIIIo on	Ξ.		

Project/Site:	Kivalina	Site No.: P45
Applicant/Ov	wner: DOT&PF	Investigator(s): Stantec
Date: <u>9/</u>	17/2016	Cowardin: PSS1/EM1C
Notes:	Drainage feature towards lake. emergent vegetation. Slight mic	Mid chest high shrub, with a mixture of low shrub and crotopographic relief evident.
Lookir	ng North	Looking East

Looking South

Looking West

WETLAND DETERMINATION DATA FORM - Alaska Region

Project/Site:	Kivalina		Borough/City	/: N	NW Arctic	Sampling Date:	Sept/Oct 2016
Applicant/Owner:			DOT&PF			Sampling Point	P56
Investigator(s):	Stant	ec	Landform (hi	llside, terrace	, hummocks, etc	Terra	ace
Local relief (concave	e, convex, none):	Concave	Slope (%):	0			
Subregion: Upper K	obuk, Koyukuk Hills	and Val Lat:	67.754557	Long:	-164.562484	Datum:	NAD83
Soil Map Unit Name	:	Not Ava	ilable		NWI classifi	cation: PSS	S1/EM1B
Are climatic / hydrole	ogic conditions on th	e site typical for th	is time of year? Ye	x No	(If no, explain	in Remarks.)	
Are Vegetation	, Soil, or Hyd	rologysignif	icantly disturbed?	Are "No	rmal Circumstance	es" present? Yes	x No
Are Vegetation	, Soil, or Hyd	rology natur	ally problematic?	(If need	ed, explain any an	swers in Remarks	s.)
SUMMARY OF FIN	DINGS – Attach site	map showing sa	ampling point loca	tions, transe	cts, important fe	atures, etc.	
Hydrophytic Vegetat	ion Present?	'es <u>x</u> No					
Hydric Soil Present?	' Y	′es x No	Is the Sam	pled Area			
Wetland Hydrology	Present? Y	′es x No	within a V	Vetland?	Yes x No		
Remarks Slight ris	se near shoreline. Lo	cation where north	n/central proposed	route would c	ross lagoon. Smal	I section is slightly	y drier than
surround	ing, but is still a wetla	and. This point cor	nbines the soil info	rmation (from	an Oct 2016 cultu	ral investigation)	with the site
photos of	vegetation during a	Sept 2016 site visi	t, conducted by Sta	intec. We hav	e determined that	there was enough	h information
	с о	from these i	nvestigations to inf	orm the status	s of the site.	0	

VEGETATION – Use scientific names of plants. List all species in the plot. MUST LIST COVER IN DESECENDING ORDER

3/3 Abbrev.	Species Name	Absolute Dominant	Indicator	Dominance Test worksheet:
Tree Stratum		% Cover Species?	Status	Number of Dominant Species That Are OBL, FACW, or FAC: <u>3</u> (A)
3 4				Total Number of Dominant Species Across All Strata: <u>3</u> (B)
	Total Cover: 50% of total cover: 0	0 20% of total cove	er: <u>0</u>	Percent of Dominant Species That Are OBL, FACW, or FAC:(A/B)
Sapling/Shrub St	tratum			
1 vaculi 2 rhotom 3	Vaccinium uliginosum Rhododendron tomentosum Salix sp (Unidentified)	80 YES 75 YES 10 NO	FAC FACW FAC	Prevalence Index worksheet: Total % Cover of: Multiply by:
4				OBL species 0 $x 1 = 0$ FACW species 75 $x 2 = 150$ FAC species 95 $x 2 = 285$
°	Total Cover: 50% of total cover: 82.5	165 20% of total cove	er: <u>33</u>	FAC species $95 \times 3 = 285$ FACU species $0 \times 4 = 0$ UPL species $0 \times 5 = 0$ Column Totals: 170 (A) 435 (B)
Herb Stratum 1	Grass, Unidentified	5 YES	FAC	Prevalence Index = $B/A = 2.5588$
3 4 5 5 6 7 8				Hydrophytic Vegetation Indicators: Yes Dominance Test is >50% Yes Prevalence Index is ≤3.0 Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate Problematic Hydrophytic Vegetation ¹ (Explain)
9 10	Total Cover:	5		¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
	50% of total cover: 2.5	20% of total cove	er: <u>1</u>	Hydrophytic
Plot size (radius, % Cover of Wetl	or length x width) and BryophytesTotal Co	% Bare Ground_ ver of Bryophytes		Vegetation Present? Yes x No
Remarks:	Slight terra	ce along ocean sho	oreline, risin	g above surrounding wetter wetlands.

SO	I	I

Sampling Point: P56

	· /Deceribe to the d						af indicators)
Profile Description	: (Describe to the de	epth needed to docum	ient the ir	idicator o	or contirr	n the absence	of Indicators.)
Depth				es Turn 1	1 2	Tantana	Damada
(inches) C	olor (moist)	6 Color (moist)	%	Type	Loc-	lexture	Remarks
0.4						DestMass	
0-4						Peat Moss	DEM-16-17
4.00						Brown/gray	
4-20						clay slity	Some roots; DEM-16-17
							DEM-16-17 is the
							Stantec Cultural Point
						0	
¹ Type: C=Concentration,	D=Depletion, RM=Re	educed Matrix, CS=Cov	ered or Co	bated San	d Grains.	² Location: F	PL=Pore Lining, M=Matrix.
Hydric Soil Indicators:	Indicato	rs for Problematic Hyd	ric Soils	3			
Histosol or Histel (A	1) Alas	ka Color Change (TA4)	4	Alaska (Gleved W	ithout Hue 5Y o	or Redder
x Histic Epipedon (A2) Alas	ka Alpine Swales (TA5)		Under	lving Lav	er	
Hvdrogen Sulfide (A	4) Alas	ka Redox With 2.5Y Hu	ie	Other (F	xolain in	Remarks)	
Thick Dark Surface	(A12)					,	
Alaska Gleved (A13) ³ One ind	icator of hydrophytic ve	netation o	ne nrimar	v indicate	or of wetland	
Alaska Oleyeu (A13	bydrolog	v and an appropriate la	ndecane r	ne prima	ust he nr	asant unlass di	sturbed
Alaska Redox (A14)	a (A15) ⁴ Give de	tails of color change in l	Remarks	0031101111	ust be pr		stubed
Alaska Gleyed Pole			Cinano.	-			
Restrictive Layer (if pre	sent):						
Type:	Permatrost			Hydric S	5011	Vee V	
Deptn (inches):	20			Present		res x	NO
Remarks Oct 2016 Sta	ntec Cultural Point D	ME-16-017 was used to	r soils. W	hile Munse	ell colors	were not identif	fied, we interpreted 0-4" as
organics, 4-2	0" as a layer of orgar	ic/mineral soil mix mee	ting the de	efinition of	a Histic I	Epipedon ('brow	vn' being chroma 2 or less,
'fewroots' as	s being evidence of o	rganics). Saturation was	s noted at	below 4".	As the si	te was sampled	d in October, we expect the
C	organics to be saturat	ed during June – Augus	st. Shallow	organic f	or epiped	lon are commoi	n in the Arctic.
Wetland Hydrology	Indicators.				Second	ary Indicators (2	or more required)
Primary Indicators (any o	no indicator is suffici	ant)			- Wo	tor stained Leas	
Surface Water (A1)		dation Visible on Aerial	Imagery (B7)	Dra	inage Patterns	(B10)
V High Water Table (/	(2) Spa	really Vagatated Capca	intagery ((B0)		dized Phizeenh	(BTO)
$\frac{x}{x}$ Saturation (A3)	(2) Spa	Doposite (B15)	e Sunace	(DO)	Dro	sonce of Podur	and Iron (C4)
X Saturation (AS)		rogon Sulfido Odor (C1)				Ence of Reduc	
Sodimont Doposito	(P2) [1yu	Seesen Water Table (CT)	· 2)			ntod or Stroopo	d Planta (D1)
Drift Deposite (B3)	(B2) Diy-	Season Waler Table (C	2)			morphic Positi	(D^2)
DInt Deposits (B3)	24)					Mow Aquitord (011 (D2) D2)
Aigal Mat of Clust (I	54)				Mio	now Aquitaru (i	DS) Poliof (D4)
Surface Soil Creake							
Surface Soli Cracks	(D0)			-			(D5)
				Wetlene			
Surface water Present?	Yes No	Deptn (inches):		Wetland	1 		
vvater Table Present?	res <u>x</u> NO	Deptn (inches):	8	Hydrolo	yyy O	×	
Saturation Present?	Yes <u>x</u> No	Depth (inches):	4	Present	7	Yes x	
(includes capillary fr	inge)						
Describe Recorded Data	(stream gauge, moni	toring well, aerial photo	s, previou	s inspectio	ons), if av	allable:	
:							
Remarks: The Oct 2016	Stantec Cultural Po	int DME-16-017 found 2	25-50% wa	ater satura	tion at 4	inches. There is	s no note of a water table, as
this inforr	nation is not typically	recorded in a cultural ir	nvestigatio	on. In our e	experienc	e in the region,	saturation of this degree
probably	means the water tab	le is near the 8 inch ma	irk during	June - Au	gust. It is	also important	to review the secondary
		chara	cteristics	of this site).		

Project/Site: Kivalina	Site No.: P56
Applicant/Owner: DOT&PF	Investigator(s): Stantec
Date: 9/17/2016	Cowardin: PSS1/EM1B
Notes: Location where north/central propo	sed route would cross lagoon. Slight terrace evident
along shoreline, with flatter wetland	ds evident in the distance.
	and the second se
the second s	and the second s
	and the second second
	and the second se
	and the second se
And the second	
Looking North	Looking East
	and a second
- All Share - All Parks	and the second s
	a such all the states and

Looking South

Looking West

Appendix C PHOTO POINTS

Project/Site:	Kivalina	Site No.:	HP1	
Applicant/Owner:	DOT&PF	Investigator(s):		Stantec
Date: 9/14/2017		Cowardin:	R2US	
Notes: Aerial ph riverine s foregoun	oto during Stantec visit (HP1). K-ł system is evident in the mid-groun d.	Hill and study area look d, with shrub dominate	ing north. S d wetlands	Small in the

Project/S	Site: Kivalina	Site No.: HP4
Applican	t/Owner: DOT&PF	Investigator(s): Stantec
Date:	9/14/2017	Cowardin: PSS1/EM1B
Notes:	Ice wedge polygon features. Saturated a	and seasonally flooded wetland are evident.
		A
		A
		ET - ET
		The second se
		The second s
		and the second
		A PARA SALAR AND A PARA

Project/Site:	Kivalina		Site No.:	HP11
Applicant/Ov	wner: DOT&PF		Investigator(s):	Stantec
Date: 9/	14/2017		Cowardin:	PSS1/EM1E
Notes:	Wulik River braids. Shrub h	habitat is evident, along	with emergent	wetlands in the
	distance. The shrubs arour	nd the river braids appe	ar to be season	ally flooded, as
	evident from the gravel des	sposits.		
				101
	Jan .			
		1	3	
	the first of the second			
	alter the state			
				and the second sec
		2021 E		and the second second
		and the second second		
			the start of the	
		Con and and	24 3 4	Der Carlo
		Section of grade	1 1 A	State Brite State
				and the second of the
		A REAL PROPERTY OF		The second second

Project/Site	: Kivalina	Site No.:	HP15	
, Applicant/O	wner: DOT&PF	Investigator(s):		Stantec
Date: 9/	/15/2017	Cowardin:	L1UB	
Notes:	Helicopter overview looking west. Shrub I emergent wetland habitat and ponds in th	nabitat is evident near th ne distance.	e shorelin	e, along with

Project/Site:	Kivalina	Site No.: HP19
Applicant/Ov	vner: DOT&PF	Investigator(s): Stantec
Date: 9/1	16/2017	Cowardin: PSS1/EM1C
		<u> </u>
Notes:	View of sloping wetlands back up to K-Hill	
NOICS.		
1	And the second s	
		and the second
		The Martin Contraction of the
		and the second
	A CONTRACTOR OF THE REAL OF	
		Part Contract Contract
		AND THE AND A DECK

Project/Site:	Kivalina	Site No.:	HP21
Applicant/Ov	vner: DOT&PF	Investigator(s):	Stantec
Date: 9/	16/2017	Cowardin:	PEM1/SS1C
Notes:	Photo taken during Stantec Site visit. Shoreline	of ocean. Demons	strates a small terrace
	above the shoreline, with a flat wetland to the b	ackground.	
	<u> </u>		
		Contraction of the Annual Section of the Ann	
		and the second	
l i			
l i			
		and the second s	and the second s
		24-	
			and the second second
			the second second
			and the second

Project/Site:	Kivalina	Site No.:	HP22
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date: 9/17/2017		Cowardin:	PEM1/SS1C
Notes: Helicopte with a few	r overview of potential gravel / small shrubs present. Pond	source near lagoon. Prima s are evident, as is the ocea	rily emergent wetland, an in the background.









Project/Site:	Kivalina	Site No.:	HP24	
Applicant/Ow	ner: DOT&PF	Investigator(s):		Stantec
Date: 9/1	4/2017	Cowardin:	R2UB	
				_
Notes:	Kivalina and south entrance to Kivalina Lagoon good understanding of the meandering riverine reaching to the ocean. Lakes and ponds are ev banks one can note high shrubs, which may pre-	/mouth of Wulik R system and wetla rident in the distan ovide important bin	iver. Picture nd comple> ce. Along th d habitat.	es give a kes ne river
			200 - 1	
			-	
			11	
			- C	
			and the second second	
			Case of	

Project/Site:	Kiva	alina	S	Site No.:	HP36	
Applicant/Ow	ner: D	OT&PF		nvestigator(s):		Stantec
Date: 9/1	5/2017			Cowardin:	PEM1/SS	<u>51</u> C
Notes:	Photo taken during vegetation with sor vegetation patterns	Stantec Site visi ne shrubs preser Lakes and pon	it (HP36). Flat v nt. At least seas ds in the backg	vetland, primar sonal flooding is round.	ily emerge s evident fr	nt rom

Project/Site	: Kivalina	Site No.:	HP37
Applicant/O	wner: DOT&PF	Investigator(s):	Stantec
Date: 9/	/15/2017	Cowardin:	PEM1/SS1C
Notes:	Photo taken during Stantec Site visit (Hi evidence of prime bird habitat. Lakes ar	P37). Scrub Shrub wetlan Id ponds are present in th	d evident, with le distance.
	<image/>		

Project/Site: Kivalina		Site No.: HP38		
Applicant/Owner: DOT&PF		Investigator(s): Stantec		
Date:	9/15/2017	Cowardin: PEM1/SS1C		
Notes:	Aerial Photo taken during Stantec Site \ some shrubs present.	/isit (HP38). Flat emergent wetland evident, with		

Project/Site:	Kivalina	Site No.: HP39	
Applicant/Owne	r: DOT&PF	Investigator(s): Stantec	
Date: 9/14/2	2016	Cowardin: U	
Notes: Ae	rial photos of K-Hill taken by Stantec (HP39). Upland	

Project/Site:	Kivalina	Site No.: P1	
Applicant/Ov	wner: DOT&PF	Investigator(s):	Stantec
Date: 9/	15/2016	Cowardin: U	
Notes:	Topography change next to lake - start of small hummocks, no standing water. P1 Labrador tea	of higher/drier plateau, blueberrie site vegetation, Polar grass, blu	es, low shrubs, leberry,
	<image/> <caption></caption>		



Project/Site:	Kivalina	Site No.:	P3	
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec	
Date: 9/15/2017		Cowardin:	PSS1/EM1C	
Notes: Vegetationside. P3	on and landscape change, sta site vegetation (sedges, cotto	nding water between tusso ngrass, Labrador tea)	cks on south/flatter	





South



East



West

Project/Site:	Kivalina	Site No.:	P4	
Applicant/Owner:	DOT&PF	Investigator(s):	St	antec
Date: 9/15/2016		Cowardin:	PSS1/EM1C	
Notes: Lower I geomol	ying finger of grassy/less shrub rphic change from areas to wes	vegetation extending up th t and east	e hilll. Slight	



North



South



East



West

Project/Site:	Kivalina	Site No.:	P22	
Applicant/Owner:	DOT&PF	Investigator(s):		Stantec
Date: 9/15/2017		Cowardin:	R2UB	
Notes: Photo ta	aken during Stantec Site visit. N	Wulik River gravel bar		



North



South



East



West



Project/Site:	Kivalina	Site No : P25
Applicant/Ow		Investigator(s): Stantec
Date: 9/1	16/2016	Cowardin: PSS1/EM1E
Duto: 0/1		
Notes:	Standing water, frozen ground, example of wet in this area	ground boundary. Cottongrass present
	North	East
with respect to the PS 2004	South	West

Project/Site:	Kivalina	Site No.:	P30
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date: 9/16/2016		Cowardin:	PEM1/SS1C
Notes: Increas cover,	sing dryness, increasing shrubs - 20 increasing elevation to west slightly	0 - 30% cover. Grasses a /	and moss ground
Ale and			



North



East



South



West

Project/Site	: Kivalina	Site No.: P34B	
Applicant/O	wner: DOT&PF	Investigator(s):	Stantec
Date: 9	/16/2016	Cowardin: PEM1	=
Notes:	Moving west along potential southern ro elevation to west. P33 represents edge	ute- wetland with surface water, in of standing surface water	ncreasing
	North	East	

South

West



Project/Site:		Kivalina	Site No.:	P36
Applicant/Ov	wner:	DOT&PF	Investigator(s):	Stantec
Date: 9/	16/2017		Cowardin:	PEM1/SS1C
Notes:	Photo taken d this area. Star	uring Stantec Site visit. P nding water in current loc	ockets of standing water w ation.	etlands throughout
	North		East	

South

新学(-)

West

Project/Site:	Kivalina	Site No.:	P41A
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date: 9/16/2017		Cowardin:	PEM1/SS1C
Notes: Standing	water wetland complex, late	ral N-S ridges between	



Looking North



Looking South



Looking East



Looking West

Project/Site:	Kivalina	Site No.:	P41B
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date: 9/16/2016		Cowardin:	PEM1/SS1C
Notes: Wetland	d complex, saturated at surface	but not standing water at the	his exact location.



Looking North



Looking South



Looking East



Looking West

Project/Site:	Kivalina	Site No.: P42		
Applicant/Own	ner: DOT&PF	Investigator(s): Stante	с	
Date: 9/17	7/2016	Cowardin: PSS1/EM1C		
Notes: F s a	Feature on northern proposed route, north shrubs present (similar to Photo Points P3 and tussocks.	of two lakes. Down sloping to west. Small and P4), intermixed with grass vegetation		
T				
	Fourth			
	South	vvest		
4				
Project/Site:	Kivalina	Site No.:	P48	
----------------------------	--	--	-----------------	--
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec	
Date: 9/17/2016		Cowardin:	PEM1/SS1C	
Notes: Photo tak Hummoc	en during Stantec Site visit. ks widespread, with low eme	Potential drainage feature, s rgent and shrub vegetation.	standing water.	



Looking North



Looking East



Looking South



Looking West

Project/Site:	Kivalina	Site No.:	P50	
Applicant/Owner:	DOT&PF	Investigator(s):		Stantec
Date: 9/17/2016		Cowardin:	PEM1F	
Notes: Saturate	ed area just north of small pon	d, standing water, grasses/s	edges only	′.



Looking North



Looking South



Looking East



Looking West

Project/Site:	Kivalina	Site No.:	P54
Applicant/Owner:	DOT&PF	Investigator(s):	Stantec
Date: 9/17/2016		Cowardin:	PEM1/SS1C
Notes: Drainage/	wetland feature sloping to la	ke, sedges, standing water.	



Looking North



Looking South



Looking East



Looking West

Project/Site: Kivalina	Site No.: P58
Applicant/Owner: DOT&PF	Investigator(s): Stantec
Date: 9/17/2016	Cowardin: PEM1F
Notes: Small drainage feature. Grass only in thi	is strip as compared to areas around
containing more shrubs. Standing water	at surface.
	and the second s
	Company of the second
at the second	and the state of the
A MARKEN AND AND AND AND AND AND AND AND AND AN	The second se
and the second second second	
The second s	
	a second and the second second
North	East
The second second second second second	and the second
and the second	A DESCRIPTION OF THE REAL OF
MARCH STREET, S	
The second second second	
South	West



Project/Site:	Kivalina	Site No.: USACE 1	
Applicant/Ov	vner: DOT&PF	Investigator(s): Jeremy Grauf	
Date: 8/*	15/2017	Cowardin: Wetland	
Notes:	Wetland. There was a visible vegetative shi 1 figure 1 of 10), and the upland soil consis gravel and coble layer below164.386537,	ft from wetlands to uplands (see enclosure ted of shallow (6 inch) organic layer with 67.808152 (WGS 1984)	
	<image/>		

Project/Site: Kivalina	Site No.: USACE 2
Applicant/Owner: DOT&PF	Investigator(s): Jeremy Grauf
Date: 8/15/2017	Cowardin: <u>Upland</u>
Notes: Upland164.387573, 67.808517 (WGS 1984)	

Project/Site:	Kivalina	Site No.: USAC	E 3
Applicant/Ow	vner: DOT&PF	Investigator(s):	Jeremy Grauf
Date: 8/1	15/2017	Cowardin: Upl	and
Notes:	Upland164.385235, 67.809277 (WGS 1984)		



Project/Site:	Kivalina	Site No.: JAJ-17-009
, Applicant/Ov	vner: DOT&PF	Investigator(s): Stantec, Justin Junge
Date: 8/	16/2017	Cowardin: Upland
Notes:	K-Hill Slope. 0-2cm: Brown silt, 30-50% of angular pebbles, roots throughout; 2-10c small to very large pebbles and small col impassable gravels. 67.809801, -164.380	gravels with small to large sub-rounded to cm: brown silty clay loam, >75% gravels with bbles, some roots; 10 cmbs terminated due to 6027

Project/Site:	Kivalina	Site No.: JR	H-17-012
Applicant/Ov	vner: DOT&PF	Investigator(s):	Stantec, John Hemmeter
Date: 8/1	6/2017	Cowardin:	Wetland
Notes:	0-18cm: Root mat, vegetation layer, brothroughout, loose compaction; 18-38cr saturation at 20 cm; 39 cmbs terminate 164.375925	own silty loam, no gravels, n grey compacted silt, no g ed. Permafrost at 40 cmbs.	rootlets to small roots gravels, +75% water . 67.805115, -

Project/Site: K	ivalina	Site No.: WCP1
Applicant/Owner:	DOT&PF	Investigator(s): Stantec, Ross Smith
Date: 8/17/2017		Cowardin: Wetland
Notes: WCP1 = Wetlan silt (A/B soil hori cmbs; soil probe 67.810444, -164	d Control Point 1. 0-20cm: Satu zons); 20-35cm: Saturated gray showed no change in sedimen .409389	rated active organic mat & organic-rich ⁷ silt. Terminated shovel probe at 35 ts before encountering rock at 60 cmbs.