
APPENDIX F
ANAKTUVUK PASS TRAIL REHABILITATION AQUATIC SITE
ASSESSMENT AND CREDIT-DEBIT CALCULATION

***Willow Master Development Plan
Wetlands Compensatory Mitigation Plan***

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**WILLOW MASTER DEVELOPMENT PLAN
POA-2018-00190 HARRISON BAY**

**ANAKTUVUK PASS SUBSISTENCE TRAIL
REHABILITATION AQUATIC SITE ASSESSMENT
AND
CREDIT DEBIT CALCULATION**

North Slope, Alaska

for



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Anchorage, AK 99510**

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Acronyms and Abbreviations

Abbreviation	Definition
Δ	Change
CPAI	ConocoPhillips Alaska, Inc.
FCI	functional capacity index
GIS	geographic information system
HGM	hydrogeomorphic
NPR-A	National Petroleum Reserve-Alaska
USACE	U.S. Army Corps of Engineers
WAA	Wetland Assessment Area
Willow Project	Willow Master Development Plan

1.0 INTRODUCTION

ConocoPhillips Alaska, Inc. (CPAI), as operator and working interest owner, proposes to develop hydrocarbon resources from federal oil and gas leases in the Northeast Planning Area of the National Petroleum Reserve-Alaska (NPR-A). The Willow Master Development Plan (Willow Project) proposes a series of infrastructure components that will be constructed over an approximate 10-year period for the purpose of oil and gas development in the NPR-A. The Willow Project involves placement of fill material in waters of the U.S. and would require authorization from the USACE under Section 404 of the Clean Water Act. To support permit evaluation, CPAI has prepared this aquatic site assessment and credit-debit calculations to assess wetlands that would receive functional uplift as a result of an Anaktuvuk Pass Trail Rehabilitation Project (Anaktuvuk Pass Subsistence Trail) under consideration by CPAI to offset unavoidable impacts to wetlands and other waters of the U.S.

2.0 METHODOLOGY

This Aquatic Site Assessment and debit calculation followed the methodologies found in the *Operational Draft Regional Guidebook for the Rapid Assessment of Wetlands in the North Slope Region of Alaska* (NS Assessment Method) (Berkowitz et al., 2017) and Alaska District: Credit Debit Methodology, Version 1.0 (USACE, 2016).

The Anaktuvuk Pass Subsistence Trail credit area is defined as the area of existing trail damage including lateral web effect that would be rehabilitated through placement of new geogrid. The area as delineated based on aerial interpretation of the area of disturbance along the entire length of two trails that travel north and northeast from the Anaktuvuk Pass landfill area. The north-trending trail ends near a group of cabins near Kongumavik Creek. The east-trending trails end near an unnamed tributary of Kongumavik Creek. The Anaktuvuk Pass Subsistence Trail credit evaluation area was broken into Wetland Assessment Areas (WAAs) based on disturbance class as shown in Table 2-1 below. Following WAA identification, representative data points were selected to evaluate the conditions within each WAA following the NS Assessment Method (Figure 1).

Table 2-1. Anaktuvuk Pass Subsistence Trail Wetland Assessment Areas

Area Type	Area	Disturbance Class ^a	HGM Class	Representative Point	Acres
Mitigation	AKP Subsistence Trail	Disturbed w/in 80m	TBD	ANAKWAA1	9.9
Mitigation	AKP Subsistence Trail	Disturbed w/in 80m	TBD	ANAKWAA2	0.8
Mitigation	AKP Subsistence Trail	Undisturbed	TBD	ANAKWAA3	31.8
Mitigation	AKP Subsistence Trail	Disturbed >80m but <800m	TBD	ANAKWAA5	57.7
Total^b					100.1

^a Disturbance class based on distance from existing infrastructure (e.g., roads, pipelines). Disturbance class for mitigation projects reflects disturbance other than infrastructure being modified.

^b Values may not sum to totals because of rounding.

Notes: HGM: hydrogeomorphic; SA: special area; FW: fresh water; m: meters, AKP: Anaktuvuk Pass.

Data were collected at each representative point through a desktop analysis to determine the off-site variables outlined in the NS Assessment Method. The data collected with respect to each variable were

tabulated in an electronic data form (Attachment A) developed by HDR using the equations and formulas provided by USACE to calculate subindex scores for each variable. The eight subindex variables are then used to calculate three wetland function scores: habitat, hydrology, and biogeochemical cycling. Once calculated, the three wetland function assessment scores are averaged to calculate an overall functional capacity index (FCI) for the WAA. The FCI represents the overall wetland condition from 0.00, representing no function (or an upland), to 1.00, representing pristine conditions.

Data were collected and FCI scores were calculated for each representative point for both pre-project and post-project conditions. Functional gains were evaluated based on changes in the FCI prior to and then following implementation of the mitigation project based on professional judgment regarding how the mitigation project would affect existing conditions in each WAA. The rationale for functional uplift in local landscape disturbance (V_{LLD}), anthropogenically-derived surface water (V_{SW}), impediments to hydrology (V_{IH}), and landscape disturbance (V_{LD}) are based on the same rationale provided for the Nuiqsut Subsistence Trail Tundra Rehabilitation Project described in the Willow Project Aquatic Site Assessment.

The change in FCI score between the pre-project and post-project condition (the FCI Δ) and the acreage of the affected area were used to calculate debits and credits for each area consistent with the Alaska District: Credit Debit Methodology. Credits also considered factors of time lag and risk, which discount credits received based on when the assessment area can be expected to reach the calculated post-project FCI and the degree of uncertainty that the proposed conditions will be obtained.

3.0 ANAKTUVK PASS SUBSISTENCE TRAIL REHABILITATION RESULTS

Table 3-1 provides wetland function score data calculated for each representative point for the Anaktuvuk Pass Subsistence Trail compensatory mitigation project. The full suite of variable data are in the electronic data forms in Attachment A.

Table 3-1. Anaktuvuk Pass Subsistence Trail Representative Points

Point	Disturb. Class ^a	HGM Class	Lat. (°N)	Long. (°W)	Pre/ Post	Habitat Score	Hydro. Score	BGC Score	FCI
ANAKWAA1	Disturbed <80 m	TBD	68.1726	151.6935	Pre	0.25	0.00	0.00	0.08
					Post	0.45	0.70	0.68	0.61
ANAKWAA2	Disturbed <80 m	TBD	68.1912	151.6700	Pre	0.96	0.63	0.83	0.80
					Post	0.98	0.98	0.93	0.96
ANAKWAA3	Undisturbed	TBD	68.1840	151.6558	Pre	0.83	0.00	0.30	0.38
					Post	0.99	0.99	0.95	0.97
ANAKWAA5	Disturbed >80m but <800m	TBD	68.1757	151.6895	Pre	0.58	0.00	0.00	0.19
					Post	0.70	0.70	0.70	0.70

^a Disturbance class based on distance from existing infrastructure (e.g., roads, pipelines).

Notes: HGM: hydrogeomorphic; Lat.: latitude; °N: degrees North; Long.: longitude; °W: degrees West; m: meters; Hydro.: hydrology; BGC: biogeochemical cycling; FCI: functional capacity index.

3.1.1 ANAKWAA1

Representative point ANAKWAA1 is located along the subsistence trail within 80 meters of the Anaktuvuk landfill and the landfill access road (Figure 2). This area represents the most widespread damage associated with the trail, with multiple tracks and ruts fanning out from the road and around the landfill. Table 3-2 provides the NS Assessment Method variables, subindex scores, and assessment scores for ANAKWAA1.

Table 3-2. Wetland Assessment Area 1

Variables		Pre	Post
80-m radius plot	1. V _{LDD} Local Landscape Disturbance V _{LDD} Subindex score	99% 0.00	13% 0.68
	2. V _{SW} Anthropogenically-derived surface water V _{SW} Subindex Score	41% 0.00	0% 1.00
	3. V _{IH} Impediment to Hydrology V _{IH} Subindex Score	4 0.00	2 0.50
	4. V _{DD} Evidence of Dust	Yes	Yes
	5. V _{TK} Evidence of Thermokarst	Yes	Yes
800-m radius plot	6. V _{LD} Landscape Disturbance V _{LD} Subindex Score	12% 0.84	3% 1.00
	7. V _{IW} Impediment to Wildlife V _{IW} Subindex Score	3 0.25	3 0.25
	8. V _{DR} Distance to Roadway V _{DR} Subindex Score	35 m 0.07	35 m 0.07
Habitat Assessment Score		0.25	0.45
Hydrology Assessment Score		0.00	0.70
Biogeochemical Cycling Assessment Score		0.00	0.68
Average Score		0.08	0.61

Local Landscape Disturbance (V_{LDD})

Local landscape disturbance is defined as the total anthropogenic disturbance quantified as a percentage of the 80-meter-radius plot area. Currently, ANAKWAA1 contains 4.9 acres of existing local landscape disturbance in the 80-meter-radius plot (99 percent of the plot area) related to a web of rutted trail sections cause by the repeated use of all-terrain vehicles (ATVs). These trail ruts are evident on aerial imagery as texture and discoloration differences from the surrounding un-impacted wetlands.

In the post-mitigation condition, anthropogenic landscape disturbance related to the trail would be removed. Similar to the Nuiqsut Subsistence Trail Tundra Rehabilitation Project, CPAI conservatively estimated that recovery may take between 6 to 10 years to achieve functional uplift due to reduction in

anthropogenic disturbance from existing trail disturbance. In the post-mitigation condition, the landfill and landfill access road would remain. Furthermore, the new geogrid would add new anthropogenic disturbance in the form of a structural feature, which was accounted for in the post-assessment condition. The total acreage of anthropogenic disturbance in the post-mitigation plot is estimated to be 0.6 acre (13 percent of the plot area).

Anthropogenically-Derived Surface Water (V_{sw})

Anthropogenically-derived surface water is defined in the NS Assessment Method as the total amount of anthropogenically-derived surface water, quantified as a percentage of an 80-meter-radius plot (Berkowitz et al. 2017). Currently, ANAKWAA1 contains 2.1 acres of anthropogenically-derived surface water in the 80-meter-radius plot (41 percent of the plot area) caused by repeated use of ATVs that result in ruts and tundra damage that fill with water.

As described for the Nuiqsut Subsistence Trail Tundra Rehabilitation Project, CPAI anticipates that anthropogenically-derived surface water related to the subsistence trail damage would decrease to zero in the post-mitigation project condition. CPAI estimates reduction of all anthropogenically-derived surface water along the Anaktuvuk Pass Subsistence Trail within 6 to 10 years.

Impediment to Hydrology (V_{IH})

The NS Assessment Method defines the impediment to hydrology variable as the number of quarter segments assigned in any direction that contain hydrologic impediment, which is caused by the presence of man-made structures, excavations, or fill material (Berkowitz et al. 2017). Currently, ANAKWAA1 contains impediments to hydrology in four quadrants from ruts within the trail footprint and web effect that impedes or redirects lateral surface water movement. Compacted soils may also affect the lateral and vertical shallow subsurface movement that results in abnormal ponding. The adjacent landfill is also present in the plot and also impedes natural water movement.

As described for the Nuiqsut Subsistence Trail Tundra Rehabilitation Project, the subsistence trail ruts would no longer serve as impediments to natural hydrology as the vegetation and soils recover. As described above, functional uplift resulting from reduction in impediments to hydrology is expected to occur within 6 to 10 years. Recovery of natural vegetation through reduction in anthropogenic disturbance would allow re-establishment of natural drainage patterns. The new geogrid trail is not expected to result in a barrier to surface and subsurface water movements because it is designed to float on the surface and allow water to pass laterally. The perforated open cell design will allow vertical movement as well. At ANAKWAA1, the adjacent landfill and access road would continue to serve as an impediment to hydrology in two quadrants after the geogrid trail is constructed.

Landscape Disturbance (V_{LD})

Landscape disturbance is defined identically to local landscape disturbance, but it is measured within the 800-meter-radius plot. Currently, CMWAA6 contains 61.7 acres of existing anthropogenic landscape disturbance within the 800-meter-radius plot (12 percent of the plot area). In a similar fashion as the local landscape disturbance metric, anthropogenic disturbance related to the landfill and landfill access road would remain following mitigation project completion, but disturbance resulting from trail rutting would be removed in 6 to 10 years through use of the new geogrid trail. However, the geogrid would add new

anthropogenic disturbance within the geogrid footprint. The total acreage of disturbance in the post-mitigation plot is estimated to be 12.7 acres (3 percent of the plot area).

Other Variables

Dust (V_{DD}) is assumed to be present adjacent to gravel fill and the landfill. Thermokarst (V_{TK}) is visible in the aerial imagery, particularly near the landfill and within trail ruts. The 800-meter-radius plot includes impediments to wildlife movement (V_{IW}) in three quadrants. The site is 35 meters from the nearest road (V_{DR}). In the post-mitigation condition, no change would occur to evidence of dust, evidence of thermokarst, impediments to wildlife, or distance to roadway.

Assessment Scores and Average Score

The average pre-assessment score is estimated to be 0.08; the average post-assessment score is anticipated to be 0.61 within 6 to 10 years. Based on the pre- and post-assessments, the FCI Δ for ANAKWAA1 would be 0.53.

3.1.2 ANAKWAA2

Representative point ANAKWAA2 near the northeastern end the subsistence trail within 80 meters of a number of cabins and other structures (Figure 3). However, the area appears drier than other portions of the trail and the existing trail disturbance appears less severe and more concentrated in a narrower trail footprint. Table 3-3 provides the NS Assessment Method variables, subindex scores, and assessment scores for ANAKWAA2. The rationale for the new geogrid trail resulting in functional uplift is similar to what is described for ANAKWAA1 and for the Nuiqsut Subsistence Trail Tundra Rehabilitation Project.

Table 3-3. Wetland Assessment Area 2

Variables			Pre	Post
80-m radius plot	1. V_{LLD}	Local Landscape Disturbance	7%	3%
		V_{LLD} Subindex score	0.83	0.93
	2. V_{SW}	Anthropogenically-derived surface water	2%	0%
		V_{SW} Subindex Score	0.88	1.00
	3. V_{IH}	Impediment to Hydrology	4	0
800-m radius plot		V_{IH} Subindex Score	0.00	1.00
	4. V_{DD}	Evidence of Dust	No	No
	5. V_{TK}	Evidence of Thermokarst	No	No
	6. V_{LD}	Landscape Disturbance	1%	0%
		V_{LD} Subindex Score	1.00	1.00
800-m radius plot	7. V_{IW}	Impediment to Wildlife	0	0
		V_{IW} Subindex Score	1.00	1.00
	8. V_{DR}	Distance to Roadway	800 m	800 m
			1.00	1.00
Habitat Assessment Score			0.96	0.98
Hydrology Assessment Score			0.63	0.98
Biogeochemical Cycling Assessment Score			0.83	0.93
Average Score			0.80	0.96

Local Landscape Disturbance (V_{LLD})

Currently, ANAKWAA2 contains 0.3 acre of existing local landscape disturbance in the 80-meter-radius plot (7 percent of the plot area) from the existing trail and the existing cabins and structures.

Anthropogenic landscape disturbance related to the trail would be removed. However, the geogrid would add new anthropogenic disturbance and anthropogenic disturbance related to the cabins would remain.

The total acreage of disturbance in the post-mitigation plot is estimated to be 0.2 acre (3 percent of the plot area).

Anthropogenically-Derived Surface Water (V_{SW})

Currently, ANAKWAA2 contains 0.1 acre of anthropogenically-derived surface water in the 80-meter-radius plot (2 percent of the plot area). In the post condition, anthropogenically-derived surface water related to the subsistence trail damage would decrease to zero as natural vegetation recovers.

Impediment to Hydrology (V_{IH})

Currently, ANAKWAA2 contains impediments to hydrology occur in four quadrants from ruts within the footprint of the multiple parallel trails. The subsistence trail ruts would recover in the 6 to 10-year timeframe and would no longer serve as impediments to natural hydrology as the vegetation recovers.

Landscape Disturbance (V_{LD})

Currently, ANAKWAA2 contains 6.5 acres of existing anthropogenic landscape disturbance within the 800-meter-radius plot (1 percent of the plot area) related to the existing trail ruts and cabins and structures. Anthropogenic landscape disturbance related to the trail would be removed; anthropogenic disturbance related to the cabins would remain. In addition, the geogrid would add new anthropogenic disturbance. The total acreage of disturbance in the post-mitigation plot is estimated to be 1.1 acres (0 percent of the plot area).

Other Variables

No sources of dust occur within 80 meters, and no dust is visible on the aerial imagery (V_{DD}). No evidence of thermokarst is visible in the aerial imagery (V_{TK}). The plot does not include impediments to wildlife movement (V_{IW}) based on the assumption that the existing cabins do not impede wildlife movement. The site is more than 800 meters from the nearest road (V_{DR}). In the post-mitigation condition, no change would occur to evidence of dust, evidence of thermokarst, impediments to wildlife, or distance to roadway.

Assessment Scores and Average Score

The average pre-assessment score is estimated to be 0.80; the average post-assessment score is anticipated to be 0.96 within 6 to 10 years. Based on these values, the FCI Δ for ANAKWAA2 would be 0.16.

3.1.3 ANAKWAA3

Representative point ANAKWAA3 is located along the subsistence trail more than 800 meters from anthropogenic disturbance other than the disturbance resulting from the current rutted trail (Figure 4). The trail network is more consolidated in drier locations along the trail but contains areas of wide disturbance where the trail crosses wetter wetland types. Table 3-4 provides the NS Assessment Method variables, subindex scores, and assessment scores for ANAKWAA3.

Table 3-4. Wetland Assessment Area 3

Variables			Pre	Post
80-m radius plot	1. V _{LDD}	Local Landscape Disturbance	28%	2%
		V _{LDD} Subindex score	0.30	0.95
	2. V _{SW}	Anthropogenically-derived surface water	19%	0%
		V _{SW} Subindex Score	0.00	1.00
	3. V _{IH}	Impediment to Hydrology	4	0
800-m radius plot		V _{IH} Subindex Score	0.00	1.00
	4. V _{DD}	Evidence of Dust	No	No
	5. V _{TK}	Evidence of Thermokarst	No	No
	6. V _{LD}	Landscape Disturbance	3%	0%
		V _{LD} Subindex Score	1.00	1.00
800-m radius plot	7. V _{IW}	Impediment to Wildlife	0	0
		V _{IW} Subindex Score	1.00	1.00
	8. V _{DR}	Distance to Roadway	800 m	800 m
			1.00	1.00
Habitat Assessment Score			0.83	0.99
Hydrology Assessment Score			0.00	0.99
Biogeochemical Cycling Assessment Score			0.30	0.95
Average Score			0.38	0.97

Local Landscape Disturbance (V_{LDD})

Currently, ANAKWAA3 contains 1.4 acres of existing local landscape disturbance (28 percent of the plot area). This disturbance is related to the existing trail ruts and vegetation disturbance. In the post condition, anthropogenic landscape disturbance related to the trail would be removed in 6 to 10 years, but new geogrid trail would be added. The total acreage of disturbance in the post-mitigation plot is estimated to be 0.1 acre (2 percent of the plot area).

Anthropogenically-Derived Surface Water (V_{SW})

Currently, ANAKWAA3 contains 0.9 acre of anthropogenically-derived surface water in the 80-meter-radius plot (19 percent of the plot area). In the post condition, anthropogenically-derived surface water related to the subsistence trail damage would decrease to zero as natural vegetation recovers.

Impediment to Hydrology (V_{IH})

Impediments to hydrology occur in four quadrants for both sites from ruts within the trail footprint which increase the duration of surface water. Within 6 to 10 years following completion of the mitigation project, the subsistence trail ruts would no longer serve as impediments to natural hydrology as the vegetation recovers and soil compaction is mitigated by the new geogrid trail.

Landscape Disturbance (V_{LD})

ANAKWAA3 contains 15.2 acres of existing anthropogenic landscape disturbance within the 800-meter-radius plot (3 percent of the plot area). In the post-mitigation condition, disturbance related to the trail would be removed but disturbance from the new geogrid trail would be added. The total acreage of disturbance in the post-mitigation plot is estimated to be 1.0 acre (0 percent of each plot area).

Other Variables

Currently, ANAKWAA3 has no sources of dust within 80 meters, and no dust is visible on the aerial imagery (V_{DD}). No thermokarst is visible in the aerial imagery (V_{TK}). The plot contains no impediments to wildlife movement (V_{IW}). The site is more than 800 meters from the nearest road (V_{DR}). In the post-mitigation condition, no change would occur to evidence of dust, evidence of thermokarst, impediments to wildlife, or distance to roadway.

Assessment Scores and Average Score

The average pre-assessment score for ANAKWAA3 is estimated to be 0.38; the average post-assessment score is anticipated to be 0.97 within 6 to 10 years. Based on these values, the FCI Δ for ANAKWAA3 would be 0.59.

3.1.4 ANAKWAA5

Representative point ANAKWAA5 is located along the subsistence trail more than 80 meters but less than 800 meters from the Anaktuvuk landfill (Figure 5). Table 3-5 provides the NS Assessment Method variables, subindex scores, and assessment scores for ANAKWAA5.

Table 3-5. Wetland Assessment Area 5

Variables			Pre	Post
80-m radius plot	1. V_{LLD}	Local Landscape Disturbance	100%	2%
		V_{LLD} Subindex score	0.00	0.95
	2. V_{SW}	Anthropogenically-derived surface water	18%	0%
		V_{SW} Subindex Score	0.00	1.00
	3. V_{IH}	Impediment to Hydrology	4	0
800-m radius plot		V_{IH} Subindex Score	0.00	1.00
	4. V_{DD}	Evidence of Dust	No	No
	5. V_{TK}	Evidence of Thermokarst	Yes	Yes
	6. V_{LD}	Landscape Disturbance	14%	0%
		V_{LD} Subindex Score	0.80	1.00
800-m radius plot	7. V_{IW}	Impediment to Wildlife	1	1
		V_{IW} Subindex Score	0.75	0.75
	8. V_{DR}	Distance to Roadway	409 m	409 m
			0.82	0.82
Habitat Assessment Score			0.58	0.70
Hydrology Assessment Score			0.00	0.70
Biogeochemical Cycling Assessment Score			0.00	0.70
Average Score			0.19	0.70

Local Landscape Disturbance (V_{LLD})

Currently, ANAKWAA5 contains 4.9 acres of existing local landscape disturbance in the 80-meter-radius plot (100 percent of the plot area). Anthropogenic landscape disturbance related to the trail would be removed. However, the geogrid would add new anthropogenic disturbance. The total acreage of disturbance in the post-mitigation plot is estimated to be 0.1 acre (2 percent of the plot area).

Anthropogenically-Derived Surface Water (V_{SW})

Currently, ANAKWAA5 contains 0.9 acres of anthropogenically-derived surface water in the 80-meter-radius plot (18 percent of the plot area). In the post condition, anthropogenically-derived surface water related to the subsistence trail damage would decrease to zero as natural vegetation recovers.

Impediment to Hydrology (V_{IH})

Currently, ANAKWAA5 contains impediments to hydrology occur in four quadrants from ruts within the footprint of the multiple parallel trails. The subsistence trail ruts would recover in the 6 to 10-year timeframe and would no longer serve as impediments to natural hydrology as the vegetation recovers.

Landscape Disturbance (V_{LD})

Currently, ANAKWAA5 contains 70.5 acres of existing anthropogenic landscape disturbance within the 800-meter-radius plot (14 percent of the plot area) related to the existing trail ruts and adjacent landfill.

Anthropogenic landscape disturbance related to the trail would be removed; anthropogenic disturbance related to the landfill would remain. In addition, the geogrid would add new anthropogenic disturbance. The total acreage of disturbance in the post-mitigation plot is estimated to be 10.6 acres (2 percent of the plot area).

Other Variables

No sources of dust occur within 80 meters, and no dust is visible on the aerial imagery (V_{DD}). Minor thermokarst is visible in the aerial imagery within the trail ruts (V_{TK}). The plot includes an impediment to wildlife movement (V_{IW}) in one quadrant from the landfill. The site is 409 meters from the nearest road (V_{DR}). In the post-mitigation condition, no change would occur to evidence of dust, evidence of thermokarst, impediments to wildlife, or distance to roadway.

Assessment Scores and Average Score

The average pre-assessment score is estimated to be 0.19; the average post-assessment score is anticipated to be 0.70 within 6 to 10 years. Based on these values, the FCI Δ for ANAKWAA5 would be 0.51.

4.0 CREDIT ANALYSIS SUMMARY

Following the Alaska District: Credit Debit Methodology, the FCI Δ for mitigation projects is adjusted through application of time lag and risk factors to determine the overall credits gained.

4.1 Risk and Time Lag

In the Alaska District: Credit Debit Methodology, mitigation risk accounts for the degree of uncertainty that the proposed conditions will be achieved. Risk is measured on a scale from 1.0 (no or *de minimis* risk) to 3.0 (high risk). The Anaktuvuk Pass Subsistence Trail Project would be subject to moderate risk (1.75) risk of success due to the absence of a traditional site protection instrument and the potential for future impacts associated with ATV use adjacent to or stemming from the geogrid trail similar to those described for the Nuiqsut Subsistence Trail Tundra Rehabilitation Project.

Similarly, the Alaska Credit Debit Methodology requires consideration of time lag, which is defined as the period of time (in years) between when the functions are lost at an impact site and when the compensatory mitigation site has achieved the outcome that was scored using the appropriate functional assessment methodology. CPAI has conservatively estimated the time lag to achieve functional uplift described above as 6 to 10 years. Therefore, the Anaktuvuk Pass Subsistence Trail Project would experience an adjusted FCI Δ based on a time lag factor of 1.0876.

4.2 Credit Summary

Based on the acreages and FCI scores described above, the Anaktuvuk Pass Subsistence Trail project would gain 28.2 credits (Table 4-1). The adjusted FCI is based on an assumed time lag of 6 to 10 years to achieve post-mitigation project conditions. The risk of the project is moderate (1.75).

Table 4-1. Anaktuvuk Pass Subsistence Trail Credit Analysis

Disturbance Class ^a	HGM Class	Representative Points	Acres	Pre FCI	Post FCI	FCI Δ	Adjust. Δ	Credits
Disturbed 80m	TBD	ANAKWAA1	9.9	0.08	0.61	0.53	0.28	2.7
Disturbed 80m	TBD	ANAKWAA2	0.8	0.80	0.96	0.16	0.08	0.1
Undisturbed	TBD	ANAKWAA3	31.8	0.38	0.97	0.60	0.32	10.0
Disturbed 800m	TBD	ANAKWAA5	57.7	0.19	0.70	0.51	0.27	15.4
Totals			100.1	-	-	-	-	28.2

^a Disturbance class based on distance from existing infrastructure (e.g., roads, pipelines).

Notes: HGM: hydrogeomorphic; FCI: functional capacity index; Δ: change.

5.0 REFERENCES

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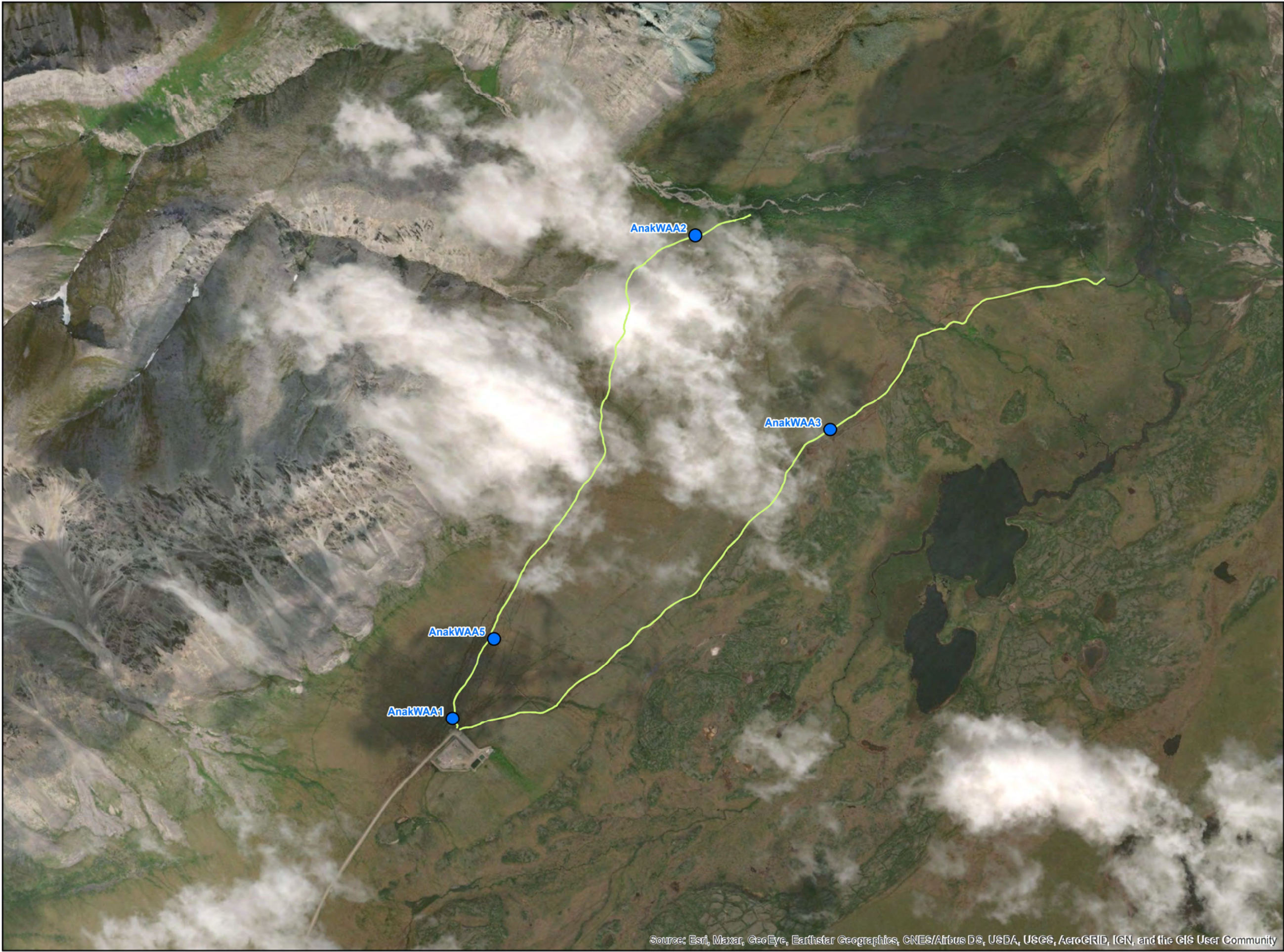
Figures

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**Willow and CM Projects
North Slope Rapid
Assessment Method**
Figure 1
Anaktuvuk Pass Trail
Overview

Wetland Assessment Area (WAA)
Locations
● WAA Points

Project Type Features
■ Anaktuvuk Pass Trail



N

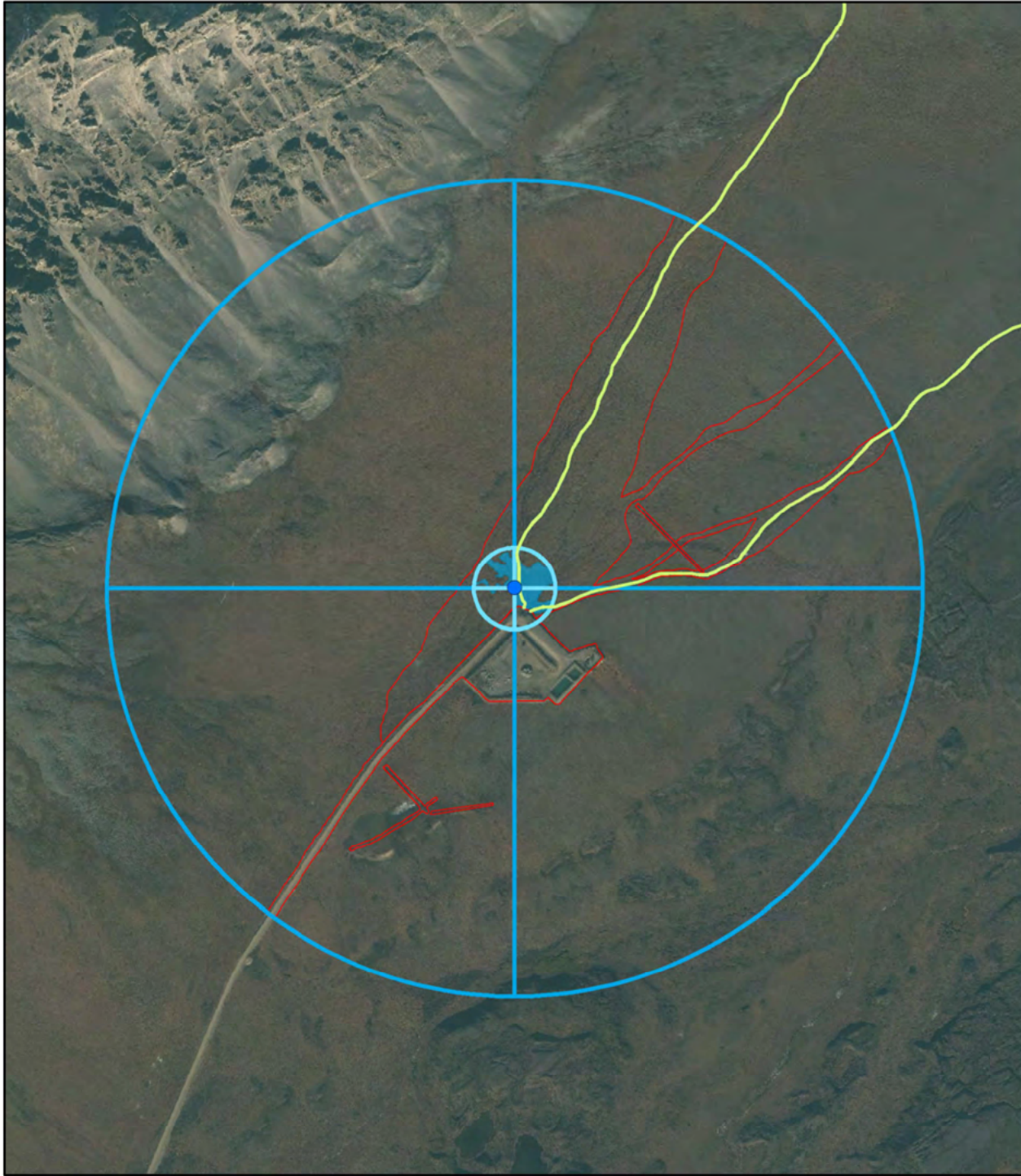
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October 7, 2020

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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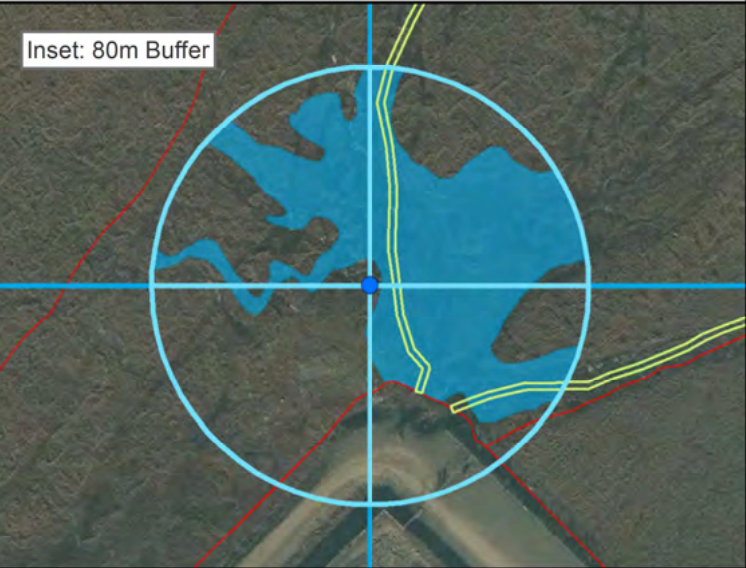
Willow and CM Projects
North Slope Rapid Assessment Method

Figure 2
AnakWAA1: Anaktuvuk Pass Trail

Wetland Assessment Area (WAA) and Project Area

- | | |
|-------------------|--|
| ● WAA Points | □ Anaktuvuk Pass Trail |
| □ WAA 80m Buffer | □ Anthropogenically -
Derived Surface Water |
| □ WAA 800m Buffer | □ Disturbed Areas |

Imagery: Maxar Global Mosaic

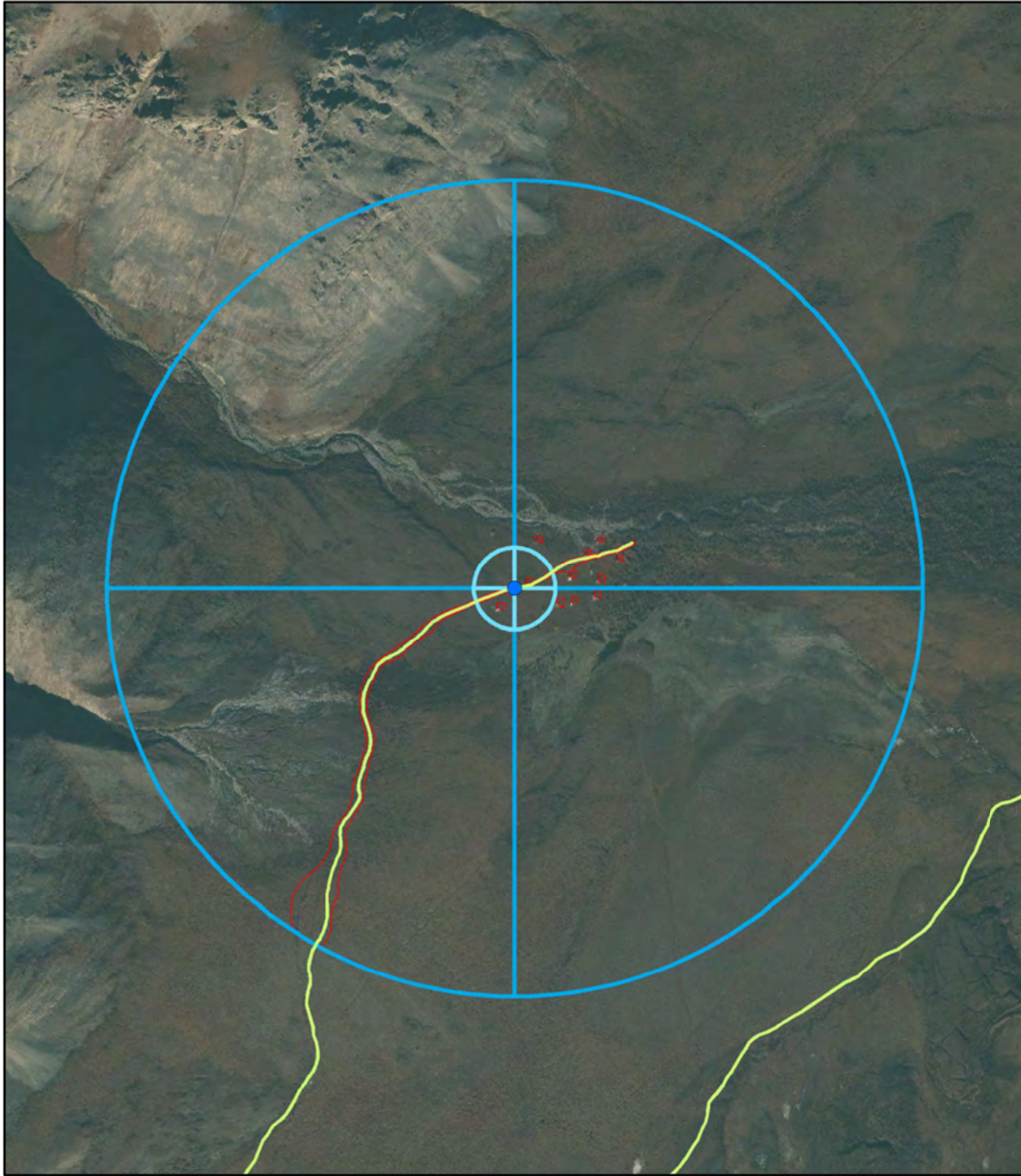


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October 7, 2020



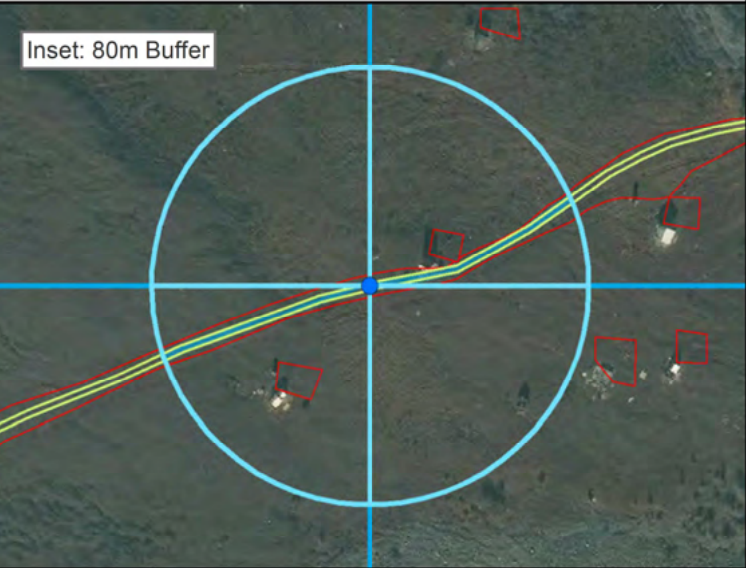
Willow and CM Projects North Slope Rapid Assessment Method

Figure 3
AnakWAA2: Anaktuvuk Pass Trail

Wetland Assessment Area (WAA) and Project Area

- WAA Points
- WAA 80m Buffer
- WAA 800m Buffer
- Anaktuvuk Pass Trail
- Anthropogenically - Derived Surface Water
- Disturbed Areas

Imagery: Maxar Global Mosaic



N

0 400 800 Feet

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Willow and CM Projects North Slope Rapid Assessment Method

Figure 4

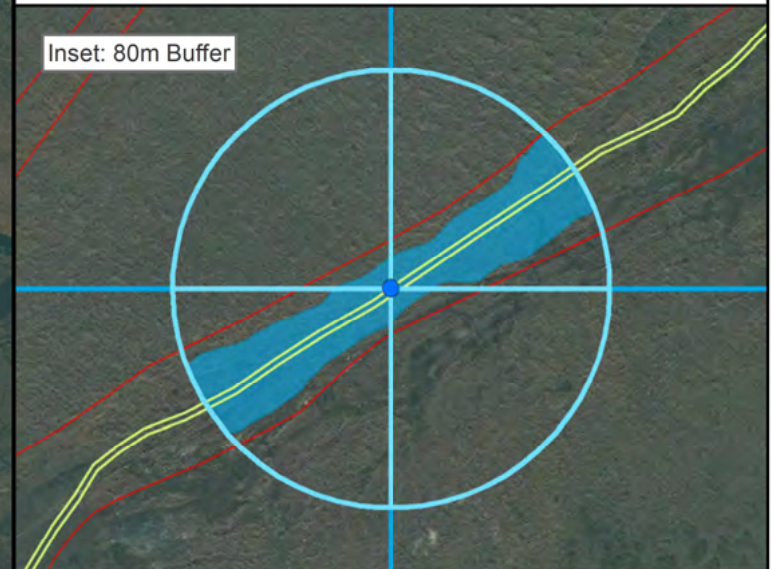
AnakWAA3: Anaktuvuk Pass Trail

Wetland Assessment Area (WAA) and Project Area

- WAA Points
- WAA 80m Buffer
- WAA 800m Buffer
- Anaktuvuk Pass Trail
- Anthropogenically - Derived Surface Water
- Disturbed Areas

Imagery: Maxar Global Mosaic

Inset: 80m Buffer



0 400 800 Feet

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Alaska, Inc.

October 7, 2020

Document Name: Willow_ASA_WAA_MapBook_AKP_Trail.mxd

Willow and CM Projects North Slope Rapid Assessment Method

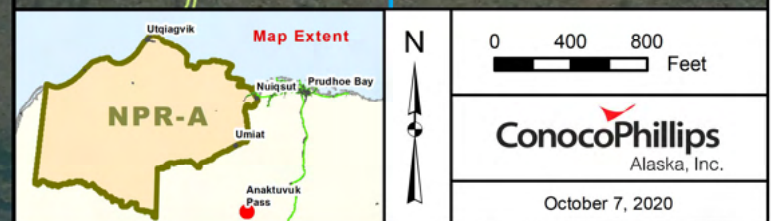
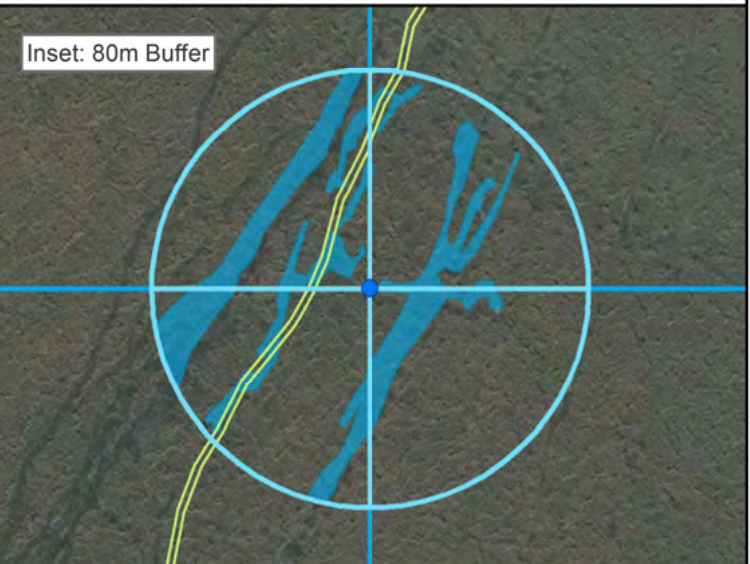
Figure 5

AnakWAA5: Anaktuvuk Pass Trail

Wetland Assessment Area (WAA) and Project Area

- WAA Points
- WAA 80m Buffer
- WAA 800m Buffer
- Anaktuvuk Pass Trail
- Anthropogenically - Derived Surface Water

Imagery: Maxar Global Mosaic



Attachment A

North Slope Rapid Assessment Method Data Sheets

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Alaska North Slope Rapid Assessment Method			
Section A: Desk Top (Offsite) Data			
Site Name/Location	AKP Trail WAA1 80m	Latitude/UTM Northing	68.1726
Date	10/6/2020	Longitude/UTM Easting	151.6935
Impact/Mitigation	Mitigation	Pre/Post	Pre/Post-Assessment
Region	Arctic Foothills	Coordinate System	NAD 1983
HGM Class		Imagery Source (Year)	
Investigators	Joe Christopher, Hannah Griego		
Determine values for variables 1-5 using an 80-m radius plot		Pre-Assess.	Post-Assess.
1. V_{LD}	Local Landscape Disturbance (percent of plot (0-100) occupied by anthropogenic disturbance and/or man-made features)	99	13
	V_{LD} Subindex score	0.00	0.68
2. V_{SW}	Anthropogenically derived surface water- percent of the plot (0 - 100) occupied by surface water derived from human activities, including thermokarst if directly associated, and conspicuously linked.	41	0
	V_{SW} Subindex Score	0.00	1.00
3. V_{IH}	Impediment to Hydrology - number of quarter segments (0 - 4) assignable in any direction that have hydrologic impediments.	4	2
	V_{IH} Subindex Score	0.00	0.50
4. V_{DD}	Evidence of Dust - accumulation of sediment on vegetation, appearing as areas of discoloration.	Yes	Yes
5. V_{TK}	Evidence of Thermokarst	Yes	Yes
Determine values for variables 6-8 using an 800 meter radius plot.			
6. V_{LD}	Landscape Disturbance - percent of the plot (0 - 100) occupied by anthropogenic disturbance and/or man-made features.	12	3
	V_{LD} Subindex Score	0.84	1.00
7. V_{IW}	Impediment to Wildlife - number of quarter segments (0 - 4) assignable in any direction with impediments to the free movement of wildlife.	3	3
	V_{IW} Subindex Score	0.25	0.25
8. V_{DR}	Distance to Roadway - minimum distance in meters (0 - 800) to a roadway of any size, class, or condition.	35	35
	V_{DR} Subindex Score	0.07	0.07
	Habitat Assessment Score	0.25	0.45
	Hydrology Assessment Score	0.00	0.70
	Biogeochemical Cycling Assessment Score	0.00	0.68
	Average Score	0.08	0.61

--

Alaska North Slope Rapid Assessment Method			
Section A: Desk Top (Offsite) Data			
Site Name/Location	AKP Trail WAA2 80m	Latitude/UTM Northing	68.1912
Date	10/6/2020	Longitude/UTM Easting	151.6700
Impact/Mitigation	Mitigation	Pre/Post	Pre/Post-Assessment
Region	Arctic Foothills	Coordinate System	NAD 1983
HGM Class		Imagery Source (Year)	
Investigators	Joe Christopher, Hannah Griego		
Determine values for variables 1-5 using an 80-m radius plot		Pre-Assess.	Post-Assess.
1. V_{LD}	Local Landscape Disturbance (percent of plot (0-100) occupied by anthropogenic disturbance and/or man-made features)	7	3
	V_{LD} Subindex score	0.83	0.93
2. V_{SW}	Anthropogenically derived surface water- percent of the plot (0 - 100) occupied by surface water derived from human activities, including thermokarst if directly associated, and conspicuously linked.	2	0
	V_{SW} Subindex Score	0.88	1.00
3. V_{IH}	Impediment to Hydrology - number of quarter segments (0 - 4) assignable in any direction that have hydrologic impediments.	4	0
	V_{IH} Subindex Score	0.00	1.00
4. V_{DD}	Evidence of Dust - accumulation of sediment on vegetation, appearing as areas of discoloration.	No	No
5. V_{TK}	Evidence of Thermokarst	No	No
Determine values for variables 6-8 using an 800 meter radius plot.			
6. V_{LD}	Landscape Disturbance - percent of the plot (0 - 100) occupied by anthropogenic disturbance and/or man-made features.	1	0
	V_{LD} Subindex Score	1.00	1.00
7. V_{IW}	Impediment to Wildlife - number of quarter segments (0 - 4) assignable in any direction with impediments to the free movement of wildlife.	0	0
	V_{IW} Subindex Score	1.00	1.00
8. V_{DR}	Distance to Roadway - minimum distance in meters (0 - 800) to a roadway of any size, class, or condition.	800	800
	V_{DR} Subindex Score	1.00	1.00
	Habitat Assessment Score	0.96	0.98
	Hydrology Assessment Score	0.63	0.98
	Biogeochemical Cycling Assessment Score	0.83	0.93
	Average Score	0.80	0.96

Remarks:

Alaska North Slope Rapid Assessment Method			
Section A: Desk Top (Offsite) Data			
Site Name/Location	AKP Trail WAA3 Undisturb	Latitude/UTM Northing	68.1840
Date	10/6/2020	Longitude/UTM Easting	151.6558
Impact/Mitigation	Mitigation	Pre/Post	Pre/Post-Assessment
Region	Arctic Foothills	Coordinate System	NAD 1983
HGM Class		Imagery Source (Year)	
Investigators	Joe Christopher, Hannah Griego		
Determine values for variables 1-5 using an 80-m radius plot		Pre-Assess.	Post-Assess.
1. V_{LD}	Local Landscape Disturbance (percent of plot (0-100) occupied by anthropogenic disturbance and/or man-made features)	28	2
	V_{LD} Subindex score	0.30	0.95
2. V_{SW}	Anthropogenically derived surface water- percent of the plot (0 - 100) occupied by surface water derived from human activities, including thermokarst if directly associated, and conspicuously linked.	19	0
	V_{SW} Subindex Score	0.00	1.00
3. V_{IH}	Impediment to Hydrology - number of quarter segments (0 - 4) assignable in any direction that have hydrologic impediments.	4	0
	V_{IH} Subindex Score	0.00	1.00
4. V_{DD}	Evidence of Dust - accumulation of sediment on vegetation, appearing as areas of discoloration.	No	No
5. V_{TK}	Evidence of Thermokarst	No	No
Determine values for variables 6-8 using an 800 meter radius plot.			
6. V_{LD}	Landscape Disturbance - percent of the plot (0 - 100) occupied by anthropogenic disturbance and/or man-made features.	3	0
	V_{LD} Subindex Score	1.00	1.00
7. V_{IW}	Impediment to Wildlife - number of quarter segments (0 - 4) assignable in any direction with impediments to the free movement of wildlife.	0	0
	V_{IW} Subindex Score	1.00	1.00
8. V_{DR}	Distance to Roadway - minimum distance in meters (0 - 800) to a roadway of any size, class, or condition.	800	800
	V_{DR} Subindex Score	1.00	1.00
	Habitat Assessment Score	0.83	0.99
	Hydrology Assessment Score	0.00	0.99
	Biogeochemical Cycling Assessment Score	0.30	0.95
	Average Score	0.38	0.97

--

Alaska North Slope Rapid Assessment Method			
Section A: Desk Top (Offsite) Data			
Site Name/Location	AKP Trail WAA5 800m	Latitude/UTM Northing	68.1757
Date	10/6/2020	Longitude/UTM Easting	151.6895
Impact/Mitigation	Mitigation	Pre/Post	Pre/Post-Assessment
Region	Arctic Foothills	Coordinate System	NAD 1983
HGM Class		Imagery Source (Year)	
Investigators	Joe Christopher, Hannah Griego		
Determine values for variables 1-5 using an 80-m radius plot		Pre-Assess.	Post-Assess.
1. V_{LD}	Local Landscape Disturbance (percent of plot (0-100) occupied by anthropogenic disturbance and/or man-made features)	100	2
	V_{LD} Subindex score	0.00	0.95
2. V_{SW}	Anthropogenically derived surface water- percent of the plot (0 - 100) occupied by surface water derived from human activities, including thermokarst if directly associated, and conspicuously linked.	18	0
	V_{SW} Subindex Score	0.00	1.00
3. V_{IH}	Impediment to Hydrology - number of quarter segments (0 - 4) assignable in any direction that have hydrologic impediments.	4	0
	V_{IH} Subindex Score	0.00	1.00
4. V_{DD}	Evidence of Dust - accumulation of sediment on vegetation, appearing as areas of discoloration.	No	No
5. V_{TK}	Evidence of Thermokarst	Yes	Yes
Determine values for variables 6-8 using an 800 meter radius plot.			
6. V_{LD}	Landscape Disturbance - percent of the plot (0 - 100) occupied by anthropogenic disturbance and/or man-made features.	14	2
	V_{LD} Subindex Score	0.80	1.00
7. V_{IW}	Impediment to Wildlife - number of quarter segments (0 - 4) assignable in any direction with impediments to the free movement of wildlife.	1	1
	V_{IW} Subindex Score	0.75	0.75
8. V_{DR}	Distance to Roadway - minimum distance in meters (0 - 800) to a roadway of any size, class, or condition.	409	409
	V_{DR} Subindex Score	0.82	0.82
	Habitat Assessment Score	0.58	0.70
	Hydrology Assessment Score	0.00	0.70
	Biogeochemical Cycling Assessment Score	0.00	0.70
	Average Score	0.19	0.70

--

APPENDIX G
WETLANDS ENHANCEMENT MITIGATION MONITORING PLAN-
NUIQSUT AND ANAKTUVUK PASS TRAIL TUNDRA REHABILITATION

***Willow Master Development Plan
Wetlands Compensatory Mitigation Plan***

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**WILLOW MASTER DEVELOPMENT PLAN
(WILLOW PROJECT)
POA-2018-00190 HARRISON BAY**

**WETLANDS ENHANCEMENT MITIGATION
MONITORING PLAN- NUIQSUT AND
ANAKTUVUK PASS TRAIL TUNDRA
REHABILITATION**

NORTH SLOPE, ALASKA

Prepared by:

ConocoPhillips Alaska, Inc.
Anchorage, AK



October 2020

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4.0 MITIGATION MONITORING FREQUENCY.....	3
5.0 QUALITY CONTROL.....	4
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List of Appendices

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Appendix B	Field Data Form

ABBREVIATIONS

Anaktuvuk Pass Trail	Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation
ATV	all-terrain vehicle
CPAI	ConocoPhillips Alaska, Inc.
Mitigation Plan	Willow Project Wetlands Compensatory Mitigation Plan
Monitoring Plan	permittee responsible mitigation and monitoring plan
Nuiqsut Trail	Nuiqsut Subsistence Trail Tundra Rehabilitation
UAV	Unmanned Aerial Vehicle
USACE	United States Army Corps of Engineers

1.0 Introduction

ConocoPhillips Alaska, Inc. (CPAI) is submitting this permittee responsible preservation mitigation monitoring plan (Monitoring Plan) to the United States Army Corps of Engineers (USACE) that describes the monitoring methods, frequency, and reporting format to support the Willow Project (POA-2018-00190 Harrison Bay) Wetlands Compensatory Mitigation Plan (Mitigation Plan) dated October 2020. CPAI plans to enhance wetlands near Nuiqsut and Anaktuvuk Pass, Alaska by upgrading two subsistence trails that have become damaged due to all-terrain vehicle (ATV) use in order to access subsistence areas. The trail upgrades will involve placement of a geogrid trail over the damaged tundra in order to provide a stable surface to access subsistence locations. The projects are referred to as the Nuiqsut Subsistence Trail Tundra Rehabilitation (Nuiqsut Trail) and Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation (Anaktuvuk Pass Trail) projects. The two projects will enhance 109.0 acres near Nuiqsut and 100.1 acres in Anaktuvuk Pass. Both compensatory mitigation projects will partially offset debits incurred by constructing the Willow Project. A project site and vicinity map for the Nuiqsut Trail project and Anaktuvuk Pass Trail project are shown on Figures 1 and 2, respectively, in Appendix A.

CPAI will perform on site monitoring at both sites as described below in this Monitoring Plan. The Nuiqsut Trail project is located within the Umiat Meridian of the United States Geological Survey Quadrangle maps of Harrison Bay A-2, Sec. 7, 9-11, 14-18, T 10 N, R 4 E and Harrison Bay A-3, Sec. 12, T 10 N, R 3 E. The Anaktuvuk Pass Trail project is located the Umiat Meridian of the United States Geological Survey Quadrangle maps of Chandler Lake A-3, Sec. 33 and 34, T 14 S, R 2 E and Sec. 3-5, T 15 S, R 2E. Both projects sites are shown along with proposed field target locations on Figure 3 and 4, respectively in Appendix A.

2.0 Mitigation Monitoring Methods

CPAI will perform on-site mitigation monitoring at both the Nuiqsut Trail and Anaktuvuk Pass Trail project locations at a baseline event prior to construction and over a three-year period as described below in Section 4.0. The monitoring criteria and methods will be the same for each site. The methods described below were developed with the intent of having local residents and trail users participate in the monitoring and take ownership in the projects to help ensure success and long-term protection. To affect this outcome CPAI will provide a wetland scientist on site during the baseline and initial annual event. The wetland scientist will train community members that will participate in the monitoring on the proper procedures to make sure the data collected is repeatable and accurate. CPAI wetlands scientists will be responsible for analyzing the data and preparing all annual monitoring reports.

Each site will be monitored at five pre-selected field target points shown on Figures 3 and 4 during a baseline event and then over an annual three-year period to document a progression toward achieving the performance standards and recovery under the new geogrid and in the adjacent tundra. Field survey figures depicting each field target site are shown on Figures 5-9 (Nuiqsut Trail) and 10-14 (Anaktuvuk Pass Trail) in Appendix A. Additional monitoring past year three will be coupled with routine maintenance obligations once per year until year 10, or until the trail

is considered by the USACE to be on a successful progression to rehabilitation. Monitoring may be reduced at the USACE's discretion if conditions warrant.

The baseline and annual monitoring will include photo documentation at each field target. Photo points at predetermined locations along the trail – both on and off the trail—will be collected. Specific reproducible photographs will include a trail overview, and photos collected in the four cardinal directions (north, east, south, and west). Photographs collected in this manner will provide a reproducible monitoring method that can document progression toward recovery over the monitoring period. In addition, at each field target CPAI will document vegetation visible through the geogrid. CPAI will utilize the open cell geometric nature of the geogrid to document vegetation recovery. CPAI will establish a permanent number of adjoined monitoring grid panels (~50) at each field target. During each field monitoring event, the number of monitoring grid panels with emergent vegetation will be counted. In addition, the dominant vegetation species in every tenth monitoring grid panel will be documented. CPAI will designate the permanent monitoring grid panels during the first annual monitoring period. The cells will be identified by a method suitable to ensure the same monitoring grid panels are evaluated during every event (numbering, survey, etc.). Monitoring in this fashion will assist in determining if the conditions beneath the geogrid trail are able to support the establishment of natural vegetation needed to establish a tundra mat that is durable to ATV traffic while providing thermal insulation.

CPAI will also conduct an aerial survey using an unmanned aerial vehicle (UAV) each monitoring year to visually assess progression over the entire area. Photos collected by the UAV will be included in the monitoring report. The monitoring data will be tabulated on a custom data sheet (Appendix B) and summarized with photos in an annual report submitted to USACE by December 31 of each monitoring year.

Monitoring will be conducted until the ecological success criteria are met and approved by the USACE.

2.1 Monitoring Criteria

The specific criteria that will be documented at each field target during the baseline event include:

- Confirm wetlands desktop mapping is accurate by performing a wetlands delineation at each field target according to the USACE 1987 Manual and 2007 Regional Supplement.
- Document general trail condition and vegetation damage.
- Record the dominant vegetation species present.
- Document soil and surface hydrology conditions.
- Document adjacent tundra use and condition.

The specific criteria that will be monitored at each field target during subsequent events for the three-year period include the following:

- Document trail is installed as recommended by manufacturer.
- Document any trail geogrid damage along the length of the trail.
- Document and monitor that the trail is supporting traffic loads and two-way traffic.

- Document geogrid condition and ATV use on and adjacent to trail and evaluate the need for signage or adaptive management.
- Document vegetation recovery under the trail and adjacent to the trail.
 - CPAI will observe and document vegetation growth and a reduction of ponding under the geogrid and laterally from each field target within the enhancement area used to calculate enhancement credits

2.2 Performance Standards

The monitoring criteria above will be used to document the geogrid material was installed according to manufacturer specifications. Success will be considered attained if the material is capable of supporting the weight of anticipated loads and is wide enough to allow two-way ATV traffic along the length of the new path. This will mitigate ponding (ruts), allow the tundra vegetative mat to recover, and encourage the return of wetland function. Success will also be measured by observing progressive vegetation growth through the geogrid over the three-year monitoring period, which would indicate the damaged tundra is recovering. With the trail reinforcement, ATV use adjacent to the trail will be minimized to the extent practicable in order to access subsistence resources. Performance standards will also be considered met when vegetation growth and a reduction of ponding under the geogrid and laterally from each field target within the enhancement area used to calculate enhancement credits are observed and documented.

3.0 General Observations

General observations along each trail will be made and recorded on the field data forms (Appendix B). General observations may include, but are not limited to: weather conditions, animal usage, plant vigor, recent rainfall, and site use. Observations with respect to damaged trail section or where maintenance may be required will be documented along with coordinates on the field data form. General notes regarding the need for potential adaptive management measures will also be recorded.

4.0 Mitigation Monitoring Frequency

Monitoring will be conducted to gather baseline information and confirm desktop wetlands mapping provided in the October 2020 Mitigation Plan. Subsequent monitoring events will then be conducted once at the end of each growing season for three years after completion of construction. Monitoring will be completed after year three, if necessary, and until success criteria are met and approved by the USACE.

As presented in the Mitigation Plan, the two projects will be completed according to the construction schedule presented in Table 1. The proposed monitoring schedule is provided in Table 2.

Table 1. Proposed Compensatory Mitigation Construction Schedule

Project Name	Data Gathering, Design, Material Procurement and Delivery	Execution
Nuiqsut Subsistence Trail Tundra Rehabilitation	2021-2024	Summer 2025-2026
Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation	2022-2025	2026-2027

Table 2. Proposed Compensatory Mitigation Monitoring Schedule

Project Name	Baseline Data Collection	Annual Events
Nuiqsut Subsistence Trail Tundra Rehabilitation	2021	2027-2029
Anaktuvuk Pass Subsistence Trail Tundra Rehabilitation	2022	2028-2030

Additional monitoring past year three will be coupled with routine maintenance obligations once per year until year ten, or until the trail is considered by the USACE to be on a successful progression to rehabilitation. Monitoring may be reduced at the USACE's discretion if conditions warrant.

5.0 Quality Control

Custom datasheets (Appendix B) will be used for each trail project to ensure accurate site conditions are documented. Imagery interpretation will be reviewed for verification and accuracy. Experienced wetland biologists will lead the baseline monitoring efforts and review all annual monitoring data to ensure accurate data gathering practices.

6.0 Reporting

A report summarizing the initial year's baseline monitoring effort will be submitted to USACE prior to December 31, 2021. The report will conform to the requirements set forth in Regulatory Guidance Letter 08-03. Annual reports prepared in the same format will be submitted after years one through three as presented in Table 2. Each annual report will compare observations to baseline conditions, and previous annual events to monitor progress toward achieving the performance standards documented in the Mitigation Plan. Each report will be submitted by December 31 of the appropriate year. The year three report will include a recommendation to USACE regarding the need for future investigations and monitoring.

**APPENDIX A
FIGURES**

***Willow Master Development Plan
Wetlands Enhancement Mitigation Monitoring Plan***

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Nuiqsut Trail Rehabilitation Mitigation Monitoring Plan

Figure 1
Site Vicinity

Compensatory Mitigation

Proposed Mitigation Area

Infrastructure

Pipeline Pad

Road

Boundaries

NPR-A (BLM)

*Imagery: Quantum Spatial, 2018
USGS Quadrangle 63k:
Harrison Bay A-2 and A-3*

N

0 1,500 3,000
Feet

ConocoPhillips
Alaska, Inc.

October 16, 2020

**Anaktuvuk Pass
Trail Rehabilitation
Mitigation Monitoring Plan**

**Figure 2
Site Vicinity**

Compensatory Mitigation
Proposed Mitigation Area

Imagery Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

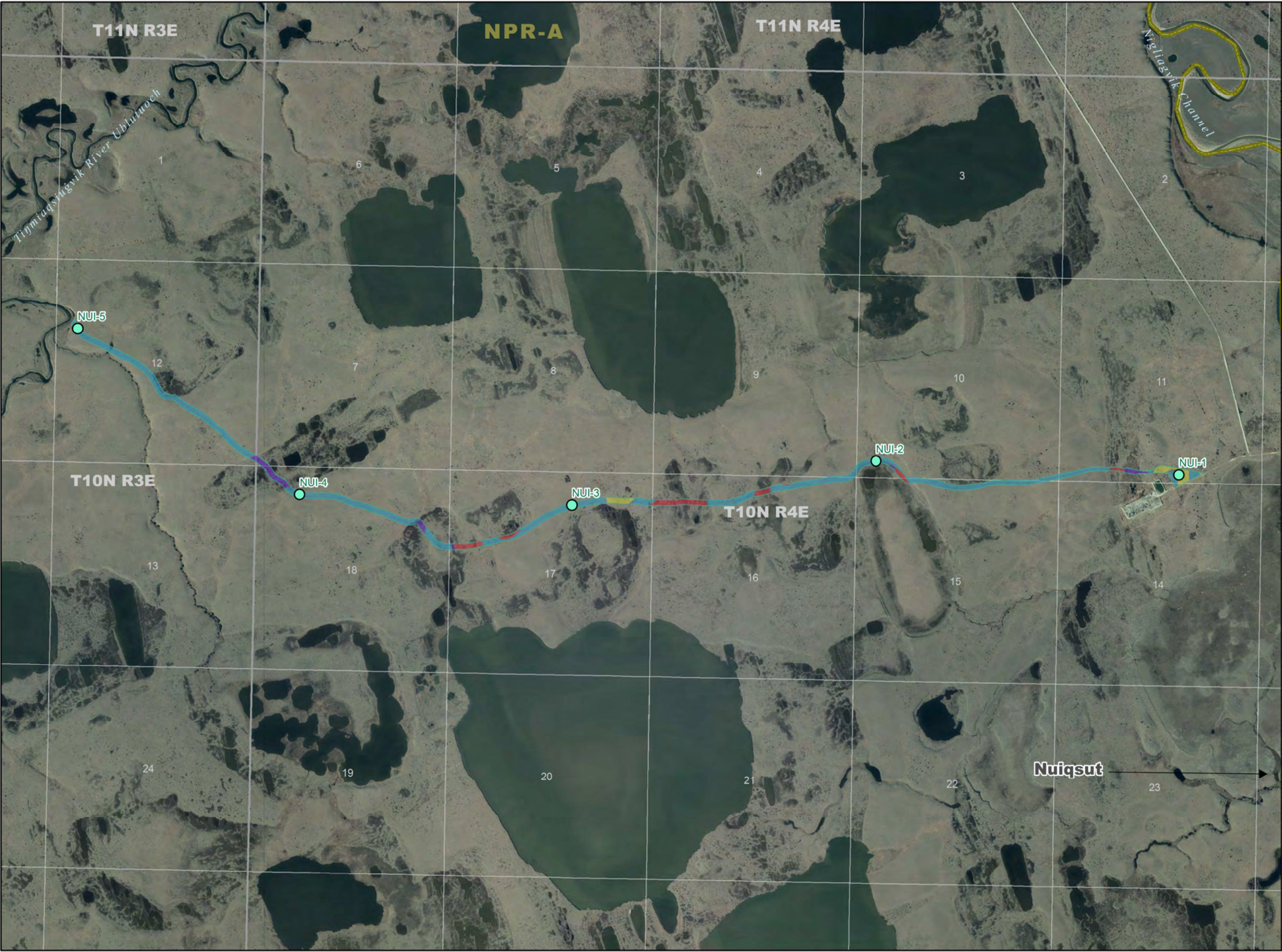
USGS Quadrangle 63k: Chandler Lake A-3



0 500 1,000 Feet

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October 16, 2020



Nuiqsut Trail Rehabilitation Mitigation Monitoring Plan

Figure 3
Site Map

Project Features

- Field Targets
- Proposed Mitigation Area

Wetlands by Cowardin Code

- PEM1/SS1B
- PEM1/SS1E
- PEM1E
- PEM1F

Infrastructure

- Pipeline
- Pad
- Road

Boundaries

- NPR-A (BLM)

Imagery: Quantum Spatial, 2018
USGS Quadrangle 63k:
Harrison Bay A-2 and A-3

N

0 1,500 3,000 Feet

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October 16, 2020

Anaktuvuk Pass
Trail Rehabilitation
Mitigation Monitoring Plan

Figure 4
Site Map

Project Features

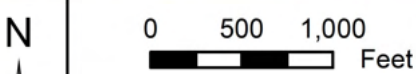
- Field Targets
- Proposed Mitigation Area

Wetlands by Cowardin Code

- PEM1/SS1B
- PEM1/SS1C
- PEM1/SS1E
- PEM1E
- PEM1F
- PSS1/EM1A
- PSS1/EM1B
- PSS1/EM1E
- PSS1B
- R2UBH
- U

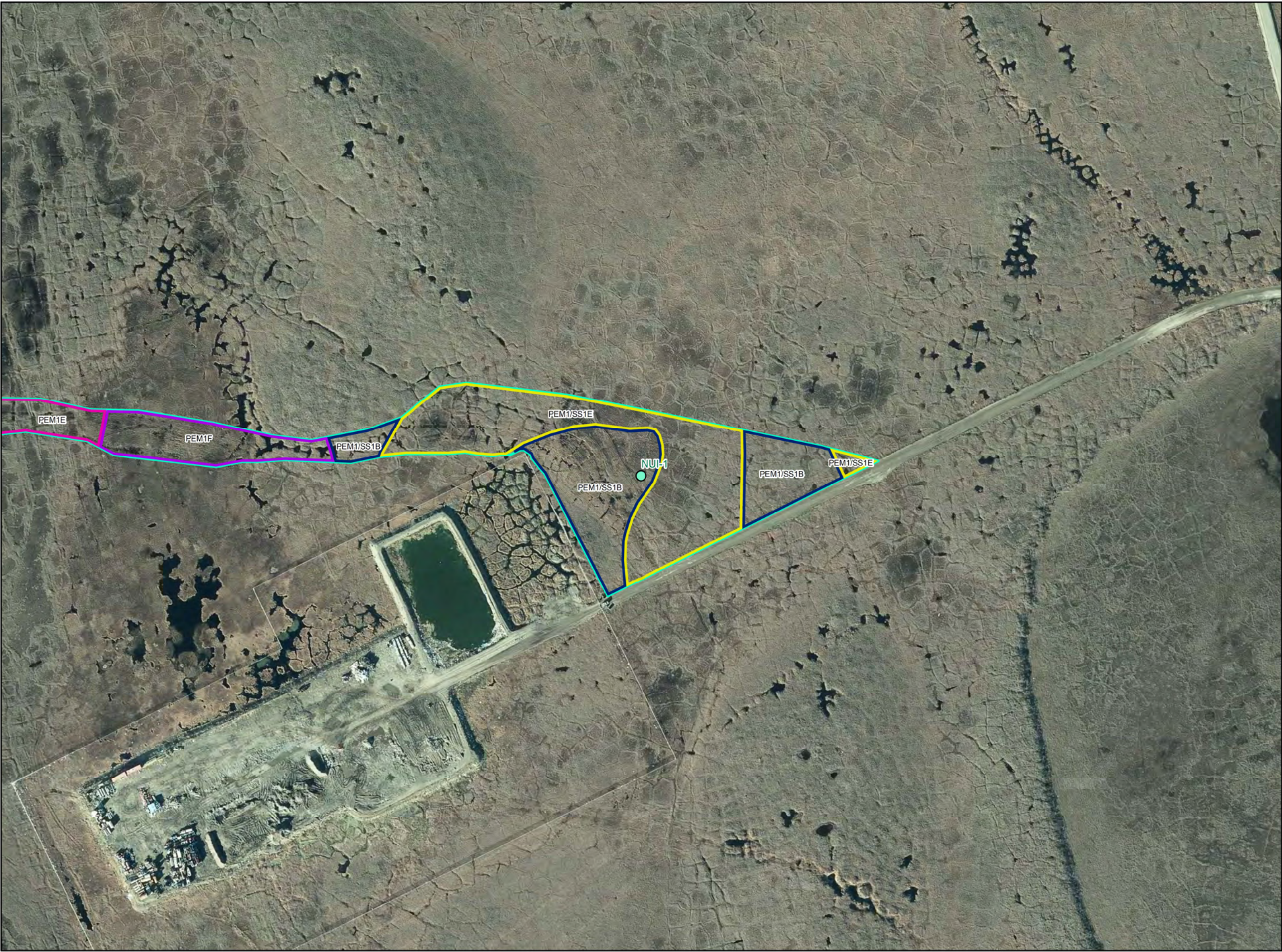
Imagery Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

USGS Quadrangle 63k: Chandler Lake A-3



October 16, 2020

Document Name: Fig2b_Willow_AKPTrail_SiteMap.mxd



Nuiqsut Trail Rehabilitation Mitigation Monitoring Plan

Figure 5
Field Target: NUI-1

Compensatory Mitigation

Proposed Mitigation Area

Wetlands by Cowardin Code

PEM1/SS1B

PEM1/SS1E

PEM1E

PEM1F

Infrastructure

— Pipeline Pad

Road

Boundaries

NPR-A (BLM)

Imagery: Quantum Spatial, 2018
USGS Quadrangle 63k:
Harrison Bay A-2 and A-3

N

0 150 300 Feet

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October 16, 2020

**Nuiqsut
Trail Rehabilitation
Mitigation Monitoring Plan**
Figure 6
Field Target: NUI-2

Compensatory Mitigation

 Proposed Mitigation Area

Wetlands by Cowardin Code

-  PEM1/SS1B
-  PEM1/SS1E
-  PEM1E
-  PEM1F

Infrastructure

-  Pipeline
-  Pad
-  Road

Boundaries

-  NPR-A (BLM)

*Imagery: Quantum Spatial, 2018
USGS Quadrangle 63k:
Harrison Bay A-2 and A-3*



0 150 300
Feet

ConocoPhillips
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October 16, 2020

**Nuiqsut
Trail Rehabilitation
Mitigation Monitoring Plan**
Figure 7
Field Target: NUI-3

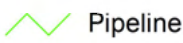
Compensatory Mitigation

 Proposed Mitigation Area

Wetlands by Cowardin Code

-  PEM1/SS1B
-  PEM1/SS1E
-  PEM1E
-  PEM1F

Infrastructure

-  Pipeline
-  Pad
-  Road

Boundaries

 NPR-A (BLM)

Imagery: Quantum Spatial, 2018
USGS Quadrangle 63k:
Harrison Bay A-2 and A-3



0 150 300
Feet

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Alaska, Inc.

October 16, 2020



**Nuiqsut
Trail Rehabilitation
Mitigation Monitoring Plan**

Figure 8
Field Target: NUI-4

Compensatory Mitigation

 Proposed Mitigation Area

Wetlands by Cowardin Code

-  PEM1/SS1B
-  PEM1/SS1E
-  PEM1E
-  PEM1F

Infrastructure

-  Pipeline
-  Pad
-  Road

Boundaries

 NPR-A (BLM)

Imagery: Quantum Spatial, 2018
USGS Quadrangle 63k:
Harrison Bay A-2 and A-3



0 150 300
Feet

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**Nuiqsut
Trail Rehabilitation
Mitigation Monitoring Plan**

Figure 9
Field Target: NUI-5

Compensatory Mitigation

 Proposed Mitigation Area

Wetlands by Cowardin Code

-  PEM1/SS1B
-  PEM1/SS1E
-  PEM1E
-  PEM1F

Infrastructure

-  Pipeline
-  Pad
-  Road

Boundaries

 NPR-A (BLM)

Imagery: Quantum Spatial, 2018
USGS Quadrangle 63k:
Harrison Bay A-2 and A-3



0 150 300
Feet

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Anaktuvuk Pass Trail Rehabilitation Mitigation Monitoring Plan

Figure 10
Field Target: AKP-1

Project Features

- Field Target
- Proposed Mitigation Area

Wetlands by Cowardin Code

- PEM1/SS1B
- PEM1/SS1C
- PEM1/SS1E
- PEM1E
- PEM1F
- PSS1/EM1A
- PSS1/EM1B
- PSS1/EM1E
- PSS1B
- R2UBH
- U

Imagery Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

USGS Quadrangle 63k: Chandler Lake A-3



0 150 300 Feet

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Anaktuvuk Pass
Trail Rehabilitation
Mitigation Monitoring Plan

Figure 11
Field Target: AKP-2

Project Features

- Field Target
- Proposed Mitigation Area

Wetlands by Cowardin Code

- PEM1/SS1B
- PEM1/SS1C
- PEM1/SS1E
- PEM1E
- PEM1F
- PSS1/EM1A
- PSS1/EM1B
- PSS1/EM1E
- PSS1B
- R2UBH
- U

Imagery Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

USGS Quadrangle 63k: Chandler Lake A-3



0 150 300 Feet

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Anaktuvuk Pass
Trail Rehabilitation
Mitigation Monitoring Plan

Figure 12
Field Target: AKP-3

Project Features

- Field Target
- Proposed Mitigation Area

Wetlands by Cowardin Code

- PEM1/SS1B
- PEM1/SS1C
- PEM1/SS1E
- PEM1E
- PEM1F
- PSS1/EM1A
- PSS1/EM1B
- PSS1/EM1E
- PSS1B
- R2UBH
- U

Imagery Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

USGS Quadrangle 63k: Chandler Lake A-3



0 150 300 Feet

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October 16, 2020

Anaktuvuk Pass
Trail Rehabilitation
Mitigation Monitoring Plan

Figure 13
Field Target: AKP-4

Project Features

- Field Target
- Other Field Target
- Proposed Mitigation Area

Wetlands by Cowardin Code

- PEM1/SS1B
- PEM1/SS1C
- PEM1/SS1E
- PEM1E
- PEM1F
- PSS1/EM1A
- PSS1/EM1B
- PSS1/EM1E
- PSS1B
- R2UBH
- U

Imagery Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

USGS Quadrangle 63k: Chandler Lake A-3



N



0 150 300 Feet

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October 16, 2020

Anaktuvuk Pass
Trail Rehabilitation
Mitigation Monitoring Plan

Figure 14
Field Target: AKP-5

Project Features

- Field Target
- Other Field Target
- Proposed Mitigation Area

Wetlands by Cowardin Code

- PEM1/SS1B
- PEM1/SS1C
- PEM1/SS1E
- PEM1E
- PEM1F
- PSS1/EM1A
- PSS1/EM1B
- PSS1/EM1E
- PSS1B
- R2UBH
- U

Imagery Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

USGS Quadrangle 63k: Chandler Lake A-3



0 150 300 Feet

ConocoPhillips
Alaska, Inc.

October 16, 2020

APPENDIX B
FIELD DATA FORM

***Willow Master Development Plan
Wetlands Enhancement Mitigation Monitoring Plan***

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Nuiqsut and Anaktuvuk Pass Trail Tundra Rehabilitation Monitoring Data Sheet			
Project/Site:			Date:
Investigator:			Field Target:
Criteria	Yes/No	Description of Observed Condition	Coordinates
General trail in good condition			
Trail installed as recommended by manufacturer			
Any trail geogrid damage along the length of the trail			
Trail is supporting traffic loads and two-way traffic			
Any evidence of ATV use on trail			
Any evidence of ATV use adjacent to trail			
Signage or adaptive management needed			
Vegetation recovery evident under trail (# of grids with vegetation)			
Vegetation recovery evident around adjacent to trail			
Additional Notes:			
General Observations	Description (include resource: e.g. imagery, internet, local knowledge)		Coordinates
Weather conditions			
Recent rainfall			
Animal usage			
Plant vigor			
Site use			
Additional Notes:			

Nuiqsut and Anaktuvuk Pass Trail Tundra Rehabilitation Monitoring Data Sheet			
Project/Site:			Date:
Investigators:			Field Target:
Photo	Photo Identification Number	Notes	
Overview			
North			
East			
South			
West			
General Site Overview Sketch:			

APPENDIX H
WETLANDS PRESERVATION MITIGATION MONITORING PLAN-
CAPE HALKETT OR FISH CREEK

***Willow Master Development Plan
Wetlands Compensatory Mitigation Plan***

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**WILLOW MASTER DEVELOPMENT PLAN
(WILLOW PROJECT)
POA-2018-00190 HARRISON BAY**

**WETLANDS PRESERVATION MITIGATION
MONITORING PLAN—CAPE HALKETT**

NORTH SLOPE, ALASKA

Prepared by:

ConocoPhillips Alaska, Inc.
Anchorage, AK



April 2021

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***Willow Master Development Plan
Wetlands Preservation Mitigation Monitoring Plan***

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1.0 Introduction

ConocoPhillips Alaska, Inc. (CPAI) is submitting this permittee responsible preservation mitigation monitoring plan to the United States Army Corps of Engineers (USACE) to document compliance with Title 33 Code of Federal Regulations (CFR) § 332.4 (c)10. This document describes the monitoring methods, frequency, and reporting format to support the Willow Project (POA-2018-00190 Harrison Bay) Wetlands Compensatory Mitigation (CM) Plan dated October 2020. This plan revises the original October 24, 2020 Preservation Site Monitoring Plan based on site selection, the additional USACE requirement to perform on-site baseline monitoring, and a revision to the monitoring frequency at the preservation site.

To complete the preservation requirement described in the CM plan, CPAI permanently preserved 800 acres of land at Cape Halkett. CPAI worked with the landowner, Arctic Slope Regional Corporation, and the USACE to define the boundary of an 800-acre parcel. The 800-acre preservation parcel at Cape Halkett is located within the Umiat Meridian of the United States Geological Survey Quadrangle maps of Harrison Bay D-4, Sec. 19 and 30, T17N, R1W, and Sec. 24 and 25, T17N, 2W as shown on Figure 1 in Appendix A.

2.0 Mitigation Monitoring Methods

CPAI will physically visit the Cape Halkett preservation parcel between May 1, 2021 and October 1, 2021 (unless prevented by weather or other extenuating circumstances, in which case the visit will be deferred to the next year) to document baseline conditions. Current aerial photography for 2021 will be collected during the 2021 growing season. Subsequent monitoring events will be conducted at the frequency noted in section 3.0 by remote sensing methods using aerial photography collected during the same growing season of each monitoring year.

2.1 Monitoring Criteria

To document baseline conditions of the preservation site, CPAI will conduct an onsite visit to collect baseline information at pre-selected Field Target locations across the preservation site. The Field Target locations and current wetland mapping are presented on Figure 2 in Appendix A. The Field Targets were selected to represent the eight wetlands habitat types present at the preservation site (Table 1, below). CPAI will also document the overall conditions through aerial reconnaissance of the entire preservation parcel with respect to the restricted activities identified in the Restrictive Covenant.

Table 1. Wetland Type and Field Target Reference

Wetland Type	Acres	Field Target (FT)
PEM1/SS1B	203.8	FT 1
PEM1/SS1F	276.1	FT 2
L1UBH	49.3	FT 3
PEM1C	20.1	FT 4
PEM1E	99.0	FT 5
PEM1F	127.4	FT 6
PUBH	23.2	FT 7
PEM1/UBF	1.3	FT 8

The baseline data collection event will document general site conditions and confirm the wetlands habitat types present across the site. Although the site visit will not constitute a routine wetlands delineation as defined by the USACE, CPAI will document the dominant plant species and their wetlands indicator status, field wetlands indicators of shallow subsurface soils, and wetlands hydrology using a standard Wetlands Field Delineation Sheet (Appendix B). General site conditions will be documented by collecting photographs at each Field Target.

During subsequent remote sensing monitoring events, the conditions documented during the baseline event will be compared to conditions observed in aerial imagery from that monitoring year and metrics from previous monitoring. Site conditions at each wetland habitat type will be referenced using the pre-selected field targets established during the baseline event shown on Table 1 and presented on Figure 2. The overall condition of the preservation site will be observed and documented via air during the baseline event, and through remote sensing using aerial imagery in subsequent monitoring events.

During the baseline event and the subsequent remote sensing events, activities prohibited in the site deed restriction will be documented on the Preservation Site Monitoring Sheet presented in Appendix B. The following list describes the activities that are prohibited under the deed restriction and will form the basis of the monitoring criteria:

1. Altering the surface hydrology of the Property by ditching, pumping, damming, or other dewatering or hydration methods;
2. Any dredging or excavation of any existing soils, sediments, and other substrates from the surface of the Property or that affects the surface of the Property;
3. Any discharge of dredged or fill materials on the Property;
4. Disturbance of soil, sediment, and other substrates by mechanical equipment and transportation vehicles;

5. Drilling from the surface of the Property for hydrocarbon resources and surface mining of the Property;
6. Mechanized snow and ice clearing operations and construction of ice structures, including ice roads and ice pads;
7. Permanent structures; and
8. Vegetation removal, clearing, cutting, or other destruction except for subsistence purposes.

For protection of subsistence and other allowed uses, the following list provides an example of activities that are be expressly reserved as allowed uses under the deed restriction:

1. Subsistence uses, such as hunting, fishing, trapping, egg gathering, vegetation and dead wood collection;
2. Winter snow vehicle use for local cultural activities and approved scientific uses;
3. Cultural, non-commercial site improvements such as temporary subsistence camps and other low impact subsistence uses;
4. Exploration, development, and production of the mineral estate in the property, including oil and gas, from surface locations outside the property;
5. Non-destructive education or scientific activities; and
6. Emergency access by required means of transportation: vehicular, watercraft and/or aircraft.

2.2 Performance Standards

CPAI's proposed performance standard for preservation is confirmation that prohibited actions identified in the deed restriction are not present. The assessment will occur through completion of an on-site baseline monitoring event and subsequent remote sensing events that review current aerial imagery.

2.3 Aerial Imagery

Current aerial imagery will be collected during the growing season and prior to each monitoring event described in section 3.0. CPAI has the option to choose the aerial image capturing methods that will sufficiently achieve the above requirements. Such methods including but are not limited to commercially purchased images, unmanned aerial vehicle (drone), fly over, or satellite imagery, etc.

3.0 Mitigation Monitoring Frequency

CPAI will complete a baseline monitoring event between May 1, 2021 and October 1, 2021 unless prevented by weather or other extenuating circumstances, in which case the visit will be deferred to the next year. Routine remote sensing monitoring events will be conducted in 2024 (year 3),

2026 (year 5), 2028 (year 7), and 2031 (year 10). At year 10, USACE will determine the frequency of further monitoring.

4.0 Quality Control

Custom datasheets will be used for each field target location of the preservation area (Appendix B) to ensure an accurate site condition assessment. Imagery interpretation will be reviewed for verification and accuracy. Experienced wetland biologists will lead the baseline and remote sensing monitoring efforts to ensure accurate data gathering practices.

5.0 Reporting

A monitoring report conforming to Title 33 CFR § 332.6 and Regulatory Guidance Letter 08-03 summarizing each monitoring effort will be submitted to USACE prior to December 1 of each monitoring year. The reports will describe the current monitoring results and compare those results to baseline and previous events. Any observations of activities that are not allowed by the site protection instrument will be identified on maps and included in each report. The year 10 report will include a recommendation to USACE regarding the need for future investigations and monitoring.

APPENDIX A
FIGURES

***Willow Master Development Plan
Wetlands Preservation Mitigation Monitoring Plan***

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APPENDIX B
WETLANDS DELINEATION DATA SHEET & PRESERVATION SITE
MONITORING DATA SHEET

***Willow Master Development Plan
Wetlands Preservation Mitigation Monitoring Plan***

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**Willow Master Development Plan
Wetlands Preservation Mitigation Monitoring Plan**

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: _____ Borough/City: _____ Sampling Date: _____
 Applicant/Owner: _____ Sampling Point: _____
 Investigator(s): _____ Landform (hillside, terrace, hummocks, etc.): _____
 Local relief (concave, convex, none): _____ Slope (%): _____
 Subregion: _____ Lat: _____ Long: _____ Datum: _____
 Soil Map Unit Name: _____ NWI classification: _____
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No _____ Hydric Soil Present? Yes _____ No _____ Wetland Hydrology Present? Yes _____ No _____	Is the Sampled Area within a Wetland? Yes _____ No _____	Remarks: _____ _____ _____
--	--	----------------------------------

VEGETATION – Use scientific names of plants. List all species in the plot.

<u>Tree Stratum</u>	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:
1. _____	_____	_____	_____	Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A) Total Number of Dominant Species Across All Strata: _____ (B) Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
Total Cover: _____				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
50% of total cover: _____ 20% of total cover: _____				
<u>Sapling/Shrub Stratum</u>				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	Hydrophytic Vegetation Indicators: ___ Dominance Test is >50% ___ Prevalence Index is ≤3.0 ___ Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
6. _____	_____	_____	_____	
Total Cover: _____				
50% of total cover: _____ 20% of total cover: _____				
<u>Herb Stratum</u>				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	Hydrophytic Vegetation Present? Yes _____ No _____
10. _____	_____	_____	_____	
Total Cover: _____				
50% of total cover: _____ 20% of total cover: _____				
Plot size (radius, or length x width) _____ % Bare Ground _____ % Cover of Wetland Bryophytes _____ Total Cover of Bryophytes _____ (Where applicable)				
Remarks: _____ _____ _____				

**Willow Master Development Plan
Wetlands Preservation Mitigation Monitoring Plan**

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: ☐ Histosol or Histel (A1) ☐ Histic Epipedon (A2) ☐ Hydrogen Sulfide (A4) ☐ Thick Dark Surface (A12) ☐ Alaska Gleyed (A13) ☐ Alaska Redox (A14) ☐ Alaska Gleyed Pores (A15)	Indicators for Problematic Hydric Soils³: ☐ Alaska Color Change (TA4) ⁴ ☐ Alaska Alpine Swales (TA5) ☐ Alaska Redox With 2.5Y Hue ³ One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic. ⁴ Give details of color change in Remarks.	☐ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer ☐ Other (Explain in Remarks)
---	---	---

Restrictive Layer (if present): Type: _____ Depth (inches): _____	Hydric Soil Present? Yes _____ No _____
Remarks:	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (any one indicator is sufficient)</u> ☐ Surface Water (A1) ☐ Inundation Visible on Aerial Imagery (B7) ☐ High Water Table (A2) ☐ Sparsely Vegetated Concave Surface (B8) ☐ Saturation (A3) ☐ Marl Deposits (B15) ☐ Water Marks (B1) ☐ Hydrogen Sulfide Odor (C1) ☐ Sediment Deposits (B2) ☐ Dry-Season Water Table (C2) ☐ Drift Deposits (B3) ☐ Other (Explain in Remarks) ☐ Algal Mat or Crust (B4) ☐ Iron Deposits (B5) ☐ Surface Soil Cracks (B6)	<u>Secondary Indicators (2 or more required)</u> ☐ Water-stained Leaves (B9) ☐ Drainage Patterns (B10) ☐ Oxidized Rhizospheres along Living Roots (C3) ☐ Presence of Reduced Iron (C4) ☐ Salt Deposits (C5) ☐ Stunted or Stressed Plants (D1) ☐ Geomorphic Position (D2) ☐ Shallow Aquitard (D3) ☐ Microtopographic Relief (D4) ☐ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No _____ Depth (inches): _____ Water Table Present? Yes _____ No _____ Depth (inches): _____ Saturation Present? Yes _____ No _____ Depth (inches): _____ (includes capillary fringe)	Wetland Hydrology Present? Yes _____ No _____
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	

***Willow Master Development Plan
Wetlands Preservation Mitigation Monitoring Plan***

Preservation Site Monitoring Data Sheet			
Project/Site:			Date:
Investigator:			Field Target Area
Prohibited Activity	Description of Observed Prohibited Use (include affected resources)	Coordinates (if mapped)	
Altering surface hydrology			
Dredging or excavation			
Discharge of dredge or fill material			
Soil disturbance by mechanical equipment			
Surface drilling or mining			
Mechanized snow and ice clearing/const.			
Permanent structures			
Construction of ice roads/pads			
Veg. Removal (except for subsistence)			
Additional Notes:			
General Observations			
	Description (include resource: e.g. imagery, internet, local knowledge)		
Weather conditions			
Recent rainfall			
Animal usage			
Wetland Type (NWI)			
Site use			
Additional Notes:			

***Willow Master Development Plan
Wetlands Preservation Mitigation Monitoring Plan***

Preservation Site Monitoring Photo Sheet			
Project/Site:		Date:	
Investigators:		Field Target Area	
Notes:			