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Shaping the Future

Final

Environmental Evaluation Document

Kuparuk Industrial Center and Kuparuk Construction Services Pad Expansion Projects

December 16, 2013

Prepared For

ConocoPhillips Alaska, Inc.

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Acronyms

° C	Degrees Celsius
° F	Degrees Fahrenheit
AAAQS	Alaska Ambient Air Quality Standards
ABR, Inc.	ABR, Inc.–Environmental Research and Services
ACP	Arctic Coastal Plain
ACS	Alaska Clean Seas
ADEC	Alaska Department of Environmental Conservation
ADNR	Alaska Department of Natural Resources
ADFG	Alaska Department of Fish and Game
ANWR	Arctic National Wildlife Refuge
APDES	Alaska Pollutant Discharge Elimination Systems
ASHPA	Alaska State Historic Preservation Act
BAT	Best Available Technology
BMPs	Best Management Practices
bpd	Barrels per day
BPXA	BP Exploration (Alaska) Inc.
CAH	Central Arctic Caribou Herd

CD4	Colville Delta 4 Development
CPAI	ConocoPhillips Alaska, Inc.
CPF	Central Processing Facilities
cy	Cubic yard
DS	Drill Site
EO	Executive Order
ft	Feet/foot
GMU	Game Management Unit
ha	Hectare
KCS	Kuparuk Construction Services
KIC	Kuparuk Industrial Center
km^2	Square Kilometers
KOC	Kuparuk Operations Center
KRU	Kuparuk River Unit
Kuparuk	Kuparuk Oil Field
m	Meters
m^3	Cubic Meters
µg	Microgram
mi^2	Square Miles
NAAQS	National Ambient Air Quality Standards
NEPDG	National Energy Policy Development Group
NPRA	National Petroleum Reserve – Alaska
NSB	North Slope Borough
NWI	National Wetland Inventory
ODPCP	Oil Discharge Prevention and Contingency Plan
RGL	Regulatory Guidance Letter
STP	Seawater Treatment Plant
SPCC	Spill Prevention, Control, and Countermeasure
SWPPP	Storm Water Pollution Prevention Plan
TWUP	Temporary Water Use Permit
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USEIA	U.S Energy Information Administration

USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WRCC	Western Regional Climate Center

Executive Summary

ConocoPhillips Alaska, Inc. is proposing to expand the existing Kuparuk Industrial Center (KIC) and Kuparuk Construction Services (KCS) pads in the Kuparuk Oil Field (Kuparuk) on the Arctic Coastal Plain of Alaska's North Slope. The proposed Projects are located in the North Slope Borough on leased lands owned by the State of Alaska and the North Slope Borough. The expanded work surfaces would support growth necessary for the continued development and production of oil and gas resources within the Kuparuk River Unit (KRU).

This environmental evaluation describes existing conditions and discusses potential environmental effects of the proposed KIC and KCS Pad Expansion Projects. There are safety benefits and economic benefits to the State and North Slope Borough communities from the proposed Project, and potential effects on the local environment. Potential environmental effects would result from placement of gravel fill on tundra, and short-term disturbance resulting from increased traffic levels during construction. The extent of potential environmental effects is minimized by replacement, consolidation, and expansion of existing support facilities within Kuparuk. The Projects consist of the following construction activities and components:

- Construction of a 48 acre (19 hectare) expansion of KIC to accommodate: temporary camp additions, wells chemical building, construction office expansion, construction shops, roads and pads equipment building, wells shop and offices, and field services shops, office, and parts storage; and
- Construction of a 10 acre (4 hectare) expansion of KCS to accommodate: bulk chemical tanks, maintenance office building, drilling office building, fabrication shop office building, wells tool shop, electrical and instrumentation shop, well house assembly shop, and consolidated warehouse and office building.

The risk of small fuel and chemical spills would be present during construction and operations. Fill for the two expansions would cover an estimated 1.13 acres (0.46 hectares) of high to moderate functioning wetlands (Category II) and 54.13 acres (21.89 hectares) of moderate to low functioning wetlands (Category III). Birds and terrestrial mammals using the Project area as habitat may experience short-term, localized disturbance from construction activities. The Project is within a region that experiences disturbance from air traffic and industrial traffic centered on the Kuparuk Operations Center. No fish habitats would be directly affected by the pad expansions.

Three federally-protected threatened species may occur in the Kuparuk region: polar bears (*Ursus maritimus*), Spectacled Eiders (*Somateria fischeri*), and Steller's Eiders (*Polysticta stelleri*). Polar bears may, but are not likely to be adversely affected by the Projects; these affects are covered under current authorizations. Spectacled Eiders may, but are not likely to be adversely affected by the Projects. Steller's Eiders, and the candidate for federal protection the Yellow-billed Loon (*Gavia adamsii*), are unlikely to occur near the Projects.

There would be no effects on subsistence or subsistence resources, cultural resources, or any disproportionate impacts on minority or low income groups.

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1. Introduction

1.1 Kuparuk River Unit

ConocoPhillips Alaska, Inc.'s (CPAI) Kuparuk Industrial Center (KIC) and Kuparuk Construction Services (KCS) pads are within the Kuparuk Oil Field (Kuparuk) on the Arctic Coastal Plain (ACP) of Alaska's North Slope. Kuparuk is about 40 miles west of Prudhoe Bay and has three Central Processing Facilities (CPF), a Seawater Treatment Plant (STP), and 42 drill sites (DS) (CPAI 2012a). The KIC is located north, and the KCS is located west of the Kuparuk Operations Center (KOC) base camp. Both pads are south of the BP Exploration (Alaska) Inc. operated Milne Point development, and west of Milne Point Road (Figure 1-1). The closest Native village to the KIC and KCS Project areas is the present day location of Nuiqsut, approximately 25 miles west of the area.

1.2 Background

The proposed KIC and KCS Pad Expansion Project would allow for continued development of Kuparuk within the Kuparuk River Unit (KRU). Development within the KRU began in the early 1980's. With additional development, supported by this Project, production is expected to continue for another 30 to 40 years. The KIC pad is located approximately 1 mile north of CPF-1 and the KCS pad is located approximately 3 miles west of CPF-1 within the KRU.

1.3 Purpose and Need

The purpose and need for the proposed action is to allow CPAI to continue to efficiently develop and produce oil and gas resources within the KRU using primarily existing infrastructure to generate a financial return on its investment.

1.3.1 Purpose

The proposed action would place gravel fill material to expand the work surfaces of KIC and KCS pads to support growth necessary for the continued development and production of oil and gas resources within the KRU. Over the past 20 years, the work load within the KRU has increased by 4% to 4.5% each year and these pad expansions would increase efficiency to continue to meet this increasing demand. Further development within the KRU would increase domestic oil production for the United States and could sustain production for the next 30 to 40 years.

The Projects would provide economic benefits to the State of Alaska and local communities, including the North Slope Borough (NSB), through supporting generation of tax revenue and creation of jobs. These benefits would include: potential temporary jobs during fill placement, long-term jobs supporting permanent operations at the expanded facilities, and post-operation jobs for decommissioning the expanded facilities.

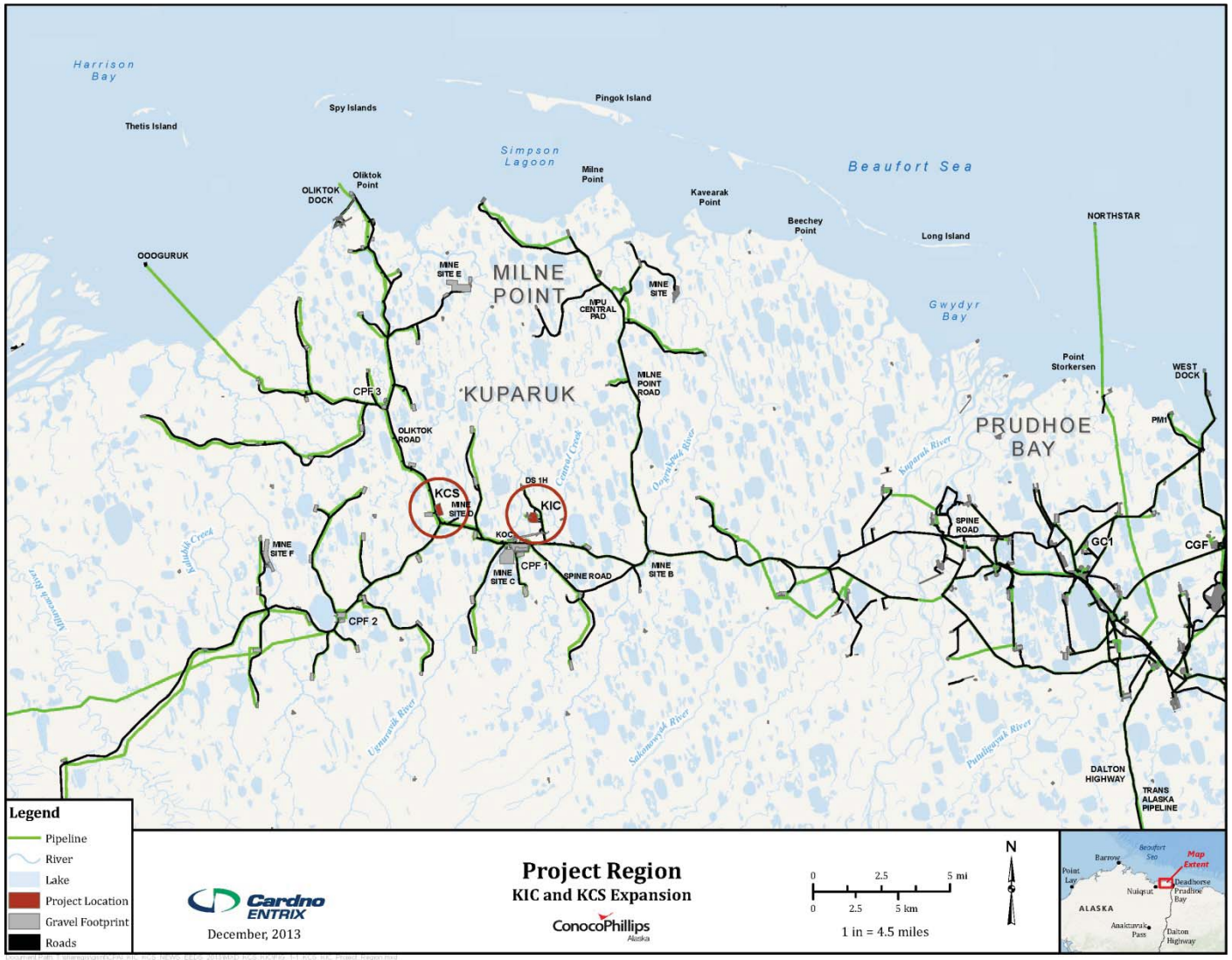

Figure 1-1. KIC and KCS Expansion Projects – Project Region

1.3.2 Need

President George W. Bush issued Executive Order (EO) 13212 on May 16, 2001, which directed the National Energy Policy Development Group (NEPDG) to promote domestic oil and gas production to meet the country's energy needs in the 21st Century. The NEPDG report (2001) directs federal agencies to expedite permits and other federal actions necessary for energy-related project approvals on a national basis. More recently, on July 12, 2011, President Barack Obama issued EO 13580, establishing an interagency working group tasked with coordinating domestic energy development and permitting in Alaska (Office of the Press Secretary 2011). This EO reiterates the need for increased domestic energy resource development, both onshore and offshore, and advocates for efficient domestic energy development and permitting in Alaska that is in compliance with health, safety, and environmental protection standards.

As of 2011, the U.S. imported approximately 45% of its oil from foreign markets (USDOE 2012). The amount imported has been declining steadily since 2006 and the U.S. Energy Information Administration (USEIA) expects net petroleum imports to decline to 36% by 2035 (USEIA 2012). In place of imported oil, domestic supplies must be developed, including crude oil. The EIA estimates that U.S. crude oil production will increase to 6.7 million barrels per day (bpd) by 2020, of which crude oil produced through Alaska assets would be a part.

Although domestic oil production contributes to the health of the entire nation's economy, it has a significant effect on the State of Alaska by generating revenue to the State through jobs, investments, taxes, and royalties. Development of this Project would support production of an increased stream of revenue to the state and local communities in addition to revenues currently being produced through the KRU. The development of this particular Project would help meet the facilities needs for CPAI operations so that increasing demand for domestic oil can continue to be met in a safe and efficient manner.

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2. Project Description

2.1 Project Summary

CPAI is proposing to expand the KIC and KCS pads to support infrastructure growth necessary for continued development within the KRU (Figure 2-1, CPAI 2013a). In some cases existing buildings would be demolished and replaced with new buildings that meet current building codes, and in other cases new buildings would replace structures that are currently located within blast zones of existing oil and gas production infrastructure. CPAI proposes to place gravel fill next to the KIC and KCS pads and, in the future, to install new facilities on both pads. The pad expansions would require placement of approximately 453,500 cubic yards (cy) (355,900 cubic meters) of gravel fill covering 58 acres (23 hectares) of tundra: 385,500 cy (294,736 cubic meters) and 48 acres (19 hectare) at KIC; 80,000 cy (61,164 cubic meters) and 10 acres (4 hectare) at KCS[1]. The placement of fill would accommodate continued development and maintenance activities by providing space for current and potential future shops, offices, camps, and equipment storage. Expansion at KIC would allow equipment to be staged next to shops for service and maintenance. Existing infrastructure would be used to support the Projects for access, egress, and power supply. No new drill sites, cross-country pipelines, or power lines are proposed as part of these projects. Gravel for construction of the KIC pad expansion would be obtained from Mine Site C. Gravel for the KCS pad expansion would be obtained primarily from Mine Site C; however, there is potential for a limited gravel haul from Mine Site E.

2.2 Project Components

The overall scope of the pad expansions includes use of the following existing resources:

- Gravel from Mine Site C (ADL 419337);
- Gravel from Mine Site E (ADL 419337);
- Access Roads; and
- Fresh water from the KIC Reservoir (ADL 407812), Mine Site D (LAS 23894), and Lake K107 (TWUP A2011-166) for gravel compaction and dust control.

Expansion areas and new or replacement facilities proposed for these Projects would include:

- A 48 acre (19 hectare) expansion of KIC pad (Figure 2-2) to accommodate:
  - Access Road
  - Temporary Camp Additions,
  - Wells Chemical Building,
  - Construction Office Expansion,
  - Construction Shops,

[1] In general English units are the primary and preferred units presented throughout the EED, metric units are provided where space allows. Metric units are not presented in all tables. Metric units are the primary units presented when metric units are reported in the cited references.

  - Roads and Pads Equipment Building,
  - Wells Shop and Offices, and
  - Field Services Shops, Office, and Parts Storage.
- A 10 acre (4 hectare) expansion of KCS pad (Figure 2-3) to accommodate:
  - Bulk Chemical Tanks,
  - Maintenance Office Building,
  - Drilling Office Building,
  - Fabrication Shop Office Building,
  - Wells Tool Shop,
  - Electrical and Instrumentation Shop,
  - Well House Assembly Shop, and
  - Consolidated Warehouse and Office Building.

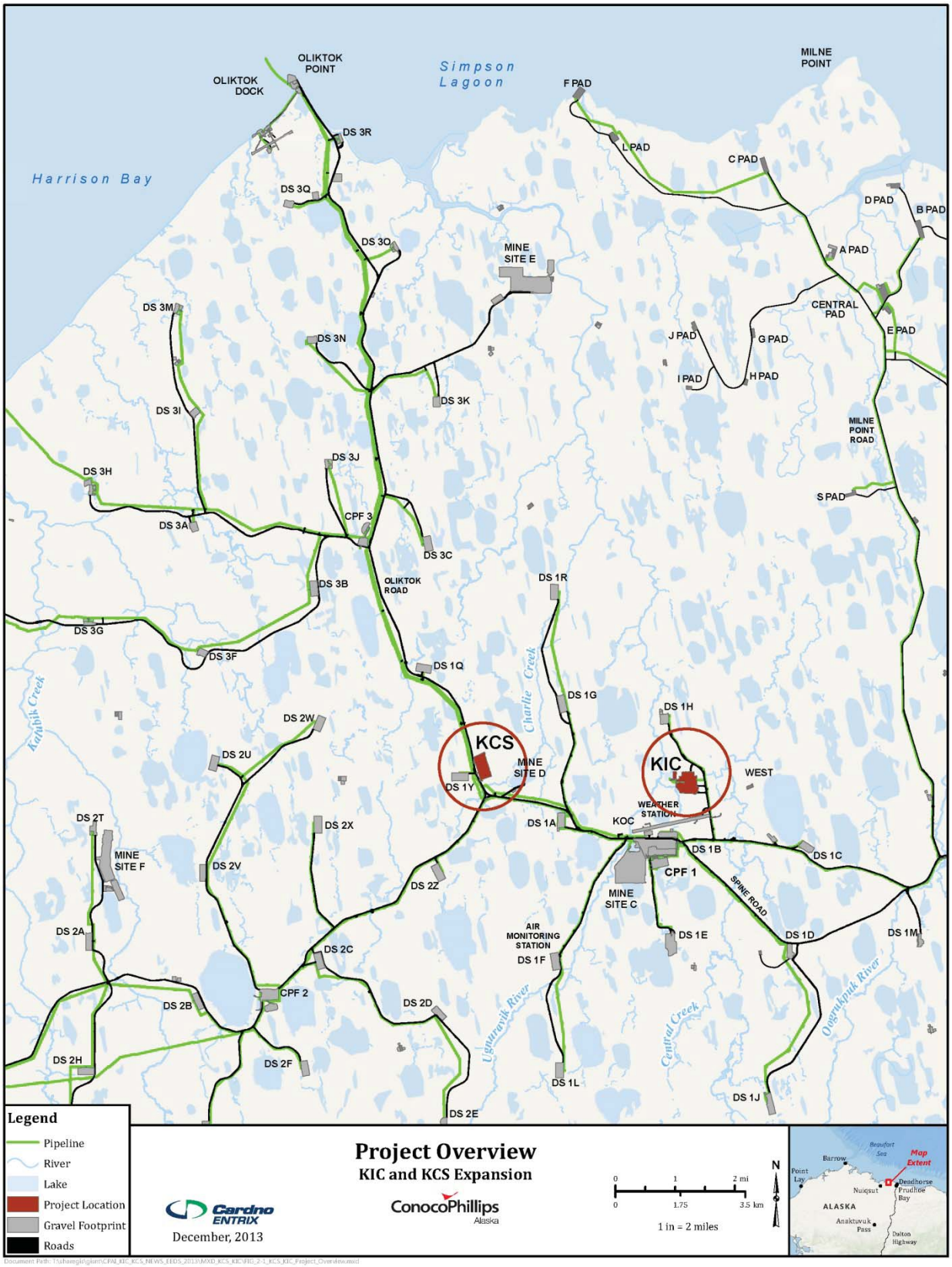

Figure 2-1. KIC and KCS Expansion Projects – Project Overview

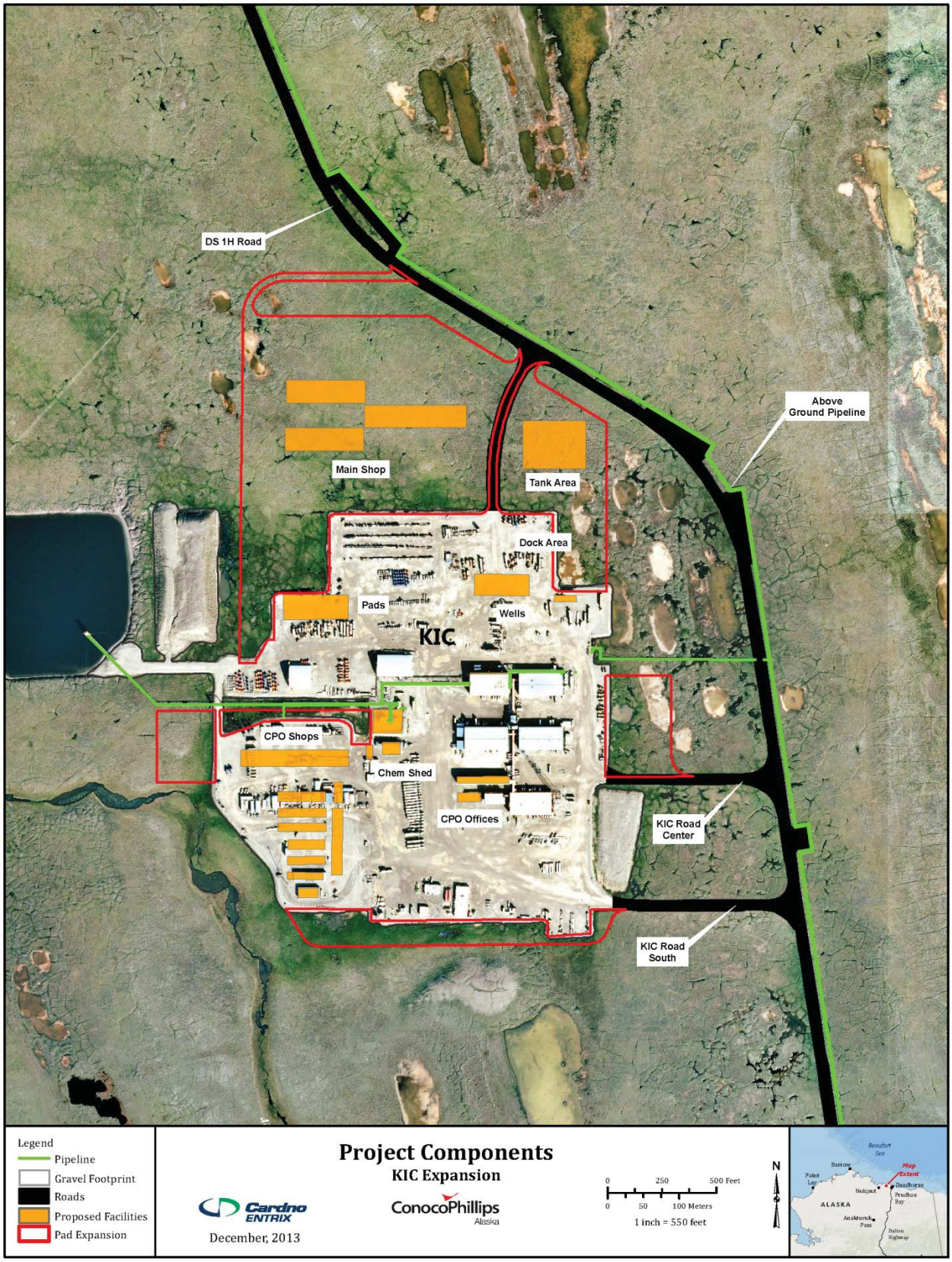

Figure 2-2. KIC Expansion Project – Project Components

Figure 2-3. KCS Expansion Project – Project Components

2.3 Spill Prevention and Response

The Kuparuk River Unit Oil Discharge Prevention and Contingency Plan (ODPCP, CPAI 2013b) includes descriptions of spill prevention measures, as well as guidelines for spill response preparedness. The KRU ODPCP includes the following sections: Response Action Plan; Prevention Plan; Supplemental Information; Best Available Technology (BAT); and Response Planning Standard. The Response Action Plan outlines deployment and response strategies for the facility and its operations, including information on safety, emergency actions, and incident reporting and notification requirements. The Prevention Plan outlines pollution prevention measures and programs, personnel training, site inspection schedules, and maintenance protocols. Supplemental information includes a description of the facilities and operations conducted at the facilities, a description of the potential receiving environment, logistical support personnel and equipment, and spill response team training for all employees on-site and the Incident Management Team. The BAT section includes an analysis of various technologies that have been used or are available for use within the KRU for well source control, pipeline source control and leak detection, tank source control and leak detection, tank liquid level determination and overfill protection, corrosion control and surveys, and wildlife capture, treatment, and release. The Response Planning Standard describes the worst case discharge volume of oil for various oil discharge scenarios, which are then presented in the Response Action Plan section of the ODPCP. The ODPCP would be amended to address the expansion of the KIC and KCS pads and would comply with all state and federal requirements.

In addition to the ODPCP, a spill prevention, control, and countermeasures plan is in place for KRU in accordance with U.S. Environmental Protection Agency (USEPA) regulations. This plan would be updated to accommodate the KIC and KCS pad expansions. Secondary containment would be provided for all regulated fuel tanks and would be sized appropriately based on regulation requirements.

2.3.1 Response Organization and Equipment

Alaska Clean Seas (ACS) would serve as CPAI's Oil Spill Response/Removal Organization and primary Response Action Contractor, as approved by the U.S. Coast Guard (USCG) and Alaska Department of Environmental Conservation (ADEC). ACS would help assemble, store, maintain, and operate the spill response equipment. Deployment strategies for spill response involving North Slope drilling operations are based on the capabilities of ACS, as outlined in the ACS Technical Manual. Important elements of quick deployment following an incident include timely notifications and activation, appropriate transportation infrastructure and arrangements, and trained personnel that can deploy readily available response resources.

2.3.2 Response Communication and Methods

The Kuparuk Emergency Operations Center would serve as the command center if an incident should require more than the on-site spill response team. All communications with oil spill emergency response teams would be based out of the command center. A Communication Plan would be developed for compatibility with communications equipment through CPAI, ACS, and the KRU during a response. The spill communication system is scalable in size and scope to serve both small and large incidents and response teams.

Scenarios in the ODPCP describe the numbers and types of equipment necessary to implement the planned response, including the time frame for delivery and start-up, recovery capacities,

transit times, transfer rates, and storage of recovered oil and potentially contaminated snow. The Project facilities would be designed to minimize the possibility of spills and include the use of secondary containment for fuels and hazardous materials, as required by state and Federal regulations. Hydrocarbon storage tanks would have over fill protection systems in place which meet BAT guidelines. In addition, an employee spill prevention training program would be implemented to increase preparedness and awareness and reduce the likelihood of spills. Approved leak detection systems would be in place for pipelines and/or fuel storage tanks as required. Detection of discharges may also be accomplished by visual observation as part of normal operations, scheduled site inspections, and while personnel are traveling throughout the site. Specific on-site inspections would include visual observation of tank conditions, lines, and pumps. All above-ground pipes and storage tanks would be visually inspected on a regular schedule.

2.4 Construction Schedule

Construction of the KIC and KCS pad expansions are schedule to begin in the second quarter of 2014 (Table 2.4-1). Most gravel would be placed in 2014 and would be allowed to season and dry in 2015. An alternate schedule would begin with construction of the KCS expansion prior to the KIC expansion (Table 2.4-1). Under both the proposed and alternate schedules, the proposed expansion Projects would be completed by the end of 2015.

TABLE 2.4-1. SCHEDULE FOR GRAVEL HAULING FOR THE KIC AND KCS PAD EXPANSION PROJECTS

Month	Year	KIC Gravel Haul from Mine Site C	KCS Gravel Haul from Mine Site C	KCS Gravel Haul from Mine Site E
May (mid-month Start)	2014	X	A	A
June	2014	X	A	A
July	2014	X		
August (mid-month finish)	2014	X		
August (mid-month start)	2014	A	X	X
October (full month)	2014	A	X	X
June	2015	X	X	X
July	2015	X	X	X
August	2015	X	X	X

Notes: X – proposed schedule; A – alternate schedule.
Source: CPAI 2013a

2.5 Project Alternatives

The proposed action involves expanding the KIC pad by approximately 48 acres (19 hectares) and the KCS pad by approximately 10 acres (4 hectares) to provide additional work and storage space needed to continue oil and gas production at Kuparuk efficiently and safely. Fill would be placed on tundra and areas of partial gravel fill. Evaluation by CPAI concluded that these areas were the minimum expansions required at each site to safely meet Project objectives. The proposed action is CPAI's preferred alternative and is the basis for this environmental evaluation (Table 2.5-1 and Table 2.5-2).

A no action alternative would not allow expansion of the KIC or KCS pads. This alternative is inconsistent with the stated purpose of the proposed Projects to provide additional work and storage space to allow for the safe continuation of development and production of oil and gas within the KRU for the next 30-40 years and to cease outsourcing of equipment service and maintenance work to Deadhorse. Without the expansion of both pads, production would continue from the KRU with associated operation activities and associated impacts until the reservoir is depleted or production becomes uneconomic. Without pad expansions, storage space would be overcrowded and equipment service and maintenance would continue to be outsourced to facilities in Deadhorse, which requires additional transportation time and fuel.

TABLE 2.5-1. ESTIMATED KIC AND KCS PROJECT AREA AND EXPANSION FOOTPRINTS BY WETLAND FUNCTIONAL CLASS

Wetland Functional Class	NWI Code	KIC PA (acre [% of area])	KCS PA (acre [% of area])	KIC Pad Expansion (acre [ha])	KCS Pad Expansion (acre [ha])	Total Pad Expansion (acre [ha]
Wetlands						
Permanently Flooded Sedge Marsh	PEM1H	-	1.48 [1%]	-	0	0
Seasonally Flooded Saturated Wet Sedge Meadow	PEM1E	28.64 [9%]	55.89 [28%]	10.24 [4.14]	1.13 [0.46]	11.37 [4.60]
Temporarily Flooded Graminoid Shrub	PEM1/SS1A	5.69 [2%]	-	0	-	0
Seasonally Flooded Saturated Graminoid Shrub	PEM1/SS1E	0.16 [<1%]	-	0	-	0
Saturated Graminoid Shrub	PEM1/SS1B	174.15 [56%]	84.01 [42%]	33.57 [13.58]	8.61 [3.48]	42.18 [22.19]
Waters						
Permanently Flooded Pond (<20 acres)	PUBH	18.99 [6%]	0.16 [<1%]	1.71 [0.69]	0	1.71 [0.69]

Note: KIC Project Area (PA) is 27% non-wetland – due to gravel fill. Part of the expansion area extents onto previous fill areas (2.29 acres, 0.93 hectares, 1% of Project area)
Note: KCS Project Area (PA) is 29% non-wetland – due to gravel fill. Part of the expansion area extents onto previous fill areas (0.34 acres, 0.14 hectares, <1% of Project area)
Sources: Appendix A, Appendix B, Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012, ABR 2013a, USFWS 1985

TABLE 2.5-2. ESTIMATED KIC AND KCS PROJECT AREA AND EXPANSION FOOTPRINTS BY WETLAND AND WATER FUNCTIONAL VALUE

Wetland and Water Category	KIC PA (acre [% of area])	KCS PA (acre [% of area])	KIC Pad Expansion (acre [ha])	KCS Pad Expansion (acre [ha])	Total Pad Expansion (acre [ha])
I – High Functioning Wetlands	0 [0%]	0 [0%]	0	0	0
II – High to Moderate Functioning Wetlands	5.69 [2%]	57.37 [23.22]	0	1.13 [0.46]	1.13 [0.46]
III – Moderate to Low Functioning Wetlands	221.93 [71%]	84.16 [42%]	45.52 [18.41]	8.61 [3.48]	54.13 [21.89]
IV – Degraded and Low Functioning Wetlands	0 [0%]	0 [0%]	0	0	0
Totals	227.62 [73%]	141.53 [71%]	45.52 [18.41]	9.74 [3.94]	55.26 [22.35]

Note: KIC Project Area (PA) is 27% non-wetland – due to gravel fill.
Note: KCS Project Area (PA) is 29% non-wetland – due to gravel fill.
Sources: Appendix A, Appendix B, Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012, ABR 2013a, USFWS 1985

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3. Affected Environment

3.1 Overview

This chapter provides a summary of the physical (geology, climate, air, water), biological (vegetation, wetlands, wildlife), and social environments potentially affected by the proposed expansions of KIC and KCS for continuing operations within Kuparuk. The KIC and KCS are within the Arctic Peaty Lowland (Figure 3-1) ecological landscape which is characterized by low-lying flats, drained-lake basins, poorly drained soils with moderately thick to thick organic layers over silts, and sands that are generally around neutral to alkaline trending toward acidic on older terrain (Jorgenson and Grunblatt 2013). Permafrost underlies the region and contributes to the poorly drained soils. Vegetation varies along an elevation and moisture gradient from dryas dwarf shrub tundra on ridges, tussock tundra and sedge-dryas tundra on gentle slope, wet sedge meadow tundra in swales and drained-lake basins, and fresh sedge or grass marsh in shallow water (Figure 3-2, Jorgenson and Grunblatt 2013).

Environmental conditions are briefly described for the central Kuparuk region and also more specifically for some resources within a 1.0 mile (1.6 km) or a 656 foot (200 meter) area around the pad expansions, and access roads to Mine Site C and Mine Site E (Figure 3-3). Several recent reports that document environmental conditions and protected species within this region are summarized below, and are incorporated by reference for descriptions of Kuparuk area resources: ABR 2013b, USFWS 2013, Lawhead et al. 2013, Stickney et al. 2013, Roth et al. 2007, Roth and Loomis 2008, and Wells et al. 2012. Site-specific evaluations based on geodatabases that include multiple years of surveys are cited as the most recent survey report: Lawhead et al. (2013) for mammal data; and Stickney et al. (2013) for bird data. These sources provide references to previous years' surveys.

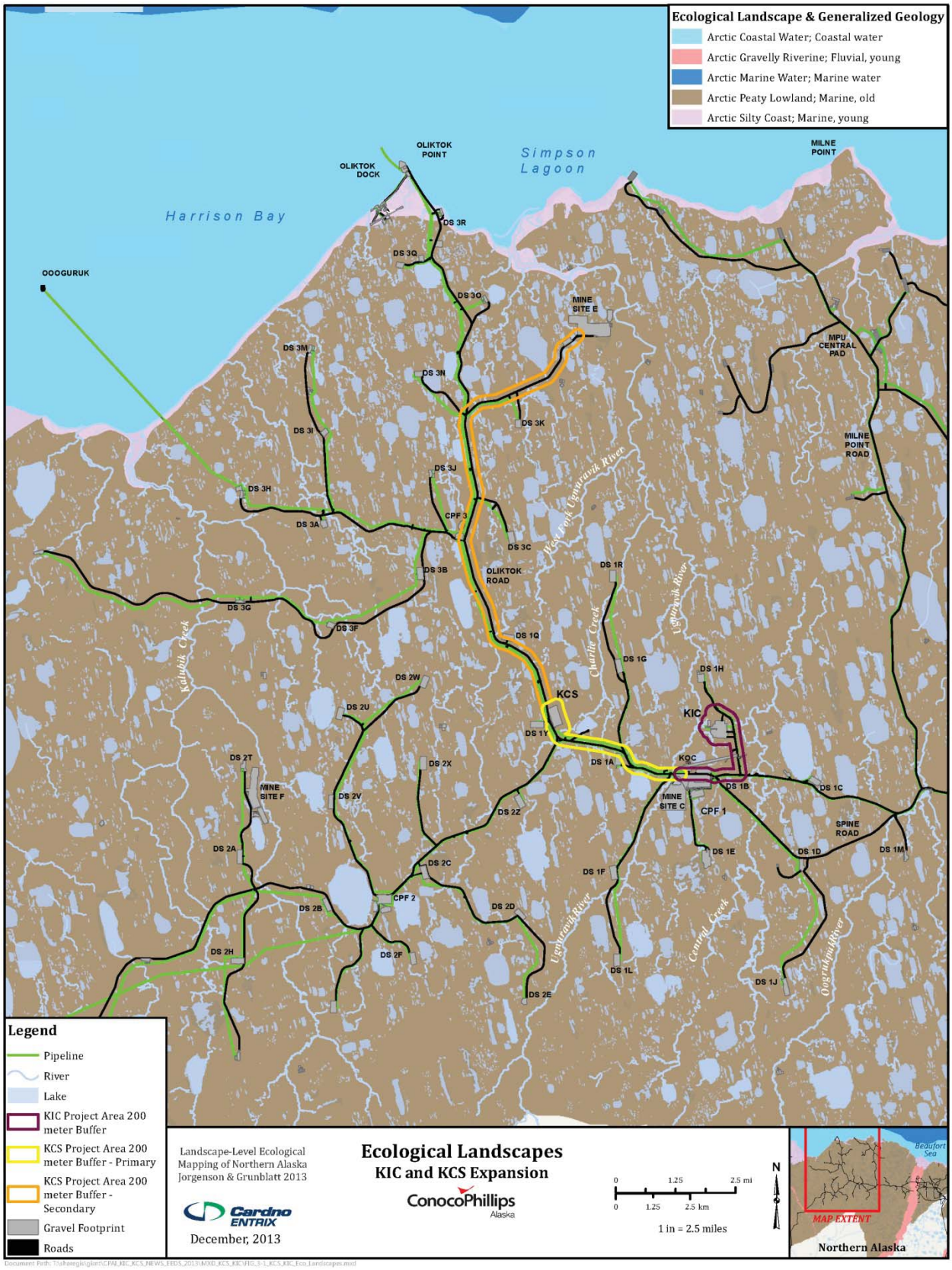

Figure 3-1. KIC and KCS Expansion Projects – Ecological Landscapes

Arctic Peaty Lowland Photograph
Landscape-Level Ecological Mapping
of Northern Alaska
Jorgenson & Grunblatt 2013

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December, 2013

Arctic Peaty Lowland
KIC and KCS Expansion

ConocoPhillips Alaska

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Figure 3-2. KIC and KCS Expansion Projects – Arctic Peaty Lowland

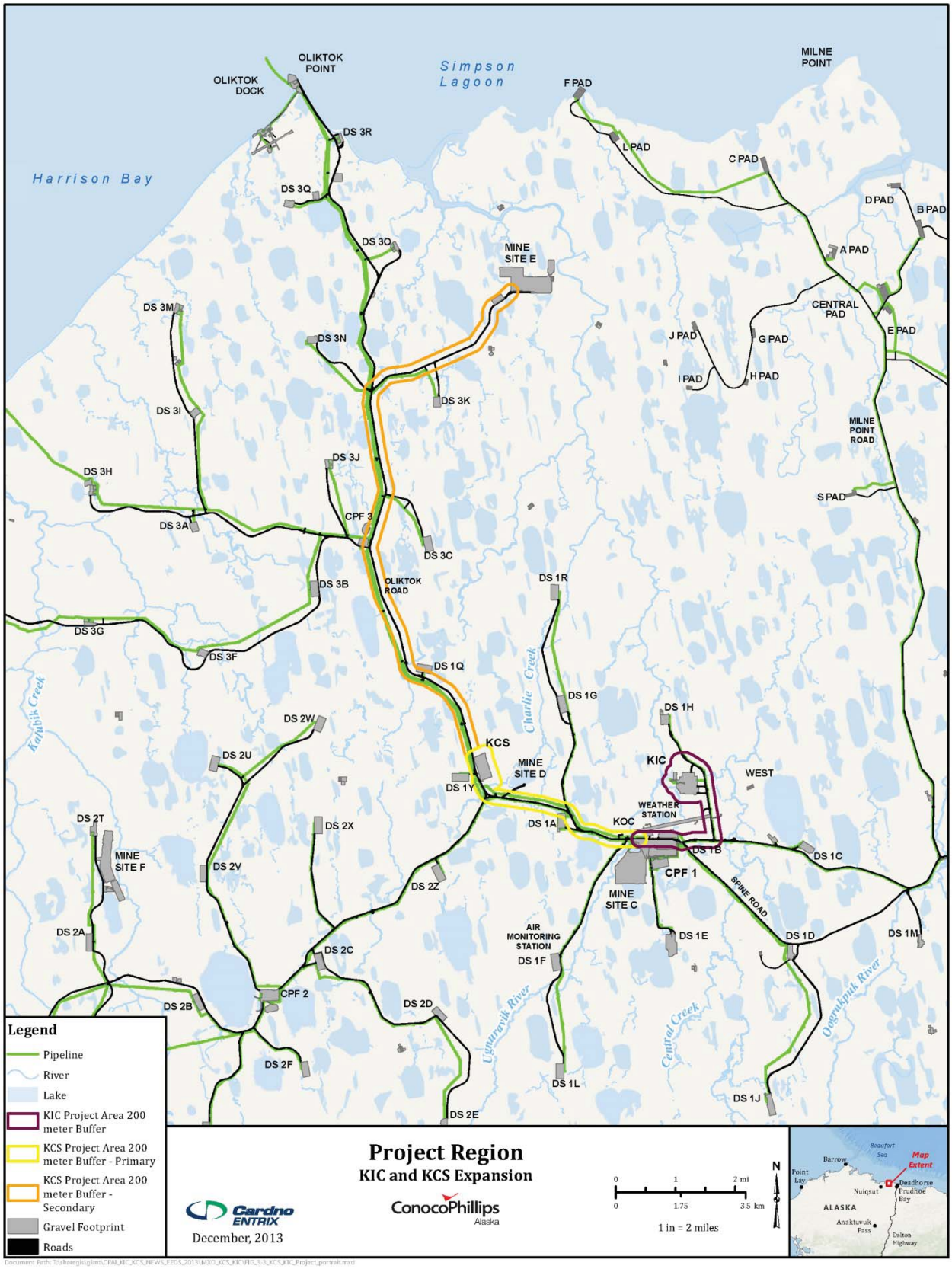

Figure 3-3. KIC and KCS Expansion Projects – Project Region

3.2 Physical Environment

3.2.1 Geology and Geomorphology

Kuparuk lies within the Ugnuravik Coastal Plain physiographyic province which is characterized as a 1,283 km^2 coastal plain underlain by old marine deposits, with peat, pebbly silt, and sand lithologies (Jorgenson and Grunblatt 2013). The ACP slopes northward from the Brooks Range and is underlain by quaternary age deposits of the Gubik Formation (Rawlinson 1993).

Rolling thaw-lake plains with numerous broad-based mounds characterize the topography west of the Kuparuk River where the distribution and amount of ice within the permafrost affect the surface morphology (Rawlinson 1993). Permafrost-related features such as pingos, ice-wedge polygons, and oriented thaw-lakes mark the gently sloping terrain. Kuparuk is dominated by ice-rich thaw basin deposits. Three geomorphic types dominate at Kuparuk: ice-rich thaw basins (45%), alluvial plain deposits (26%), and fresh water (20%; Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012).

3.2.2 Seismicity

Seismicity is generally low across the central Beaufort Sea coast compared to the rest of Alaska. Most earthquakes across the central Beaufort Sea coast have occurred east of Kuparuk within the Arctic National Wildlife Refuge (ANWR) (AEIC 2013); where the Brooks Range extends northward to within about 20 miles of the coast. A total of 37 earthquakes have been reported within about 100 miles of KIC and KCS in Kuparuk during the period from 1898 to 2012 (AEIC 2013). These quakes have been mostly small (<4.0 magnitude, 81%), relatively shallow (< 33 km depth, 89%), and occur on an average frequency of about 1 quake per year (range 0 to 8 per year) between the first quake in 1976 through 2012 (AEIC 2013).

3.2.3 Soils

Soils in Kuparuk vary in amount of organic development with surface forms with the thickest organic accumulations in nonpatterned tundra and the thinnest organic accumulations in strangs (Roth et al. 2007, Wells et al. 2012). Soils are predominately circumneutral (62%, mean 6.7, range 5.8 to 7.3) or alkaline (38%, mean 7.7, range 7.4 to 8.2, Roth et al. 2007, Wells et al. 2012). Active layer depths ranged from 30 to 105 cm (Roth et al. 2007, Wells et al. 2012).

3.3 Climate and Air Quality

A cooperative weather monitoring station (Kuparuk, Alaska; Station 505136) located near the Kuparuk airstrip has been in operation since 1983 (WRCC 2013, Figure 3-3). This station provides current and historical climate data for the Kuparuk area. Two air quality stations have been operated in the Kuparuk area, one in Nuiqsut, and one at DS-1F. DS-1F is located about 3.75 miles southeast of the KCS Expansion Project and 3.75 miles southwest of the KIC Expansion Project (Figure 3-3).

3.3.1 Climate

Nearshore Beaufort Sea region winters are frequently stormy and typically include temperature inversions (warm air above colder air) during calmer periods (Veltkamp and Wilcox 2007). Summers are typically cloudy with less frequent temperature inversions (Veltkamp and Wilcox 2007).

Sub-freezing temperatures generally occur from mid-October into May (WRCC 2013). Thawing season typically lasts 110 days, from late May through mid-October (Roth et al. 2007). Long-term climatic records at the Kuparuk Airport from February 1983 through May 2013 indicate February is the coldest month, averaging -17° F, and July is the warmest month, averaging 47° F (WRCC 2013). Over half of the annual average 4 inches of precipitation falls as summer rain with an average of 32 inches of snow (WRCC 2013). Snow depth begins building in mid to late September to a peak of 9 inches in April, and snow melt generally begins in May (WRCC 2013).

North Slope winds are bimodal, with a primary east-northeast onshore component that increases seasonally and peaks in June due to the arctic sea breeze effect, and a secondary west-southwest offshore component (Veltkamp and Wilcox 2007). Winter winds average 15 to 25 miles per hour decreasing during the summer (ADEC 2012a). Summer wind speeds are highest near the coast and decrease with distance inland (Veltkamp and Wilcox 2007).

3.3.2 Climate Change

Mean annual temperatures on the North Slope have followed an increasing trend for the past 50 years and projections show the annual temperature will increase by 7.3° C (~13 ° F) by the end of the century (Martin et al. 2009). The greatest increases in temperature are projected to occur during the winter months from October to May (Martin et al. 2009). The ACP frost-free season is projected to increase by 33 days, primarily due to delayed freezing in the fall, and precipitation is projected to increase by 50% by the end of the century (Martin et al. 2009). Projected climate changes in the Alaskan arctic are anticipated to result in the alteration of: (1) hydrologic processes – precipitation water balance and distribution of surface water; (2) vegetation – community composition and phenology; (3) invertebrates – productivity and phenology; and (4) coastal dynamics – erosion, sedimentation, stream discharge, inundation, and plant succession (Martin et al. 2009).

3.3.3 Ambient Air Quality

Alaska's North Slope air quality is within National Ambient Air Quality Standards (NAAQS) and Alaska Ambient Air Quality Standards (AAAQS) for criteria pollutants (USEPA 2012). Criteria air pollutants include: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), and particulates (fine particulates $PM_{2.5}$ and course particulates PM_{10}; ADEC 2012a). Lead has not been monitored on the North Slope (MACTEC 2011).

Regional oil and gas production sources of emissions that may affect air quality include: gas-fired turbines and heaters, incinerators, emergency flares, stand-by diesel-fired power generators, portable diesel engines and heaters, storage tanks, fugitive hydrocarbon process emissions, and mobile sources. Data from Kuparuk DS-1F and Nuiqsut ambient monitoring stations indicate that air quality in this region is in compliance with applicable NAAQS and AAAQS for all pollutants and averaging periods (Table 3.3-1) (CPAI 2013c). Values reported in Table 3.3-1 are the highest measured concentrations; computed ambient values would be lower than these maximum readings (CPAI 2013c).

TABLE 3.3-1. HIGHEST MEASURED CONCENTRATIONS AT SELECTED NORTH SLOPE AMBIENT MONITORING STATIONS AND FEDERAL AIR QUALITY STANDARDS

	Federal Standards[a]		Maximum Monitored Concentration	
Air Pollutant	NAAQS Concentration ($\mu g/m^3$)	Averaging Period	Kuparuk DS-1F[b] ($\mu g/m^3$)	Nuiqsut[c] ($\mu g/m^3$)
Ozone (O_3)	147	8-hour	110	114[d]
	40,000	1-hour	375	141
Carbon Monoxide (CO)	10,000	8-hour	188	1,688
	188	1-hour	67.2	133
Nitrogen Dioxide (NO_2)	100	Annual	4.23	18.6
	1,300	3-hour	6.58	39.0
	365	24-hour	3.23	11.8
Sulfur Dioxide (SO_2)	80	Annual	0.795	1.57
	35	24-hour	10.5	33.5[e]
Particulate Matter ($PM_{2.5}$)	12	Annual	3.59	3.58
	150	24-hour	48.3	395[f]
Particulate Matter (PM_{10})	50	Annual	6.51	16.4

Sources: MACTEC 2011, CPAI 2013c, 40 CFR Part 50
Notes:
[a] National and state standards, other than those based on annual average, are not to be exceeded more than once a year.
[b] Maximum concentrations measured during 2012-2013.
[c] Maximum concentration measured during April 1999 - September 2013.
[d] Is the second maximum. The maximum ozone for Nuiqsut (272 $\mu g/m^3$) occurred during 14 September 2007 fire.
[e] Is the second maximum. The maximum $PM_{2.5}$ for Nuiqsut (85 $\mu g/m^3$) occurred during 4 August 2009 fire.
[f]There are a total of 11 events above the 24-hour PM_{10} standard. All values are result of fire and dry conditions and/or windblown dust from the banks of the Nechelik channel of the Colville River Delta. In the absence of these conditions, the typical maximum values are around 35 $\mu g/m^3$.

3.4 Water Resources

Water resources in the Kuparuk area are primarily surface waters which are dominated by climatic factors with shallow lakes and most streams frozen for most of the year (Sloan 1987). Water in the soils beneath the active thaw layer and water within subsurface deposits are locked in permafrost. Permafrost forms a barrier to surface water infiltration and generally results in saturation of the overlying soils. Unfrozen winter ground water is generally limited to shallow, isolated areas of unfrozen material or taliks (thawed areas) underneath deep lakes or within hyporheic zones in sediments underneath major rivers and streams (BLM 2004). Ground blizzards redistribute the snow on minor terrain features and exposures, and snowmelt dominates arctic stream hydrography.

The central Kuparuk area is primarily within the Ugnuravik River and Central Creek drainages. The Ugnuravik River and Central Creek originate on the ACP, so they are classified as tundra streams. Tundra streams are meandering creeks and small rivers that drain tundra-covered slopes and coastal plains into larger streams or directly into the Beaufort Sea. The Ugnuravik River is 37.3 miles long with 20 tributaries and a total drainage area of 120.7 mi^2 (USGS 2013, HUC 10 and flowlines). Stream flow in mid-July 1980 at river mile 13.5 just north of KIC was about 2

cubic feet per second (Moulton and Dew 1983). Central Creek is 29.2 miles long with 16 tributaries and a total drainage area of 71.5 mi^2 (USGS 2013, HUC 12 and flowlines).

Surface water such as lakes, ponds, and nearshore water covers about 21% of the Kuparuk area (Figure 3-4). Aquatic habitats within the Kuparuk area include both shallow and deep lakes and ponds, many of which are associated with thaw basin deposits, and riverine complex (Figure 3-4, Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012). Shallow water melts earlier and becomes warmer than deep water; connected lakes may allow for fish passage and overwintering; and tapped lakes and brackish lakes may vary widely in salinity (Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012). No water withdrawals are proposed for either the KIC or KCS Expansion Projects; all freshwater required for gravel compaction and dust abatement would be obtained from the KIC Reservoir, Mine Site D, and Lake K107 .

3.4.1 Water Quality

North Slope waters are not considered to have impaired water quality (ADEC 2010); all North Slope waters meet or exceed designated use dependent water quality criteria for color, fecal coliform, dissolved oxygen, dissolved inorganics, petroleum hydrocarbons, pH, radioactivity, residues, sediment, temperature, toxics, and turbidity (ADEC 2012b, 18 AAC 70). Typically, tundra streams on the North Slope have lower calcium concentrations, and lower pH and conductivity readings than other streams (such as spring fed streams or mountain streams). The water in tundra streams is often a natural yellow to brown color; ranging from 40 to 68 °F in summer, with pH ranging from 6.4 to 8.5 (Craig and McCart 1975).

Fall water quality measurements for potential freshwater sources are listed in Table 3.4-1. Measurements were taken from the lakes in winter and fall 2005 as part of the Kuparuk Lake Monitoring Study; withdrawals were occurring from Mine Site D and KIC Reservoir, while Lake K107 was a control with no withdrawal (MBJ 2005).

TABLE 3.4-1. WATER QUALITY PARAMETERS FOR POTENTIAL SURFACE WATER SOURCES

Lake Site	Sampling Period	Fall Temperature (°C in August)	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Percent Oxygen Saturation (%)	Salinity (ppt)
KIC Reservoir	Withdrawal	11.0	275	11.9	108.2	0.17
Mine Site D	Withdrawal	6.0	220	11.9	95.6	0.14
Lake K107	Non-withdrawal	11.1	314	11.3	102.7	0.23
Average	---	9.4	270	11.7	102.2	0.18

Source: MBJ 2005

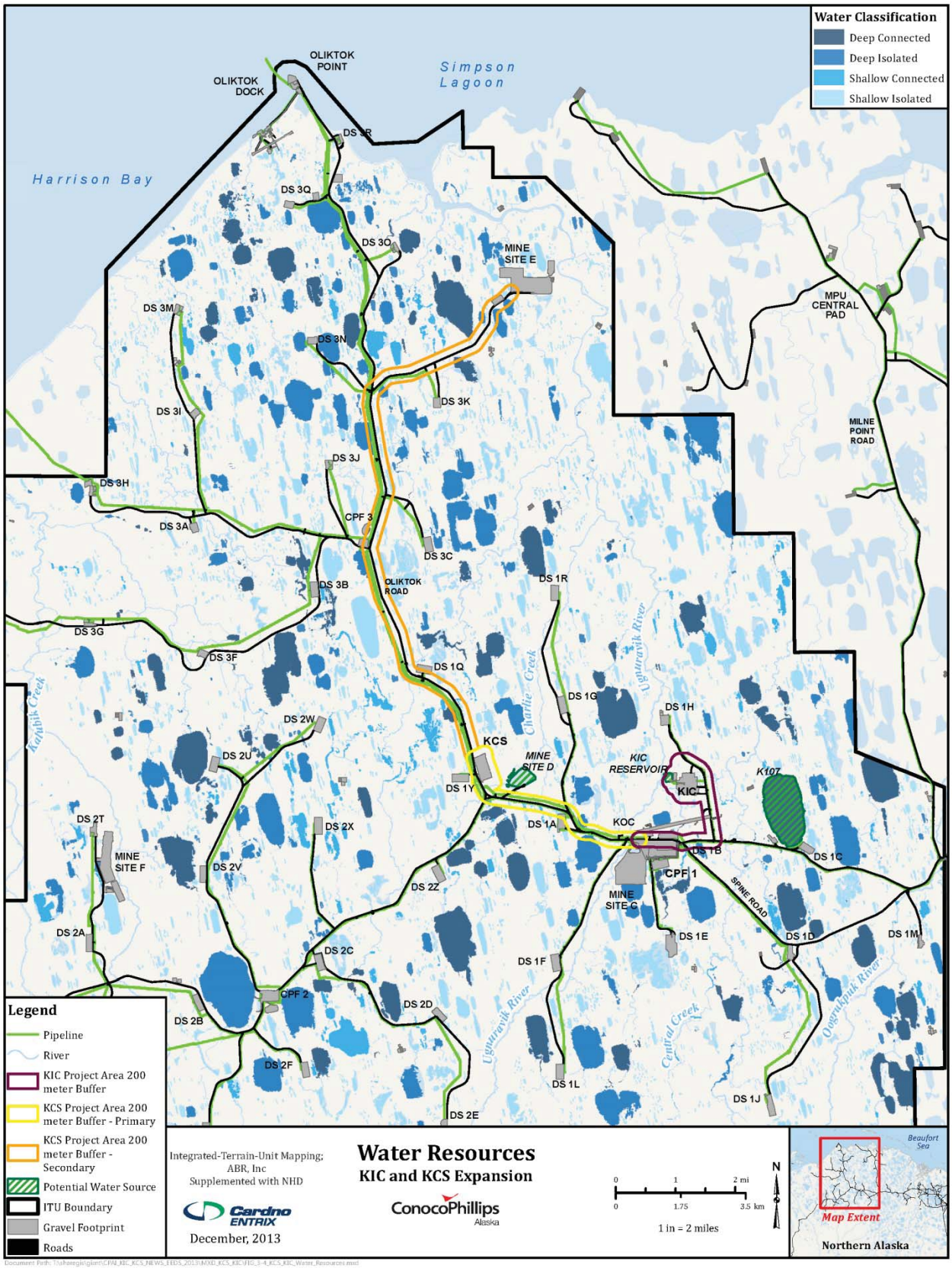

Figure 3-4. KIC and KCS Expansion Projects – Water Resources

3.5 Vegetation and Wetlands

3.5.1 Vegetation Types

Arctic Coastal Plain vegetation is strongly related to microtopographic features that affect drainage. Wetter soils and seasonally flooded areas in flat low areas support herbaceous communities dominated by sedges or grasses. Drier soils in elevated areas such as thaw lake margins, river bluffs, rims of low centered polygons, or centers of high-centered polygons support a mixture of sedges and dwarf shrub communities. Vegetation classes in the Kuparuk area (excluding water) are dominated by tussock tundra, wet sedge meadow tundra, moist sedge-shrub tundra, and old basin wetland complex (Table 3.5-1, Figure 3-5, Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012). In general, vegetation classes in the Kuparuk area are considered wetlands, with the exception of human modified barrens which include gravel footprints for pads, roads, and excavated mine sites.

TABLE 3.5-1. VEGETATION TYPES IN THE KUPARUK AREA

Vegetation Type[1]	Area (acres)	Area (percent)
Aquatic Algae	187	0%
Barren	1,928	2%
Cassiope Dwarf Shrub Tundra	95	0%
Coastal Complex	118	0%
Dryas Dwarf Shrub Tundra	2,402	2%
Fresh Grass Marsh	404	0%
Fresh Sedge Marsh	3,275	3%
Halophytic Sedge-Grass Wet Meadow, brackish	33	0%
Moist Salt-killed Meadow	252	0%
Moist Sedge-Shrub Tundra	18,014	18%
Old Basin Wetland Complex	13,872	14%
Open Low Willow	63	0%
Partially Vegetated	451	0%
Riverine Complex	750	1%
Tussock Tundra	36,449	37%
Wet Sedge Meadow Tundra	20,253	20%
Young Basin Wetland Complex	450	0%
Totals[1]	98,997	100%

Sources: Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012
[1] Water classifications brackish water, fresh water, marine water, and water excluded. Water accounts for 21% of mapped area (Figure 3-5).

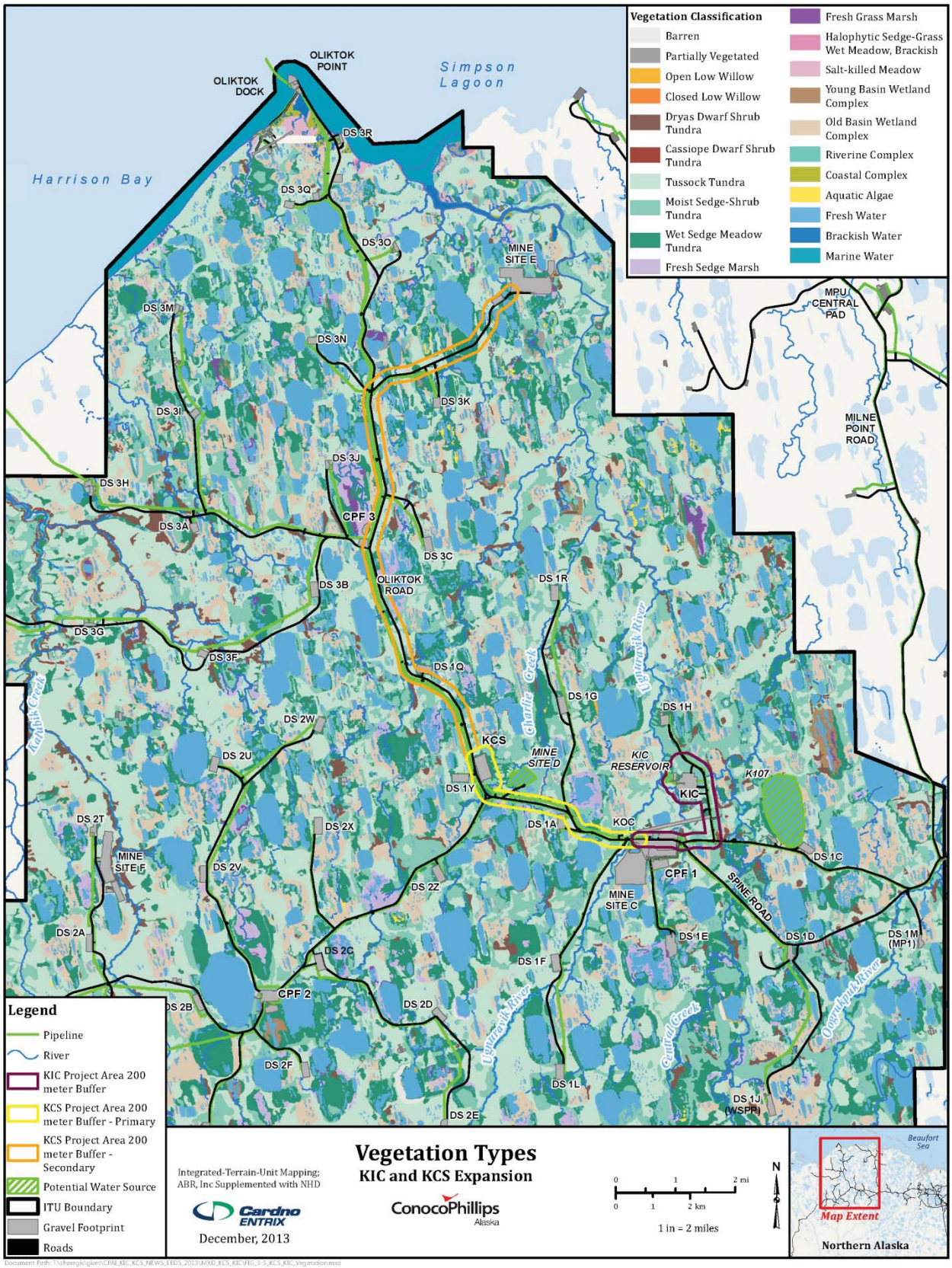

Figure 3-5. KIC and KCS Expansion Projects – Vegetation Types

3.5.2 Habitat Types

Surface landform, vegetation, and ecotypes combine to identify land cover features that are useful for determining wildlife habitat values (Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012). Habitat and vegetation are very similar in many respects, but habitat categories identify additional features that have been found to be important for wildlife – such as islands for nesting birds in lakes (Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012). About 3% of habitats in the Kuparuk area have been directly or indirectly modified by oil field infrastructure. Water-dominated habitats, including sedge and grass marshes, cover about 24% of the Kuparuk area while terrestrial habitats cover about 76% (Table 3.5-2). Habitats are dominated by moist tussock tundra, moist sedge-shrub meadow, and old basin wetland complex (Table 3.5-2).

TABLE 3.5-2. WILDLIFE HABITATS IN THE KUPARUK AREA

Habitat	Land Habitat (acres)	Water Habitat (acres)	All Habitats (acres)	Area (percent)
Barrens	351		351	0%
Brackish Water		42	42	0%
Deep Open Water with Islands or Polygonized Margins		7,320	7,320	6%
Deep Open Water without Islands		5,466	5,466	4%
Dry Dwarf Shrub	2,402		2,402	2%
Grass Marsh		386	386	0%
Human Modified	4,193		4,193	3%
Moist Dwarf Shrub	95		95	0%
Moist Low Shrub	63		63	0%
Moist Sedge-Shrub Meadow	17,784		17,784	14%
Moist Tussock Tundra	36,240		36,240	29%
Nonpatterned Wet Meadow	8,786		8,786	7%
Old Basin Wetland Complex	13,872		13,872	11%
Open Nearshore Water		735	735	1%
Patterned Wet Meadow	11,053		11,053	9%
River or Stream		331	331	0%
Riverine Complex		750	750	1%
Salt Marsh	152		152	0%
Salt-Killed Tundra	252		252	0%
Sedge Marsh		3,200	3,200	3%
Shallow Open Water with Islands or Polygonized Margins		5,067	5,067	4%
Shallow Open Water without Islands		5,660	5,660	5%
Tapped Lake with Low-water Connection		29	29	0%
Tidal Flat Barrens	88		88	0%
Young Basin Wetland Complex		450	450	0%
Total	**95,329**	**29,436**	**124,765**	**100%**

Sources: Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012.

3.5.3 Wetland Functional Classes

To evaluate wetland functions that could be affected by the proposed pad expansions, habitat and vegetation types for areas within 656 ft (200 m) of the proposed Project were compared to the National Wetland Inventory (NWI) classes mapped in the region by the U.S. Fish and Wildlife Service (USFWS 1985) and a cross-reference table was constructed following the methods developed by ABR, Inc.–Environmental Research and Services (ABR 2013a). Wetland functions by NWI classes were then evaluated by completing a Waters and Wetland Functions Data Form developed by ABR, Inc. in consultation with the Alaska Regional U.S. Army Corps of Engineers (USACE, ABR 2013a). This assessment form relies on best professional judgment for evaluating eight wetland functions for North Slope, Alaska wetlands in order to determine ratings for potential compensatory mitigation for wetland losses based on USACE Regulatory Guidance Letter (RGL 90-01, USACE 2011). Site-specific data were used to evaluate wildlife use of wetland habitats within 200 m of the development (Lawhead et al. 2013, Stickney et al. 2013, Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012).

Five wetland functional classes were developed for the purpose of assessing wetland functions based on 10 habitats and seven vegetation types that occur within 656 ft (200 m) of the KIC pad and expansion area (Table 3.5-3, Appendix A). Some of the wetlands surrounding KIC show indications of alteration due to gravel and dust spray from pads and roads, themokarst, and increased moisture levels due to snow piling (Figure 3-6). Barren habitats modified by gravel fill covering about 84 acres (34 ha) were considered uplands and were not evaluated for wetland function.

Four wetland functional classes were developed for the purpose of assessing wetland functions based on seven habitats and five vegetation types that occur within 656 ft (200 m) of the KCS pad and expansion area (Table 3.5-3, Appendix B). Some of the wetlands surrounding KCS show indications of alteration due to gravel and dust spray from the pads and nearby access roads, thermokarst, drainage impoundment, and increased moisture levels due to snow piling (Figure 3-7). Barren habitats modified by gravel fill covering about 59 acres (24 ha) were considered uplands and were not evaluated for wetland function.

TABLE 3.5-3. WETLAND FUNCTIONAL CLASSES IN THE KIC AND KCS PROJECT AREAS

Wetland Functional Class	NWI Code	Habitat	Vegetation	KIC Project Area[1]		KCS Project Area[1]	
				Area (acres)	Area (hectare)	Area (acres)	Area (hectare)
Wetlands							
Permanently Flooded Sedge Marsh	PEM1H	Sedge Marsh	Fresh Sedge Marsh	-	-	1.48	0.60
Seasonally Flooded Saturated Wet Sedge Meadow	PEM1E	Human Modified	Wet Sedge Meadow Tundra	20.87	8.45	15.86	6.42
		Nonpatterned Wet Meadow	Wet Sedge Meadow Tundra	0.90	0.36	16.36	6.62
		Patterned Wet Meadow	Wet Sedge Meadow Tundra	6.86	2.78	23.67	9.58
Temporarily Flooded Graminoid Shrub	PEM1/SS1A	Riverine Complex	Riverine Complex	5.69	2.30	-	-
Seasonally Flooded Saturated Graminoid Shrub	PEM1/SS1E	Old Basin Wetland Complex	Old Basin Wetland Complex	0.16	0.06	-	-
Saturated Graminoid Shrub	PEM1/SS1B	Dry Dwarf Shrub	Dryas Dwarf Shrub Tundra	7.06	2.86	-	-
		Human Modified	Moist Sedge-Shrub Tundra	3.57	1.45	-	-
		Moist Sedge-Shrub Meadow	Moist Sedge-Shrub Tundra	112.10	45.36	44.91	18.18
		Moist Tussock Tundra	Tussock Tundra	51.42	20.81	39.09	15.82
Waters							
Permanently Flooded Pond (<20 acres)	PUBH	Human Modified	Fresh Water	10.32	4.18	-	-
		Shallow Open Water without Islands	Fresh Water	5.99	2.29	0.16	0.06
		Shallow Open Water with Islands or Polygonized Margins	Fresh Water	2.68	1.09	-	-
Non Wetland or Water							
Upland – Non wetland	U	Human Modified	Gravel Fill	83.77	33.56	58.83	23.81

[1] The KIC Project Area is defined as a 656-foot (200-meter) buffer surrounding the KIC pad and proposed expansions (Figure 3-6). The KCS Expansion Area is defined as a 656-foot (200-meter) buffer surrounding the KCS pad and the proposed expansion (Figure 3-7).

- Class does not occur within Project Area

Sources: Appendix A, Appendix B, Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012, ABR 2013a, USFWS 1985

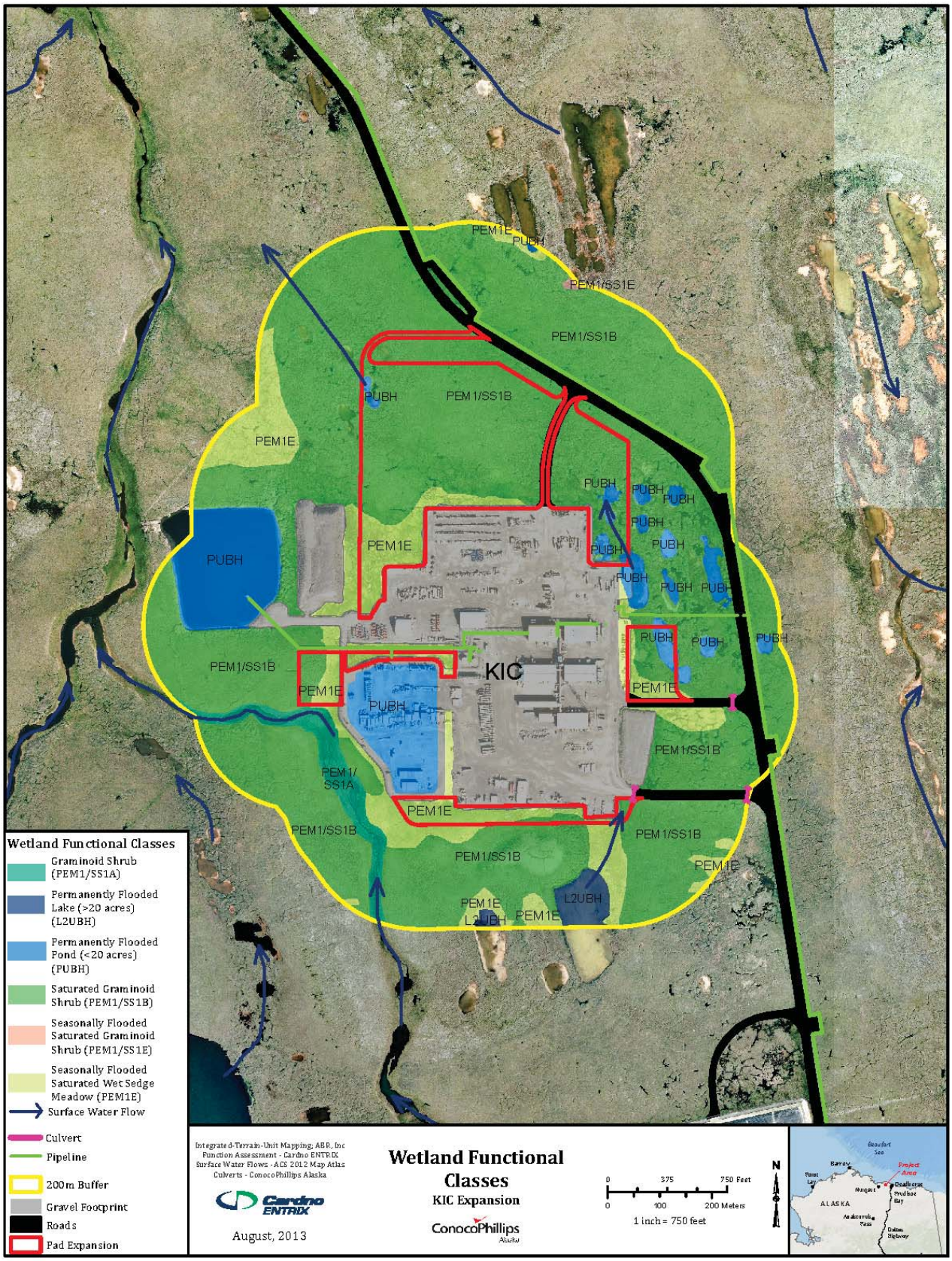

Figure 3-6. KIC Expansion Project – Wetland Functional Classes

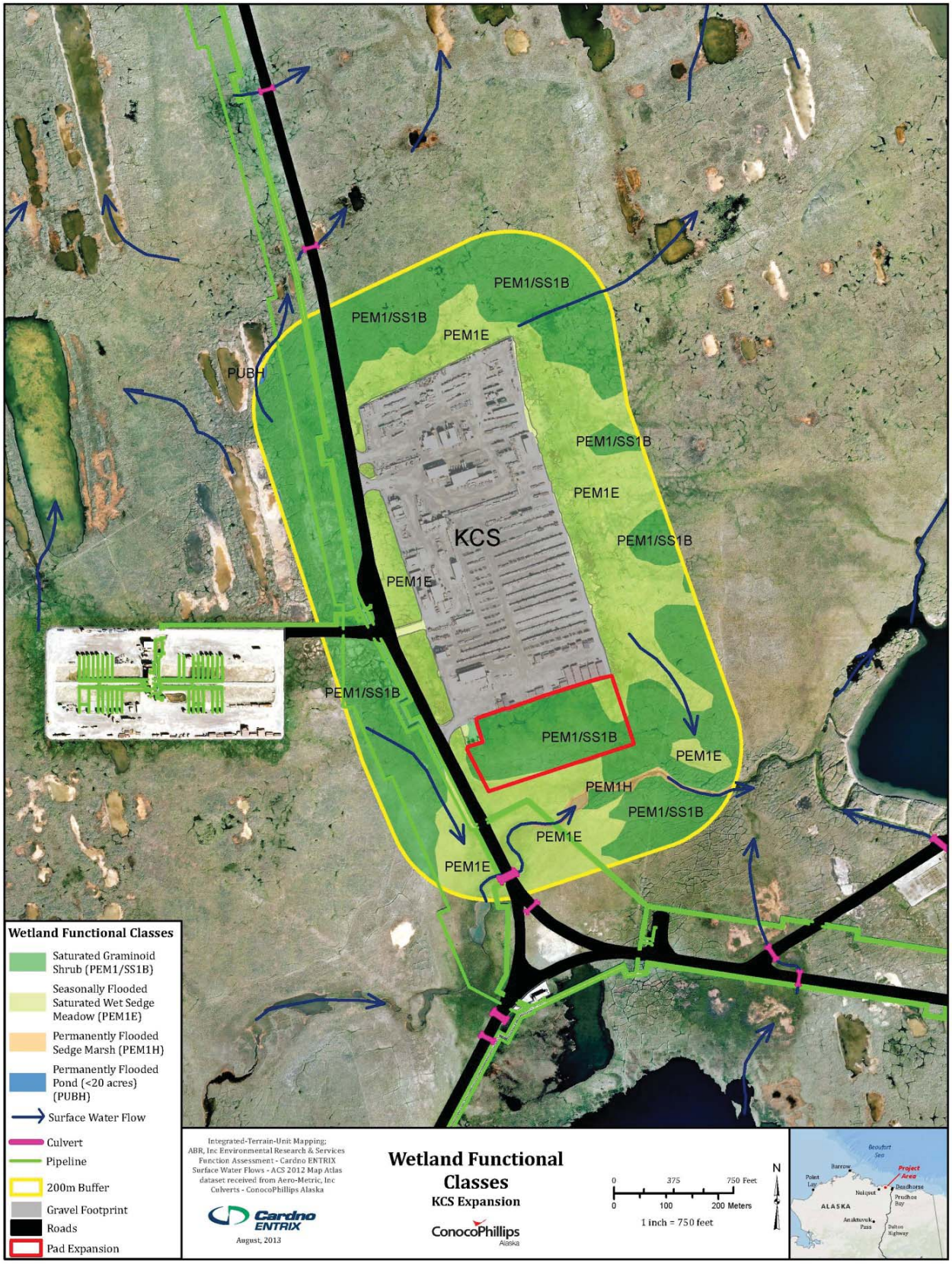

Figure 3-7. KCS Expansion Project – Wetland Functional Classes

3.6 Fish and Wildlife

Habitats within Kuparuk support a diversity of wildlife, including important subsistence resources and birds, and a marine mammal protected as threatened or under consideration for protection under the Endangered Species Act (Lawhead et al. 2013, Stickney et al. 2013, Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012).

Wildlife habitats and resources are described in general for the Kuparuk area with specific information on occurrence within a 656-ft (200 m) area around the KIC and KCS pads, the pad expansion areas, and the gravel haul routes from the pads to Mine Site C and Mine Site E (Figure 3-1). Descriptions of wildlife habitats and resources in the KCS Expansion Project area are further broken into primary and secondary areas based on the routes to the primary gravel source at Mine Site C and the secondary gravel source at Mine Site E (Figure 3-1).

3.6.1 Terrestrial Mammals

Caribou (*Rangifer tarandus*), muskoxen (*Ovibos moschatus*), brown bear (*Ursus arctos*), arctic fox (*Alopex lagopus*), and red fox (*Vulpes vulpes*) commonly occur in the Kuparuk area. The discussion below is limited to those mammals that have been observed during aerial or ground-based studies near the KIC and KCS pads, including the gravel haul routes from the proposed gravel sources at Mine Site C and Mine Site E.

Caribou

Caribou cows that calve between the Colville and Canning Rivers on Alaska's ACP by definition are assigned to the Central Arctic Caribou Herd (CAH, Lenart 2011a). Caribou that range within and around Kuparuk during spring and summer belong primarily to the CAH (Lawhead et al. 2013, Arthur and Del Vecchio 2009). The CAH was estimated at 70,034 animals in 2010, reflecting a 13% mean annual increase from 2002 (Lawhead et al. 2013). CAH caribou range seasonally from the Brooks Range to the Beaufort Sea and from the Ikpikpuk River in the Northeast National Petroleum Reserve – Alaska (NPRA), to the Jago River within ANWR (Arthur and Del Vecchio 2009, Figure 3-8).

In the early 1980s, CPAI (previously ARCO Alaska, Inc. and Phillips Alaska, Inc.) in coordination with the Alaska Department of Fish and Game (ADFG), sponsored caribou research studies focused on evaluating potential adverse effects of Kuparuk construction and operation activities on caribou movement and habitat use (Rea 2002). Since 1992, ADFG, with partial funding from CPAI, has focused efforts on telemetry studies that track female caribou using conventional Very High Frequency radio-collars or satellite collars (Lawhead et al 2013). Studies were focused on acquiring information that would be useful in developing standard mitigation practices to prevent disruption of caribou movements through Kuparuk to coastal insect relief habitats and to evaluate oil field-related disturbance to caribou during the calving period.

Calving surveys in early to mid-June encompassing Kuparuk have consistently shown that the highest concentrations of caribou occurred within the area located south of Kuparuk (Lawhead et al. 2013). Estimated 2012 abundance during the calving season in Kuparuk was 98 ± 37 large caribou and 2 calves, or about 2 per 10 mi^2 [1 caribou per 10 km^2] (Lawhead et al. 2013).

During the 18 years of caribou calving surveys completed since 1993 in Kuparuk, no caribou have been observed in the KIC Project Area. Caribou are more likely to occur near the KIC

Project Area during the parasitic insect season in late June through July (Figure 3-9). A total of 130 caribou have been documented in the KIC Project Area during 12 years of insect season surveys completed since 1992, for an average annual density of about 10 caribou per mi^2 (4 per km^2).

Caribou calving surveys in Kuparuk have documented 39 large caribou and 7 calves in the KCS Project Area for an average annual unadjusted density of about 7 caribou per 10 mi^2 (3 per 10 km^2) (Lawhead et al. 2013, Figure 3-9). Ten adults and one calf were observed in the primary gravel haul area to Mine Site C, with an average annual unadjusted density of 6 per 10 mi^2 (2 per km^2) (Lawhead et al. 2013). Most of the calving caribou (29 large caribou and 6 calves) were observed in the secondary gravel haul area to Mine Site E, with an average annual unadjusted density of 8 caribou per 10 mi^2 (3 per 10 km^2) (Lawhead et al. 2013).

Caribou are more likely to occur near the KCS Project Areas during the parasitic insect season in late June through July (Figure 3-9); when an average annual density of about 41 caribou per mi^2 (16 caribou per km^2) have been observed primarily along the secondary gravel haul route to Mine Site E (Figure 3-9). The secondary area contained an average annual density of about 54 caribou per mi^2 (21 per km^2) compared to an average annual density of about 11 caribou per mi^2 (4 per km^2) near the primary gravel haul route to Mine Site C (Lawhead et al. 2013, Figure 3-9).

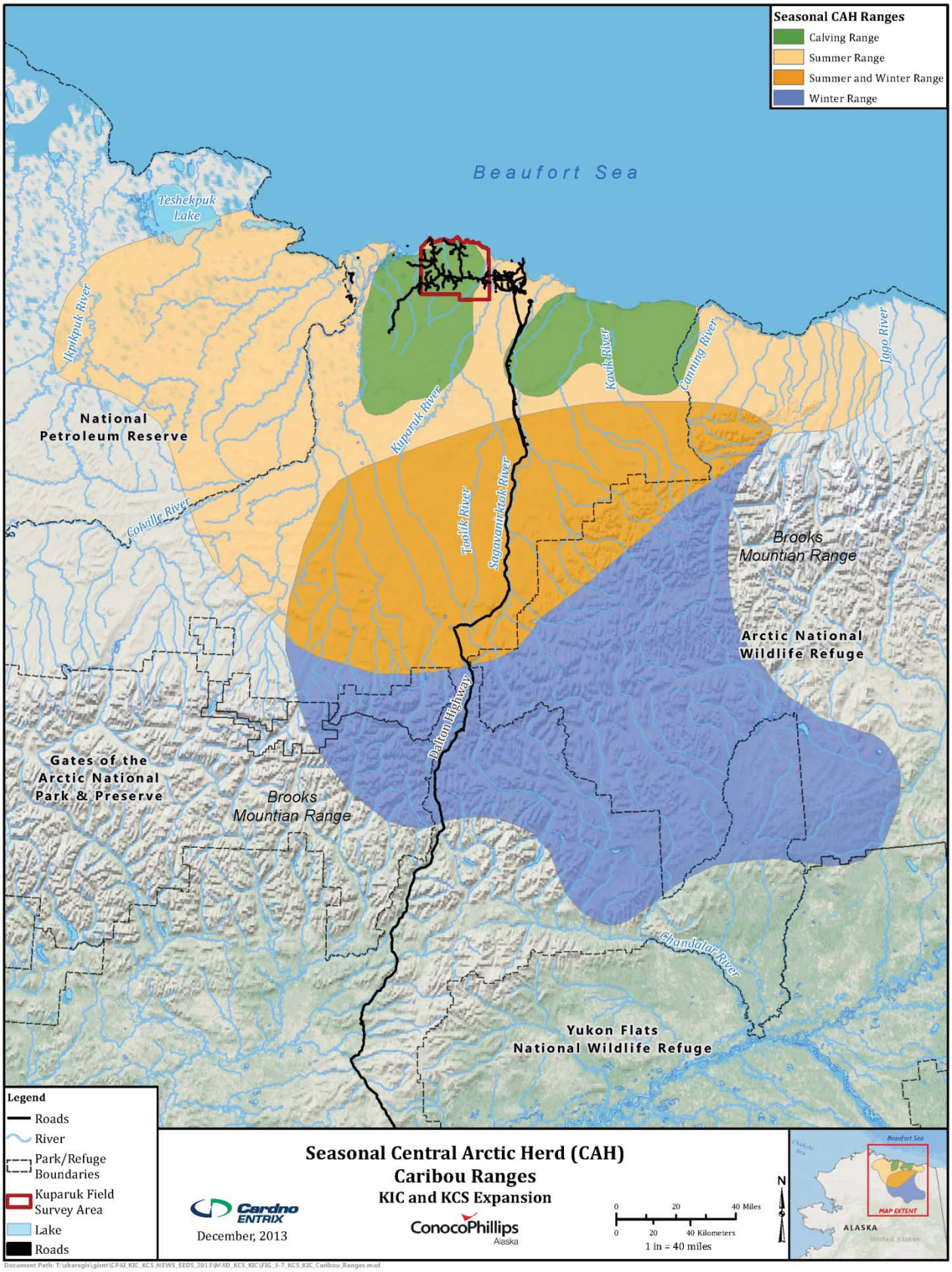

Figure 3-8. KIC and KCS Expansion Projects – Seasonal Central Arctic Caribou Herd Ranges

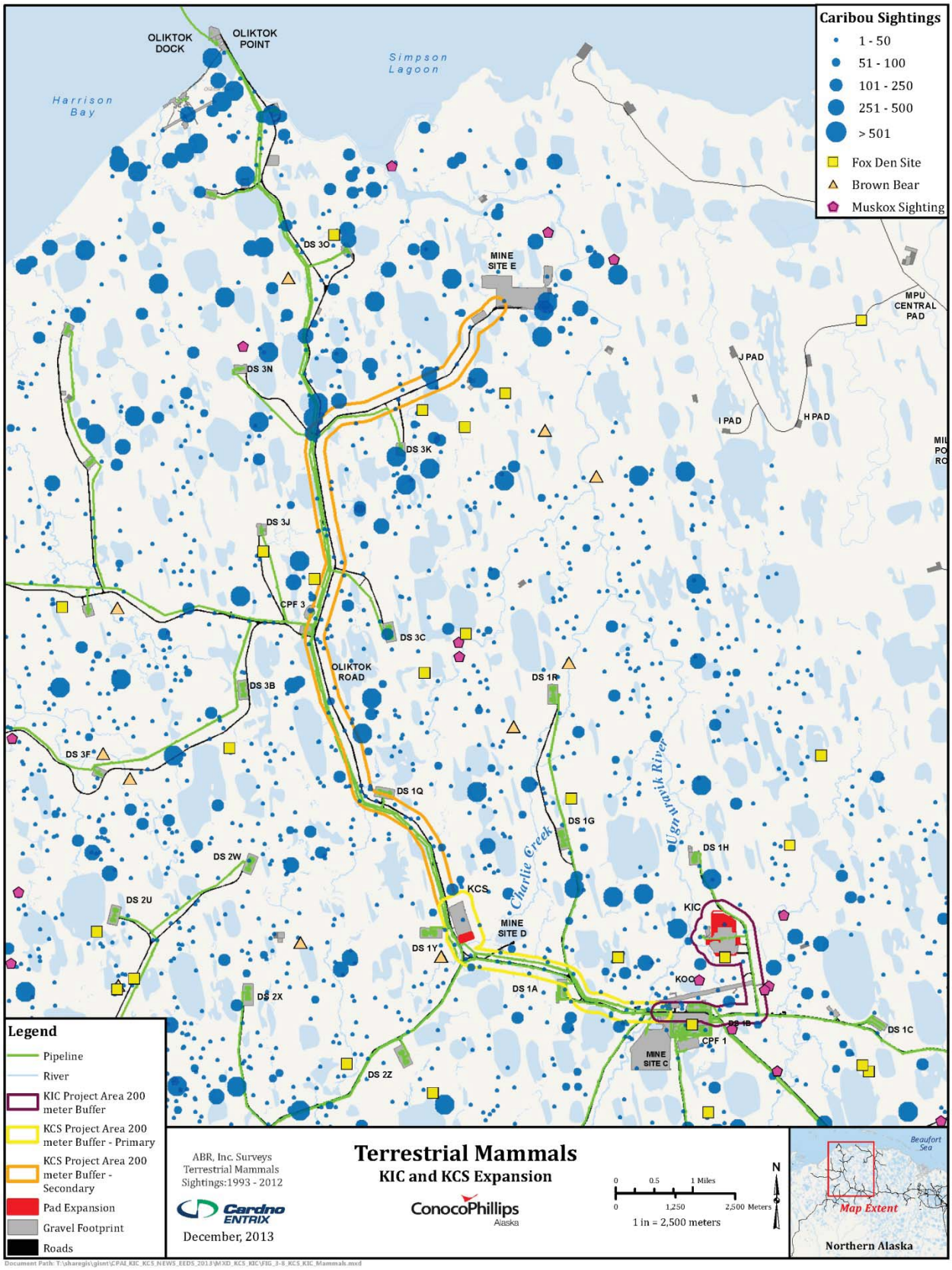

Figure 3-9. KIC and KCS Expansion Projects – Terrestrial Mammal Sightings and Fox Den Sites, 1993 to 2012

Muskoxen

About 200 muskoxen occur on the central and eastern North Slope of Alaska (Game Management Unit – GMU 26B and C) (Lenart 2011b). In recent years, most of these animals have remained east of the Canning River in GMU 26C with 40 or fewer found in GMU 26B (Lenart 2011b).

Muskoxen groups were reported during caribou surveys in 2012, with multiple resightings of groups, for an estimated total of 43 muskoxen during the summer (Lawhead et al. 2013). In previous years, two groups of muskoxen have been repeatedly observed; one near the Colville River delta and one near the Kuparuk River delta and Milne Point (Lawhead et al. 2013).

No muskoxen have been observed during aerial surveys in the KIC Project Area (Figure 3-9, Lawhead et al. 2013). There have been several sightings of muskoxen near the KIC access road, however: one group of 10 muskoxen with no calves was observed on October 27, 2003; one group of 25 or 26 muskoxen, including 4 calves was observed on June 2, 2008; and this group was sighted again just east of the KOC on June 5, 2008 (Lawhead et al. 2013). No muskoxen have been documented during aerial surveys in the KCS Project Area (Figure 3-9, Lawhead et al. 2013).

Brown Bears

About 265 brown bears are estimated to occur in GMU 26B, with the highest densities in the foothills, and the lowest densities on the ACP with an estimated 66 bears (Lenart 2011c), consistent with the 60 to 70 bears estimated for the oil fields (Shideler and Hechtel 2000). Brown bears use riparian habitats to forage and for travel during spring and summer, and hibernate through the winter in dens dug in late fall into pingos, hillsides, stream banks, and terraces (Shideler and Hechtel 2000). Pregnant females enter dens earliest in the fall between late September and mid-November, and emerge latest in the spring between March and May while adult males enter dens latest in the fall and emerge earliest in the spring (Shideler and Hechtel 2000).

Kuparuk has been consistently used by brown bears, especially in areas along the Kachemach and Miluveach rivers and west of CPF-3 (Lawhead et al. 2013). No brown bears have been documented in the KIC or KCS Project areas during aerial surveys (Figure 3-9. Lawhead et al. 2013).

Arctic and Red Fox

Arctic fox and red fox may range widely and are active year round. Foxes center activity for whelping and raising kits during March or April through the summer months near den sites that have been excavated or enlarged the previous summer (Burgess 2000). Red fox are more common along major river drainages, occurring less frequently in Kuparuk than arctic foxes (Lawhead and Prichard 2005). The larger red fox may be increasing in abundance in the Prudhoe Bay oil field (Pamperin et al. 2006). Red foxes are generally aggressive toward arctic foxes and may kill and displace arctic foxes from den sites (Pamperin et al. 2006). Den sites, usually located on pingos, low mounds, or stream banks, can be large and complex structures that are reused for decades (Burgess 2000).

There is a natural fox den site in a pingo on the south side of KIC (Figure 3-9, Lawhead and Prichard 2005). No fox den sites have been reported in the KCS Project Area (Figure 3-9, Lawhead and Prichard 2005).

3.6.2 Birds

Bird study methods, location, and timing in Kuparuk have focused on long-term distribution, abundance, and productivity of Spectacled Eiders (*Somateria fischeri*), Tundra Swans (*Cygnus columbianus*), and Brant (*Branta bernicla*, Stickney et al. 2013). During 2002 to 2004, plot based studies were completed that describe nest densities of tundra-nesting passerines and shorebirds that, while abundant, are not effectively documented during aerial surveys (Liebezeit 2002, 2004, Liebezeit et al. 2009). This plot-based study was designed to evaluate the influence of human developments and associated subsidized predator populations on nest survival (Liebezeit et al. 2009). Lists of species and information on abundance and habitat use are described in these studies which are incorporated by reference (Stickney et al. 2013, Liebezeit 2002, 2004, Liebezeit et al. 2009). Common Ravens (*Corvus corax*) have been increasing in abundance within North Slope oil fields and have become a focus for recent research efforts because of their role in depredation of ground-nesting birds (Powell and Backensto 2009, Liebezeit et al. 2009). The discussion below is limited to those birds that have been observed during aerial or ground-based studies near the KIC and KCS Project areas.

Aerial and Road-Based Waterbird Observations

Most waterbird observations during surveys that include the KIC and KCS Project areas have been dominated by King Eiders (*Somateria spectabilis*) and Tundra Swans (*Cygnus columbianus*, Figure 3-10, Stickney et al. 2013).

Five nests have been recorded in the KIC Project Area: one Canada Goose (*Branta canadensis*) and one Glaucous Gull (*Larus hyperboreus*) nest were recorded in June 2008; three Canada Goose nests were recorded in June 2007 (Stickney et al. 2013). An annual average of 5 King Eiders (68% single pairs) and 0.6 Tundra Swans (4 pairs, 1 single, 1 brood) have been documented during 19 years of surveys in the KIC Project area, including the gravel haul route to Mine Site C. These sightings may include repeated observations of the same birds over the summer.

Fifteen waterbird nests have been recorded in the KCS Project Area. Three nests were recorded along the primary gravel haul route to Mine Site C: two nests, one Canada Goose, and one Greater White-fronted Goose (*Anser albifrons*), were recorded in June 2008; and one King Eider nest was recorded in June 2003 (Figure 3-10, Stickney et al. 2013). Twelve waterbird nests have been recorded along the secondary gravel haul route to Mine Site E including: seven Canada Goose, two Greater White-fronted Goose, one King Eider, one Tundra Swan, and one Glaucous Gull nest (Figure 3-10, Stickney et al. 2013). An annual average of 36 King Eiders (72% pairs, 18% singles) and 3 Tundra Swans (61% pairs, 33% singles, and 2 broods) have been documented in the KCS Project Area over 19 years of surveys: 3 King Eiders and 0.5 Tundra Swans per year along the primary gravel haul route to Mine Site C; and 33 King Eiders and 2.5 Tundra Swans per year along the secondary gravel haul route to Mine Site E (Figure 3-10, Stickney et al. 2013). Two Common Eiders (*Somateria mollissima*) have also been observed along the primary gravel haul route to Mine Site C (Figure 3-10, Stickney et al. 2013). These sightings may include repeated observations of the same birds over the summer.

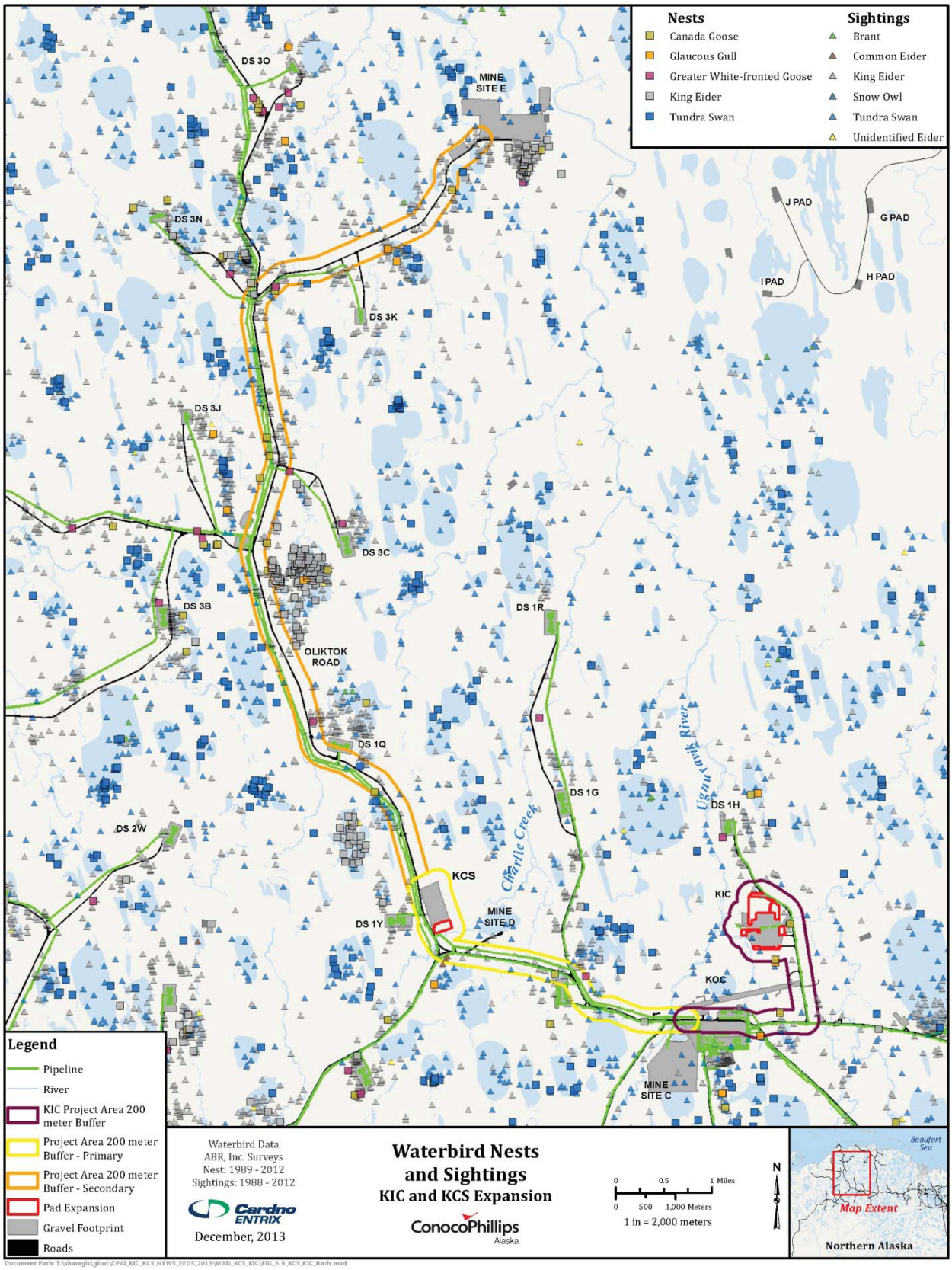

Figure 3-10. KIC and KCS Expansion Projects – Waterbird Nests and Sightings, 1988 to 2012

Plot-Based Nests

Most nests in 24 plots searched at Kuparuk in 2003 were found on strangmoor or disjunct polygon rims; mixed high- and low-centered polygons; and high-centered polygons (Liebezeit 2004). Lapland Longspurs (*Calcarius lapponicus*) were the most abundant nesting bird, followed by Pectoral (*Calidris malanotos*) and Semipalmated Sandpipers (*Calidris pusilla*, Table 3.6-1).

TABLE 3.6-1. BIRD NEST DENSITY AT KUPARUK BASED ON PLOT-BASED STUDIES

Common Name	Scientific Name	2002 Density (nests/km^2)	2003 Density (nests/km^2)
Passerines			
Lapland Longspur	*Calcarius lapponicus*	17.9	23.8
Shorebirds			
American Golden-plover	*Pluvialis dominica*	0.8	0.8
Black-bellied Plover	*Pluvialis squatarola*	1.7	1.3
Dunlin	*Calidris alpina*	0.8	0.8
Long-billed Dowitcher	*Limnodromus scolopaceus*	4.2	2.5
Pectoral Sandpiper	*Calidris melanotos*	11.7	11.3
Red Phalarope	*Phalaropus fulicarius*	2.5	2.9
Red-necked Phalarope	*Phalaropus lobatus*	3.3	1.3
Semipalmated Sandpiper	*Calidris pusilla*	10.4	8.3
Stilt Sandpiper	*Calidris himantopus*	0.8	1.7
	Subtotal	**36.2**	**30.9**
Waterbirds			
Greater White-fronted Goose	*Anser albifrons*	3.3	6.7
King Eider	*Somateria spectabilis*	0.8	2.5
Long-tailed Duck	*Clangula hyemalis*	0.8	0.4
Northern Pintail	*Anas acuta*	0.8	0
Pacific Loon	*Gavia pacifica*	0	0.4
	Subtotal	**5.7**	**10**
Other			
Willow Ptarmigan	*Lagopus lagopus*	0.4	0
	Total	**60.2**	**64.7**

Sources: Liebezeit 2002, 2004

Common Raven

Common Ravens occur year-round with about 20 to 25 breeding pairs using infrastructure for nest sites within North Slope oil fields (Powell and Backensto 2009). Thirteen nesting locations have been documented in Kuparuk, one of these was located near the KOC and one was located on KCS (Powell and Backensto 2009, Stickney et al. 2013).

3.6.3 Fish

Fisheries resources in Kuparuk include anadromous and resident fish (Figure 3-11). Prior to construction and connection of deepwater habitats at Mine Site C, Mine Site D, and the KIC Reservoir, the Ugnuravik River drainage was not considered to support overwintering habitat for anadromous whitefish and ciscoes (*Coregous* spp.; Moulton and Dew 1983, Hemming 1993, 1994). Arctic grayling (*Thymallus arcticus*) were introduced into the Ugnuravik drainage at Mine Site D which was opened to Charlie Creek (Hemming 1993, 1994). Whitefishes (*Coregonus* spp.), broad whitefish (*C. nasus*), and least cisco (*C. sardinella*) are present and use the Ugnuravik River (330-00-10620) and an unnamed tributary locally known as Charlie Creek (330-00-10620-2020) for rearing (Figure 3-11, Johnson and Daigneault 2013). Fish surveys conducted in the Ugnuravik River system have also reported ninespine stickleback (*Pungitius pungitius*), and four-horned sculpin (*Myoxocephalus quadricornis*; Dew 1982, Moulton and Dew 1983, Hemming 1993, 1994, Morris and Winters 2008, Moulton 2007, 2012).

3.7 Threatened and Endangered Species

This section addresses three federally listed threatened species, polar bear (*Ursus maritimus*), Spectacled Eider, and Steller's Eider (*Polysticta stelleri*), and one candidate species, Yellow-billed Loon (*Gavia adamsii*), which could occur near KIC and KCS. Information on the rationale for protected status, ACP or Beaufort Sea population status and trends, and distributions for polar bears, Spectacled Eiders, Steller's Eiders, and Yellow-billed Loons is described in the recent U.S. Fish and Wildlife Service (USFWS) (2013) Biological Opinion for the DS-2S Development located in Kuparuk about 17 miles southwest of the KIC is incorporated here by reference. The discussion below is focused on site-specific information on potentially suitable habitats and observations of these federally-protected animals near KIC and KCS. The action area for polar bears is considered the area of potential disturbances to natal dens within a1.0-mile buffer of the Project areas (Figure 3-12). The action area for Spectacled and Steller's Eiders and Yellow-billed Loons is considered the area of potential activity and noise related disturbances within a 656-foot (200m) buffer around the pad expansions, the KIC and KCS pads, and the access road routes to Mine Site C and Mine Site E (Figure 3-13).

3.7.1 Polar Bears

Polar bears may occur in Kuparuk at any time of year, but are most likely to occur from spring to late fall. Adult males and non-pregnant female polar bears are active year-round. Pregnant female polar bears enter winter dens in mid-November to hibernate and give birth, emerging in late March or April (Amstrup 2000). Females with cubs remain near the den on average about 8 days, ranging from 1.5 to 14 days (Smith et al. 2007).

No polar bears or dens have been reported within 1.0 miles (1.6 km) of the KIC Project Area (Figure 3-12, Durner et al. 2010). Two polar bear sightings were reported both within the 1.0 mile buffer of the KCS pad on July 24 and 25, 1998; most likely these two sightings were the same bear (Figure 3-12, Durner et al. 2010). Habitats potentially suitable for polar bear den sites within 1.0 miles of the KIC and KCS Project areas are located along the Ugnuravik River and in several locations along Central Creek and Charlie Creek (Figure 3-12, Durner et al. 2001).

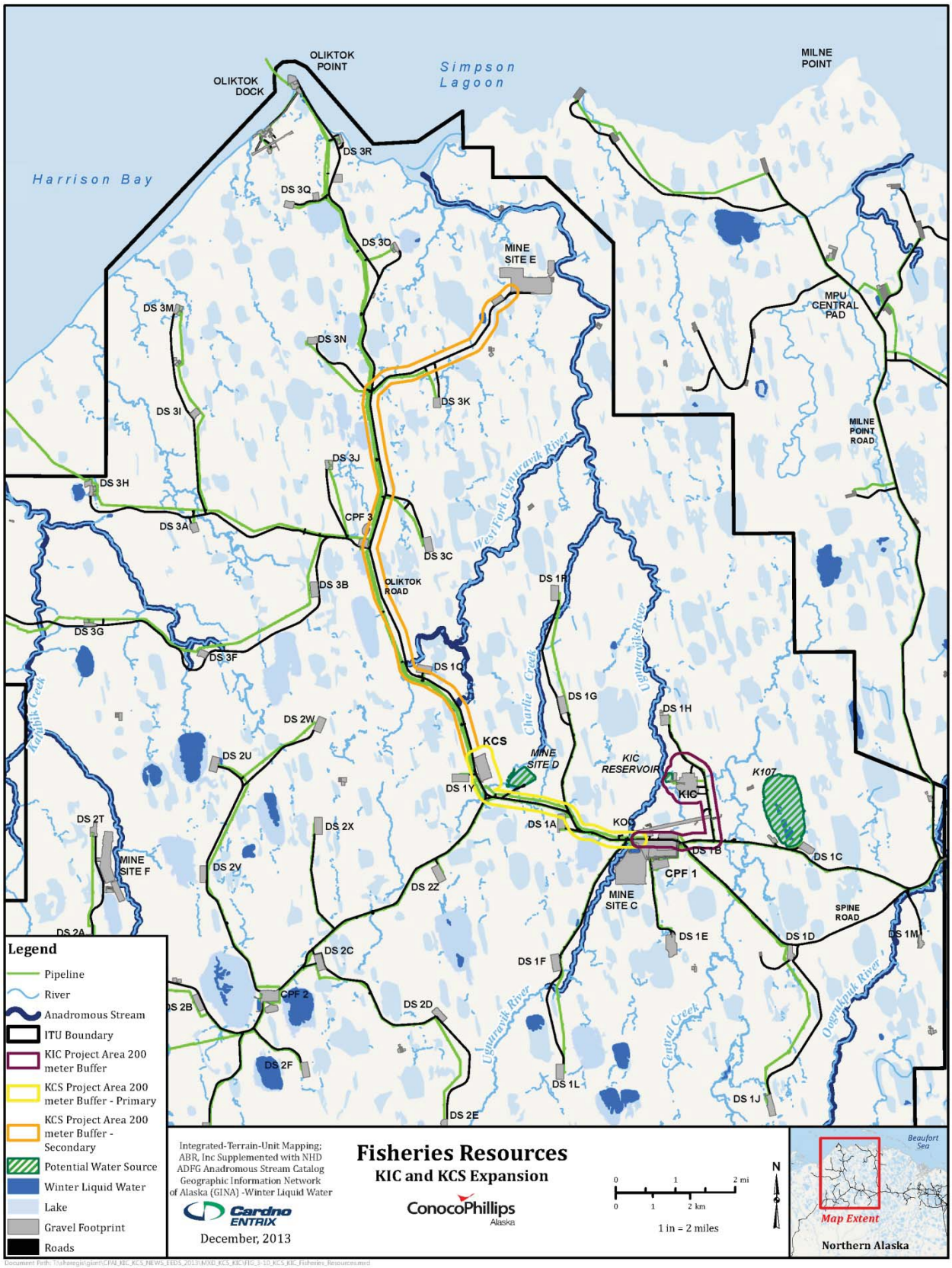

Figure 3-11. KIC and KCS Expansion Projects – Fisheries Resources

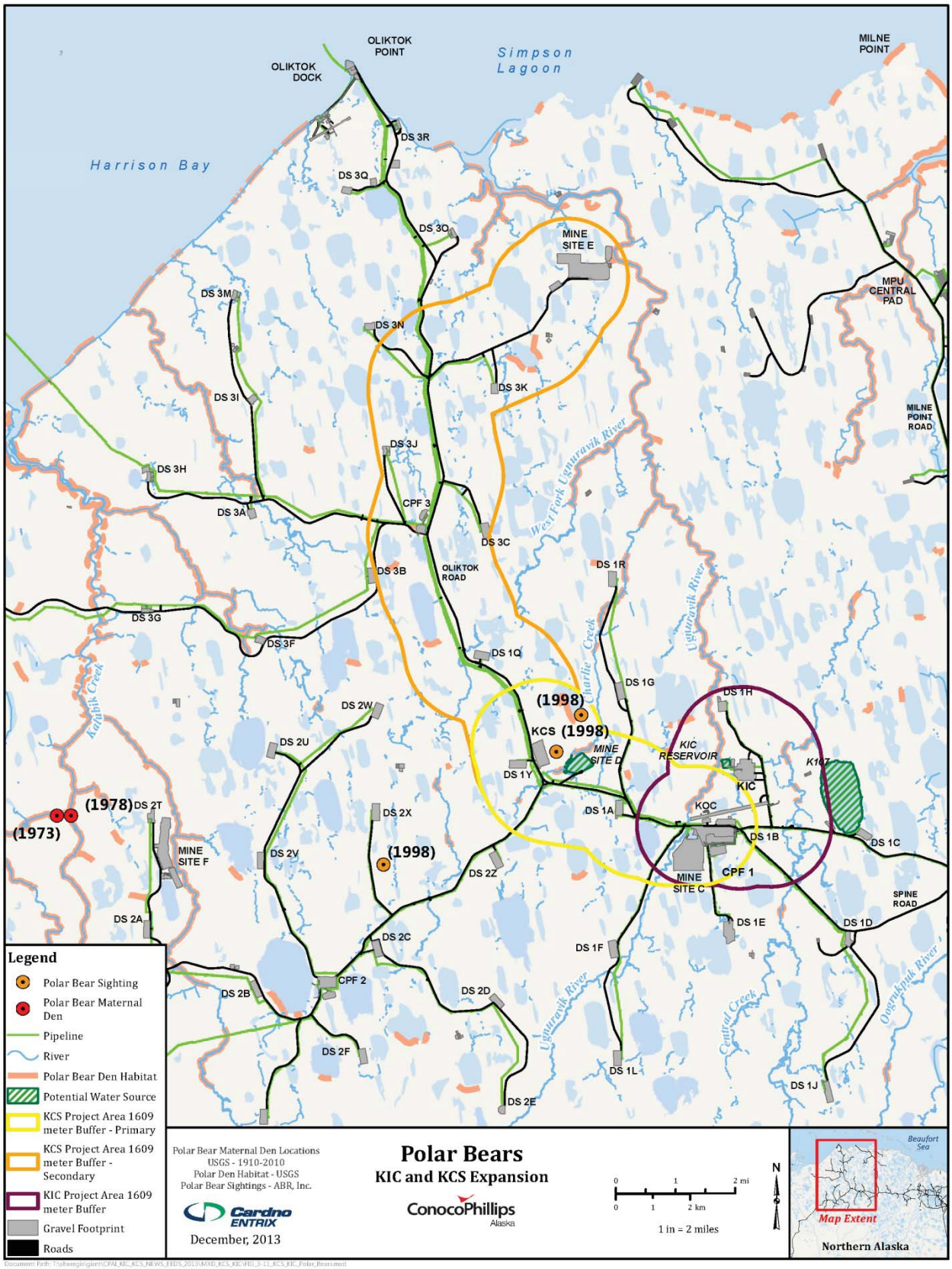

Figure 3-12. KIC and KCS Expansion Projects – Polar Bear Sightings, Dens, and Den Habitat 1910 to 2010

3.7.2 Spectacled Eider

Spectacled Eiders occur in Kuparuk from mid to late-May through early-October. The long-term average Spectacled Eider density in Kuparuk based on 19 years of aerial surveys is 0.07 birds/km^2 based on USFWS standard breeding pair calculations. Known and probably Spectacled Eider nests averaged 1,378 ft (420 m) from the nearest oil field infrastructure based on 20 years of ground-based surveys (Stickney et al. 2013). The 20-year mean nesting success at Kuparuk is 42.8% with an average of 10.5 nests found each year (Stickney et al. 2013). Spectacled Eiders in Kuparuk may nest in aggregations or colonies of more than one nesting pair at sites that may be used over multiple years (Stickney et al. 2013). Colony sites near the proposed KIC and KCS Expansion Projects are located south of Mine Site E, southeast of CPF-3 east of the Oliktok Point Road, and northwest of DS-1Y west of the Oliktok Point Road (Figure 3-13, Stickney et al. 2013).

Identification of potentially suitable pre-nesting, nesting, and brood-rearing habitats was based on the ongoing Spectacled Eider monitoring in Kuparuk (Stickney et al. 2013). Pre-nesting habitat was defined as those habitats used by 9% or more of the 213 pre-nesting Spectacled Eider observations (Figure 3-13, Stickney et al. 2013). Nesting habitat was defined as those habitats used by 9% or more of the 186 known or suspected Spectacled Eider nests (Figure 3-13, Stickney et al. 2013). Brood-rearing habitat was defined as those habitats containing 9% or more of the 15 brood observations (Figure 3-13, Stickney et al. 2013). Some habitats were used in one or more period; in general habitats used during pre-nesting were also likely to be used during nesting and brood-rearing. Habitats used by 9% or more of sightings at Kuparuk during one or more periods included: 1) deep open water with islands; 2) deep open water without islands; 3) grass marsh; 4) nonpatterned wet meadow; 5) old basin wetland complex; 6) shallow open water with islands; 7) shallow open water without islands; and 8) sedge marsh (Stickney et al. 2013).

No Spectacled Eider nests have been documented within the KIC Project Area (Figure 3-13, Stickney et al. 2013). A pair of Spectacled Eiders was observed on a pond with islands south of KIC on June 12, 1998 within KIC Project Area (Figure 3-13, Stickney et al. 2013). A pair of Spectacled Eiders was observed 122 ft (37 m) north of the gravel haul route portion of the KIC Project area in a pond next to a reserve pit between KOC and the Kuparuk Airstrip on June 10, 2009 (Figure 3-13, Stickney et al. 2013).

No Spectacled Eider nests have been recorded within the KCS Project Area (Figure 3-13, Stickney et al. 2013). One Spectacled Eider brood with 6 ducklings was recorded in the KCS Project Area on a deep lake without islands along the secondary gravel haul route along the Oliktok Road to Mine Site E on July 24, 1993 (Stickney et al. 2013).

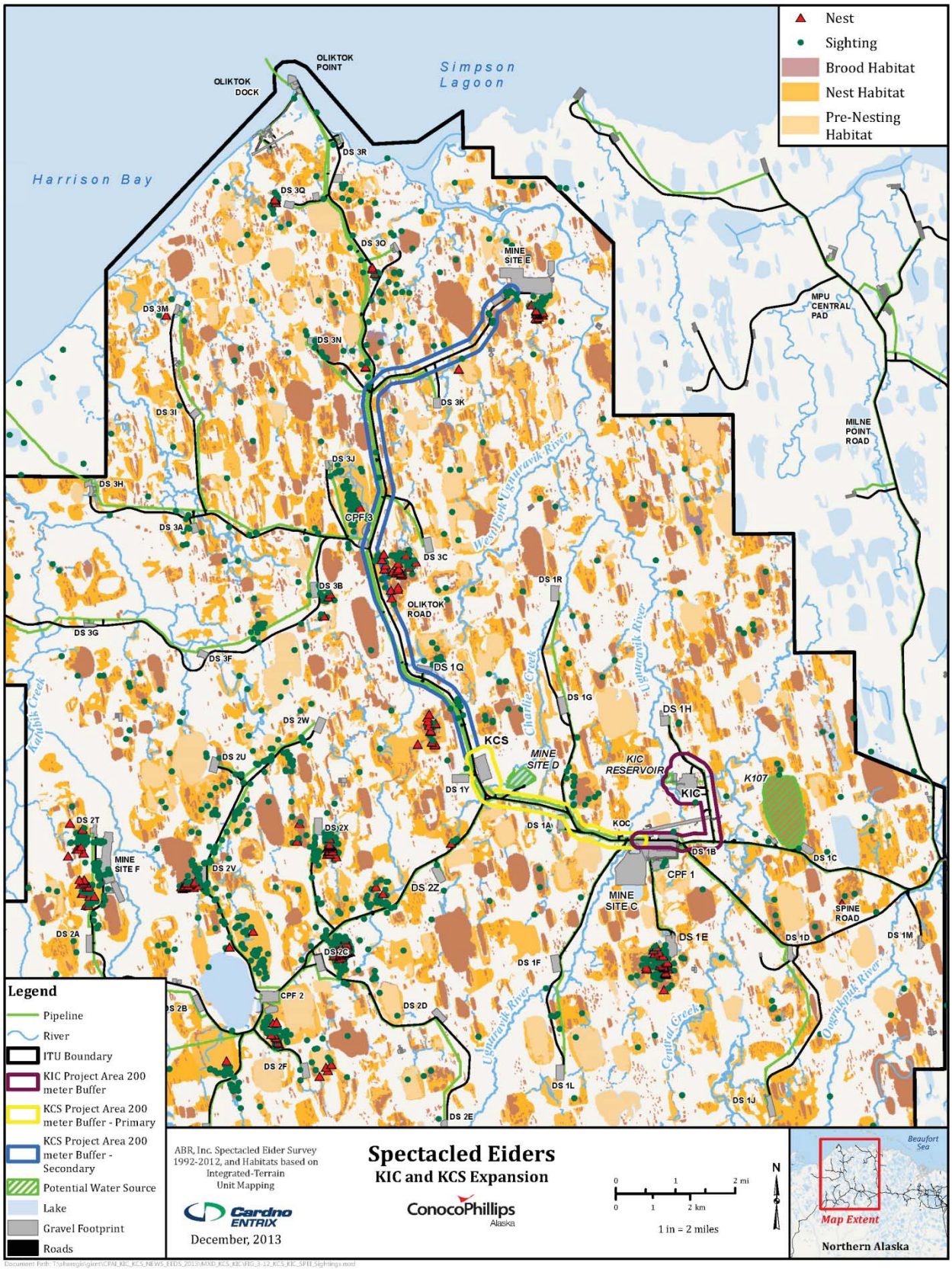

Figure 3-13. KIC and KCS Expansion Projects – Spectacled Eider Nests, Sightings, and Habitats, 1993 to 2012

An annual average of 3 Spectacled Eiders (23 pairs, 6 singles, and 1 group of 6) have been documented in the KCS Project Area over 19 years of surveys: 0 Spectacled Eiders per year along the primary gravel haul route to Mine Site C; and 3 Spectacled Eiders per year along the secondary gravel haul route to Mine Site E (Figure 3-13, Stickney et al. 2013). Some of these sightings may be repeated observations of the same birds over the summer. Three sightings of Spectacled Eiders were recorded outside of primary gravel haul route to Mine Site C: a pair of Spectacled Eiders was observed on a shallow pond without islands 238 ft (73 m) west of the KCS Project Area on June 10, 2009; a male Spectacled Eider was recorded on June 16 1993 on a pond without islands 200 ft (61 m) northeast of the gravel haul route to Mine Site C; and a pair of Spectacled Eiders was recorded on this same pond 291 ft (89 m) northeast of gravel haul route on June 13, 2003 (Figure 3-13, Stickney et al. 2013).

3.7.3 Steller's Eider

Two pairs of Steller's Eiders were sighted in an old basin wetland complex west of CPF-3 on June 11, 2007 about 6 miles west northwest of KCS; no Steller's Eiders have been observed near the KIC or KCS Project areas in 19 years of surveys (Figure 3-14, Stickney et al. 2013). Most Steller's Eiders nest well west of Kuparuk and the DS-1H NEWS Project (USFWS 2013).

3.7.4 Yellow-billed Loon

One pair and a single Yellow-billed Loon were incidentally sighted by USFWS along the shoreline in Harrison Bay, about 11.5 miles northwest of the KCS Project Area; no Yellow-billed Loons have been observed near the KIC or KCS Project areas in 19 years of aerial surveys for listed eiders conducted by ABR, Inc. on behalf of CPAI (Figure 3-14, Stickney et al. 2013).

3.8 Cultural Resources

It is estimated that for the last 11,000 years, the mid-Beaufort region of Alaska's North Slope has been occupied and used by hunter-gatherers (Reuther et al. 2007). Both inland and coastal areas indicate pre-historic use for hunting and fishing camps, among other uses, for multiple Native groups (Reuther et al. 2007).

In September 2013, Reanier and Associates, Inc. completed a 0.08-mi^2 (49 acre) cultural resources survey for the KIC Expansion Project (Reanier 2013a). The results of this survey meet the minimum requirements of a Phase I (Identification level) survey report required under Section 106 of the National Historic Preservation Act (NHPA) of 1996 (as amended), and the Alaska State Historic Preservation Act (ASHPA, Reanier 2013a). No cultural resources were found during this survey in or near the KIC Expansion Project; the closest recorded site is 1.1 miles away from the proposed KIC Expansion Project (Reanier 2013a).

A cultural resources survey for the KCS Expansion Project was conducted by Reanier & Associates, Inc. in conjunction with the survey conducted for the KIC Expansion Project (Reanier 2013b). The survey at the KCS pad was 0.03 mi^2 (17 acres) and also meets the minimum requirements of a Phase I (Identification level) survey report under Section 106 of the NHPA and the ASHPA (Reanier 2013b). No cultural resources were found during this survey in or near the KCS Expansion Project; the closest recorded site is 3 miles away from the proposed Project KCS Expansion Project (Reanier 2013b).

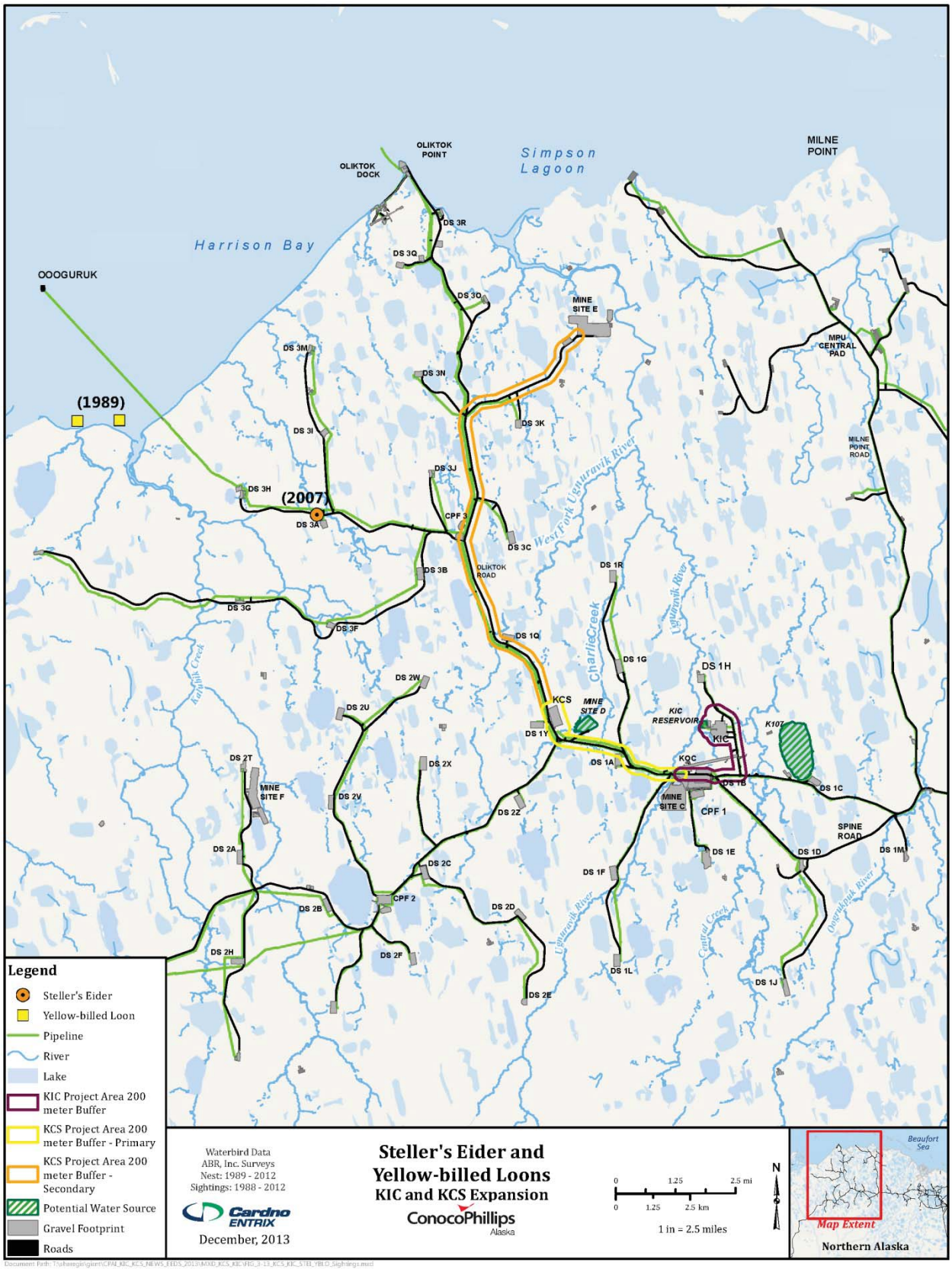

Figure 3-14. KIC and KCS Expansion Projects – Steller's Eider and Yellow-billed Loon Sightings, 1988 to 2012

3.9 Socioeconomic Resources

The closest Native village to KIC and KCS is the present day location of Nuiqsut, located 31 miles west of the KCS pad and 34 miles west of the KIC pad. Nuiqsut was originally settled in a different location, but was abandoned in the late 1940's due to the federal requirement that children attend school as the village lacked a school. It was re-established in 1973 by 27 Inupiat families from Barrow. In 1974, the Arctic Slope Regional Corporation funded construction in the village and it was incorporated in 1975 (ADNR 2008, ASRC 2013). The NSB provides utilities to Nuiqsut residents, including electricity, water/wastewater services, and trash pick-up. Natural gas for heating is provided from CPAI's Alpine Central Facility and is conditioned for use by Nuiqsut residents at a facility constructed by the NSB in Nuiqsut. Communication methods include a local telephone network and long distance capabilities, mail, public radio, and cable television. The village is served by scheduled and chartered flights from Barrow, Deadhorse, Fairbanks, and Anchorage, and freight arrives year-round by air cargo at the local airport. Nuiqsut also has a health clinic, school, public safety building, fire station, a community center/city hall, and a Presbyterian church. Ice road access, constructed by the oil industry, to the Dalton Highway is available 4 months of the year (NSB 2013).

3.9.1 Population, Employment and Income

In 1973, 27 families re-established the village of Nuiqsut. According to the 1980 U.S. Census, the population of Nuiqsut was 208 and has grown to an estimated 428 in 2013 (ADCCED 2013, USDOC 1980). In 2010, the median age was 25.2 years and 7.5% of the population was over the age of 62. The resident population was approximately 87% Native Alaskan, 10% Caucasian, and the remaining residents noted two or more races or are of other descent (ADLWD 2010).

The Nuiqsut economy is based mostly on subsistence hunting, fishing, and whaling; species include caribou, bowhead whale (*Balaena mysticetus*), fish, waterfowl, and Ptarmigan (*Lagopus* spp.), among others. Trapping and craft-making also supply income for some households. Approximately 37% of the work force is within the private sector; much of the private sector employment is provided by the Kuukpik Native Corporation, the village store, and the construction industry. Public sector employers include the NSB and the School District; approximately 63% of the work force is employed by the public sector (ADNR 2008; ADLWD 2010; NSB 2013).

The 2007-2011 American Community Survey 5-Year Estimate established that the median household income in Nuiqsut was $93,750. The per capita income was $27,356. About 0.35% of all residents had incomes below the poverty level (ADCCED 2013).

3.9.2 Public Revenues and Expenditures

The NSB and its bonding authority have funded infrastructure development and other services throughout the Borough and all its communities through taxation of property used for development by the oil and gas industry. These revenues provide for electricity and other services for the villages (BLM 2004). In addition, as a result of the Alpine Development Project, the 14.4-mile Nuiqsut Natural Gas Pipeline was constructed to provide Nuiqsut residents with natural gas to heat their homes. Natural gas delivery via the pipeline began in 2008 and in 2009, service was provided to 122 homes and 30 commercial buildings (SPCO 2010).

Costs in Nuiqsut and other NSB communities are high compared to state and national averages. A survey conducted in 2004 by the Cooperative Extension Service of the University of Alaska

Fairbanks indicated that, of the 24 locations surveyed, Nuiqsut was the second most expensive location with regards to food costs for families with school-aged children. However, the survey did not factor in peoples' reliance on subsistence resources. The survey showed food costs in Nuiqsut to be 2.3 times more expensive than in Anchorage (ADNR 2008). In addition to high personal costs of living, the per capita state expenditures are very high due to harsh climates, low population densities, and the relative inaccessibility of the communities. Borough expenditures are also high, but have remained fairly constant from 1992-2001 (BLM 2004).

3.9.3 Subsistence

Subsistence activities are a central socio-cultural element for the community of Nuiqsut, and Nuiqsut's location on the Colville River, about 35 miles upstream from the Beaufort Sea, is an important area for fish and caribou harvests. The location also provides access to the ocean for harvest of marine mammals. It is estimated that over 90% of households in Nuiqsut give or receive subsistence resources (USACE 2012). Subsistence harvest activities are dependent upon the seasonal availability of their subsistence resources (Table 3.9-1).

TABLE 3.9-1. NUIQSUT ANNUAL CYCLE OF SUBSISTENCE ACTIVITIES

	Winter					Spring		Summer			Fall	
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Fish	■		▒	▒	▒	▒	■		▒	▒	▒	■
Birds/Eggs	▒	▒	▒	▒	▒	▒	▒	■	▒	▒	▒	■
Berries								▒	▒	■		
Moose										▒	■	▒
Caribou	▒	■	▒	▒	■	■	■	▒	▒	■	■	■
Furbearers	▒	▒	▒	▒	▒	■	■					▒
Polar bear	■	▒	▒	▒	▒	▒	▒				▒	▒
Seals	▒	▒			▒	■	▒			▒	■	▒
Bowhead										▒	■	

Source: USACE 2012 Level of subsistence activity: ■ High ▒ Low to Medium □ None to Very Low

The Kuukpik Subsistence Oversight Panel was established in 1996 through the surface use agreement with CPAI to monitor oil and gas exploration, development, and production and impacts on the health of subsistence resources on Kuukpik lands (NSB 2005). With construction of Alpine's Colville River Delta 3 (CD3) and CD4 pads, CPAI has been required to conduct a subsistence study to understand and respond to impacts of the CD4 development and other satellite developments within a 30-mile radius of CD4. KIC and KCS are east of the 30-mile radius, but the study has identified caribou hunting and harvest areas for Nuiqsut during 2008 and 2009 (SRBA 2011). In general, Nuiqsut hunters would be most likely to access the Kuparuk area during winter by snow machine when caribou are in the foothills (SRBA 2011). All caribou hunting and harvest areas in 2008 and 2009 were reported to occur either to the west or north along the coast (SRBA 2011) and would not overlap with KIC or KCS Expansion Project activities.

3.9.4 Environmental Justice

Environmental justice, as defined by the U.S. Environmental Protection Agency (USEPA), is the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (USEPA 2010). Executive Order 12898 requires the identification and analysis of potential impacts on minority and low-income populations to ensure environmental justice for all communities that may be affected by federal actions. To determine if a community may potentially be considered an environmental justice community that may be disproportionately affected by a particular action, the USEPA recommends that certain demographic measures for individual communities be compared to state-wide measurements. If certain measures regarding population and income are greater than the state average, the community may need to be considered in an environmental justice evaluation.

The community of Nuiqsut is the closest community to the proposed KIC and KCS Expansion Projects; it is 31 miles west of KCS and 34 miles west of KIC. As discussed in Section 3.9.1, 87% of the population in Nuiqsut is Native Alaskan and 3% indicated two or more races or other descent (ADLWD 2010). As such, the total minority population for Nuiqsut in 2010 was considered 90%. The total minority population in the state of Alaska in 2010 was considered 33% (USDOC 2010). Based on population statistics for race alone, Nuiqsut must be considered in an evaluation to determine whether disproportionate impacts from the proposed Projects could affect the community. If such impacts are likely to occur, mitigation measures would be needed to reduce, avoid, or eliminate the impacts.

3.9.5 Land Ownership, Use and Management

With the exception of a few villages, much of the land on Alaska's North Slope is undeveloped. Oil exploration and scientific research activities occur in various locations throughout the North Slope. North Slope Alaska Natives, particularly those from Nuiqsut, use the Kuparuk area for subsistence hunting and gathering (BLM 2004).

Land ownership on the North Slope is regulated by several land laws including the Native Allotment Act, Alaska Statehood Act, Alaska Native Claims Settlement Act, Alaska National Interest Lands Conservation Act, and the Naval Petroleum Reserves production act of 1976. Essentially all lands east of the Colville River and west of the Sagavanirktok River, south to the Brooks Range foothills are owned by the State of Alaska and are managed by the Alaska Department of Natural Resources (ADNR), with the exception of some private landholdings (Native Corporation or Native Allotment). The KIC pad expansion would be located on state and NSB leased land. The KCS pad expansion would be located on state land. Both pad expansion projects are within Kuparuk and in the KRU. There are no other public or private landholdings within the KIC and KCS Expansion Project areas (ASGDC 2013). CPAI is the current Kuparuk River Unit operator, working on behalf of other working interest companies.

Land uses outside of the NPRA are subject to local government land use regulations as listed in Title 19 adopted by the NSB (BLM 2004). ADNR manages state owned lands through the issuance of leases or permits. ADNR, other state and local agencies, and federal agencies are responsible for the permits/approvals listed in Table 3.9-2.

TABLE 3.9-2. LIST OF APPLICABLE PERMITS FOR KIC AND KCS PAD EXPANSION PROJECTS

Agency	Permit/Approval	Scope and Jurisdiction
Federal		
U.S. Army Corps of Engineers	Clean Water Act, Section 404 Permit	Fill in Waters of the U.S. (wetlands)
U.S. Fish and Wildlife Service	Endangered Species Act, Section 7 Consultation	Project activities that may affect threatened and endangered species (e.g., spectacled eiders, polar bears)
U.S. Fish and Wildlife Service	Marine Mammal Protection Act - Letter of Authorization (LOA)	Incidental disturbance of polar bears (construction and operations); activities covered under Kuparuk LOA
State		
Alaska Department of Environmental Conservation		
Division of Spill Prevention and Response	Oil Discharge Prevention and Contingency Plan	Spill prevention, response, and clean-up measures related to drilling, storage, production, and transportation; amendment to existing plan
Division of Water	Water Quality Section 401 Certification	Section 404 discharges (fill materials)
Division of Water	Alaska Pollutant Discharge Elimination Systems (APDES) Stormwater Permit	Amendment of existing permit
Alaska Department of Natural Resources		
Division of Mining, Land, and Water	Land Use Permit	Project surface use and activities not covered by Unit Plan of Operations (i.e., off-Unit tundra access)
Division of Mining, Land, and Water	Material Sales Contract	For use of gravel from contracted sites; use of existing permitted sources.
Division of Mining, Land, and Water	Temporary Water Use Permit (TWUP)	Water use for gravel compaction and dust abatement; use of existing KOC permitted source.
Division of Oil and Gas	Unit Plan of Operations	Surface use to support subsurface development on unit (facilities and activities) for both construction and production
Alaska State Historic Preservation Office	Section 106 Historic Preservation Authorization(s)	Project construction activities that may affect archaeological, historical, or cultural resources
Alaska Department of Fish and Game		
Alaska Department of Fish and Game	Fish Habitat Permit	Activities and construction in fish bearing waters (rivers, lakes, streams, etc.), including drainage structures and water extraction
Local		
North Slope Borough	Development Permit	Surface use activities within the North Slope Borough, including construction, drilling, and production activities
North Slope Borough	Cultural Clearance	Surface use activities within the North Slope Borough, including construction, drilling, and production activities

Source: CPAI 2013a

3.10 Transportation

The transportation system on the North Slope consists of roadways, air facilities, and marine facilities. Oil and gas operations on the North Slope rely heavily upon ground, air, and marine transport for materials. Most personnel arrive on the North Slope by airplane and may drive between facilities within the oil fields on gravel roadways. Roadless oil and gas developments to both the east (Badami, Point Thomson) and west (Alpine) of the Prudhoe Bay and Kuparuk oil fields are accessed by air and by ice roads during winter months. Oil and gas products are transported through a network of pipelines. No marine transportation for materials would be required for the KIC or KCS Pad Expansion Projects.

3.10.1 Highway/Road Transportation

The oil industry has developed a network of gravel roads to access facilities on the North Slope. These roads are restricted to authorized traffic, which includes some use by local residents. The main road between Prudhoe Bay and Kuparuk is called the Spine Road. The Spine Road connects the Dalton Highway at Deadhorse with oil facilities from Endicott in the east to Kuparuk in the west.

3.10.2 Air Transportation

The private Kuparuk airstrip is located about 1 mile south of the KIC and 3 miles east of the KCS pad. State owned and operated airports are located at Barrow and Deadhorse. The nearest public airport is located at Deadhorse.

The oil companies working on the North Slope operate and maintain a lighted 6,551-foot long and 150-foot wide asphalt surface airstrip at Kuparuk, Alaska. In addition, Badami and Alpine Field production sites both host additional airstrips. These are private use airstrips, serviced by Shared Services Aviation that transports oil and gas personnel to and from the North Slope for rotations and necessary site visits (BLM 2004).

The Deadhorse Airport has a lighted 6,500-foot asphalt/grooved runway that is 150 feet wide. There is no control tower and there are very few services provided. For the 12-month period ending December 12, 2012, the airport had an average of 90 aircraft operations per day. Of these operations, 49% were commercial, 28% were local general aviation, 14% were air taxi, 9% were transient general aviation, and <1% were military (AirNav 2013). Transient general aviation operations include chartered passenger and cargo operations, and private general aviation (BLM 2004). Aside from private charters, Alaska Airlines and Era Aviation provide flights to Deadhorse from Anchorage, Fairbanks, and Barrow (Era 2013).

4. Environmental Consequences

4.1 Overview

The KIC and KCS Pad Expansion Projects are developments within an existing oil field that would incrementally increase the gravel footprint and general disturbance within Kuparuk to construct facilities needed to contribute to overall oil production. The KIC and KCS Expansion Projects would rely on existing oil and gas production infrastructure.

Disturbance from construction would primarily occur during the gravel hauls between Mine Site C and the KIC and KCS pads (Table 4.1-1). If required, gravel for the KCS pad expansion may also be obtained from Mine Site E (Table 4.1-1). Most gravel would be placed in 2014 and would be allowed to season and dry in 2015. The alternate schedule would begin with construction of the KCS expansion prior to the KIC expansion (Table 4.1-1). Under both the proposed and alternate schedules, the expansion Projects would be completed by the end of 2015.

No new drill sites, cross-country pipelines, or power lines are proposed for these pad expansion projects. The KIC and KCS Expansion Projects would operate under existing Kuparuk environmental regulations and permits, with acquisition of new permits and revisions to existing permits where applicable. Mitigation that has been incorporated into the day-to-day operations of at Kuparuk would be used to avoid or reduce potential impacts to the environment (Table 4.1-2).

TABLE 4.1-1. ANTICIPATED TRAFFIC LEVELS (ROUND TRIPS PER DAY) DURING KIC AND KCS PAD EXPANSION CONSTRUCTION

Month	Year	KIC Gravel Haul from Mine Site C		KCS Gravel Haul from Mine Site C	KCS Gravel Haul from Mine Site E	
		Heavy Equipment	Light Trucks	Heavy Equipment	Heavy Equipment	Light Trucks
May (begin mid-month)	2014	210	10	*180*	*20*	*10*
June (entire month)	2014	210	10	*180*	*20*	*10*
July (entire month)	2014	210	10			
August (end mid-month)	2014	210	10			
August (begin mid-month)	2014	*420*	*20*	180	20	10
October (entire month)	2014	*420*	*20*	180	20	10
June (as required)	2015	50	5	20	5	5
July (as required)	2015	50	5	20	5	5
August (as required)	2015	50	5	10	5	5

Alternative schedule traffic shown in bold italics.
Source: CPAI 2013a

Initiation of gravel placement on tundra for the KIC or KCS Expansion Projects is scheduled to begin in mid-May prior to bird nesting, and in mid-August after most birds have completed nesting. The gravel lay in mid-May would begin by spreading a layer of gravel that would cover

the entire extent of the expansion area to prevent birds from initiating nests within the construction area. Should mid-May initiation of gravel hauling for KIC or KCS be delayed, a mat covering would be applied to the expansion area in mid-May to prevent birds from nesting within the construction area. Initiation of gravel placement on tundra in mid-August would begin by spreading a layer of gravel that would cover the extent of the expansion area. Initial placement of gravel may be delayed until after the end of August dependent upon USFWS guidance. If gravel placement was to begin in mid-August, biologists would clear the site prior to any construction to ensure that no bird nests or broods would be injured by the construction.

TABLE 4.1-2. MITIGATION MEASURES APPLICABLE FOR MINIMIZING POTENTIAL KIC AND KCS EXPANSION PROJECT IMPACTS

Protection/Impact	Activity	Standard Design Feature or Practice
Bear Dens	Agency Coordination	CPAI coordinates with ADFG and the USFWS to locate brown bear and polar bear dens so that they can be avoided.
Bird Nests	Construction Schedule	CPAI would adhere to USFWS guidance for placement of gravel on the tundra to avoid impacts to migratory birds and their nests as practicable; should construction begin during the bird nesting season, CPAI would consult with USFWS and would have trained biologists survey the area prior to any construction to ensure no active bird nests would be harmed.
Cultural/archaeological Resources	Construction	Cultural/archaeological resource survey are conducted prior to ground disturbing activity,
Dust Control	Road Watering	Gravel roads are watered to reduce dust and maintain the integrity of the roads,
Habitat	Gravel Mines	Rehabilitation plans are prepared for gravel mine site to enhance wildlife habitat were possible.
Minimal Foot Print	Road Design	Roads are built to the minimum width necessary for adequate operations and safety,
Minimal Foot Print	Pad Design	Pad expansions are designed for the minimum footprint necessary for the activity,
Permafrost	Road and Pad Design	Gravel road and pad would be a minimum of 5 feet thick.
Ponding, runoff	Operations	Cleared snow is placed in designated areas.
Predator Control	Food Waste	Predator-proof dumpster bins are used for accumulation of food wastes. All food waste is incinerated. Workers are trained regarding the problems associated with feeding wildlife. CPAI's Wildlife Avoidance and Interaction Plan provides for continued worker awareness training.
Predator Control	Training	CPAI's Wildlife Avoidance and Interaction Plan provides guidance to employees and contractors for managing their actions to minimize attraction of predators.
Runoff, ponding	Pad Design	Pad and facilities are orientated to minimize wind drifted snow accumulations.
Socio-cultural	Jobs	CPAI pursues hiring of North Slope Borough residents for jobs at Kuparuk.
Socio-cultural	Training	All CPAI employees and contractors receive cultural awareness training.
Spills	Spill Prevention and Response Planning	CPAI prepares Oil Discharge Prevention and Contingency Plans and Spill Prevention Control and Countermeasures Plans (or amends existing plans) to address spill prevention measures and response actions for all drill sites. All CPAI

TABLE 4.1-2. MITIGATION MEASURES APPLICABLE FOR MINIMIZING POTENTIAL KIC AND KCS EXPANSION PROJECT IMPACTS

Protection/Impact	Activity	Standard Design Feature or Practice
		employees and contractors are mandated to complete training on their responsibilities pertaining to spill prevention and response.
Spills	Spill Response	Alaska Clean Seas is funded by CPAI and its partners to respond to spills.
Subsistence	Hunter Access	Subsistence hunters are allowed access to CPAI's oil fields subject to safety policies.
Tundra Impacts	Construction	Major off pad construction activities are performed in the winter.
Waste Minimization	Waste Disposal	Wastes are managed according to the Alaska Waste Disposal and Reuse Guide (the "Red Book").
Wildlife, Safety	Speed Limits	CPAI maintains safe speed limits on all North Slope roads.

Source: CPAI 2013a

4.2 Physical Environment

4.2.1 Geology and Geomorphology

The KIC and KCS pads are located on a mix of alluvial plain deposits and ice-rich thaw basins that exhibit permafrost-related polygons, water tracks and thaw pits. Construction of the pad expansions would potentially alter the geomorphology of the areas by increasing the thaw depth near the edges of the pad expansion footprints. Thermokarst is the process of thawing of permafrost and the subsequent settling of the ground surface, which creates thaw pits, ponds, retreating scarps, or mud flows (NRC 2003). Some thermokarst is apparent around the edges of the existing pads (Figure 2-2, and Figure 2-3). Based on the extent of thermokarst around the existing pad edges; KIC and KCS pads were likely built on ice-rich alluvium, which may be prone to thaw and subsidence.

To minimize thermokarst, the KIC and KCS pad expansions would be filled to a minimum of 5 feet thick to provide for insulation. Inclusion of this design feature would minimize potential thermal impacts on permafrost under and around the pad expansion areas, although some increase in thermokarst is expected. Based on review of aerial photography surrounding each pad expansion, the area out to about 197 ft (60 m) around the KIC pad expansion footprints, and the area out to about 131 ft (40 m) around the KCS pad expansion footprint are expected to be subject to increased rates of thermokarst due to high permafrost ice content.

4.2.2 Seismicity

The small shallow earthquakes that occur within about 100 miles (161 km) of Projects about once per year, on average, are not expected to adversely affect the Projects.

4.2.3 Soils

Soil compaction and erosion are not expected from construction of the KIC and KCS pad expansions. All travel, equipment delivery, and material transport would occur on existing roads.

Materials, equipment, and personnel would be transported via existing roads, and gravel would be obtained under existing permits from Mine Site C and potentially from Mine Site E.

Accidental releases of petroleum materials can result in large areas of contaminated soils, if not addressed immediately and correctly. Clean-up of these spills can be difficult in the summer months when the material is fluid and can penetrate into the thawed ground; allowing for absorption of the petroleum material by the soil. For the KIC and KCS Expansion Projects, the approved Spill Prevention, Control, and Countermeasure (SPCC Plan) and ODPCP for the KRU would be amended to address the construction and operation of the proposed Projects. The amendments to these documents with subsequent approval by the appropriate agencies demonstrate CPAIs willingness and ability to prevent and respond to accidental releases, should they occur. Most spills would be expected to be small and would likely be contained on the gravel work surface and would be cleaned up as quickly as possible.

4.3 Climate and Air Quality

4.3.1 Climate Change

Annul temperatures on the ACP are projected to increase by 7.3° C (13.1° F), precipitation is expected to increase by 50%, and the frost-free season is projected to decrease by 33 days by the end of the century (Martin et al. 2009). Project components for both the KIC and KCS expansions most likely to affect these changes could include waste heat from vehicle exhaust, light plants, temporary heaters, and dust spray on snow that reduces albedo. The affect from these Project components on climate change would be in addition to any effects from current operations at Kuparuk. However, due to the scale of oil and gas operations in the area, the effects from the KIC and KCS Expansion Projects on climate change would be incremental. In addition, the Projects have been designed specifically to make use of as much existing infrastructure as possible, minimizing the potential impacts on climate on the ACP. Therefore, impacts generated by the proposed Projects are not expected to have any effect on the local or regional climate or to cause the rate of climate change to alter markedly.

4.3.2 Air Quality

Air quality in the proposed Project areas measured at the DS-1F station is in compliance with NAAQS and AAAQS for all pollutants and averaging periods (Table 3.3-1, CPAI 2013c). Fires and wind-blown dust from the Colville River have caused exceedances of the ozone and particulate standards at the Nuiqsut station (Table 3.3-1, CPAI 2013c). Construction equipment used during expansion of the KIC and KCS pads would add emission sources that may affect air quality that are temporary and mobile, such as dozers, trucks, loaders, light plants, and temporary heaters. These emission sources, due to the incremental increase, would generally operate within the levels historically and currently known at Kuparuk and emissions are not expected to cause non-compliance with either NAAQS or AAAQS or to reduce air quality at Kuparuk. The Projects have been designed to make full use of existing infrastructure within Kuparuk to minimize the impacts on air quality. Providing equipment service and repair facilities at KIC would eliminate the need to transport equipment to Deadhorse for service and repair which could potentially reduce the overall amount of fuel used at Kuparuk by a minor amount. Air emissions during construction of and operations on the KIC and KCS pad expansions would be regulated by the existing air permit for CPF-1 and would incorporate mitigation measures currently in place for existing operations at Kuparuk.

4.4 Water Resources

Permafrost is present throughout the KIC and KCS Expansion Project areas; and the ice content of the permafrost is high compared to other areas, which can cause changes in surface flow during break-up (Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012). Because of the low topographic relief, changes in surface flow can be difficult to predict and can change from year to year.

The KIC Expansion Project is designed to provide thermal protection for permafrost and to minimize the Project footprint to prevent potential changes to surface flow hydrology during break-up. The KIC pad is located east of the Ugnuravik River in an area of moderate topographic relief. The KIC pad appears to slope from a high of nearly 62 ft (19 m) in the northeast corner to a low of 55 ft (17 m) on the southwest corner. Surface drainage on the east side of KIC likely flows from the thaw ponds through the access road culverts through the ponds in the basin south of the pad and then into the East Fork Ugnuravik River (Figure A-1). Drainage on the west side of KIC likely flows through low areas directly to the East Fork Ugnuravik River, and drainage on the northwest corner appears to flow through low areas to the Ugnuravik River. The majority of the gravel fill would be placed north of the existing pad between the pad and the DS-1H access road. This placement avoids affecting many of the ponds on the east side of the pad, and minimizes interruption of surface flow. This placement also keeps most of the expansion area as far from the East Fork Ugnuravik River as practicable, minimizing potential risk of flooding. The KIC Pad Expansion Project is not expected to substantially alter the existing surface hydrology.

The KCS Pad Expansion Project is designed to provide thermal protection for permafrost and minimize the Project footprint to affect as little of the surrounding hydrologic regime as possible. The Project area has moderate topographic relief ranging from a high of nearly 68 ft (21 m) on the KCS pad work surface to a low of about 50 ft (15 m) next to Charlie Creek (Appendix B). The KCS pad appears to sit on a plateau that is within the 60 ft (18 m) elevation contour (Figure B-1). Drainage on the east side of KCS appears to generally slope away from the pad either to the northeast toward a drained lake basin, east then southeast toward Mine Site D, or south toward Charlie Creek (Figure B-1). South of the KCS pad, drainage appears to follow the southern edge of the pad and then flows from the southeast corner toward Charlie Creek. Drainage on the west side of KCS is blocked by multiple access roads between the KCS pad and the Oliktok Point Road; but drainage appears to follow a route toward the southeast (Figure B-1). Based on a review of the topography, the expansion area would not likely be affected by flooding during break-up. The KCS Pad Expansion Project is not expected to substantially alter the existing surface flow hydrology.

The only freshwater that would be required for the proposed Projects would be for gravel compaction and dust control during construction of the pad expansions. The water would come from the KIC Reservoir, Mine Site D, and Lake K107. All sources would be permitted for water use. All freshwater sources and use would be authorized and would comply with state water withdrawal requirements and permit conditions. The proposed freshwater requirements are relatively minor and projected effects on freshwater sources are expected to be minimal. Potential effects would be moderated by standard withdrawal limitations and mitigation techniques for permitted freshwater sources.

4.4.1 Water Quality

For the proposed Projects, several regulatory requirements regarding water quality must be met (Table 3.9-2). Currently, no North Slope waters are considered to have impaired water quality and CPAI is committed to maintaining this status (ADEC 2010). Water withdrawals are not expected to reduce water quality within the permitted sources. The APDES Stormwater Pollution Prevention Plan (SWPPP) would be required for the proposed Projects to minimize potential impacts of stormwater discharges to waters within or near the Projects. CPAI would comply with all permit and plan conditions to ensure that no water quality impacts would occur during construction or operation of the proposed Projects.

Spills of petroleum products or other materials that reach surface waters could potentially affect water quality. Because of the location of both the KIC and KCS Expansion Projects, wetlands and waterbodies could potentially be at risk from accidental releases. Mandatory safety measures and protocols designed to limit the occurrence and frequency of spills are an integral part of operations on the North Slope. CPAI would update their current ODPCP to include specifics regarding the expansion of both the KIC and KCS pads if necessary, and it would remain in place during construction of and operations on the proposed Project areas. The ODPCP serves as a guide for CPAI personnel to use in the event of an accidental release and also outlines the capabilities of CPAI to ensure that a response to an accidental release would be well-staffed and smoothly run. In addition, CPAI would update its SPCC Plan to ensure that all containers and equipment on-site during construction and operation are enclosed in proper secondary containment and proper monitoring takes place when necessary. Both Plans outline Best Management Practices (BMPs) and BAT to be used to avoid accidental releases, as well as to minimize and mitigate for any impacts should an accidental release occur. As stated above, the locations of the proposed Projects could allow for surface water to be affected by an accidental release due to their proximity to wetlands and waterbodies. However, with both the ODPCP and SPCC Plan in place, impacts on water quality would be minimized through the use of BMPs and BAT outlined in both Plans.

4.5 Vegetation and Wetlands

The KIC Expansion Project would cover about 48 acres (19 hectares) with about 385,500 cy (294,736 cubic meters) of gravel fill. The KCS Expansion Project would cover approximately 10 acres (4 hectares) with about 80,000 cy (61,164 cubic meters) of gravel fill. Vegetation, wetlands, and waters would be covered by gravel during the construction of the KIC and KCS Pad Expansion Projects.

Construction and operation vehicle traffic on gravel access roads and work surfaces would result in dust deposition that covers vegetation, results in increased soil mineralization, and reduced vegetation community diversity (Auerbach et al. 1997). Damage to vegetation next to roads and pads from dust and gravel spay leads to an increase in the depth of the active layer and thermokarst. Traffic would be limited to existing roadways, and would not increase the area currently modified by gravel and dust spray, and thermokarst. Road and work surface watering and reduced traffic speeds would be used to minimize dust from vehicle traffic.

4.5.1 Vegetation and Habitat

As noted in Section 3.5.2, vegetation and habitat types are very similar, but habitat categories incorporate additional information on surface landform, vegetation, and ecotypes that identify

land cover features useful for determining wildlife habitat value (Figure 4-1, Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012.). Estimated direct and indirect Project-related effects that would result in loss or changes in vegetation communities are summarized by vegetation type (Table 4.5-1) and for wildlife habitats (Table 4.5-2). Estimates for projected indirect effects on vegetation and habitat are based on:

1) the estimated extent for increased thermokarst around the KIC Pad Expansion within 197 ft (60 m); and

2) the estimated extent for increased thermokarst around the KCS Pad Expansion within 131 ft (40 m) for the KCS Project, as discussed in Section 4.2.1.

A total of 47.80 acres (19.34 ha) would be covered with gravel for the KIC pad expansion and an estimated total area of 33.08 acres (12.85 ha) of vegetation and wildlife habitat would be indirectly effected by an increased rate of thermokarst (Tables 4.5-1 and 4.5-2).

A total of 10.07 acres (4.08 ha) would be covered with gravel for the KCS pad expansion and an estimated total area of 5.74 acres (2.33 ha) of vegetation and wildlife habitat would be indirectly effected by an increased rate of thermokarst (Tables 4.5-1 and 4.5-2).

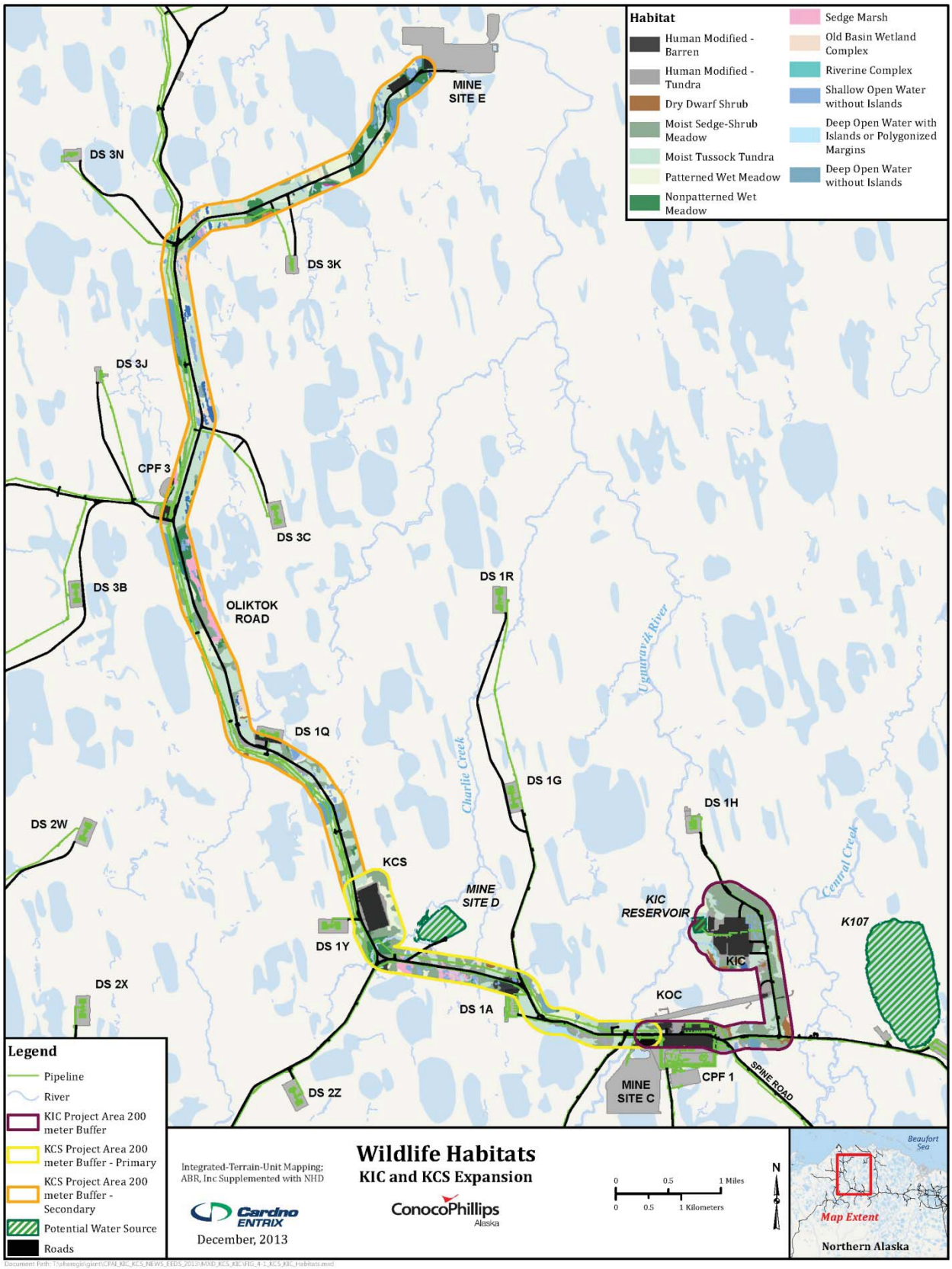

Figure 4-1. KIC and KCS Expansion Projects – Wildlife Habitats

TABLE 4.5-1. VEGETATION TYPES IN THE KIC AND KCS PAD EXPANSION PROJECT FOOTPRINTS

Vegetation Type[1]	KIC & KCS PA[2]		KIC Effect Areas (acres)[3]			KCS Effect Areas (acres)[4]			Combined KIC & KCS Impacts	Proportion of KIC & KCS PA
	Area (acres)	Area (percent)	Direct Effects	Indirect Effects	Direct & Indirect	Direct Effects	Indirect Effects	Direct & Indirect		
Aquatic Algae	6.96	0%	0	0	0	0	0	0	0	0%
Barren	373.20	14%	2.25	0	2.25	0.26	0	0.26	2.51	0.7%
Dryas Dwarf Shrub Tundra	35.64	1%	0	0	0	0	0	0	0	0%
Fresh Grass Marsh	4.28	0%	0	0	0	0	0	0	0	0%
Fresh Sedge Marsh	87.43	3%	0	0	0	0	0	0	0	0%
Moist Sedge-Shrub Tundra	555.18	22%	29.09	19.21	48.30	8.68	2.16	10.84	59.14	10.6%
Old Basin Wetland Complex	75.20	3%	0	0	0	0	0	0	0	0%
Partially Vegetated	4.74	0%	0	0	0	0	0	0	0	0%
Riverine Complex	9.44	0%	0	0	0	0	0	0	0	0%
Tussock Tundra	915.86	36%	4.48	6.60	11.08	0	0	0	11.08	1.2%
Wet Sedge Meadow Tundra	506.50	20%	10.24	5.94	16.18	1.13	3.58	4.71	20.89	4.1%
Young Basin Wetland Complex	4.51	0%	0	0	0	0	0	0	0	0%
Totals[1]	**2,578.94**	**100%**	**46.06**	**31.75**	**77.81**	**10.07**	**5.74**	**15.81**	**93.62**	**3.6%**

Sources: Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012, CPAI 2013a

[1] Water classifications brackish water, fresh water, marine water, and water excluded. Water covers 303.29 acres 11% of the combined KIC and KCS Project Area (Figure 4-1).

[2] Combined KIC and KCS PA (Project Area) is defined as 200 m (656 ft) buffer around pad expansions, pads, and access routes to Mine Site C, and Mine Site E.

[3] KIC Footprint direct effect area include pad expansion toe footprint. KIC footprint indirect effect area includes area of potential thermokarst within a 60 m (197 ft) buffer around the outer edge of the pad expansion.

[4] KCS Footprint direct effect area include pad expansion toe footprint. KCS footprint indirect effect area includes area of potential thermokarst within a 40 m (131 ft) buffer around the outer edge of the pad expansion.

TABLE 4.5-2. WILDLIFE HABITAT TYPES IN THE KIC AND KCS PAD EXPANSION PROJECT FOOTPRINTS

Habitat Type	KIC & KCS PA[1]		KIC Effect Areas (acres)[2]			KCS Effect Areas (acres)[3]			Combined KIC & KCS Impacts	Proportion of KIC & KCS PA (percent)
	Area (acres)	Area (percent)	Direct Effects	Indirect Effects	Direct & Indirect	Direct Effects	Indirect Effects	Direct & Indirect		
Barrens	4.11	0%	0	0	0	0	0	0	0	0%
Deep Water with Islands	16.57	1%	0	0	0	0	0	0	0	0%
Deep Water w/o Islands	107.54	4%	0	0	0	0	0	0	0	0%
Dry Dwarf Shrub	35.64	1%	0	0	0	0	0	0	0	0%
Grass Marsh	1.59	0%	0	0	0	0	0	0	0	0%
Human Modified – Barren	370.19	13%	2.25	0	2.25	0.27	0	0.27	2.52	0.7%
Human Modified – Tundra/Water	205.41	7%	10.24	6.87	17.11	0.12	0.07	0.19	17.30	8.4%
Moist Sedge-Shrub Meadow	533.03	18%	29.09	18.29	47.38	8.68	2.16	10.84	58.22	10.9%
Moist Tussock Tundra	893.87	31%	4.48	6.60	11.08	0	0	0	11.08	1.2%
Nonpatterned Wet Meadow	180.37	6%	0	0	0	0.36	3.13	3.49	3.49	1.9%
Old Basin Wetland Complex	75.20	3%	0	0	0	0	0	0	0	0%
Patterned Wet Meadow	226.45	8%	0	0	0	0.64	0.38	1.02	1.02	0.5%
River or Stream	2.06	0%	0	0	0	0	0	0	0	0%
Riverine Complex	9.44	0%	0	0	0	0	0	0	0	0%
Sedge Marsh	74.89	3%	0	0	0	0	0	0	0	0%
Shallow Water with Islands	34.56	1%	0	0	0	0	0	0	0	0%
Shallow Water w/o Islands	106.80	4%	1.74	1.32	3.06	0	0	0	3.06	2.9%
Young Basin Wetland Complex	4.51	0%	0	0	0	0	0	0	0	0%
Totals[1]	**2,882.23**	**100%**	**47.80**	**33.08**	**80.88**	**10.07**	**5.74**	**15.81**	**96.69**	**3.4%**

Sources: Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012, CPAI 2013a
[1] Combined KIC and KCS PA (Project Area) are defined as 200 m (656 ft) buffer around pad expansions, pads, and access routes to Mine Site C, and Mine Site E.
[2] KIC Footprint direct effect area includes pad expansion toe footprint; indirect effect area includes area within 60 m (197 ft) buffer around the outer edge of the pad expansion.
[3] KCS Footprint direct effect area include pad expansion toe footprint; indirect effect area includes area within 40 m (131 ft) buffer around the outer edge of the pad expansion.

4.5.2 Wetland Functional Classes

The combined pad expansion projects would cover approximately 55 acres of wetlands and waters in three of six wetland functional classes (Table 4.5-3). Wetland vegetation and soils would be directly affected by gravel cover. Wetland vegetation and soils would be indirectly affected by thermokarst, snow drifts, and snow piles. Direct and indirect effect areas include about 17 acres of wetlands that have been previously modified by the KIC or KCS pads and adjacent roads; these wetlands exhibit various levels of increased thermokarst, drainage impoundment, gravel spray, leaching from the pads, and potential contaminants.

The KIC Pad Expansion Project would cover approximately 45.5 acres of wetlands and waters in three functional classes (Table 4.5-3). The Project appears to potentially intersect surface water flow in three locations: at the southeast corner of the pad at the access road junction, where the expansion appears to block one of the two existing culverts; at the north access road near the DS-1H access road junction, where the expansion appears to block an unmapped culvert near the junction; and at the new north access road where the pad expansion, access road, and DS-1H access road would create an enclosed section of tundra. The pond complex on the east side of the pad drains to the south through the culvers in the paired access roads. Tundra at the northwest corner of the KIC pad drains to the northwest. Indirect effects to waters and wet sedge meadow (PEM1E) are not expected to alter their current function. Increased moisture resulting from thermokarst may alter the character of graminoid shrub wetlands (PEM1/SS1B), but it would not be expected to reduce their current function.

The KCS Expansion Project would cover approximately 9.7 acres of wetlands in two functional classes (Table 4.5-3). The Project does not appear to intersect surface water flows, and it is not anticipated that wetland hydrology would be affected by the expansion of the KCS pad. Indirect effect areas include primarily unpatterned wet sedge meadow wetlands (PEM1E) that have not been notes as previously modified by the KCS pad or Oliktok Point Road; these wetlands may become patterned through accelerated thermokarst, but their functions are not expected to be altered. Increased moisture resulting from thermokarst may alter the character of graminoid shrub wetlands (PEM1/SS1B), but their functions are not likely to be reduced from current levels.

All wetland functional classes were evaluated for site-specific wetland functions using the *Waters and Wetland Functions Data Form* questionnaire. Wetland area potentially affected by the KIC and KCS Pad Expansion Projects are summarized by wetland function ratings in Table 4.5-4. Site-specific ratings with rationale for the ratings from the questionnaires are presented in Appendix A for the KIC Pad Expansion Project and Appendix B for the KCS Pad Expansion Project.

Using the site-specific characteristics and functional evaluations each wetlands type was assigned an overall function category from I to IV:

- High Functioning Wetlands (Category I) are characterized as valuable high functioning wetlands that may be regionally rare, difficult to replace, and are generally less common than wetlands in other categories.

- High to Moderate Functioning Wetlands (Category II) are characterized as wetlands that may provide habitat for very sensitive or important wildlife or plants; be difficult to replace; or provide very high functions, particularly for wildlife.

- Moderate to Low Functioning Wetlands (Category III) are characterized as wetlands that can provide important functions and be important for a variety of wildlife; but these wetlands are generally less diverse than Category II wetlands.

- Degraded and Low-Functioning Wetlands (Category IV) are characterized as wetlands that are typically the smallest, often isolated with very little vegetation diversity, and generally already degraded by human activities.

Wetlands and waters were classified as Category II, when three or more of the eight functions were rated High. Wetlands and waters were classified as Category III when three or more of the eight functions were rated at least Moderate. Wetlands types encountered for these functional assessments are not considered rare or unique, and they are within the developed portion of Kuparuk so none were classified as Category I. In addition, wetland types evaluated for these functional assessments were not extensively degraded or considered low-functioning so none were classified as Category IV.

Functional categories were generally consistent between the two Project areas with the exception of the Seasonally Flooded Saturated Wet Sedge Meadow (PEM1E) class. This class received a Category III rating within the KIC Pad Expansion area (Appendix A), but received a Category II rating within the KCS Pad Expansion area (Appendix B). The difference in the ratings was due to the proximity of PEM1E class wetlands to Charlie Creek in the KCS Pad Expansion area; which resulted in increasing the rankings from Moderate or Not Applicable to High for flood flow regulation, erosion control, and export of nutrient functions for this wetland class (Appendix A, Appendix B).

TABLE 4.5-3. WETLAND FUNCTIONAL CLASSES IN THE KIC AND KCS FOOTPRINT AREAS

Wetland Functional Class	NWI Code	Habitat	Vegetation	KIC Effects (acres)[1]			KCS Effects (acres)[2]			KIC & KCS Effects
				Direct Effects	Indirect Effects	Direct & Indirect	Direct Effects	Indirect Effects	Direct & Indirect	
Wetlands										
Permanently Flooded Sedge Marsh	PEM1H	Sedge Marsh	Fresh Sedge Marsh	0	0	0	0	0	0	0
Seasonally Flooded Saturated Wet Sedge Meadow	PEM1E	Human Modified	Wet Sedge Meadow Tundra	10.24	5.94	16.18	0.12	0.07	0.19	16.37
		Nonpatterned Wet Meadow	Wet Sedge Meadow Tundra	0	0	0	0.36	3.13	3.49	3.49
		Patterned Wet Meadow	Wet Sedge Meadow Tundra	0	0	0	0.64	0.38	1.02	1.02
Temporarily Flooded Graminoid Shrub	PEM1/SS1A	Riverine Complex	Riverine Complex	0	0	0	0	0	0	0
Seasonally Flooded Saturated Graminoid Shrub	PEM1/SS1E	Old Basin Wetland Complex	Old Basin Wetland Complex	0	0	0	0	0	0	0
Saturated Graminoid Shrub	PEM1/SS1B	Dry Dwarf Shrub	Dryas Dwarf Shrub Tundra	0	0	0	0	0	0	0
		Human Modified	Moist Sedge-Shrub Tundra	0	0.93	0.93	0	0	0	0.93
		Moist Sedge-Shrub Meadow	Moist Sedge-Shrub Tundra	29.08	18.29	47.37	8.61	2.16	10.77	58.14
		Moist Tussock Tundra	Tussock Tundra	4.48	6.60	11.08	0	0	0	11.08
Waters										
Permanently Flooded Pond (<20 acres)	PUBH	Human Modified	Fresh Water	0	0	0	0	0	0	0
		Shallow Water without Islands	Fresh Water	1.71	1.32	3.03	0	0	0	3.03
		Shallow Water with Islands	Fresh Water	0	0	0	0	0	0	0
Non Wetland or Water										
Upland – Non wetland	U	Human Modified	Gravel Fill	2.29	0	2.29	0.34	0	0.34	2.63

[1] KIC Footprint direct effect area includes pad expansion toe footprint; indirect effect area includes area within 60 m (197 ft) buffer around the outer edge of the pad expansion.

[2] KCS Footprint direct effect area include pad expansion toe footprint; indirect effect area includes area within 40 m (131 ft) buffer around the outer edge of the pad expansion.

Sources: Appendix A, Appendix B, Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012, ABR 2013a, USFWS 1985, CPAI 2013a

TABLE 4.5-4. ESTIMATED KIC AND KCS EXPANSION PROJECT FOOTPRINTS BY WETLAND AND WATER FUNCTIONAL RATINGS

Wetland and Water Category	KIC PA acre [% of area]	KCS PA acre [% of area]	KIC Pad Expansion (acre [ha])			KCS Pad Expansion (acre [ha])			KIC & KCS (acre [ha])	
			Direct Effects	Indirect Effects	Direct & Indirect	Direct Effects	Indirect Effects	Direct & Indirect	Direct & Indirect	Proportion of Category
I – High Functioning Wetlands	0 [0%]	0 [0%]	0	0	0	0	0	0	0	0%
II – High to Moderate Functioning Wetlands	5.69 [2%]	57.37 [23.22]	0	0	0	1.13 [0.46]	3.58 [1.45]	4.71 [1.91]	4.71 [1.91]	7.5%
III – Moderate to Low Functioning Wetlands	221.93 [71%]	84.16 [42%]	45.52 [18.42]	33.08 [13.39]	78.60 [31.81]	8.61 [3.48]	2.16 [0.88]	10.77 [4.36]	89.37 [36.16]	29.2%
IV – Degraded and Low Functioning Wetlands	0 [0%]	0 [0%]	0	0	0	0	0	0	0	0%
Totals	227.62 [73%]	141.53 [71%]	45.52 [18.42]	33.08 [13.39]	78.60 [31.81]	9.74 [3.94]	5.74 [2.32]	15.48 [6.26]	94.08 [38.07]	25.5%

Note: KIC Project Area (PA) defined as a 200 m (656 ft) buffer around the KIC pad and expansion areas is 27% non-wetland – due to gravel fill.
Note: KCS Project Area (PA) defined as a 200 m (656 ft) buffer around the KCS pad and expansion area is 29% non-wetland – due to gravel fill.
Sources: Appendix A, Appendix B, Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012, ABR 2013a, USFWS 1985, CPAI 2013a

4.6 Fish and Wildlife

Potential Project-related effects on wildlife would primarily include habitat loss or alteration, disturbance from noise or human activity, increases in predators, and potential collision with vehicles or infrastructure. Construction of the pad expansions would convert tundra habitats to barren gravel fill. No Project infrastructure would be placed in or across fish habitat and no ice roads would be required. Water withdrawal for gravel compaction and dust control from the KIC Reservoir, Mine Site D, and Lake K107 could potentially temporarily alter fish habitat and cause injury to fish.

ConocoPhillips Alaska, Incorporated's Wildlife Avoidance and Interaction Plan (CPAI 2012b) describes personnel training requirements, interaction and response protocols, food and waste management, and reporting requirements for wildlife encounters that have been developed with oversight of applicable resource management agencies to minimize adverse and cumulative effects of development and operation of North Slope oil fields. Measures that have been developed to avoid and minimize potential impacts to wildlife are described in greater depth in this document which is incorporated here by reference along with the supporting documents and tools: Encountering Wildlife on Alaska's North Slope, Grizzly Bear Avoidance and Human Encounter/Interaction Plan, Polar Bear Avoidance and Interaction Plan, Predator and Waste Management, North Slope Environmental Field Handbook, Employee Awareness Tools, and Alaska Waste Disposal and Reuse Guide (CPAI 2012b).

Accidental oil and fuel spills could be detrimental to all fish and wildlife and their habitats. Prevention and control of spills are addressed in CPAI's Kuparuk River Unit Oil Discharge Prevention and Contingency Plan (ODPCP, CPAI 2013b). Most spills would be expected to be small, would likely be contained on the gravel work surface, and would be cleaned up as quickly as possible. These types of spills are unlikely to result in detrimental effects on fish, wildlife, or their habitats.

4.6.1 Terrestrial Mammals

The most likely Project-related effects on terrestrial mammals would include habitat loss and alteration, disturbance, and vehicle collision mortality. Habitat loss and alteration would be long-term, but the area impacted would be limited to about 81 acres (33 ha) for the KIC Pad Expansion Project and to about 16 acres (6 ha) for the KCS Pad Expansion Project. Disturbance could result in displacement of some animals from the vicinity of the Projects. Traffic disturbance would be highest during construction and would generally occur on primary roads that currently support high levels of traffic around the KIC, KOC, and CPF-1. Activities associated with these Projects may cause some short-term displacement and/or disturbance to a few terrestrial mammals.

Caribou

Caribou are most sensitive to disturbance near the period when they give birth, and when cows are accompanied by newborn calves (Murphy and Lawhead 2000, Haskell and Ballard 2008). During this period, caribou cows generally move into tundra habitats on the ACP (Figure 3-8), and concentrate their foraging on nutritious newly emergent inflorescences of the tussock forming *Eriophorum vaginatum* (Nellemann and Thomsen 1994, Murphy and Lawhead 2000). Highest concentrations of cows and calves in Kuparuk during the calving period (early to mid-June) occur south or west of the Project area, with few cows and calves documented to occur in

the Project area (Lawhead et al. 2013). The Project area contains 31% tussock tundra, of which an estimate 11 acres or 1.2% would be lost or altered by the Projects (Table 4.5-2). Later in the calving period in mid to late June, caribou cows and calves would likely re-habituate each year to oil field activities and disturbance responses becoming more tolerant and using habitats closer to roads and pads (Haskell et al. 2006, Haskell and Ballard 2008, Lawhead et al. 2004).

During the 18 years of calving surveys completed since 1993 in Kuparuk, 39 large caribou and 7 calves have been documented in the KIC and KCS Project areas (Lawhead et al. 2013); based on these observations, an average of about 2.6 caribou per year would be expected to use the Project areas during calving. All of the June caribou observations were along the gravel haul routes from KCS along the Oliktok Point Road to Mine Site E or along the Spine Road to Mine Site C (Lawhead et al. 2013). Because few caribou appear to calve in the Pad Expansion Project areas, little of the preferred forage for nursing cows would be lost, cows would likely re-habituate annually to industry activity later during calving, and most traffic would be concentrated between Mine Site C and the KIC and KCS pads during summer or fall; a few caribou cows and calves during May through June may experience some disturbance but are not expected to be adversely affected by Pad Expansion Projects.

Most caribou occur within the Project areas in July during the period parasitic insects such as mosquitoes, bot flies, and warble flies are active, and caribou seek out coastal and riparian insect-relief habitats (Murphy and Lawhead 2000, Lawhead et al. 2013). A total of 67 caribou sightings with a total of 1,802 caribou have been documented in the Project areas during the 12 years of surveys; of which 69% of the groups contained less than 10 caribou (Lawhead et al. 2013). Sightings of large caribou groups in the Project area have been limited to four groups of more than 100 caribou all observed north of KCS along the Oliktok Point Road (Lawhead et al. 2013). Based on these observations, an average of 150 caribou per year would be expected to use the Project areas primarily during late June and July (Figure 3-9, Lawhead et al. 2013). Other than the existing gravel pads and elevated buildings, the Project areas do not provide natural habitats that would provide insect-relief to caribou. Disturbance and potential diversion or deflection of caribou movements attributable to development of Projects would be most likely to occur with increased traffic along the gravel haul routes between KIC and KCS to Mine Site C. Caribou have been shown to successfully negotiate through Kuparuk and the potential small incremental increase in disturbance attributable to the KIC and KCS Pad Expansion Projects is not expected to result in negative effects to caribou movements (Murphy and Lawhead 2000, Lawhead et al. 2013).

Although vehicle-caribou collision mortality could potentially be increased by increased traffic levels primarily during construction, measures that control traffic speed and increase driver awareness of potential hazards would minimize the potential for collisions. Collisions would be most likely to occur during periods of decreased visibility, especially during winter darkness. Since KIC construction is scheduled to occurring primarily during the summer months, and mitigation measures would be in effect, few if any collision-related mortalities are expected (Table 4.1-1). Construction for the KCS would primarily occur from mid-August thru October, after most of the caribou have migrated out of the Kuparuk region and construction traffic would primarily occur along the access road from Mine Site C to KCS pad where large caribou groups are less prevalent (Table 4.1-1). As most caribou migrate to wintering areas away from the KCS Project area when the majority of the construction would be occurring and current mitigation measures are in effect, few if any collision-related mortalities are expected.

Muskoxen

No muskoxen have been observed within the Project areas; however a few muskoxen may occur near the Project area during summer or fall, which could lead to some disturbance (Figure 3-9, Lawhead et al. 2013). The likelihood is low, however, that Project activities would coincide with muskoxen occurrence near the Project. Project-related effects to muskoxen are unlikely in light of current mitigations for wildlife and the low probability of muskoxen occurrence in the Project area.

Brown Bears

A brown bear was observed within 0.5 miles of the KCS pad on June 17, 1995 (Figure 3-9, Lawhead et al. 2013). Brown bears regularly occur at Kuparuk, and there is potential for Project-related activities to affect brown bears primarily through potential disturbance of hibernating bears at den sites or through attraction of previously food-conditioned bears to food wastes and odors. Habitats that may be suitable for brown bear denning, similar to those potentially suitable for polar bear denning, occur along the Ugnuravik River and Central Creek (Figure 3-12). As part of the CPAI Grizzly Bear Avoidance and Human Encounter/Interaction Plan, regular training is provided to North Slope workers to avoid and minimize potential for human-bear interactions (CPAI 2012b). Because mitigation measures have largely been effective at eliminating food-conditioning and habituation of brown bears at Kuparuk and because pre-construction surveys to detect bear den sites would be completed prior to construction, no brown bears are likely to be adversely affected by the Pad Expansion Projects.

Arctic and Red Fox

One fox den site occurs in the Pad Expansion Project area in a small pingo just south of the KIC pad; this den site would not be covered by the expansion footprint (Figure 3-9, Lawhead and Prichard 2005; Site No. 504). This den site was active with more than three pups in one of two years of observation (Lawhead and Prichard 2005; Site No. 504). If this den site is used as a natal den during construction in spring and summer 2014 and 2015, disturbance could cause abandonment of the den site. Available den sites are not generally limiting in the region (Burgess 2000), however, and it is likely that if the site was active and disturbance caused the fox to abandon the site, the pups would likely be moved to a secondary site. Because this den site is next to an active industrial area, however, it is likely that any foxes using the site would be habituated to regular activity at KIC.

The most likely impact of the Pad Expansion Projects on foxes would be collision mortality, especially if foxes are using infrastructure for denning, such as the site at KOC (Figure 3-9, Lawhead and Prichard 2005; Site No. 552). Although vehicle-caribou collision mortality could potentially be increased by increased traffic levels primarily during construction, measures that control traffic speed and increase driver awareness of potential hazards would minimize the potential for collisions. Collisions would be most likely to occur during periods of decreased visibility, especially during winter darkness. Because construction would primarily occur during spring through fall primarily during daylight, and current mitigation measures are in effect, few if any collision-related mortalities are expected.

4.6.2 Birds

Habitat loss due to gravel placement for the Pad Expansion Projects would be most likely to affect Lapland Longspurs, Pectoral Sandpipers, and Semipalmated Sandpipers (Table 3.6-1);

with an estimated displacement of 12 nests (~55 nests/km^2 times 0.2170 km^2 pad expansion – gravel toe on tundra vegetation). Indirect effects on wildlife habitats may leave some additional habitat unavailable for early nesting birds due to snow drifts or snow piles around the pads.

No nests, eggs, or nestlings are expected to be lost due to construction. Gravel would be spread across all the areas for the KIC or KCS Pad Expansion prior to June 1 with initiation of gravel hauling in mid-May (Table 4.1-1), consistent with USFWS guidance for protection of bird nests, eggs, and nestlings (USFWS 2009). Nest initiation is moderated by snow cover such that during an early snow melt shorebird nests are initiated sooner – as early as 6 June with little to no snow cover and as late as 15 June with heavy snow cover (Troy 2000). At the Kuparuk latitude of 70° North, Lapland Longspur, one of the earliest nesting ACP birds, nest initiation averages about 1 June (Hussell and Montgomerie 2002). Average Lapland Longspur nest initiation dates for plots in Kuparuk was June 1 in 2002 with early snow melt and June 8 in 2003 with late snow melt (Liebezeit 2002, 2004). Gravel would be spread across either the KCS or KIC Pad Expansion area beginning in mid-August (Table 4.1-1), after the July 31 USFWS guidance (USFWS 2009); after nesting has been completed, which would prevent destruction of bird nests on the tundra. Initiation of gravel placement would likely be delayed until after the end of August following USFWS guidance. If gravel placement was to begin earlier in mid-August, biologists would clear the site prior to any construction to ensure that no bird nests or broods would be injured by the construction.

No waterbird nests are likely to be affected by habitat loss, as none have been observed in the pad expansion footprint areas (Figure 4-2). Construction-related disturbance to would potentially affect as many as nine waterbird nests during the summer construction activities in 2014 and 2015. Twenty waterbird nests have been recorded within the Project areas, with a maximum of nine nests observed per year in 2007 and 2008 (Stickney et al. 2013). About half of these nests were along the gravel haul route from KCS to Mine Site E (Figure 3-10). These areas are already fairly heavily trafficked, so it is unlikely that the additional disturbance would result in more than localized effects.

Mammalian predators of birds are unlikely to be attracted to the Project areas because wildlife interaction plans and employee training should negate access of foxes and bears to human foods and food wastes. Common Ravens may be attracted to perches and potential nesting sites provided by new infrastructure. A raven nest has been documented on the KCS drill site (Powell and Backensto 2009, Stickney et al. 2013). Construction activities at KCS would begin in mid-August (Table 4.1-1), after the nesting season and would not be likely to disturb nesting common ravens.

Bird-vehicle and bird-infrastructure collisions may injure or kill birds. Vehicle-collision mortality would be most commonly expected when birds use grit along roadways; small birds fly low across roadways; and waterfowl broods cross roadways. Collisions with infrastructure would be most commonly expected during storms and poor visibility conditions when birds may fly into buildings. Buildings and modules that would eventually be added to the pad expansion areas are not likely to significantly increase bird collision hazards.

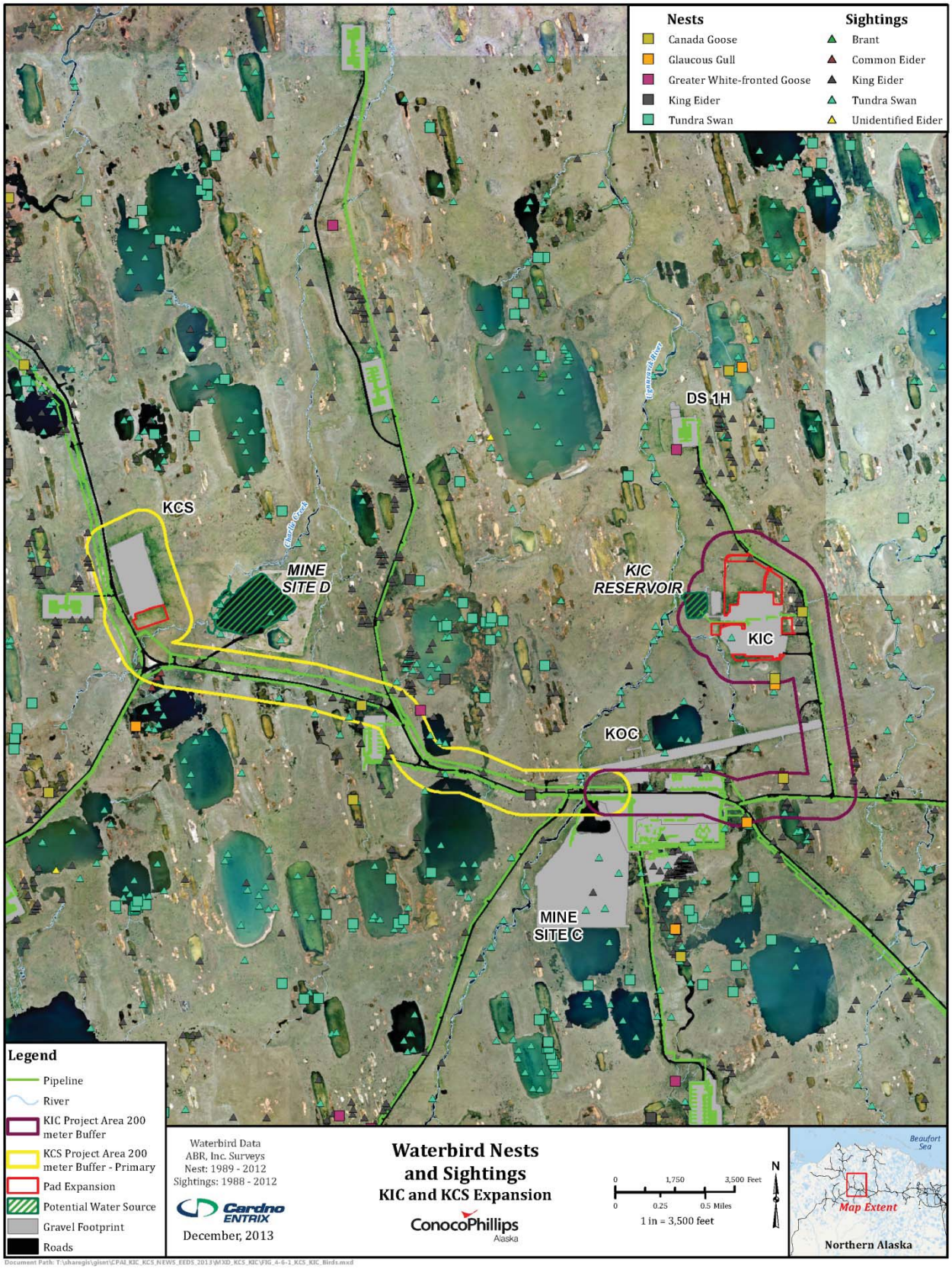

Figure 4-2. KIC and KCS Pad Expansion Projects – Waterbird Nests and Sightings, 1988 to 2012

4.6.3 Fish

The highest potential for Project-related impact to fish and fish habitat would be water withdrawal from the KIC Reservoir, and Mine Site D during the winter. Both of these sources may contain overwintering fish that are considered sensitive to water withdrawal; arctic grayling, whitefish, and cisco (Moulton 2007; Morris and Winters 2008). Lake K107 is a deep connected lake, with connection to Central Creek, which contains ninespine stickleback (Morris and Winters 2008). However, this connection is indirect and likely sporadic through a drained lake basin; and while Lake K107 may contain some winter liquid water to support fish, this lake has not been documented as used by fish (Moulton 2012, Figure 3-10). Water withdrawal from the KIC Reservoir and Mine Site D would be unlikely to cause undue stress to sensitive fish. All withdrawals would be conducted in compliance with permits that limit the total amount of water that can be withdrawn, and that provide for screening to prevent entrapment or entrainment of fish on intake hoses. CPAI would adhere to any withdrawal criterion set by ADFG to protect fish. Project-related impacts to fish and fish habitat could potentially result from encroachment of the KIC expansion on the East Fork Ugnuravik River (Figure 2-2), and encroachment of the KCS expansion on Charlie Creek (Figure 2-3). Both expansions are above the floodplains of these waters, which provide habitat for resident freshwater fishes (Morris and Winters 2008, Johnson and Daigneault 2013).

Small spills and leaks from these pad expansions may be more likely to reach these waters. CPAI would update their current ODPCP to include specifics regarding the expansion of both the KIC and KCS pads and it would remain in place during construction of and operations on the proposed Project areas. Snow piled from these locations could contribute to the spread of non-point source pollutants which could then enter the streams. A snow removal plan would be developed prior to construction which would be incorporated into the KRU Field Services Snow Removal Procedures. Snow would be piled in approved locations (Table 4.1-2); and the Kuparuk SWPPP would be amended if required to incorporate the pad expansions (Table 3.9-2).

4.7 Threatened and Endangered Species

Two federally listed threatened species, the polar bear and the Spectacled Eider; and one candidate species, the Yellow-billed Loon, occur at Kuparuk and could potentially occur within the Project areas (USFWS 2013). The Steller's Eider, a federallylisted threatened species, is unlikely to occur at Kuparuk, and is unlikely to occur or migrate through the Project areas as a result of breeding range contraction (USFWS 2013). Table 4.7-1 summarizes the preliminary direct and indirect effect determinations for these species based on: 1) communications with the USFWS; 2) habitat requirements and know distribution of these species; and 3) habitat analyses and field survey data for these species collected between 1993 and 2012. No currently designated critical habitat for any listed species occurs within the Project areas. This evaluation includes an evaluation of potential Project-related impacts to previously designated critical polar bear denning habitat on the North Slope.

TABLE 4.7-1. SUMMARY OF SPECIES INCLUDED IN ANALYSIS AND PRELIMINARY FINDINGS FOR THE KIC AND KCS PAD EXPANSION PROJECTS

Common Name	Species Name	Federal Status	Detailed Analysis	Preliminary Findings
Polar Bear	*Ursus maritimus*	Threatened	Yes	MA – NLAA
Spectacled Eider	*Somateria fischeri*	Threatened	Yes	MA – NLAA
Steller's Eider	*Polysticta stelleri*	Threatened	No	No Effect
Yellow-billed Loon	*Gavia adamsii*	Candidate	No	No Effect

MA – NLAA = May affect, not likely to adversely affect
MA – LAA = May affect, likely to adversely affect

4.7.1 Polar Bears

Polar bears are managed by the USFWS and are protected under the Marine Mammal Protection Act (MMPA) (16 USC § 1361-1423h) and were listed as threatened throughout their range under the ESA because of projected loss of sea ice habitat on May 15, 2008 (73 FR 28212). Polar bears are also protected under an international Agreement on the Conservation of Polar Bears and Their Habitat and the Convention on International Trade in Endangered species of Wild Flora and Fauna (CITES). Under the ESA 4(d) rule, the regulatory requirements of the MMPA and CITES are in effect, while ESA Section 7 consultation requirements apply for activities that may potentially affect polar bears (73 FR 76249).

Critical habitat was previously defined as sea ice, terrestrial denning habitat, and barrier island habitat within Alaska and adjacent territorial and United States waters (75 FR 76086); although this critical habitat rule has been vacated and no critical habitat is currently designated for polar bears. Terrestrial denning habitats that are potentially suitable for polar bear maternity den sites at Kuparuk have been mapped based on locations of bluffs along streams and lakes with vertical relief and steep slopes that accumulate adequate persistent snow drifts for den construction (Durner et al. 2001).

Oil and gas exploration and development activities that can affect polar bears on the North Slope are regulated through Incidental Take Regulations (ITR); issued under Section 101(a)(5) of the MMPA for five-year periods to regulate the nonlethal, incidental, unintentional taking of small numbers of polar bears (76 FR 47010). A Letter of Authorization (LOA) under this ITR was issued to CPAI for exploration, production, operations, remediation, and rehabilitation of oil and gas facilities within the boundaries of the Greater Kuparuk Unit and Western North Slope Production fields (LOA 11-22). In 2012, CPAI was issued a LOA covering North Slope oilfields for the intentional take of polar bears by means of harassment for the protection of human life and of polar bears while conducting activities in polar bear habitat during 2013-2014 (LOA 13-INT-04).

Polar bears are unlikely to, but could occur in the Project area; and polar bear presence could lead to bear-human interactions and disturbance of den sites. CPAI would follow measures in its Polar Bear Avoidance and Interaction Plan. Prior to winter activities CPAI may, if requested by USFWS, use Forward Looking Infrared Radar (FLIR) to identify polar bear den location prior to construction. If den sites are located within a mile of proposed Project activities, CPAI would contact the USFWS to develop and modify Project plans to avoid disturbing the den site during denning and immediately following den emergence. Small areas of potentially suitable polar bear

denning habitat occur along rises next to the Ugnuravik River, Central Creek, and Charlie Creek (Figure 3-12, Table 4.7-2). No potential polar bear denning habitat would be altered by the pad expansion footprints (Table 4.7-2). Because gravel hauls would occur after polar bears emerge from hibernation in late-March to April and before polar bears generally enter dens in November (Table 4.1-1), no disturbance to denning polar bears are likely.

The Projects "may affect, but are not likely to adversely affect" polar bears that may roam into the area; however, few if any polar bears are likely to roam this far inland (Durner et al. 2010). This determination is based on the limited potential for polar bear occurrence within the Project area. Potential Project-related effects on polar bears are covered by CPAI's current consultation and LOAs for North Slope operations (LOA 11-22 and LOA 13-INT-04); therefore no additional consultation under MMPA or ESA would be required for approved activities in Kuparuk.

TABLE 4.7-2. KIC AND KCS PAD EXPANSION PROJECTS – POLAR BEAR DEN HABITAT

	Polar Bear Den Habitat	
Project Components	**Miles**	**Kilometers**
Action Area[1]	7.50	12.08
KIC to Mine Site C	3.69	5.94
KCS to Mine Site C	2.63	4.23
KCS to Mine Site E	2.20	3.54
KIC Pad Expansion Footprint[2]	0	0
KCS Pad Expansion Footprint[2]	0	0

[1] KIC and KCS Pad Expansion Project Action Area for Polar Bears is defined as the 1.0 mile (1.6 km) buffer surrounding the pad expansions, KIC and KCS pads, and the gravel haul routes to Mine Site C and Mine Site E. KIC and KCS 1.0 mile buffers to Mine Site C overlap 1.02 miles (1.63 kilometers) of den habitat.

[2] KIC and KCS Pad Expansion Footprints are defined as the toe of the gravel pad expansions.

Source: adapted from Durner et al. 2001

4.7.2 Spectacled Eiders

Spectacled Eiders are managed by the USFWS under the MBTA (16 U.S.C. 703-712) and as threatened under the ESA throughout Alaska, based on declines observed on the Yukon-Kuskokwim Delta (May 10, 1993, 58 FR 27474). Critical nesting habitat on the Yukon-Kuskokwim Delta, molting habitat in Norton Sound, and Ledyard Bay and wintering habitat in the Bering Sea between St. Lawrence and St. Matthew Islands were designated on February 6, 2001 (66 FR 9146). No critical habitat for Spectacled Eiders was designated on the Alaska's ACP (66 FR 9146), although Spectacled Eiders nest along the Beaufort Sea coast from Point Barrow to Demarcation Point.

Causes for Spectacled Eider population declines are unknown but could include: poisoning from spent lead shot, reductions in benthic marine prey, subsistence harvest, predation on breeding grounds and research-related disturbance. The ACP Spectacled Eider breeding population has a slight declining trend for the past 10 years with a 21-year average breeding population index of 6,896 birds (Stehn et al. 2013, Larned et al. 2012).

Spectacled Eiders occur within Kuparuk and are annually monitored (Stickney et al. 2013). Spectacled Eiders may also occur in the KIC and KCS Project areas during pre-nesting; although none have been documented to nest in these areas during the 20 years of aerial and ground-based monitoring (Figure 4-3, Stickney et al. 2013). An annual average of 3.5 Spectacled Eiders has been observed in the Project areas over the 19 years of pre-nesting aerial surveys with the majority of observations on the route from KCS to Mine Site E: 0.1 from KIC to Mine Site C; 0.4 from KCS to Mine Site C; and 3.0 for KCS to Mine Site E.

Potentially suitable Spectacled Eider pre-nesting, nesting, and brood-rearing habitats at Kuparuk include: 1) deep open water with islands; 2) deep open water without islands; 3) grass marsh; 4) nonpatterned wet meadow; 5) old basin wetland complex; 6) shallow open water with islands; 7) shallow open water without islands; and 8) sedge marsh (Stickney et al. 2013). Small amounts of pre-nesting and brood-rearing habitat would be directly affected by the KIC Project; and small amounts of nesting habitat would be directly affected by the KCS Project (Table 4.7-3). These habitats would be lost due to gravel fill, although it is unlikely that habitats within these footprint areas are suitable for Spectacled Eider use, as there has been no documented use of these areas in 20 years of monitoring (Stickney et al. 2013)

TABLE 4.7-3. KIC AND KCS PAD EXPANSION PROJECTS – SPECTACLED EIDER HABITATS

	Spectacled Eider Habitats[1]									
	Pre-Nesting		Nesting		Pre-Nesting & Nesting		Brood-Rearing		Pre-Nesting & Brood-Rearing	
Project Components	acres	ha	acres	ha	acres	ha	acres	ha	acres	ha
Action Area[2]	16.56	6.71	255.27	103.30	75.20	30.43	1.59	0.64	248.90	100.73
KIC to Mine Site C	1.40	0.57	1.02	0.41	9.74	3.94	0	0	19.25	7.79
KCS to Mine Site C	11.44	4.63	58.26	23.58	5.19	2.10	0	0	31.33	12.68
KCS to Mine Site E	3.72	1.51	195.99	79.31	60.27	24.39	1.59	0.64	198.32	80.26
KIC Pad Expansion Footprint[3]	0	0	0	0	0	0	0	0	1.74	0.70
KCS Pad Expansion Footprint[3]	0	0	0.36	0.15	0	0	0	0	0	0

[1] Pre-Nesting Habitat used by ≥ 9% of Kuparuk pre-nesting observations: deep open water with islands, ***deep open water without islands***, ***old basin wetland complex***, ***shallow open water with islands, shallow open water without islands***

Nesting habitat used by ≥ 9% of Kuparuk nest observations: nonpatterned wet meadow, ***old basin wetland complex***, sedge marsh

Brood-rearing habitat used by ≥ 9% of Kuparuk brood observations: ***deep open water without islands***, grass marsh, ***shallow open water with islands; shallow open water without islands.*** Habitats that overlap between categories are in bold italics.

[2] KIC and KCS Pad Expansion Projects Action Area for Spectacled Eiders is defined as the 200 m (656 ft) buffer surrounding the pad expansions, KIC and KCS pads, and the gravel haul routes to Mine Site C and Mine Site E

[3] Pad Expansion Footprint are defined as the toe of the gravel pad expansions

Sources: adapted from Stickney et al. 2013, Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012

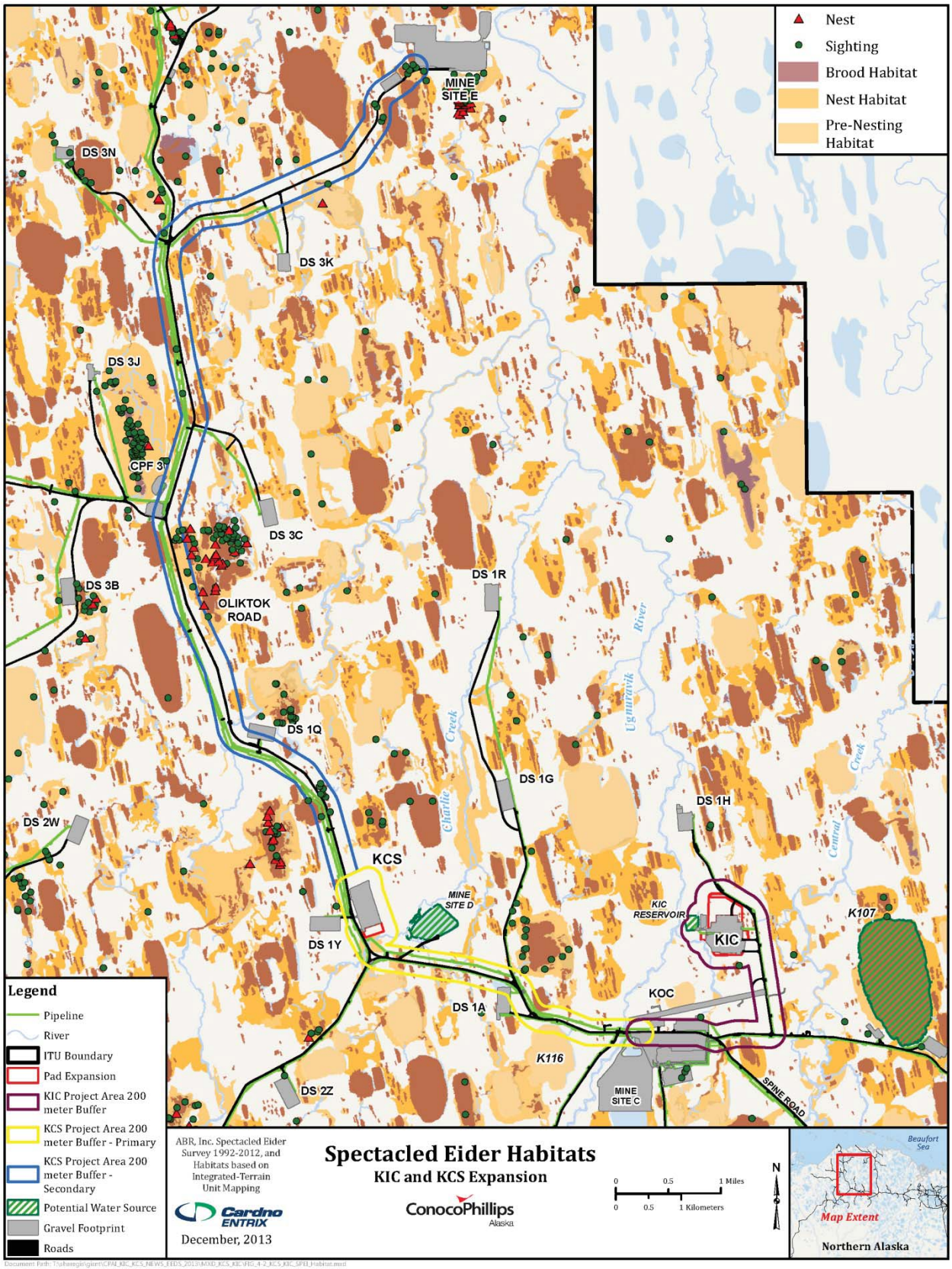

Figure 4-3. KIC and KCS Pad Expansion Projects – Spectacled Eider Nests, Sightings, and Habitats, 1993 to 2012

Habitats lost due to construction of the KIC and KCS Pad Expansion Projects are not expected to affect Spectacled Eiders given that no Spectacled Eiders have been observed using these habitats in any period (Stickney et al. 2013). Habitats disturbed by the gravel hauls from Mine Site C and due to construction of the KIC and KCS Pad Expansion Projects are not expected to affect Spectacled Eiders (Figure 4-3, Stickney et al. 2013). An estimated 598 acres (242 ha) of potentially suitable pre-nesting, nesting, and brood-rearing habitat within the Project areas could be exposed to disturbance from traffic and construction-related activities that could result in nest abandonment or facilitate depredation (Table 4.7-3). Most of this habitat (77%) occurs along the gravel haul route from Mine Site E to KCS, which would potentially receive a limited amount of construction-related traffic (Figure 4-3, Table 4.1-1).

An annual average of 0.5 Spectacled Eiders, or total of 1 Spectacled Eider, would potentially be exposed to disturbance along the primary gravel haul routes from Mine Site C to KIC and KCS during May through August, 2014 and 2015. However, because no Spectacled Eider nests have been documented in these areas during 20-years of surveys, this potential disturbance is highly unlikely.

The 20 years of Kuparuk survey data that indicate no Spectacled Eiders have nested within either the KIC or KCS Project footprints or Project areas indicate that no Spectacled Eider nests are likely to be directly or indirectly adversely affected by habitat loss over a 40-year period and construction-related loss due to disturbance over 2 summers. Nest losses are not expected to result due to disturbance from the primary gravel hauls over the 2-year summer construction of the KIC and KCS Pad Expansion Projects from Mine Site C to KIC and KCS. In addition, the minor gravel hauls from Mine Site E to KCS are unlikely to create a level of additional disturbance that would affect nesting Spectacled Eiders, and no nests have been found in this area making nest and egg loss due to disturbance even more unlikely.

The KIC and KCS Projects “may affect, but are not likely to adversely affect” Spectacled Eiders. Kuparuk survey data for Spectacled Eiders indicate that no nests have been documented within the Project areas in 20 years of monitoring (Stickney et al. 2013). This determination is based on the potential for Spectacled Eider occurrence within the Project area, but the unlikely occurrence of nests that could be exposed to construction traffic disturbance within the KIC and KCS Project areas.

4.7.3 Steller’s Eiders

Steller’s Eiders are managed by the USFWS under the MBTA (16 U.S.C. 703-712) and the Alaska breeding population is managed as threatened under the ESA, based on contraction of their breeding range in western Alaska and the eastern ACP (June 11, 1997, 62 FR 31748). Causes for Steller’s Eider breeding range contraction are unknown but may have included: predation, ingestion of lead shot, and changes in the marine environment. Five critical habitat units have been designated, including breeding habitat in the Yukon-Kuskokwim Delta and marine molting, resting, feeding, and wintering habitat units in southwest Alaska (66 FR 8850).

Steller’s Eiders may, but are not likely to occur in the Project areas during nesting. No Steller’s Eiders have been observed within the Project areas during 20 years of aerial and road surveys specifically designed to document occurrence of federally-protected eiders (Figure 3-14, Stickney et al. 2013).

Nesting habitats near Barrow are characterized by proximity to an active pomarine jaeger nests (within about 125 m [394 ft]) and proximity to permanent or ephemeral waterbodies (within about 22 m [72 ft]) with flooded pendant grass (*Arctophila fulva*) or water sedge (*Carex aquatilis*) marshes (Obritschkewitsche et al. 2001). The Project areas are comprised of less than 1% grass and 3% sedge marsh habitats; and neither habitat would be directly or indirectly affected by the Projects (Table 4.5-2).

The KIC and KCS Pad Expansion Projects would have no effect on the Alaska breeding population of Steller's Eiders. This determination is based on the lack of potential for occurrence and the lack of potentially for suitable nesting habitat within the Project area.

4.7.4 Yellow-billed Loon

Yellow-billed Loons are managed by the USFWS under the MBTA (16 U.S.C. 703-712) and have been considered vulnerable to listing under the ESA because of a combination of low population size; low reproduction rates; and their nesting and brood rearing requirements for relatively large deep lakes with hydrologic connectivity to streams, fish, and complex vegetated shorelines (74 FR 12932, Earnst et al. 2006).

Four lakes meet two of the four minimum requirements for use by Yellow-billed Loons (Earnst et al. 2006); and two of these four lakes meet three of the requirements with all likely to contain fish based on connectivity (Figure 4-4). Three of these lakes are located along the KCS to Mine Site E gravel haul route which would receive limited use. It is highly unlikely that any Yellow-billed Loons will occur in the vicinity of the projects due to the lack of preferred habitat in these areas.

Yellow-billed Loons may, but are not likely to occur in the Project area during nesting. No Yellow-billed Loons have been observed within the KIC and KCS Project areas during 20 years of aerial and road surveys for eiders, during which their occurrence, because of its rarity, would likely have been noted (Figure 3-14, Stickney et al. 2013, ABR, Inc. 2013b).

The KIC and KCS Pad Expansion Projects would have no effect on the candidate Yellow-billed Loon; based on the lack of occurrence and the scarcity of suitable nesting lakes within the Project areas.

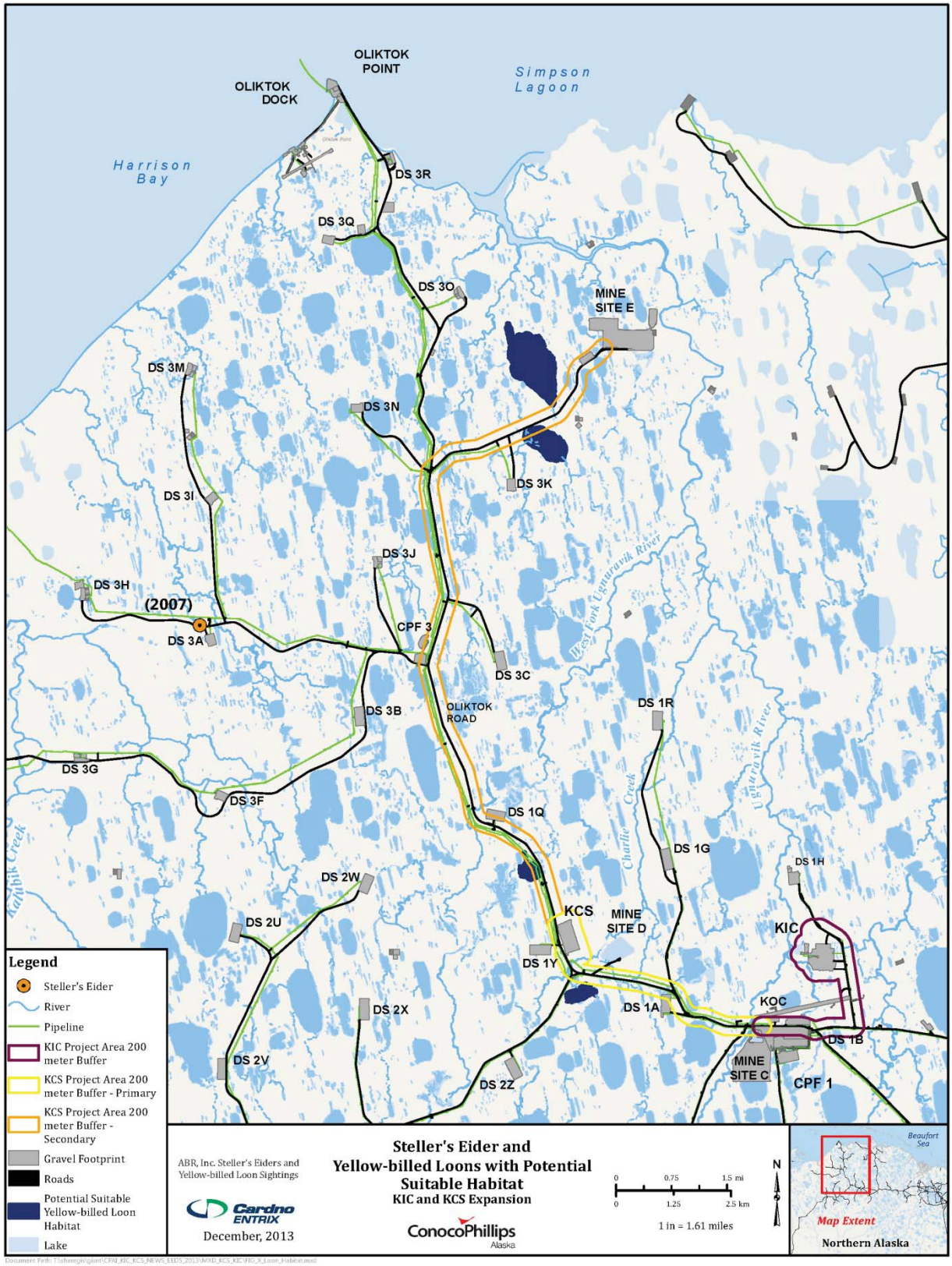

Figure 4-4. KIC and KCS Pad Expansion Projects – Steller's Eider Sightings and Yellow-billed Loon Potentially Suitable Lake Habitats

4.8 Cultural Resources

In September 2013, a cultural resources survey was conducted for both the KIC and KCS pad expansion areas by Reanier & Associates, Inc. As discussed in Section 3.9, the results of that survey meet the Phase I (Identification Level) survey report requirement under Section 106 of the NHPA and the ASPHA (Reanier 2013a, 2013b). During the survey no prehistoric sites or other archaeologically sensitive areas were identified (Reanier 2013a, 2013b). The closest cultural resource to the existing KIC pad is located 1.1 miles away and the closest cultural resource to the existing KCS pad is 3 miles away. As the locations of these sensitive sites are known, CPAI would ensure that they are not disturbed, as is required by law. No historic sites were identified within either the KIC or KCS Expansion Project areas, and none would be affected by either of the Projects (Reanier 2013a, 2013b).

NSB cultural resource management policies and codes require that any unanticipated discoveries of cultural or paleontological resources be immediately reported to the NSB Inupiat History, Language, and Culture Commission. In addition, the resources may not be disturbed. CPAI is committed to protecting cultural resources in the area and would adhere to all regulations concerning known and newly discovered resources.

4.9 Socioeconomic Resources

4.9.1 Nuiqsut

The closest populated village is Nuiqsut, which is located 31 miles west of the KCS pad and 34 miles west of the KIC pad. During construction of the KIC and KCS Expansion Projects, personnel would be housed at the Kuparuk Operations Center or at an off-site location if needed. Therefore, impacts from construction personnel on Nuiqsut would be no different from current operations at Kuparuk.

Some of the personnel assigned to the construction of the pad expansions may be residents from Nuiqsut, which would create a positive financial impact on the community of Nuiqsut in the form of new employment and income opportunities. CPAI is committed to continuing its partnership with local businesses during the development of the proposed Projects and would hire and provide training, where appropriate, to qualified individuals interested in working on the proposed Projects. In addition, the pad expansions for KIC and KCS would allow for additional work that is currently outsourced to Deadhorse to be conducted on-site, providing additional jobs once construction is complete. Actual work force numbers stemming from local residents would depend on availability of personnel, types of skills required, contractor hiring policies, season, and several other factors. In addition to potentially providing work for some residents, the proposed Projects would increase the cash economy in Nuiqsut by causing land lease payments to increase in value, and through the direct purchase of goods and services. Due to the potential positive cash flow to Nuiqsut and limited impacts from non-local workers, the proposed Projects are anticipated to have a positive impact on the community of Nuiqsut.

4.9.2 Public Revenues

Although no oil production or processing would be conducted at either the KIC or KCS pads, expansion of the pads would allow for continued development of the Kuparuk Oilfield. This, in turn, would increase revenues to federal, state, and local government entities. Revenues would consist of royalties and tax payments to all three branches, but contributions to the NSB would have the most impact on the local community of Nuiqsut and the surrounding area. New

revenues from the expansion of KIC and KCS and the continued development of the Kuparuk Oilfield would increase revenues to the NSB, which help to enhance the services provided to the communities and the facilities used by the communities. As discussed in Section 3.9.2, the cost of living in Nuiqsut is quite high compared with other locations and additional revenues provided by the further development of the Kuparuk Oilfield through the KIC and KCS Expansion Projects would be a positive impact on both the government entities that receive them and the communities that are benefitted by government programs and facilities.

4.9.3 Subsistence

Subsistence is a central socio-economic facet of the community of Nuiqsut. Many residents supplement their income through subsistence and most residents supplement their diet through subsistence resources. In addition, families throughout the community share their subsistence resources with other families within the community. Nuiqsut is situated in a prime location for the harvest of many resources, but marine mammals (particularly bowhead whales) make up the largest percentage of subsistence resources consumed by the community, followed by caribou and fish (USACE 2012). Most of the harvesting of these resources is done offshore, 9 miles north of the proposed Project areas, or is centered around the Colville River, which is 13 miles east of the existing KCS pad and 16 miles east of the existing KIC pad.

Of the three most widely consumed subsistence resources, caribou are the most likely to occur near the KIC and KCS Project areas. The Projects would not affect the harvest of either marine mammals or fish due to their distances from the harvest areas. Although caribou may be present in or near the proposed Project areas, the Projects are not expected to prevent current caribou use of habitats near either KIC or KCS. Subsistence hunting in and near the Project areas is not likely, as most subsistence harvests occur in the marine environment or are concentrated around the Colville River (SRBA 2011). As the proposed Projects would not affect any land currently used for subsistence, the KIC and KCS Expansion Projects would have no effect on subsistence.

4.9.4 Environmental Justice

Health, environmental, or socioeconomic impacts on minority and/or low-income populations in the NSB, particularly Nuiqsut, would not be disproportionately high. Petroleum resource development has been a long-standing practice on the North Slope and any impacts from the proposed Projects would not be selectively imposed on Nuiqsut. The proposed KIC and KCS Expansion Projects have been designed to minimize any health, environmental, or socioeconomic impacts through the use of BMPs, BAT, and mitigation efforts. In addition, various permits and approvals from several regulatory agencies, including the NSB, are required prior to start-up of the Projects, which serve to protect low-income and minority populations. During the permitting process, the Project descriptions and other elements of the Projects go through Public Notice, which allows residents to review the proposed Projects and comment on any concerns they may have. CPAI is committed to addressing and mitigating any concerns that arise during the Public Notice process.

4.10 Transportation

4.10.1 Road Transportation

Development of the KIC and KCS Expansion Projects would require construction of an additional access road to the KIC. Transport of personnel, equipment, and materials would primarily take place over existing roads. Equipment traffic, especially during the gravel haul,

would result in some increased traffic, which may result in congestion and delays along existing roads, especially between Mine Site C, KIC, KCS, and KOC.

Project equipment and supplies would be hauled to Deadhorse via the Dalton Highway and would continue to Kuparuk via the Spine Road. Some incremental increase in industrial traffic may result; however, levels are not expected to result in effects on local traffic or roads. Over the long-term, providing equipment service and maintenance at KIC would reduce the need to transport equipment to Deadhorse and, therefore, would result in some reduction of traffic between Kuparuk and Deadhorse.

4.10.2 Air Transportation

Air transportation would be used to bring workers into Kuparuk or Deadhorse. Most personnel would likely arrive at the Kuparuk airstrip, located about 1 mile south of the existing KIC pad and 2.5 miles east of the existing KCS pad. Some personnel may also arrive by air transportation to Deadhorse, and would then be bussed to Kuparuk. No additional flights beyond the current schedules are expected to be required to support the KIC and KCS Expansion Projects. The proposed Projects are not expected to affect airports in the area or the use of those resources for other activities.

4.11 Cumulative Effects

The purpose of the cumulative effects analysis is to identify potential effects from the proposed Project that, when in combination with effects from other existing or proposed projects in the region, may cumulatively become significant. An analysis of cumulative effects is required by NEPA and, for the purposes of this document the definition of cumulative impacts comes from 40 CFR 1508.7 whereby:

> *A cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time.*

Cumulative effect from ongoing oil and gas development activities within the North Slope oil fields was evaluated by the National Research Council (NRC 2003). Based on comparison of the analysis of potential effects resulting from construction and operation of the DS-1H NEWS Project with effects identified by the National Research Council (NRC 2003); the following have the potential to cumulate with existing past and present actions at Kuparuk:

1) Growth of industrial activity (footprint),

2) Effects on animal populations,

3) Oil spills, and

4) Response of North Slope cultures to declining revenues (NRC 2003).

4.11.2 Reasonably Foreseeable Future Actions

Reasonably Foreseeable future actions occurring within Kuparuk include: development of DS-2S, and DS-1H NEWS, and continued development of NEWS resources, as well as the expansion of KIC and KCS pads to accommodate additional support facilities, equipment storage, and supply storage. These future actions would also likely have similar or lesser effects on the growth of the industrial footprint, effects on animal populations, oil spills, and response of North Slope cultures to declining revenues.

Cumulative Effects of the Proposed Action and Reasonably Foreseeable Future Actions

The primary observable and measurable cumulative effect from development of the KIC and KCS Pad Expansion Projects and other reasonably foreseeable future actions at Kuparuk is expansion of the area of tundra wetlands covered by gravel and altered by indirect effects including: thermokarst, dust and gravel spray, and leaching of contaminants (Table 4.11-1). Of the 3.4% of tundra habitats that have been lost or altered by industrial activities at Kuparuk; 1.5% have been directly affected by gravel fill (Roth et al 2007, Roth and Loomis 2008, Wells et al. 2012). The KIC and KCS Pad Expansion Projects in combination with reasonably foreseeable future actions at Kuparuk would contribute to a 0.1% increase in gravel fill, and a 0.2% increase to the overall industrial disturbance area (Table 4.11-1).

Cumulative effects on animal populations attributable to the KIC and KCS Pad Expansion Projects and other reasonably foreseeable future actions at Kuparuk would be difficult to distinguish from existing oil and gas development effects on wildlife populations, natural variability in animal populations, and climate-change related effects. Cumulative effects on animal populations from oil and gas development on the North Slope have been cited as: disturbance of denning polar bears, increase in predators from access to human food, decrease in bird productivity from increased predators, and decreased productivity of caribou exposed to disturbance and stress from insect harassment (NRC 2003). Regulations and operational measures have been developed to limit potential disturbance of denning polar bears and access of predators to human foods.

The KIC and KCS Pad Expansion Projects and other reasonably foreseeable future developments at Kuparuk would contribute to an increased probability for oil spills. Cumulative effects may result in more spills especially as infrastructure ages. Most spills would likely be small and would be contained on gravel work surfaces. New in-field developments would likely prolong production at Kuparuk and would logically lead to an increase investment in maintenance of existing infrastructure; which would likely moderate any increase in spill risks. Current regulations and oil field operations are designed to avoid and minimize oil spills. CPAI would update both the ODPCP and SPCC Plan for Kuparuk if required to address the proposed Projects, which would help to minimize response time and maximize response efficiency in the event of an incident.

The KIC and KCS Pad Expansion Projects and other reasonably foreseeable future developments at Kuparuk would contribute to reducing the steepness of the overall decline in revenues, which could moderate the overall cultural response to declining revenues.

TABLE 4.11-1. CUMULATIVE EFFECTS OF INDUSTRIAL GROWTH AT THE KUPARUK OIL FIELD

Disturbance Categories	Kuparuk		DS-1H NEWS[1]	DS-2S[2]	NEWS Development[3]	KIC Expansion[4]	KCS Expansion[5]	Cumulative Effects	
	Acre	Percent	Acre	Acre	Acre	Acre	Acre	Acre	Percent
Natural Disturbances									
Undisturbed	120320.51	96.4%							
Storm surges, Flooding	251.93	0.2%							
Sub-Total	*120572.44*	*96.6%*							
Industrial Disturbance									
Commercial or Industrial Development	677.20	0.5%	12.66	162.49				852.35	0.7%
Drainage Impoundment	609.49	0.5%						609.49	0.5%
Excavation/Pits (undifferentiated)	123.98	0.1%						123.98	0.1%
Gravel Fill	1880.92	1.5%	8.98	20.50	85.66	47.80	10.07	2053.93	1.6%
Human Created Waterbodies	330.21	0.3%						330.21	0.3%
Water-filled excavation	22.22	0.0%						22.22	0.0%
Pollutants, Contaminants, Leachates	548.62	0.4%	-5.05					543.57	0.4%
Sub-Total	*4192.64*	*3.4%*	*16.59*	*182.99*	*85.66*	*47.80*	*10.07*	*4535.75*	*3.6%*
Kuparuk Total Area	**124765.08**	**100.0%**						**124765.08**	

1 DS-1H NEWS = 8.98 acres fill on tundra, 0.47 acre fill on fill; -5.05 acres fill and indirect effects on previously disturbed tundra; 12.66 acres indirect effects on previously undisturbed tundra (Table 4.5-1).

2 DS-2S = 20.50 acres fill on tundra; 162.49 acres indirect effects within 100 m (ABR, Inc. 2013x)

3 NEWS = 2 pads and access road; direct fill estimate only

4 KIC expansion = direct fill estimate only

5 KCS expansion = direct fill estimate only

Sources: Roth et al. 2007, Roth and Loomis 2008, Wells et al. 20120, CPAI 2013a, ABR, Inc. 2013b

5. Consultation and Coordination

5.1 Overview

Consultation and coordination was initiated by CPAI with a pre-applications meeting. Consultations are to obtain comments and input on regulatory requirements and receive stakeholder input on the proposed action. This section summarized the on-going consultation and coordination process for the proposed action.

5.2 Agency and Stakeholder Meetings and Consultations

CPAI has completed several meetings to discuss the KIC and KCS Expansion Projects with agency and stakeholders. These meetings are summarized below.

- April 30, 2013 – KIC Pad Expansion Meeting – CPAI and USACE. Discussed need for project and revisions to expansion design to move expansion away from ponds.
- July 24, 2013 – KIC and KCS Pad Expansion Pre-Application Meeting – CPAI and NSB Planning Department.
- August 29, 2013 – KIC and KCS Pad Expansion Pre-Application Meeting – CPAI and NSB Planning Department.
- October 29, 2013 – KIC and KCS Pad Expansion Pre-Application Meeting – CPAI presented projects to USACE, USEPA, ADNR, NSB, USFWS and other state and federal agencies.
- October 30, 2013 – KIC and KCS Pad Expansion Pre-Application Meeting – CPAI presented projects to ADFG and other state and federal agencies.

5.3 Status of Key Permit Applications

All required permit applications and authorizations would be submitted along with the EED to the regulatory agencies. Table 3.9-2 lists the permits and authorizations required for the KIC and KCS pad expansions. These pad expansions fall within the operations of the Kuparuk Oil Field, existing permits and authorizations either already cover the pad expansion activities, or they would be modified to include the KIC and KCS pad expansions.

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EED Preparers

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Resource Descriptions ..... Lynn Noel
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Technical Review ..... Sue Ban

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Appendix A

KIC
Wetland Functional Assessment

Appendix A

KIC Wetland Functional Assessment

As an integral part of the environmental evaluation for the Kuparuk Industrial Center (KIC) pad expansion, ConocoPhillips Alaska, Inc. (CPAI) requested that Cardno ENTRIX evaluate the current functions of wetlands that would be filled by expansion of KIC to support on-going oil production within the Kuparuk Oil Field (Kuparuk). The functional assessment provides categorical rankings for wetland types in support of Clean Water Act (CWA) (33 USC § 1251 et seq. 1972) Section 404 wetland permit application and evaluation for applicability of compensatory mitigation. The KIC Project area established for this functional assessment includes about 311 acres (126 hectares [ha]) of wetlands and existing gravel fill within a 656-foot [ft] (200-meter [m]) buffer surrounding the KIC and proposed expansion footprint (Figure A-1).

A.1 Assessment Method

To evaluate wetland functions that could be affected by the proposed KIC Project, habitat and vegetation types for areas within 656 ft (200 m) of the proposed Project were compared to the National Wetland Inventory (NWI) classes mapped in the region by the U.S. Fish and Wildlife Service (USFWS 1985) and a cross-reference table was constructed following the methods developed by ABR, Inc.–Environmental Research and Services (ABR 2013a). Wetland functions by NWI classes were then evaluated by completing a *Waters and Wetland Functions Data Form* adapted for arctic wetlands by ABR, Inc. in consultation with the Alaska Regional U.S. Army Corps of Engineers (USACE, ABR 2013a). This assessment form relies on best professional judgment for evaluating 8 wetland functions for North Slope, Alaska, wetlands in order to determine functional categories for application to potential compensatory mitigation for wetland losses based on USACE Regulatory Guidance Letter (RGL 90-01, USACE 2011). Site-specific data were used to evaluate, wetland vegetation, hydrologic conditions, and wildlife use of wetland habitats within 656 ft (200 m) of the development footprint including KIC (Lawhead et al. 2013, Stickney et al. 2013, Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012).

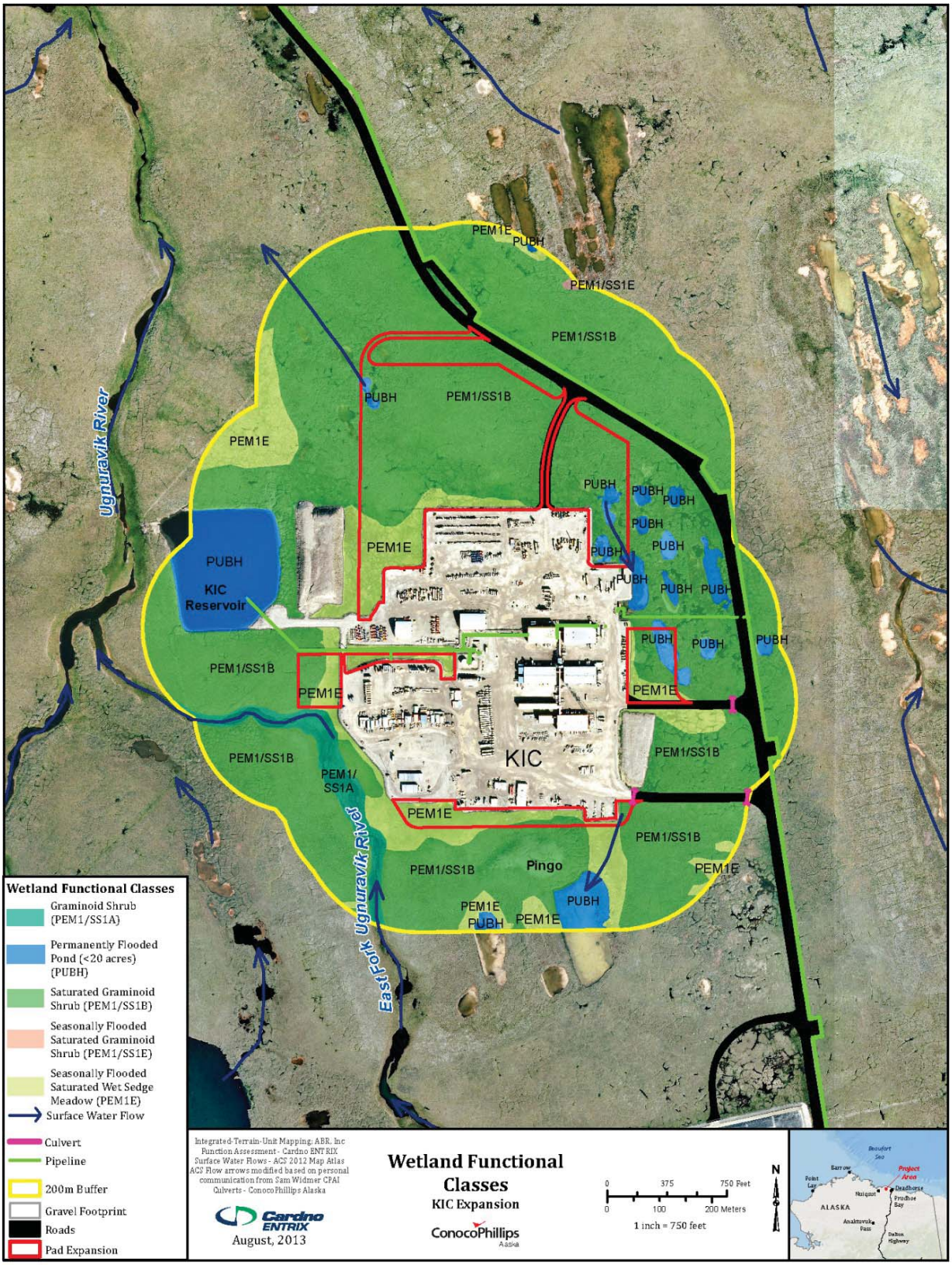

Figure A-1. KIC Expansion Project – Wetland Functional Classes

A.2 Assessment Results

A.2.1 KIC Project Area Wetland Functional Classes

Five wetland and waters functional classes were developed for the purpose of assessing wetland functions based on 10 habitats and 7 vegetation types that occur within 656 ft (200 m) of the KIC pad and expansion area (Table A-1). Some of the wetlands surrounding the KIC pad show signs of alteration due to gravel and dust spray from the pads and roads, themokarst, and increased moisture levels due to snow piling (Figure A-1). Barren habitats modified by gravel fill covering about 84 acres (34 ha) were considered uplands and were not evaluated for wetland function.

TABLE A-1. WETLAND FUNCTIONAL CLASSES IN THE KIC PROJECT AREA[1]

Wetland Functional Class	NWI Code	Habitat	Vegetation	Area (acres)	Area (hectare)
Wetlands					
Seasonally Flooded Saturated Wet Sedge Meadow	PEM1E	Human Modified	Wet Sedge Meadow Tundra	20.87	8.45
		Nonpatterned Wet Meadow	Wet Sedge Meadow Tundra	0.90	0.36
		Patterned Wet Meadow	Wet Sedge Meadow Tundra	6.86	2.78
Temporarily Flooded Graminoid Shrub	PEM1/SS1A	Riverine Complex	Riverine Complex	5.69	2.30
Seasonally Flooded Saturated Graminoid Shrub	PEM1/SS1E	Old Basin Wetland Complex	Old Basin Wetland Complex	0.16	0.06
Saturated Graminoid Shrub	PEM1/SS1B	Dry Dwarf Shrub	Dryas Dwarf Shrub Tundra	7.06	2.86
		Human Modified	Moist Sedge-Shrub Tundra	3.57	1.45
		Moist Sedge-Shrub Meadow	Moist Sedge-Shrub Tundra	112.10	45.36
		Moist Tussock Tundra	Tussock Tundra	51.42	20.81
Waters					
Permanently Flooded Pond (<20 acres)	PUBH	Human Modified	Fresh Water	10.32	4.18
		Shallow Open Water without Islands	Fresh Water	5.99	2.29
		Shallow Open Water with Islands or Polygonized Margins	Fresh Water	2.68	1.09
Non Wetland or Water					
Upland – Non wetland	U	Human Modified	Gravel Fill	83.77	33.56

[1] The KIC Project Areas is defined as a 656-foot (200-meter) buffer surrounding all proposed Project components and the KIC pad.
Sources: Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012, ABR 2013a, USFWS 1985 (Figure A-1).

A.2.2 Functional Class Characteristics

Of the five wetland and water functional classes occurring within 656 ft (200 m) of the KIC expansion area, two wetlands and one water would be directly impacted by gravel fill (Figure A-1, Table A-2). The Project area has moderate topographic relief ranging from highs of nearly 103 ft (31 m) on the overburden pile east of the KIC reservoir and 78 ft (24 m) on the pingo south of the KIC pad to a low of about 49 ft (15 m) next to the East Fork Ugnuravik River near the southwest corner of the pad. The KIC pad appears to slope from a high of nearly 62 ft (19 m)

in the northeast corner to a low of 55 feet (17 m) on the southwest corner. Drainage on the eastern side of KIC likely flows from the thaw ponds through the access road culverts through the ponds south of pad to the East Fork Ugnuravik River (Figure A-1). Drainage on the west side of KIC likely flows through low areas directly to the East Fork Ugnuravik River (Figure A-1). Drainage on the northwest corner appears to flow through low areas to the Ugnuravik River (Figure A-1).

TABLE A-2. ESTIMATED KIC PROJECT AREA AND EXPANSION FOOTPRINT BY WETLAND FUNCTIONAL CLASS

Wetland Functional Class	NWI Code	KIC PA (acre [hectare])	KIC PA (% of area)	Pad Expansion (acre [hectare])	Pad Expansion (% of area)
Wetlands					
Seasonally Flooded Saturated Wet Sedge Meadow	PEM1E	28.64 [11.59]	9%	10.24 [4.14]	3%
Temporarily Flooded Graminoid Shrub	PEM1/SS1A	5.69 [2.30]	2%	0	0%
Seasonally Flooded Saturated Graminoid Shrub	PEM1/SS1E	0.16 [0.06]	<1%	0	0%
Saturated Graminoid Shrub	PEM1/SS1B	174.15 [70.47]	56%	33.57 [13.58]	11%
Waters					
Permanently Flooded Pond (<20 acres)	PUBH	18.99 [7.55]	6%	1.71 [0.69]	1%

Note: KIC Project Area (PA) is 27% non-wetland – due to gravel fill. Part of the expansion area extents onto previous fill areas (2.29 acres, 0.93 hectares, 1% of Project area)
Sources: Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012, ABR 2013a, USFWS 1985

PEM1E – Seasonally Flooded Saturated Wet Sedge Meadow in the KIC Project area is primarily a mix of high- and low-centered polygonal patterned wet sedge meadow tundra that has been modified by the existing pad. Most of the remaining patterned wet sedge meadow is a mix of water tracks and low-centered, low-relief polygons. This wetland type is the second most common wetland covering about 9% of the Project area. About 73% of PEM1E surrounding KIC shows signs of thermokarst including wetter areas with some apparently enlarged thaw pits with standing water. The area in the northwest corner of the pad between the pad and the overburden stockpile shows signs of thermokarst.

PEM1/SS1A – Temporarily Flooded Graminoid Shrub in the KIC Project area is characterized by riverine complex along the beads of the East Fork Ugnuravik River. Riverine complex is characterized by a mosaic of water, fresh sedge or grass marsh, wet sedge meadow, and most sedge-shrub tundra. A small portion of this wetland class is intersected by the Project area covering about 2% of the Project area.

PEM1/SS1E – Seasonally Flooded Saturated Graminoid Shrub in the KIC Project area is composed of old basin wetland complex which is characterized by a mosaic of water, fresh sedge marsh, wet sedge meadow, moist sedge-shrub and tussock tundra vegetation. This wetland class is limited to the drained basin at the northern edge and covers less than 1% of the Project area.

PEM1/SS1B – Saturated Graminoid Shrub in the KIC Project area is a mix of mostly moist sedge-shrub tundra and tussock tundra vegetation in a mix of high- and low-centered, low-relief polygons. There is also a *Dryas* dwarf shrub tundra (2%) component on the pingo and high areas

on either side of the river in the southern portion of the Project area. This wetland type is by far the most common covering about 56% of the Project area. Similar to PEM1E, where this wetland class occurs next to KIC or the DS-1H access road, it shows signs of thermokarst

PUBH – Permanently Flooded Pond in the KIC Project area is characterized by shallow water bodies less than 20 acres (8.1 hectares) in size with unconsolidated silt bottom substrates. Some ponds may dry during the summer and all will freeze solid during the winter.

A.2.3 Summary of KIC Wetland Functions

All five classes were evaluated for site-specific wetland functions using the *Waters and Wetland Functions Data Form* questionnaire. Function ratings are summarized in Table A-3 and the ratings and rationale for each rating are presented in Figures A-2 through A-6.

Using the site-specific characteristics and functional evaluations each wetlands type was assigned an overall function category from I to IV:

- High Functioning Wetlands (Category I) are characterized as valuable high functioning wetlands that may be regionally rare, difficult to replace, and are generally less common than wetlands in other categories.

- High to Moderate Functioning Wetlands (Category II) are characterized as wetlands that may provide habitat for very sensitive or important wildlife or plants; be difficult to replace; or provide very high functions, particularly for wildlife.

- Moderate to Low Functioning Wetlands (Category III) are characterized as wetlands that can provide important functions and be important for a variety of wildlife; but these wetlands are generally less diverse than Category II wetlands.

- Degraded and Low-Functioning Wetlands (Category IV) are characterized as wetlands that are typically the smallest, often isolated with very little vegetation diversity, and generally already degraded by human activities.

Wetlands and waters were classified as Category II, when three or more of the eight functions were rated High. Wetlands and waters were classified as Category III when three or more of the eight functions were rated at least Moderate. Wetlands types encountered for this functional assessment are not generally considered rare or unique, and they area within the developed portion of Kuparuk so none were classified as Category I. In addition, wetland types for this functional assessment were not extensively degraded or considered low-functioning so none were classified as Category IV.

TABLE A-3. SITE-SPECIFIC WETLAND AND WATER FUNCTIONAL RANKINGS FOR WETLANDS WITHIN THE KIC PROJECT AREA

Wetland and Water Functional Class	Category	Flood Flow Regulation	Sediment, Nutrient, & Toxicant Removal	Erosion Control & Shoreline Stabilization	Organic Matter Production & Export	General Habitat Suitability	Fish Habitat	Educational, Scientific, Recreational, or Subsistence Use	Uniqueness & Special Status
Wetlands									
PEM1E	III	Mod	High	NA	Mod	Low	NA	Mod	Low
PEM1/SS1A	II	High	High	High	High	Mod	Mod	Mod	Low
PEM1/SS1E	III	Mod	High	High	NA	Mod	Low	Mod	Mod
PEM1/SS1B	III	Mod	Mod	High	NA	Mod	NA	Mod	Low
Waters									
PUBH	III	Mod	Mod	NA	NA	Mod	Low	Mod	Low

Sources: Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012, ABR 2013a, USFWS 1985

TABLE A-4. ESTIMATED KIC PROJECT AREA AND FOOTPRINT AREAS BY WETLAND AND WATER FUNCTIONAL VALUE

Wetland and Water Category	KIC PA (acre [hectare])	KIC PA (% of area)	Pad Expansion (acre [hectare])	Pad Expansion (% of area)
I – High Functioning Wetlands	0	0%	0	0%
II – High to Moderate Functioning Wetlands	5.69 [2.30]	2%	0	0%
III – Moderate to Low Functioning Wetlands	221.93 [89.68]	71%	45.52 [18.41]	15%
IV – Degraded and Low Functioning Wetlands	0	0%	0	0%
Totals	227.62 [91.98]	73%	45.52 [18.41]	15%

Note: KIC Project Area (PA) is 27% non-wetland – due to gravel fill.
Sources: Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012, ABR 2013a, USFWS 1985

Summary

Project: KIC Expansion	Date: August 26, 2013
Classification: Seasonally Flooded Saturated Wet Sedge Meadow	Assessed By: LEN
Cowardin Class: PEM1E	Wetland Size: 28.64 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – Mod	Flooding likely occurs during snow melt, human alteration caused thermokarst and drainage impoundment moderate function.
Sediment, Nutrient (N and P), Toxicant Removal	Y – High	Wetland receives gravel spray and leachates from existing gravel pad and roadway.
Erosion Control and Shoreline Stabilization	N – NA	No adjacent shorelines.
Organic Matter Production and Export	Y – Mod	Flooding during snow melt; reduction in vegetated mat near existing pad edge, thermokarst, and drainage impoundment moderate value of function.
General Habitat Suitability	Y – Low	Wetland is fragmented by existing disturbance and has low documented use by wildlife.
Fish Habitat	N – NA	No water accessible to fish
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope Villages, coast, or Colville River. Most subsistence use in region is focused on Colville River, this area would have no use for subsistence harvesters.
Uniqueness and Special Status	Y – Low	No documented ESA species in 19 years of surveys, no designated critical habitat. Wetland is patterned wet sedge with mixed high- and low-centered polygons. Location near existing pad edge, thermokarst, and drainage impoundment moderate value of function.

Figure A-2. KIC – Seasonally Flooded Saturated Wet Sedge Meadow (PEM1E) Evaluation – Summary.

Summary

Project: KIC Expansion	Date: September 4, 2013
Classification: Temporarily flooded Graminoid Shrub	Assessed By: LEN
Cowardin Class: PEM1/SS1A	Wetland Size: 5.69 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – High	Riverine complex wetland, well vegetated and flooded.
Sediment, Nutrient (N and P), Toxicant Removal	Y – High	Likely receives sediment, leachates from nearby development, well vegetated and experiences flooding.
Erosion Control and Shoreline Stabilization	Y – High	Well vegetated, includes stream shorelines.
Organic Matter Production and Export	Y – High	Next to stream channel, well vegetated and experiences flooding.
General Habitat Suitability	Y – Mod	Likely used by wildlife, but use may be moderated by nearby development.
Fish Habitat	Y – Mod	Connected to Ugnuravik River, ninespine stickleback native, arctic grayling introduced. Freezes in winter, but likely provides summer rearing habitat and passage.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope Villages, coast, or Colville River. Most subsistence use in region is focused on Colville River, this area would have no use for subsistence harvesters.
Uniqueness and Special Status	Y – Low	No documented ESA species in 19 years of surveys, no designated critical habitat.

Figure A-3. KIC – Temporarily Flooded Graminoid Shrub (PEM1/SS1A) Evaluation - Summary.

Summary

Project: KIC Expansion	Date: September 4, 2013
Classification: Seasonally Flooded Saturated Graminoid Shrub	Assessed By: LEN
Cowardin Class: PEM1/SS1E	Wetland Size: 0.16 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – Mod	Corner of drained lake basin, likely floods only during spring breakup.
Sediment, Nutrient (N and P), Toxicant Removal	Y – High	May receive some sediment and leachates from roads, well vegetated.
Erosion Control and Shoreline Stabilization	Y – High	Well vegetated to pond margin in old basin.
Organic Matter Production and Export	N – NA	Well vegetated but not likely flooded for export.
General Habitat Suitability	Y – Mod	Documented waterbird use of wetland just outside of the Project Area boundary, use may be moderated by traffic on nearby road.
Fish Habitat	N – Low	Shallow water freezes solid in winter, no apparent passage connection.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope Villages, coast, or Colville River. Most subsistence use in region is focused on Colville River, this area would have no use for subsistence harvesters.
Uniqueness and Special Status	Y – Mod	No documented ESA species in 19 years of surveys, no designated critical habitat. Wetland is within drained lake basin complex.

Figure A-4. KIC – Seasonally Flooded Saturated Graminoid Shrub (PEM1/SS1E) Evaluation – Summary.

Summary

Project: KIC Expansion	Date: August 26, 2013
Classification: Saturated Graminoid Shrub	Assessed By: LEN
Cowardin Class: PEM1/SS1B	Wetland Size: 174.15 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – Mod	Most common wetland type throughout area, well vegetated but not likely subject to frequent flooding, water stores as saturated soils.
Sediment, Nutrient (N and P), Toxicant Removal	Y – Mod	May provide some nutrient and toxicant removal from nearby development, not frequently flooded but well vegetated.
Erosion Control and Shoreline Stabilization	Y – High	Assessment is problematic as only part of pond shorelines are vegetated and no moderate function available.
Organic Matter Production and Export	N – NA	Not frequently flooded, no export of nutrients.
General Habitat Suitability	Y – Mod	Fragmented wetland with some evidence of wildlife use, disturbance from existing development likely moderates use by wildlife.
Fish Habitat	N – NA	Water in isolated thermokarst pits only.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope villages, coast or Colville River. Most subsistence use in region is focused along Colville River, this area does not likely have use for subsistence harvesters.
Uniqueness and Special Status	N – Low	No documented ESA species in 19 years of surveys, and no designated critical habitat. Wetland is mix of thaw pits and polygons and high-centered, low relief polygons.

Figure A-5. KIC – Saturated Graminoid Shrub (PEM1/SS1B) Evaluation – Summary.

Summary

Project: KIC Expansion — Date: August 26, 2013
Classification: Permanently Flooded Pond — Assessed By: LEN
Cowardin Class: PUBH — Wetland Size: 18.99 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – Mod	Permanently flooded ponds in ice-rich thaw basin, not likely flooded regularly, ponds show evidence of water level fluctuation – algal mats.
Sediment, Nutrient (N and P), Toxicant Removal	Y – Mod	Ponds may receive nutrients or toxicants from surrounding pad and road.
Erosion Control and Shoreline Stabilization	N – NA	Unvegetated water – function not applicable.
Organic Matter Production and Export	N – NA	Unvegetated water – function not applicable.
General Habitat Suitability	Y – Mod	Ponds used by waterfowl based on survey data, shorebird use also likely.
Fish Habitat	N – Low	Not considered fish habitat – no access from waterways, ponds are shallow and likely freeze solid over winter.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope Villages, coast or Colville River. Most subsistence use in the region is focused on the Colville Rivers, this area would have no use for subsistence harvesters.
Uniqueness and Special Status	N – Low	No documented ESA species use in 19 years of surveys, and no designated critical habitat. Waters are small, shallow, isolated thaw lakes.

Figure A-6. KIC – Permanently Flooded Pond (PUBH) Evaluation – Summary.

A.3 References

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A.4 Waters and Wetland Functions Data Forms

Waters and Wetland Functions Data Form-Alaska Regulatory Best Professional Judgment Characterization for North Slope, Alaska (Modified by ABR Inc. Feb. 2013)

Project: KIC Expansion Date: August 26, 2013

Classification: Seasonally Flooded Saturated Wet Sedge Meadow PM/RS: LEN

A. Flood Flow Regulation (Storage and Desynchronization): If waters proceed to statements 3 to 6 (Use N/A for item 1 and 2 and 7).	Wetland/water likely to perform function? Rating:
1. Wetland occurs in a zone with relatively deep active layers.	1. No
2. Wetland has a dense herbaceous or woody layer.	2. Yes
3. Wetland or water is capable of retaining much higher volumes of water during storm events than under normal rainfall conditions.	3. Yes
4. Wetland or water is a closed (depressional) system subject to flooding or shows evidence of flooding.	4. No
5. If flow-through, wetland or water has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	5. No
6. Wetland or water receives floodwater from an adjacent water course at least once every 10 years.	6. No
7. Floodwaters enter and flow through wetland predominantly as sheet flow rather than channel flow.	7. Yes
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
B. Sediment, Nutrient (N and P), Toxicant Removal: If waters consider statements 1 and 2.	Wetland/water likely to perform function? Rating:
1. Sediment, nutrients and/or toxicants (from tillage, mining, construction or other sources of pollution) appear to be or are likely to be entering the wetland or water.	1. Yes
2. Slow-moving or still water is present or occurs during flooding that happens at least once every 10 years.	2. Yes
3. Dense (>50% cover) herbaceous vegetation is present.	3. Yes
4. At least moderate interspersion of vegetation and water is present or occurs during flooding that happens at least once every 10 years.	4. Yes
5. Sediment deposits are present (evidence of deposition during floods).	5. Yes
6. Thick surface organic horizon and/or abundant fine organic litter is present.	6. Yes
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
C. Erosion Control and Shoreline Stabilization: Function only applicable for wetlands directly abutting permanent or relatively permanent waters	Wetland likely to perform function? Rating:
1. Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1. NA
2. Historical aerial photography (if available) indicates stable shoreline features.	2. NA
	1–2 attributes (Y)—High, None—Low Function
D. Organic Matter Production and Export: Function only applicable if wetland is flooded at least once every 10 years. Function is not applicable for unvegetated waters.	Wetland likely to perform function? Rating:
1. Wetland is flooded at least once every 10 years. If no, proceed no further, wetland is low functioning.	1. Yes
2. Wetland has at least 30% cover of herbaceous vegetation.	2. Yes
3. Woody plants in wetland are mostly deciduous.	3. Yes
4. High degree of plant community structure, vegetation density, and species richness present.	4. No
5. Interspersion of vegetation and water is at least moderate.	5. No
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low

E. General Habitat Suitability: Only complete first three for waters.	Wetland likely to perform function? Rating:
1. Wetland or water is not fragmented.	1. No
2. Area surrounding wetland or water is undisturbed.	2. No
3. Evidence of wildlife use (e.g., nests, tracks, scat, gnawed stumps, survey data) is present. Waters only high functioning if wildlife survey or direct observation data are available.	3. Yes
4. Plant community has two or more strata, with at least two of those strata having >10% total cover.	4. No
5. Wetland has at least a moderate degree of Cowardin Class interspersion.	5. No
6. Diversity (evenness of cover) of plant species is moderately high (≥ 5 species with at least 10% cover each).	6. No
	Waters: 3 attributes (Y) – High, 2 attributes (Y) – Moderate, 1 attributes (Y) Low **Wetlands**: 5–6 attributes (Y)—High, 2–4 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
F. Fish Habitat: Function only applicable if a water or if wetland has perennial or intermittent surface water connection to a fish bearing water body.	Wetland likely to perform function? Rating:
1. Wetland or water has sufficient size and depth of open water so as not to freeze completely during winter.	1. NA
2. Fish are present.	2. NA
3. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	3. NA
4. Spawning areas are present (aquatic vegetation and/or gravel beds.	4. NA
5. Juvenile rest areas present (e.g. pools with organic debris or overhanging vegetation).	5. NA
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low Function
G. Educational, Scientific, Recreational, or Subsistence Use	Wetland likely to perform function? Rating:
1. Site has documented scientific or educational use.	1. No
2. Wetland or water is in public ownership.	2. Yes
3. Accessible trails are available.	3. No
4. Wetland or water supports subsistence activities (e.g., hunting, fishing, berry picking).	4. No
	3–4 attributes (Y)—High, 1–2 attribute (Y)—Moderate, 0 attributes (Y)—Low
H. Uniqueness and Special Status	Wetland likely to perform function? Rating:
1. Wetland or water contains documented occurrence of a state or federally listed threatened or endangered species. *If yes, wetland is high functioning.*	1. No
2. Wetland or water contains documented critical habitat, high quality ecosystems, or priority species, respectively designated by the U.S. Fish and Wildlife Service	2. No
3. Wetland or water has biological, geological, or other features that are determined to be rare.	3. No
4. Wetland or water has been determined significant because it provides functions scarce for the area.	4. No
5. Wetland complex contains one or more of the following habitats 1) Tall shrub habitat (>.5ft in height) dominated by *Salix* spp. 2) Aquatic herb habitat dominated by *Arctophila fulva*. 3) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins 4) Anadromous fish overwintering habitat 5) Patterned wet sedge meadow and low center polygons 6) High center polygon complex 7) Riverine coastal mudflats 8) Non-patterned wet meadow adjacent to streams and river bluffs.	5. No ≥ 2 attributes (Y)—High, 1 attribute (Y)—Moderate, None—Low

Summary

Project: KIC Expansion
Date: August 26, 2013
Classification: Seasonally Flooded Saturated Wet Sedge Meadow
Assessed By: LEN
Cowardin Class: PEM1E
Wetland Size: 28.64 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – Mod	Flooding likely occurs during snow melt, human alteration caused thermokarst and drainage impoundment moderate function.
Sediment, Nutrient (N and P), Toxicant Removal	Y – High	Wetland receives gravel spray and leachates from existing gravel pad and roadway.
Erosion Control and Shoreline Stabilization	N – NA	No adjacent shorelines.
Organic Matter Production and Export	Y – Mod	Flooding during snow melt; reduction in vegetated mat near existing pad edge, thermokarst, and drainage impoundment moderate value of function.
General Habitat Suitability	Y – Low	Wetland is fragmented by existing disturbance and has low documented use by wildlife.
Fish Habitat	N – NA	No water accessible to fish
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope Villages, coast, or Colville River. Most subsistence use in region is focused on Colville River, this area would have no use for subsistence harvesters.
Uniqueness and Special Status	Y – Low	No documented ESA species in 19 years of surveys, no designated critical habitat. Wetland is patterned wet sedge with mixed high- and low-centered polygons. Location near existing pad edge, thermokarst, and drainage impoundment moderate value of function.

Waters and Wetland Functions Data Form-Alaska Regulatory Best Professional Judgment Characterization for North Slope, Alaska (Modified by ABR Inc. Feb. 2013)

Project: KIC Expansion — Date: September 4, 2013

Classification: Temporarily Flooded Graminoid shrub — PM/RS: LEN

A. Flood Flow Regulation (Storage and Desynchronization): If waters proceed to statements 3 to 6 (Use N/A for item 1 and 2 and 7).	Wetland/water likely to perform function? Rating:
1. Wetland occurs in a zone with relatively deep active layers.	1. Yes
2. Wetland has a dense herbaceous or woody layer.	2. Yes
3. Wetland or water is capable of retaining much higher volumes of water during storm events than under normal rainfall conditions.	3. Yes
4. Wetland or water is a closed (depressional) system subject to flooding or shows evidence of flooding.	4. No
5. If flow-through, wetland or water has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	5. Yes
6. Wetland or water receives floodwater from an adjacent water course at least once every 10 years.	6. Yes
7. Floodwaters enter and flow through wetland predominantly as sheet flow rather than channel flow.	7. No
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
B. Sediment, Nutrient (N and P), Toxicant Removal: If waters consider statements 1 and 2.	Wetland/water likely to perform function? Rating:
1. Sediment, nutrients and/or toxicants (from tillage, mining, construction or other sources of pollution) appear to be or are likely to be entering the wetland or water.	1. Yes
2. Slow-moving or still water is present or occurs during flooding that happens at least once every 10 years.	2. Yes
3. Dense (>50% cover) herbaceous vegetation is present.	3. Yes
4. At least moderate interspersion of vegetation and water is present or occurs during flooding that happens at least once every 10 years.	4. Yes
5. Sediment deposits are present (evidence of deposition during floods).	5. Yes
6. Thick surface organic horizon and/or abundant fine organic litter is present.	6. No
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
C. Erosion Control and Shoreline Stabilization: Function only applicable for wetlands directly abutting permanent or relatively permanent waters	Wetland likely to perform function? Rating:
1. Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1. Yes
2. Historical aerial photography (if available) indicates stable shoreline features.	2. NA
	1–2 attributes (Y)—High, None—Low Function
D. Organic Matter Production and Export: Function only applicable if wetland is flooded at least once every 10 years. Function is not applicable for unvegetated waters.	Wetland likely to perform function? Rating:
1. Wetland is flooded at least once every 10 years. If no, proceed no further, wetland is low functioning.	1. Yes
2. Wetland has at least 30% cover of herbaceous vegetation.	2. Yes
3. Woody plants in wetland are mostly deciduous.	3. Yes
4. High degree of plant community structure, vegetation density, and species richness present.	4. No
5. Interspersion of vegetation and water is at least moderate.	5. Yes
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low

E. General Habitat Suitability: Only complete first three for waters.	Wetland likely to perform function? Rating:
1. Wetland or water is not fragmented.	1. No
2. Area surrounding wetland or water is undisturbed.	2. No
3. Evidence of wildlife use (e.g., nests, tracks, scat, gnawed stumps, survey data) is present. Waters only high functioning if wildlife survey or direct observation data are available.	3. Yes
4. Plant community has two or more strata, with at least two of those strata having >10% total cover.	4. No
5. Wetland has at least a moderate degree of Cowardin Class interspersion.	5. Yes
6. Diversity (evenness of cover) of plant species is moderately high (≥ 5 species with at least 10% cover each).	6. No
	Waters: 3 attributes (Y) – High, 2 attributes (Y) – Moderate, 1 attributes (Y) Low **Wetlands**: 5–6 attributes (Y)—High, 2–4 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
F. Fish Habitat: Function only applicable if a water or if wetland has perennial or intermittent surface water connection to a fish bearing water body.	Wetland likely to perform function? Rating:
1. Wetland or water has sufficient size and depth of open water so as not to freeze completely during winter.	1. No
2. Fish are present.	2. Yes
3. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	3. Yes
4. Spawning areas are present (aquatic vegetation and/or gravel beds.	4. No
5. Juvenile rest areas present (e.g. pools with organic debris or overhanging vegetation).	5. Yes
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low Function
G. Educational, Scientific, Recreational, or Subsistence Use	Wetland likely to perform function? Rating:
1. Site has documented scientific or educational use.	1. No
2. Wetland or water is in public ownership.	2. Yes
3. Accessible trails are available.	3. No
4. Wetland or water supports subsistence activities (e.g., hunting, fishing, berry picking).	4. No
	3–4 attributes (Y)—High, 1–2 attribute (Y)—Moderate, 0 attributes (Y)—Low
H. Uniqueness and Special Status	Wetland likely to perform function? Rating:
1. Wetland or water contains documented occurrence of a state or federally listed threatened or endangered species. *If yes, wetland is high functioning.*	1. No
2. Wetland or water contains documented critical habitat, high quality ecosystems, or priority species, respectively designated by the U.S. Fish and Wildlife Service	2. No
3. Wetland or water has biological, geological, or other features that are determined to be rare.	3. No
4. Wetland or water has been determined significant because it provides functions scarce for the area.	4. No
5. Wetland complex contains one or more of the following habitats 1) Tall shrub habitat (>.5ft in height) dominated by *Salix* spp. 2) Aquatic herb habitat dominated by *Arctophila fulva*. 3) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins 4) Anadromous fish overwintering habitat 5) Patterned wet sedge meadow and low center polygons 6) High center polygon complex 7) Riverine coastal mudflats 8) Non-patterned wet meadow adjacent to streams and river bluffs.	5. No
	≥ 2 attributes (Y)—High, 1 attribute (Y)—Moderate, None—Low

Summary

Project: KIC Expansion | Date: September 4, 2013
Classification: Temporarily flooded Graminoid Shrub | Assessed By: LEN
Cowardin Class: PEM1/SS1A | Wetland Size: 5.69 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – High	Riverine complex wetland, well vegetated and flooded.
Sediment, Nutrient (N and P), Toxicant Removal	Y – High	Likely receives sediment, leachates from nearby development, well vegetated and experiences flooding.
Erosion Control and Shoreline Stabilization	Y – High	Well vegetated, includes stream shorelines.
Organic Matter Production and Export	Y – High	Next to stream channel, well vegetated and experiences flooding.
General Habitat Suitability	Y – Mod	Likely used by wildlife, but use may be moderated by nearby development.
Fish Habitat	Y – Mod	Connected to Ugnuravik River, ninespine stickleback native, arctic grayling introduced. Freezes in winter, but likely provides summer rearing habitat and passage.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope Villages, coast, or Colville River. Most subsistence use in region is focused on Colville River, this area would have no use for subsistence harvesters.
Uniqueness and Special Status	Y – Low	No documented ESA species in 19 years of surveys, no designated critical habitat.

Waters and Wetland Functions Data Form-Alaska Regulatory Best Professional Judgment Characterization for North Slope, Alaska (Modified by ABR Inc. Feb. 2013)

Project: KIC Expansion — Date: September 4, 2013

Classification: Seasonally Flooded Saturated Graminoid Shrub — PM/RS: LEN

A. Flood Flow Regulation (Storage and Desynchronization): If waters proceed to statements 3 to 6 (Use N/A for item 1 and 2 and 7).	Wetland/water likely to perform function? Rating:
1. Wetland occurs in a zone with relatively deep active layers.	1. No
2. Wetland has a dense herbaceous or woody layer.	2. Yes
3. Wetland or water is capable of retaining much higher volumes of water during storm events than under normal rainfall conditions.	3. Yes
4. Wetland or water is a closed (depressional) system subject to flooding or shows evidence of flooding.	4. No
5. If flow-through, wetland or water has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	5. No
6. Wetland or water receives floodwater from an adjacent water course at least once every 10 years.	6. No
7. Floodwaters enter and flow through wetland predominantly as sheet flow rather than channel flow.	7. Yes
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
B. Sediment, Nutrient (N and P), Toxicant Removal: If waters consider statements 1 and 2.	Wetland/water likely to perform function? Rating:
1. Sediment, nutrients and/or toxicants (from tillage, mining, construction or other sources of pollution) appear to be or are likely to be entering the wetland or water.	1. Yes
2. Slow-moving or still water is present or occurs during flooding that happens at least once every 10 years.	2. Yes
3. Dense (>50% cover) herbaceous vegetation is present.	3. Yes
4. At least moderate interspersion of vegetation and water is present or occurs during flooding that happens at least once every 10 years.	4. Yes
5. Sediment deposits are present (evidence of deposition during floods).	5. No
6. Thick surface organic horizon and/or abundant fine organic litter is present.	6. No
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
C. Erosion Control and Shoreline Stabilization: Function only applicable for wetlands directly abutting permanent or relatively permanent waters	Wetland likely to perform function? Rating:
1. Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1. Yes
2. Historical aerial photography (if available) indicates stable shoreline features.	2. NA
	1–2 attributes (Y)—High, None—Low Function
D. Organic Matter Production and Export: Function only applicable if wetland is flooded at least once every 10 years. Function is not applicable for unvegetated waters.	Wetland likely to perform function? Rating:
1. Wetland is flooded at least once every 10 years. If no, proceed no further, wetland is low functioning.	1. No
2. Wetland has at least 30% cover of herbaceous vegetation.	2. NA
3. Woody plants in wetland are mostly deciduous.	3. NA
4. High degree of plant community structure, vegetation density, and species richness present.	4. NA
5. Interspersion of vegetation and water is at least moderate.	5. NA
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low

E. General Habitat Suitability: Only complete first three for waters.	Wetland likely to perform function? Rating:
1. Wetland or water is not fragmented.	1. Yes
2. Area surrounding wetland or water is undisturbed.	2. No
3. Evidence of wildlife use (e.g., nests, tracks, scat, gnawed stumps, survey data) is present. Waters only high functioning if wildlife survey or direct observation data are available.	3. Yes
4. Plant community has two or more strata, with at least two of those strata having >10% total cover.	4. Yes
5. Wetland has at least a moderate degree of Cowardin Class interspersion.	5. Yes
6. Diversity (evenness of cover) of plant species is moderately high (≥ 5 species with at least 10% cover each).	6. No
	Waters: 3 attributes (Y) – High, 2 attributes (Y) – Moderate, 1 attributes (Y) Low **Wetlands**: 5–6 attributes (Y)—High, 2–4 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
F. Fish Habitat: Function only applicable if a water or if wetland has perennial or intermittent surface water connection to a fish bearing water body.	Wetland likely to perform function? Rating:
1. Wetland or water has sufficient size and depth of open water so as not to freeze completely during winter.	1. No
2. Fish are present.	2. No
3. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	3. No
4. Spawning areas are present (aquatic vegetation and/or gravel beds.	4. No
5. Juvenile rest areas present (e.g. pools with organic debris or overhanging vegetation).	5. No
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low Function
G. Educational, Scientific, Recreational, or Subsistence Use	Wetland likely to perform function? Rating:
1. Site has documented scientific or educational use.	1. No
2. Wetland or water is in public ownership.	2. Yes
3. Accessible trails are available.	3. No
4. Wetland or water supports subsistence activities (e.g., hunting, fishing, berry picking).	4. No
	3–4 attributes (Y)—High, 1–2 attribute (Y)—Moderate, 0 attributes (Y)—Low
H. Uniqueness and Special Status	Wetland likely to perform function? Rating:
1. Wetland or water contains documented occurrence of a state or federally listed threatened or endangered species. *If yes, wetland is high functioning.*	1. No
2. Wetland or water contains documented critical habitat, high quality ecosystems, or priority species, respectively designated by the U.S. Fish and Wildlife Service	2. No
3. Wetland or water has biological, geological, or other features that are determined to be rare.	3. No
4. Wetland or water has been determined significant because it provides functions scarce for the area.	4. No
5. Wetland complex contains one or more of the following habitats 1) Tall shrub habitat (>.5ft in height) dominated by *Salix* spp. 2) Aquatic herb habitat dominated by *Arctophila fulva*. 3) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins 4) Anadromous fish overwintering habitat 5) Patterned wet sedge meadow and low center polygons 6) High center polygon complex 7) Riverine coastal mudflats 8) Non-patterned wet meadow adjacent to streams and river bluffs.	5. Yes ≥ 2 attributes (Y)—High, 1 attribute (Y)—Moderate, None—Low

Summary

Project: KIC Expansion | Date: September 4, 2013
Classification: Seasonally Flooded Saturated Graminoid Shrub | Assessed By: LEN
Cowardin Class: PEM1/SS1E | Wetland Size: 0.16 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – Mod	Corner of drained lake basin, likely floods only during spring breakup.
Sediment, Nutrient (N and P), Toxicant Removal	Y – High	May receive some sediment and leachates from roads, well vegetated.
Erosion Control and Shoreline Stabilization	Y – High	Well vegetated to pond margin in old basin.
Organic Matter Production and Export	N – NA	Well vegetated but not likely flooded for export.
General Habitat Suitability	Y – Mod	Documented waterbird use of wetland just outside of the Project Area boundary, use may be moderated by traffic on nearby road.
Fish Habitat	N – Low	Shallow water freezes solid in winter, no apparent passage connection.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope Villages, coast, or Colville River. Most subsistence use in region is focused on Colville River, this area would have no use for subsistence harvesters.
Uniqueness and Special Status	Y – Mod	No documented ESA species in 19 years of surveys, no designated critical habitat. Wetland is within drained lake basin complex.

Waters and Wetland Functions Data Form-Alaska Regulatory Best Professional Judgment Characterization for North Slope, Alaska (Modified by ABR Inc. Feb. 2013)

Project: KIC Expansion | Date: August 26, 2013

Classification: Saturated Graminoid Shrub | PM/RS: LEN

A. Flood Flow Regulation (Storage and Desynchronization): If waters proceed to statements 3 to 6 (Use N/A for item 1 and 2 and 7).	Wetland/water likely to perform function? Rating:
1. Wetland occurs in a zone with relatively deep active layers.	1. No
2. Wetland has a dense herbaceous or woody layer.	2. Yes
3. Wetland or water is capable of retaining much higher volumes of water during storm events than under normal rainfall conditions.	3. Yes
4. Wetland or water is a closed (depressional) system subject to flooding or shows evidence of flooding.	4. No
5. If flow-through, wetland or water has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	5. No
6. Wetland or water receives floodwater from an adjacent water course at least once every 10 years.	6. No
7. Floodwaters enter and flow through wetland predominantly as sheet flow rather than channel flow.	7. No
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
B. Sediment, Nutrient (N and P), Toxicant Removal: If waters consider statements 1 and 2.	Wetland/water likely to perform function? Rating:
1. Sediment, nutrients and/or toxicants (from tillage, mining, construction or other sources of pollution) appear to be or are likely to be entering the wetland or water.	1. Yes
2. Slow-moving or still water is present or occurs during flooding that happens at least once every 10 years.	2. Yes
3. Dense (>50% cover) herbaceous vegetation is present.	3. No
4. At least moderate interspersion of vegetation and water is present or occurs during flooding that happens at least once every 10 years.	4. Yes
5. Sediment deposits are present (evidence of deposition during floods).	5. No
6. Thick surface organic horizon and/or abundant fine organic litter is present.	6. No
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
C. Erosion Control and Shoreline Stabilization: Function only applicable for wetlands directly abutting permanent or relatively permanent waters	Wetland likely to perform function? Rating:
1. Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1. Yes
2. Historical aerial photography (if available) indicates stable shoreline features.	2. NA
	1–2 attributes (Y)—High, None—Low Function
D. Organic Matter Production and Export: Function only applicable if wetland is flooded at least once every 10 years. Function is not applicable for unvegetated waters.	Wetland likely to perform function? Rating:
1. Wetland is flooded at least once every 10 years. If no, proceed no further, wetland is low functioning.	1. No
2. Wetland has at least 30% cover of herbaceous vegetation.	2. NA
3. Woody plants in wetland are mostly deciduous.	3. NA
4. High degree of plant community structure, vegetation density, and species richness present.	4. NA
5. Interspersion of vegetation and water is at least moderate.	5. NA
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low

E. General Habitat Suitability: Only complete first three for waters.	Wetland likely to perform function? Rating:
1. Wetland or water is not fragmented.	1. No
2. Area surrounding wetland or water is undisturbed.	2. No
3. Evidence of wildlife use (e.g., nests, tracks, scat, gnawed stumps, survey data) is present. Waters only high functioning if wildlife survey or direct observation data are available.	3. Yes
4. Plant community has two or more strata, with at least two of those strata having >10% total cover.	4. Yes
5. Wetland has at least a moderate degree of Cowardin Class interspersion.	5. Yes
6. Diversity (evenness of cover) of plant species is moderately high (≥ 5 species with at least 10% cover each).	6. No
	Waters: 3 attributes (Y) – High, 2 attributes (Y) – Moderate, 1 attributes (Y) Low **Wetlands**: 5–6 attributes (Y)—High, 2–4 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
F. Fish Habitat: Function only applicable if a water or if wetland has perennial or intermittent surface water connection to a fish bearing water body.	Wetland likely to perform function? Rating:
1. Wetland or water has sufficient size and depth of open water so as not to freeze completely during winter.	1. NA
2. Fish are present.	2. NA
3. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	3. NA
4. Spawning areas are present (aquatic vegetation and/or gravel beds.	4. NA
5. Juvenile rest areas present (e.g. pools with organic debris or overhanging vegetation).	5. NA
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low Function
G. Educational, Scientific, Recreational, or Subsistence Use	Wetland likely to perform function? Rating:
1. Site has documented scientific or educational use.	1. No
2. Wetland or water is in public ownership.	2. Yes
3. Accessible trails are available.	3. No
4. Wetland or water supports subsistence activities (e.g., hunting, fishing, berry picking).	4. No
	3–4 attributes (Y)—High, 1–2 attribute (Y)—Moderate, 0 attributes (Y)—Low
H. Uniqueness and Special Status	Wetland likely to perform function? Rating:
1. Wetland or water contains documented occurrence of a state or federally listed threatened or endangered species. *If yes, wetland is high functioning.*	1. No
2. Wetland or water contains documented critical habitat, high quality ecosystems, or priority species, respectively designated by the U.S. Fish and Wildlife Service	2. No
3. Wetland or water has biological, geological, or other features that are determined to be rare.	3. No
4. Wetland or water has been determined significant because it provides functions scarce for the area.	4. No
5. Wetland complex contains one or more of the following habitats 1) Tall shrub habitat (>.5ft in height) dominated by *Salix* spp. 2) Aquatic herb habitat dominated by *Arctophila fulva*. 3) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins 4) Anadromous fish overwintering habitat 5) Patterned wet sedge meadow and low center polygons 6) High center polygon complex 7) Riverine coastal mudflats 8) Non-patterned wet meadow adjacent to streams and river bluffs.	5. No
	≥ 2 attributes (Y)—High, 1 attribute (Y)—Moderate, None—Low

Summary

Project: KIC Expansion | Date: August 26, 2013
Classification: Saturated Graminoid Shrub | Assessed By: LEN
Cowardin Class: PEM1/SS1B | Wetland Size: 174.15 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – Mod	Most common wetland type throughout area, well vegetated but not likely subject to frequent flooding, water stores as saturated soils.
Sediment, Nutrient (N and P), Toxicant Removal	Y – Mod	May provide some nutrient and toxicant removal from nearby development, not frequently flooded but well vegetated.
Erosion Control and Shoreline Stabilization	Y – High	Assessment is problematic as only part of pond shorelines are vegetated and no moderate function available.
Organic Matter Production and Export	N – NA	Not frequently flooded, no export of nutrients.
General Habitat Suitability	Y – Mod	Fragmented wetland with some evidence of wildlife use, disturbance from existing development likely moderates use by wildlife.
Fish Habitat	N – NA	Water in isolated thermokarst pits only.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope villages, coast or Colville River. Most subsistence use in region is focused along Colville River, this area does not likely have use for subsistence harvesters.
Uniqueness and Special Status	N – Low	No documented ESA species in 19 years of surveys, and no designated critical habitat. Wetland is mix of thaw pits and polygons and high-centered, low relief polygons.

Waters and Wetland Functions Data Form-Alaska Regulatory Best Professional Judgment Characterization for North Slope, Alaska (Modified by ABR Inc. Feb. 2013)

Project: KIC Expansion — Date: August 26, 2013

Classification: Permanently Flooded Pond — PM/RS: LEN

A. Flood Flow Regulation (Storage and Desynchronization): If waters proceed to statements 3 to 6 (Use N/A for item 1 and 2 and 7).	Wetland/water likely to perform function? Rating:
1. Wetland occurs in a zone with relatively deep active layers.	1. NA
2. Wetland has a dense herbaceous or woody layer.	2. NA
3. Wetland or water is capable of retaining much higher volumes of water during storm events than under normal rainfall conditions.	3. Yes
4. Wetland or water is a closed (depressional) system subject to flooding or shows evidence of flooding.	4. No
5. If flow-through, wetland or water has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	5. Yes
6. Wetland or water receives floodwater from an adjacent water course at least once every 10 years.	6. No
7. Floodwaters enter and flow through wetland predominantly as sheet flow rather than channel flow.	7. NA
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
B. Sediment, Nutrient (N and P), Toxicant Removal: If waters consider statements 1 and 2.	Wetland/water likely to perform function? Rating:
1. Sediment, nutrients and/or toxicants (from tillage, mining, construction or other sources of pollution) appear to be or are likely to be entering the wetland or water.	1. Yes
2. Slow-moving or still water is present or occurs during flooding that happens at least once every 10 years.	2. Yes
3. Dense (>50% cover) herbaceous vegetation is present.	3. NA
4. At least moderate interspersion of vegetation and water is present or occurs during flooding that happens at least once every 10 years.	4. NA
5. Sediment deposits are present (evidence of deposition during floods).	5. NA
6. Thick surface organic horizon and/or abundant fine organic litter is present.	6. NA
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
C. Erosion Control and Shoreline Stabilization: Function only applicable for wetlands directly abutting permanent or relatively permanent waters	Wetland likely to perform function? Rating:
1. Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1. NA
2. Historical aerial photography (if available) indicates stable shoreline features.	2. NA
	1–2 attributes (Y)—High, None—Low Function
D. Organic Matter Production and Export: Function only applicable if wetland is flooded at least once every 10 years. Function is not applicable for unvegetated waters.	Wetland likely to perform function? Rating:
1. Wetland is flooded at least once every 10 years. If no, proceed no further, wetland is low functioning.	1. NA
2. Wetland has at least 30% cover of herbaceous vegetation.	2. NA
3. Woody plants in wetland are mostly deciduous.	3. NA
4. High degree of plant community structure, vegetation density, and species richness present.	4. NA
5. Interspersion of vegetation and water is at least moderate.	5. NA
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low

E. General Habitat Suitability: Only complete first three for waters.	Wetland likely to perform function? Rating:
1. Wetland or water is not fragmented.	1. Yes
2. Area surrounding wetland or water is undisturbed.	2. No
3. Evidence of wildlife use (e.g., nests, tracks, scat, gnawed stumps, survey data) is present. Waters only high functioning if wildlife survey or direct observation data are available.	3. Yes
4. Plant community has two or more strata, with at least two of those strata having >10% total cover.	4. NA
5. Wetland has at least a moderate degree of Cowardin Class interspersion.	5. NA
6. Diversity (evenness of cover) of plant species is moderately high (≥ 5 species with at least 10% cover each).	6. NA
	Waters: 3 attributes (Y) – High, 2 attributes (Y) – Moderate, 1 attributes (Y) Low **Wetlands**: 5–6 attributes (Y)—High, 2–4 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
F. Fish Habitat: Function only applicable if a water or if wetland has perennial or intermittent surface water connection to a fish bearing water body.	Wetland likely to perform function? Rating:
1. Wetland or water has sufficient size and depth of open water so as not to freeze completely during winter.	1. No
2. Fish are present.	2. No
3. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	3. NA
4. Spawning areas are present (aquatic vegetation and/or gravel beds.	4. No
5. Juvenile rest areas present (e.g. pools with organic debris or overhanging vegetation).	5. NA
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low Function
G. Educational, Scientific, Recreational, or Subsistence Use	Wetland likely to perform function? Rating:
1. Site has documented scientific or educational use.	1. No
2. Wetland or water is in public ownership.	2. Yes
3. Accessible trails are available.	3. No
4. Wetland or water supports subsistence activities (e.g., hunting, fishing, berry picking).	4. No
	3–4 attributes (Y)—High, 1–2 attribute (Y)—Moderate, 0 attributes (Y)—Low
H. Uniqueness and Special Status	Wetland likely to perform function? Rating:
1. Wetland or water contains documented occurrence of a state or federally listed threatened or endangered species. *If yes, wetland is high functioning.*	1. No
2. Wetland or water contains documented critical habitat, high quality ecosystems, or priority species, respectively designated by the U.S. Fish and Wildlife Service	2. No
3. Wetland or water has biological, geological, or other features that are determined to be rare.	3. No
4. Wetland or water has been determined significant because it provides functions scarce for the area.	4. No
5. Wetland complex contains one or more of the following habitats 1) Tall shrub habitat (>.5ft in height) dominated by *Salix* spp. 2) Aquatic herb habitat dominated by *Arctophila fulva*. 3) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins 4) Anadromous fish overwintering habitat 5) Patterned wet sedge meadow and low center polygons 6) High center polygon complex 7) Riverine coastal mudflats 8) Non-patterned wet meadow adjacent to streams and river bluffs.	5. No ≥ 2 attributes (Y)—High, 1 attribute (Y)—Moderate, None—Low

Summary

Project: KIC Expansion Date: August 26, 2013
Classification: Permanently Flooded Pond Assessed By: LEN
Cowardin Class: PUBH Wetland Size: 18.99 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – Mod	Permanently flooded ponds in ice-rich thaw basin, not likely flooded regularly, ponds show evidence of water level fluctuation – algal mats.
Sediment, Nutrient (N and P), Toxicant Removal	Y – Mod	Ponds may receive nutrients or toxicants from surrounding pad and road.
Erosion Control and Shoreline Stabilization	N – NA	Unvegetated water – function not applicable.
Organic Matter Production and Export	N – NA	Unvegetated water – function not applicable.
General Habitat Suitability	Y – Mod	Ponds used by waterfowl based on survey data, shorebird use also likely.
Fish Habitat	N – Low	Not considered fish habitat – no access from waterways, ponds are shallow and likely freeze solid over winter.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope Villages, coast or Colville River. Most subsistence use in the region is focused on the Colville Rivers, this area would have no use for subsistence harvesters.
Uniqueness and Special Status	N – Low	No documented ESA species use in 19 years of surveys, and no designated critical habitat. Waters are small, shallow, isolated thaw lakes.

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Appendix B

KCS Wetland Functional Assessment

Appendix B

KCS Wetland Functional Assessment

As an integral part of the environmental evaluation for the Kuparuk Construction Services (KCS) pad expansion, ConocoPhillips Alaska, Inc. (CPAI) requested that Cardno ENTRIX evaluate the current functions of wetlands that would be filled by expansion of KCS to support on-going oil productions within the Kuparuk Oil Field (Kuparuk). The functional assessment provides categorical rankings for wetland types in support of Clean Water Act (CWA) (33 USC § 1251 et seq. 1972) Section 404 wetland permit application and evaluation for applicability of compensatory mitigation. The KCS Project area established for this functional assessment includes about 200 acres (81 hectares [ha]) of wetlands and existing gravel fill within a 656-foot [ft] (200-meter [m]) buffer surrounding the KCS pad and proposed expansion area footprint (Figure B-1).

B.1 Assessment Method

To evaluate wetland functions that could be affected by the proposed KCS Project, habitat and vegetation types for areas within 656 ft (200 m) of the proposed Project were compared to the National Wetland Inventory (NWI) classes mapped in the region by the U.S. Fish and Wildlife Service (USFWS 1985) and a cross-reference table was constructed following the methods developed by ABR, Inc.–Environmental Research and Services (ABR 2013a). Wetland functions by NWI classes were then evaluated by completing a *Waters and Wetland Functions Data Form* adapted for arctic wetlands by ABR, Inc. in consultation with the Alaska Regional U.S. Army Corps of Engineers (USACE, ABR 2013a). This assessment form relies on best professional judgment for evaluating eight wetland functions for North Slope, Alaska, wetlands in order to determine functional categories for application to potential compensatory mitigation for wetland losses based on USACE Regulatory Guidance Letter (RGL 90-01, USACE 2011). Site-specific data were used to evaluate, wetland vegetation, hydrologic conditions, and wildlife use of wetland habitats within 656 ft (200 m) of the development footprint including KCS (Lawhead et al. 2013, Stickney et al. 2013, Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012).

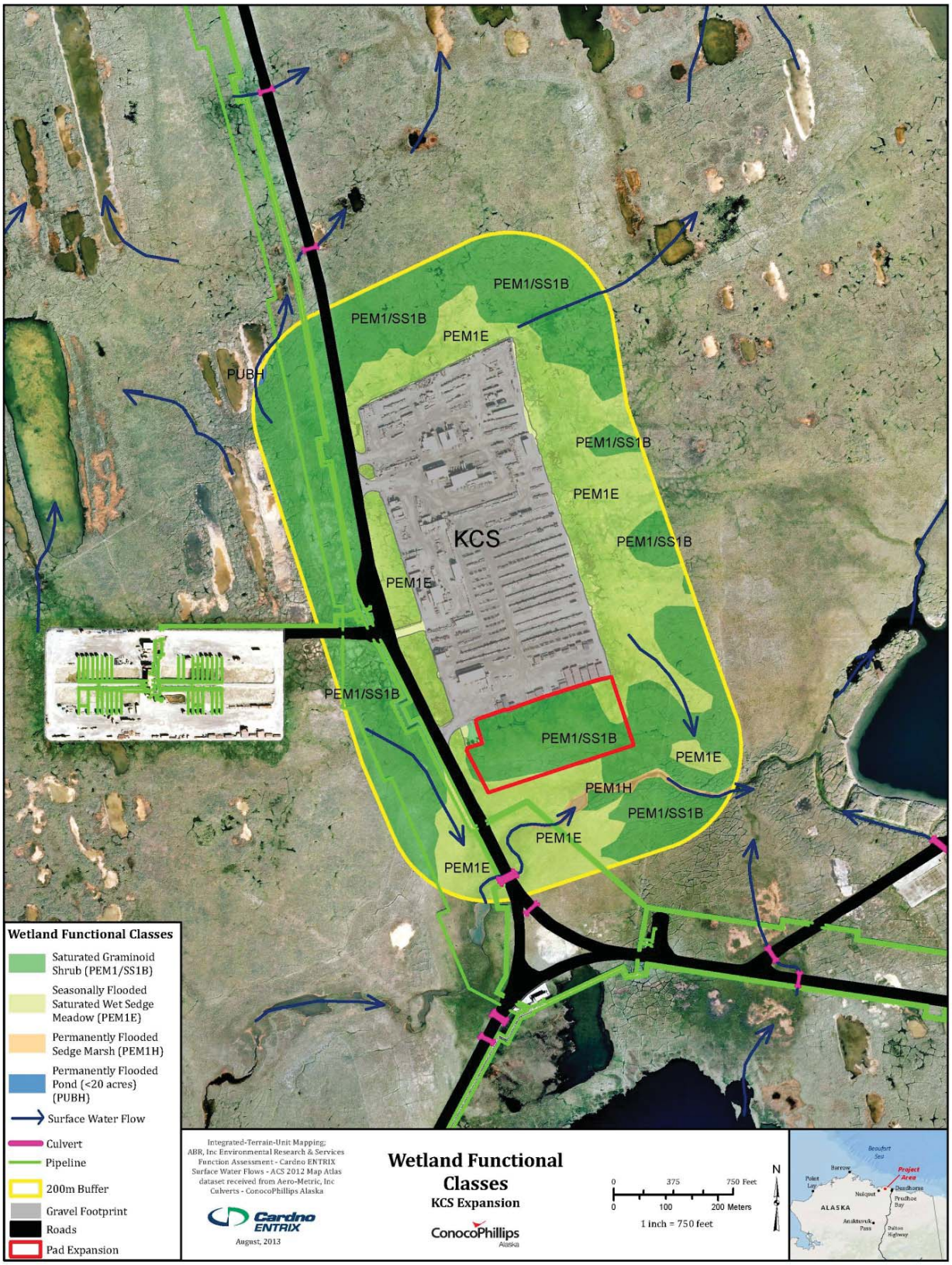

Figure B-1. KCS Expansion Project – Wetland Functional Classes

B.2 Assessment Results

B.2.1 KCS Project Area Wetland Functional Classes

Four wetland and waters functional classes were developed for the purpose of assessing wetland functions based on seven habitats and five vegetation types that occur within 656 ft (200 m) of the KCS pad and expansion area (Table B-1). Some of the wetlands surrounding the existing pad show indications of alteration due to gravel and dust spray from the pads and nearby access roads, themokarst, drainage impoundment, and increased moisture levels due to snow piling (Figure B-1). Barren habitats modified by gravel fill covering about 59 acres (24 ha) were considered uplands and were not evaluated for wetland function.

TABLE B-1. WETLAND FUNCTIONAL CLASSES IN THE KCS PROJECT AREA[1]

Wetland Functional Class	NWI Code	Habitat	Vegetation	Area (acre)	Area (hectare)
Wetlands (in order of wetness)					
Permanently Flooded Sedge Marsh	PEM1H	Sedge Marsh	Fresh Sedge Marsh	1.48	0.60
Seasonally Flooded Saturated Wet Sedge Meadow	PEM1E	Human Modified	Wet Sedge Meadow Tundra	15.86	6.42
		Nonpatterned Wet Meadow	Wet Sedge Meadow Tundra	16.36	6.62
		Patterned Wet Meadow	Wet Sedge Meadow Tundra	23.67	9.58
Saturated Graminoid Shrub	PEM1/SS1B	Moist Sedge-Shrub Meadow	Moist Sedge-Shrub Tundra	44.91	18.18
		Moist Tussock Tundra	Tussock Tundra	39.09	15.82
Waters					
Permanently Flooded Pond (<20 acres)	PUBH	Shallow Open Water without Islands	Fresh Water	0.16	0.06
Non-Wetland or Water					
Upland – Non-wetland	U	Human Modified	Gravel Fill	58.83	23.81

[1] The KCS Expansion Areas are defined as a 656-foot (200-meter) buffer surrounding the KCS pad and the proposed expansion.
Sources: Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012, ABR 2013a, USFWS 1985 (Figure B-1).

B.2.2 Functional Class Characteristics

Of the four wetland and water functional classes occurring within the KCS Project Area, the two most common classes, PEM1/SS1B and PEM1E, would potentially be directly impacted by gravel fill (Figure B-1, Table B-2). The Project area has moderate topographic relief ranging from a high of nearly 68 ft (21 m) on the KCS pad work surface to a low of about50 ft (15 m) next to Charlie Creek. The KCS pad appears to sit on a plateau that is within the 60 ft (18 m) elevation contour. Drainage on the eastern side of KCS appears generally to slope away from the pad either northeasterly toward a drained lake basin, easterly then southeasterly toward the Mine Site D lake, or southerly toward Charlie Creek. On the south side of KCS, drainage appears to follow the southern edge of the pad and then at the southeast corner flows south to Charlie

Creek. Drainage on the west side of KCS is blocked by multiple access roads between KCS and the Oliktok Point Road but appears to have followed a route toward the southeast (Figure B-1).

TABLE B-2. ESTIMATED KCS PROJECT AREA AND EXPANSION FOOTPRINT BY WETLAND FUNCTIONAL CLASS

Wetland Functional Class	NWI Code	KCS PA (acre [hectare])	KCS PA (% of area)	Pad Expansion (acre [hectare])	Pad Expansion (% of area)
Wetlands					
Permanently Flooded Sedge Marsh	PEM1H	1.48 [0.60]	1%	0	0%
Seasonally Flooded Saturated Wet Sedge Meadow	PEM1E	55.89 [22.62]	28%	1.13 [0.46]	1%
Saturated Graminoid Shrub	PEM1/SS1B	84.01 [34.00]	42%	8.61 [3.48]	4%
Waters					
Permanently Flooded Pond (<20 acres)	PUBH	0.16 [0.06]	<1%	0	0%

Note: KCS Project Area (PA) is 29% non-wetland – due to gravel fill. Part of the expansion area extents onto previous fill areas (0.34 acres, 0.14 hectares, <1% of Project area)
Sources: Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012, ABR 2013a, USFWS 1985

PEM1H – Permanently Flooded Sedge Marsh in the KCS Project area is characterized by fresh sedge marsh and water along Charlie Creek to the south of KCS. This wetland class is relatively uncommon along streams in units large enough to be mapped and covers about 1% of the Project area.

PEM1E – Seasonally Flooded Saturated Wet Sedge Meadow in the KCS Project area is primarily polygonal patterned wet sedge meadow tundra interspersed with non-patterned and human modified wet sedge meadow. This wetland type is the second most common wetland covering about 28% of the Project area. About 28% of PEM1E surrounding KCS shows signs of thermokarst including wetter areas with some apparently enlarged thaw pits with standing water out to as far as about 200 feet (~60 meters) from the eastern pad edge. Areas on the west edge of the pad also show signs of thermokarst, but may also be influenced by drainage impoundment.

PEM1/SS1B – Saturated Graminoid Shrub in the KCS Project area is a combination of primarily high-centered, low-relief patterned moist sedge-shrub tundra and tussock tundra. There are high-centered, high relief polygons bordering Charlie Creek as it leaves the Project area to the southeast. This wetland type is the most common covering about 42% of the Project area. Similar to PEM1E, where this wetland class occurs next to KCS, it shows signs of thermokarst.

PUBH – Permanently Flooded Pond in the KCS Project area is limited to the edges of several ponds to the northwest of the pad. These are by shallow water bodies less than 20 acres (8.1 hectares) in size with unconsolidated silt bottom substrates. There is evidence these ponds may dry during the summer and all will freeze solid during the winter.

B.2.3 Summary of KCS Wetland Functions

All four classes were evaluated for site-specific wetland functions using the *Waters and Wetland Functions Data Form* questionnaire. Function ratings are summarized in Table B-3 and B-4, and the ratings with rationale for the ratings from the questionnaires are presented in Figures B-2 through B-5.

Using the site-specific characteristics and functional evaluations each wetlands type was assigned an overall function category from I to IV:

- High Functioning Wetlands (Category I) are characterized as valuable high functioning wetlands that may be regionally rare, difficult to replace, and are generally less common than wetlands in other categories.

- High to Moderate Functioning Wetlands (Category II) are characterized as wetlands that may provide habitat for very sensitive or important wildlife or plants; be difficult to replace; or provide very high functions, particularly for wildlife.

- Moderate to Low Functioning Wetlands (Category III) are characterized as wetlands that can provide important functions and be important for a variety of wildlife; but these wetlands are generally less diverse than Category II wetlands.

- Degraded and Low-Functioning Wetlands (Category IV) are characterized as wetlands that are typically the smallest, often isolated with very little vegetation diversity, and generally already degraded by human activities.

Wetlands and waters were classified as Category II, when three or more of the eight functions were rated High. Wetlands and waters were classified as Category III when three or more of the eight functions were rated at least Moderate. Wetlands types encountered for this functional assessment are not considered rare or unique, and they are within the developed portion of Kuparuk, so none were classified as Category I. In addition, wetland types for this functional assessment were not extensively degraded or considered low-functioning so none were classified as Category IV.

TABLE B-3. SITE-SPECIFIC WETLAND AND WATER FUNCTIONAL RANKINGS FOR WETLANDS WITHIN THE KCS PROJECT AREA

Wetland and Water Functional Class	Category	Flood Flow Regulation	Sediment, Nutrient, & Toxicant Removal	Erosion Control & Shoreline Stabilization	Organic Matter Production & Export	General Habitat Suitability	Fish Habitat	Educational, Scientific, Recreational, or Subsistence Use	Uniqueness & Special Status
Wetlands									
PEM1H	II	High	High	High	High	Mod	Mod	Mod	Low

PEM1E	II	High	High	High	High	Mod	NA	Mod	Low
PEM1/SS1B	III	Mod	Mod	NA	NA	Mod	NA	Mod	Mod
Waters									
PUBH	III	Mod	Mod	NA	NA	Mod	Low	Mod	Low

Sources: Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012, ABR 2013a, USFWS 1985

TABLE B-4. ESTIMATED KCS PROJECT AREA AND FOOTPRINT AREAS BY WETLAND AND WATER FUNCTIONAL VALUE

Wetland and Water Category	KCS PA (acre [hectare])	KCS PA (% of area)	Pad Expansion (acre [hectare])	Pad Expansion (% of area)
I – High Functioning Wetlands	0	0%	0	0%
II – High to Moderate Functioning Wetlands	57.37 [23.22]	29%	1.13 [0.46]	1%
III – Moderate to Low Functioning Wetlands	84.16 [34.06]	42%	8.61 [3.48]	4%
IV – Degraded and Low Functioning Wetlands	0	0%	0	0%
Totals	141.53 [57.28]	71%	9.74 [3.94]	5%

Note: KIC Project Area (PA) is 29% non-wetland – due to gravel fill.
Sources: Roth et al. 2007, Roth and Loomis 2008, Wells et al. 2012, ABR 2013a, USFWS 1985

Summary

Project: KCS Expansion — Date: September 3, 2013
Classification: Permanently Flooded Sedge Marsh — Assessed By: LEN
Cowardin Class: PEM1H — Wetland Size: 1.48 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – High	Wetland predominantly non-patterned wet sedge bordering stream beads and channels along Charlie Creek.
Sediment, Nutrient (N and P), Toxicant Removal	Y – High	Well vegetated and subject to flooding, exposed to sediment and toxicants from existing roads and pads.
Erosion Control and Shoreline Stabilization	Y – High	Wetlands border Charlie Creek and assist in erosion control.
Organic Matter Production and Export	Y – High	Vegetation communities next to stream for export primarily from floods.
General Habitat Suitability	Y – Mod	No direct wildlife observations, but likely used. Use may be moderated by disturbance from nearby drill site and storage pad.
Fish Habitat	Y – Mod	Arctic Grayling, ninespine stickleback considered present, may be stickleback spawning and rearing habitat, access to overwintering habitat at Mine Site D.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope villages, coast or Colville River. Most subsistence use in region is focused along Colville River, this area is not likely to be valuable for subsistence.
Uniqueness and Special Status	Y – Low	No documented ESA species in 19 years of surveys, and no designated critical habitat. Wetland contains non-patterned wet meadow next to a small stream.

Figure B-2. KCS – Permanently Flooded Sedge Marsh (PEM1H) Evaluation – Summary

Summary

Project: KCS Expansion	Date: August 27, 2013
Classification: Seasonally Flooded Saturated Wet Sedge Meadow	Assessed By: LEN
Cowardin Class: PEM1E	Wetland Size: 55.89 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – High	Flooding likely occurs during snow melt, human alteration resulting in thermokarst pits and drainage impoundments may moderate function.
Sediment, Nutrient (N and P), Toxicant Removal	Y – High	Wetland may receive gravel spray and leachates from existing gravel pad.
Erosion Control and Shoreline Stabilization	Y – High	Portion of wetland contains Charlie Creek and its floodplain.
Organic Matter Production and Export	Y – High	Flooding during snow melt and breakup of Charlie creek; potential reduction in vegetated mat near pad edges where thermokarst and drainage impoundment likely moderate function.
General Habitat Suitability	Y – Mod	Wetland is fragmented and there is existing disturbance; low documented use by wildlife.
Fish Habitat	N – NA	No water, no fish habitat.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope villages, coast or Colville River. Most subsistence use in region is focused along Colville River, this area does not likely have use for subsistence harvesters.
Uniqueness and Special Status	Y – Low	No documented ESA species in 19 years of surveys, and no designated critical habitat. Wetland contains non-patterned wet meadow next to a small stream.

Figure B-3. KCS – Seasonally Flooded Saturated Wet Sedge Meadow (PEM1E) Evaluation – Summary.

Summary

Project: KCS Expansion	Date: August 27, 2013
Classification: Saturated Graminoid Shrub	Assessed By: LEN
Cowardin Class: PEM1/SS1B	Wetland Size: 84.01 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – Mod	Common wetland type, well vegetated but not likely subject to frequent flooding, water stored as saturated soils, in thaw pits, and some polygon troughs.
Sediment, Nutrient (N and P), Toxicant Removal	Y – Mod	May provide some nutrient and toxicant removal for nearby development, not frequently flooded, but well vegetated.
Erosion Control and Shoreline Stabilization	N – NA	No shorelines – no function.
Organic Matter Production and Export	N – NA	Not frequently flooded, no export of nutrients.
General Habitat Suitability	Y – Mod	Fragmented wetland with some evidence of wildlife use; disturbance from existing development likely moderates use by wildlife.
Fish Habitat	N – NA	Water is isolated in polygon troughs and thermokarst pits – no fish habitat.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope villages, coast or Colville River. Most subsistence use in region is focused along Colville River, this area does not likely have use for subsistence harvesters.
Uniqueness and Special Status	Y – Mod	No documented ESA species in 19 years of surveys, and no designated critical habitat. Wetland is about 5% high-centered polygon complex (High-centered, High-relief Polygons).

Figure B-4. KCS –Saturated Graminoid Shrub (PEM1/SS1B) Evaluation – Summary.

Summary

Project: KCS Expansion	Date: September 3, 2013
Classification: Permanently Flooded Pond	Assessed By: LEN
Cowardin Class: PUBH	Wetland Size: 0.16 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – Mod	Interconnected ponds within drained basin.
Sediment, Nutrient (N and P), Toxicant Removal	Y – Mod	May receive some sediment and leachates from nearby development.
Erosion Control and Shoreline Stabilization	N – NA	No shorelines – no function.
Organic Matter Production and Export	N – NA	No vegetation – no function.
General Habitat Suitability	Y – Mod	Documented waterbird use, may be moderated by disturbance from nearby development.
Fish Habitat	N – Low	Freezes solid, no clear fish access – ho fish habitats.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope villages, coast or Colville River. Most subsistence use in region is focused along Colville River, this area does not likely have use for subsistence harvesters.
Uniqueness and Special Status	N – Low	No documented ESA species in 19 years of surveys, and no designated critical habitat. Small portions of ponds in drained lake basin with roads on two sides.

Figure B-5. KCS – Permanently Flooded Pond (PUBH) Evaluation – Summary.

B.3 References

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B.4 Waters and Wetland Functions Data Forms

Waters and Wetland Functions Data Form-Alaska Regulatory Best Professional Judgment Characterization for North Slope, Alaska (Modified by ABR Inc. Feb. 2013)

Project: KCS Expansion — Date: September 3, 2013

Classification: Permanently Flooded Sedge Marsh — PM/RS: LEN

A. Flood Flow Regulation (Storage and Desynchronization): If waters proceed to statements 3 to 6 (Use N/A for item 1 and 2 and 7).	Wetland/water likely to perform function? Rating:
1. Wetland occurs in a zone with relatively deep active layers.	1. Yes
2. Wetland has a dense herbaceous or woody layer.	2. Yes
3. Wetland or water is capable of retaining much higher volumes of water during storm events than under normal rainfall conditions.	3. Yes
4. Wetland or water is a closed (depressional) system subject to flooding or shows evidence of flooding.	4. No
5. If flow-through, wetland or water has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	5. Yes
6. Wetland or water receives floodwater from an adjacent water course at least once every 10 years.	6. Yes
7. Floodwaters enter and flow through wetland predominantly as sheet flow rather than channel flow.	7. No
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
B. Sediment, Nutrient (N and P), Toxicant Removal: If waters consider statements 1 and 2.	Wetland/water likely to perform function? Rating:
1. Sediment, nutrients and/or toxicants (from tillage, mining, construction or other sources of pollution) appear to be or are likely to be entering the wetland or water.	1. Yes
2. Slow-moving or still water is present or occurs during flooding that happens at least once every 10 years.	2. Yes
3. Dense (>50% cover) herbaceous vegetation is present.	3. Yes
4. At least moderate interspersion of vegetation and water is present or occurs during flooding that happens at least once every 10 years.	4. Yes
5. Sediment deposits are present (evidence of deposition during floods).	5. Yes
6. Thick surface organic horizon and/or abundant fine organic litter is present.	6. Yes
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
C. Erosion Control and Shoreline Stabilization: Function only applicable for wetlands directly abutting permanent or relatively permanent waters	Wetland likely to perform function? Rating:
1. Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1. Yes
2. Historical aerial photography (if available) indicates stable shoreline features.	2. NA
	1–2 attributes (Y)—High, None—Low Function
D. Organic Matter Production and Export: Function only applicable if wetland is flooded at least once every 10 years. Function is not applicable for unvegetated waters.	Wetland likely to perform function? Rating:
1. Wetland is flooded at least once every 10 years. If no, proceed no further, wetland is low functioning.	1. Yes
2. Wetland has at least 30% cover of herbaceous vegetation.	2. Yes
3. Woody plants in wetland are mostly deciduous.	3. Yes
4. High degree of plant community structure, vegetation density, and species richness present.	4. No
5. Interspersion of vegetation and water is at least moderate.	5. Yes
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low

E. General Habitat Suitability: Only complete first three for waters.	Wetland likely to perform function? Rating:
1. Wetland or water is not fragmented.	1. No
2. Area surrounding wetland or water is undisturbed.	2. No
3. Evidence of wildlife use (e.g., nests, tracks, scat, gnawed stumps, survey data) is present. Waters only high functioning if wildlife survey or direct observation data are available.	3. Yes
4. Plant community has two or more strata, with at least two of those strata having >10% total cover.	4. No
5. Wetland has at least a moderate degree of Cowardin Class interspersion.	5. Yes
6. Diversity (evenness of cover) of plant species is moderately high (≥ 5 species with at least 10% cover each).	6. No
	Waters: 3 attributes (Y) – High, 2 attributes (Y) – Moderate, 1 attributes (Y) Low **Wetlands**: 5–6 attributes (Y)—High, 2–4 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
F. Fish Habitat: Function only applicable if a water or if wetland has perennial or intermittent surface water connection to a fish bearing water body.	Wetland likely to perform function? Rating:
1. Wetland or water has sufficient size and depth of open water so as not to freeze completely during winter.	1. No
2. Fish are present.	2. Yes
3. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	3. Yes
4. Spawning areas are present (aquatic vegetation and/or gravel beds.	4. No
5. Juvenile rest areas present (e.g. pools with organic debris or overhanging vegetation).	5. Yes
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low Function
G. Educational, Scientific, Recreational, or Subsistence Use	Wetland likely to perform function? Rating:
1. Site has documented scientific or educational use.	1. No
2. Wetland or water is in public ownership.	2. Yes
3. Accessible trails are available.	3. No
4. Wetland or water supports subsistence activities (e.g., hunting, fishing, berry picking).	4. No
	3–4 attributes (Y)—High, 1–2 attribute (Y)—Moderate, 0 attributes (Y)—Low
H. Uniqueness and Special Status	Wetland likely to perform function? Rating:
1. Wetland or water contains documented occurrence of a state or federally listed threatened or endangered species. *If yes, wetland is high functioning.*	1. No
2. Wetland or water contains documented critical habitat, high quality ecosystems, or priority species, respectively designated by the U.S. Fish and Wildlife Service	2. No
3. Wetland or water has biological, geological, or other features that are determined to be rare.	3. No
4. Wetland or water has been determined significant because it provides functions scarce for the area.	4. No
5. Wetland complex contains one or more of the following habitats 1) Tall shrub habitat (>.5ft in height) dominated by *Salix* spp. 2) Aquatic herb habitat dominated by *Arctophila fulva*. 3) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins 4) Anadromous fish overwintering habitat 5) Patterned wet sedge meadow and low center polygons 6) High center polygon complex 7) Riverine coastal mudflats 8) Non-patterned wet meadow adjacent to streams and river bluffs.	5. No ≥ 2 attributes (Y)—High, 1 attribute (Y)—Moderate, None—Low

Summary

Project: KCS Expansion | Date: September 3, 2013
Classification: Permanently Flooded Sedge Marsh | Assessed By: LEN
Cowardin Class: PEM1H | Wetland Size: 1.48 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – High	Wetland predominantly non-patterned wet sedge bordering stream beads and channels along Charlie Creek.
Sediment, Nutrient (N and P), Toxicant Removal	Y – High	Well vegetated and subject to flooding, exposed to sediment and toxicants from existing roads and pads.
Erosion Control and Shoreline Stabilization	Y – High	Wetlands border Charlie Creek and assist in erosion control.
Organic Matter Production and Export	Y – High	Vegetation communities next to stream for export primarily from floods.
General Habitat Suitability	Y – Mod	No direct wildlife observations, but likely used. Use may be moderated by disturbance from nearby drill site and storage pad.
Fish Habitat	Y – Mod	Arctic Grayling, ninespine stickleback considered present, may be stickleback spawning and rearing habitat, access to overwintering habitat at Mine Site D.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope villages, coast or Colville River. Most subsistence use in region is focused along Colville River, this area is not likely to be valuable for subsistence.
Uniqueness and Special Status	Y – Low	No documented ESA species in 19 years of surveys, and no designated critical habitat. Wetland contains non-patterned wet meadow next to a small stream.

Waters and Wetland Functions Data Form-Alaska Regulatory Best Professional Judgment Characterization for North Slope, Alaska (Modified by ABR Inc. Feb. 2013)

Project: KCS Expansion Date: August 27, 2013

Classification: Seasonally Flooded Saturated Wet Sedge Meadow PM/RS: LEN

A. Flood Flow Regulation (Storage and Desynchronization): If waters proceed to statements 3 to 6 (Use N/A for item 1 and 2 and 7).	Wetland/water likely to perform function? Rating:
1. Wetland occurs in a zone with relatively deep active layers.	1. No
2. Wetland has a dense herbaceous or woody layer.	2. Yes
3. Wetland or water is capable of retaining much higher volumes of water during storm events than under normal rainfall conditions.	3. Yes
4. Wetland or water is a closed (depressional) system subject to flooding or shows evidence of flooding.	4. No
5. If flow-through, wetland or water has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	5. Yes
6. Wetland or water receives floodwater from an adjacent water course at least once every 10 years.	6. Yes
7. Floodwaters enter and flow through wetland predominantly as sheet flow rather than channel flow.	7. Yes
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
B. Sediment, Nutrient (N and P), Toxicant Removal: If waters consider statements 1 and 2.	Wetland/water likely to perform function? Rating:
1. Sediment, nutrients and/or toxicants (from tillage, mining, construction or other sources of pollution) appear to be or are likely to be entering the wetland or water.	1. Yes
2. Slow-moving or still water is present or occurs during flooding that happens at least once every 10 years.	2. Yes
3. Dense (>50% cover) herbaceous vegetation is present.	3. Yes
4. At least moderate interspersion of vegetation and water is present or occurs during flooding that happens at least once every 10 years.	4. Yes
5. Sediment deposits are present (evidence of deposition during floods).	5. Yes
6. Thick surface organic horizon and/or abundant fine organic litter is present.	6. Yes
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
C. Erosion Control and Shoreline Stabilization: Function only applicable for wetlands directly abutting permanent or relatively permanent waters	Wetland likely to perform function? Rating:
1. Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1. Yes
2. Historical aerial photography (if available) indicates stable shoreline features.	2. NA
	1–2 attributes (Y)—High, None—Low Function
D. Organic Matter Production and Export: Function only applicable if wetland is flooded at least once every 10 years. Function is not applicable for unvegetated waters.	Wetland likely to perform function? Rating:
1. Wetland is flooded at least once every 10 years. If no, proceed no further, wetland is low functioning.	1. Yes
2. Wetland has at least 30% cover of herbaceous vegetation.	2. Yes
3. Woody plants in wetland are mostly deciduous.	3. Yes
4. High degree of plant community structure, vegetation density, and species richness present.	4. No
5. Interspersion of vegetation and water is at least moderate.	5. Yes
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low

E. General Habitat Suitability: Only complete first three for waters.	Wetland likely to perform function? Rating:
1. Wetland or water is not fragmented.	1. No
2. Area surrounding wetland or water is undisturbed.	2. No
3. Evidence of wildlife use (e.g., nests, tracks, scat, gnawed stumps, survey data) is present. Waters only high functioning if wildlife survey or direct observation data are available.	3. Yes
4. Plant community has two or more strata, with at least two of those strata having >10% total cover.	4. No
5. Wetland has at least a moderate degree of Cowardin Class interspersion.	5. Yes
6. Diversity (evenness of cover) of plant species is moderately high (≥ 5 species with at least 10% cover each).	6. No
	Waters: 3 attributes (Y) – High, 2 attributes (Y) – Moderate, 1 attributes (Y) Low **Wetlands**: 5–6 attributes (Y)—High, 2–4 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
F. Fish Habitat: Function only applicable if a water or if wetland has perennial or intermittent surface water connection to a fish bearing water body.	Wetland likely to perform function? Rating:
1. Wetland or water has sufficient size and depth of open water so as not to freeze completely during winter.	1. No
2. Fish are present.	2. NA
3. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	3. NA
4. Spawning areas are present (aquatic vegetation and/or gravel beds.	4. NA
5. Juvenile rest areas present (e.g. pools with organic debris or overhanging vegetation).	5. NA
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low Function
G. Educational, Scientific, Recreational, or Subsistence Use	Wetland likely to perform function? Rating:
1. Site has documented scientific or educational use.	1. No
2. Wetland or water is in public ownership.	2. Yes
3. Accessible trails are available.	3. No
4. Wetland or water supports subsistence activities (e.g., hunting, fishing, berry picking).	4. No
	3–4 attributes (Y)—High, 1–2 attribute (Y)—Moderate, 0 attributes (Y)—Low
H. Uniqueness and Special Status	Wetland likely to perform function? Rating:
1. Wetland or water contains documented occurrence of a state or federally listed threatened or endangered species. *If yes, wetland is high functioning.*	1. No
2. Wetland or water contains documented critical habitat, high quality ecosystems, or priority species, respectively designated by the U.S. Fish and Wildlife Service	2. No
3. Wetland or water has biological, geological, or other features that are determined to be rare.	3. No
4. Wetland or water has been determined significant because it provides functions scarce for the area.	4. No
5. Wetland complex contains one or more of the following habitats 1) Tall shrub habitat (>.5ft in height) dominated by *Salix* spp. 2) Aquatic herb habitat dominated by *Arctophila fulva*. 3) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins 4) Anadromous fish overwintering habitat 5) Patterned wet sedge meadow and low center polygons 6) High center polygon complex 7) Riverine coastal mudflats 8) Non-patterned wet meadow adjacent to streams and river bluffs.	5. No ≥ 2 attributes (Y)—High, 1 attribute (Y)—Moderate, None—Low

Summary

Project: KCS Expansion | Date: August 27, 2013
Classification: Seasonally Flooded Saturated Wet Sedge Meadow | Assessed By: LEN
Cowardin Class: PEM1E | Wetland Size: 55.89 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – High	Flooding likely occurs during snow melt, human alteration resulting in thermokarst pits and drainage impoundments may moderate function.
Sediment, Nutrient (N and P), Toxicant Removal	Y – High	Wetland may receive gravel spray and leachates from existing gravel pad.
Erosion Control and Shoreline Stabilization	Y – High	Portion of wetland contains Charlie Creek and its floodplain.
Organic Matter Production and Export	Y – High	Flooding during snow melt and breakup of Charlie creek; potential reduction in vegetated mat near pad edges where thermokarst and drainage impoundment likely moderate function.
General Habitat Suitability	Y – Mod	Wetland is fragmented and there is existing disturbance; low documented use by wildlife.
Fish Habitat	N – NA	No water, no fish habitat.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope villages, coast or Colville River. Most subsistence use in region is focused along Colville River, this area does not likely have use for subsistence harvesters.
Uniqueness and Special Status	Y – Low	No documented ESA species in 19 years of surveys, and no designated critical habitat. Wetland contains non-patterned wet meadow next to a small stream.

Waters and Wetland Functions Data Form-Alaska Regulatory Best Professional Judgment Characterization for North Slope, Alaska (Modified by ABR Inc. Feb. 2013)

Project: KCS Expansion Date: August 27, 2013

Classification: Saturated Graminoid Shrub PM/RS: LEN

A. Flood Flow Regulation (Storage and Desynchronization): If waters proceed to statements 3 to 6 (Use N/A for item 1 and 2 and 7).	Wetland/water likely to perform function? Rating:
1. Wetland occurs in a zone with relatively deep active layers.	1. No
2. Wetland has a dense herbaceous or woody layer.	2. Yes
3. Wetland or water is capable of retaining much higher volumes of water during storm events than under normal rainfall conditions.	3. Yes
4. Wetland or water is a closed (depressional) system subject to flooding or shows evidence of flooding.	4. No
5. If flow-through, wetland or water has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	5. No
6. Wetland or water receives floodwater from an adjacent water course at least once every 10 years.	6. No
7. Floodwaters enter and flow through wetland predominantly as sheet flow rather than channel flow.	7. No
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
B. Sediment, Nutrient (N and P), Toxicant Removal: If waters consider statements 1 and 2.	Wetland/water likely to perform function? Rating:
1. Sediment, nutrients and/or toxicants (from tillage, mining, construction or other sources of pollution) appear to be or are likely to be entering the wetland or water.	1. Yes
2. Slow-moving or still water is present or occurs during flooding that happens at least once every 10 years.	2. Yes
3. Dense (>50% cover) herbaceous vegetation is present.	3. No
4. At least moderate interspersion of vegetation and water is present or occurs during flooding that happens at least once every 10 years.	4. No
5. Sediment deposits are present (evidence of deposition during floods).	5. No
6. Thick surface organic horizon and/or abundant fine organic litter is present.	6. No
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
C. Erosion Control and Shoreline Stabilization: Function only applicable for wetlands directly abutting permanent or relatively permanent waters	Wetland likely to perform function? Rating:
1. Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1. NA
2. Historical aerial photography (if available) indicates stable shoreline features.	2. NA
	1–2 attributes (Y)—High, None—Low Function
D. Organic Matter Production and Export: Function only applicable if wetland is flooded at least once every 10 years. Function is not applicable for unvegetated waters.	Wetland likely to perform function? Rating:
1. Wetland is flooded at least once every 10 years. If no, proceed no further, wetland is low functioning.	1. No
2. Wetland has at least 30% cover of herbaceous vegetation.	2. NA
3. Woody plants in wetland are mostly deciduous.	3. NA
4. High degree of plant community structure, vegetation density, and species richness present.	4. NA
5. Interspersion of vegetation and water is at least moderate.	5. NA
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low

E. General Habitat Suitability: Only complete first three for waters.	Wetland likely to perform function? Rating:
1. Wetland or water is not fragmented.	1. No
2. Area surrounding wetland or water is undisturbed.	2. No
3. Evidence of wildlife use (e.g., nests, tracks, scat, gnawed stumps, survey data) is present. Waters only high functioning if wildlife survey or direct observation data are available.	3. Yes
4. Plant community has two or more strata, with at least two of those strata having >10% total cover.	4.Yes
5. Wetland has at least a moderate degree of Cowardin Class interspersion.	5. Yes
6. Diversity (evenness of cover) of plant species is moderately high (≥ 5 species with at least 10% cover each).	6. No **Waters**: 3 attributes (Y) – High, 2 attributes (Y) – Moderate, 1 attributes (Y) Low **Wetlands**: 5–6 attributes (Y)—High, 2–4 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
F. Fish Habitat: Function only applicable if a water or if wetland has perennial or intermittent surface water connection to a fish bearing water body.	Wetland likely to perform function? Rating:
1. Wetland or water has sufficient size and depth of open water so as not to freeze completely during winter.	1. NA
2. Fish are present.	2. NA
3. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	3. NA
4. Spawning areas are present (aquatic vegetation and/or gravel beds.	4. NA
5. Juvenile rest areas present (e.g. pools with organic debris or overhanging vegetation).	5. NA 4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low Function
G. Educational, Scientific, Recreational, or Subsistence Use	Wetland likely to perform function? Rating:
1. Site has documented scientific or educational use.	1. No
2. Wetland or water is in public ownership.	2. Yes
3. Accessible trails are available.	3. No
4. Wetland or water supports subsistence activities (e.g., hunting, fishing, berry picking).	4. No 3–4 attributes (Y)—High, 1–2 attribute (Y)—Moderate, 0 attributes (Y)—Low
H. Uniqueness and Special Status	Wetland likely to perform function? Rating:
1. Wetland or water contains documented occurrence of a state or federally listed threatened or endangered species. *If yes, wetland is high functioning.*	1. No
2. Wetland or water contains documented critical habitat, high quality ecosystems, or priority species, respectively designated by the U.S. Fish and Wildlife Service	2. No
3. Wetland or water has biological, geological, or other features that are determined to be rare.	3. No
4. Wetland or water has been determined significant because it provides functions scarce for the area.	4. No
5. Wetland complex contains one or more of the following habitats 1) Tall shrub habitat (>.5ft in height) dominated by *Salix* spp. 2) Aquatic herb habitat dominated by *Arctophila fulva*. 3) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins 4) Anadromous fish overwintering habitat 5) Patterned wet sedge meadow and low center polygons 6) High center polygon complex 7) Riverine coastal mudflats 8) Non-patterned wet meadow adjacent to streams and river bluffs.	5. Yes ≥ 2 attributes (Y)—High, 1 attribute (Y)—Moderate, None—Low

Summary

Project: KCS Expansion | Date: August 27, 2013
Classification: Saturated Graminoid Shrub | Assessed By: LEN
Cowardin Class: PEM1/SS1B | Wetland Size: 84.01 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – Mod	Common wetland type, well vegetated but not likely subject to frequent flooding, water stored as saturated soils, in thaw pits, and some polygon troughs.
Sediment, Nutrient (N and P), Toxicant Removal	Y – Mod	May provide some nutrient and toxicant removal for nearby development, not frequently flooded, but well vegetated.
Erosion Control and Shoreline Stabilization	N – NA	No shorelines – no function.
Organic Matter Production and Export	N – NA	Not frequently flooded, no export of nutrients.
General Habitat Suitability	Y – Mod	Fragmented wetland with some evidence of wildlife use; disturbance from existing development likely moderates use by wildlife.
Fish Habitat	N – NA	Water is isolated in polygon troughs and thermokarst pits – no fish habitat.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope villages, coast or Colville River. Most subsistence use in region is focused along Colville River, this area does not likely have use for subsistence harvesters.
Uniqueness and Special Status	Y – Mod	No documented ESA species in 19 years of surveys, and no designated critical habitat. Wetland is about 5% high-centered polygon complex (High-centered, High-relief Polygons).

Waters and Wetland Functions Data Form-Alaska Regulatory Best Professional Judgment Characterization for North Slope, Alaska (Modified by ABR Inc. Feb. 2013)

Project: KCS Expansion — Date: September 3, 2013

Classification: Permanently Flooded Pond — PM/RS: LEN

A. Flood Flow Regulation (Storage and Desynchronization): If waters proceed to statements 3 to 6 (Use N/A for item 1 and 2 and 7).	Wetland/water likely to perform function? Rating:
1. Wetland occurs in a zone with relatively deep active layers.	1. NA
2. Wetland has a dense herbaceous or woody layer.	2. NA
3. Wetland or water is capable of retaining much higher volumes of water during storm events than under normal rainfall conditions.	3. Yes
4. Wetland or water is a closed (depressional) system subject to flooding or shows evidence of flooding.	4. No
5. If flow-through, wetland or water has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	5. Yes
6. Wetland or water receives floodwater from an adjacent water course at least once every 10 years.	6. No
7. Floodwaters enter and flow through wetland predominantly as sheet flow rather than channel flow.	7. No
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
B. Sediment, Nutrient (N and P), Toxicant Removal: If waters consider statements 1 and 2.	Wetland/water likely to perform function? Rating:
1. Sediment, nutrients and/or toxicants (from tillage, mining, construction or other sources of pollution) appear to be or are likely to be entering the wetland or water.	1. Yes
2. Slow-moving or still water is present or occurs during flooding that happens at least once every 10 years.	2. Yes
3. Dense (>50% cover) herbaceous vegetation is present.	3. NA
4. At least moderate interspersion of vegetation and water is present or occurs during flooding that happens at least once every 10 years.	4. NA
5. Sediment deposits are present (evidence of deposition during floods).	5. NA
6. Thick surface organic horizon and/or abundant fine organic litter is present.	6. NA
	≥ 4 attributes (Y)—High, 2-3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
C. Erosion Control and Shoreline Stabilization: Function only applicable for wetlands directly abutting permanent or relatively permanent waters	Wetland likely to perform function? Rating:
1. Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1. NA
2. Historical aerial photography (if available) indicates stable shoreline features.	2. NA
	1–2 attributes (Y)—High, None—Low Function
D. Organic Matter Production and Export: Function only applicable if wetland is flooded at least once every 10 years. Function is not applicable for unvegetated waters.	Wetland likely to perform function? Rating:
1. Wetland is flooded at least once every 10 years. If no, proceed no further, wetland is low functioning.	1. NA
2. Wetland has at least 30% cover of herbaceous vegetation.	2. NA
3. Woody plants in wetland are mostly deciduous.	3. NA
4. High degree of plant community structure, vegetation density, and species richness present.	4. NA
5. Interspersion of vegetation and water is at least moderate.	5. NA
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low

E. General Habitat Suitability: Only complete first three for waters.	Wetland likely to perform function? Rating:
1. Wetland or water is not fragmented.	1. Yes
2. Area surrounding wetland or water is undisturbed.	2. No
3. Evidence of wildlife use (e.g., nests, tracks, scat, gnawed stumps, survey data) is present. Waters only high functioning if wildlife survey or direct observation data are available.	3. Yes
4. Plant community has two or more strata, with at least two of those strata having >10% total cover.	4. NA
5. Wetland has at least a moderate degree of Cowardin Class interspersion.	5. NA
6. Diversity (evenness of cover) of plant species is moderately high (≥ 5 species with at least 10% cover each).	6. NA
	Waters: 3 attributes (Y) – High, 2 attributes (Y) – Moderate, 1 attributes (Y) Low **Wetlands**: 5–6 attributes (Y)—High, 2–4 attributes (Y)—Moderate, 0–1 attributes (Y)—Low
F. Fish Habitat: Function only applicable if a water or if wetland has perennial or intermittent surface water connection to a fish bearing water body.	Wetland likely to perform function? Rating:
1. Wetland or water has sufficient size and depth of open water so as not to freeze completely during winter.	1. No
2. Fish are present.	2. No
3. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	3. NA
4. Spawning areas are present (aquatic vegetation and/or gravel beds.	4. NA
5. Juvenile rest areas present (e.g. pools with organic debris or overhanging vegetation).	5. NA
	4–5 attributes (Y)—High, 2–3 attributes (Y)—Moderate, 0–1 attributes (Y)—Low Function
G. Educational, Scientific, Recreational, or Subsistence Use	Wetland likely to perform function? Rating:
1. Site has documented scientific or educational use.	1. No
2. Wetland or water is in public ownership.	2. Yes
3. Accessible trails are available.	3. No
4. Wetland or water supports subsistence activities (e.g., hunting, fishing, berry picking).	4. No
	3–4 attributes (Y)—High, 1–2 attribute (Y)—Moderate, 0 attributes (Y)—Low
H. Uniqueness and Special Status	Wetland likely to perform function? Rating:
1. Wetland or water contains documented occurrence of a state or federally listed threatened or endangered species. *If yes, wetland is high functioning.*	1. No
2. Wetland or water contains documented critical habitat, high quality ecosystems, or priority species, respectively designated by the U.S. Fish and Wildlife Service	2. No
3. Wetland or water has biological, geological, or other features that are determined to be rare.	3. No
4. Wetland or water has been determined significant because it provides functions scarce for the area.	4. No
5. Wetland complex contains one or more of the following habitats 1) Tall shrub habitat (>.5ft in height) dominated by *Salix* spp. 2) Aquatic herb habitat dominated by *Arctophila fulva*. 3) Semi-permanently flooded to permanently flooded vegetated portions of drained lake basins 4) Anadromous fish overwintering habitat 5) Patterned wet sedge meadow and low center polygons 6) High center polygon complex 7) Riverine coastal mudflats 8) Non-patterned wet meadow adjacent to streams and river bluffs.	5. No
	≥ 2 attributes (Y)—High, 1 attribute (Y)—Moderate, None—Low

Summary

Project: KCS Expansion | Date: September 3, 2013
Classification: Permanently Flooded Pond | Assessed By: LEN
Cowardin Class: PUBH | Wetland Size: 0.16 acres

Function/Service	Occurrence (Y/N)	Rationale
Flood Flow Regulation (Storage and Desynchronization)	Y – Mod	Interconnected ponds within drained basin.
Sediment, Nutrient (N and P), Toxicant Removal	Y – Mod	May receive some sediment and leachates from nearby development.
Erosion Control and Shoreline Stabilization	N – NA	No shorelines – no function.
Organic Matter Production and Export	N – NA	No vegetation – no function.
General Habitat Suitability	Y – Mod	Documented waterbird use, may be moderated by disturbance from nearby development.
Fish Habitat	N – Low	Freezes solid, no clear fish access – ho fish habitats.
Educational, Scientific, Recreational, or Subsistence Use	Y – Mod	State-owned land, not adjacent to North Slope villages, coast or Colville River. Most subsistence use in region is focused along Colville River, this area does not likely have use for subsistence harvesters.
Uniqueness and Special Status	N – Low	No documented ESA species in 19 years of surveys, and no designated critical habitat. Small portions of ponds in drained lake basin with roads on two sides.

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