RECONNAISSANCE REPORT UPDATE

Point Hope Kuukpak Road Extension Emergency Evacuation

NORTH SLOPE BOROUGH
North Slope Borough Department of Public Works
Capital Improvement Program Management

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ACRONYMS

AADT	Annual Average Daily Traffic
ADOT & PF	Alaska Department of Transportation and Public Facilities
ANCSA	Alaska Native Claims Settlement Act
ANTHC	Alaska Native Tribal Health Consortium
ASRC	Arctic Slope Regional Corporation
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CASC	Crushed Aggregate Surface Course
City	City of Point Hope
CMP AMSA	Coastal Management Plan Area which Merits Special Attention
COE	U.S. Army Corps of Engineers
EA	Environmental Assessment
EER	Emergency Evacuation Road
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
HDL	Hattenburg Dilley & Linnell
IWC	International Whaling Commission
MAS	Modern Artifact Scatter
MLLW	Mean Lower Low Water

MOU	Memorandum of Understanding
MSL	Mean Sea Level
NLUR	Northern Land Use Research, Inc.
NSB	North Slope Borough
NSBCP	North Slope Borough Comprehensive Plan
NVPH	Native Village of Point Hope
NWI	National Wetlands Inventory
OHW	Ordinary High Water
PAR	Project Analysis Report
SHPO	State Historical Preservation Office
TC	Tikigaq Corporation
TO	Turn Out
USF&WS	United States Fish and Wildlife Service

1.0 Executive Summary

This report updates the December 2011 Reconnaissance Study prepared by Hattenburg Dilley and Linnell, LLC, now HDL Engineering Consultants, LLC (HDL). This report has been updated as follows: (1) the Material Source Report in Appendix B is updated to reflect the drilling performed by HDL at PHRK-04 in March of 2017, and the cost estimates under section 6.0 of this report are updated to reflect current labor, equipment, and fuel pricing. Appendix G is added to provide supporting cost estimate information. No changes were made to reflect the comprehensive plans developed for Point Hope and the North Slope Borough since 2011. All other information provided in this report is unchanged from the December 2011 document.

The Point Hope Kuukpak Road Extension Emergency Evacuation Reconnaissance Study is a Federal Highway Administration (FHWA) funded project administered by the Alaska Department of Transportation and Public Facilities (DOT&PF), with local matching funds from the North Slope Borough (NSB). The purpose of this study is to evaluate preliminary road alignment options for an all-season road from the community to the foothills of the Lisburne Hills terminating near the Kukpuk River. The community will use the road to evacuate from the peninsula, to access the Kukpuk River, to evacuate from the Kukpuk River in the event of a river flood, and to access subsistence food sources and fresh water. This report evaluates alignment and grade, topography, soils, erosion and sediment control, flooding, maintenance, hydrology, material sources, snow drifting, right-of way, wetlands, cultural resources, fish and wildlife, subsistence, community input, and cost.

Repeated flooding and erosion near Point Hope causes the community to be concerned for their safety. This community of 674 (2010 Census) is located on the flat, exposed gravel Tigara Peninsula at an elevation of 13 to 18 feet above sea level, seven miles from any elevated terrain. Flood incidents have occurred in the Marryat Inlet during the spring breakups in 2006, 2007 and 2011 and erosion continues at the old town site near the airport. In 2007, the Marryat Inlet flood incident damaged a low-lying section of Kuukpak Road leaving the community isolated from the mainland. The damaged 0.66-mile section of Kuukpak Road was rehabilitated by DOT&PF in 2009 at a cost of approximately $1.3 million. Receding sea ice from global climate change increases the frequency of severe storms, and adds to the risk of storm damage, flooding, and accelerated erosion.

Constructing a road off the peninsula has been studied and publicly discussed for years and has full community support. The project is referred to as the “17 Mile Road” by residents. Three slight variations of the same alignment have been previously suggested by the community or consultants. In 2002, the City of Point Hope proposed an alignment to the NSB Planning Commission for this new roadway (City Route). In 2003, CH2M-Hill prepared a Project Analysis Report (PAR) for the NSB that studied the feasibility and cost of extending the roadway 8 miles inland. In 2008, the Native Village of Point Hope submitted a resolution to DOT&PF in support of this project with an alignment that is referred to as Jakey's Route (named after Jakey Koonok). The alignments generally follow an established 17(b) trail route east to the Lisburne Hills.

The critical flood event is a Marryat Inlet/Kukpuk River event (Coastline Engineering, 2008 and 2010). For a Marryat Inlet flood event, Coastline Engineering recommends a 100-year design flood elevation of +10.0 feet mean lower low water (MLLW). The existing Kuukpak Road is constructed to an elevation of approximately 10.5 feet MLLW at the crown and acts like a dam holding back Marryat Inlet waters during a flood event. The existing Kuukpak Road is at risk of further damage as it settles into the permafrost, and because it is not designed to behave like a dam. In the Spring 2011 flood event, the water marks on Kuukpak Road indicated water at approximately +9.2 feet MLLW.

The 100-year ocean storm surge is estimated to be +7.3 feet MLLW with potential wave run-up to an elevation of +10 to +12 feet MLLW. Published sea level change estimates were not found for Point Hope.

In order to construct a new road, a new material source is needed. The existing material source located near the airport is nearly depleted. In 2011, the NSB had consultants prepare a Point Hope Material Source Evaluation Report (Hattenburg Dilley & Linnell (HDL) and Umiaq) that identified locations and costs for a new material source. Two new potential material sites have been identified. One source is located at the end of this alignment and one is approximately 18 miles to the southeast toward Cape Thompson. The cost of the Initial pit development and gravel delivery to a stockpile in Point Hope was estimated to be between $85 and $104 per cubic yard. Road construction costs are estimated to range from $3.47 to $7.04 million per mile depending on the material source and roadway geometry. It is anticipated that the roadway will be an 18-foot wide, 6-foot deep gravel roadway using the new gravel source. The road corridor is predominantly in soft tundra wetlands in ice-rich, fine-grained, thaw-unstable permafrost soils. Road embankments will need to be sufficiently thick (6 feet minimum at the shoulders) and be insulated to protect the underlying permafrost and minimize thaw degradation and settlement.

The next step in this project is to perform preliminary design and environmental studies to further evaluate the route options identified in this report. This report does not identify a preferred route option. Additional survey, geotechnical, mapping and imagery are needed to complete the preliminary design and environmental studies. Phased construction is recommended to utilize funding as it becomes available.

Introduction

1.1 Background

Point Hope is an Inupiat community of 674 people on the northwest coast of Alaska. See Figure 1. The Point Hope Kuukpak Road Extension Emergency Evacuation Reconnaissance Study is a Federal Highway Administration (FHWA) funded project administered through the Alaska Department of Transportation and Public Facilities (DOT&PF), with local matching funds from the North Slope Borough (NSB). The purpose of this study is to evaluate preliminary road alignment options for an all-season road from the community to the foothills of the Lisburne Hills terminating near the Kukpuk River (see Figure 2). This study was developed utilizing previous reports, field investigations, and public meetings. The following is a summary of these studies in the Point Hope area:

- Areal Geology in the Vicinity of the Chariot Site, Lisburne Peninsula, Northwestern Alaska; USGS Professional Paper 395; Russell H. Campbell; 1967; detailed geologic investigation covering over 350 square miles, although it lies to the east of the area of interest in this reconnaissance report.

- Point Hope Beach Erosion, 1972; U.S. Army Corps of Engineers, Alaska District; "Evaluate beach erosion due to storm waves and periodic flooding and investigate measures in combating this natural force which threatens Point Hope."

- Geological Soil Investigation of Beacon Hill Proposed Townsite, Point Hope Alaska; September 12, 1973; Lounsbury & Associates; 26 test holes were drilled and sampled.

- Coastal Erosion Study for Point Hope, 1993; BTS-LCMF; addressed erosion mitigation measures along the northerly coastline at Point Hope.

- Materials Reconnaissance, Beach Protection Project, Point Hope Alaska; November 10, 1999 (update); Duane Miller & Assoc.; a field investigation from Cape Thompson on the south to Cape Lisburne on the north.

- Potential Consequences of the Man-Made Breach at Point Hope, Alaska, August 2006, Coastline Engineering; evaluation of the risks associated with the man-made breach in the Marryat Inlet beach.

- Material Source Report, Pt. Hope Kuukpak Road Repair and Upgrade, February 12, 2008; Hattenburg Dilley & Linnell; report on field investigation and lab analysis of four rock locations along proposed road alignment.

- Reconnaissance Report, Point Hope Evacuation Road Rehabilitation/Extension, May 22, 2008; Hattenburg Dilley & Linnell; reconnaissance report for the repair of the existing evacuation road after flood damage and future road extension, after 2007 flood damage.

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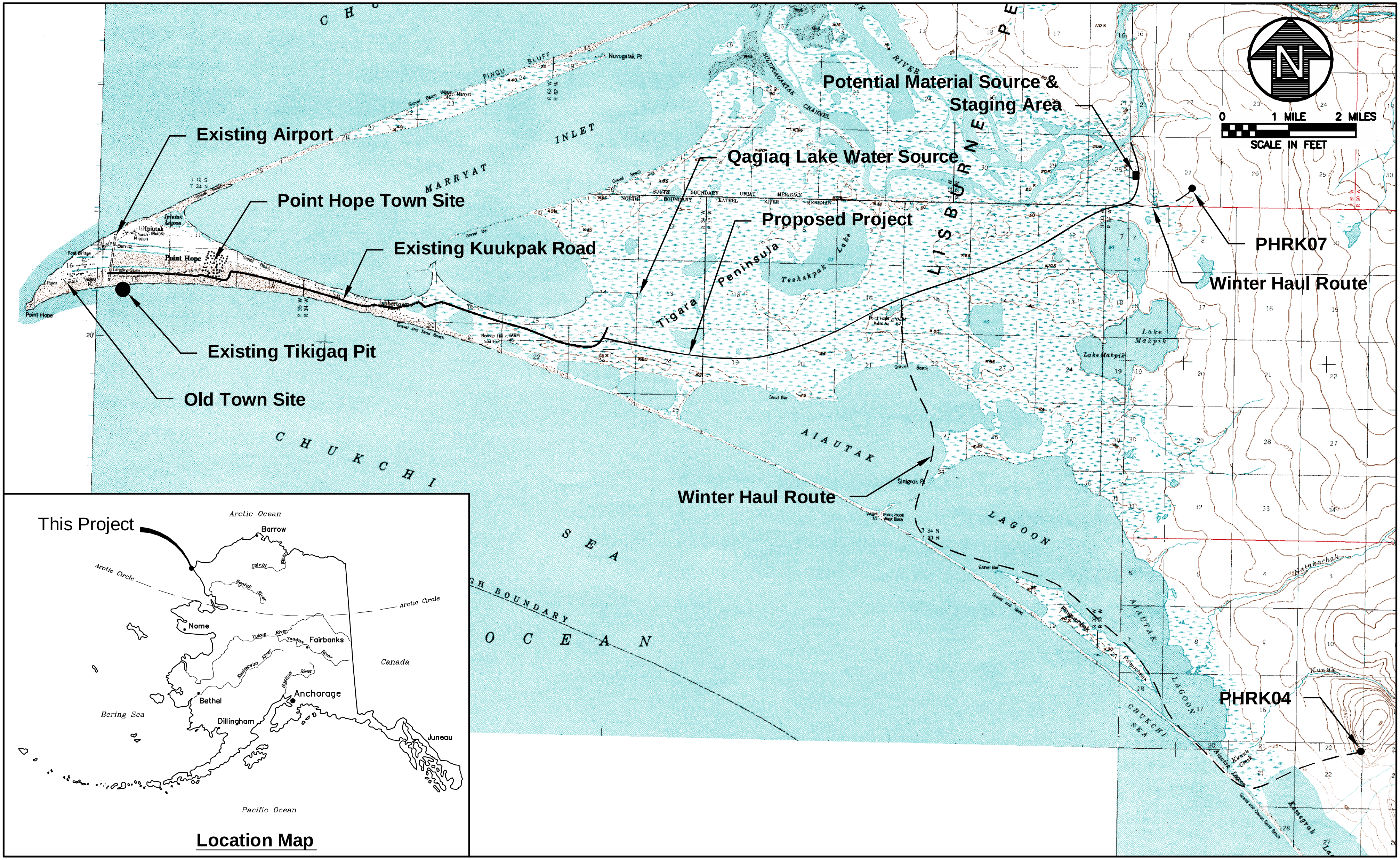

IMAGE:
USGS QUAD MAP, T034N, R035W, S17, KATEEL RIVER
POINT HOPE (B-3, A-2, C-5), ALASKA
1952 (REVISION 1987)

Reconnaissance Report
Point Hope Kuukpak Road Extension

Figure 1
Project Location Map

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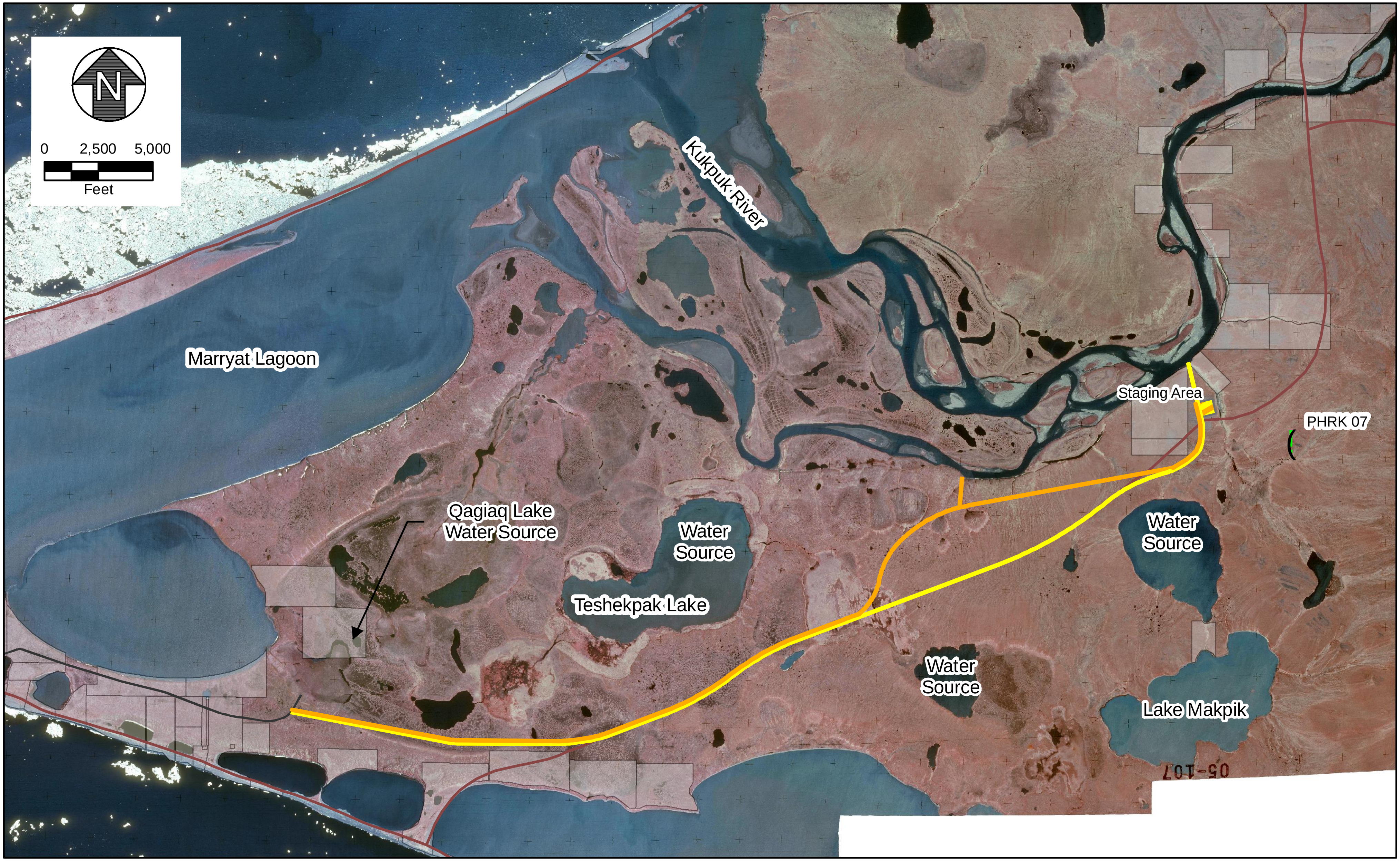

Legend

Rock Sources
Route Option A
Route Option B
17(B) Trail
Existing Right-of-Way & Road
Native Allotments

Reconnaissance Report
Point Hope Kuukpak Road Extension

Figure 2
Preliminary Route Options

- Design Study Report for Point Hope Evacuation Road Rehabilitation, August 2008; Hattenburg Dilley & Linnell; DSR identifies and evaluates alternatives for repair of 0.66 miles of Kuukpak Road damaged in 2007 Marryat Inlet Flood.

- Final Draft, Climate Change and Health Impacts, Point Hope Alaska, October 2009; Alaska Native Tribal Health Consortium (ANTHC); discusses potential impacts to subsistence resources, food security, drinking water quality, and infrastructure from climate change.

1.2 Project History

Point Hope has the distinction of being one of oldest continuously occupied Inupiat Eskimo settlements in Alaska - reportedly for over 2,500 years. Point Hope has a long history of flooding and erosion.

In 1975 erosion and storm surge flooding damaged and destroyed homes and ice cellars. As a result of the 1975 storm the entire village was forced to move to a site two miles east of the villages' historical location (old town) to avoid further erosion. In the 1990s, the north end of the Point Hope runway was protected with armor stone to abate further erosion of the runway safety area. On the north beach, 10% of the old town site has been lost due to erosion and only 50 to 60 traditional sod homes remain (ANTHC, 2009). In 2011, the north beach by the old village eroded another 80 feet causing more damage to ice cellars used for storing meat. Constructing a road off the peninsula has been studied and publicly discussed for many years and has overwhelming local support from the community. The proposed project is referred to locally as the "17-Mile Road". Three variations of the same approximate alignment have been previously proposed by the community and consultants. The alignments generally follow an established 17(b) trail eastward toward the Lisburne Hills. See Figure 3. The three alignments were:

1. **City Route.** City of Point Hope communication to the North Slope Borough Planning Commission (September 2002),

2. **PAR Route.** CH2M-Hill Project Analysis Report (PAR) for the Borough looked at the feasibility and cost of extending the road to three termini called PAR Terminus 1, PAR Terminus 2, and PAR Terminus 3 that stopped at elevations of 50 feet, 75 feet, and 100 feet (August 2003), and

3. **Jakey's Route.** Native Village of Point Hope resolution submitted to DOT&PF in support of the proposed project with an alignment that is has been referred to as Jakey's Route, named after Jakey Koonok (October 2008).

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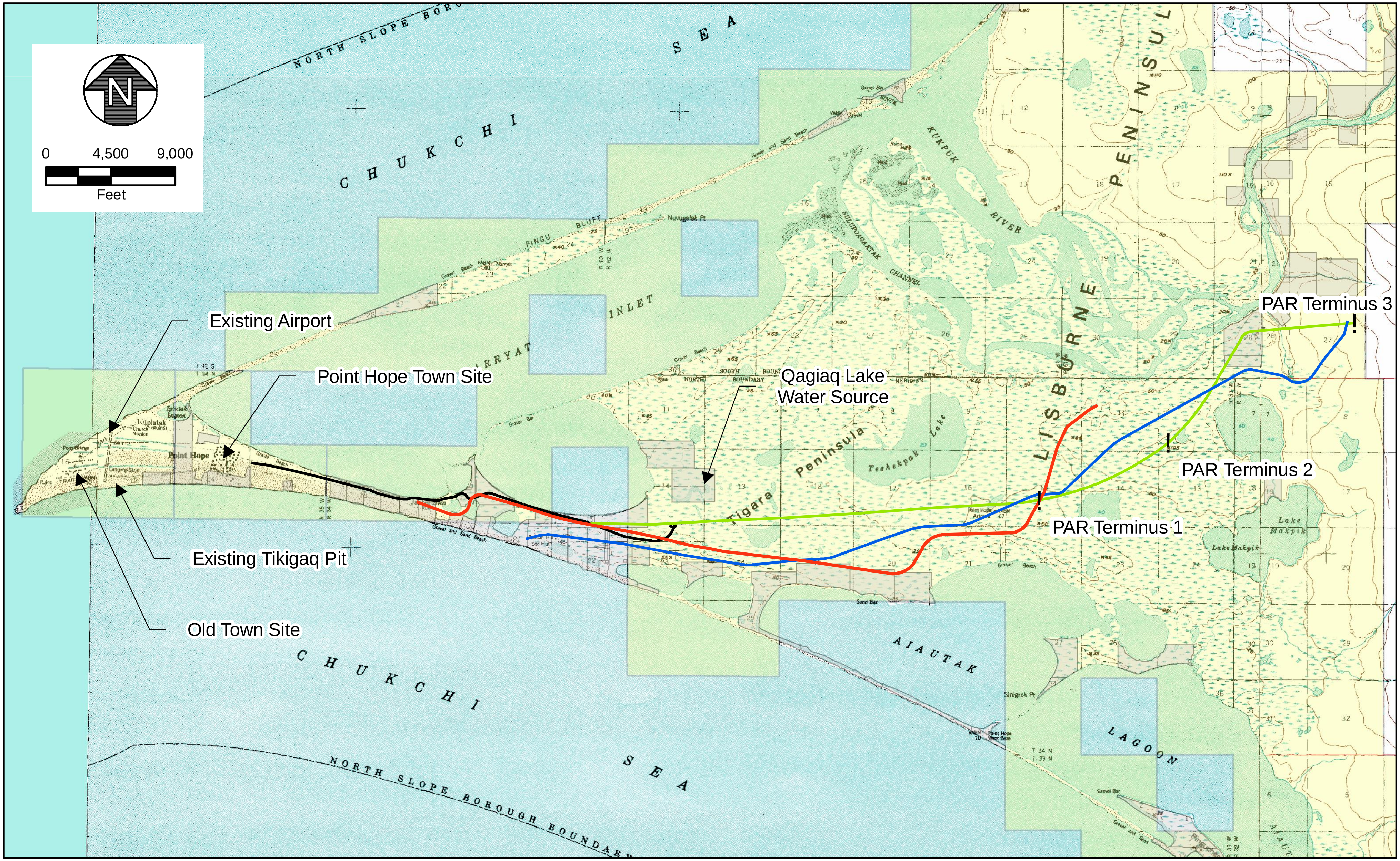

Legend

Jakey's Route (NVPH, Resolution to DOT, Oct 2008)

City Route (City to NSB Planning Comm., Sept 2002)

PAR Route (CH2MHill, PAR to NSB, Aug 2003)

! PAR Termini

Existing Road

Native Allotments

Native Lands

Reconnaissance Report

Point Hope Kuukpak Road Extension

Figure 3

History of the 17 Mile Road

1.3 History of Existing Kuukpuk Road

During the spring breakups of 2006 and 2007, the outlet to Marryat Inlet was plugged by sea ice and a Kukpuk River ice jam rapidly released a large amount of water into Marryat Inlet. The flood incident damaged Kuukpak Road (see Figure 4) and left the community surrounded by water with no way to escape to higher ground.

Figure 4: Kuukpak Road Washout after Marryat Inlet Flood Event Looking West (2007)

In 2007, the NSB and the DOT&PF signed a Memorandum of Understanding (MOU) to rehabilitate Kuukpak Road to a terminus above flood stage elevation. The same year, the NSB made temporary emergency repairs to the damaged road.

In 2009, a 0.66-mile low section of Kuukpak Road was rehabilitated and elevated to 10.5 feet mean lower low water (MLLW) by contractor Ridge Construction under a competitively-bid state construction project (NCPD-0002(206)/76966) managed by DOT&PF.

In 2010, under a contract with the NSB, HDL conducted community meetings and field research including route inspections, preliminary wetlands delineation, and a cultural resource study of the first 7.6 miles of the road corridor and developed two potential route options (this project). In 2010, Coastline Engineering updated their 2008 flood analysis with improved survey data and computer modeling. Their study estimated the 100-year flood elevation to be 9.2 feet and recommended a design flood elevation of 10.0 feet. See Appendix A.

In the Spring of 2011, another Marryat Inlet flood event elevated water levels to within 1.2 feet of the top of Kuukpak Road (approximately +9.3 feet). See Figure 5. The existing Kuukpak Road is constructed to an elevation of approximately 10.5 feet and acts like a dam by holding back waters of the Marryat Inlet during flood events. The existing Kuukpak Road is not designed to withstand differential hydrostatic pressure, but has held only because the road core is frozen during the spring flood events.

Figure 5: Kuukpak Road High Water Marks, North Side of Roadway Looking West (2011)

2.0 Preliminary Purpose and Need

The purpose of this project is to provide an all-season access road from the Tigara Peninsula to the foothills of the Lisburne Hills terminating near the Kukpuk River. This project is needed to provide egress off the peninsula, to access to the foothills and the Kukpuk River, to egress from the Kukpuk River, to provide a staging area in the event of an emergency, and to access to subsistence food and water sources. The project initially focused on emergency evacuation of residents from the peninsula, but after completing field investigation work, community meetings and the flood analysis it became clear that there are a number of other important needs for this project. Global climate changes are amplified in the Arctic's atmospheric, marine, and terrestrial environments. The effects of climate change are a major concern as the polar ice cap recedes, the arctic coastline is exposed to more frequent large storms, sea level rises, marine mammals change migration patterns, ocean circulation patterns change, water supplies diminish from reduced precipitation and permafrost warms. This project gives the community the opportunity to proactively prepare for a future that is likely far different than it is today. The project is needed for the following reasons:

- **Flooding and Erosion.** A recent study by Alaska Native Tribal Health Consortium (Climate Change and Health Impacts, Point Hope Alaska, October 2009) indicates "Continued erosion and flood prevention, and improved evacuation routes are important to help prevent injury and damage to infrastructure." In 2007 a flood washed out a portion of Kuukpak Road. The existing rehabilitated

Kuukpak Road is constructed to an elevation of approximately 10.5 feet at the crown and impounds water from Marryat Inlet during flood events. The United Nations estimates that minimum global sea level rise will be between 0.6 and 1.9 feet within 80 to 90 years (IPCC, 2007). The 100-year ocean storm surge is estimated to be +7.3 feet with potential wave run-up to +10 to +12 feet. As a result, the existing Kuukpak Road is at risk of further damage as it settles into the permafrost, and because it is not designed to behave like a dam or levee. In 1972, Point Hope was reported to be eroding at about 8.6 feet per year on the north side (U.S. Army Corps of Engineers, 1972). In 2011, the north beach lost 80 feet to erosion and is anticipated to erode at a higher rate in the future due to the receding polar ice cap (leaving the shoreline exposed). The project would provide egress off the peninsula and a safe staging area in the event of a flood event.

- **Water Supply Access.** Point Hope extracts its drinking water from a shallow tundra pond, not a lake. Despite projections of increased precipitation, the Arctic landscape is expected to become 10-30% drier by the end of the century (O'Brien & Oya, 2009). In Point Hope, summer warming combined with decreased precipitation has caused tundra ponds to dry up, impacting water availability and quality. During the summers of 2007 and 2008, water operators measured reduced quality in the raw water from the source lake (ANTHC, 2009). The project would provide access to new fresh water sources further inland.

- **Subsistence Access.** A 2003 Borough survey found that 93% of Point Hope residents depend on subsistence food sources. Whale, seal, walrus, fish, waterfowl, and caribou are the predominant protein sources. Extensive subsistence activities along the Kukpuk River for salmon, grayling, char, whitefish, Dolly Varden, and caribou are important when marine mammals are not present. (NSB Final Draft Coastal Management Plan, 2007) (NSB Comprehensive Plan, 1993). Global climate change is expected to alter subsistence food sources and activities (GAO 2003; ACIA 2004). As the sea ice moves away, so will ice-dependent walruses, seals, and polar bears, increasing the need for terrestrial food sources. The project would improve access to inland subsistence wild food sources.

- **Potential Material Source Access.** Point Hope's gravel source is exhausted. The Borough is currently seeking a new gravel source. One potential site PHRK07 is located near the proposed terminus of the project (HDL, 2011). See Appendix B. If proven to be a viable source, the project would provide year-round access to a lower cost material source when compared to the recently discovered raw material source located approximately 20 miles south of the community.

- **Mineral Development Access.** The 1989 NSB Coastal Management Plan (CMP) Area Which Merits Special Attention (AMSA) document identified potential belts of gold, silver, copper, lead, zinc, iron, platinum, and uranium on the Lisburne Peninsula south of Point Lay. The Bureau of Land Management (BLM) published the Kobuk-Seward Peninsula Proposed Resource Management Plan and Final Environmental Impact Statement in September 2007. The plan identifies the Lisburne Coal Field near Point Hope. At this time the coal field is not seen as developable due to access issues. The project would improve access for exploration. See Figure 6.

- **Plan Compatibility.** Several planning documents have identified the need for an evacuation route. Three planning documents have specifically identified this road as needed; North Slope Borough Comprehensive Plan (NSBCP) (NSBCP 1998 Update), Northwest Alaska Transportation Plan (DOT&PF, 2004), and the Coastal Management Plan for the North Slope Borough (CMP) (NSB 2005).

- **Future Airport Relocation.** Relocating the airport off the peninsula has been discussed, but is not a part of any current planning effort. The airport is located in an active erosion area that is likely to erode further with increased storm exposure from climate change. In 1997, the NSB spent approximately $2 million armoring the shoreline to protect the airport. The existing airport and airport access road are located at elevations of approximately 15.5 feet, but are not considered a viable alternative for staging an evacuation because of the exposed location. The proposed project could eventually serve as an access to higher lands to the east, should the Point Hope Airport need to be relocated.

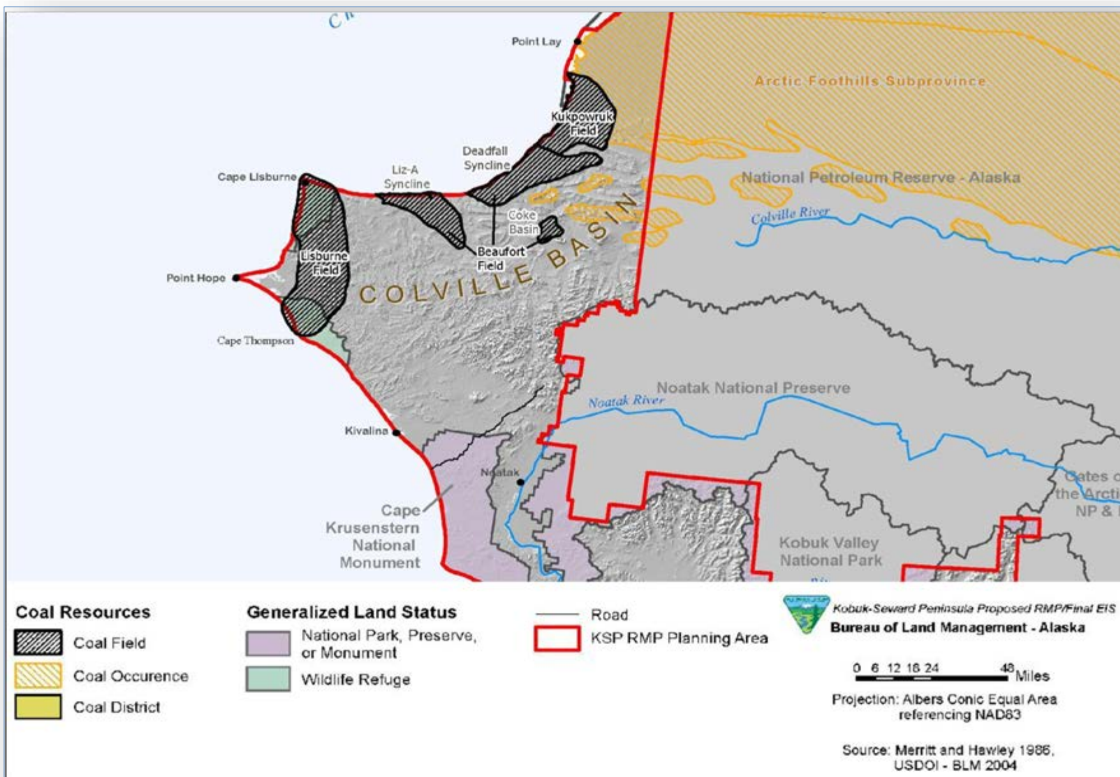

Figure 6: Lisburne Coal Field (Courtesy BLM)

3.0 Existing Conditions

3.1 Local/Regional Setting

Point Hope, Alaska lies on the Tigara Peninslua, north of the Arctic Circle. The village is approximately 11 miles from the foothills of the Lisburne Hills, 330 miles southwest of Barrow, 150 miles northwest of Kotzebue, and 170 miles southwest of mainland Russia. The community lies at 68° 21' north latitude and 166° 44' west longitude, in section 16, T034N, R035W, of the Kateel River Meridian. The village is bounded on two sides by water, the Chikchi Sea to the south and Marryat Inlet to the north. The village itself is located at an elevation of 13 to 18 feet above sea level at the end of the 15-mile long Tigara Peninsula extending into the Chukchi Sea (Figure 2). Air is the only year-round access to the community as there are no roads connecting the village to other communities. Point Hope is a community of 674 (2010 U.S. Census) people, most of whom are Iñupiat Eskimo. The Arctic Slope Regional Corporation (ASRC) is the regional Native Corporation in the area.

3.2 History

The Tigara Peninsula is one of the oldest continuously occupied Iñupiat Eskimo areas in Alaska. Several settlements have existed on the peninsula over the past 2,500 years, including Old and New Tigara, Ipiutak, Jabbertown, and present Point Hope. The peninsula offers good access to marine mammals and ice conditions allow easy boat launchings into open leads early in the spring whaling season. By 1848, commercial whaling activities brought an influx of Westerners, many of whom employed Point Hope villagers. By the late 1880s, the whalers established shore-based whaling stations, such as Jabbertown. These disappeared with the demise of whaling in the early 1900s. The city government was incorporated in 1966. The modern community of Point Hope moved from its historic location "old village" in 1975 in part because of repeated floods and the threat of continued flooding.

3.3 Public Involvement

Three public meetings have been conducted; July 14, 2010, August 4, 2010, and June 9, 2011 in Point Hope specifically for this project. The first meeting on July 14, 2010, was to introduce the community to two new Point Hope projects, the Material Source Reconnaissance Study and the Emergency Evacuation Road (EER) Preliminary Engineering and Environmental work. An introductory letter, a public notice and a map were sent to the Tikigaq Corporation (TC), Native Village of Point Hope (NVPH), and the City of Point Hope (City) on July 1, 2010 via email for posting in the village. The meeting place was arranged in advance with the City.

A second public meeting was conducted jointly with the TC, NVPH, and the City on August 4, 2010. A public notice was sent via email July 23, 2010 for posting in the village. An open house style public meeting was held at the Point Hope community center to get further input, to conduct the field reconnaissance for the Material Source Study, and to get a consensus from the community upon a road corridor for conducting environmental studies. It was reiterated that the potential alternatives to be considered included extending the road, rerouting the road onto higher ground for safety, or hardening the existing road to make it more flood-proof. The community indicated that they had already expressed their preference at earlier meetings and that Jakey Koonuk's route was presented to the Bureau of Indian Affairs (BIA) as the preferred route.

The third public meeting was held on June 9, 2011 to receive comments about extending the study area further east. A public notice was sent via email May 30, 2011 for posting in the village. An open house style public meeting was held and a map of the extended corridor was given to all attendees. See Appendix C for Meeting Minutes.

3.4 Existing Kuukpak Road

The existing Kuukpak Road, locally designated as the "7 Mile Road" is a 2-lane gravel road that varies in width from 18 to 24 feet and is approximately 6.3 miles in length. Kuukpak Road was originally built to connect the community of Point Hope to its fresh water source, Qagiaq Lake, which is a tundra pond. The road is located within a platted, public 100-foot right-of-way (Plat no. 90-3, Barrow Recording District, Point Hope, Alaska). A 6-inch diameter above-grade seasonal raw water line is located within the right-of-way next to the road. The road is primarily used by ATV's, with occasional use by light trucks and maintenance equipment. The Annual Average Daily Traffic (AADT) is estimated to be far below 400 vehicles per day and based on stagnant population growth projections, is not expected to exceed 400 AADT in the foreseeable future. See Figure 7. The existing

Figure 7: Existing Kuukpak Road Looking West Toward the Village

road was originally constructed with a beach gravel fill section. The roadway embankment is stabilized with geotextile-wrapped slopes to contain the round, uniform aggregate, and the driving surface and slopes are capped with approximately 12 inches of a 3/8-inch minus crushed aggregate surface course. The eastern segment is constructed over thaw-unstable permafrost and is showing signs of differential settlement. The road embankment varies in depth from 3 to 8 feet. The road varies in elevation from approximately 10 to 45 feet (2007 LCMF survey). The first two miles of road leading from the village have elevations ranging from 14.2 to 16.5 feet. Near mile 2.5 a low-lying section was elevated in 2009 by Ridge Contracting for approximately $1.3 million under a competitively bid construction contract managed by DOT&PF. The remaining road has elevations ranging from 13.5 to 44.6 feet Mean Sea Level (MSL). Drainage is provided by 24-inch and 36-inch diameter culverts located along the alignment. There are no pedestrian facilities or illumination.

3.5 Facilities

Point Hope acquires drinking water from a tundra pond referred to as “Qagiaq Lake”, located approximately seven miles east of the town. Water is supplied to the village by an at-grade season HDPE water line along Kuukpak Road. In the summer, water is pumped into town and is treated and stored in large, heated water tanks in Point Hope. The village uses the tanks throughout the winter for water. A number of homes have water tanks with delivery, which provides running water for kitchens; others haul water. No other utilities are known to exist within the project limits.

3.6 Transportation

Air is the primary means of transportation year-round. The Point Hope Airport has a 4,000-foot long by 75-foot wide paved airstrip. This airport is state-owned and operated. Barge service typically consists of a barge landing in the spring on the way north and then again with backhaul from Deadhorse. Barges are landed directly on the beach to the south of the community. Point Hope has 6.5 miles of existing community roads (excluding Kuukpak Road) that are used by trucks, cars, ATV’s, and snow machines. Winter travel on snow machines is the only means of traveling overland to surrounding villages.

3.7 Climate

Climate data is important in developing design criteria for road embankments and drainage structures, as well as analyzing maintenance needs for a proposed road. For this reconnaissance study, a preliminary evaluation of existing data was performed to establish road embankment heights and to make assumptions for drainage structures. The next phase of the project would evaluate this data in more detail.

The weather data collected from the FAA Station at the Point Hope airstrip includes: wind speed, wind direction, dew point, precipitation, snow fall, snow on the ground, peak winds, extreme snow loads, and temperature. Historical weather data is available from 1924 to 1954, but data is unavailable from the 1960’s through the 1980’s. Weather data is available from the Kotzebue Field Office of the National Weather Service (NWS) from 1991 until 2011.

Point Hope has an arctic climate characterized by long, severe winters, with cool, windy, and frequently wet summers. Average temperatures range from 32°F to 52°F in the summer and from -16°F to 0°F in the winter. Extreme recorded temperatures are -49°F and +72°F. Precipitation is approximately 10 inches annually, including 36 inches of snowfall. Winds in Point Hope blow near constantly.

3.8 Soils, Geology, and Material Sources

The Kukpuk River flows out of the mountains on the western margin of the Lisburne Peninsula, meanders across the low plains of Tigara Peninsula and ends in Marryat Inlet, a lagoon separated from the Chukchi Sea by a 13 mile long barrier island. A similar long barrier beach defines the southern limit of the Tigara Peninsula and isolates several large lagoons behind it, notably Aiautak Lagoon.

The village sits on sparsely vegetated, loosely compacted, and well-drained uniform granular gravel beach ridges at an elevation of approximately 13 to 18 feet. The first two miles (approximate) of the existing Kuukpak Road lies atop rounded, marine-transported sediments extending from the beach ridges that underlie town. The generally coarse granular nature of the beach ridges keeps soils drained and generally non-frost susceptible. Beyond the beach ridges the road lies atop ice-rich permafrost consisting of saturated peat and silt soils. East of the village, the peninsula tundra and pond terrain rises gently to elevations of about 100 feet MSL over a distance of fifteen miles before rising more sharply onto the foothills of the Lisburne Hills. This area is generally underlain by continuous permafrost except around large water bodies.

3.8.1 Material Sources

The existing material source is a beach deposit consisting of uniform rounded beach gravels, which present stability and erosion challenges. The existing material source is nearly exhausted and a new source is needed. Geological explorations for a new material source were conducted by LCMF, Duane Miller and Associates, and HDL in 1997, 1998, and 2007 with no success. In 2010, HDL was tasked with finding an upland material source of suitable quantity and quality to produce civil construction aggregates, and within reasonable haul distance of the village. Eight potential sites were identified and a reconnaissance was completed to evaluate the geologic features and the potential for use as a material source.

The potential of four sites was evaluated further in 2016 through a geophysical (seismic refraction) survey. The geophysical survey indicated that site PHRK04 had the greatest potential to provide a significant quantity of quality aggregate. Drilling was conducted at PHRK04 in 2017 to better define the characteristics of the rock. See Appendix B.

PHRK04 is located near a limestone outcrop on an exposed hillside approximately 18 miles southeast of the village of Point Hope and 1.5 miles inland from the beach. The outcrop shows blocky collapses from the rock face and some of the displaced blocks are on the order of eight to twelve feet in each dimension. Laboratory testing of the rock yielded good test values, as presented in Table 1.

Table 1 – Rock Test Results

PROPERTY	BASE COURSE SPECIFICATIONS	SURFACE COURSE SPECIFICATIONS	PHRK04 TEST RESULTS
LA Abrasion	50 max	45 max	21
Degradation	45 min	45 min	96
Sulfate Soundness	9 max	9 max	0.03%
Specific Gravity (SSD)	n/a	n/a	n/a
Density	n/a	n/a	174.92 lb/ft^3
Absorption	n/a	n/a	0.66%

Site PHRK04 lies inland from the beach. The terrain between the beach and the source is gently rising permafrost tundra and poorly drained wet soils. Vegetation consists of tundra grasses. Grades are reasonable until the rubble apron at the base of the knoll. Winter access from the site to Point Hope can be either by an ice road to the beach, thence up the beach; or ice road along the sheltered lagoons. Local knowledge of winter ice conditions, drifting snow areas, and ocean ice-heave characteristics will aid in designing the final access. Year-round access could be achieved by constructing an all-season road to the beach, thence up the beach. Land ownership, allotments and rights of way agreements would also have to be considered.

The boreholes conducted at PHRK04 suggest that the site is capable of yielding significant quantities of quality aggregate. The site is also likely capable of yielding smaller diameter erosion control products such as ditch lining, Class I riprap, and Class II riprap as defined by the Alaska Department of Transportation & Public Facilities Standard Specifications.

Extraction at PHRK04 will require blasting and crushing to produce construction aggregates. The rubble apron is very rough terrain with steeper grades, but the apron may offer a good initial excavation zone with minimal blasting required to create a level working area for staging and stockpiling. The 100% angular fracture faces resulting from blasting and crushing will yield an aggregate that performs well for roadways.

3.8.2 Other Hand Test Pits

Fieldwork conducted in October 2007 included the advancement of three shallow hand auger pits along Beacon Hill near the alignment of the future road extension corridor. Soil samples recovered from the pits were classified in the field and returned to the HDL soils laboratory for testing. Laboratory testing was performed in accordance with ASTM and ATM procedures. These pits generally encountered organic, sandy silts with some peat layers and bands. These soils are highly frost susceptible. Moisture contents ranged as high as 89 percent. Permafrost was encountered from 1.5 to 2.8 feet below ground surface.

Additional pits along the alignment were dug for wetland delineation in September 2010 (See Appendix D). No samples were taken. The pits generally encountered a thick organic layer with peat. Permafrost was encountered from 1.0 to 1.5 feet below the ground surface.

3.9 Right-of-Way and Land Ownership

The existing Kuukpak Road is a platted and dedicated public right-of-way per plats 90-3 and 91-5 of the Barrow Recording District.

The proposed road extension and evacuation staging area for both Route Option A and B generally follow a 17(b) trail easement. Preliminary land research identifies the Native Village of Point Hope as the primary land owner along the route. The subsurface estate belongs to the Arctic Slope Regional Corporation (ASRC) per Interim Conveyance No. 051. A comprehensive boundary survey and title search will be required when the final road alignment is determined. Right of entry permissions have been granted by the TC and the NVPH and are attached as Appendix E.

4.0 Environmental Overview

4.1 Air Quality

The Alaska Department of Environmental Conservation (ADEC) Division of Air Quality does not list Point Hope in a non-attainment area. This project is not expected to require an air quality conformity analysis. At this time there are no residences or commercial developments along the proposed road alignment options. Airborne particulates caused by temporary construction activities and affecting ambient air quality will be mitigated by watering. Eventually, the completed road would be maintained by the NSB and long term dust issues would need to be addressed.

4.2 Compatible Land Use

Each village in the NSB is zoned for Village and Conservation Districts. Portions of the project area are in Conservation District zones and will require a Conditional Use Permit by the NSB Planning Department. Other portions of the project are zoned Village District and will require a development Permit by the NSB Planning Department. The proposed project is consistent with uses identified in the North Slope Borough Comprehensive Plan (NSBCP). Land use in the project area consists of a variety of subsistence and cultural uses. Numerous native allotments in the vicinity of the project area are used for traditional hunting, fishing and trapping activities. The proposed road corridor will avoid to the greatest extent practicable existing native allotments. Accesses to native allotments require revocable use permits coordinated by the Native Village of Point Hope and approved by the land owner, and the land trustee, the BIA. Other land ownership is by the NVPH, TC, and the state and federal government. No state lands or state parks will be affected by this project. The proposed project will not take place within a federal recreational area, park, or preserve.

4.3 Construction Impacts

Construction impacts from a road project are short term. Water and air quality impacts would be addressed in the Environmental Assessment (EA) and the Erosion and Sediment Control Plan developed during the design process. The community drinking water source will require special consideration to ensure minimal water quality impacts during construction. Noise impacts to existing receptors are anticipated to be minimal due to the project's distance from the community. Winter construction is anticipated to avoid damaging sensitive tundra habitat and lessen the impact to nesting birds. Environmental concerns associated with the proposed improvements will also apply to any material site chosen within the Point Hope vicinity.

4.4 Hazardous Waste

Two decommissioned military facilities at Cape Lisburne and Cape Thompson are located near the project and are being targeted for cleanup under the Department of Defense, Installation Restoration Program. The contaminated sites are beyond the limits of this project.

4.5 Historic and Archeological

On August 31 and September 1 of 2010, Northern Land Use Research (NLUR) conducted a pedestrian and four-wheeler cultural resource survey of the Kuukpak Road extension study area. Their report titled "*Cultural Resource Survey of Proposed Kuukpak Road Extension at Point Hope, Alaska*" dated November 2010 is attached in Appendix F. NLUR located a number of modern artifact scatters (MAS) consisting of recent (twentieth century) materials relating to transportation, travel, hunting, and cadastral survey. Materials noted included discarded beverage cans, food wrappers, a wooden sled, caribou antlers and bone, cadastral survey monuments and associated wooden marker boards, and broken Styrofoam insulation pieces blown across the tundra. Repeated use by four-wheelers has established an ad hoc trail system along the northern base of the east-west trending hill which borders the northern shore of Alautak Lagoon. None of the resources noted during the survey of the project study area meet criteria of significance or integrity for eligibility for listing on the National Register of Historic Places.

NLUR recommends that a finding "No Historic Properties Affected" for the 2010 study area be forwarded to the State Historic Preservation Officer (SHPO) by the NSB.

Additional cultural resource surveys would need to be done between the road corridor study area and the road terminus to complete the EA.

4.6 Water Quality

Construction of the roadway has the potential to cause sediment laden runoff to enter waterways. Special consideration will be necessary for the quality of the community drinking water source located in the vicinity of the beginning of the project. In order to prevent impacts, any contractor constructing the project will be required to develop an Erosion and Sediment Control Plan that addressees both non-point sources of storm water runoff and potential runoff pollutants such as fuel and hazardous materials staged at storage areas. During construction, the contractor will be required to have an approved Storm Water Pollution Prevention Plan that addresses water quality issues for the project and describes control measures that must be used in order to ensure protection of water quality and human health.

4.7 Wetlands

A wetlands delineation and functional assessment of the original study area was conducted on August 30, 2010 by HDL. In 2011 the study area was expanded further east. The expanded study area, including both route options, was delineated using NWI GIS data in July 2011 (see Appendix D). The area consists mainly of palustrine wetlands with grass taxa. All the vegetative species were listed as wetlands species. The sample sites' primary indicators for hydrology were standing water and saturated soils. A US Army Corps of Engineers (COE) permit will be required to fill wetlands for both route options including embankment, pullouts, and the staging area. The table below shows the wetland impact for each option.

Table 2 – Wetland Impact for Each Route Option

ALTERNATIVE	ROADWAY IMPACT (ACRES)	STAGING IMPACT (ACRES)	TOTAL
Route Option A	81.13	10.6	91.73
Route Option B	83.03	10.6	93.63

4.8 Fish and Wildlife

The Point Hope area has not been cataloged as important for spawning, rearing, or migration of anadromous fishes. Twelve species of freshwater and anadromous fish are known to occur in the streams and lakes of this region. These species include arctic cisco, coregonus autumnalis, arctic grayling, chum, king, pink, silver, and sockeye salmon, slimy sculpin, Cottus cognatus, rainbox smelt, Osmerus mordax, whitefish, Dolly Varden, arctic char, and Slavenlinus alpinus. Any work below Ordinary High Water (OHW) would require a Fish Habitat Permit; however work below OHW is not expected for this project. National Marine Fisheries Service does not manage these species; therefore Essential Fish Habitat Consultation will not be required.

Numerous species of migratory birds use wetlands areas for feeding, nesting, molting and staging; therefore construction will most likely be prohibited from June 1 - July 31. Impacts of habitat loss to these species will need to be evaluated as well. Consultation with USF&WS will be necessary for impacts to migratory birds. Winter construction is anticipated to avoid damaging sensitive tundra habitat and lessen the impact on nesting birds.

4.9 Threatened and Endangered Species

Section 7 consultation will be required and should be started at the earliest opportunity due to federal funding. Of the species found in the Point Hope area Polar Bear (*Ursus maritimus)*, Stellar Eider (*Polysticta stelleri*), and spectacled Eider (*Somateria fischeri*) are listed as Threatened Species. Bowhead Whale (*Balaena mysticetus*) are listed as endangered. Kittlitz's murrelet (*Brachyramphus brevirostris)* is a candidate. Although Polar bears are found in the project area the corridor identified is outside of the recently approved Polar Bear Critical Habitat area. Voluntary design precautions should be implemented to minimize impacts to the habitats.

4.10 Floodplain

There are no FEMA floodplain maps for the Point Hope area. The 100-year maximum expected Marryat Inlet/Kukpuk River flood event level is needed to establish minimum roadway elevations for the project. The recommended flood design elevation of +10.0 feet MLLW was determined in a report by Coastline Engineering entitled *"Determination of Evacuation Road Elevation from 100-year Probable Flood Levels, 2011."* See attached Appendix A. The elevation of the project area is approximately 25-feet and with the addition of the road embankment will be well above the design elevation for a potential 100-year flood event, and lies outside the 100-year floodplain.

4.11 17 (b) Trail Easements

17(b) trail easement rights are reserved when the Bureau of Land Management conveys land to a Native Corporation under the Alaska Native Claims Settlement Act (ANCSA). They take the form of various sized trails and one acre sites to allow the public to cross private property to reach public lands and major waterways. There are several such trails in the Point Hope area. The existing Kuukpak Road follows a portion of 17(b) trail easement EIN 1. EIN 1 is designated as a road easement one hundred (100) feet in width that extends from Point Hope easterly along the coast, south of Marryat Inlet, then northeasterly to the Kukpuk River area where one branch crosses the Kukpuk River and goes north as EIN 25 (Public Land access). The other branch of the trail continues along the left bank (looking downstream) of the Kukpuk River and connects with EIN 11 (Upper Kukpuk River access). For this project, Route Option A will continue to generally follow the route of EIN 1. Route Option B, follows EIN 1 but breaks away to the north and follows Jakey's route. To the extent practical, the 17(b) trail easement will be used and converted to right-of-way providing equivalent or improved access to remote public lands.

4.12 Subsistence

The strategic location of Point Hope has allowed for a long and dependable history oriented towards marine mammal utilization. Both terrestrial and marine resources continue to be harvested from the sea, ice, and land environments to provide an adequate food supply. Certain species, such as seals and caribou, are present near Point Hope much of the year, and some smaller mammals and ptarmigan are available all year. Other resources such as bowhead whales can be obtained only for short periods annually. Changing environmental conditions and resource fluctuations require a specialized knowledge of the region and the ability to expand traditional hunting areas. These elements influence people's travel patterns, and ability to hunt marine resources, including the important bowhead whale hunts in the spring and fall.

Marine Mammal Resources

Beginning in late March or early April, the bowhead whale are migrating past the Point Hope area. Approximately 15-18 whaling camps are located along the edge of the landfast ice. The actual harvest area varies from year to year depending on where the open leads form. The duration of the whaling season is limited by the International Whaling Commission's (IWC's) quota. Despite the limited nature of both the whaling season and the harvest area, no other marine mammal is harvested with the intensity and concentration of effort that is focused on the bowhead whale, the most important resource in Point Hope's subsistence economy. In a 10-year period ending in 2003, the total annual number of bowheads landed varied from 0-5. Significantly less in comparison to a 10-year period ending in 1982, in which the total annual number of bowheads landed varied from 0-14. The last subsistence survey in the village was conducted by the NSB in 2009. Lack of sea ice and increased distance required to find the whales is a well realized factor in the decline of whales landed. Point Hope hunters also actively harvest beluga whale, walrus, bearded seals, ringed seals, spotted seals, and polar bears.

Terrestrial Resources

Caribou are the primary terrestrial mammal species harvested in Point Hope. Caribou are seasonally available and tend to move into the Point Hope hunting area in July but may be hunted through the winter. Point Hope primarily hunts caribou from the western Arctic caribou herd. Caribou have always been an essential source of raw materials (other than food) such as sinew for thread, skins for clothing and tents, antlers for tools, etc. The estimated number of caribou harvested (354 caribou) between July 1994 and June 1995 was similar to the estimated harvested in 1992 (256 caribou). Moose, Dall sheep, and Arctic Fox, and wolverine are other terrestrial resources with documented harvests.

Fish Resources

Point Hope residents harvest a variety of fish during the entire year. As the ice breaks free in mid- to late June, residents use a variety of methods to catch arctic char and, pink, coho and chum salmon. Fishing occurs from coastal fish camps (often converted from spring camps for hunting bearded seal and walrus) located along the shore from Cape Thompson north to Kilkralik Point. Other fish harvested include whitefish, grayling, tomcod, and occasionally flounder. In the fall, residents harvest grayling and whitefish on the Kukpuk River during the upriver fishing period.

Bird Resources

Throughout the year, waterfowl and other migratory birds also provide a source of food. Eiders, Snow Geese, and Murre eggs appear to be the most common bird resources although other species, such as Brant, Greater White-fronted Geese, and Willow Ptarmigan may also be taken. Murre eggs are gathered at Cape Thompson, southeast of Point Hope, or at Cape Lisburne, northeast of the village.

Access to and use of subsistence resources is a priority in Point Hope. As a result of environmental factors changing sea ice will affect the abundance and the access to seals, walrus, polar bears and whales, and the changing climate of the North Slope might affect the abundance of caribou (Wendler et al. 2009). Both Route Options will provide improved and increased access to these resources for the residents of Point Hope both in emergency and non-emergency situations. Subsistence resource impact issues associated with the project will be addressed during the environmental process. Additionally, the road will be designed and constructed to be compliant with the NSB Coastal Management Plan.

4.13 Climate Change

Changing climate conditions are being experienced around the world but are especially pronounced in polar and sub-polar regions. Changes as a result of this warming are not just limited to temperature but also wind, snow cover, precipitation, permafrost, and sea ice. These elements influence people's travel patterns, daily activities, and ability to hunt marine and terrestrial resources.

Warmer summer temperatures increase the occurrence of blooms of algae in freshwater ponds (drinking source), increase the population of mosquitoes, and prevents the community from hang drying meats.

High wind events cause waves to splash overland and onto the runway, the only year round access to the community. Wind and extreme cold make it unsafe for children to travel back and forth to school.

Too much or too little snow cover prevents overland winter travel which is the only time land access to surrounding communities is available and large snow events can cause damage to homes and infrastructure.

Melting of permafrost ground is resulting in a loss of shoreline and river bank. Residents report that the Kukpuk River is wider and shallower with more obstacles that make travel upriver for subsistence resources more treacherous. Ice cellars that are located in permafrost ground are being lost to erosion and others are no longer cold enough to keep essential whale meat and muktuk frozen. The decrease in safe food storage leads to increased food borne illness and causes concern for food security.

Late ice formation, decline in ice thickness, and diminishing sea ice make hunting travel more difficult and dangerous. Ice formation is occurring later in the fall and breakup is occurring earlier in the spring significantly shortening the season for over-ice transportation and ice-based hunting. The ice pack is also becoming too thin to use for whale haul out and butchering. Butchering of a whale can take place in the water but is dangerous and not traditionally done. Decreasing sea ice will also enhance erosion rates due to wave action, even if the overall storminess of the ocean stays unchanged (Wendler et al. 2009). The airport is at risk for damage due to such erosion.

With all of these changes occurring the people of Point Hope are going to need options such as this project to enable them to continue maintaining their access to subsistence resources.

4.14 Management Plans

Numerous management plans have been published by agencies that cover Alaska's North Slope region. The following documents discuss or refer to an extended access road in Point Hope:

- **Kobuk-Seward Proposed Resource Management Plan, Bureau of Land Management, 2007** – This plan identifies a coal field to the northeast of Point Hope. This coal field is a viable resource according to the BLM but at this time there are no intentions of developing the resource due to lack of access. See Figure 6.

- **Coastal Management Plan, North Slope Borough, 2007** – One goal is to construct 800 linear feet of road in Point Hope for an evacuation route.
- **North Slope Borough Comprehensive Plan Update, North Slope Borough, 1998 –** Goal 3 of the NSBCP is to maintain access to and use of subsistence resources by residents.
- **Northwest Alaska Transportation Plan, AKDOT&PF, 2004 –** This road was identified as a recommended project.
- **Climate Change in Point Hope, Alaska, Strategies for Community Health, Alaska Native Tribal Health Consortium, 2010 –** Recommends improved evacuation routes to a location outside of the flood zone.

4.15 Environmental Impact Categories Not Assessed in Detail

Farmland, Noise, Environmental Justice, Social, Economic, and Natural Resource impacts have not been addressed in this report, though will be fully addressed during the formal environmental process for the project.

4.16 Anticipated Permits:

The following is a list of anticipated permits and permitting agencies for this project:

- Alaska Department of Environmental Conservation Section 401 Water Quality Permit
- Alaska Department of Environmental Conservation Storm Water Construction General Permit
- Alaska Department of Natural Resources Barge Landing Permit
- Alaska Department of Natural Resources Temporary Water Use Permit
- Alaska State Historic Preservation Office Determination of No Historic Properties Affected
- North Slope Borough Development Permit
- U.S. Army Corps of Engineers Section 404 Permit
- U.S. Fish and Wildlife Service Polar Bear Interaction Plan
- U.S. Fish and Wildlife Service Section 7 Consultation

5.0 Road Design

5.1 Design Criteria

The new roadway will be constructed on thaw-unstable permafrost and will need to insulate the underlying permafrost to avoid differential settlement. This is done with approximately 6.0 feet of gravel and rigid insulation board. The rigid insulation would slow, but not eliminate, the thaw settlements. Due to the remote location and low traffic volumes (less than 400 AADT), a traffic and safety analysis is not needed. Table 3 presents the preliminary design criteria anticipated for this roadway.

Table 3 – Road Dimensions

ITEM	PROPOSED ROAD
Roadway Surface	Unpaved
Roadway Width Including Shoulders	18 feet with Turnouts
Minimum Embankment Depth	6 feet
Road Side Slopes	3:1
24" Culverts	5 per mile
Separation Geotextile	70'

The typical section would be an 18-foot wide, single lane road including shoulders, with 12-foot wide 100-foot long turnouts spaced every 1000 feet, and 3:1 side slopes. The minimum embankment thickness would be 6 feet at the shoulders, plus rigid insulation as needed to reduce the thaw consolidation of underlying ice-rich, fine grained permafrost. A separation geotextile would be placed between the subbase and the existing frozen tundra. The finished surface would be 8 inches of the crushed aggregate surface course. See Figure 8.

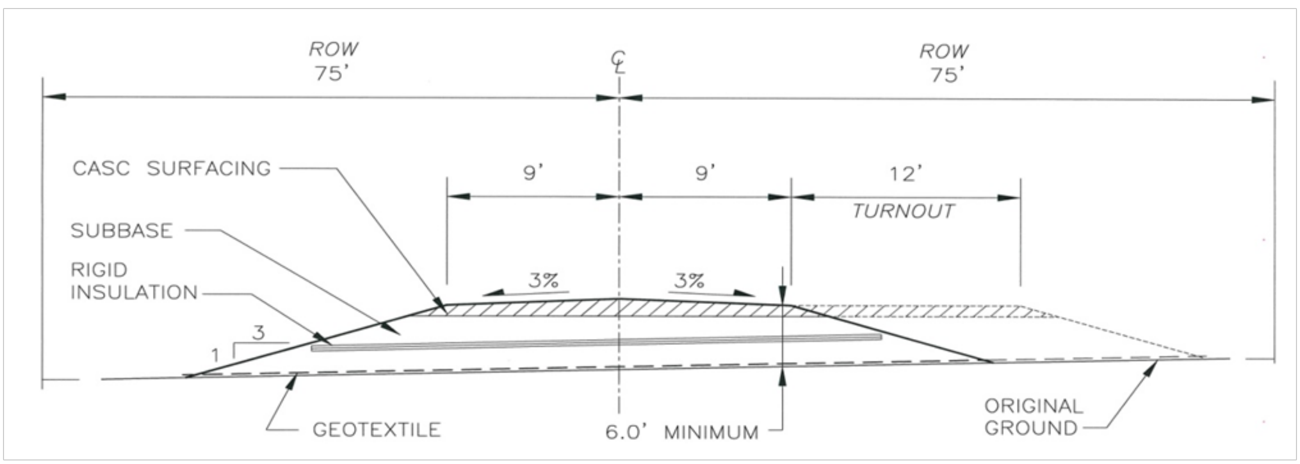

Figure 8: Recommended Typical Section

A new gravel source is needed to construct the project. If the new material source is shot rock, erosion control measures on the side slopes would not be needed. The material source will likely be a rock quarry source at PHRK04, PHRK07 or PHRK23 crushed to meet DOT&PF standards for Subbase and Crushed Aggregate Surface Course (CASC). During the geotechnical and preliminary engineering phase, we recommend further analysis and consideration of geofoam blocks, or additional insulation to offset gravel quantities. Using wet, organic, fine grained borrow along the route is not feasible for engineering and environmental reasons.

5.2 Preliminary Alignments

For this project, two feasible alternatives are considered.

5.2.1 Route Option A

Under Route Option A, a gravel roadway would extend Kuukpak Road 9.43 miles east to the Kukpuk River with a staging area located on a high and dry area south of the river (see Figure 2). The preliminary alignment for Route Option A generally follows “Jakey’s” route and the 17(b) trail, with alignment adjustments to avoid native allotments and to reduce impacts to wetlands. Any final alignment would require workshops and concurrence with village leaders. The route option provides access to subsistence hunting in the Lisburne Hills, fishing areas on the Kukpuk River, and water is available from lakes along the route, or in a stream located west of the staging area. Shelter can be established on dry ground or in cabins along the Kukpuk River. The soil at the terminus is shattered rock and no standing surface water was observed. The staging area is similar to PHRK07 and could be a potential material source site. If the material source proves up, the eventual gravel pit could also be used as break from the wind, or given the topographic relief; sheltered areas could be established in the draw to the east.

Based on the preliminary alignment, Route Option A would require approximately 700,000 cubic yards of gravel to construct the roads and turnouts plus an additional 34,200 CY to construct a (680’ x 680’) 10.6-acre staging area for a total of 734,200 cubic yards of gravel required including surfacing. If the staging area turns out to be a viable gravel source, the 34,000 cubic yards of gravel could be eliminated from the program and the gravel pit used as the staging area.

5.2.2 Route Option B

Route Option B is similar to Route Option A, except that it deviates from the 17(b) easement and more closely follows Jakey's route on the east end, and it provides access to the Kukpuk River further downstream than Route Option A (see Figure 2). This option would extend Kuukpak Road east to the staging area. A 1,400-foot long spur road off the main alignment would provide access to the Kukpuk River. The total roadway length is 9.35 miles including the spur. The staging area is a candidate for a potential material source. If the material source at this location proves up, the gravel pit could also be used as break from the wind, or given the topographic relief, sheltered areas could be established in the draw to the east.

Based on this preliminary alignment, Route Option B would require approximately 680,000 cubic yards of gravel to construct the roads and turnouts plus an additional 34,200 CY to construct a (680’ x 680’) 10.6-acre staging area for a total of 714,200 cubic yards of gravel required including surfacing. If the staging area turns out to be a viable gravel source, the 34,000 cubic yards of gravel could be eliminated from the program and the gravel pit used as the staging area.

5.3 Drainage Structures

The terrain is very flat with no defined drainage crossings. We assume five 24-inch diameter culverts will be needed per mile of road for flow equalization.

5.4 Ice Roads

An alternative to constructing a permanent year-round road would be to build a seasonal ice road. This would not meet the purpose and need because it would not provide year-round access, only seasonal access. An ice road will likely be needed for access to the material source and is discussed further below.

5.5 Construction

Construction methods will depend on the material source location. For material source PHRK04 located 18 miles southeast of the community, the gravel source development would begin by winter access to the site, drilling and shooting into the hill side, and construction of a work pad at the pit and either an ice road or gravel road to the Kemegrak Lagoon. From there a winter haul route on the lagoons or beach could be used to access the project. Native allotments along the haul route would require access permits. A crusher would be needed to process the shot rock. Fuel storage would be needed for the equipment and crusher. The new road would be constructed from the west end and would progress to the east during the winter.

For material source PHRK07, the pit development and road construction process would be essentially the same as PHRK04 except that road construction would progress from the east to the west, toward the community. Both are inaccessible remote sites requiring winter access. If PHRK07 is determined to be a valid material source, the cost would be much lower because the material site is 18 miles closer to the project and would help meet the purpose and need.

5.6 Coastal Engineering/Hydrology

Based on information from the Flood Plain Management Services of the Alaska District, U.S. Army Corps of Engineers (USACE), there has been no known flooding at the new townsite of Point Hope. Due to the flood events in 2006 and 2007, updated information was needed. Coastline Engineering (Coastline) completed a flood elevation analysis and report titled “Flood Analysis and Minimum Elevation Determination for Evacuation Route, Point Hope, Alaska” dated March 17, 2008 and updated the modeling with the report titled “Determination of Evacuation Road Elevation from 100-year Probable Flood Levels” dated December 7, 2010 as a part of this project. See attached Appendix A. Four potential flood modes were identified: two include waves overtopping the bluffs on the north or south side beaches. The third mode is an ice blockage at the outlet of the Marryat Inlet into the Chukchi Sea (similar to the 2006 and 2007 events). An ice blockage elevates the Marryat Inlet from Kukpuk River water, which floods the surrounding area. The fourth is a tsunami from an earthquake.

The 2008 Coastline report used the 100-year maximum 5-day discharge rate and increased it by 10 percent to account for uncertainty in the estimate. Flood modeling recommended using a 100-year flood elevation of 11.7 feet MSL. One foot was added to establish a recommended minimum building elevation of 12.7 feet MSL for the proposed evacuation road upgrade at that time.

The 2010 Coastline report updated the Marryat Inlet flood model and addressed the additional flood mode of a tsunami. The scope included measuring actual Kukpuk River flows to refine the river discharge estimates. It also included acquiring additional topographic information west of the community and along the shorelines on the north and south beaches to better define the Marryat Inlet basin. The contract NTP came late in the summer of 2010, so the Kukpuk River flow measurements were during the low flow condition. Maximum flows were therefore estimated using the drainage basin area and formulas proposed for this part of Alaska by the US Geological Survey. The 2010 report uses the 100-year maximum discharge event. Due to the refined Marryat Inlet basin model, the additional 10 percent is deemed unnecessary. A Marryat Inlet flood event driven by Kukpuk River flows generates a 100-year flood elevation of 9.2-feet, above which, the water will escape to the Chukchi Sea naturally. Due to the existence of man-made berms and the potential for a temporary increase in the back beach elevation due to wave activity, the maximum flood elevation is recommended to be 10 feet MSL.

The United Nations estimates that minimum global sea level rise will be between 0.6 and 1.9 feet within 80 to 90 years (IPCC, 2007). Walsh et al (2005) ran nine global climate models to potentially determine the sea level rise for the next 100 years. The nine models used were: CSIRO Mk2 Gs, GFDL-R3, MR12 GS, HadCM3, HadCM2 GS, CMC2 GS, SMCI GS, GFDL r15, and ECHAM4/OPYC3 G. Of these, six had enough data to show projected sea level rise in the Arctic. The values ranged from 0.164 feet to 1.48 feet in the next 100 years with an average of 0.88 feet or 10.56 inches over the next 100 years.

6.0 Cost Estimates

The cost of this project depends on the location of the material source and typical section of the roadway. Order of magnitude cost estimates were developed based on the following general assumptions:

1. Gravel used for construction of the project would be mined from a new gravel source PHRK04 located 18 miles south of the community,
2. The cost of initial pit development and permitting would be borne by this project,
3. The project would be publicly advertised and competitively bid in the spring of 2019,
4. The contractor would mobilize by barge in the summer of 2019. The new gravel source would be accessed during the winter/spring of 2019/2020 and work would be completed in the end of 2021, and
5. Three percent (3%) annual inflation.

6.1 Cost Variations Due to Typical Section

Several variables greatly affect the cost of this project. They are embankment height, embankment side slope, road width, and material source location.

Embankment Height. Embankment height must be of sufficient height to minimize thawing of the underlying permafrost. This can be accomplished with gravel or gravel and insulation. The depth of thaw in gravel embankment on the North Slope is calculated using the Modified Berggren Equation. The calculation typically yields a depth of about 6 feet. However, experience has shown that embankments still settle over time due to variations in albedo, southern exposure, material thermal properties, embankment moisture content, and weather anomalies. Insulation has a positive effect on the depth of thaw, however requires proper care and bedding during construction to assure proper performance. For estimating quantities and costs, we assume 4 inches of insulation, 1.5 feet of subgrade subsidence plus a 20% waste and loss for subbase and 15% waste and loss for the crushed aggregate surface course. See Table 4 for the variation of quantities by depth and side slope. The minimum embankment depths in Table 4 are measured at the shoulder.

Embankment Side Slope. A clear zone is a roadside area that is traversable and unobstructed, allowing errant vehicles that leave the traveled way to regain control and return to the roadway unharmed. The Alaska Highway Preconstruction Manual and the AASHTO Roadside Design Guide (2006) specify clear zone widths that should be met, if possible (see Table 1130-2 of the Alaska Highway Preconstruction Manual). The recommended side slope is 3:1. The 3:1 slopes are traversable, but not recoverable. Their usage would require a clear recovery area past the toe of the slope equal to the clear zone width. Some North Slope village roads are constructed at 2:1 side slopes which would save between 15 and 20 percent in project cost. But because of the narrow roadway, lack of shoulders and potential for higher speed traffic, 2:1 is not recommended.

Road Width. A single-lane roadway width of 18 feet with turnouts (TOs) at approximately 1,000-foot spacing is recommended because of the low traffic volumes. A 24-foot two-lane roadway would add 11% to 14% to the project cost, 0.6 acres per mile of wetland impact, and would require 8,000 to 13,000 more cubic yards of gravel per mile.

Table 4 – Gravel Quantities Per Mile* (cubic yards)

Road Typical Section	6' Min. Embankment Depth	8' Min. Embankment Depth	10' Min. Embankment Depth
18' Width w/ TOs, 3:1 Slopes	72,400	105,300	143,900
24' Width no TOs, 3:1 Slopes	81,300	116,500	157,300
18' Width w/ TOs, 2:1 Slopes	59,700	84,700	113,400
24' Width no TOs, 2:1 Slopes	68,600	95,800	126,800

* includes Subbase, CASC, 1.5' of permafrost subsidence, and 20% for waste/loss/topography.

6.2 Cost Variations Due to Material Source

Due to the depleted existing material source, a new source will be required. The cost of road construction will vary significantly depending on where the source is located and how it is accessed. For comparison, three potential sources are considered. They are PHRK 04 (likely case), PHRK07 (best case), and barged gravel (for comparison). See Figure 1. The estimates in Table 5 include road embankment, 8 inches of crushed aggregate surface course, geotextile, culverts, a 10.6-acre staging area, 3 years inflation at 3% per year, and a $7 million allowance for mobilization. Costs include pit development, ice roads, and surveying. See Appendix G. The length of Route Options A and B are within 1% of each other (9.43 miles versus 9.36 miles), so 9.43 miles is used for costing.

Table 5 – Estimated Construction Cost, 9.43 Miles ($ millions)

Material Source	PHRK04	PHRK07	Barged Gravel
18' Width w/ TOs, 3:1 Slopes	74.7	53.0	389.7
24' Width, 3:1 Slopes	63.1	45.2	325.2
18' Width w/ TOs, 2:1 Slopes	82.4	58.3	434.6
24' Width, 2:1 Slopes	70.8	50.5	370.1

6.3 Project Phasing

Table 6 shows how the project could be phased to match the availability of funding. If Route Option A is selected we recommend two phases, one 4.7 miles inland and a final phase 4.73 miles further inland to the Kuukpak River. If Route Option B is selected, we recommend two phases. The first 6.4 miles should go to the Kukpuk River and the balance of project to the staging area at the road's end. An eighteen foot (18') road width with turnouts, 3:1 slopes, and material source PHRK04 are assumed.

Table 6 – Phasing Options, 9.43 Miles ($ millions)

	Route Option A		Route Option B	
	Length	Construction Cost	Length	Construction Cost
Phase 1	4.7 miles	37.4	6.3 miles	35.5
Phase 2	4.7 miles	37.3	3.1 miles	17.5

7.0 Recommended Studies for Design

The following specialty studies and analyses recommended:

1. Consider drilling PHRK07 to confirm quality and quantity of material. PHRK07 if viable would reduce project costs significantly.

2. Aerial photography and mapping
3. GIS database development of engineering, environmental, survey, mapping, and land status features
4. Phase 1 Environmental Site Assessment
5. Level 1 Cultural Resource Study (for the area between the road corridor study area and the road terminus)
6. Hydrological Study
7. Environmental Assessment

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APPENDIX A

Flood Study

Determination of Evacuation Road Elevation from 100-year Probable Flood Levels

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Introduction

The North Slope Borough has retained Hattenburg Dilley & Linnell, LLC (HDL) to perform preliminary engineering and environmental studies for an emergency evacuation road for the community of Point Hope, Alaska. The work is being funded by the Federal Highway Administration through the State of Alaska Department of Transportation and Public Facilities, Northern Region Office in Fairbanks. The 100-year maximum expected flood elevation is needed to establish minimum roadway elevations for the project. Coastline Engineering has been contracted by HDL to determine this elevation. The approximate alignment of the existing road can be seen (blue line) in Figure 1.

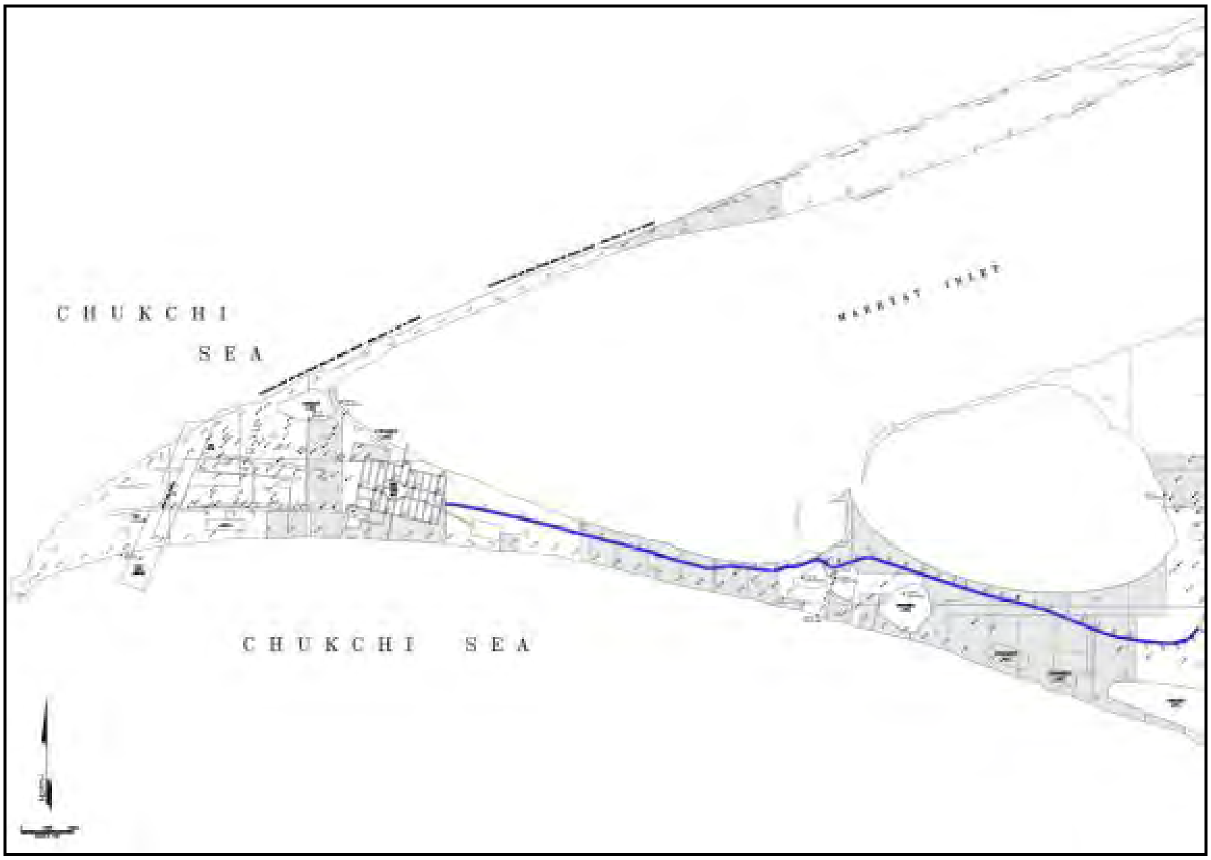

Figure 1 Point Hope at the western end of the Lisburne Peninsula. Existing road is shown in blue.

The proposed project will extend the existing road eastward toward the Delong Mountains until a logical terminus is reached. A corridor for the proposed project has been selected for further engineering and environmental evaluation and is shown in Figure 2.

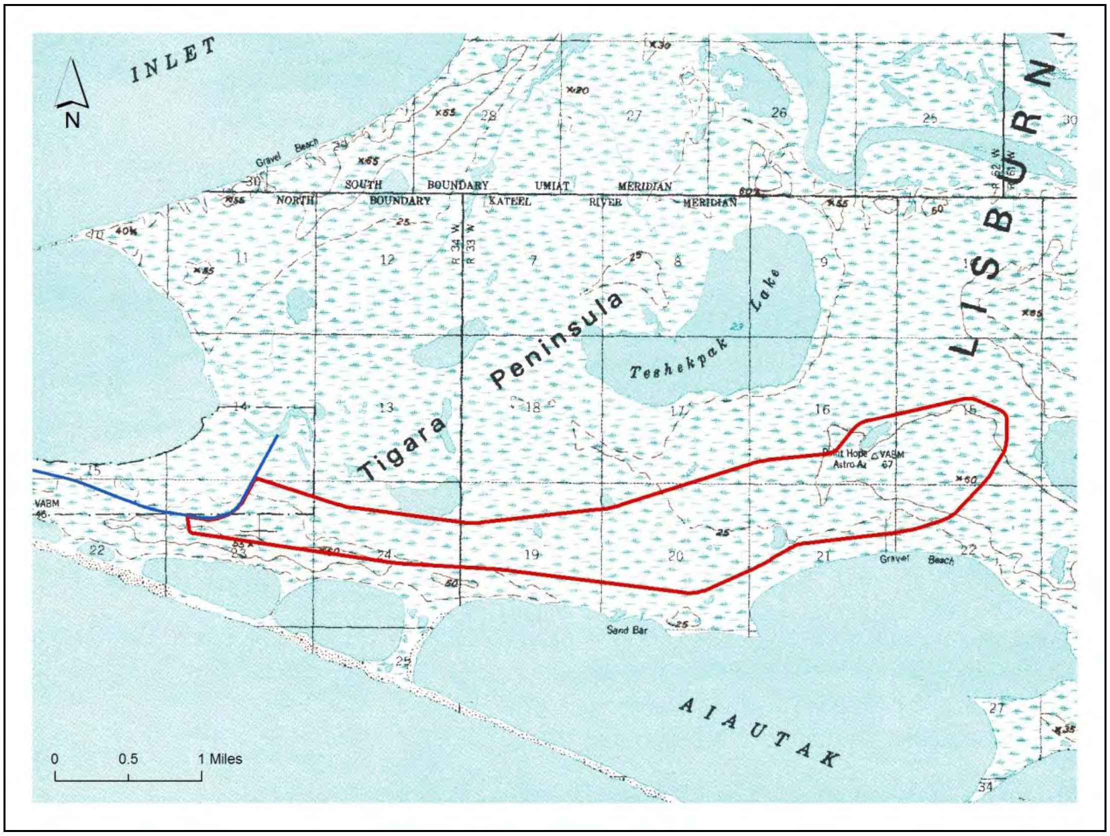

Figure 2 The proposed Emergency Evacuation Road corridor shown in red.

A previous flood report[1] defined three potential modes of flooding for the community of Point Hope. They included:

- Flooding from storm surge from west to northwest winds
- Flooding from storm surge from south winds
- Flooding from ice blockage of channel between Marryat Inlet and the Chukchi Sea during the period of high flows in the Kukpuk River.

All these modes have a history of occurrence at Point Hope. In fact the primary motivation for moving the community from the western tip peninsula in the 1970s to its present location was flooding due to storm surge.

The flood threat presented in the previous report used modeling performed by the U.S. Army Corps of Engineers (Corps) to examine the storm surge potential. The Corps used the hydrodynamic computer model ADCIRC to hindcast the probable storm surges from past storm events. From these they were able to predict storm surge levels with various return periods. The model considered the wind-induced surge level due to friction

[1] Coastline Engineering, 2008. *Flood analysis and minimum elevation determination for evacuation route—Point Hope, Alaska*, a report prepared for Hattenburg, Dilley and Linnell, LLC by Coastline Engineering.

between the wind and water. The Corps also included what is generally referred to as the "inverted barometer" effect. This results from an increase in sea level due to the lowering of atmospheric air pressure. During storms the pressure gradients can result in a lowering of atmospheric pressure by 35 or 40 millibars (mb)—standard atmospheric pressure is about 1,013 mb. A decrease in atmospheric pressure of 1 mb translates into about a 0.4 inches (1 centimeter) increase in the water level. The Corps also included the known tidal range for Point Hope of about 8 inches.

The storm surges for nearly 30 storms—from 1954 to 2003—were predicted through modeling and verified to the extent possible with a limited amount of data and anecdotal information. These surges for each storm were sorted and analyzed using extreme-value techniques to produce surge levels for a variety of return periods. The 100-yr storm surge level for Point Hope (considering wind stress on the water, reduced atmospheric pressure during storms and celestial tide levels) was estimated to be 4.3 feet above Mean Lower Low Water (MLLW).

This seems to be a modest level, but on a relatively steep sandy beach as is found on the north side of the peninsula the wave run-up might be able to reach an elevation of +9 or +10 feet. However, another factor that needs to be considered is the wave set up. Wave set-up would add additional elevation to the sea level during storms and will be discussed later.

The flood potential from high spring flows from the Kukpuk River in combination with a sea ice blockage of the exit (or entrance) channel of Marryat Inlet was addressed in the previous report[2]. At that time, there was no actual stream discharge information for that river and the discharge was inferred from the drainage basin and from analogy to the Wulik River which flows into Kivalina Lagoon. The Wulik River has been extensively gauged because of possible impacts of the Red Dog Mine. The prior Point Hope analysis assumed that the river would flow freely into Marryat Inlet without any escapement. It also assumed no infiltration into the ground (a logical conclusion since the ground remains frozen late into the summer and probably, due to permafrost, does not permit efficient appreciable infiltration).

The use of drainage basins to determine discharge is augmented by examples from nearby streams that share similar geographical and meteorological conditions. The only example for estimating the Kukpuk River discharge was one stream on the east side of Prudhoe Bay that flows into the Beaufort Sea. Therefore the previous approach for the Kukpuk River analysis was only considered an estimate and a safety factor was used. The main purpose of that analysis was to determine the rate of water level rise should those

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[2] Coastline Engineering, *op.cit.*

conditions of high flow and blocked outflow from Marryat Inlet be met. These conditions were met in very recent history in 2006 and 2007. In the earlier event, a relief channel was created across the beach and beach backshore into Marryat Inlet. This quickly reduced the flood threat. In the following year, the flooding caused a considerable rise of the inlet level but a change in the wind direction removed the ice blockage naturally and the flood threat again quickly diminished.

An additional flood concern (expressed by some of the local residents) arose from the tsunami of the 2004 (December 26th) Christmas earthquake in the Indian Ocean. This was not identified in the earlier report as a possible flood threat mode but will be addressed herein.

Current Effort

The current analysis will improve the flood rate model by using recently acquired topographic and Kukpuk stream flow information. This project acquired actual Kukpuk River flow measurements during high spring flows to refine the river discharge estimates derived from drainage basin estimates.

The principal goal of this report is to further refine the estimate of the flood elevation to support the design of an Emergency Evacuation Road from the community of Point Hope to a logical terminus at a higher elevation. It will not only review what was done previously, but will also improve the storm surge estimates to consider the real threat from tsunamis originating in the southern Bering Sea or North Pacific Ocean.

Recent Information

Earlier, the method used by the Corps to estimate storm surges for particular return periods was briefly described. The 100-year value was estimated at 4.3 feet above MLLW. Water levels are further increased, particularly during storms, due to the energy released from breaking waves. Termed wave "set-up", this effect can be modeled. An estimate of twenty percent of the deep water significant wave height is reasonable. For the storms modeled, deep water significant heights could have been 12 to 15 feet based on probable wind speeds and directions. Using the higher number, the additional wave set-up elevation could be as much as 3 feet, so the 100-year storm surge could be 7.3 feet above MLLW. On a relatively steep sand beach with a breaking wave height of 4 to 5 feet, waves could run-up to an elevation at least equal to the breaking wave height. This could easily produce overtopping for a beach elevation of +10 to +12 feet. This includes many of the elevations of the north side beach.

A similar elevation would probably be less severe along the southern beaches. On the north side once the waves overtop the beach, the water can flow down the back side of the back beach and into the lower-lying terrain. However, on the south side as the water level increases, it would encounter vegetation that will further dissipate the breaking wave energy which would likely reduce the wave set up.

Also on the south beach, there are a series of former beach berms that parallel the shoreline and provide a succession of protective barriers to confine the flood water from having access to the community. While on the north side as the waves overtop the beach, water can flow down the back side of the beach into troughs/berm system that directly leads to the community.

The potential for a tsunami reaching Point Hope was not considered in the original report. Due to the shallowness of the Bering Strait through which the wave would have to propagate, it was not thought to be a serious threat. The issue has come up again and Bill Knight at NOAA's Tsunami Warning System in Wasilla was contacted and asked about the potential for a tsunami to affect regions in the northern Bering Strait.

According to Mr. Knight, not only was the strait too shallow to allow the propagation of a tsunami without a huge loss of energy, but the transition from the relatively deep Bering Sea into the strait is so abrupt that almost the entire energy of a tsunami approaching the strait would be reflected back into the Bering Sea. What little energy got into the strait would be completely dissipated by its shallow depth. After a fairly severe seismic event in the Bering Sea, the tide gauge at Nome was examined for evidence of a rise in sea level and it was barely visible in the record and probably would have been overlooked had it not been specifically examined for this special event. The likelihood of any part of a tsunami wave reaching as far north as Point Hope is extremely small.

To improve the estimate of the flooding rate from the Kukpuk's high spring flow, additional information was required. This included more refinement in the survey information for the region of the peninsula west of the community and along the shorelines on both the north and south beaches. It was also desired to have actual high flow river-discharge information. HDL's survey consultant, LCMF, provided the survey data and Coastline Engineering obtained the stream flow information.

Refinement of Previous Survey

LCMF provided refined topographic elevation information for the area west of the community. Additionally the entire area was re-digitized and a new grid was produced incorporating the new survey data. The resultant grid was used to update the flood model previously developed for Point Hope.

An Acoustic Doppler Current Profiler (ADCP) bottom-tracking current meter was used to measure the discharge in the Kukpuk River. A mount was also constructed to attach the ADCP to a small boat. A local boat and operator were hired to travel up the Kukpuk River to a location suitable to collect flow data. The lower portion of the river consists of two main distributaries and they did not merge for a distance of about six miles upstream which appeared to be adequate for these measurements.

It quickly became obvious that we were not going to be measuring the high river discharges that accompany spring break-up. The river levels were already so low that it was necessary to get out and manually tow the boat upstream in places. When we finally reached the upstream convergence point, we could hardly discern a current and the boat was just as likely to be set upstream by the wind as downstream by the current. The channel was about 210 feet wide. The river bottom sloped gently from the northwest bank to about 170 feet where the depth was just over 10 feet and then sloped more steeply upward to the eroding bluff on its southeast bank. On the northwest side, the river bottom was exposed due to the reduced flow at the time of the measurements and was composed of gravel-, cobble- and larger-sized rocks indicative of a river bed with high flow. There was little doubt that high flows do exist in the Kukpuk River; however, at the time the ADCP was deployed the total discharge was well under 1,000 cubic feet per second (cfs). This was less than a tenth of the expected annual 5-day maximum flow rate.

Given that the measurements did not coincide with the high spring river flows, the analysis still had to rely on the maximum flows estimated from an analysis of the drainage basin area and formulas proposed for this part of Alaska by the U. S. Geological Survey[3].

In the Coastline 2008 report[4], the 100-year maximum 5-day discharge rate was used for the analysis. The rate was increased by 10 percent because of the uncertainty of the estimate. After observing the channel and river, it appeared that adding the additional 10 percent was not warranted.

[3] Curran, Janet H., David F. Meyer and Gary D. Trasker, 2003. *Estimating the magnitude and frequency of peak stream flows for ungaged sites on streams in Alaska and conterminous basins in Canada,* USGS, Water-Resources investigation Report 03-4188, prepared in cooperation with ADOT&PF, p. 13.

[4] Coastline Engineering, *op. cit*.

The peak 100-year discharge rate for the Kukpuk River was determined from the formula:

$$Q_{100} = 104.2*A^{0.8370} = 65,800 \text{ cfs}^{5}$$

The peak flow is a value expected to exist for a short period perhaps only a matter of hours and is used to size culverts. A lower flow corresponding to the 5-day maximum discharge was determined for the Wulik River gauged data at 30 percent of the peak flow. Using 30 percent of the peak flow for the Kukpuk River yields a 5-day maximum of 19,740 cfs.

Using this flow rate in the flood model for a 5-day period produced a maximum flood elevation of +9.2 feet. This value seemed quite reasonable judging from the 2006 flood event when a relief channel was opened between Marryat lnlet and the Chukchi Sea at a point where the maximum elevation was about +9.0 feet. Other low points on the crest line of the north beach between the inlet and the Chukchi Sea were just over +8.5 feet so the flood level in 2006 had not yet reached this elevation. Had the 2006 flood event exceeded +8.5 feet the beach would have been breached naturally and there would have been no need for the emergency relief channel. The water level may well have continued to rise if the relief channel had not been opened.

Maximum Flood Level

Several modes of flooding have been examined:

- Storm surges from the north and south,
- Potential seismically-generated tsunami, and
- Spring discharge from the Kukpuk River occurring simultaneously with ice damming of the Marryat Inlet entrance channel.

The analysis has shown that the maximum flood elevation is probably less than presented in an earlier report (+11.7 feet); however, the most likely mode remained a flood caused by the Kukpuk River discharge. The +9.2-foot flood elevation is predicated on a 5-day discharge rate for a 100-year discharge event. This value is lower than the previously determined +11.7-foot value by 2.5 feet primarily because of the better definition of the topography and our belief, after observing the river channel and collecting discharge data, that the discharge quantities were extremely conservative.

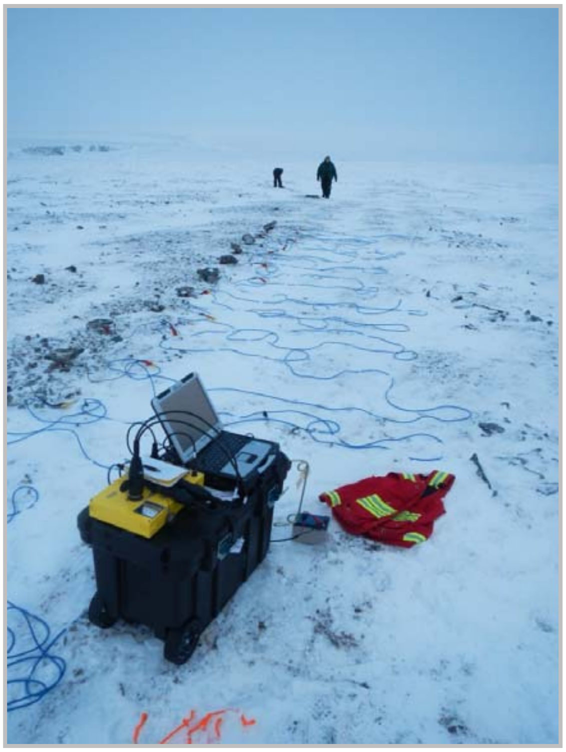
Assuming a flood event in Marryat Inlet is driven by Kukpuk River flows, +8.5 feet is the minimum water elevation above which the water will escape to the Chukchi Sea

[5] Curran, et. al., *op. cit.*

naturally. Due to a combination of the man-made berm and the potential for a temporary increase in the back beach elevation due to wave activity, it is prudent to assume the **maximum flood elevation is +10 feet above sea level**. An elevation above this level should be used as the minimum elevation of the evacuation road.

APPENDIX B

Material Source



GEOLOGIC RECONNAISSANCE REPORT

Point Hope Coastal Erosion Mitigation – Phase II Resource Study
Point Hope, Alaska

May 2, 2017

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GEOLOGIC RECONNAISSANCE REPORT

For

Point Hope Coastal Erosion Mitigation – Phase II Resource Study

Prepared for:

North Slope Borough

HDL Project Number 15-108

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POINT HOPE, ALASKA

1.0 INTRODUCTION

Point Hope is located near the tip of the Tigara Peninsula, on a large gravel spit that forms the western-most extension of the northwest Alaska coast, 315 miles southwest of Barrow and 150 miles northwest of Kotzebue. The peninsula extends almost twenty miles into the Chukchi Sea. Point Hope is located at an elevation of approximately 13 feet to 18 feet above mean sea level (MSL).

The community has a population of 672 (Alaska Department of Commerce, Community, and Economic Development (DCCED), 2016) and was relocated from the tip of the peninsula to its current location by 1975. Repeated flooding and erosion in the vicinity of Point Hope has occurred over the past few decades. Ongoing erosion and flood events during the spring breakups of 2006, 2007, and 2011 caused village residents to be increasingly concerned for their safety. The community is in need of quality aggregate for armor rock (riprap) to protect existing infrastructure from erosion as well as gravel to build roads, pads, and related civil projects. Currently, the most readily available aggregate is a rounded beach gravel material, which presents compaction problems and the potential for coastal erosion at the extraction sites. The Tigara Corporation reports that the existing beach gravel source is nearly exhausted, and erosion is a concern, if the beach material source is mined further.

Since 1973, a number of studies have been conducted to find a new material source. There are rock outcrops in the hills and riverbanks east of Point Hope. HDL Engineering Consultants, LLC (HDL) was retained to evaluate the potential for inland rock sources to produce gravel fill, crushed aggregate surface course and armor stone. The goal was to find a rock source as close to the village as possible.

HDL conducted a phased evaluation of potential inland sources. The first phase consisted of a reconnaissance of rock outcrops and rubble fields to identify potential sources near the village. A few rubble fields were identified as potential indicators of an underlying rock source. The site with the best potential for use as a material source (RK801) was drilled in 2008. The drilling indicated that the thickness of quality rock was insufficient to justify development as a material source. Another reconnaissance was performed to evaluate potential sites farther from the village in 2011. Several potential sites were identified during the second reconnaissance.

The North Slope Borough (NSB) requested that HDL perform further evaluation based on the results of the second reconnaissance. The current phase consisted of two parts, a geophysical evaluation and drilling. The geophysical evaluation was performed in March of 2016 using shear wave velocity measurements at four sites. The geophysical data was analyzed and PHRK04 was identified as the having the highest potential of producing the quantity and quality of aggregate needed. Drilling was performed at PHRK04 in March of 2017.

The purpose of this report is to present the results of the geophysical evaluation and drilling performed at potential material source locations.

2.0 EXISTING LITERATURE REVIEWED

The following is a summary of the previous geology and geotechnical studies in the Point Hope area that HDL reviewed:

- Areal Geology in the Vicinity of the Chariot Site, Lisburne Peninsula, Northwestern Alaska; USGS Professional Paper 395; Russell H. Campbell; 1967. This report detailed geologic exploration covering an area over 350 square miles that was located to the east of the area of interest in this reconnaissance report. Several additional regional studies are noted in the Bibliography section at the end of this report.
- Geological Soil Investigation of Beacon Hill Proposed Townsite, Point Hope Alaska; September 12, 1973; Lounsbury & Associates. Twenty-six (26) test holes were drilled and sampled to evaluate subsurface conditions near a proposed town site.
- Materials Reconnaissance, Beach Protection Project, Point Hope Alaska; November 10, 1999 (update); Duane Miller & Associates. (DMA). DMA performed an evaluation from Cape Thompson on the south to Cape Lisburne on the north. This report evaluated potential material sources that were further from the access road alignment and deemed not cost effective to mine for the use of rebuilding the access road.
- Material Source Report, Point Hope Kuukpak Road Repair and Upgrade, February 12, 2008; HDL (formerly Hattenburg Dilley & Linnell). HDL performed a reconnaissance of rock outcrops with easy access from Point Hope and the access road alignment. The report detailed field evaluation and lab analysis of four rock locations along proposed road alignment. The report also ruled out several previously discussed potential material sites based on access limitations and cost.
- Reconnaissance Report, Point Hope Evacuation Road Rehabilitation/Extension, May 22, 2008; HDL (formerly Hattenburg Dilley & Linnell). The report summarizes the results of engineering, environmental, cultural resource and geologic field evaluations along the existing evacuation road and proposed road extension.
- Point Hope Proposed Material Source Study, July 2, 2008; HDL (formerly Hattenburg Dilley & Linnell). HDL performed eight test holes using air rotary drilling techniques at a potential material source located approximately 12.5 miles east of Point Hope. Samples of the rock were brought back to the laboratory for testing and further classification.

Based on the observed subsurface conditions and results of laboratory testing, HDL did not recommend further evaluation of site PTH MS-1.

- Point Hope Material Resource Reconnaissance, March 9, 2011; HDL (formerly Hattenburg Dilley & Linnell). HDL performed a field reconnaissance across 20 square miles of terrain east of the village of Point Hope using all-terrain vehicles and motorized skiffs. The reconnaissance focused on areas of higher terrain and exposed rock such as steep cutbank slopes, riverbanks, and hillsides. The report describes rock outcrops in various locations near Point Hope, as well as laboratory test results on the rocks collected by hand. Laboratory test results from select samples are in Appendix A and further detail is in the 2011 report.

3.0 REGIONAL SETTING

The following sections describe the general geology, climate, and physical setting of the region.

3.1 Climate

The climate near Point Hope is arctic and temperatures range from -49°F to 78°F. Precipitation is approximately 10 inches annually, with snowfall of 36 inches. The Chukchi Sea is normally ice-free near Point Hope from late June until mid-September (DDCCED 2016).

Research by the National Oceanic and Atmospheric Administration (NOAA) shows an increase in the mean annual temperature from 1925 to 2016, Figure 1. The figure shows an average increase of 0.3°F per decade. This increase in temperature should be considered when estimating thaw consolidation of material under any proposed improvement.

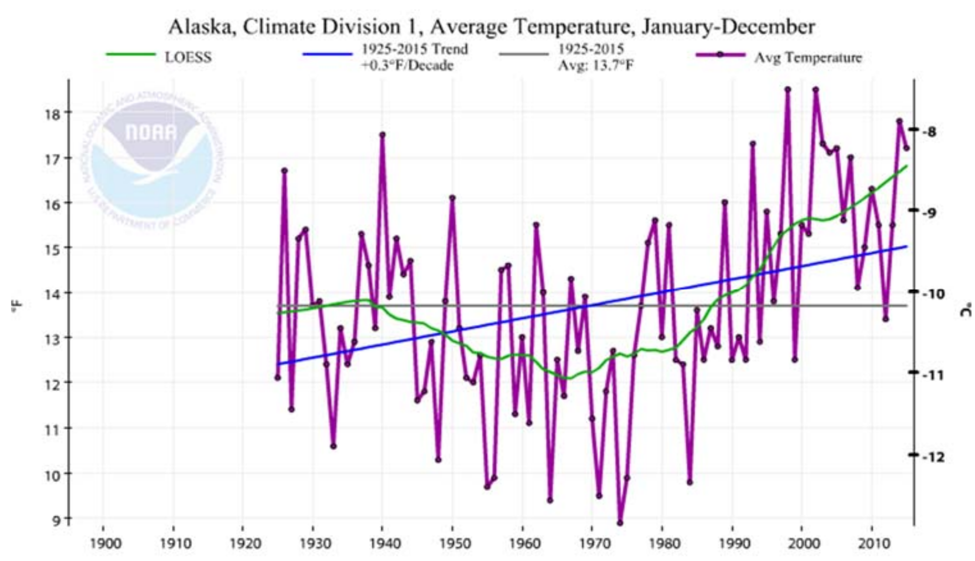


Figure 1. Mean Annual Temperatures for the North Slope from 1925 to 2016

Table 1 presents a summary of climatological data for the North Slope from NOAA.

Table 1. Climatological Summary Data Averages, North Slope (1925-2016)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Mean Temperature (°F)	-13.1	-14.4	-10.4	5.1	25.9	44.0	49.6	44.3	32.9	14.3	-1.8	-11.6	13.7
Mean Maximum Temperature (°F)	-6.1	-7.1	-2.2	14.0	32.8	51.6	57.9	51.1	38.6	20.2	4.7	-5.2	20.9
Mean Minimum Temperature (°F)	-20.0	-21.7	-18.6	-3.7	18.9	36.4	41.3	37.1	27.2	8.5	-8.3	-17.9	6.6
Precipitation (in)	0.53	0.46	0.37	0.37	0.50	1.06	1.93	2.11	1.30	0.93	0.87	0.55	11.0

3.2 Topography, Drainage, & Vegetation

Point Hope is located on sparsely vegetated sand and gravel beach ridges at elevations exceeding 13 feet above MSL. East of the village, the peninsula tundra and pond terrain rises gently to elevations of approximately 100 feet above MSL over a distance of fifteen miles before rising abruptly onto the foothills of the Lisburne Hills. This portion of Alaska is generally underlain by continuous permafrost except around large water bodies. The gently rolling tundra hills of the Tigara Peninsula exhibit many of the common indicators of shallow permafrost; among these are polygonal patterned ground, ice wedges, thaw margin ponds, thaw slump blocks, mud boils, earth and turf hummocks, beaded drainage courses, and generally wet, mucky surface conditions due to high water table atop a shallow impermeable layer.

Kukpuk River flows out of the mountains on the western margin of the Lisburne Peninsula, meanders across the low plains of Tigara Peninsula and ends in Marryat Inlet. The Marryat Inlet is separated from the Chukchi Sea by a 13 mile long barrier beach. A similar long barrier beach defines the southern limit of the Tigara Peninsula and isolates several large lagoons behind it, notably Aiautak Lagoon.

Vegetation across much of Tigara Peninsula consists primarily of tundra grasses and low shrubs, most no higher than a foot above the ground. Some scattered alder and willow shrubs up to six feet tall can be found along the Kukpuk River and in some wind-protected hollows.

3.3 Regional Geology & Seismicity

The areas evaluated in this phase are located in the foothills at the western edge of the Lisburne Peninsula, generally from the mouth of the Kukpuk River drainage south to near Cape Thompson. Geologic studies associated with the Chariot Project of the 1960's east of Point Hope did not extend directly into the area of interest, but much of the lithology and stratigraphy can be extrapolated westwards into this area of interest.

The rock underlying the western Lisburne Peninsula is predominantly of marine sedimentary origin, with subsequent metamorphism and associated folding and faulting. The structural relationships are complex; there appears to be a westerly dip to the strata, although the geologic data indicates a regional dip toward the east. The area near Cape Thompson consists of sequences of limestone, dolomite and interbedded shales. These sequences vary in structure from thick bedded, massive and resistant limestone units to thinly bedded, fractured shale units. Sequences of coal, and fossiliferous and cherty limestones can also be found near Cape Thompson.

Bedrock farther north is metamorphosed calcareous sandstone, limestone, shale and siltstone, which also originated as marine sequences. Many of these sequences show calcite filling of the fracture joints and seams, and in many cases a slightly calcareous matrix. Dips are noted to range from 24° to 64° toward the southwest.

During the Pleistocene era over 2 million years ago, the glacial Kukpuk River carried large amounts of outwash from its drainage in the Delong Mountains and Southern Lisburne Hills, toward the Chukchi Sea. Sea levels were considerably lower during the Pleistocene and the sediments formed the large triangular shaped peninsula that is now the Tigara Peninsula. Peat growth on these sediments was later covered by silt deposits from the Kukpuk River. It is these peat and silt sequences that comprise the shallow subsurface conditions on the Tigara Peninsula (Cambell, 1967).

Extensive tundra covers the terrain from the low areas of the Tigara Peninsula from a few miles east of the village of Point Hope, to the higher foothills to the east. The tundra consists of organic soils, both fibrous and amorphous in texture to depths of several feet, below which are relatively fine-grained sands and silts. The tundra displays typical ice polygon patterns indicative of permafrost. The shallow permafrost creates an impermeable zone where the perched water tables create extensive areas of surface water, saturated soils, and wetland vegetation. The active layer atop the frozen permafrost layer is generally two feet or less.

There is little exposed rock along the Tigara Peninsula. The rock that is encountered on the tundra surface tends to be low, frost-shattered exposures with no intact structure being visible. Farther north near the Kukpuk River, exposed rock is found mainly along riverbanks and a few lakeshore exposures.

Seismicity of northwest Alaska is characterized by relatively little activity. Records since 1958 indicate the only seismic events within approximately 50 miles of Point Hope have occurred under Kotzebue Sound (Fox, 2006). The most prominent concentration of seismicity in northwest Alaska lies within the Maiyumerak Mountain Range about 135 miles to the east and includes events as large as magnitude 5.3. The Herald Thrust Fault is the nearest major fault in the region, and is mapped as an arc to the north and west from Point Hope.

4.0 SITE AND PROJECT DESCRIPTION

The geophysical survey was performed at four locations previously studied by HDL. Sites RK801 and PHRK07 are located between thirteen and fifteen miles east of the village of Point Hope. The sites lie on the tundra plain south of the Kukpuk River near the proposed terminus of the Emergency Evacuation Road. PHRK13 is located approximately sixteen miles east of the village of Point Hope on the northeast side of a rounded knoll south of the Kukpuk River. Site PHRK04 is located approximately eighteen miles southeast along the beach from Point Hope. This outcrop is located on the west side of a rounded knoll about 1.75 miles northeast of Kotzebue Sound and Kemegrak Lagoon. The knoll extends approximately 7,400 feet southeastward from Kunuk Creek on the north, and is 4,600 feet wide with a broad summit at an elevation of about 500 feet. The drilling was also performed at site PHRK04. The approximate locations of the four sites are shown on the Vicinity Map provided as Figure 2.

5.0 FIELD EXPLORATIONS

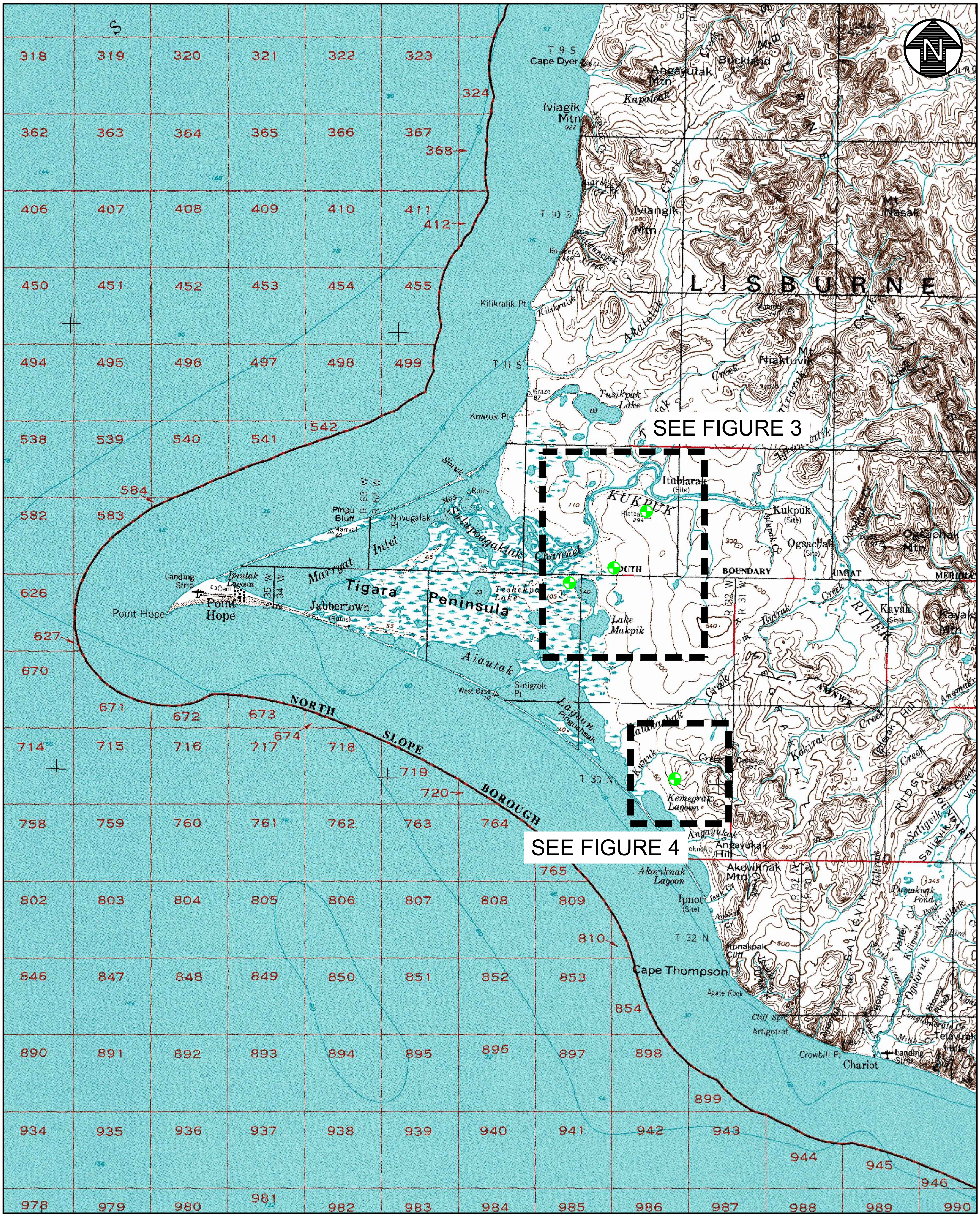
The material source evaluation consisted of two phases. The first phase consisted of a geophysical survey at four sites. The second phases consisted of drilling at the site that appeared to have the best potential for quality rock based on the geophysical results.

5.1 Geophysical Survey

HDL conducted a geophysical evaluation consisting of seismic refraction at four sites; RK801, PHRK04, PHRK07, and PHRK13. RK801 was a site that had been previously evaluated and drilled. The drilling at RK801 indicated that the layer of quantity bedrock was too thin to be viable as an aggregate source. PHRK04 was in an area at the edge of a bluff where the composition of the subsurface could be inferred from the debris on the slope. Seismic refraction was performed at RK801 and PHRK04 to provide a reference of the shallow shear wave velocity profile in areas where the subsurface conditions were better understood based on drilling and outcrops. Seismic refraction surveys were then conducted at sites PHRK07 and PHRK13 and compared to RK801 and PHRK04. Refer to Figure 3, Geophysical Survey Location Map, for the approximate location of the seismic refraction surveys.

HDL conducted the geophysical survey at the four sites noted in March of 2016. The survey was conducted using a using a 24-channel array and 4.5 hertz (Hz) geophones with a spacing of 3 feet to 10 feet. Ambient vibrations and a hammer were used as the energy source. Typically, 20 recordings that were 30 seconds long were made at each survey line and two perpendicular survey lines were made at each location except PHRK04.

The seismic refraction data was analyzed in accordance with recommended SeisOpt Remi software procedures. The equipment and software uses seismic refraction technology to allow the user to identify changes in subsurface strata by identifying variations in seismic wave response. The higher the response (velocity), the more dense the subsurface material, and the lower the response (velocity) indicates a lower density of material.



H:\jobs\15-108 Point Hope Coastal Erosion (NSB)\04-Geotechnical Drilling\CAD\DRAWINGS\15-108_FIG-1-3-PLANS, 1=1, 05-02-17 at 09:27 by jkk
LAYOUT: FIG-1 VICINITY

NORTH SLOPE BOROUGH
BARROW, AK

Figure 2
VICINITY MAP
POINT HOPE COASTAL EROSION MITIGATION - PHASE II RESOURCE STUDY
POINT HOPE, AK

H:\jobs\15-108 Point Hope Coastal Erosion (NSB)\04-Geotechnical Drilling\CAD\DRAWINGS\15-108_FIG-1-3-PLANS, 1=1, 05-02-17 at 09:32 by jkk
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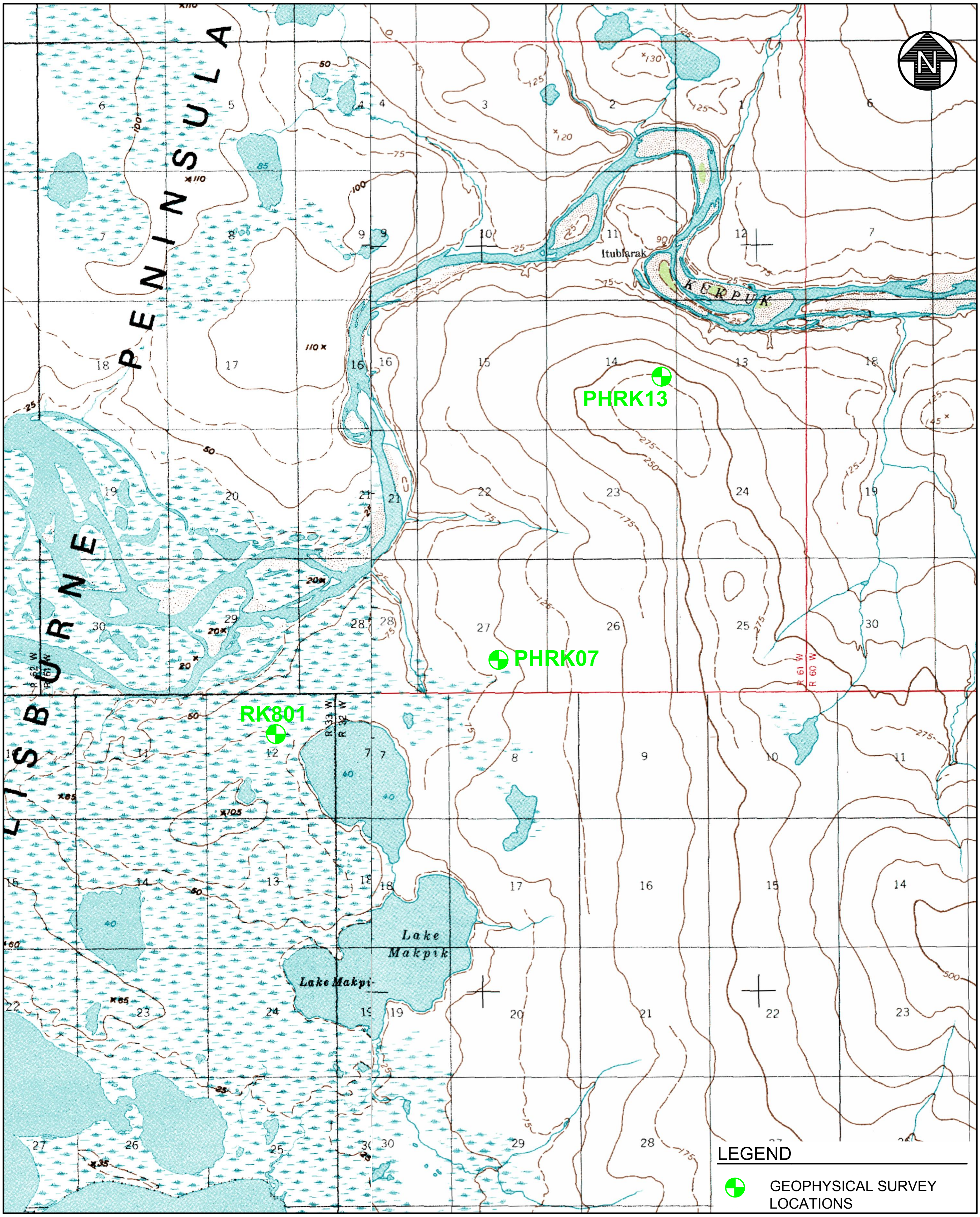


NORTH SLOPE BOROUGH
BARROW, AK

Figure 3
GEOPHYSICAL SURVEY LOCATION MAP
POINT HOPE COASTAL EROSION MITIGATION - PHASE II RESOURCE STUDY
POINT HOPE, AK

The resulting shear-wave velocity models for all four sites are presented as Appendix B.

The velocity model for RK801 generally indicated lower velocity materials near the surface, followed by a thin layer of higher velocity material, then the velocity decreased sharply. The velocities below 2,000 feet per second near the surface were interpreted to correspond to the soil and low quality bedrock above the higher quality rock in the area. The velocity model for PHRK04 showed high velocity material that is close to the surface and the velocities were relatively uniform to significant depths.

The velocity model at PHRK07 followed a pattern that is similar to that at RK801 with a thin layer of higher velocity material between layers of lower velocity material. The velocity model at PHRK13 indicated a higher velocity material below a layer of lower velocity material. The model did show some decrease in velocity below the top of the high velocity layer, but the decrease is not as sharp and the overall velocity remained higher.

The results of the geophysical survey indicated that PHRK04 provided the highest potential for producing a significant quantity of quality aggregate. Therefore, PHRK04 was selected for further evaluation by drilling.

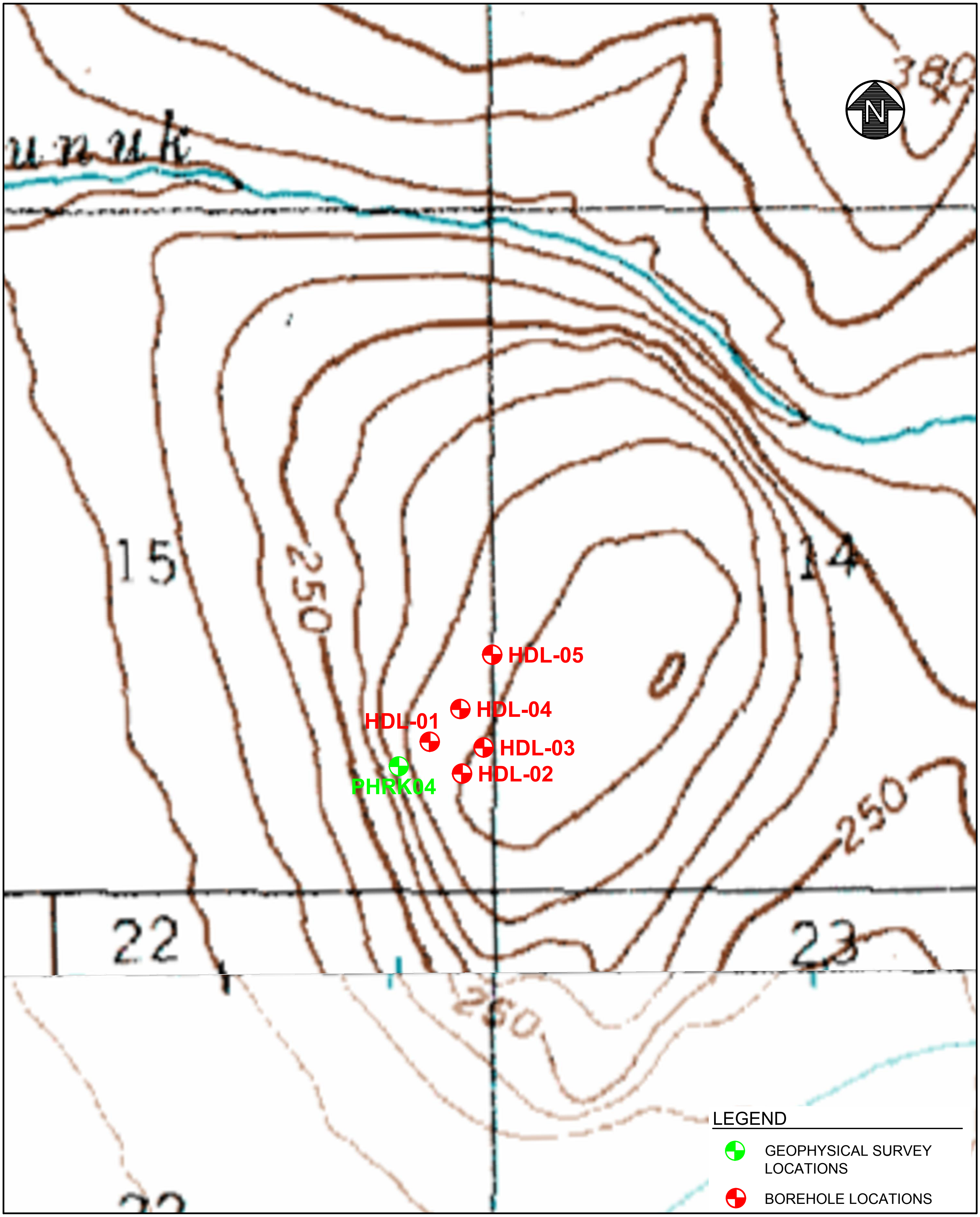
5.2 Drilling

HDL observed the drilling of five (5) borings from March 5, 2017 to March 10, 2017 to further evaluate site PHRK04 as a potential material source. The borings were designated HDL-01 through HDL-05 and reached depths ranging from 17 feet to 26 feet below existing ground surface (bgs). The borings were distributed across the site to evaluate the potential for aggregate over a broad area. Refer to Figure 4, Borehole Location Map for the approximate location of the borings.

The borings were drilled by GeoTek Alaska, Inc., of Anchorage, Alaska, working as a subcontractor to HDL. The borings were advanced using a Geoprobe 6620DT drill rig with multiple tooling combinations. A downhole hammer and 4.5-inch outside diameter (O.D.) casing was used to advance through the shallow subsurface and prevent sloughing of soils or collapse of the weathered bedrock materials near the surface. A NQ_3 core barrel system with a 2.98-inch O.D. that produces 1.75-inch O.D. core was used to advance through the bedrock to the depth of the borings. Core samples were collected at intervals ranging from one (1) foot to five (5) feet and classified while on site.

Fieldwork was performed in general accordance with the procedures outlined in the Alaska Department of Transportation and Public Facilities (AKDOT&PF) "Alaska Geotechnical Procedures Manual". Samples were collected, sealed in wax impregnated cardboard core boxes, and delivered to HDL's laboratory for further review and classification.

H:\jobs\15-108 Point Hope Coastal Erosion (NSB)\04-Geotechnical Drilling\CAD\DRAWINGS\15-108_FIG-1-3-PLANS, 1=1, 05-02-17 at 09:32 by jkk
LAYOUT: Layout3



NORTH SLOPE BOROUGH
BARROW, AK

Figure 4
BOREHOLE LOCATION MAP
POINT HOPE COASTAL EROSION MITIGATION - PHASE II RESOURCE STUDY
POINT HOPE, AK

An experienced HDL engineer assistant was present during drilling to locate the borings, observe drilling action, collect samples, and log subsurface conditions. Upon completion, the borings were backfilled with native material to approximately match existing grade. The subsurface conditions encountered are summarized below, and detailed information may be found on the rock core logs in Appendix C.

Poorly-graded gravel was encountered at the ground surface in all five borings. The gravel was typically less than 1 foot thick. The poorly-graded gravel was underlain by completely to highly weathered limestone to depths ranging from one (1) to five (5) feet bgs. Moderately weathered to fresh limestone was generally encountered beneath the highly weathered rock and extended to depths ranging from eight (8) to thirteen (13) feet bgs. The limestone encountered was light grey to tan, had an aphanitic crystalline structure and was classified as medium weak (R3) to strong (R4). There were planar to undulating fractures with smooth to very rough fracture surfaces and there were also calcite filled fractures. The fracture spacing ranged from extremely close to close spacing. The Rock Quality Description (RQD) of this layer of rock ranged from 0% to 47% indicated relatively very poor to poor quality rock.

The color, mineral composition, and general structure of the limestone was generally consist as the depth increased. However, the RQD of the limestone generally increased with depth and ranged from 55% to 95% in the higher quality layers indicating relatively fair to excellent quality rock.

Seams of highly to completely weathered limestone and residual soil ranging in thickness from three (3) inches to greater than 1.7 feet were encountered in HDL-02, HDL-03, and HDL-04. These boring were terminated in a layer of highly to completely weathered limestone.

6.0 SUMMARY AND CONCLUSIONS

The results of the laboratory testing for samples recovered from PHRK04 in 2011 suggest that the fresh to slightly weathered limestone layers will meet or exceed the requirements for riprap and crushed aggregate specified by the AKDOT&PF. The completely weathered and residual soil layers will contain a high fines content making the material susceptible to frost action. If the area is developed as a material source, the layers of completely weathered rock may need to be separated to prevent contamination of the quality aggregate.

The RQD values indicate that the quality of the rock generally increases with depth. However, the layers of completely weathered rock and residual soil reduce the overall quality of the site as a potential material source.

Based on the borings and laboratory testing, it is HDL's opinion that area around PHRK04 has sufficient quality and quantity of material to be viable as a material source. The results of the subsurface evaluation suggest that PHRK04 is a viable material source capable of producing manufactured aggregate products for use in road and general construction projects.

The RQD values suggest that the material source will likely produce material that meets the AKDOT&PF 2015 Standard Specifications for Highway Construction (Standard Specifications) requirements for ditch lining material. Ditch lining material contains rock that is primarily 3 inches to 8 inches in diameter. This material can be used to protect against erosion in ditches and along low energy shorelines like some lakes and inlets.

The RQD values suggest that the material source may have the ability to produce Class I and Class II riprap per Section 611 of the Standard Specifications. Class I riprap consists of rock that that is slightly larger than the ditch lining material noted above. Class I riprap can have individual stones over 50 pounds (lbs) but typically has stones that weigh around 25 lbs or less. For reference, a 50 lb stone and a 25 lb stone are approximately 10 inches and 8 inches in diameter, respectively. Class II riprap is larger than Class I riprap and includes stones that could weigh more than 400 lbs but typically has stones that weigh around 200 lbs. This corresponds to stones that are approximately 16 inches to 20 inches in diameter. Class I and Class II riprap can be used for erosion control low to moderate energy environments such as small rivers and lakes and inlets with moderate wave action.

Larger classes of riprap and armor stone are needed for erosion protection in high energy environments similar to the coast line near Point Hope. The conditions observed in the borings suggest that the material source is not likely to produce larger classes of riprap or armoring stone. However, the boulder field at the base of the slope near PHRK04 contains rocks that are large enough to be armor stone. It is HDL's opinion that the area near PHRK04 will produce limited amounts of large riprap and armor stone.

We recommend that the economic viability of the material source near PHRK04 be evaluated assuming that the primary product (by volume) will be road aggregates. The material source appears to be able to produce significant quantities of ditch lining material and some small riprap; this can be considered when evaluating the economic viability. We recommend considering any large riprap or armoring stone to be incidental.

7.0 CLOSURE AND LIMITATIONS

The conclusions, opinions and recommendations included in this report are based on site conditions as they exist in the borings observed by HDL. We assume that the geophysical survey and boring results are representative of the subsurface conditions throughout the site, and the subsurface conditions everywhere are not significantly different from those observed.

If substantial time has elapsed between submission of this report and the start of work at the site, or if conditions have changed because of natural causes or construction operations at or adjacent to the site, HDL recommends that this report be reviewed to determine the applicability of the discussion of site conditions contained herein considering the time lapse or changed conditions.

Unanticipated soil and rock conditions are commonly encountered and cannot be fully determined by merely taking surface samples or borings. Such unexpected conditions may impact the viability of the material source or result in increased cost for development. Therefore, it is recommended that some contingency be considered during the development of the material source to accommodate such potential extra costs.

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Geotechnical Services Manager

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APPENDIX A

Laboratory Test Results (5 pages)

TEST		DOT&PF Spec. (Hwy & Arpt)	USCOE Spec.	SAMPLE NUMBER				COMMENT
				PHRK 01	PHRK 04	PHRK 07	PHRK 23	
Sulfate Soundness	Crushed- ASTM C 88	5% max.	5% max.	5.3%	0.3%	0.2%	3.2%	Samples meet DOT&PF, USCOE specs. Results are good indication of freeze-thaw stability.
Degradation	ATM T13	45 min.	n/a	91	96	89	76	DOT&PF spec. applies to aggregate products only. Samples meet DOT&PF spec.
LA Abrasion	ASTM C 131	45/50 max	20 max.	35	21	23	23	DOT&P spec applies to aggregate products and is based on ASTM C131, Coarse Aggregate-Small. Samples exceed DOT&PF specs. USCOE spec. is based on ASTM C 535, Coarse Aggregate-Large.
Specific Gravity (SSD) Density	ASTM C 127	n/a	2.65 min.	2.63 163.87 lb/ft^3	2.81 174.92 lb/ft^3	2.62 163.43 lb/ft^3	2.61 162.38 lb/ft^3	Samples display variability in specific gravity, not all meet USCOE spec. All are suitable for DOT&PF projects.
Specific Gravity (Apparent) Density	ASTM C 127	n/a		2.69 167.72 lb/ft^3	2.84 177.02 lb/ft^3	2.67 166.14 lb/ft^3	2.69 167.46 lb/ft^3	
Absorption	ASTM C 127	n/a	2.5 max.	1.40%	0.66%	1.00%	1.88%	Samples meet USCOE spec.

USCOE = U.S.army Corps of Engineers
ARRC=Alaska Railroad Corporation
DOT&PF=Alaska Dept. of Transportation & Public Facilities
ASTM=American Society for Testing & Materials

Table 1 - Laboratory Test Results of Point Hope Samples

PETROGRAPHIC ANALYSIS REPORT

Client: HDL

Thin Section ID: Ph-4a

Project: Pt. Hope; Project #10018-2

Field Classification: Light gray crystalline limestone with some thin calcite veinlets.

COMPOSITION

Constituent	Optical/Physical Properties	Estimated %
Calcite -	This rock is essentially monomineralic. It consists of a crystalline mosaic of interlocking calcite grains ranging from 0.5mm down to <0.01mm. The calcite exhibits the typical uniaxial negative interference figure encircled with rings, and the typical relief that varies with orientation as the stage is rotated. The rock texture varies only as the differing sizes of calcite grains within the various grain clusters (or veins) varies.	**99%**
Opaques –	Hematite, possibly some magnetite? The opaques in this rock occur mostly as tiny (≤0.01mm) grains here and there, or as small patches filling interstices or microveinlets. The largest patch by far is 0.4mm across and is subhedral with blood-red edges.	**<1%**

TEXTURES AND STRUCTURES

Grain Size: Ranges from 0.5mm down to <0.01mm.

Textures: Crystalline, with varying grain sizes in mosaic patches suggesting original "bioturbation" by critters. Original "bioturbation(?)" is largely obliterated by recrystallization.

Structures: A very few thin veinlets are defined by recrystallized calcite. A couple of very thin microfractures are filled with opaque hematite. The rock is finely porous.

Alteration: Diagenetic recrystallization and possibly some dolomitization.

PETROGRAPHIC CLASSIFICATION: Crystalline Limestone

PETROGENESIS: This rock was probably originally a calcite mud in which invertebrates (mollusks and gastropods?) lived (and burrowed) in a low energy marine depositional environment. Subsequent diagenetic recrystallization has almost obliterated suggested fossil evidence.

COMMENTS: The hand specimen effervesced, but somewhat slowly. This fact may suggest the presence of some dolomite.

Carolyn C.N. Stevens
Petrographer

1/18/2011
Date

Petrographic Descriptions for
HDL Engineering Consultants
John Fritz

Descriptions and Microphotography by:

James W. Deininger, Jr.
CPG, Alaska License #A203

Date

October 18, 2010

Sample Number Ph – 4a

Light gray, micritic limestone. A rather dense, moderately hard rock with low porosity and permeability. Intensely fractured but fractures tend to be linear, sub-parallel and partly to well healed with filling of crystalline calcite and iron oxide cement.

Mineralogy:

Percent	Observed Properties
	Non-Opaque Mineralogy
95	Calcite
	Opaque Mineralogy
5	Opaques iron oxides and possibly magnetite.

Mineral relations/alteration/reactions:

Texture and Grain Size: Fine grained granular (orthochemical)

Grain Size, Habit and Textural Description:
Calcite – rhomb shapes, 0.24x0.32 mm. nominal size. Larger grains (1.0x0.84 mm) occur in aggregations (1.0x1.4 mm) of crystals.
Opaques - occur as subhedral geometric shapes (0.16x0.24 mm individuals) clustered as nucleus of larger calcite crystal aggregations, as smaller intergranular, disseminated grains (0.05x0.03 mm) and as irregular shapes incompletely coating the margins of fracture boundaries (iron oxide cement).

Engineering Properties:
Bedding/foliation: Not bedded or foliated.
Hardness: Moderately hard.
Porosity & Permeability: low porosity and permeability.
Contacts/ discontinuities: No contacts or discontinuities noted. In homogeneities occur with randomly located aggregates of calcite crystals nucleated around iron oxide grains (magnetite?).
Fractures:
Degree and healing: Intensely fractured, partly healed with calcite crystals and iron oxide cement. Fracture margins are slightly rough.
Fracture length: In excess of 32 mm.
Fracture openness: Slightly open to tight.
Fracture width: varies along individual fractures (pinch and swell) 0.52 to 0.16 mm.
Fracture fill: Calcite rhombs and iron oxide cement form a “micro” vuggy fill.

Figure 3 - Scan of billet, Ph4a. Note sub parallel alignment of linear fractures moderately well cemented with calcite and iron. What porosity (blue coloration) there is tends to be clustered along the diagonal, right hand fracture. Blebs of white scattered particularly on the left side of the photo could represent porosity that was filled during precipitation of the calcite fracture fillings.

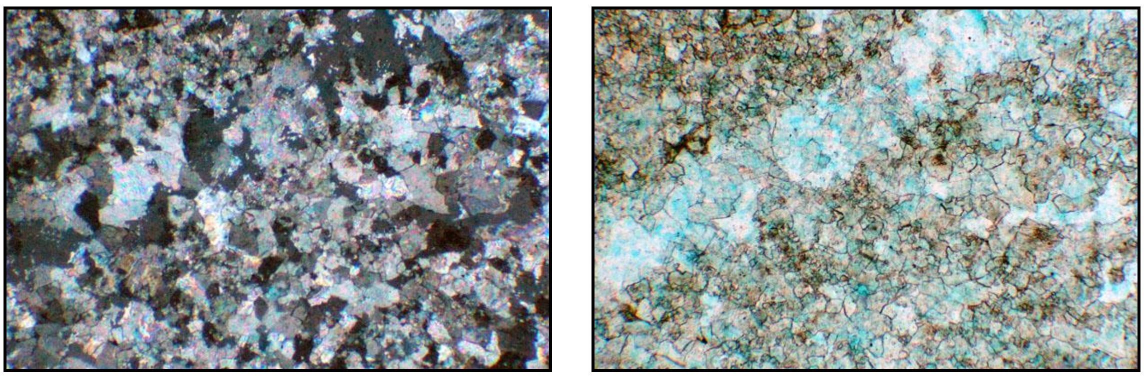


Figure 4 – Ph4a-1. Photomicrograph, on the left, crossed polars and on the right, plane polarized light views. 50X magnification, FOV = 3.2 mm. Porosity and permeability are low judging from the pale blue coloration smeared across the rock in the right hand view as well as the evident, interlocking texture visible in the left hand view. The rock is cut by a calcite veinlet (lower left to upper right).

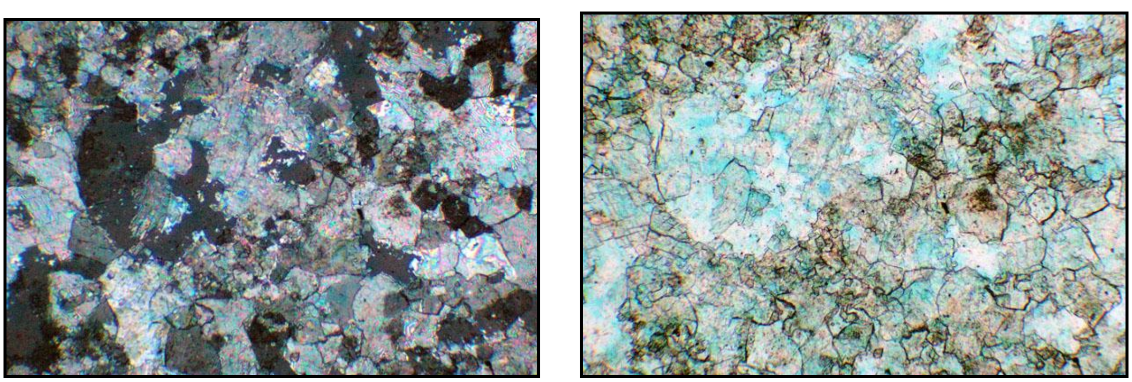
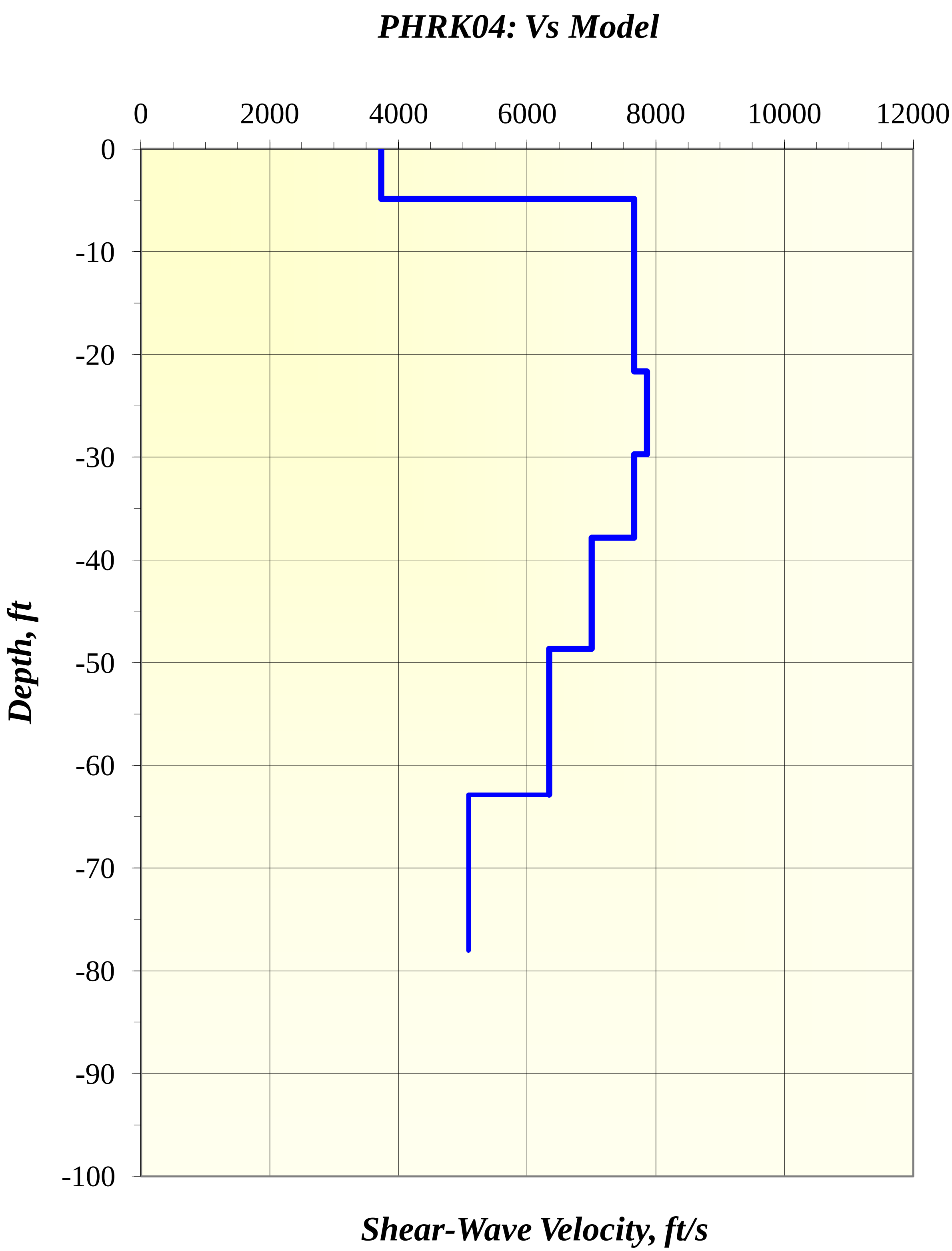


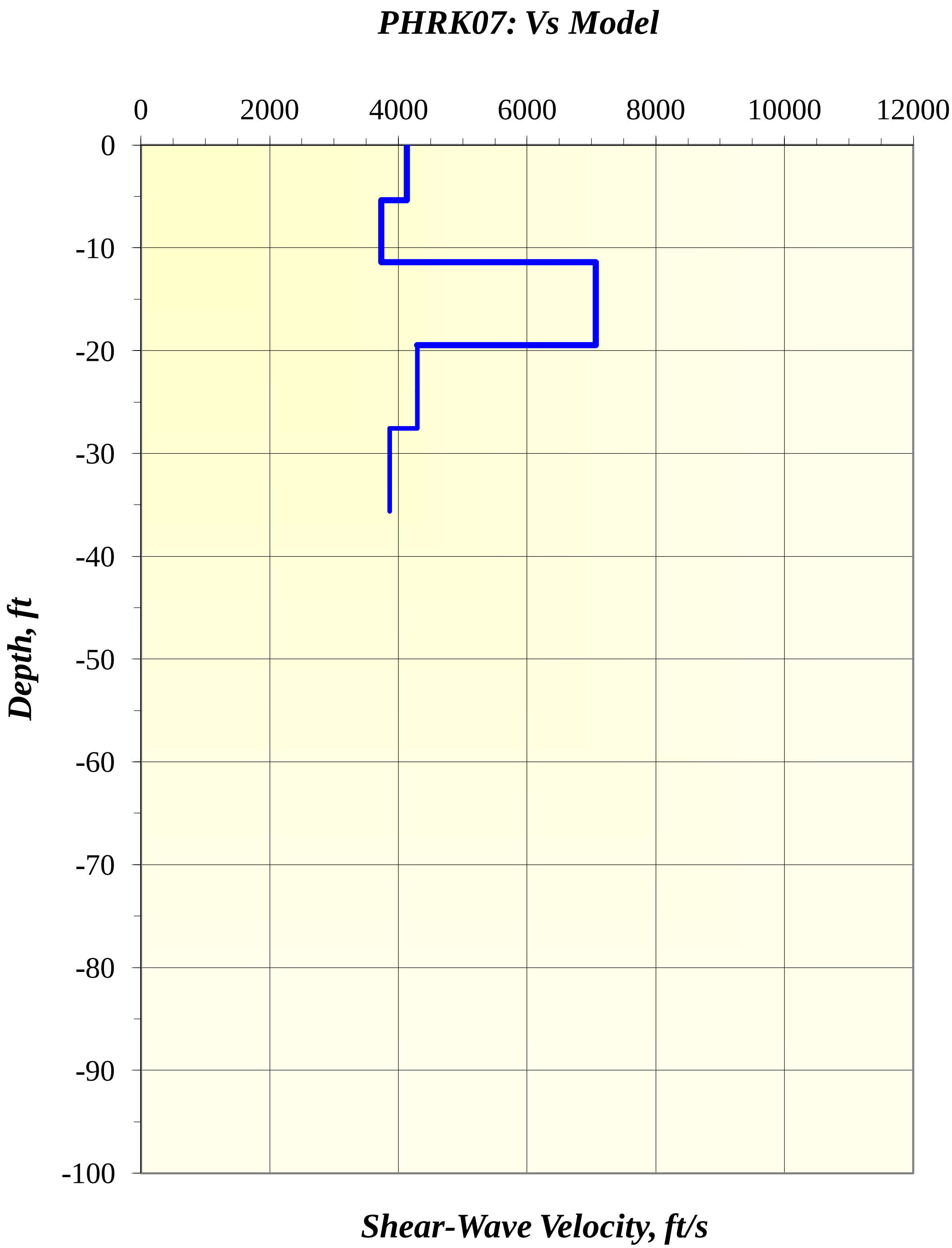
Figure 5 – Ph4a-2. Photomicrograph, on the left, crossed polars and on the right, plane polarized light views. 100X magnification, FOV = 1.8 mm. Same view as Figure 2 under increased magnification. Then pores are very small and very shallow, not likely interconnected resulting in decreased permeability.

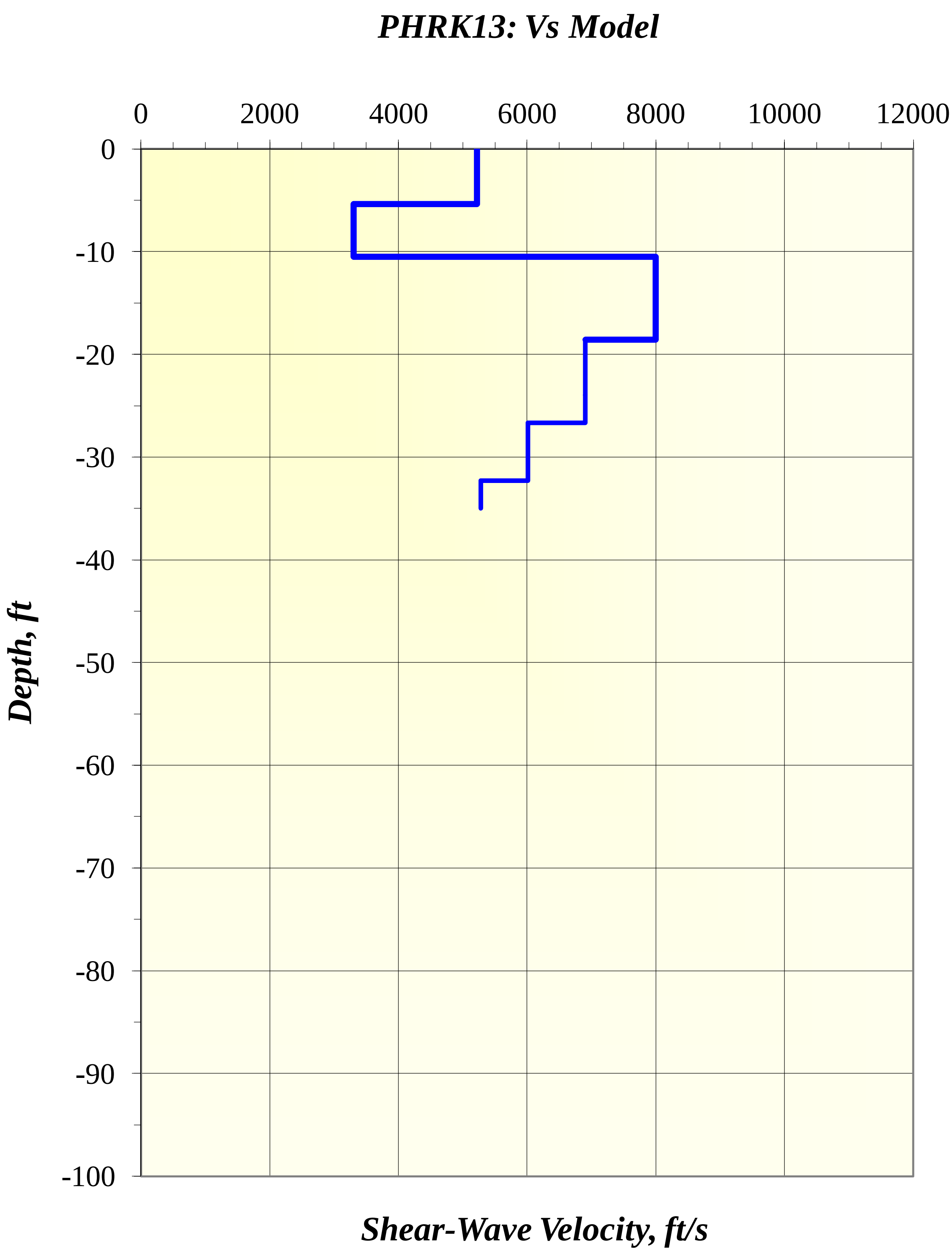
APPENDIX B

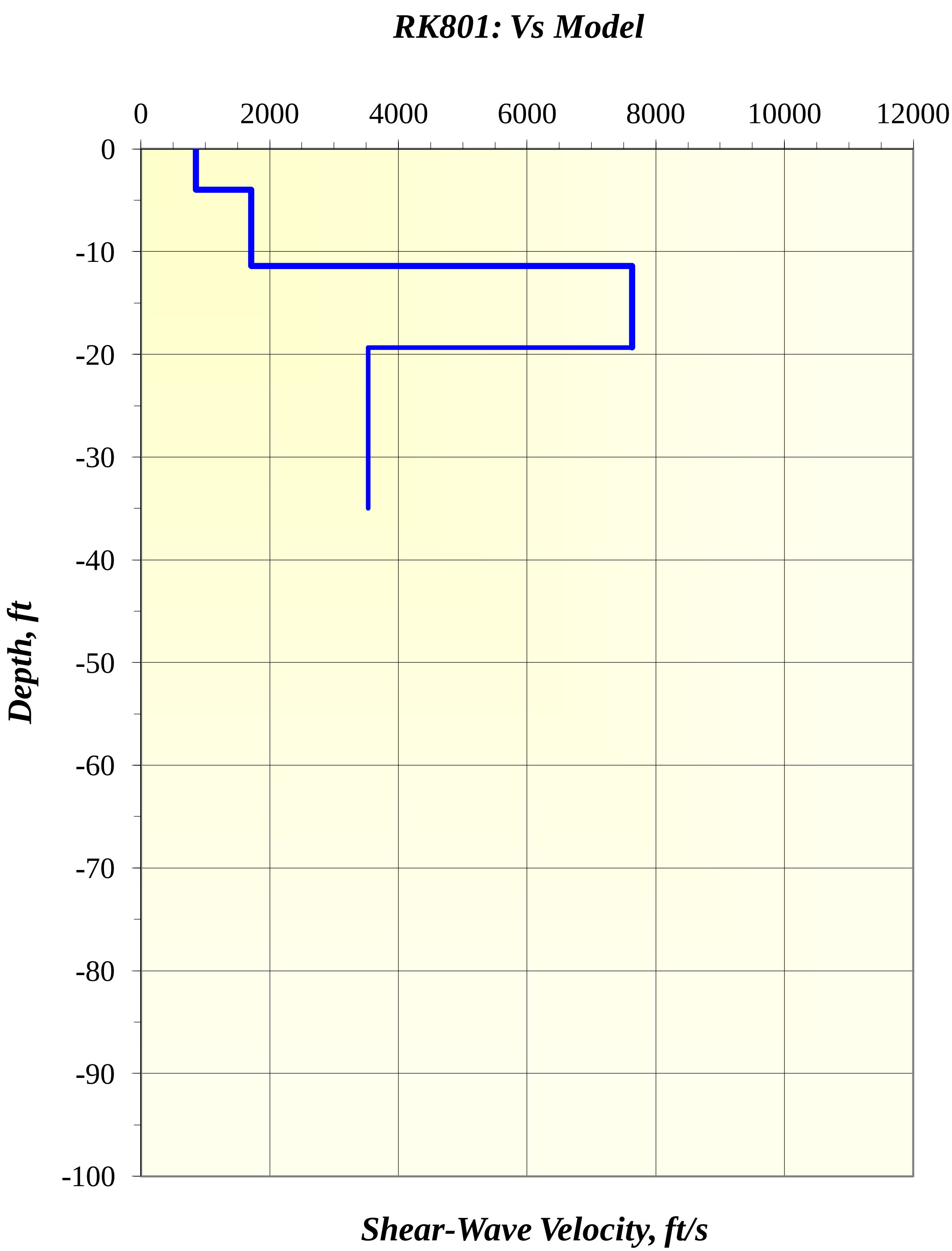
Shear-Wave Velocity Models (4 pages)



PHRK04: Vs Model
0
2000
4000
6000
8000
10000
12000
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Depth, ft
Shear-Wave Velocity, ft/s


PHRK07: Vs Model
0
2000
4000
6000
8000
10000
12000
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Depth, ft
Shear-Wave Velocity, ft/s


PHRK13: Vs Model
0
2000
4000
6000
8000
10000
12000
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Depth, ft
Shear-Wave Velocity, ft/s


RK801: Vs Model
0
2000
4000
6000
8000
10000
12000
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Depth, ft
Shear-Wave Velocity, ft/s

APPENDIX C

ROCK CLASSIFICATION GUIDE

CLASSIFICATION OF ROCK MATERIALS STRENGTHS[1]		
GRADE	DESCRIPTION	FIELD IDENTIFICATION
R6	Extremely Strong Rock	Specimen can only be chipped with geologic hammer.
R5	Very Strong Rock	Specimen requires many blow of geologic hammer to fracture it.
R4	Strong Rock	Specimen requires more than one blow with a geological hammer to fracture it.
R3	Medium Weak Rock	Cannot be scraped with a pocketknife; can be fractured with a single firm blow of geological hammer.
R2	Weak Rock	Can be peeled with a pocketknife; shallow indentations made by firm blow with point of geological hammer.
R1	Very Weak Rock	Crumbles under firm blows with point of geological hammer; can be peeled with a pocketknife.
R0	Extremely Weak Rock	Indented by thumbnail.
S6	Hard Clay	Indented with difficulty with thumbnail.
S5	Very Stiff Clay	Readily indented by thumbnail.
S4	Stiff Clay	Readily indented by thumb, but penetrated only with great difficulty.
S3	Firm Clay	Can be penetrated several inches by thumb with moderate effort.
S2	Soft Clay	Easily penetrated several inches by thumb.
S1	Very Soft Clay	Easily penetrated several inches by fist.

Note: Grades S1 to S6 apply to cohesive soils, for example clays, silty clays, and combinations of silts and clays with sand, generally slow draining. Discontinuity wall strength will generally be characterized by grades R0-R6 (rock) while S1-S6 (clay) will generally apply to filled discontinuities. Some rounding of strength values has been made when converting to S.I. units.

[1] ISRM, "*Suggested Methods for the Quantitative Description of Discontinuities in Rock Masses,"* International Society for Rock Mechanics, (Int. J. Rock Mech. Min. Sci. & Geomech. Abstr. Vol. 15, 1978)

WEATHERING AND ALTERATION GRADES[1]		
GRADE	TERM	DESCRIPTION
I	Fresh	No visible sign of rock material weathering; perhaps slight discoloration on major discontinuity surfaces.
II	Slightly weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
III	Moderately weathered	Less than half the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
IV	Highly weathered	More than half the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present as a discontinuous framework or as corestones.
V	Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
VI	Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STANDARD CORE BARREL SYSTEMS[A]				
DESIGNATION	CORE DIAMETER		HOLE DIAMETER	
	in.	mm	in.	mm
AQ	1.065	27.1	1.89	48.0
BQ	1.432	36.4	2.36	60.0
NQ	1.875	47.6	2.98	75.7
NQ_3	1.750	44.4	2.98	75.7
HQ	2.500	63.5	3.79	96.3
HQ_3	2.375	60.3	3.79	96.3

[A] Dimensions and designations may vary according to manufacturer.

DISCONTINUITY TYPE	
F	Fault
J	Joint
Fr	Fracture
Sh	Shear
Fo	Foliation
V	Vein
B	Bedding

DISCONTINUITY SPACING			
SYMBOL	DESCRIPTION	cm	in.
EC	Extremely Close	< 2.0	< 0.8
VC	Very Close	2.0 – 6.4	0.8 – 2.5
C	Close	6.4 – 20.3	2.5 – 8
M	Moderate	20.3 – 61.0	8 – 24
W	Wide	61.0 – 201	24 – 79
VW	Very Wide	201 – 610	79 – 240
EW	Extremely Wide	> 610	> 240

ROCK QUALITY DESCRIPTION (RQD)	
RQD VALUE	DESCRIPTION OF ROCK QUALITY
0% - 25%	Very Poor
26% - 50%	Poor
51% - 75%	Fair
76% - 90%	Good
91% - 100%	Excellent

SURFACE SHAPE	
PL	Planar
C	Curved
U	Undulating
ST	Stepped
I	Irregular

SURFACE DESCRIPTION	
K	Slickensided
SM	Smooth
R	Rough
VR	Very Rough

$$RQD = \frac{\Sigma Length\ of\ core\ pieces > 10cm(\sim 4in)}{Total\ Core\ Length} \times 100\%$$

ROCK CORE LOG

HDL ENGINEERING Consultants

Project Name: Point Hope Coastal Erosion Mitigation – Phase II Resource Study
Project Location Point Hope, Alaska
Client: North Slope Borough

Boring No.: HDL-01
Page: 1 of 1
Project #: 15-108
Checked By: D. Simon

Contractor: Geotek Alaska
Foreman: Glen
Rig: Geoprobe 6620 DT
Logged By: J. Dvorak
Date Start/Finish: 3/5/2017 - 3/6/2017
Boring Location: 68.254217,-166.06484
GS Elevation: **Datum:**

Auger / Casing
Type: 4.5 inch O.D. casing
Core Diameter: NQ_3
Other:

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
3/6/2017	Complete	NW		

Surveyed By: N/A
Survey Date:

DEPTH (feet)	Type	Core Run No.	Core Length (ft)	Recovery (ft)	RQD	SAMPLE DESCRIPTION AND CLASSIFICATION
0	DHH	-	-	-	-	Poorly-graded GRAVEL, medium to coarse, angular, light grey to tan, dry; transitioning to completely weathered bedrock based on hammer action and cuttings.
5	DHH	-	-	-	-	Transition to competent bedrock based on hammer action. Chips/cuttings similar to rock below, grey and tan, slightly effervescent.
8	CORE	-	1.0	0.1	-	Limestone, slightly weathered, R4, slightly effervescent on fractured surface, highly fractured, unable to retain core.
9	CORE	1	4.0	3.6	46	Limestone, crystaline, aphanitic, slightly weathered, R4, undulating to planar fractures, smooth to rough, close fracture spacing, some discoloration on fractures, grey to tan, no distinct bedding, generally massive, calcite filled fractures, effervescent on fractured and fresh surfaces.
13	CORE	2	5.0	4.7	82	Same as above, slightly weathered to fresh, close to moderate fracture spacing.
18	CORE	3	5.0	3.2	57	Same as above, close fracture spacing.
23	CORE	4	3.0	5.1	87	Same as above, close to moderate fracture spacing, calcite filled fractures and voids. Core 4 appears to include part of Core 3.
26						BOTTOM OF BORING

NOTES: "DHH" = Down hole hammer
Paused HDL-01 on 03/05/2017
Resumed HDL-01 on 03/06/2017

ROCK CORE LOG

HDL ENGINEERING Consultants

Project Name:	Point Hope Coastal Erosion Mitigation – Phase II Resource Study	**Boring No.:**	HDL-02
Project Location	Point Hope, Alaska	**Page:**	1 of 1
Client:	North Slope Borough	**Project #:**	15-108
		Checked By:	D. Simon

Contractor:	Geotek Alaska	**Auger / Casing**	
Foreman:	Glen	**Type:**	4.5 inch O.D. casing
Rig:	Geoprobe 6620 DT	**Core Diameter:**	NQ_3
Logged By:	J. Dvorak	**Other:**	
Date Start/Finish:	3/6/2017		
Boring Location:	68.253543,-166.062994		
GS Elevation:		**Datum:**	

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
3/6/2017	Complete	NW		

Surveyed By: N/A

Survey Date:

DEPTH (feet)	Type	Core Run No.	Core Length (ft)	Recovery (ft)	RQD	SAMPLE DESCRIPTION AND CLASSIFICATION
0	DHH	-	-	-	-	Poorly-graded GRAVEL, medium to coarse, angular, light grey to tan, dry.
0.75	DHH	-	-	-	-	Transitioning to highly weathered bedrock based on hammer action and cuttings, cuttings alternate between tanish grey and tan.
3	CORE	1	2.7	1.3	0	Limestone, crystalline, aphanitic, highly weathered, R3-R4, irregular fractures, smooth to rough, very close to extremely close fracture spacing, grey to tan, no distinct bedding, effervescent on fractured and fresh surfaces.
5.7	CORE	2	2.3	1.5	31	Limestone, crystalline, aphanitic, slightly weathered to fresh, R4, undulating to planar fractures, smooth to very rough, close to very close fracture spacing, grey to tan, no distinct bedding, effervescent on fractured and fresh surfaces.
8	CORE	3	5.0	4.7	68	Same as above, smooth to rough, close to moderate fracture spacing, calcite filled fractures
8.8						Three-inch seam of residual soil and ice, tan.
13	CORE	4	4.0	3.2	78	Limestone, crystalline, aphanitic, slightly weathered to fresh, R4, undulating to planar fractures, smooth to rough, close to moderate fracture spacing, grey to tan, no distinct bedding, effervescent on fractured and fresh surfaces.
16						Transition to completely weathered Limestone to residual soil, tan, frozen
17						BOTTOM OF BORING

NOTES: "DHH" = Down hole hammer
Loss of cuttings at ~8.8 feet bgs. Advance ~3 inches rapidly
Cuttings return at ~14 feet bgs
Cuttings transition to soil/completely weathered bedrock, tan at ~15.5 feet bgs, core advanced rapidly
Transition back to competent bedrock at ~16.5 feet bgs based on action; loss of cuttings
Terminate boring at ~17 feet bgs based on quality of rock above

ROCK CORE LOG

HDL ENGINEERING Consultants

Project Name:	Point Hope Coastal Erosion Mitigation – Phase II Resource Study
Project Location	Point Hope, Alaska
Client:	North Slope Borough
Boring No.:	HDL-03
Page:	1 of 1
Project #:	15-108
Checked By:	D. Simon

Contractor:	Geotek Alaska
Foreman:	Glen
Rig:	Geoprobe 6620 DT
Logged By:	J. Dvorak
Date Start/Finish:	3/7/2017
Boring Location:	68.254095,-166.061757
GS Elevation:	
Datum:	

Auger / Casing

Type:	4.5 inch O.D. casing
Core Diameter:	NQ_3
Other:	

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
3/7/2017	Complete	NW		

Surveyed By: N/A

Survey Date:

DEPTH (feet)	Type	Core Run No.	Core Length (ft)	Recovery (ft)	RQD	SAMPLE DESCRIPTION AND CLASSIFICATION
0	DHH	-	-	-	-	Poorly-graded GRAVEL, medium to coarse, angular, light grey and tan, dry, transitioning to completely weathered bedrock based on hammer action and cuttings.
1	DHH	-	-	-	-	Transition to competent bedrock based on hammer action.
3	CORE	1	3.5	1.1	0	Limestone, crystaline, aphanititc, slightly to moderately weathered, R3-R4, irregular fractures, smooth to rough, very close to extremely close fracture spacing, light grey and tan, no distinct bedding, effervescent on fractured and fresh surfaces.
6.5	CORE	2	1.5	0.8	0	Limestone, crystaline, aphanititc, slightly weathered, R3-R4, undulating to irregular fractures, smooth to rough, very close to extremely close fracture spacing, multiple ice lenses, no distinct bedding, effervescent on fractured and fresh surfaces.
8	CORE	3	5.0	4.8	76	Limestone, crystaline, aphanititc, slightly weathered to fresh, R3-R4, planar to undulating fractures, smooth to rough, close fracture spacing, light grey, no distinct bedding, calcite filled fractures, effervescent on fractured and fresh surfaces.
9.2						Three-inch seam of completely weathered bedrock/residual soil and ice, tan.
13	CORE	4	5.0	4.9	95	Limestone, crystaline, aphanititc, fresh, R4, planar to undulating fractures, smooth to rough, close to moderate fracture spacing, light grey, no distinct bedding, calcite filled fractures, occasional vugs, effervescent on fractured and fresh surfaces.
18	CORE	5	2.5	2.6	71	Same as above, slightly weathered
18.55						Limestone, crystaline, aphanititc, moderately weathered, R3, planar to undulating fractures, smooth to rough, close fracture spacing, light grey to tan, no distinct bedding, calcite filled fractures, occasional vugs, effervescent on fractured and fresh surfaces.
19.75						Limestone, completely weathered, to residual soil, tan.
20.5						BOTTOM OF BORING

NOTES: "DHH" = Down hole hammer
Wet residual soil/completely weathered bedrock, tan, coming out of hole from ~9.25 to ~9.5 feet bgs
Cuttings turn from light grey to tan at ~19 feet bgs
Installed 1 inch diameter pex pipe for temperature monitoring

ROCK CORE LOG

HDL ENGINEERING Consultants

Project Name: Point Hope Coastal Erosion Mitigation – Phase II Resource Study
Project Location Point Hope, Alaska
Client: North Slope Borough

Boring No.: HDL-04
Page: 1 of 1
Project #: 15-108
Checked By: D. Simon

Contractor: Geotek Alaska
Foreman: Glen
Rig: Geoprobe 6620 DT
Logged By: J. Dvorak
Date Start/Finish: 3/07/2017 - 3/10/2017
Boring Location: 68.254913,-166.063087
GS Elevation: **Datum:**

Auger / Casing
Type: 4.5 inch O.D. casing
Core Diameter: NQ_3
Other:

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
3/10/2017	Complete	NW		

Surveyed By: N/A
Survey Date:

DEPTH (feet)	Type	Core Run No.	Core Length (ft)	Recovery (ft)	RQD	SAMPLE DESCRIPTION AND CLASSIFICATION
0	DHH	-	-	-	-	Poorly-graded GRAVEL, medium to coarse, angular, light grey and tan, dry, transitioning to completely weathered bedrock based on hammer action and cuttings
5	CORE	1	3.2	0.9	0	Limestone, crystaline, aphanititc, moderately weathered, R3-R4, irregular fractures, smooth to rough, very close to extremely close fracture spacing, greyish tan, no distinct bedding, occasional vugs, effervescent on fractured and fresh surfaces.
6.2	CORE	2	1.8	1.1	0	Limestone, crystaline, aphanititc, slightly weathered to fresh, R4, planar to undulating fractures, smooth to rough, very close to close fracture spacing, grey, no distinct bedding, calcite filled fractures, occasional vugs, effervescent on fractured and fresh surfaces.
6.9						Three-inch ice lense
8	CORE	3	5.0	4.7	47	Same as above, calcite veins up to 1/4" wide.
9						Three-inch ice lense
11.8						Limestone, highly to completely weathered, with ice inclusions, Planar to undulating fractures, smooth to very rough, very close to close fracture spacing, tan, no distinct bedding, effervescent on fractured and fresh surfaces.
12.5						Limestone, crystaline, aphanititc, slightly weathered to fresh, R4, planar to undulating fractures, smooth to rough, very close to close fracture spacing, grey, no distinct bedding, effervescent on fractured and fresh surfaces.
13	CORE	4	5.0	4.9	91	Same as above, very close to moderate fracture spacing.
15.2						Two-inch seam of completely weathered bedrock/residual soil and ice, tan.
16						Same as above, grey to black, very thin undulating bedding structure, calcite inflillings.
18	CORE	5	5.0	4.6	83	Same as above, calcite infillings.
19.8						Limestone, crystaline, aphanititc, slightly weathered, R2-R3, planar to undulating fractures, smooth to rough, close fracture spacing, grey to tan, very thin undulating bedding structure, calcite infillings, areas of dissolution, effervescent on fractured and fresh surfaces.
20.2						Lose distinct bedding.
23	CORE	6	2.0	2.1	22	Same as above, light grey to tan.
23.3						Limestone, crystaline, aphanititc, moderately to highly weathered, R1-R2, planar to irregular fractures, smooth to rough, close to extremely close fracture spacing, tan, no distinct bedding, effervescent on fractured and fresh surfaces.
25						BOTTOM OF BORING

NOTES: "DHH" = Down hole hammer
Transition to competent bedrock at ~5 feet bgs based on hammer action.
Cuttings switch back and forth between grey and tan from ~5 feet bgs to ~6 feet bgs
Paused HDL-04 on 03/07/2017
Resumed HDL-04 on 03/08/2017
After attempting to core through ice and snow in hole, rods froze in ground. Pause drilling and leave site due to weather.
Resumed HDL-04 on 03/10/2017

ROCK CORE LOG

Project Name:	Point Hope Coastal Erosion Mitigation – Phase II Resource Study
Project Location	Point Hope, Alaska
Client:	North Slope Borough
Boring No.:	HDL-05
Page:	1 of 1
Project #:	15-108
Checked By:	D. Simon

HDL ENGINEERING Consultants

Contractor:	Geotek Alaska
Foreman:	Glen
Rig:	Geoprobe 6620 DT
Logged By:	J. Dvorak
Date Start/Finish:	3/10/2017
Boring Location:	68.256059,-166.06128
GS Elevation:	
Datum:	

Auger / Casing

Type:	4.5 inch O.D. casing
Core Diameter:	NQ_3
Other:	

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
3/10/2017	Complete	NW		

Surveyed By: N/A

Survey Date:

DEPTH (feet)	Type	Core Run No.	Core Length (ft)	Recovery (ft)	RQD	SAMPLE DESCRIPTION AND CLASSIFICATION
0	DHH	-	-	-	-	Poorly-graded GRAVEL, medium to coarse, angular, light grey and tan, dry, transitioning to completely weathered bedrock based on hammer action and cuttings.
3	DHH	-	-	-	-	Limestone, highly to moderately weathered, light grey, based on hammer action and cuttings.
6	DHH	-	-	-	-	Transitioning to more competent bedrock based on hammer action and cuttings.
8	CORE	1	4.0	3.5	55	Limestone, crystaline, aphanititc, slightly weathered, R4, planar to undulating fractures, smooth to rough, very close to close fracture spacing, light grey and tan, no distinct bedding, calcite filled fractures, effervescent on fractured and fresh surfaces..
12	CORE	2	5.0	5.0	88	Limestone, crystaline, aphanititc, slightly weathered to fresh, R4, planar to undulating fractures, smooth to rough, very close to moderate fracture spacing, light grey and tan, no distinct bedding, calcite infillings, effervescent on fractured and fresh surfaces.
17	CORE	3	5.0	5.1	77	Same as above, grey to white, significant calcite infillings.
22						BOTTOM OF BORING

NOTES: "DHH" = Down hole hammer

APPENDIX C

Meeting Minutes

PUBLIC MEETING

July 14, 2010

Point Hope Emergency Evacuation Road and Material Source Study
Meeting Notes

Meeting Date: Wednesday, 14 July 2010
Location: Point Hope Community Center
Times: 1:00 to 4:00 pm and 7:00 to 9:00 pm

HDL Projects:
10-018 Material Source
10-020 Evacuation Road
(NSB CIP 07-254)

Those in Attendance:

- Steve Chronic, LCMF
- Scott Hattenburg, HDL
- Christina Tippin, NVPH Roads Technician
- Rex Tuzroluk
- Lillie Tuzroyluke, NVPH Executive Director
- Debbie Koenig, NSB Liason
- Daisy Sage, Mayor City of Point Hope
- Jack Schaefer, Tikigaq Corporation
- Approximately 15 other residents as identified on the attached sign in sheet.

Purpose of the Meeting:

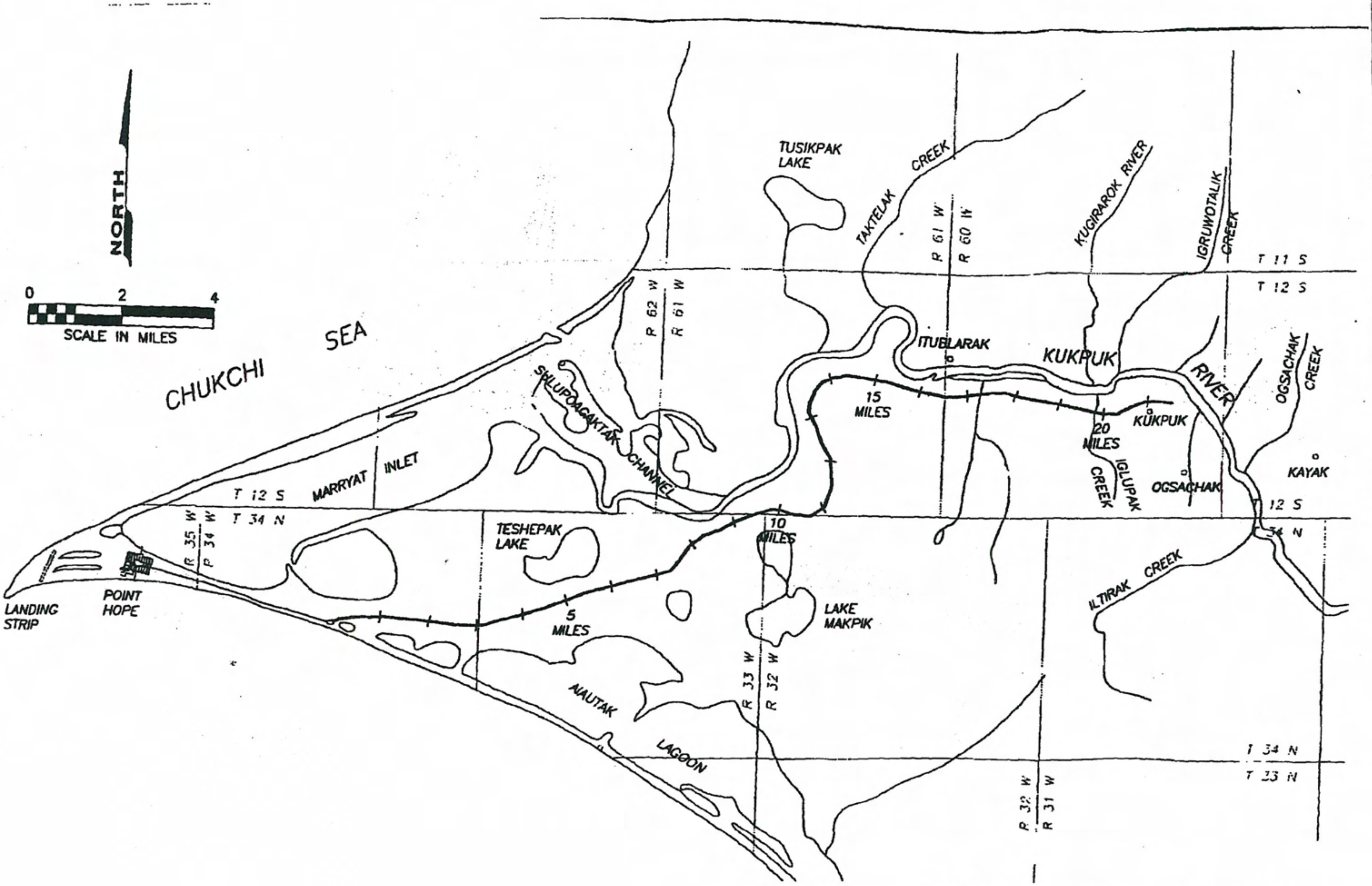
To introduce the community to two new Point Hope projects, the Material Source Reconnaissance Study and the Emergency Evacuation Road (EER) Preliminary Engineering and Environmental work.

Pre Meeting Activity:

An introductory letter, a public notice and a map were sent to the Tikigaq Corporation (TC), Native Village of Point Hope (NVPH), and the City of Point Hope (City) on July 1, 2010 via email. The meeting place was arranged in advance with the City. Prior to the meeting Steve and Scott stopped by and talked to Jack Schaefer with TC; Ray Koonuk, Sr. NVPH EPA Manager (formerly the NVPH Roads Manager, Debbie Koenig, NSB Liason, and Lily Tuzroyluke, Executive Director, NVPH; and Daisy Sage, Mayor of the City of Point Hope.

Summary:

An open house style public meeting was held at the Point Hope community center. The projects were introduced and input from the community sought. It was explained that the funding source for the EER was through the FHWA and had limitations on what the funding could be used for, and that approximately $2.5 million was available for construction of the next phase of the EER. ($3.0 million minus approximately $500,000 for DOT administration) It was explained that the agencies would likely fund the EER to above the 100-year flood elevation as determined by the flood study currently underway by Coastline Engineering. It was explained that there is a possibility that the existing road may currently be above the 100-year flood elevation. We handed out drawings and asked folks to help us determine the preferred route. It was explained that potential alternatives to be considered included extending the road,



LCMF Incorporated
A subsidiary of Ukpeaġvik Iñupiat Corporation
Anchorage, Alaska (907) 562-1830

NORTH SLOPE BOROUGH

ACCESS ROAD TO KUKPUK SITE PLAN

POINT HOPE, ALASKA

rerouting the road onto higher ground for safety, or hardening the existing road to make it more flood proof. The community indicated that the community had already expressed their preference at earlier meetings and that "Jakie's route" was presented to the BIA as the preferred route and is generally the route liked by the community.

Rex Tuzroluk and Jack Schaefer were present and expressed several concerns and suggestions regarding both projects. Jack expressed several times that the community wanted to see the 17-mile road on a drawing and that this project needed to extend the road...as funding allowed. It was reiterated that funding was for constructing a roadway that got the community above the 100-year flood elevation.

Rex expressed concerns about the existing road. Others in attendance expressed the same concerns. He indicated that the material used to construct the road would not stand up to heavy use and felt that during an evacuation event there was a concern that the road would fail particularly along the low areas where the roadway is narrow and elevated. He also expressed that the road was in the wrong location and should be re-built on higher ground to avoid the low area. He and others indicated that the road alignment was originally selected to access the water source, not to address evacuation.

Rex also expressed concerns about past material sources being selected based on the least cost and that those sources were not very good. He indicated that the hard, round rocks that comprise the beach gravel of the Point Hope are not good for building roads even when crushed.

We were also informed by Karen Tippin with NVPH that they acquired 100,000 acres of land from TC in the 1980's and now they controlled the surface use of that property. These tribal lands are managed for subsistence purposes. Residents indicated that those areas along the Kukpuk River were used heavily for subsistence and any mining along the river would be a conflict with their subsistence activity. The Kukpuk River has salmon, arctic char, grayling and other fish species. The Kukpuk River has many native allotments. Development on allotments would require involvement with and approval by BIA. For these reason the consultant team suggests dropping the Kukpuk River from evaluation as a material source. Karen provided a copy of the transfer document from Tigara Corp to NVPH. We indicated we would provide a map of NVPH lands to NVPH. ASRC apparently has this information on a GIS layer. The consultant will make contact with ASRC Land Manager, Richard Glenn.

General Consensus/Highlights:

- TC requested to see the MOU between the Borough and ADOT&PF

- The NVPH and TC reiterated that Rights of Entry will be needed for access to tribal and native allotment lands.

- The village wanted village guides to accompany consultants on any inland work.

- Areas long the Kukpuk River would likely conflict with a mining operation due to high subsistence use.

- The village wants to see the 17-mile road on a map at the next meeting
- The village wants to see the previously studied routes at the next meeting
- The consultant will check with WH Pacific regarding getting the 17-mile road on the Borough's Comprehensive Plan.
- The village wanted to know if there were emergency shelters planned along the 17-mile evacuation road because of the long length. We indicated not at this point.
- The village wanted the prior study routes incorporated into the next presentation.
- The village wanted to know if there are any deadlines on the FHWA funding.
- The village wanted to make sure that future public notices are posted at the store and post office.
- The Mayor and attendees suggested door prizes at the next meeting to get more people to attend.
- The village wanted the public notices to indicate what the project is about.
- The village suggested a power point presentation with a large map at the next meeting.

We indicated that this was an introductory meeting and that we would come back about the first week of August and conduct another meeting to get further input and to conduct the field reconnaissance for the Material Source Study. We would then return in August to conduct the cultural resource and environmental field work for the Evacuation Road before the snow flies. We explained that if the field work did not occur before the snow flies that the project would likely be delayed one year.

Adjourned: at 8:45 pm

Respectfully Submitted

Scott Hattenburg, P.E./Principal
Hattenburg Dilley and Linnell

LCMF LLC

July 1, 2010

Native Village of Point Hope
Lily Tuzroyluke, Executive Director
P.O. Box 109
Point Hope, Alaska 99766

Tikigaq Corporation
Rex Rock, Sr., President
P.O. Box 9
Point Hope, Alaska 99766

City of Point Hope
Steve Oomittuk, Mayor
P.O. Box 169
Point Hope, Alaska 99766

Re: Public Meeting Request to discuss the North Slope Borough's Material Source Evaluation and Emergency Evacuation Road projects.

Dear Ms. Tuzroyluke, Mr. Rock and Mr. Oomittuk,

LCMF LLC and Hattenburg, Dilley & Linnell Engineering Consultants (HDL) would like to schedule a Public Meeting in Point Hope for the purpose of introducing two North Slope Borough projects to the community. The two projects are the Material Source Evaluation (MSE) and the Emergency Evacuation Road (EER). The two projects are separate, but the MSE may play a part in possible options regarding the EER project. LCMF is the prime consultant for the MSE project and HDL is the prime consultant for the EER project.

In addition to introducing the projects to the community, we are seeking public input for the initial phase of both projects. We will be seeking public input on anticipated MSE sites and transportation options. We will also discuss concepts of developing a Material Site to be used for future projects. The EER project discussion will present some of the Federal and State requirements that govern the funding for this project and must be followed to assure that funding is not withdrawn. We will need a place to hold this meeting and have reserved the City Hall in Point Hope for the meeting.

Architecture

Engineering

Surveying

Project Management

615 E 82nd Ave Ste 300
Anchorage, AK 99518
Voice (907) 273-1830
Fax (907) 273-1831

P.O.Box 955
Barrow, AK 99723
Voice (907) 852-8212
Fax (907) 852-8213

The attached public notice assumes that the City Hall is available based on input that we received from the City of Point Hope, but we can change locations if needed. We are prepared to rent the space for the meeting.

We will have 'tentative' schedules for project development, and maps to show general locations of where material sites will be looked for within the Point Hope region.

In order to accomplish the field work associated with the projects we will need to rent four wheelers with a guide and operated boats to get to the various areas being evaluated for a possible material source. We will also need lodging and meals for three or four people for about 3 days and one or two people for an additional 2 or 3 days. Our goal this trip, after having the community meeting, is to begin some of the initial field work associated with the MSE. Doug Jones, the coastal engineer for the project, will be looking at some of the river flows for the EER project ahead of our meeting to catch spring runoff. We are interested in rivers that flow into Marryat Inlet. We need to measure water flow in those rivers during the spring/early summer. This will help us calculate potential water flow and associated flooding.

Enclosed is a small map that shows the area we are looking to evaluate for possible material sources. In addition to the areas indicated, we are looking for community input on 'other' areas in the region of the map that might hold material that could be used to build roads and other embankment projects.

Also enclosed is a public notice for the meeting discussed herein that we would like posted within the community so we can get as many people as possible informed as to when and where the meeting will be. By copy of this letter to the NSB Village Coordinators and it's attachments we are asking that they also let people in the community know about the meeting and post the meeting notice in the appropriate areas. We encourage representatives from all groups to attend the meeting.

Our intent is to travel to Point Hope on the 13th of July and conduct the meeting during the 14th between 1:00 p.m. and 4:00 p.m., with a break until 7:00 p.m. then resume the meeting until 9:00 p.m. This is indicated within the meeting notice.

We are looking forward to meeting with the residents of Point Hope. In addition to explaining the projects to the residents, we hope to gain knowledge from the community on how we can best go forward with the successful development of the projects.

Please review this information and if anyone has questions contact me at (907)-273-1830 or by email at schronic@lcmf.com.

Respectfully,

Steve W. Chronic, PE/PLS
General Manager

Cc: Ms. Ella Omnik and/or Ms. Debbie Koenig; NSB Village Coordinator
Ray Koonuk, NVPH Roads Program Coordinator
Laura Strand, NSB - CIPM
Scott Hattenburg, HDL
John Fritz, HDL
Katrina Moss, HDL

Attachments as noted: Area Map and Community Meeting Notice

PUBLIC MEETING

Point Hope Material Source Evaluation

&

Emergence Evacuation Road/Kuukpak Road Extension

CIP No. 07-254

The North Slope Borough (NSB) is initiating site investigations for two projects. The two projects are the Point Hope Material Source Evaluation (MSE) and the Emergency Evacuation Road (EER). The two projects are separate, but the MSE may play a part in possible options regarding the EER project.

1) The Material Source Evaluation project will continue previous field efforts to identify a suitable material source among several alternatives for future projects. This project is being conducted solely by the North Slope Borough.

2) The Emergency Evacuation Road project is being conducted by the North Slope Borough in conjunction with the Alaska Department of Transportation and Public Facilities (ADOT&PF) and the Federal Highway Administration (FHWA). Planning, surveying, geotechnical, and environmental investigations will be conducted to provide for the best use of federal earmark dollars to extend Kuukpak Road while complying with the National Environmental Policy Act and permitting requirements.

You are invited to attend an informal, informational meeting to learn more about both projects and to meet the consultants selected by the Borough to conduct these services.

Wednesday, July 14, 2010; 1:00 – 4:00 p.m. and from 7:00 p.m. – 9:00 p.m.
The City Hall of Point Hope

DATE 7/14/2010 SHEET ______ OF ______

PREPARED BY

SUBJECT Public Meeting Sign In Sheet

PROJECT Emergency Evacuation Road & Gravel Source Study

LCMF LLC

Architecture • Engineering • Surveying • Project Management

P.O. Box 955
Barrow, Alaska 99723
800-478-8213 Voice
907-852-8213 Fax

615 E. 82nd Ave. Ste. 200
Anchorage, Alaska 99518
Voice 907-273-1830
Fax 907-273-1831

NAME	ORGANIZATION	EMAIL	Phone
Scott Hattenburg	HDL	shattenburg@hdlalaska.com	564-2111
Steve Chronic	LCMF	schronic@LCMF.com	273-1846
Christina Tippin	NVPH	Christina.Tippin@tikigaq.com	368-3117
John Long Jr			368-2182
Lily Barger	NVPH	lily.barger@tikigaq.org	368-2330
Debbie Koenig	NSB Liaison	debbie.koenig@north-slope.org	368-2630
Mitchell Cannon			368-3005
Joseph Towksjhea			368-3249
Andrew B. Oviok			368 1511
Billy Stone Sr.			368-2080
Isaac Levi Killigvuk Sr			368-0148
Thomas Killigvuk		inupiaq_taco@yahoo.com	
Lillie Tuzroyluk			368 7621
Alice Mgrebel			
Rose Omnik			
Annie Attungana			
Delia Stone			
Daisy Sage	City of PHO	daisysage@hotmail.com	907 368-2836
Irma Hunnicutt			
Willard Hunnicutt	Fire Dept.	willard.hunnicutt@north-slope.org	907-368-2222
Jack Schaefer	Tikigaq Corp		907 368 2453
Peggy Frankson		pegfrankson@yahoo	317-7631

NORTH SLOPE BOROUGH
KUUKPAK ROAD EXTENSION
EMERGENCY EVACUATION

HATTENBURG DILLEY & LINNELL
Engineering Consultants

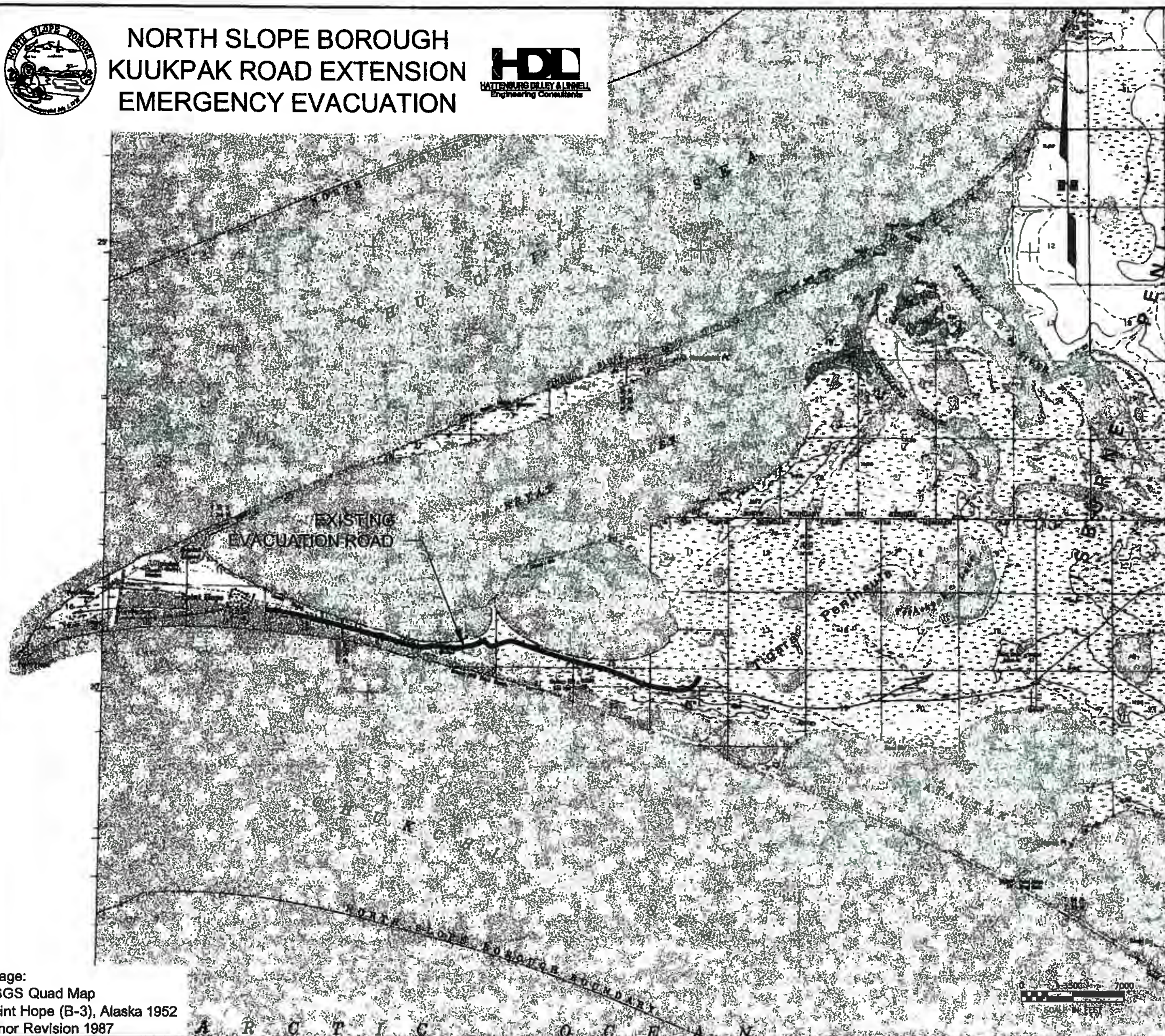


Image:
USGS Quad Map
Point Hope (B-3), Alaska 1952
Minor Revision 1987

KUUKPAK ROAD EXTENSION
EMERGENCY EVACUATION
Please show where the evacuation road should go by marking it on the map.
Please explain why you selected this route.

I've selected the highest Points that I know. I've First hand knowledge base on my travels in the ~~area~~. It's my hope that this road go beyond what this map shows.

Contact Information
Name: Gordon Omnik
Telephone: 368-2235
E-Mail: Gomnik@tikigaq.com

NORTH SLOPE BOROUGH
KUUKPAK ROAD EXTENSION
EMERGENCY EVACUATION

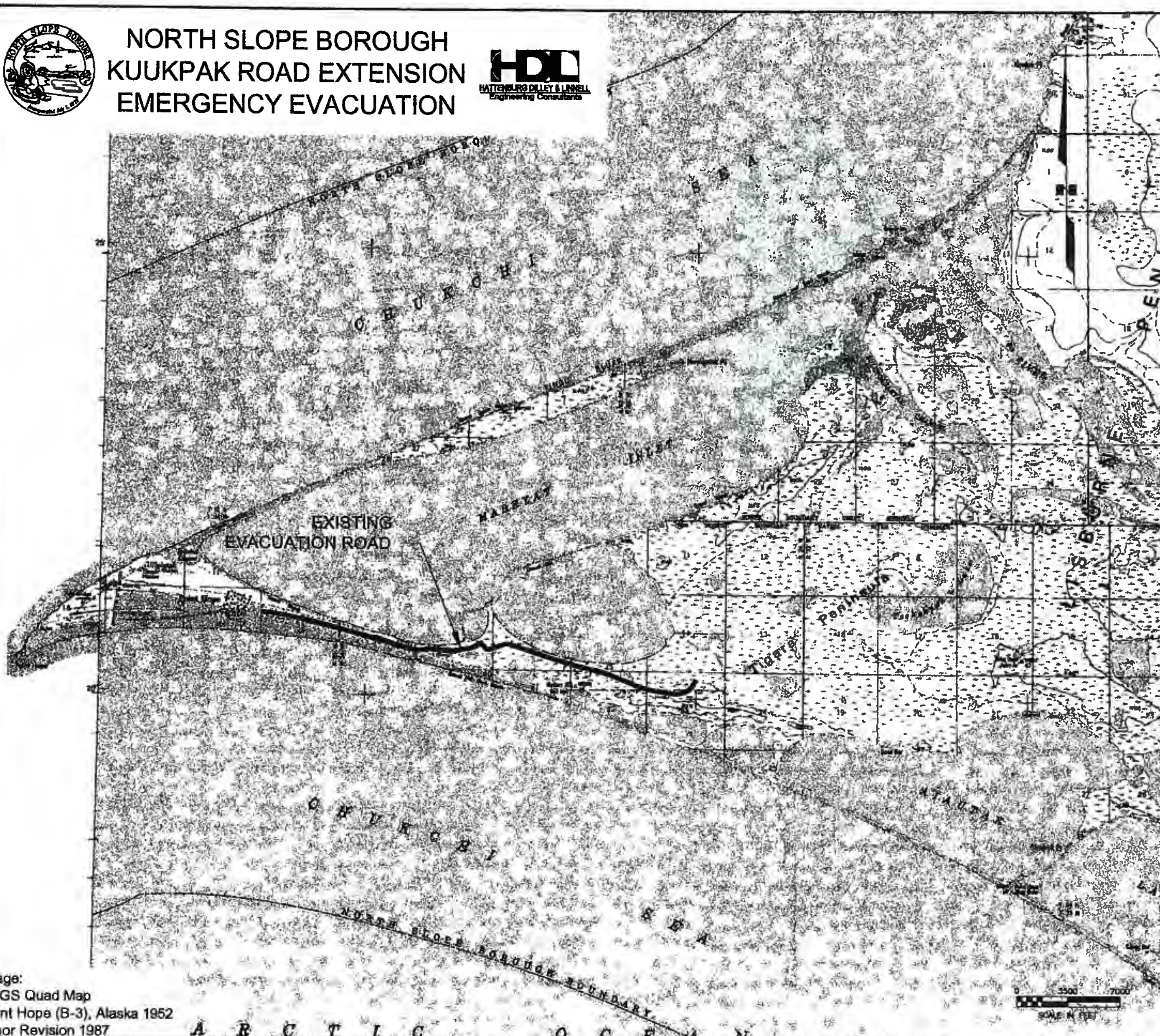


Image:
USGS Quad Map
Point Hope (B-3), Alaska 1952
Minor Revision 1987

KUUKPAK ROAD EXTENSION
EMERGENCY EVACUATION
Please show where the evacuation road should go by marking it on the map.
Please explain why you selected this route.

I choose Jakie's route, you have his route.

Contact Information
Name: Lily Barger
Telephone: 368-2330
E-Mail: lily.barger@hotmail.com

NORTH SLOPE BOROUGH
KUUKPAK ROAD EXTENSION
EMERGENCY EVACUATION

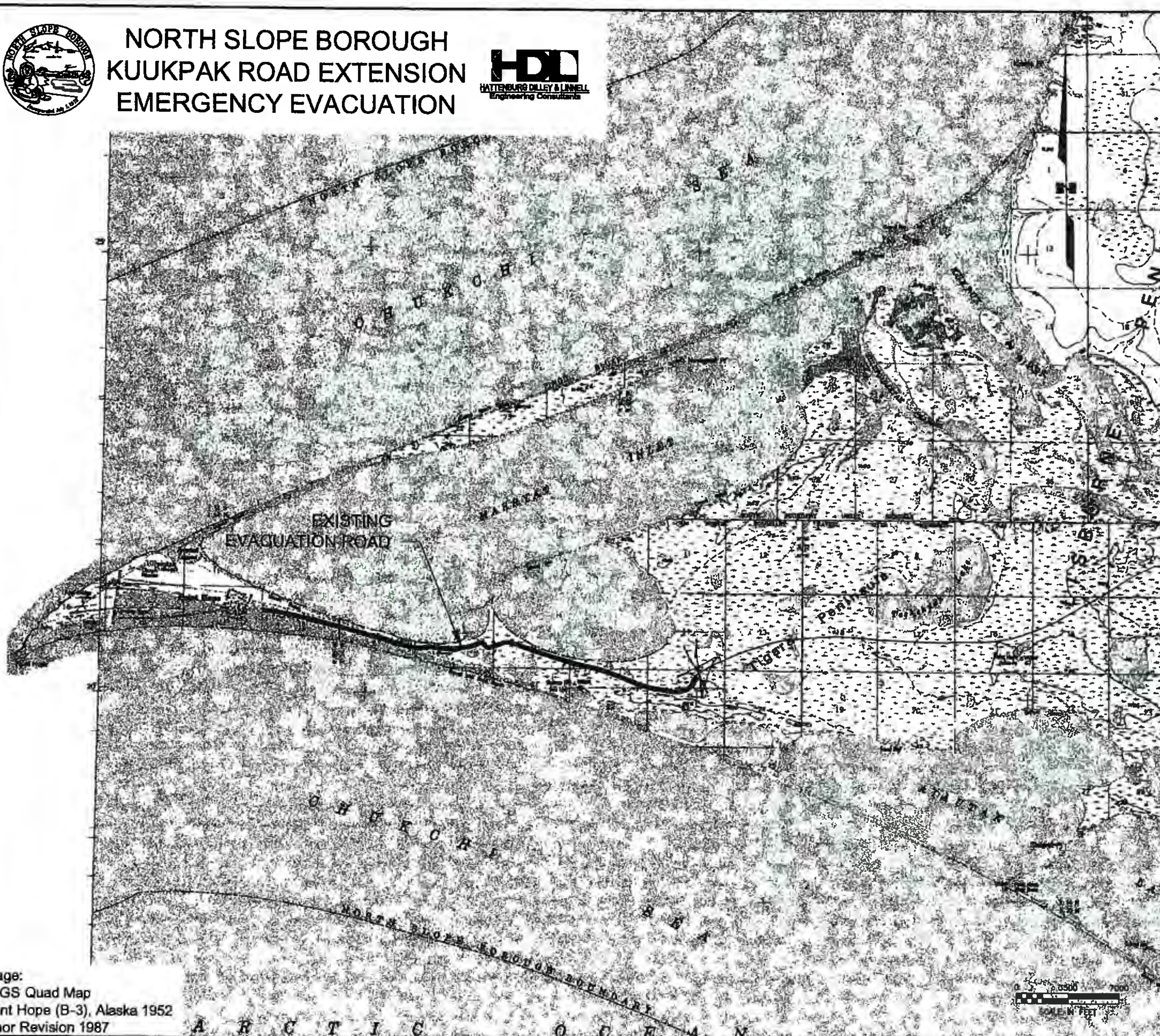


Image:
USGS Quad Map
Point Hope (B-3), Alaska 1952
Minor Revision 1987

KUUKPAK ROAD EXTENSION
EMERGENCY EVACUATION
Please show where the evacuation road should go by marking it on the map.
Please explain why you selected this route.

There are rocks that you can see over towards the Thompson road trails. Also there are rock along the north beach up towards Cape Lisbourne.

Contact Information
Name:
Telephone:
E-Mail:

NORTH SLOPE BOROUGH
KUUKPAK ROAD EXTENSION
EMERGENCY EVACUATION

HATTENBURG DILLEY & LINNELL
Engineering Consultants

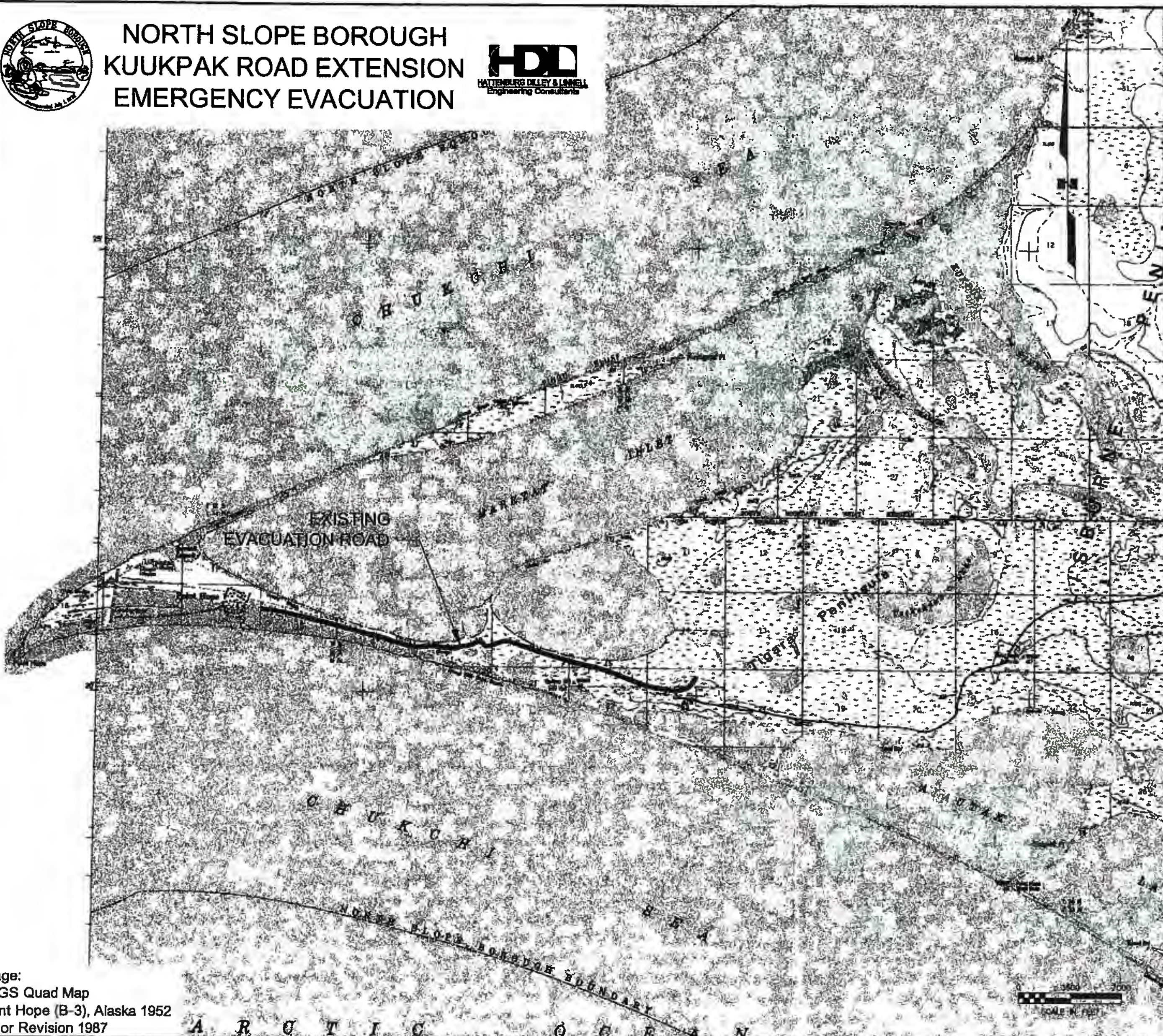


Image:
USGS Quad Map
Point Hope (B-3), Alaska 1952
Minor Revision 1987

KUUKPAK ROAD EXTENSION
EMERGENCY EVACUATION
Please show where the evacuation road should go
by marking it on the map.
Please explain why you selected this route.

not long enough!!

Contact Information
Name: Ted Frankson Jr
Telephone: 368-2817
E-Mail:


CHUK
PINGU BLUFF
Nuvugalak Pt
MARRYAT 1950
USS 9175
INLET
MARRYAT
SULUPOAGAKTAK CHANNEL
RIVER
NORTH SOUTH BOUNDARY KATEEL RIVER MERIDIAN
T. 34 N.
R. 34 W.
USS 9236
PT. HOPE ASTRO 1950
USS 9237
USS 9218
BEACON HILL 1950
USS 9191
AIAUTAK
Sinigrok Pt
PT. HOPE W. 1950
R. 35 W.
CHUKCHI

PUBLIC MEETING

August 4, 2010

Point Hope Emergency Evacuation Road and Material Source Study
Meeting Notes

Meeting Date: Wednesday, 4 August 2010
Location: Point Hope Community Center
Times: 2:00 to 5:00 pm and 7:00 to 9:00 pm

HDL Projects:
10-018 Material Source
10-020 Evacuation Road
(NSB CIP 07-254)

Those in Attendance:

- Scott Hattenburg, HDL
- Laura Strand, NSB Project Administrator
- Jack Schaefer, Tikigaq Corp.
- Terri Mitchell, HDL Environmental Manager
- Christina Tippin, NVPH Roads Technician
- Debbie Koenig, NSB Liason
- Daisy Sage, Mayor City of Point Hope
- Approximately 65 other residents as identified on the attached sign in sheets

Purpose of Meeting:

Pre Meeting Activity:

Summary:

An open house style public meeting was held at the Point Hope community center as a follow-up meeting to those held on July 14, 2010 in order to get further input, to conduct the field reconnaissance for the Material Source Study, and to agree upon a corridor for conducting studies. It was reiterated that the potential alternatives to be considered included extending the road, rerouting the road onto higher ground for safety, or hardening the existing road to make it more flood proof. The community indicated that they had already expressed their preference at earlier meetings and that Jakie Koonuk's route was presented to the BIA as the preferred route.

The first issue brought to the table was that there had been no local hire last year and that the community desired that there be people from the community who work with NSB. Laura Strand explained that the road last year had been administered by DOT, not NSB, and that because they were federally funded, they may not have been required to use local hire. It was said by several members of the community that the main concern being faced was that outsiders were coming to their lands to build roads without consultation with or input from the village. Scott Hattenburg, HDL, said that pressure would be put on the contractor from HDL for local hire. Lauren Keeisuu suggested that there be a pre-construction meeting with the village so that problems and concerns may be discussed.

Jack Schaefer, Tikigaq Corp., inquired about the route alternatives that were discussed in the previous meeting, stating that all routes were desired on one map. Laura and Scott state that all routes being considered are within the corridor, which exists in the study area.

Jack Schaefer began discussion about Jakie Koonuk's route, claiming that it was approved by the Tikigaq president and that there was documentation, but that Jakie had addressed concerns to environmental documents.

A local inquired about the 100,000 acres of NVPH land and its whereabouts in relationship to study area, to which Laura pointed out the yellow areas on the map depicting native village lands. These lands will be avoided as much as possible because any disturbance requires that the native village be compensated. The community stated that they had not been previously compensated, to which Terri Mitchell, HDL, said that new laws had been implemented to disallow disturbances of native land.

Tri-lateral became the main topic of discussion. The village claimed that their input had never been taken seriously, but that they realized they needed to put costs and trespasses aside in order to have this road completed. Safety comes first. The community has large concern for impending flooding, and wants the road finished to ensure their well-being and their futures. Scott expresses HDL's and NSB's desire and willingness to work with the people of the community in order to get the road done in a timely fashion and suit everyone's needs.

Scott says that field testing needs to be done before snow falls. Jack inquires about flood testing and material sites, to which Scott says that it is taking time because of the processes that have to be completed.

Jack and elders, thus encouraging other community members, agree to allow studying to be done in yellow areas (native allotments), and agree to the proposed corridor. Laura and Scott make a draft and an agreement to be signed and show a map of proposed possible material extraction sites.

Peggy Frankson asked about criterion needing to be met in order to obtain funding for the road. Scott mention the Environmental Assessment that had to be approved by FWHA.

General Consensus/Highlights:

- NVHP requested that a copy of HDL's powerpoint presentation be sent to the Executive Director and Road Technician.

We indicated that the village should get together a group or team of people knowledgeable of the area that can help partner with us so that the best route will be chosen for the road.

HATTENBURG DILLEY & LINNELL
Engineering Consultants

July 22, 2010

File: 10-020

Native Village of Point Hope
Lily Tuzroyluke, Executive Director
P.O. Box 109
Point Hope, Alaska 99766

Tikigaq Corporation
Rex Rock, Sr., President
P.O. Box 9
Point Hope, Alaska 99766

City of Point Hope
Honorable Daisy Sage, Mayor
P.O. Box 169
Point Hope, Alaska 99766

Re: Public Scoping Meeting
North Slope Borough Emergency Evacuation Road Project.

Dear Ms. Tuzroyluke, Mr. Rock, and Ms. Sage,

The North Slope Borough (NSB) and Hattenburg, Dilley & Linnell (HDL) invite you to attend a Public Scoping Meeting for the Emergency Evacuation Road project. We will be seeking comments on preliminary routes and provide follow-up information from comments and requests received at the prior meeting held July 14^{th}. The meeting is scheduled for August 4^{th} at Point Hope City Hall between 2:00PM and 4:00PM and again from 7:00PM to 9:00PM. We will provide a slide presentation that will include maps showing preliminary routes as well as those from previous studies. The slide presentation will begin at 2:30PM and again at 7:30PM. Time before and after the presentations will allow attendees to view available graphics and other project materials and discuss the project with project staff.

Enclosed is a public notice for the meeting that we would like posted within the community so we can get as many people as possible informed as to when and where the meeting will be. Per request at the July 14^{th} meeting, also enclosed is a copy of the signed Memorandum of Understanding between the Alaska Department of Transportation and Public Facilities and the North Slope Borough regarding Point Hope Evacuation Road establishing roles and responsibilities, development schedule, and funding commitments.

By copy of this letter to the NSB Village Coordinators and enclosures we are asking that they also let people in the community know about the meeting and post the meeting notice in the appropriate areas such as the store, post office, Native Village of Point Hope office, and City Hall. We encourage representatives from all groups to attend the meeting.

3335 Arctic Boulevard Suite 100 • Anchorage Alaska 99503 • Phone: 907.564.2120 • Fax: 907.564.2122
202 W. Elmwood Avenue Suite 1 • Palmer Alaska 99645 • Phone: 907.746.5230 • Fax: 907.746.5231

We are looking forward to meeting again with the residents of Point Hope. We hope to gain knowledge from the community on how we can best go forward with the successful development of this project.

Please review this information and if anyone has questions contact me at (907) 564-2111 or by email at shattenburg@hdlalaska.com.

Respectfully,

HATTENBURG DILLEY & LINNELL

Scott Hattenburg, PE
Principal/Project Manager

Attach: Public Scoping Meeting Notice
MOU between ADOT&PF and NSB

cc: Ms. Ella Omnik and/or Ms. Debbie Koenig; NSB Village Coordinator
Christina Tippin, NVPH Roads Technician
Laura Strand, NSB - CIPM
Katrina Moss, HDL
Steve Chronic, LCMF

North Slope Borough

Department of Capital Improvement Program Management
P.O. Box 350
Barrow, Alaska 99723

Phone: 907-852-0489 or
907-852-2611
Fax 907-852-0257

Matthew C. Dunn, Director

August 3, 2010

File: 10-020

Native Village of Point Hope
Lily Tuzroyluke, Executive Director
P.O. Box 109
Point Hope, Alaska 99766

Tikigaq Corporation
Rex Rock, Sr., President
P.O. Box 9
Point Hope, Alaska 99766

City of Point Hope
Honorable Daisy Sage, Mayor
P.O. Box 169
Point Hope, Alaska 99766

Re: North Slope Borough <u>Emergency Evacuation Road</u> Project.

Dear Ms. Tuzroyluke, Mr. Rock, and Ms. Sage,

As you know, the North Slope Borough (NSB) in conjunction with the Alaska Department of Transportation & Public Facilities (ADOTPF) is conducting a public meeting in Point Hope in regards to the Emergency Evacuation Road (EER). The meetings are scheduled for August 4 at the City Hall. In the meeting we will be outlining the project status, project schedule and the project processes that will occur during the first phases of this project.

With the assistance of Hattenburg Dilley & Linnell, the NSB has reviewed and analyzed past studies and recommendations for an EER route. Attached are two figures showing the project's route history and the proposed road corridor. In October 2008, the Native Village of

Point Hope (NVPH) recommended the route preferred in their resolution 2008-10 to the ADOTPF.

Although the NVPH preferred route (known as Jakey's Route) is shown as a line on paper, the actual route is yet to be finalized. A broad area along the route must be analyzed with field studies before the final road alignment can be selected. Once signed rights-of-entries are received, field scientists and engineers will walk the corridor area and talk with village residents and elders to get their input on cultural resources.

During their time in the field, they will investigate land ownership impacts, cultural resources, wetlands, topographic and soils data. The broader corridor will allow for route adjustments to best meet environmental and engineering requirements. Once all of the information is gathered and analyzed, the route may shift to minimize impacts to cultural resources, wetlands, land owners, and take advantage of topography and soils information to optimize the road alignment.

We look forward to discussing the project and getting the community's input on potential impacts to resources within the project corridor. Please contact me with any questions, comments, or concerns. I can be reached at 646-8274 or at laura.strand@north-slope.org.

Respectfully,

NORTH SLOPE BOROUGH

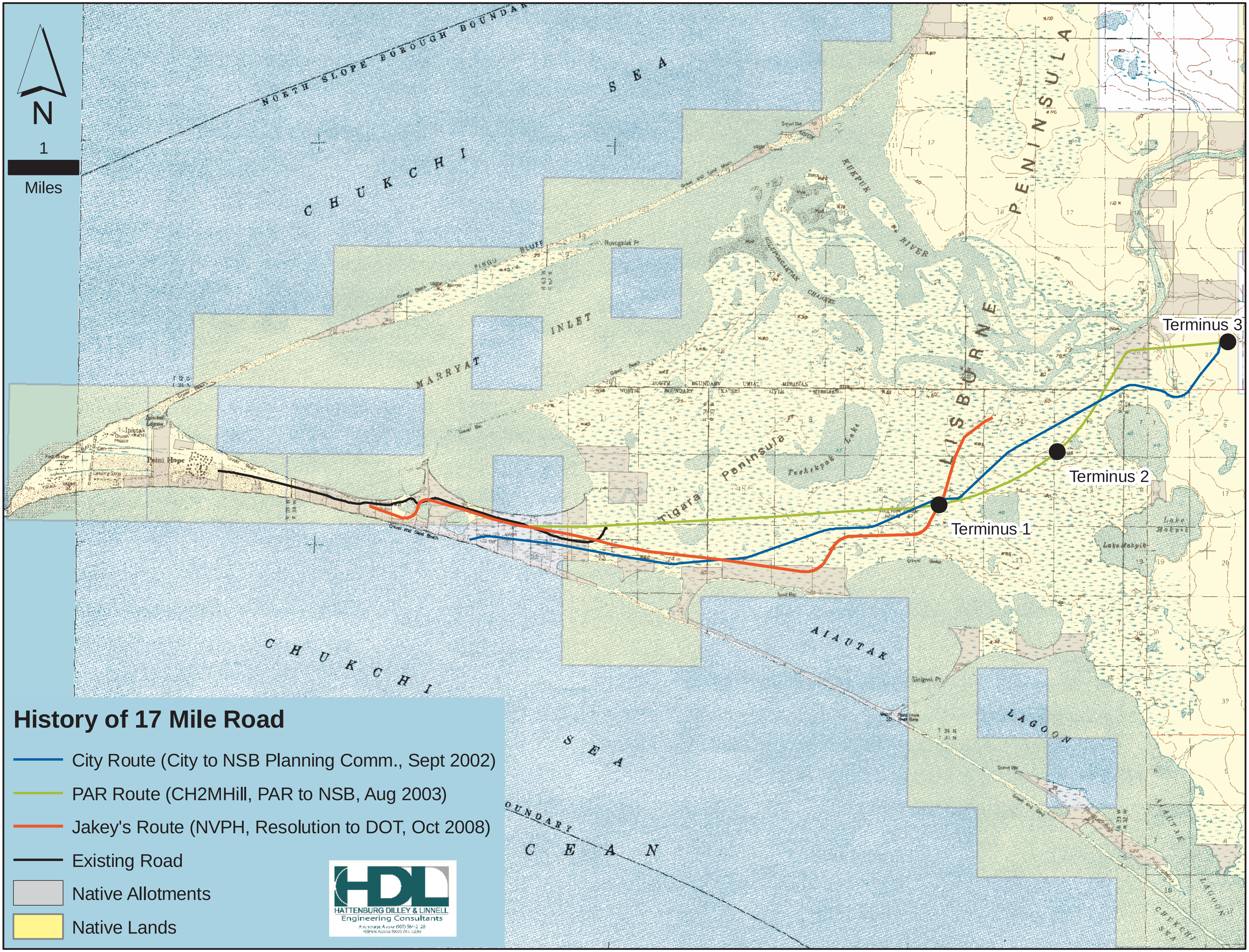
Laura Strand

Laura Strand, P.E./Project Manager

Attach: History of 17 Mile Road Figure
Proposed Evacuation Road Corridor Figure

cc: Ms. Ella Omnik and/or Ms. Debbie Koenig; NSB Village Coordinator
Christina Tippin, NVPH Realty
Jack Schaefer, Tikigaq Corporation
Scott Hattenburg,HDL
Stephanie Mormillo, HDL
Steve Chronic, LCMF

N
1
Miles
Terminus 1
Terminus 2
Terminus 3
Proposed Evacuation Road Corridor
Jakey's Route (NVPH, Resolution to DOT, Oct 2008)
Existing Road
Road Corridor Study Area
Native Allotments
HATTENBURG DILLEY & LINNELL
Engineering Consultants


History of 17 Mile Road
City Route (City to NSB Planning Comm., Sept 2002)
PAR Route (CH2MHill, PAR to NSB, Aug 2003)
Jakey's Route (NVPH, Resolution to DOT, Oct 2008)
Existing Road
Native Allotments
Native Lands
N
1
Miles
Terminus 1
Terminus 2
Terminus 3
CHUKCHI SEA
NORTH SLOPE BOROUGH BOUNDARY
MARRYAT INLET
LISBURNE PENINSULA
Tigara Peninsula
KUKPUK RIVER
AIAUTAK LAGOON
Point Hope
HDL
HATTENBURG DILLEY & LINNELL
Engineering Consultants

PUBLIC SCOPING MEETING

Emergency Evacuation Road / Kuukpak Road Extension

CIP No. 07-254

The North Slope Borough (NSB) in conjunction with the Alaska Department of Transportation and Public Facilities (ADOT&PF) and the Federal Highway Administration (FHWA) proposes to extend the Kuukpak Emergency Evacuation Road to a terminus above flood-stage elevation. The NSB is seeking public comments on the proposed <u>Emergency Evacuation Road</u> project in order to develop alternatives that meet the project purpose and need and initiate preliminary design and environmental analysis of those alternatives.

You are invited to attend an informal, informational meeting to learn more about the project and provide comments. Attendees will be eligible for Door Prizes!

Wednesday, August 4, 2010

2:00 – 4:00 p.m. and 7:00 – 9:00 p.m.
Presentations to start at 2:30 p.m. and 7:30 p.m.

Qalgi Center, Community Building

2:00 pm

PUBLIC MEETING SIGN IN SHEET

Point Hope Emergency Evacuation Road Project
AUGUST 4, 2010

1. Aggualluk Hawk
2. Enoch Tooyak NVPHO
3. Rex Tuzroyluk
4. Bessie Kowunna
5. Howard Stone
6. Delia M Stone
7. Patricia Stone
8. Taylor Milligrock
9. Aaren Milligrock
10. Aaron Oktollik
11. Isaac Killigvuk S
12. Lily Barger
13. Nathan Paul Milligrock
14. George Kingik
15. Diana Oktollik
16. Christina Tippin NVPH
17. Daisy Sage City of PHO
18. Lloyd Vincent
19. Patti Milligrock
20. Ella Omnik
21. Annie Rose Omnik
22. [illegible]
23. Debbie Koenig
24. Ricky C Stone Jr
25. Morris B. Ovinuk
26. Elizabeth Stone
27. Isaac Snyder Jr
28. Charlie [illegible]
29. Lorna A Snyder

Shawn Stone

2:00 pm

[illegible]
Phyllis FRANKSON
SPIKE Milligrock
Esther Elavik
[illegible] Johnson
ALICE WEBER
Shirley Ipalook
[illegible]
Luke Koonook [illegible]
Lillie Tuzroyluk
Vanessa Eves
Hannah Tearoumeak
molly & Jonah Killigvuk
Desire Snyder
[illegible]
Ella Nashookpuk
[illegible]
Emma Hunnicutt
Daisy J. Ward
[illegible]
[illegible]
Peter [illegible]
Zack Schaefer
[illegible]
Sylvia Kinneeveauk
Monique Nashookpuk
Lane Butera
Shaun Butera
Mallorie Barger
Chester Koonuk
Chester Wood
Jermaine Johnson

Eva M. Nashoalook

Delia Stone

Thomas Kaiyo

Esther Tearjurneak

Sarah Teayumeax

Virginia Teayumeak

Dodo Lisbourne

Mabel Brown

Loren Hegisick

Caroline P. Cannon

Public Meeting 7:00pm

Thomas [illegible]
Dorcas Willie
IRMA WILLIE
MARTIN OKTOLLIK
SPIKE Millugrock
Aaron Millugrock
Myrna Ovick
Ronald Oxereok Jr.
[illegible]
Eunice L. Kane
Lillie [illegible]
Yona Chamber
Isaac Smith Jr
Isaiah Eves
[illegible]
Peggy Frankson
[illegible] Stone
Diana Oktollik
Bertha Tony
Bessie Kowunna
Roy File
Abraham Kowunna
Ella Kowunna
Henry Kowunna
Hubert Koonuk
Debbie Koenig
Dorothy W.A. Koenig
Daisy Sage
Dodo Lisbourne
OTHNIEL A OOMITTUK JR
Helen Minix
Aggie Attungana
Briana C.A. Muktoyuk

GEORGE KINGIK
JANESSA KINGIK
Bryan S. Muktoyuk Jr.
Henrietta Attungana
Eric Nashookpuk
AQQUILLUK HANK
Dolly Hank
Nichole Jewel Hank
Jaslynn Oenga
Pat Frankson
Summer Tooyak
Jermaine Johnson
Caroline P. Cannon
Ullen Oktollik
Chase Koonuk
Josephine Rock
Aggie Mae Kowunna
Jerri Jessica Kowunna
Kitchallean Nash
Evan Nashookpuk
James Allen Nashookpuk Jr.
Raymond Frankson
Aileen Frankson
Tanya Frankson
Ned Arey Jr
Billy Stone
Joe Frankson
RICKY Nashookpuk
ISAAC KILLIGIVUK

Public Meeting 7:00pm

30. Howard Stone Jr
31. Roberta Milligrock
32. [illegible]
33. [illegible]
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Point Hope Emergency Evacuation Road Extension

August 4, 2010 Public Scoping Meeting, Point Hope City Hall

Your comments, please...

Please use this comment sheet to share any issues, needs or local knowledge you believe will help us as we begin preliminary design and environmental analysis. If you wish to be included on the project mailing list and receive project updates and notices by e-mail, please check the box below and provide your contact information. Thanks for your input!

please forward an electronic copy of Scott's PowerPoint presentation to us: NVPH's Executive Director, lily.h.tuzroyluke@tikigaq.org

& myself: Christina.Tippin@tikigaq.org.

FYI: Daisy Sage = Mrs. Sage
Debbee Koenig = Mrs. Koenig
Jakey's Route = Jakie Koonuk's route
Herbert Kinneeveauk - Tikigaq President
17 mile Rd = 7 mile Rd. Thanks.

Name: Christina Tippin (already on your mailing list)
Address: NVPH; Realty; PO Box 109; Pt Hope, AK 99766
E-mail: See above.

Fax this form to (907) 564-2122, fold and **mail** to address on the back of this sheet, or e-mail comments to tmitchell@hdlalaska.com.

Point Hope Emergency Evacuation Road Extension

August 4, 2010 Public Scoping Meeting, Point Hope City Hall

Your comments, please...

Please use this comment sheet to share any issues, needs or local knowledge you believe will help us as we begin preliminary design and environmental analysis. If you wish to be included on the project mailing list and receive project updates and notices by e-mail, please check the box below and provide your contact information. Thanks for your input!

due to flood and beach erosions in early 60's, the Army Corp. of ENGINeers held their public meeting in early 70' and also possibly two more public Meetings with NAtive Village of Point Hope / tribal counsels in Mid-Summer of 1960-62. This was discussed till the relocation of Point Hope in 1977. Since then the erosion & the building of the road ext was possibly to do more of Safe side to extend the 7mile road to HIGHER Ground.

Name: MoRRis B. Oviuk

Address: PO Box 28 Point Hope, Alaska 99766

E-mail:

Fax this form to (907) 564-2122, fold and **mail** to address on the back of this sheet, or e-mail comments to tmitchell@hdlalaska.com.

Point Hope Emergency Evacuation Road Extension

August 4, 2010 Public Scoping Meeting, Point Hope City Hall

Your comments, please...

Please use this comment sheet to share any issues, needs or local knowledge you believe will help us as we begin preliminary design and environmental analysis. If you wish to be included on the project mailing list and receive project updates and notices by e-mail, please check the box below and provide your contact information. Thanks for your input!

There should be another (plan B) would be good to have Boat transportation for the people that are unable to get around like there are people w/ out honda's, trucks etc, that will not be able to get to safe grounds, there are not alot of vehicles to cover the whole town, so this should be something to keep in mind have boats available for this purpose only & to be kept lock & maintained by the tribal government, not to be used for any other use, there is money out there grant money available & for housing up in the land there are houses but not to house the whole town.

Name: Eunice L. Lane

Address: Box 5 Pt. Hope, AK 99766

E-mail: sunguklane@hotmail.com

Fax this form to (907) 564-2122, fold and **mail** to address on the back of this sheet, or e-mail comments to tmitchell@hdlalaska.com.

City of Point Hope
P.O. Box 169
Point Hope, Alaska 99766
(907)368-2537/2836
Fax: (907)368-2835
e-mail: akphogov@hotmail.com

fx to: 907-564-2122

Qalgi Center Usage
Request Form

WHEREAS, on this 4th day of August, ~~200~~2010

The Lessor name and address:

City of Point Hope
P.O. Box 169
Point Hope, Alaska 99766

The Lessee name and address:

Attn. Katrina Moss

Agreement for rental of Qalgi Center, Community Building premises; the main area on the first floor including men and women restroom and the Arctic entry way.

The following terms are read and fully understood by the Lessor and Lessee:

1) Amount: The daily/nightly rental amount shall be $200.00 per usage.
2) General Conditions: All of the premises will be kept clean, safe, and in good condition by the Lessee. Any repairs to keep the building safe and decent should notify the Lessor immediately.

WHEREOF, the parties bind themselves hereto by their signatures agree to all terms mentioned above:

Marsuh Lane
Lessor
for City of PHO

X
Lessee

PUBLIC MEETING

June 9, 2011

Point Hope Emergency Evacuation Road Meeting Notes

Date: Thursday, June 9, 2011
Location: Point Hope Community Center
Time: 6:00 pm to 9:00 pm

HDL Projects:
10-020 Evacuation Road
(NSB CIP 07-254)

Those in Attendance:

- Scott Hattenburg, HDL
- Laura Strand, NSB Project Administrator
- Jack Schaefer, Tikigaq Corporation
- Leonard Barger, NVPH Road Director
- Aqquilluk Hank, Sr., Mayor City of Point Hope
- Approximately 6 other residents as identified on the attached sign in sheets

Purpose of Meeting: Discuss Evacuation Road - Extended Terminus

Summary:

An open house style public meeting was held at the Point Hope Community Center to get further input on extending the evacuation road study area further east. A map of the extended corridor were given to all attendees. The purpose of extending the alignment is to strengthen the purpose and need for the project as required by the federal funding and the National Environmental Policy Act (NEPA). Scott Hattenburg provided a power point presentation and explained that last fall, HDL completed wetlands delineation, a cultural resources study, a flood study and reviewed potential road corridors to approximately Terminus 1 generally following Jakies' Route. In December 2011, HDL completed and submitted a reconnaissance report to the North Slope Borough (NSB), Alaska Department of Transportation and Public Facilities (DOT&PF) (Lauren Ivanov and Bruce Campbell) and the Federal Highway Administration (FHWA) (Pete Forsling). HDL then teleconferenced with the NSB, DOT&PF, and FHWA in March 2011 wherein the agencies determined that a stronger purpose and need was needed to carry the project forward. The updated flood study prepared by Doug Jones, PhD, of Coastline Engineering in December of 2010 was mentioned and the results indicated that the village, the existing Kuukpak Road, and the end of Kuukpak Road were bove the estimated 100-year flood elevation of 9.2 feet above sea level. Ideas for strengthening the purpose and need were discussed including evacuating both directions (toward the village if the river floods, and toward the foothills if the village floods); following the 17(b) trail; and using more extreme flood events due to climate change.

Jack Schaefer, Tikigaq Corporation questioned why we did not use this route in the first place as the village preferred and had concerns about wasting the money. Jack suggested recording or having a designated note-taker at the meetings.

Point Hope Emergency Evacuation Road Meeting Notes

General Discussions:

Reasons for the proposed termini

- Provide evacuation from both river and road
- Site already proposed through BIA/Ted Steven's office
- 17(b) easement corridor to Cape Lisburne, considered a safe harbor but inaccessible due to winds part of the year
- Close to area selected for potential Coast Guard access
- Site identified in LCMF report
- Central location with water source, good high ground and shelter from the wind
- Some existing hunting cabins in the area
- Possible corridor to future natural gas and coal resources inland
- Subsistence food sources, caribou, etc.

Resources for project

- NSB Emergency Response Plan
- Northwest Area Resource Management Plan – BLM
    - For area Point Lay to White Mountain – has coal, gas, mineral location
- IHLC traditional land use studies
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- LCMF study
- NSB GIS subsistence data, especially species and wildlife resource maps.

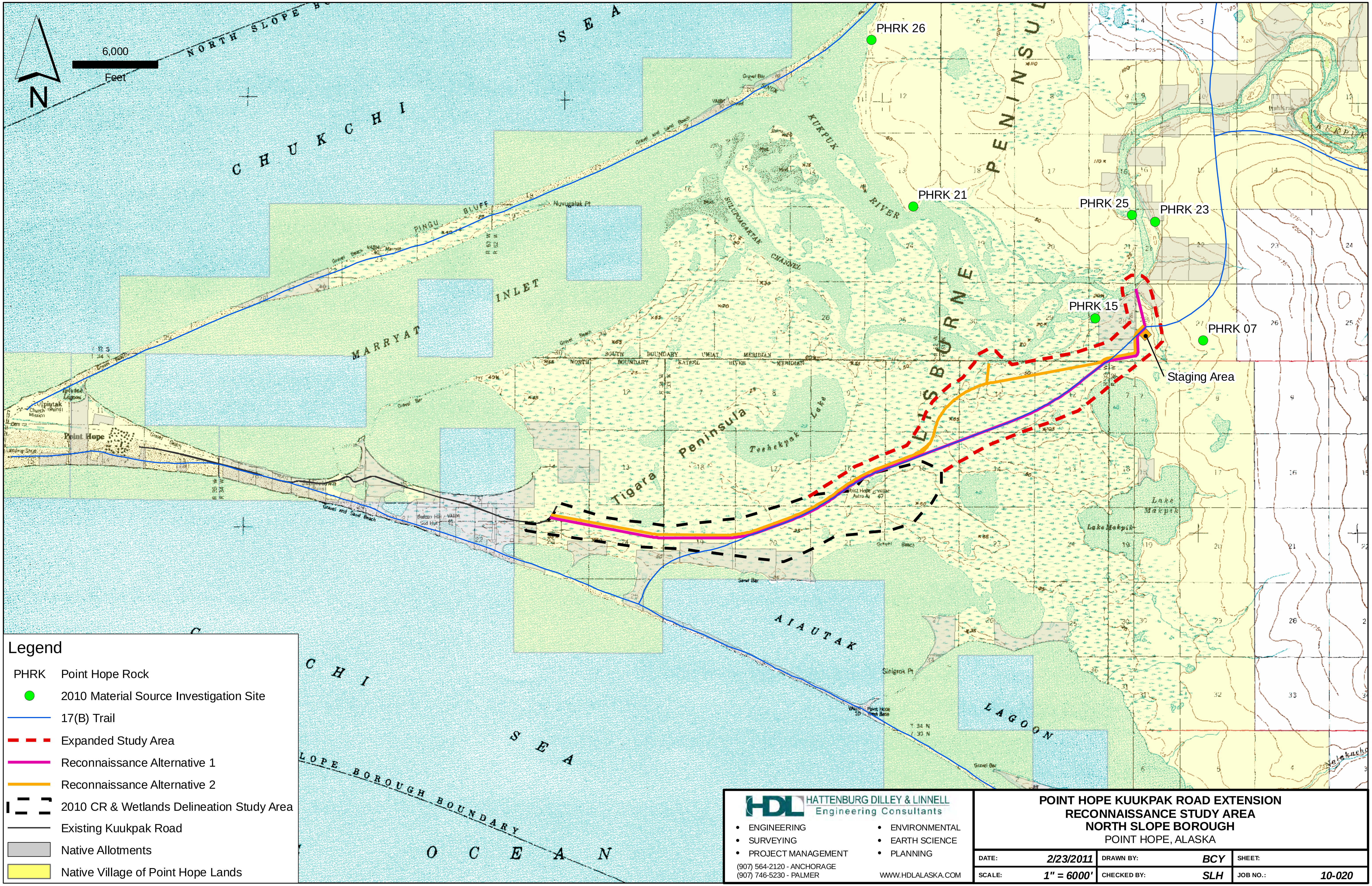
Suggestions on how to proceed

- Research suggested resources, historical records search
- Follow through to let community know research done and work performed
- Send copies of December 2010 recon report to Tikigaq Corportation, City and NVPH
- Send updated recon report when complete.
- Use NSB GIS resources
- Get tribal, village and city council approval. Have a separate meeting later in the summer
- Need local help to coordinate meeting times

With no further input or questions the meeting was adjourned at 8:30pm.

Respectfully Submitted.

Scott Hattenburg, PE, Project Manager



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CHUKCHI SEA
NORTH SLOPE BOROUGH BOUNDARY
MARRYAT INLET
KUKPUK RIVER
LISBURNE PENINSULA
Tigara Peninsula
AIAUTAK LAGOON
CHUKCHI SEA
OCEAN
Point Hope
Lake Makpik
PHRK 26
PHRK 21
PHRK 25
PHRK 23
PHRK 15
PHRK 07
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RECONNAISSANCE STUDY AREA
NORTH SLOPE BOROUGH
POINT HOPE, ALASKA
DATE: 2/23/2011
DRAWN BY: BCY
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SCALE: 1" = 6000'
CHECKED BY: SLH
JOB NO.: 10-020

PUBLIC MEETING

Emergency Evacuation Road / Kuukpak Road Extension

Thursday, June 9, 2011
2:00 to 4:00 p.m. and 7:00 to 9:00 p.m.
Presentations to start at 2:30 p.m. and 7:30 p.m.

Qalgi Center, Community Building

The North Slope Borough (NSB) in conjunction with the Alaska Department of Transportation and Public Facilities (ADOT&PF) and the Federal Highway Administration (FHWA) will be holding a public meeting to discuss the Kuukpak Emergency Evacuation Road project. The NSB is seeking public comments on the proposed Emergency Evacuation Road terminus location in order to further develop alternatives that meet the project purpose and need and initiate preliminary design and environmental analysis of those alternatives.

We will be discussing a new terminus that extends the road corridor further east to address evacuation from up-river sites, routes that follow 17(B) trails, and analysis of potentially larger flood events due to climate change.

You are invited to attend an informal, informational meeting to learn more about the project and provide comments. Attendees will be eligible for Door Prizes!

For questions regarding this public meeting, please contact:
Scott Hattenburg, Project Manager, 907-564-2120

If you are unable to come to the meeting, we still want to hear your questions and comments about the road project. Written statements for the public record can be submitted at the public meeting, by mail, or by mail to:

Scott Hattenburg, P.E., Project Manager
Hattenburg Dilley & Linnell, LLC
3335 Arctic Blvd, Suite 100
Anchorage, Alaska 99503
shattenburg@hdlalaska.com

Laura Strand, P.E., Project Administrator
NSB Public Works Department
3000 C Street, Suite 104
Anchorage, Alaska 99503
laura.strand@north-slope.org

North Slope Borough

Department of Public Works
Division of Capital Improvement Program Management
3000 C St., Suite 104
Anchorage, Alaska 99503

Phone: 907-561-6605
Fax 907-561-0112

May 30,2008

Native Village of Point Hope
P.O. Box 109
Point Hope, Alaska 99766
Attn: Jack Schaeffer, Vice President
Attn: Lilly Tuzroyluke, Executive Director

Tikigaq Village Corporation
2121 Abbott Road
Anchorage, Alaska 99507
Attn: Rex Rock, Sr., President/CEO

City of Point Hope
P.O. Box 169
Point Hope, Alaska 99766-0169
Attn: George Kingik, Mayor

Dear Everyone,

Staff from the engineering firm Hattenburg, Dilley, and Linnell (HDL), and Tikigaq Engineering, as well as NSB Public Works staff are planning a site visit to Point Hope on October 3 rd and 4th to begin reconnaissance work on the Point Hope Emergency Evacuation Road project. The purpose of this letter is to introduce the reconnassisance team, along with general descriptions of the work they will be doing. We are also attaching a graphic illustrating the area we want to include in the field work.

Tikigaq Engineering staff has obtained permission from Tikigaq Village Corporation for permission to access their property as necessary to assess cultural resources, perform surveys, assess potential gravel sources, etc. We have talked with Jack Schaeffer about obtaining permission to access Native Village land and understand that it will be discussed during the Native Village meeting scheduled for 3pm tomorrow. We will avoid all native allotment land and all land that we do not have permission to access.

While the team is in Point Hope we will visit the offices of the Native Village of Point Hope, Tikigaq Corporation and the City of Point Hope to meet with leaders to discuss the project. We understand that there may be existing data including, proposed route maps, road right-of-way research, cost estimates, potential gravel source studies, survey, and other related work relevant and related to the Emergency Evacuation Road on file. We would like to request that we be able to gather any information that is

North Slope Borough
Department of Public Works
Division of Capital Improvement Program Management
3000 C St., Suite 104
Anchorage, Alaska 99503

Phone: 907-561-6605
Fax 907-561-0112

relevant, and then bring everything back to Anchorage to duplicate. After we have made our copies, we will send all originals back to you in Point Hope.

We will schedule a public meeting once we have the draft Reconnaissance Report completed, due in early December. At this time, we will return to Point Hope to provide information and take public comments on the project. We will be in contact with each of your organizations to coordinate the meeting schedule to accommodate as many interested parties as possible.

Sincerely,

Laura Strand, PE, Project Administrator
Public Works/CIPM Division
Direct Line 907-646-8274
3000 C St, Suite 104
Anchorage, Alaska 99503

cc: Mayor Edward S. Itta, NSB
Marvin Olson, Director of Public Works
Dave Hodges, Program Manager, Public Works
Scott Hattenburg, P.E. Hattenburg, Dilley and Linnell

Point Hope Emergency Evacuation Road Meeting Notes

Date: Thursday, June 9, 2011
Location: Point Hope Community Center
Time: 6:00 pm to 9:00 pm

HDL Projects:
10-020 Evacuation Road
(NSB CIP 07-254)

Those in Attendance:

- Scott Hattenburg, HDL
- Laura Strand, NSB Project Administrator
- Jack Schaefer, Tikigaq Corporation
- Leonard Barger, NVPH Road Director
- Aqquilluk Hank, Sr., Mayor City of Point Hope
- Approximately 6 other residents as identified on the attached sign in sheets

Purpose of Meeting: Discuss Evacuation Road - Extended Terminus

Summary:

An open house style public meeting was held at the Point Hope Community Center to get further input on extending the evacuation road study area further east. A map of the extended corridor were given to all attendees. The purpose of extending the alignment is to strengthen the purpose and need for the project as required by the federal funding and the National Environmental Policy Act (NEPA). Scott Hattenburg provided a power point presentation and explained that last fall, HDL completed wetlands delineation, a cultural resources study, a flood study and reviewed potential road corridors to approximately Terminus 1 generally following Jakies' Route. In December 2011, HDL completed and submitted a reconnaissance report to the North Slope Borough (NSB), Alaska Department of Transportation and Public Facilities (DOT&PF) (Lauren Ivanov and Bruce Campbell) and the Federal Highway Administration (FHWA) (Pete Forsling). HDL then teleconferenced with the NSB, DOT&PF, and FHWA in March 2011 wherein the agencies determined that a stronger purpose and need was needed to carry the project forward. The updated flood study prepared by Doug Jones, PhD, of Coastline Engineering in December of 2010 was mentioned and the results indicated that the village, the existing Kuukpak Road, and the end of Kuukpak Road were bove the estimated 100-year flood elevation of 9.2 feet above sea level. Ideas for strengthening the purpose and need were discussed including evacuating both directions (toward the village if the river floods, and toward the foothills if the village floods); following the 17(b) trail; and using more extreme flood events due to climate change.

Jack Schaefer, Tikigaq Corporation questioned why we did not use this route in the first place as the village preferred and had concerns about wasting the money. Jack suggested recording or having a designated note-taker at the meetings.

Point Hope Emergency Evacuation Road Meeting Notes

General Discussions:

Reasons for the proposed termini

- Provide evacuation from both river and road
- Site already proposed through BIA/Ted Steven's office
- 17(b) easement corridor to Cape Lisburne, considered a safe harbor but inaccessible due to winds part of the year
- Close to area selected for potential Coast Guard access
- Site identified in LCMF report
- Central location with water source, good high ground and shelter from the wind
- Some existing hunting cabins in the area
- Possible corridor to future natural gas and coal resources inland
- Subsistence food sources, caribou, etc.

Resources for project

- NSB Emergency Response Plan
- Northwest Area Resource Management Plan – BLM
  - For area Point Lay to White Mountain – has coal, gas, mineral location
- IHLC traditional land use studies
- Ted Steven's office/BIA records
- LCMF study
- NSB GIS subsistence data, especially species and wildlife resource maps.

Suggestions on how to proceed

- Research suggested resources, historical records search
- Follow through to let community know research done and work performed
- Send copies of December 2010 recon report to Tikigaq Corportation, City and NVPH
- Send updated recon report when complete.
- Use NSB GIS resources
- Get tribal, village and city council approval. Have a separate meeting later in the summer
- Need local help to coordinate meeting times

With no further input or questions the meeting was adjourned at 8:30pm.

Respectfully Submitted.

Scott Hattenburg, PE, Project Manager

APPENDIX D

Wetlands Delineation Report

Wetland Delineation and Functional Assessment for Kuukpak Road Extension, Point Hope, Alaska

Prepared For:

North Slope Borough
3000 C Street, Suite 104
Anchorage, Alaska 99503

Prepared by:

HATTENBURG DILLEY & LINNELL
Engineering Consultants
3335 Arctic Boulevard, Suite 100
Anchorage, Alaska 99503

November 2011

Table of Contents

Tables

Figures

Appendix

1.0 INTRODUCTION

The Community of Point Hope, Alaska is located near the tip of the Tigara peninsula, a large gravel spit that forms the western-most extension of the northwest Alaska coast. The community is 150 miles northwest of Kotzebue, Alaska, the nearest major transportation and service hub. Flood events in the Marryat Inlet, located north east of the village, are causing village residents to be concerned for their safety. The North Slope Borough (NSB), in cooperation with the Federal Highways Administration (FHWA), proposes to extend the existing 6.3-mile long Point Hope Evacuation Road (Kuukpak Road) inland. The proposed extension will be approximately 9.5 miles with a 680 X 680 foot staging area at the terminus. See Figure 1 for project location. Two alternatives have been developed for further consideration. In both alternatives it is anticipated that the road will be an 18 foot wide 6-foot deep gravel roadway, with turnouts, and have side slopes of 3:1. This project is needed to provide egress off the peninsula, access to the foothills and the Kukpuk River, egress from the Kukpuk River, a staging area in the event of an emergency, and access to subsistence food and water sources for the community of Point Hope.

2.0 METHODS

Preliminary wetland mapping was conducted prior to the site visit. Based on National Wetland Inventory (NWI) Geographical Information System (GIS) data it was determined that the whole project would be located within wetlands. Wetland determinations were performed on August 30th, 2010 at 13 sites throughout the initial study area to field verify the presence and type of wetlands using the approach described in the U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual (Environmental Laboratory 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region Version 2.0 (USACE 2007).

Data sheets following the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region Version 2.0 (USACE 2007) were used to record observed soil, plant, and hydrological characteristics at the sites. The test pits were hand dug to a depth of ten to twelve inches deep. The soil profile of each pit was described and soil colors noted on the data sheets (Appendix A). These colors were determined using Munsell Soil Color Charts (2000).

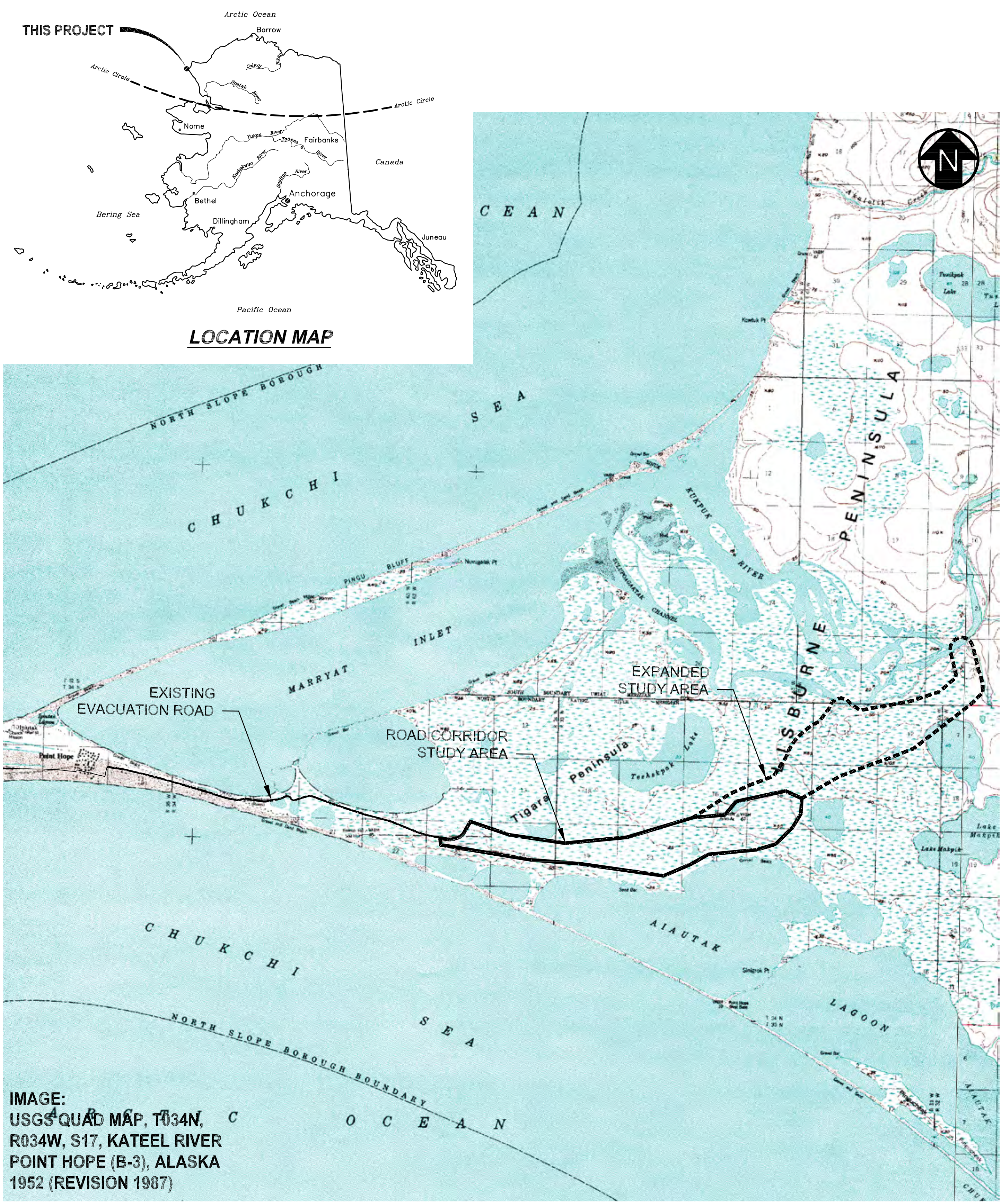
The plant species present were recorded at each of the sites. The wetland indicator status for these species was determined using Appendix C of the COE Wetlands Delineation Manual (USACE, 1987) Region A.

Wetland Hydrologic indicators were assessed at each site, including the presence of standing water, soil saturation within 12 inches of the surface, and drainage patterns or channelization. These were recorded on the data sheets (Appendix A).

Digital photographs were taken at each test pit location (Appendix B).

Wetlands in the road alignments outside of the study area were ground verified. However, sample pits were not dug outside of the Road Corridor Study area shown on figures 2-4.

After the August 30th site visit. The study area was expanded and an additional alternative was added. The additional study area was delineated using NWI GIS data in July 2011. See Figure 2 for project study area and alternatives.



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POINT HOPE ENVIRONMENTAL
LOCATION MAP
NORTH SLOPE BOROUGH
POINT HOPE, ALASKA

DATE:	11/26/2010	DRAWN BY:	BCY	SHEET:	FIGURE 1
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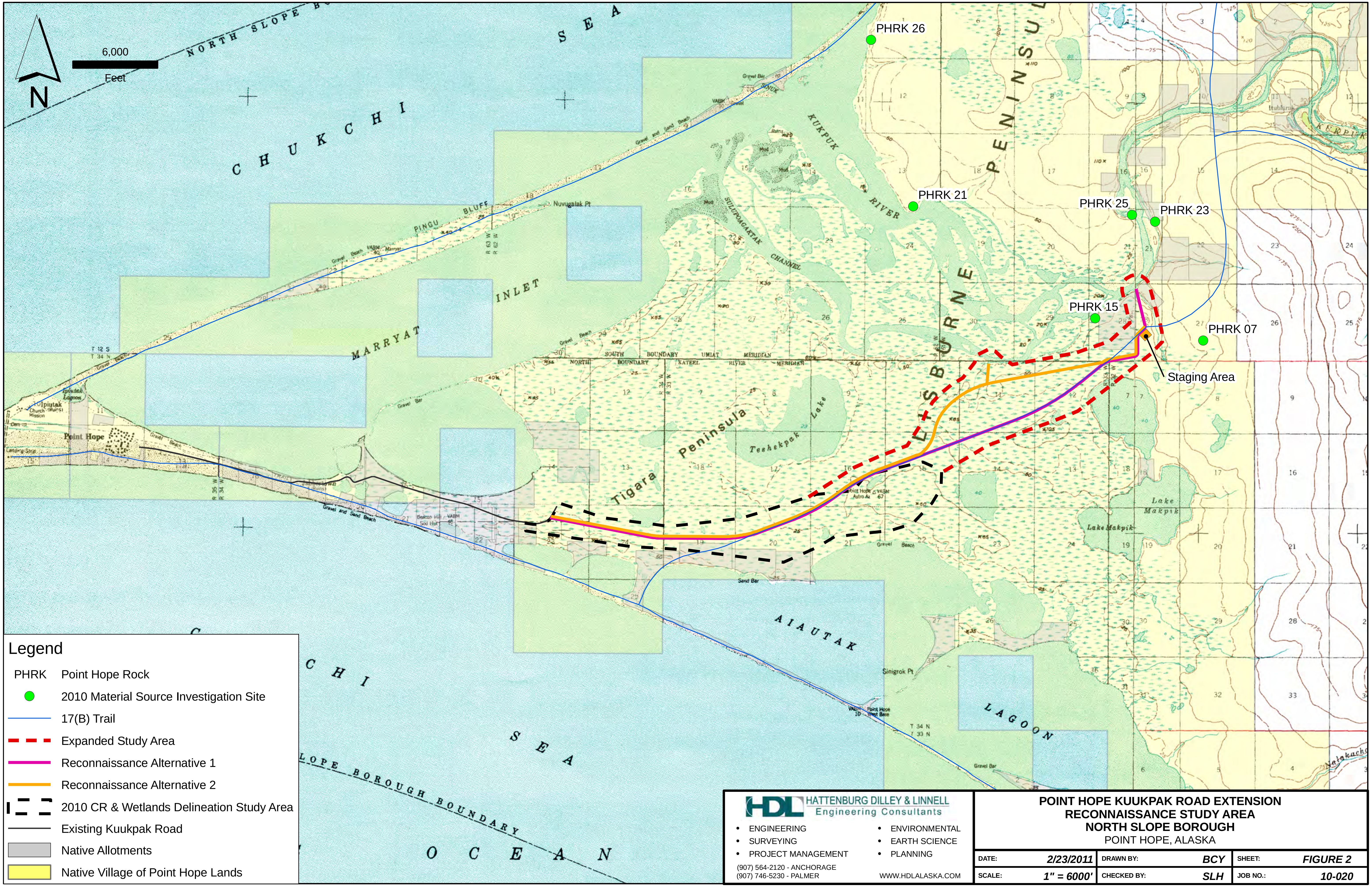

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POINT HOPE KUUKPAK ROAD EXTENSION
RECONNAISSANCE STUDY AREA
NORTH SLOPE BOROUGH
POINT HOPE, ALASKA
DATE: 2/23/2011
DRAWN BY: BCY
SHEET: FIGURE 2
SCALE: 1" = 6000'
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JOB NO.: 10-020

3.0 FIELD OBSERVATIONS

Whitney Strid and Trevor Crosby of HDL visited the site and conducted a wetland delineation survey of the area August 30, 2010. The weather was mostly sunny and approximately 45°F. The project site was of homogeneous habitat. Vegetation consisted primarily of various wetland grasses. There were obvious drainage patterns throughout the site with standing water in most areas. See Appendix B for photos. Areas observed were level plains with frost scars, low mounds, and tussocks. No wildlife was observed except for a few hawks and shorebirds.

4.0 RESULTS

According to the United States Department of Agriculture (USDA) Soil Conservation Service Exploratory Soil Survey of Alaska the project area is comprised of Histic Pergelic Cryaquepts, loamy, nearly level to rolling soil. According to NWI GIS data four types of wetlands are located within the project site: PEM1E, PEM1/SS1B, PEM1/SS1E, PEM1B, PEM1F, and PEM2H.

The entire site consisted predominantly of grass taxa. All of the vegetative species were listed as wetland species.

The project sites primary indicators for hydrology were standing water, saturated soils, and iron sheen. These indicators were documented on the data sheets. See Appendix A.

4.1 Wetland Types

Wetland types identified in the study area are Palustrine Systems. The following section lists the two NWI map codes of the wetland type located within the project area, and then gives the corresponding definitions of the codes.

4.1.1 Palustrine System

In the study area, using NWI coding, Palustrine wetland types include:

PEM1E PEM1/SS1B PEM1/SS1E PEM1B PEM1F PEM2H

[P] Palustrine – The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, emergents, mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean derived salts is below 0.5 parts per thousand (ppt). Wetlands lacking such vegetation are also included if they exhibit all of the following characteristics:

1. are less than 8 hectares (20 acres);

2. do not have an active wave-formed or bedrock shoreline feature;

3. have at low water a depth less than 2 meters (6.6 feet) in the deepest part of the basin;

4. have a salinity due to ocean-derived salts of less than 0.5 ppt.

[EM] Emergent – Characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants.

(1) Persistent – Dominated by species that normally remain standing at least until the beginning of the next growing season. This subclass is found only in the Estuarine and Palustrine systems.

(2) Non-Persistent – Dominated by plants which fall to the surface of substrate or below the surface of the water at the end of the growing season so that, at certain seasons of the year, there is no obvious sign of emergent vegetation.

[B] Saturated – The substrate is saturated to the surface for extended periods during the growing season, but surface water is seldom present.

[E] Seasonally Flooded/Saturated – Surface water is present for extended periods especially early in the growing season and when surface water is absent, substrate remains saturated near the surface for most of the growing season.

[F] Semi-permanently Flooded: Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land's surface.

[SS] Scrub-Shrub – Includes areas dominated by woody vegetation less than 6 m (20 feet) tall. The species include true shrubs, young trees (saplings), and trees or shrubs that are small or stunted because of environmental conditions.

(1) Broad-leaved Deciduous - No definition given.

[H] Permanently Flooded– The substrate is permanently flooded with tidal water.

The results of this delineation indicate that the project does affect wetlands and ground verifies wetland data collected prior to visiting the project site.

4.2 Wetland Functional Assessment

The functions performed by wetlands and waters in the project area were qualitatively rated as low, moderate, or high, depending on the extent to which certain conditions were met and/or site characteristics were present. Ratings reflect both the capability and opportunity for a given function to be performed and are not restricted to those portions of wetlands and waters within the study area. The assessment extends to the entire wetland or river/stream reach encompassing the project area.

Hydrological functions were assessed by reviewing the aerial photography and field data, and examining local topographic conditions. Three specific processes were considered.

- Flood flow regulation – Detention of surface water (and to some degree groundwater) flow, which moderated downstream flooding.
- Groundwater discharge – Movement (vertical or lateral) of water from the subsurface storage areas to the ground surface.

Water quality functions are wetland processes that can remove sediments, nutrients, and contaminants (e.g., heavy metals, pesticides) from the water while contributing organic matter to the food web. Two general processes are considered:

- Removal of sediment, nitrogen and phosphorus – reduction and long-term storage of suspended sediment, nitrogen and phosphorus from surface water entering the wetland.
- Production and export of organic matter – production of organic matter (primarily through plant growth) and contribution of organic matter to the food web.

Habitat functions are based on the relative ability of a wetland to support fish and wildlife populations and to provide species and habitat diversity. Three general characteristics of a wetland are considered:

- General habitat suitability – direct support of mammals, birds, fish & invertebrates that may be present in the vicinity.
- Fish habitat – direct support of fish that may be present in the vicinity.
- Native plant richness – direct support of vascular plant species diversity.

Other functions considered for this analysis include a combination of subsistence, recreational and educational, and scientific uses, and wetland's special status and rarity:

- Subsistence/recreational/educational/scientific use – direct support of hunting and gathering activities, travel and/or education including scientific research.
- Uniqueness and special status – these distinctions are based on support of state or federally listed species, high quality habitat, presence of rare features and/or support of functions not commonly provided within the watershed.

The wetland functional assessment was based on environmental conditions and characteristics such as size, type, landscape position, fish and wildlife use and human use of the wetlands and waters in the study area. Additional information considered includes local topography, plant community structure, hydrologic regime and disturbance history.

Following the guidelines outlined in USACE Regulatory Guidance Letter (RGL 09-01), each category rank is described as follows:

Category I – High functioning wetlands- Uncommon wetlands that: 1) provide a life support function for threatened or endangered species that has been documented; 2) represent a high quality example of a rare wetland type; 3) represent a type that is rare within a given region; or, 4) are undisturbed and contain ecological attributes that are impossible or difficult to replace within a generation, if at all. Examples include certain bogs and fens. High level of protection is typically warranted.

Category II – High to moderate functioning wetlands – Wetlands that: 1) provide habitat for very sensitive or important wildlife or plants; 2) are either difficult to replace (such as bogs); or 3) provide very high functions, particularly for wildlife habitat. These wetlands may occur more commonly than Category I wetlands, but still warrant a high level of protection.

Category III – Moderate to low functioning wetlands – wetlands that are important for a variety of wildlife species and can provide watershed protection functions depending on where they are located. Generally these wetlands will be smaller and/or provide less cohesion in the landscape than Category II wetlands. These wetlands may have experienced some for of degradation, but to a lesser degree than Category IV wetlands.

Category IV – Degraded and low functioning wetlands – the smallest, most isolated and least diverse wetlands, that likely have been degraded by human activities. These are wetland that may be readily restored and/or enhanced. Category IV wetland can provide important functions and values, and should to some degree be protected depending on their position in the watershed and watershed condition.

We assigned all of the wetland types in the assessment area a Category II ranking with the exception of the Deep and Shallow Water (PUBH) wetlands which we assigned a Category III ranking. Our local guides informed us that caribou are likely to be found foraging in the area, although, we did not encounter any during our field survey. Eiders are also known or believed to occur along Alaska's Arctic Coast including coastal plains (USF&WS). Although the wetlands scored moderate and/or high for individual functions such as Sediment, Nutrient, and Toxicant Removal; Educational, Scientific, Recreational, or Subsistence Use; and Uniqueness and Special Status functions these habitats are extensive across the North Slope and are not considered critical habitats. See Appendix C for Wetland Functions Data Forms.

5.0 DISCUSSION/RESULTS

In order to complete this project, NSB will need to submit this wetland delineation and functional assessment to the COE along with an application for a permit to fill wetlands for this project.

The table below shows the acreage of each wetland type located within the project area.

Table 1: Roadway Wetland Acreage

Wetland Type	NWI Code	Habitat Type	Alternative 1 Acres	Alternative 2 Acres
Saturated Emergent/Shrub-Scrub	PEM1E	Moist Sedge-Shrub Meadow	23.06	23.88
Saturated Emergent/Shrub-Scrub	PEM1/SS1B	Moist Sedge-Shrub Meadow	43.62	45.29
Saturated Emergent/Shrub-Scrub	PEM1/SS1E	Moist Sedge-Shrub Meadow	6.29	6.29
Saturated Emergent/Shrub-Scrub	PEM1B	Moist Sedge-Shrub Meadow	4.58	3.16
Saturated Emergent/Shrub-Scrub	PEM2H	Saturated Emergent/Shrub-Scrub	0.32	0.32
Freshwater Pond	PUBH	Freshwater Pond	0.51	0.51
Riverine	R1UBV	Riverine	-	0.02
Saturated Emergent/Shrub-Scrub	PEM1F	Saturated Emergent/Shrub-Scrub	1.25	2.06
		Total	79.63	81.53

Table 2: Staging Area Wetland Acreage

Wetland Type	NWI Code	Habitat Type	Alternative 1 Acres	Alternative 2 Acres
Saturated Emergent/Shrub-Scrub	PEM1/SS1B	Moist Sedge-Shrub Meadow	10.6	10.6
		Total	10.6	10.6

References

Munsell Soil Color Charts, 2000. Revised Edition. Kollmorgen Instruments Corporation, Baltimore, MD.

Rieger, S., Schoephorster, D., Furbush, C., U.S. Department of Agriculture, Soil Conservation Service. 1979. Exploratory Soil Survey of Alaska.

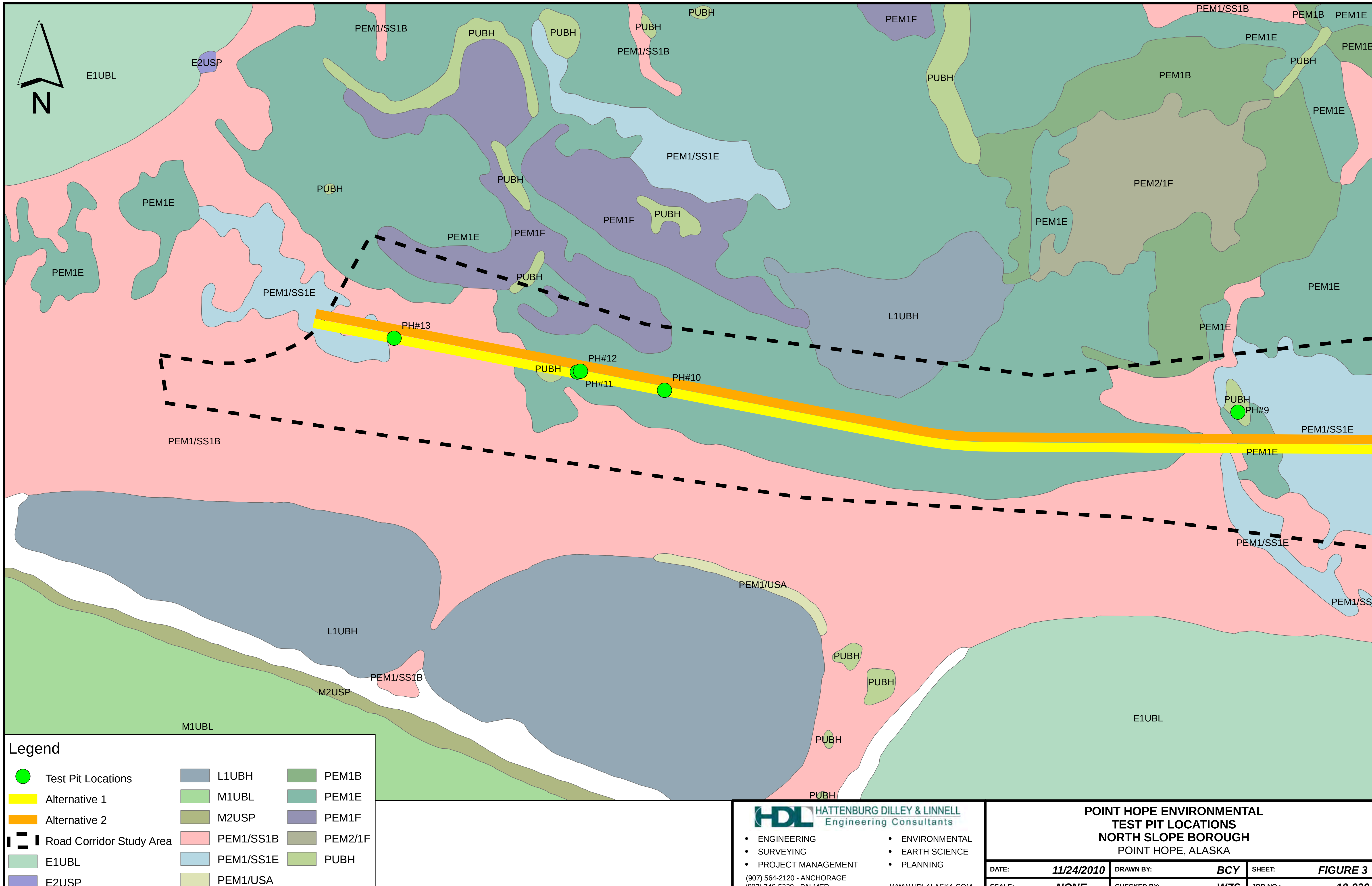
Schofield, Janice J. 2006. Alaska's Wild Plants. Alaska Northwest Books, Portland, OR.

U.S. Army Corps of Engineers (USACE). 1987. Corps of Engineers Wetlands Delineation Manual. Department of the Army, Waterways Experiment Station, Vicksburg, MS. Tech. Rep. Y-87-1

U.S. Fish and Wildlife Service, Species Profile Spectacled eider.
http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B08Z#conservationPlans

U.S. Fish and Wildlife Service, Species Profile Steller's Eider.
http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B090#conservationPlans

U.S. Fish and Wildlife Service, National Wetlands Inventory Branch of Resource and Mapping Support. Wetlands and Deepwater Habitats Classification.



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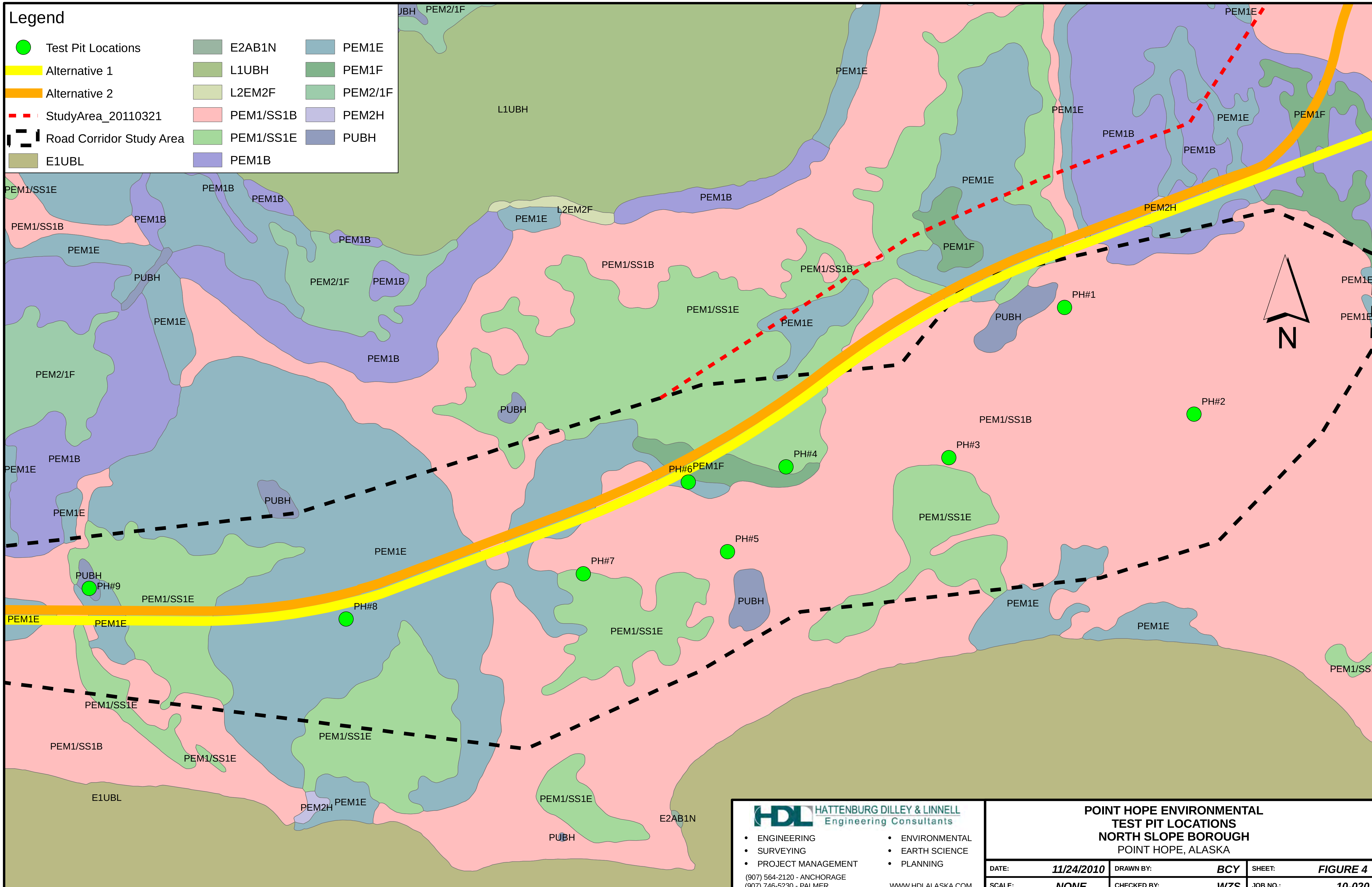
POINT HOPE ENVIRONMENTAL
TEST PIT LOCATIONS
NORTH SLOPE BOROUGH
POINT HOPE, ALASKA

DATE:	11/24/2010	DRAWN BY:	BCY	SHEET:	FIGURE 3
SCALE:	NONE	CHECKED BY:	WZS	JOB NO.:	10-020


Legend
Test Pit Locations
Alternative 1
Alternative 2
StudyArea_20110321
Road Corridor Study Area
E1UBL
E2AB1N
L1UBH
L2EM2F
PEM1/SS1B
PEM1/SS1E
PEM1B
PEM1E
PEM1F
PEM2/1F
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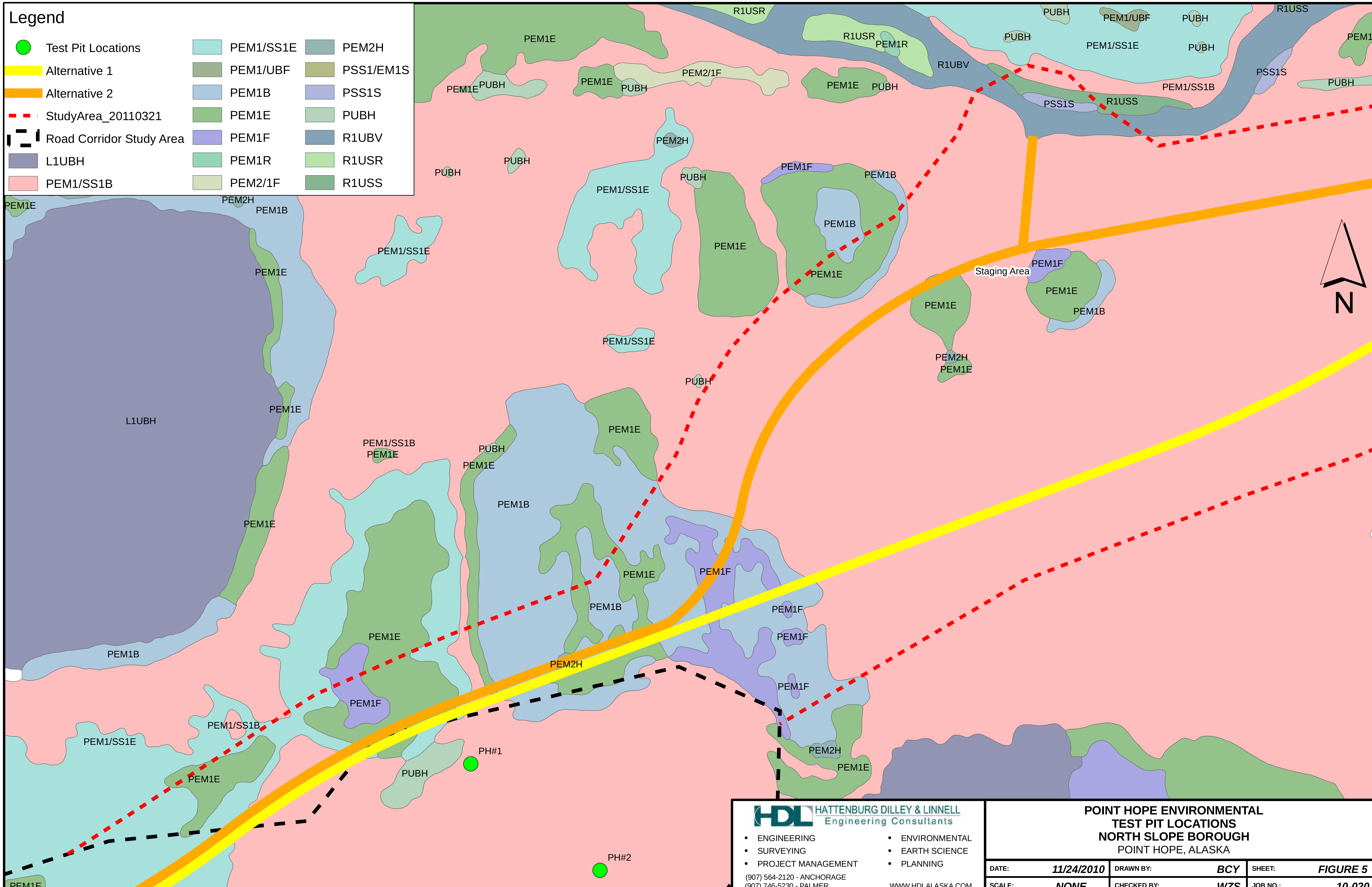
POINT HOPE ENVIRONMENTAL
TEST PIT LOCATIONS
NORTH SLOPE BOROUGH
POINT HOPE, ALASKA
DATE: 11/24/2010
DRAWN BY: BCY
SHEET: FIGURE 4
SCALE: NONE
CHECKED BY: WZS
JOB NO.: 10-020



Legend
Test Pit Locations
Alternative 1
Alternative 2
StudyArea_20110321
Road Corridor Study Area
L1UBH
PEM1/SS1B
PEM1/SS1E
PEM1/UBF
PEM1B
PEM1E
PEM1F
PEM1R
PEM2/1F
PEM2H
PSS1/EM1S
PSS1S
PUBH
R1UBV
R1USR
R1USS
Staging Area
PH#1
PH#2
N
L1UBH
PEM1E
PEM1B
PEM1F
PEM2H
PUBH
PEM1/SS1E
PEM1/SS1B
PEM1/UBF
PEM2/1F
PEM1R
PSS1S
R1USR
R1UBV
R1USS
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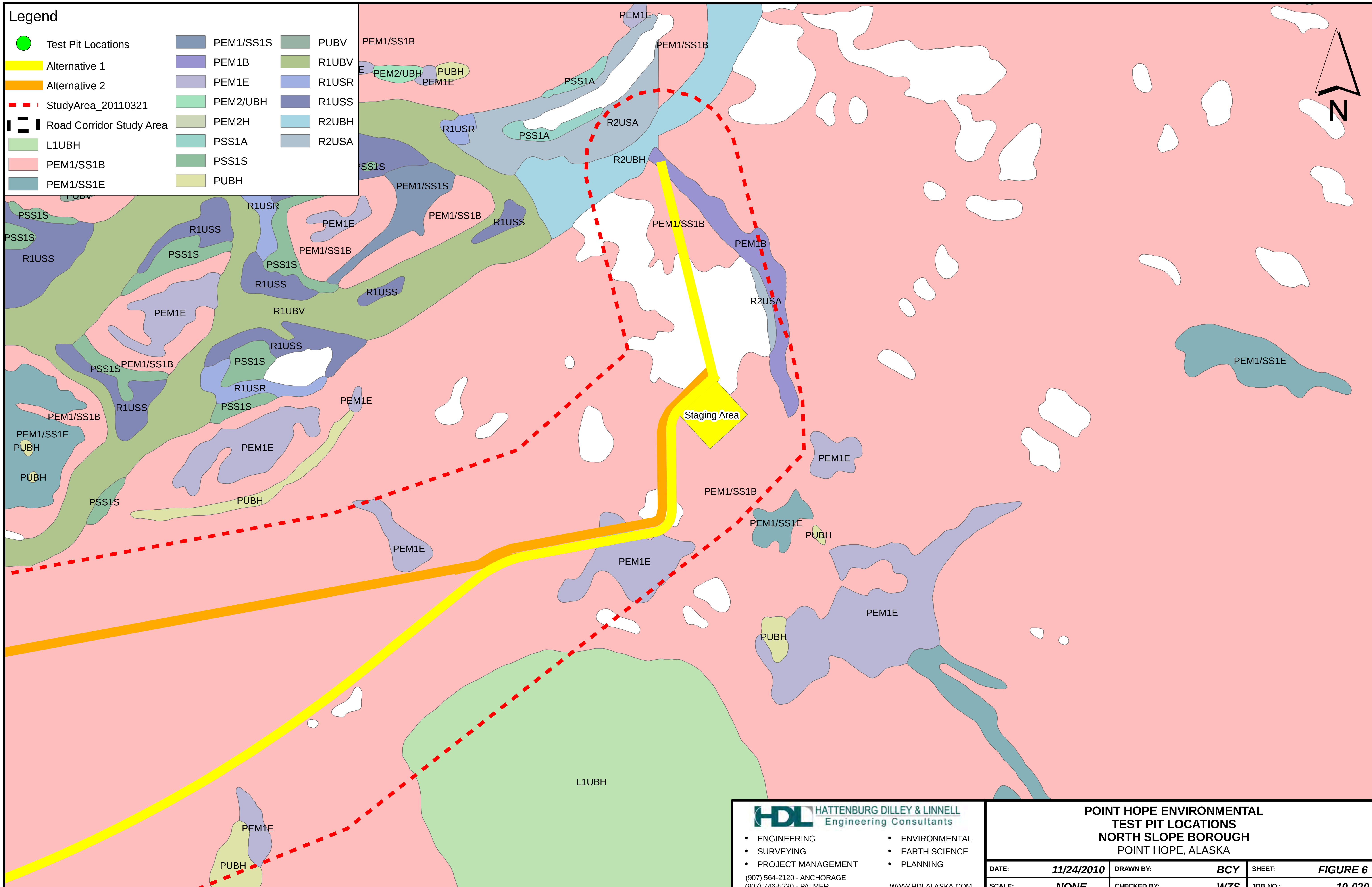
TEST PIT LOCATIONS
NORTH SLOPE BOROUGH
POINT HOPE, ALASKA
DATE: 11/24/2010
DRAWN BY: BCY
SHEET: FIGURE 5
SCALE: NONE
CHECKED BY: WZS
JOB NO.: 10-020


Legend
Test Pit Locations
Alternative 1
Alternative 2
StudyArea_20110321
Road Corridor Study Area
L1UBH
PEM1/SS1B
PEM1/SS1E
PEM1/SS1S
PEM1B
PEM1E
PEM2/UBH
PEM2H
PSS1A
PSS1S
PUBH
PUBV
R1UBV
R1USR
R1USS
R2UBH
R2USA
N
Staging Area
L1UBH
R2USA
R2UBH
R1UBV
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POINT HOPE ENVIRONMENTAL
TEST PIT LOCATIONS
NORTH SLOPE BOROUGH
POINT HOPE, ALASKA
DATE: 11/24/2010
DRAWN BY: BCY
SHEET: FIGURE 6
SCALE: NONE
CHECKED BY: WZS
JOB NO.: 10-020

APPENDIX A: Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Point Hope evac Road 2010 Borough/City: NSB Sampling Date: 8/30

Applicant/Owner: HDL, LLC Sampling Point: PH#

Investigator(s): W. Strid, T. Crosby Landform (hillside, terrace, hummocks, etc.): lake

Local relief (concave, convex, none): ______ Slope (%): ______

Subregion: Arctic Lat: 166°20.067' Long: 68°20.562' Datum: Pt Hope

Soil Map Unit Name: ______ NWI classification: PUBH

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes ✓ No ____	**Is the Sampled Area within a Wetland?**	**Yes** ✓ **No** ____
Hydric Soil Present?	Yes ✓ No ____		
Wetland Hydrology Present?	Yes ✓ No ____		

Remarks: Area is a lake. Site is a wetland.

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

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Herb Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			

Plot size (radius, or length x width) ______ % Bare Ground ______

% Cover of Wetland Bryophytes ______ (Where applicable) Total Cover of Bryophytes ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology mu be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ____

Remarks:

SOIL

Sampling Point: ____________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks

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

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ____________________

Depth (inches): ____________________

Hydric Soil Present? Yes _____ No _____

Remarks:
No sample pit dug. Area was lake.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): __________

Water Table Present? Yes _____ No _____ Depth (inches): __________

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): __________

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Lake. Site is a wetland.

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Point Hope EVAC Road 2010 Borough/City: NSB Sampling Date: 8/30/10

Applicant/Owner: HDL, LLC Sampling Point: PH#2

Investigator(s): W. Strid, T. Crosby Landform (hillside, terrace, hummocks, etc.): high point / Ridge

Local relief (concave, convex, none): ______ Slope (%): ______

Subregion: Arctic Lat: 68°20.333'N Long: 166° 19.307' W Datum: ______

Soil Map Unit Name: ______ NWI classification: PEM1/SS1B

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

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

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

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Ø			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Herb Stratum			
1. moss			
2. sedge			
3. salmon berry limited			
4. mushrooms			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			

Plot size (radius, or length x width) ______ % Bare Ground ______

% Cover of Wetland Bryophytes ______ (Where applicable) Total Cover of Bryophytes ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ____

Remarks:

SOIL

Sampling Point: ___________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3								peat
3-6								dark organic
6-10-11					3/2	7.5YR		silt mixed w/ organics
13-16	frost							

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

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: frost layer

Depth (inches): 13-16 inches

Hydric Soil Present? Yes ✓ No ___

Remarks:

Water filled in hole to

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ✓ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Point Hope Evac Road 2010 Borough/City: NSB Sampling Date: 8/30/10

Applicant/Owner: HDL, LLC Sampling Point: PH#3

Investigator(s): W. Strid, T. Crosby Landform (hillside, terrace, hummocks, etc.): ______

Local relief (concave, convex, none): ______ Slope (%): ______

Subregion: Artic Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: ______ NWI classification: PEM1/SS1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No ___ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ___

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes ✓ No ___	**Is the Sampled Area within a Wetland?** Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:

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

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2. NONE			
3.			
4.			
Total Cover:			

50% of total cover: ______ 20% of total cover: ______

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. none			
2.			
3.			
4.			
5.			
6.			
Total Cover:			

50% of total cover: ______ 20% of total cover: ______

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. cranberry			
2. salmonberry			
3. grass			
4. moss			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			

50% of total cover: ______ 20% of total cover: ______

Plot size (radius, or length x width) ______ % Bare Ground ______

% Cover of Wetland Bryophytes ______ (Where applicable) Total Cover of Bryophytes ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

US Army Corps of Engineers Alaska Version 2.0

SOIL

Sampling Point: ___________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4								dark organic, fibrous
4-9	organics m/w slight silt							~~organic mixed w/silts~~
9-13	organic/silt slightly plastic					3/2	7.5YR	~~silt mixed w/ organic~~
13+	permafrost							

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

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ___________

Depth (inches): ___________

Hydric Soil Present? Yes ✓ No ___

Remarks:
hole fills w/ water w/in 10 minutes

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ✓ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- X Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- X Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- X Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): ___________

Water Table Present? Yes X No ___ Depth (inches): ___________

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): ___________

Wetland Hydrology Present? Yes ___ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
Aerial photos, NWI mapping.

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Point Hope EVAC Road 2010 Borough/City: NSB Sampling Date: 8/30/1
Applicant/Owner: HDL, LLC Sampling Point: PH#1
Investigator(s): W. Strid, T. Crosby Landform (hillside, terrace, hummocks, etc.): Saturated to surface same as #3
Local relief (concave, convex, none): ______ Slope (%): ______
Subregion: ______ Lat: ______ Long: ______ Datum: ______
Soil Map Unit Name: ______ NWI classification: PEM1E
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes ____ No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes ____ No ____	
Wetland Hydrology Present?	Yes ____ No ____	

Remarks:

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

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Herb Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			

Plot size (radius, or length x width) ______ % Bare Ground ______
% Cover of Wetland Bryophytes ______ (Where applicable) Total Cover of Bryophytes ______

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)
Total Number of Dominant Species Across All Strata: ______ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:
__ Dominance Test is >50%
__ Prevalence Index is ≤3.0
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ____

Remarks:

SOIL

Sampling Point: ____________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks

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

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ______________________________

Depth (inches): ______________________________

Hydric Soil Present? **Yes** _____ **No** _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): ____________

Water Table Present? Yes _____ No _____ Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): ____________

Wetland Hydrology Present? **Yes** _____ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Point Hope EVAC Road 2010 Borough/City: NSB Sampling Date: 8/30/10

Applicant/Owner: HDL, LLC Sampling Point: PH#11

Investigator(s): W. Stid, T. Crosby Landform (hillside, terrace, hummocks, etc.): lake

Local relief (concave, convex, none): ______ Slope (%): ______

Subregion: ______ Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: ______ NWI classification: PUBH

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes ____ No ____ Hydric Soil Present? Yes ____ No ____ Wetland Hydrology Present? Yes ____ No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Remarks:	

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

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Herb Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			

Plot size (radius, or length x width) ______ % Bare Ground ______

% Cover of Wetland Bryophytes ______ (Where applicable) Total Cover of Bryophytes ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

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

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ______	x 1 = ______
FACW species ______	x 2 = ______
FAC species ______	x 3 = ______
FACU species ______	x 4 = ______
UPL species ______	x 5 = ______
Column Totals: ______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ____ **No** ____

Remarks:

SOIL

Sampling Point: ___________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

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

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ______________________

Depth (inches): ______________________

Hydric Soil Present? Yes _____ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): ___________

Water Table Present? Yes _____ No _____ Depth (inches): ___________

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): ___________

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Point Hope EVAC Road 2010 Borough/City: NSB Sampling Date: 8/30/10

Applicant/Owner: HDL, LLC Sampling Point: PH#12

Investigator(s): W. Strid, T. Crosby Landform (hillside, terrace, hummocks, etc.): hummocks

Local relief (concave, convex, none): ______ Slope (%): ______

Subregion: ______ Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: ______ NWI classification: PEM1/SS1B ld call it

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ______ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

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

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

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

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ______ 20% of total cover: ______			

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
Total Cover:			
50% of total cover: ______ 20% of total cover: ______			

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. grass			
2. Moss			
3. berries			
4. ~~Bearberries~~			
5. Salmonberries			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
50% of total cover: ______ 20% of total cover: ______			

Plot size (radius, or length x width) ______ % Bare Ground ______

% Cover of Wetland Bryophytes ______ (Where applicable) Total Cover of Bryophytes ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	______	x 1 =	______
FACW species	______	x 2 =	______
FAC species	______	x 3 =	______
FACU species	______	x 4 =	______
UPL species	______	x 5 =	______
Column Totals:	______ (A)		______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ______ **No** ______

Remarks:

SOIL

Sampling Point: ___________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3								black/dark organic moss
3-14								organics dark high organic
14+	permafrost							

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

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ___________

Depth (inches): ___________

Hydric Soil Present? Yes _____ No _____

Remarks:
hole fill w/in 10 minutes + saturated - not as fas as previous.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): ___________

Water Table Present? Yes _____ No _____ Depth (inches): ___________

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): ___________

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Point Hope EVAC Road Borough/City: NSB Sampling Date: 8/30/10

Applicant/Owner: HDL, LLC Sampling Point: PH13

Investigator(s): W. Stroid, T. Crosby Landform (hillside, terrace, hummocks, etc.): hummocks

Local relief (concave, convex, none): ______ Slope (%): ______

Subregion: ______ Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: ______ NWI classification: PEM1/SS1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes ___ No ___	Is the Sampled Area within a Wetland?	Yes X No ___
Hydric Soil Present? Yes ___ No ___		
Wetland Hydrology Present? Yes ___ No ___		

Remarks:

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

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. grasses			
2. some moss			
3. cottongrass			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			

Plot size (radius, or length x width) ______ % Bare Ground ______

% Cover of Wetland Bryophytes ______ (Where applicable) Total Cover of Bryophytes ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	___	x 1 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No ___

Remarks:

SOIL

Sampling Point: ____________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4								organic dark
4-8								light organic
8-12								organic silty matter

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

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes _____ No _____

Remarks:

hole filling w/in 5 minutes.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): ____________

Water Table Present? Yes _____ No _____ Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): ____________

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Point Hope EVAC Road 2010 Borough/City: NSB Sampling Date: 8/30/10
Applicant/Owner: HDL, LLC Sampling Point: PH #7
Investigator(s): W. Strid, T. Crosby Landform (hillside, terrace, hummocks, etc.): ______
Local relief (concave, convex, none): ______ Slope (%): ______
Subregion: ______ Lat: ______ Long: ______ Datum: ______
Soil Map Unit Name: ______ NWI classification: PEM1/SS1E
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes ____ No ____	Is the Sampled Area within a Wetland? Yes ____ No ____
Hydric Soil Present?	Yes ____ No ____	
Wetland Hydrology Present?	Yes ____ No ____	

Remarks:

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

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. blueberries & crowberries	10%		
2. grass	98%		
3. moss			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			

Plot size (radius, or length x width) ______ % Bare Ground ______
% Cover of Wetland Bryophytes ______ Total Cover of Bryophytes ______
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ____

Remarks:

SOIL

Sampling Point: ___________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3								light organics
3-6								black organic/mossy
6-12								brown fiberous organics w/ trace silts/

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

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ______________________

Depth (inches): ______________________

Hydric Soil Present? Yes _____ No _____

Remarks:
below 12 dark non plastic fiberous organic silt mix
have saturation but not filling as fast as other holes,
Numerous small ponds in area.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): ___________

Water Table Present? Yes _____ No _____ Depth (inches): ___________

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): ___________

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Point Hope Borough/City: NSB Sampling Date: 8/30/10

Applicant/Owner: HDL, LLC Sampling Point: PH#8

Investigator(s): W. Stod, T. Crosby Landform (hillside, terrace, hummocks, etc.): ____

Local relief (concave, convex, none): ____ Slope (%): ____

Subregion: ____ Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes ____ No ____ Hydric Soil Present? Yes ____ No ____ Wetland Hydrology Present? Yes ____ No ____	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** ____

Remarks: From last SP to here mostly surface water from 1-4 inches deep or deeper save high spots - few.

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

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Herb Stratum			
1. grass (sedge)			
2. cottongrass			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			

Plot size (radius, or length x width) ____ % Bare Ground ____

% Cover of Wetland Bryophytes ____ (Where applicable) Total Cover of Bryophytes ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ____ **No** ____

Remarks:

SOIL

Sampling Point: ____________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
Ø	water @ surface							

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

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ____________________

Depth (inches): ____________________

Hydric Soil Present? **Yes** _____ **No** _____

Remarks:

No hole dug water @ surface

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): __________

Water Table Present? Yes _____ No _____ Depth (inches): __________

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): __________

Wetland Hydrology Present? **Yes** _____ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Point Hope EVAC Road 2010 Borough/City: NSB Sampling Date: 8/30/10
Applicant/Owner: HDL, LLC Sampling Point: PH#9
Investigator(s): J. Crosby, W. Strid Landform (hillside, terrace, hummocks, etc.): lake
Local relief (concave, convex, none): ______ Slope (%): ______
Subregion: ______ Lat: ______ Long: ______ Datum: ______
Soil Map Unit Name: ______ NWI classification: PUBH
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes ____ No ____		Is the Sampled Area within a Wetland? Yes X No ____
Hydric Soil Present? Yes ____ No ____		
Wetland Hydrology Present? Yes ____ No ____		

Remarks:

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

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Herb Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			

Plot size (radius, or length x width) ______ % Bare Ground ______
% Cover of Wetland Bryophytes ______ (Where applicable) Total Cover of Bryophytes ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)
Total Number of Dominant Species Across All Strata: ______ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ______	x 1 = ______
FACW species ______	x 2 = ______
FAC species ______	x 3 = ______
FACU species ______	x 4 = ______
UPL species ______	x 5 = ______
Column Totals: ______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%
___ Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ____

Remarks:

SOIL

Sampling Point: ____________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

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

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.

[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ______________________________

Depth (inches): ______________________________

Hydric Soil Present? Yes _____ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): ____________

Water Table Present? Yes _____ No _____ Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): ____________

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Point Hope, Evac Road 2010 Borough/City: NSB Sampling Date: 8/30/10

Applicant/Owner: HDL, LLC Sampling Point: PH#4

Investigator(s): W. Strid, T. Crosby Landform (hillside, terrace, hummocks, etc.): ____

Local relief (concave, convex, none): ____ Slope (%): ____

Subregion: Arctic Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM1/SS1E or PEM1F

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

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

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

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

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Herb Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			

Plot size (radius, or length x width) ____ % Bare Ground ____

% Cover of Wetland Bryophytes ____ Total Cover of Bryophytes ____
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ____

Remarks:

SOIL

Sampling Point: ___________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	organic							black organics
4-12								brown fibrous organics
permafrost @ 20" w/probe								

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

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ___________

Depth (inches): ___________

Hydric Soil Present? Yes X No ___

Remarks:
hole filled w/in 5 minutes

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- X Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___________

Water Table Present? Yes ___ No ___ Depth (inches): ___________

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___________

Wetland Hydrology Present? Yes ___ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Point Hope EVAC Road 2010 Borough/City: NSB Sampling Date: 8/30/10
Applicant/Owner: HDL, LLC Sampling Point: PH #5
Investigator(s): ______ Landform (hillside, terrace, hummocks, etc.): lake
Local relief (concave, convex, none): ______ Slope (%): ______
Subregion: Artic Lat: ______ Long: ______ Datum: ______
Soil Map Unit Name: ______ NWI classification: PUBH
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes ___ No ___	Is the Sampled Area within a Wetland?	Yes ___ No ___
Hydric Soil Present?	Yes ___ No ___		
Wetland Hydrology Present?	Yes ___ No ___		

Remarks:

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

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			
Herb Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			

Plot size (radius, or length x width) ______ % Bare Ground ______
% Cover of Wetland Bryophytes ______ (Where applicable) Total Cover of Bryophytes ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)
Total Number of Dominant Species Across All Strata: ______ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ______	x 1 = ______
FACW species ______	x 2 = ______
FAC species ______	x 3 = ______
FACU species ______	x 4 = ______
UPL species ______	x 5 = ______
Column Totals: ______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%
___ Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No ___

Remarks:

SOIL

Sampling Point: ____________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

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

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ____________________

Depth (inches): ____________________

Hydric Soil Present? Yes _____ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): ____________

Water Table Present? Yes _____ No _____ Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): ____________

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Point Hope EVAC Road 2010 Borough/City: NSB Sampling Date: 8/30/10

Applicant/Owner: HDL, LLC Sampling Point: PH#6

Investigator(s): W. Strid, T. Crosby Landform (hillside, terrace, hummocks, etc.): ______

Local relief (concave, convex, none): ______ Slope (%): ______

Subregion: Arctic Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: ______ NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ______ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

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

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

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

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ______ 20% of total cover: ______			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
Total Cover:			
50% of total cover: ______ 20% of total cover: ______			
Herb Stratum			
1. mostly tall grasses			
2. moss patches			
3. w/ little hummocks			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
50% of total cover: ______ 20% of total cover: ______			

Plot size (radius, or length x width) ______ % Bare Ground ______

% Cover of Wetland Bryophytes ______ (Where applicable) Total Cover of Bryophytes ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ______ **No** ______

Remarks:

SOIL

Sampling Point: ___________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3								organic dark
3-11								organics l. brown fibrous

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

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ___________________________

Depth (inches): ___________________________

Hydric Soil Present? Yes _____ No _____

Remarks:

water filled hole quickly

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): ___________

Water Table Present? Yes _____ No _____ Depth (inches): ___________

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): ___________

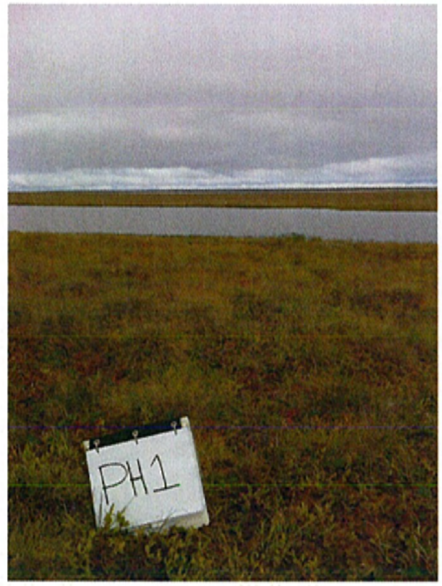
Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

APPENDIX B: Site Photos

PHOTOS



PH#1: PUBH, lake, no test pit.

PH#2: PEM1/SS1B, permafrost @ 16"

PH#2: Organics – organics mixed with silt.

PH#2: Pit filled with water within 10 minutes.

PH#3: PEM1/SS1E, permafrost @ 13"

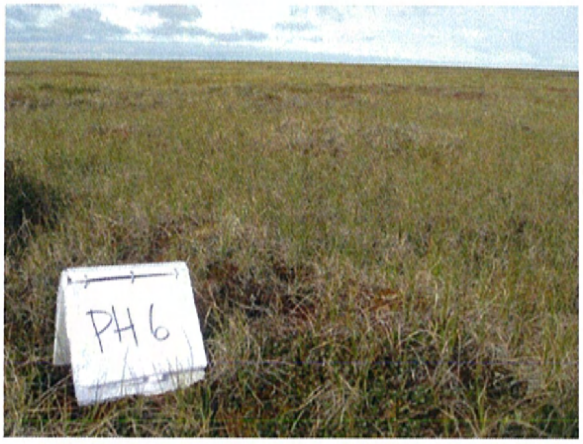
PH3#: Dark organics very fibrous.

PH#4: PEM1/SS1F, permafrost @ 20"

PH#4: Black and brown fibrous organics.

PH#4: Pit filled with water within 5 minutes.

PH#5: PUBH, lake, no test pit.



PH#6: PEM1E

PH#6: Dark organics, hole filled in 1 minute.

PH#7: PEM1/SS1E

PH#7: Organics with trace silts at 12+ inches.

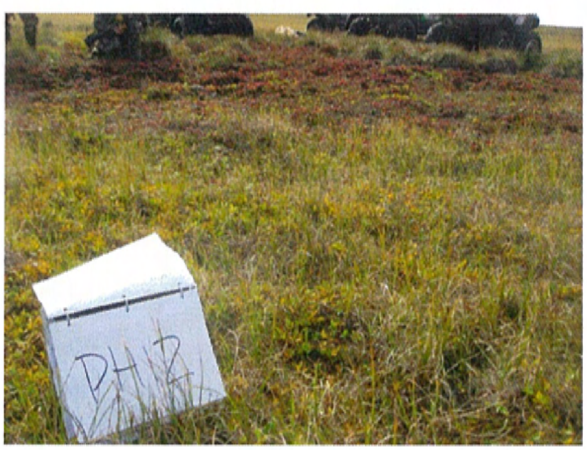
PH#8: PEM1E

PH#8: Saturated at surface, no test pit.

PH#9: PUBH, lake, no test pit.

PH#10: PEM1E, saturated to surface, no test pit.

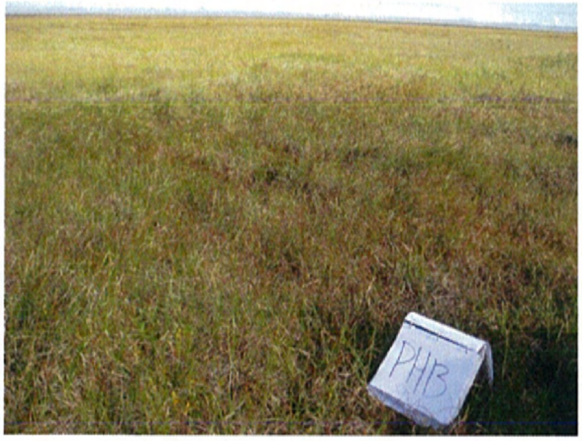
PH#11: PUBH, lake, no test pit.



PH#12: PEM1/SS1B

PH#12: Dark organics, permafrost 14+

HATTENBURG DILLEY & LINNELL
Engineering Consultants



PH#13: PEM1/SS1E

PH#13: Dark organics, test pit filled with water in 5 minutes.

APPENDIX C: Functional Assessment Data Forms

Wetland Functions Data Form-Alaska Regulatory Best Professional Judgment Characterization

File #: Point Hope, Kuukpak Road Date: 9/6/10 Category III
Wetland: PUBH PM/RS: WS

A. Flood Flow Regulation (Storage and Desynchronization)	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. Wetland is capable of retaining much higher volumes of water during storm events than under normal rainfall conditions. 2. Wetland is a closed (depressional) system subject to flooding or shows evidence of flooding. 3. If flow-through, wetland has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris. 4. Wetland has dense (>40% cover) woody vegetation. 5. Wetland receives floodwater from an adjacent water course at least once every 10 years. 6. Floodwaters enter and flow through wetland predominantly as sheet flow rather than channel flow.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 3 > 4 attributes (Y)—High Function 2-3 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function
B. Sediment, Nutrient (N and P), Toxicant Removal	Likely or not likely to Provide (Y or N): N Rating: LOW
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. 2. Slow-moving or still water is present or occurs during flooding that happens at least once every 10 years. 3. Dense (≥50% cover) herbaceous vegetation is present. 4. At least moderate interspersion of vegetation and water is present or occurs during flooding that happens at least once every 10 years. 5. Sediment deposits are present (evidence of deposition during floods). 6. Thick surface organic horizon and/or abundant fine organic litter is present.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 1 > 4 attributes (Y)—High Function 2-3 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function
C. Erosion Control and Shoreline Stabilization (Only assess if directly abuts permanent or relatively permanent water)	Likely or not likely to Provide (Y or N): Rating: N/A
1. Wetland has dense, energy absorbing vegetation (trees, shrubs) bordering the water course and no evidence of erosion. 2. An at least moderately dense herbaceous layer is present.	1. Y N 2. Y N # of Attributes 1-2 attributes (Y)—High Function None—Low Function
D. Production of Organic Matter and its Export	Likely or not likely to Provide (Y or N): N Rating: LOW
1. Wetland has at least 30% cover of herbaceous vegetation. 2. Woody plants in wetland are mostly deciduous. 3. High degree of plant community structure, vegetation density, and species richness present. 4. Interspersion of vegetation and water is at least moderate. 5. Wetland is flooded at least once every 10 years. 6. A more than minimal amount of organic matter is flushed from the wetland by water flow at least once every 10 years.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 1 > 4 attributes (Y)—High Function 2-3 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function If Function 5 or 6 is N, then automatically low function

E. General Habitat Suitability	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. Wetland is not fragmented by development. 2. Upland surrounding wetland is undisturbed. 3. Diversity (evenness of cover) of plant species is moderately high (>5 species with at least 10% cover each). 4. Plant community has two or more strata, with at least two of those strata having >10% total cover. 5. Wetland has at least a moderate degree of Cowardin Class interspersion. 6. Evidence of wildlife use (e.g., nests, tracks, scat, gnawed stumps, survey data) is present.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 3 > 5 attributes (Y)—High Function 2-4 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function
F. General Fish Habitat (must be associated with a fish-bearing stream)	Likely or not likely to Provide (Y or N):___ Rating: ______ N/A
1. Wetland has perennial or intermittent surface water connection to a fish-bearing water body. 2. Wetland has sufficient size and depth of open water so as not to freeze completely during winter. 3. Fish are present or are known to be present. 4. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter. 5. Spawning areas are present (aquatic vegetation and/or gravel beds 6. Juvenile rest areas present (e.g. pools with organic debris or overhanging vegetation).	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes ______ > 5 attributes (Y)—High Function 3-4 attributes (Y)—Moderate Function 0-2 attributes (Y)—Low Function
G. Native Plant Richness	Likely or not likely to Provide (Y or N): N Rating: Low
1. At least 20 native plant species occur in the wetland 2. Wetland contains two or more Cowardin Classes. 3. Wetland has three or more strata of vegetation with at least 10% cover in each stratum.	1. Y N 2. Y N 3. Y N # of Attributes Ø > 2 attributes (Y)—High Function 1 attribute (Y)—Moderate Function None—Low Function
H. Educational, Scientific, Recreational, or Subsistence Use	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. Site has documented scientific or educational use. 2. Wetland is in public ownership. 3. Accessible trails are available. 4. Wetland supports subsistence activities (e.g., hunting, fishing, berry picking).	1. Y N 2. Y N 3. Y N 4. Y N # of Attributes 1 > 2 attributes (Y)—High Function 1 attribute (Y)—Moderate Function None—Low Function
I. Uniqueness and Special Status	Likely or not likely to Provide (Y or N): Y Rating: High
1. Wetland contains documented occurrence of a state or federally listed threatened or endangered species. 2. Wetland contains documented critical habitat, high quality ecosystems, or priority species, respectively designated by the U.S. Fish and Wildlife Service 3. Wetland has biological, geological, or other features that are determined to be rare. 4. Wetland has been determined significant because it provides functions scarce for the area.	1. Y N 2. Y N 3. Y N 4. Y N # of Attributes 1 > 2 attributes (Y)—High Function 1 attribute (Y)—Moderate Function None—Low Function If attribute 1 is Y, then automatically High Function

Wetland Functions Data Form-Alaska Regulatory Best Professional Judgment Characterization

Category II

File #: Point Hope Kuukpak Road Date: 9/6/10
Wetland: PEM/F PM/RS: WS

A. Flood Flow Regulation (Storage and Desynchronization)	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. Wetland is capable of retaining much higher volumes of water during storm events than under normal rainfall conditions. 2. Wetland is a closed (depressional) system subject to flooding or shows evidence of flooding. 3. If flow-through, wetland has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris. 4. Wetland has dense (>40% cover) woody vegetation. 5. Wetland receives floodwater from an adjacent water course at least once every 10 years. 6. Floodwaters enter and flow through wetland predominantly as sheet flow rather than channel flow.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 3 > 4 attributes (Y)—High Function 2-3 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function
B. Sediment, Nutrient (N and P), Toxicant Removal	Likely or not likely to Provide (Y or N): Y Rating: Moderate
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. 2. Slow-moving or still water is present or occurs during flooding that happens at least once every 10 years. 3. Dense (≥50% cover) herbaceous vegetation is present. 4. At least moderate interspersion of vegetation and water is present or occurs during flooding that happens at least once every 10 years. 5. Sediment deposits are present (evidence of deposition during floods). 6. Thick surface organic horizon and/or abundant fine organic litter is present.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 3 > 4 attributes (Y)—High Function 2-3 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function
C. Erosion Control and Shoreline Stabilization (Only assess if directly abuts permanent or relatively permanent water)	Likely or not likely to Provide (Y or N):___ Rating: ______ N/A
1. Wetland has dense, energy absorbing vegetation (trees, shrubs) bordering the water course and no evidence of erosion. 2. An at least moderately dense herbaceous layer is present.	1. Y N 2. Y N # of Attributes ___ 1-2 attributes (Y)—High Function None—Low Function
D. Production of Organic Matter and its Export	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. Wetland has at least 30% cover of herbaceous vegetation. 2. Woody plants in wetland are mostly deciduous. 3. High degree of plant community structure, vegetation density, and species richness present. 4. Interspersion of vegetation and water is at least moderate. 5. Wetland is flooded at least once every 10 years. 6. A more than minimal amount of organic matter is flushed from the wetland by water flow at least once every 10 years.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 3 > 4 attributes (Y)—High Function 2-3 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function If Function 5 or 6 is N, then automatically low function

E. General Habitat Suitability	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. Wetland is not fragmented by development. 2. Upland surrounding wetland is undisturbed. 3. Diversity (evenness of cover) of plant species is moderately high (>5 species with at least 10% cover each). 4. Plant community has two or more strata, with at least two of those strata having >10% total cover. 5. Wetland has at least a moderate degree of Cowardin Class interspersion. 6. Evidence of wildlife use (e.g., nests, tracks, scat, gnawed stumps, survey data) is present.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 3 > 5 attributes (Y)—High Function 2-4 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function
F. General Fish Habitat (must be associated with a fish-bearing stream)	Likely or not likely to Provide (Y or N):__ Rating: ______ N/A
1. Wetland has perennial or intermittent surface water connection to a fish-bearing water body. 2. Wetland has sufficient size and depth of open water so as not to freeze completely during winter. 3. Fish are present or are known to be present. 4. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter. 5. Spawning areas are present (aquatic vegetation and/or gravel beds 6. Juvenile rest areas present (e.g. pools with organic debris or overhanging vegetation).	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes ____ > 5 attributes (Y)—High Function 3-4 attributes (Y)—Moderate Function 0-2 attributes (Y)—Low Function
G. Native Plant Richness	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. At least 20 native plant species occur in the wetland 2. Wetland contains two or more Cowardin Classes. 3. Wetland has three or more strata of vegetation with at least 10% cover in each stratum.	1. Y N 2. Y N 3. Y N # of Attributes 1 > 2 attributes (Y)—High Function 1 attribute (Y)—Moderate Function None—Low Function
H. Educational, Scientific, Recreational, or Subsistence Use	Likely or not likely to Provide (Y or N): Y Rating: High
1. Site has documented scientific or educational use. 2. Wetland is in public ownership. 3. Accessible trails are available. 4. Wetland supports subsistence activities (e.g., hunting, fishing, berry picking).	1. Y N 2. Y N 3. Y N 4. Y N # of Attributes 2 > 2 attributes (Y)—High Function 1 attribute (Y)—Moderate Function None—Low Function
I. Uniqueness and Special Status	Likely or not likely to Provide (Y or N): Y Rating: High
1. Wetland contains documented occurrence of a state or federally listed threatened or endangered species. 2. Wetland contains documented critical habitat, high quality ecosystems, or priority species, respectively designated by the U.S. Fish and Wildlife Service 3. Wetland has biological, geological, or other features that are determined to be rare. 4. Wetland has been determined significant because it provides functions scarce for the area.	1. Y N 2. Y N 3. Y N 4. Y N # of Attributes 1 > 2 attributes (Y)—High Function 1 attribute (Y)—Moderate Function None—Low Function If attribute 1 is Y, then automatically High Function

Wetland Functions Data Form-Alaska Regulatory Best Professional Judgment Characterization

File #: Point Hope, Knukpak Road Date: 9/6/10 Category II
Wetland: PEM1/SS1B PM/RS: WS

A. Flood Flow Regulation (Storage and Desynchronization)	Likely or not likely to Provide (Y or N): Y Rating: MODERATE
1. Wetland is capable of retaining much higher volumes of water during storm events than under normal rainfall conditions. 2. Wetland is a closed (depressional) system subject to flooding or shows evidence of flooding. 3. If flow-through, wetland has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris. 4. Wetland has dense (>40% cover) woody vegetation. 5. Wetland receives floodwater from an adjacent water course at least once every 10 years. 6. Floodwaters enter and flow through wetland predominantly as sheet flow rather than channel flow.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 3 > 4 attributes (Y)—High Function 2-3 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function
B. Sediment, Nutrient (N and P), Toxicant Removal	Likely or not likely to Provide (Y or N): Y Rating: High
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. 2. Slow-moving or still water is present or occurs during flooding that happens at least once every 10 years. 3. Dense (≥50% cover) herbaceous vegetation is present. 4. At least moderate interspersion of vegetation and water is present or occurs during flooding that happens at least once every 10 years. 5. Sediment deposits are present (evidence of deposition during floods). 6. Thick surface organic horizon and/or abundant fine organic litter is present.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 4 > 4 attributes (Y)—High Function 2-3 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function
C. Erosion Control and Shoreline Stabilization (Only assess if directly abuts permanent or relatively permanent water)	Likely or not likely to Provide (Y or N): Y Rating: High
1. Wetland has dense, energy absorbing vegetation (trees, shrubs) bordering the water course and no evidence of erosion. 2. An at least moderately dense herbaceous layer is present.	1. Y N 2. Y N # of Attributes 1 1-2 attributes (Y)—High Function None—Low Function
D. Production of Organic Matter and its Export	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. Wetland has at least 30% cover of herbaceous vegetation. 2. Woody plants in wetland are mostly deciduous. 3. High degree of plant community structure, vegetation density, and species richness present. 4. Interspersion of vegetation and water is at least moderate. 5. Wetland is flooded at least once every 10 years. 6. A more than minimal amount of organic matter is flushed from the wetland by water flow at least once every 10 years.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 2 > 4 attributes (Y)—High Function 2-3 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function If Function 5 or 6 is N, then automatically low function

E. General Habitat Suitability	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. Wetland is not fragmented by development. 2. Upland surrounding wetland is undisturbed. 3. Diversity (evenness of cover) of plant species is moderately high (>5 species with at least 10% cover each). 4. Plant community has two or more strata, with at least two of those strata having >10% total cover. 5. Wetland has at least a moderate degree of Cowardin Class interspersion. 6. Evidence of wildlife use (e.g., nests, tracks, scat, gnawed stumps, survey data) is present.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 3 > 5 attributes (Y)—High Function 2-4 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function
F. General Fish Habitat (must be associated with a fish-bearing stream)	Likely or not likely to Provide (Y or N):___ Rating: ______ N/A
1. Wetland has perennial or intermittent surface water connection to a fish-bearing water body. 2. Wetland has sufficient size and depth of open water so as not to freeze completely during winter. 3. Fish are present or are known to be present. 4. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter. 5. Spawning areas are present (aquatic vegetation and/or gravel beds 6. Juvenile rest areas present (e.g. pools with organic debris or overhanging vegetation).	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes ____ > 5 attributes (Y)—High Function 3-4 attributes (Y)—Moderate Function 0-2 attributes (Y)—Low Function
G. Native Plant Richness	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. At least 20 native plant species occur in the wetland 2. Wetland contains two or more Cowardin Classes. 3. Wetland has three or more strata of vegetation with at least 10% cover in each stratum.	1. Y N 2. Y N 3. Y N # of Attributes 1 > 2 attributes (Y)—High Function 1 attribute (Y)—Moderate Function None—Low Function
H. Educational, Scientific, Recreational, or Subsistence Use	Likely or not likely to Provide (Y or N): Y Rating: High
1. Site has documented scientific or educational use. 2. Wetland is in public ownership. 3. Accessible trails are available. 4. Wetland supports subsistence activities (e.g., hunting, fishing, berry picking).	1. Y N 2. Y N 3. Y N 4. Y N # of Attributes 2 > 2 attributes (Y)—High Function 1 attribute (Y)—Moderate Function None—Low Function
I. Uniqueness and Special Status	Likely or not likely to Provide (Y or N): Y Rating: High
1. Wetland contains documented occurrence of a state or federally listed threatened or endangered species. 2. Wetland contains documented critical habitat, high quality ecosystems, or priority species, respectively designated by the U.S. Fish and Wildlife Service 3. Wetland has biological, geological, or other features that are determined to be rare. 4. Wetland has been determined significant because it provides functions scarce for the area.	1. Y N 2. Y N 3. Y N 4. Y N # of Attributes 1 > 2 attributes (Y)—High Function 1 attribute (Y)—Moderate Function None—Low Function If attribute 1 is Y, then automatically High Function

Wetland Functions Data Form-Alaska Regulatory Best Professional Judgment Characterization

File #: Point Hope, Kuukpak Road Date: 9/6/10 Category II
Wetland: PEM1E PM/RS: WS

A. Flood Flow Regulation (Storage and Desynchronization)	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. Wetland is capable of retaining much higher volumes of water during storm events than under normal rainfall conditions. 2. Wetland is a closed (depressional) system subject to flooding or shows evidence of flooding. 3. If flow-through, wetland has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris. 4. Wetland has dense (>40% cover) woody vegetation. 5. Wetland receives floodwater from an adjacent water course at least once every 10 years. 6. Floodwaters enter and flow through wetland predominantly as sheet flow rather than channel flow.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 3 > 4 attributes (Y)—High Function 2-3 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function
B. Sediment, Nutrient (N and P), Toxicant Removal	Likely or not likely to Provide (Y or N): Y Rating: HIGH
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. 2. Slow-moving or still water is present or occurs during flooding that happens at least once every 10 years. 3. Dense (≥50% cover) herbaceous vegetation is present. 4. At least moderate interspersion of vegetation and water is present or occurs during flooding that happens at least once every 10 years. 5. Sediment deposits are present (evidence of deposition during floods). 6. Thick surface organic horizon and/or abundant fine organic litter is present.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 4 > 4 attributes (Y)—High Function 2-3 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function
C. Erosion Control and Shoreline Stabilization (Only assess if directly abuts permanent or relatively permanent water)	Likely or not likely to Provide (Y or N):___ Rating: ______ N/A
1. Wetland has dense, energy absorbing vegetation (trees, shrubs) bordering the water course and no evidence of erosion. 2. An at least moderately dense herbaceous layer is present.	1. Y N 2. Y N # of Attributes ____ 1-2 attributes (Y)—High Function None—Low Function
D. Production of Organic Matter and its Export	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. Wetland has at least 30% cover of herbaceous vegetation. 2. Woody plants in wetland are mostly deciduous. 3. High degree of plant community structure, vegetation density, and species richness present. 4. Interspersion of vegetation and water is at least moderate. 5. Wetland is flooded at least once every 10 years. 6. A more than minimal amount of organic matter is flushed from the wetland by water flow at least once every 10 years.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 2 > 4 attributes (Y)—High Function 2-3 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function If Function 5 or 6 is N, then automatically low function

E. General Habitat Suitability	Likely or not likely to Provide (Y or N): Y Rating: MODERATE
1. Wetland is not fragmented by development. 2. Upland surrounding wetland is undisturbed. 3. Diversity (evenness of cover) of plant species is moderately high (>5 species with at least 10% cover each). 4. Plant community has two or more strata, with at least two of those strata having >10% total cover. 5. Wetland has at least a moderate degree of Cowardin Class interspersion. 6. Evidence of wildlife use (e.g., nests, tracks, scat, gnawed stumps, survey data) is present.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 3 > 5 attributes (Y)—High Function 2-4 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function
F. General Fish Habitat (must be associated with a fish-bearing stream)	Likely or not likely to Provide (Y or N):___ Rating: ________ N/A
1. Wetland has perennial or intermittent surface water connection to a fish-bearing water body. 2. Wetland has sufficient size and depth of open water so as not to freeze completely during winter. 3. Fish are present or are known to be present. 4. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter. 5. Spawning areas are present (aquatic vegetation and/or gravel beds 6. Juvenile rest areas present (e.g. pools with organic debris or overhanging vegetation).	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes ____ > 5 attributes (Y)—High Function 3-4 attributes (Y)—Moderate Function 0-2 attributes (Y)—Low Function
G. Native Plant Richness	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. At least 20 native plant species occur in the wetland 2. Wetland contains two or more Cowardin Classes. 3. Wetland has three or more strata of vegetation with at least 10% cover in each stratum.	1. Y N 2. Y N 3. Y N # of Attributes ____ > 2 attributes (Y)—High Function 1 attribute (Y)—Moderate Function None—Low Function
H. Educational, Scientific, Recreational, or Subsistence Use	Likely or not likely to Provide (Y or N): Y Rating: HIGH
1. Site has documented scientific or educational use. 2. Wetland is in public ownership. 3. Accessible trails are available. 4. Wetland supports subsistence activities (e.g., hunting, fishing, berry picking).	1. Y N 2. Y N 3. Y N 4. Y N # of Attributes 2 > 2 attributes (Y)—High Function 1 attribute (Y)—Moderate Function None—Low Function
I. Uniqueness and Special Status	Likely or not likely to Provide (Y or N): Y Rating: High
1. Wetland contains documented occurrence of a state or federally listed threatened or endangered species. 2. Wetland contains documented critical habitat, high quality ecosystems, or priority species, respectively designated by the U.S. Fish and Wildlife Service 3. Wetland has biological, geological, or other features that are determined to be rare. 4. Wetland has been determined significant because it provides functions scarce for the area.	1. Y N 2. Y N 3. Y N 4. Y N # of Attributes 1 > 2 attributes (Y)—High Function 1 attribute (Y)—Moderate Function None—Low Function If attribute 1 is Y, then automatically High Function

Wetland Functions Data Form-Alaska Regulatory Best Professional Judgment Characterization

File #: Point Hope, Kuukpak Road Date: 9/6/10 Category II
Wetland: PEM1/SS1E PM/RS: WS

A. Flood Flow Regulation (Storage and Desynchronization)	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. Wetland is capable of retaining much higher volumes of water during storm events than under normal rainfall conditions. 2. Wetland is a closed (depressional) system subject to flooding or shows evidence of flooding. 3. If flow-through, wetland has constricted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris. 4. Wetland has dense (>40% cover) woody vegetation. 5. Wetland receives floodwater from an adjacent water course at least once every 10 years. 6. Floodwaters enter and flow through wetland predominantly as sheet flow rather than channel flow.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 3 > 4 attributes (Y)—High Function 2-3 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function
B. Sediment, Nutrient (N and P), Toxicant Removal	Likely or not likely to Provide (Y or N): Y Rating: Moderate
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. 2. Slow-moving or still water is present or occurs during flooding that happens at least once every 10 years. 3. Dense (≥50% cover) herbaceous vegetation is present. 4. At least moderate interspersion of vegetation and water is present or occurs during flooding that happens at least once every 10 years. 5. Sediment deposits are present (evidence of deposition during floods). 6. Thick surface organic horizon and/or abundant fine organic litter is present.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 3 > 4 attributes (Y)—High Function 2-3 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function
C. Erosion Control and Shoreline Stabilization (Only assess if directly abuts permanent or relatively permanent water)	Likely or not likely to Provide (Y or N): Rating: N/A
1. Wetland has dense, energy absorbing vegetation (trees, shrubs) bordering the water course and no evidence of erosion. 2. An at least moderately dense herbaceous layer is present.	1. Y N 2. Y N # of Attributes 1-2 attributes (Y)—High Function None—Low Function
D. Production of Organic Matter and its Export	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. Wetland has at least 30% cover of herbaceous vegetation. 2. Woody plants in wetland are mostly deciduous. 3. High degree of plant community structure, vegetation density, and species richness present. 4. Interspersion of vegetation and water is at least moderate. 5. Wetland is flooded at least once every 10 years. 6. A more than minimal amount of organic matter is flushed from the wetland by water flow at least once every 10 years.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 3 > 4 attributes (Y)—High Function 2-3 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function If Function 5 or 6 is N, then automatically low function

E. General Habitat Suitability	Likely or not likely to Provide (Y or N): Y Rating: Moderate
1. Wetland is not fragmented by development. 2. Upland surrounding wetland is undisturbed. 3. Diversity (evenness of cover) of plant species is moderately high (>5 species with at least 10% cover each). 4. Plant community has two or more strata, with at least two of those strata having >10% total cover. 5. Wetland has at least a moderate degree of Cowardin Class interspersion. 6. Evidence of wildlife use (e.g., nests, tracks, scat, gnawed stumps, survey data) is present.	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes 3 > 5 attributes (Y)—High Function 2-4 attributes (Y)—Moderate Function 0-1 attributes (Y)—Low Function
F. General Fish Habitat (must be associated with a fish-bearing stream)	Likely or not likely to Provide (Y or N):___ Rating: ______ NH
1. Wetland has perennial or intermittent surface water connection to a fish-bearing water body. 2. Wetland has sufficient size and depth of open water so as not to freeze completely during winter. 3. Fish are present or are known to be present. 4. Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter. 5. Spawning areas are present (aquatic vegetation and/or gravel beds 6. Juvenile rest areas present (e.g. pools with organic debris or overhanging vegetation).	1. Y N 2. Y N 3. Y N 4. Y N 5. Y N 6. Y N # of Attributes ___ > 5 attributes (Y)—High Function 3-4 attributes (Y)—Moderate Function 0-2 attributes (Y)—Low Function
G. Native Plant Richness	Likely or not likely to Provide (Y or N): Y Rating: moderate
1. At least 20 native plant species occur in the wetland 2. Wetland contains two or more Cowardin Classes. 3. Wetland has three or more strata of vegetation with at least 10% cover in each stratum.	1. Y N 2. Y N 3. Y N # of Attributes ___ > 2 attributes (Y)—High Function 1 attribute (Y)—Moderate Function None—Low Function
H. Educational, Scientific, Recreational, or Subsistence Use	Likely or not likely to Provide (Y or N): Y Rating: HIGH
1. Site has documented scientific or educational use. 2. Wetland is in public ownership. 3. Accessible trails are available. 4. Wetland supports subsistence activities (e.g., hunting, fishing, berry picking).	1. Y N 2. Y N 3. Y N 4. Y N # of Attributes 2 > 2 attributes (Y)—High Function 1 attribute (Y)—Moderate Function None—Low Function
I. Uniqueness and Special Status	Likely or not likely to Provide (Y or N): Y Rating: HIGH
1. Wetland contains documented occurrence of a state or federally listed threatened or endangered species. 2. Wetland contains documented critical habitat, high quality ecosystems, or priority species, respectively designated by the U.S. Fish and Wildlife Service 3. Wetland has biological, geological, or other features that are determined to be rare. 4. Wetland has been determined significant because it provides functions scarce for the area.	1. Y N 2. Y N 3. Y N 4. Y N # of Attributes 1 > 2 attributes (Y)—High Function 1 attribute (Y)—Moderate Function None—Low Function If attribute 1 is Y, then automatically High Function

APPENDIX E

Right of Entries

NATIVE VILLAGE OF POINT HOPE
P.O. BOX 109
POINT HOPE, ALASKA 99766
(907) 368-2330
FAX: (907) 368-2332

September 22, 2010

CERTIFIED MAIL 7006 0810 0005 2478 7038

Hattenburg Dilley & Linnell
Scott Hattenburg
3335 Arctic Blvd., Suite 100
Anchorage, AK 99503

Re: Revocable Use Permit (RUP) of Native Allotment F-13470A
For Emergency Evacuation Road in Point Hope materials study

Dear Mr. Hattenburg;

As the realty service provider for Point Hope and in order to obtain a permit from the Native Allotee for Point Hope's Emergency Evacuation Road, please have your authorized representative sign and return the Revocable Use Permit to the address listed above. The statutory authority for permitting is as follows: the Act of August 9, 1955 (69 Stat. 539) as amended (25 USC 415) and 25 CFR Part 162.

Please forward the RUP as soon as possible so I can send forward it to the BIA for approval. If you have any questions, please call me at 368-3117. Thank you.

Sincerely,

Christina Tippin
Realty Director

Enclosure

Cc: RUP & Reading file

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS

REVOCABLE USE PERMIT

Pursuant to the authority of 25 U.S.C. 415 and 25 CFR 162.3, Raymond Frankson Sr., of Native Allotment Number F-13470, Parcel A, of P. O. Box 56, Point Hope, AK, 99766-0056, hereinafter called the "PERMITTER", hereby grants permission to, HDL, 3335 Arctic Blvd., Anchorage, AK 99503, hereinafter called the "PERMITTEE."

WITNESSETH: The PERMITTER, in consideration of a full and complete report after the studies, Raymond Frankson Sr. grants permission to PERMITTEE, subject to limitations hereafter stated, a non-exclusive right beginning September 24, 2010 and terminating on midnight, October 30, 2010, for the following purpose:

Collecting data for the Point Hope Emergency Evacuation Road route upon the following described tract of land:

> F-13470, Parcel A, Lot 3, U. S. Survey No. 9117, Alaska, as depicted on the map attached hereto, as Exhibit A (more specifically located within Sections 16, 17, 20 & 21 & , T. 33 N., R. 32 W., Kateel River Meridian, Alaska), containing 79.98 acres more or less.

HEREINAFTER described as the PREMISES. In consideration of this permission, PERMITTEE agrees:

1. It is agreed that any reference to "Damages" contained in the General Conditions of this permit does not apply to authorized activities of other Federal agencies.

2. Any liability of the PERMITTEE for property damage, personal injury, or death shall be governed by the Federal Tort Claims Act (FTCA), 28 U.S.C. 2671 et seq. Pursuant to the provisions of the FTCA, the PERMITEE assumes responsibility for any negligent acts of its officers and employees, in the scope of employment, incident to this permit. Any requirement for the payment or obligation of funds by the PERMITTEE shall be subject to the availability of appropriated funds, and no provision herein shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, 31 U.S.C. 1341.

3. The PERMITTEE will not alter or make improvements to the road without prior written approval from the PERMITTERS and the United States.

4. PERMITTEE will conduct a briefing for all employees, contractors, and subcontractors which will cover the stipulations required by this permit.

5. All operations will be conducted in such a manner as to not cause damage or disturbance to any improvements on or adjacent to the PREMISES.

6. PERMITTEE shall prohibit their employees, agents, contractors, subcontractors and their employees from disturbing or appropriating any objects from the PREMISES.

7. PERMITTEE shall not assign this permit in any event.

8. PERMITTEE shall commit no waste on the PREMISES and at all times shall keep the PREMISES in a clean and sanitary condition.

9. The PREMISES may not be used for any unlawful purpose.

10. A copy of this permit shall at all times be in the possession of the party chief or some other member of the PERMITTEE's crew while conducting the field operations.

11. The PERMITTEE will not store fuel, flammable material or any hazardous material on the PREMISES. In the event of an accidental spill, every effort will be made to protect the surface and groundwater supplies from contamination. All spills will be reported immediately to the PERMITTER and the Department of Interior, Bureau of Indian Affairs.

12. Upon expiration, revocation or abandonment of operations, PERMITTEE agrees to remove all equipment from the land and notify the PERMITTER and the Fairbanks Agency, Bureau of Indian Affairs in writing that cleanup operations have been completed.

13. PERMITTEE agrees to conduct operations in compliance with all applicable Federal, State and local laws, ordinances or regulations, including but not limited to those pertaining to fire, sanitation, conservation, water pollution, fish and game.

14. The PERMITTEE will comply with the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470), the Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001-03013), the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa-470ll), and all implementing regulations.

15. During the term of this Permit, if any previously unknown archeological or historic remains are discovered during the life of this permit or in the course of associated activities, they shall be protected from disturbance pending further recommendations from the BIA Area Archeologist (36 CFR § 800.11). Work should be halted immediately and the office listed below contacted. Any person who knows of the discovery of human remains or cultural items must provide notification in writing to the BIA Area Archeologist (43 CFR § 10.4).

16. No person may excavate, remove, damage, or otherwise alter or deface any archeological resource on Indian lands (43 CFR § 7.4). This includes any historic or prehistoric cultural materials. The Federal land manager may assess a civil penalty against any person who has violated any term or condition included in § 7.4 or who has violated any term or condition in a permit issued in accordance with the Act and this part (43 CFR § 7.15).

17. Notices and communications shall be in writing and shall be personally delivered, or mailed by Certified Mail, Return Receipt Requested, and addressed to:

Native Village of Point Hope
Realty Department
P.O. Box 109
Point Hope, AK 99766-0109
(907) 368-3117

PERMITTER:
Raymond Frankson Sr.
P.O. Box 56
Point Hope, AK 99766-0056

PERMITTEE:
HDL
3335 Arctic Blvd., Suite 100
Anchorage, AK 99503

It is further understood and agreed that this instrument is not a lease and is not to be taken or construed as granting any leasehold interest or right in or to the PREMISES herein described, but is merely a temporary Permit terminable and revocable at the discretion of the PERMITTER, with the approval of the Secretary of the Interior.

This Permit may be extended upon written request to the Native Village of Point Hope, Realty Department, P.O. Box 109, Point Hope, AK, 99766-0109.

This Permit shall terminate upon the breach of any of the conditions herein. In the event of such termination prior to expiration through failure on the part of the PERMITTEE, demands shall be made for payment of obligations pursuant to 25 CFR § 162.14. Any advance payments made shall become the property of the PERMITTER.

Nothing contained in this lease shall operate to delay or prevent a termination of Federal trust responsibilities with respect to the land by the issuance of a fee patent or otherwise during the term of the lease; however, such termination shall not serve to abrogate the lease. The owners of the land and the lessee and his surety or sureties shall be notified of any such change in the status of the land.

Accepted by:

PERMITTER:

Raymond Frankson Sr. 9/22/10
Raymond Frankson Sr. Date
Native Allotment Number F-13470 A

PERMITTEE:

_______________________________ 9/27/10
Date

HDL

UNITED STATES
DEPARTMENT OF THE INTEIROR
BUREAU OF INDIAN AFFAIRS

The within Permit is hereby approved this ______ day of _______________, 20_____, pursuant to the authority delegated by 209 DM 8, 230 DM1, 3 IAM 4 and Addendum to 10 BIAM 3.

____
Kathy B. Wilson
Superintendent
Fairbanks Agency - BIA

NATIVE VILLAGE OF POINT HOPE
P.O. BOX 109
POINT HOPE, ALASKA 99766
(907) 368-2330
FAX: (907) 368-2332

October 15, 2010

Hattenburg Dilley & Linnell
3335 Arctic Blvd., Suite 100
Anchorage, AK 99503
Attn: Scott Hattenburg

Re: Revocable Use Permit (RUP) of Native Allotment F-13558
for studies for the Emergency Evacuation Road route in Point Hope

Dear Mr. Hattenburg;

As the realty service provider for Point Hope and in order to obtain a permit from the Native Allotee for Point Hope's Emergency Evacuation Road, please have your authorized representative sign and return the Revocable Use Permit to the address listed above. The statutory authority for permitting is as follows: the Act of August 9, 1955 (69 Stat. 539) as amended (25 USC 415) and 25 CFR Part 162.

Please forward the RUP as soon as possible so I can send forward it to the BIA for approval. If you have any questions, please call me at 368-3117. Thank you.

Sincerely,

Christina Tippin
Realty Director

Enclosure

Cc: RUP & Reading file

HATTENBURG DILLEY & LINNELL
OCT 18 2010
RECEIVED

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS

REVOCABLE USE PERMIT

Pursuant to the authority of 25 U.S.C. 415 and 25 CFR 162.3, Ella Kowunna, heir of Abraham P. Kowunna Sr., of Native Allotment Number F-13558, of P. O. Box 21, Point Hope, AK, 99766-0021, hereinafter called the "PERMITTER", hereby grants permission to, HDL, 3335 Arctic Blvd., Anchorage, AK 99503, hereinafter called the "PERMITTEE."

WITNESSETH: The PERMITTER, in consideration of a full and complete report after the studies, Ella Kowunna, the heir of Abraham P. Kowunna Sr. grants permission to PERMITTEE, subject to limitations hereafter stated, a non-exclusive right beginning June 15, 2011 and terminating on midnight, September 30, 2011, for the following purpose:

Collecting data for the Point Hope Emergency Evacuation Road route upon the following described tract of land:

> F-13558, Lot 4, U. S. Survey No. 9191, Alaska, as depicted on the map attached hereto, as Exhibit A (more specifically located within Section 19, T. 34 N., R. 33 W., Kateel River Meridian, Alaska), containing 159.95 acres more or less.

HEREINAFTER described as the PREMISES. In consideration of this permission, PERMITTEE agrees:

1. It is agreed that any reference to "Damages" contained in the General Conditions of this permit does not apply to authorized activities of other Federal agencies.

2. Any liability of the PERMITTEE for property damage, personal injury, or death shall be governed by the Federal Tort Claims Act (FTCA), 28 U.S.C. 2671 et seq. Pursuant to the provisions of the FTCA, the PERMITEE assumes responsibility for any negligent acts of its officers and employees, in the scope of employment, incident to this permit. Any requirement for the payment or obligation of funds by the PERMITTEE shall be subject to the availability of appropriated funds, and no provision herein shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, 31 U.S.C. 1341.

3. The PERMITTEE will not alter or make improvements to the road without prior written approval from the PERMITTERS and the United States.

4. PERMITTEE will conduct a briefing for all employees, contractors, and subcontractors which will cover the stipulations required by this permit.

5. All operations will be conducted in such a manner as to not cause damage or disturbance to any improvements on or adjacent to the PREMISES.

6. PERMITTEE shall prohibit their employees, agents, contractors, subcontractors and their employees from disturbing or appropriating any objects from the PREMISES.

7. PERMITTEE shall not assign this permit in any event.

8. PERMITTEE shall commit no waste on the PREMISES and at all times shall keep the PREMISES in a clean and sanitary condition.

9. The PREMISES may not be used for any unlawful purpose.

10. A copy of this permit shall at all times be in the possession of the party chief or some other member of the PERMITTEE's crew while conducting the field operations.

11. The PERMITTEE will not store fuel, flammable material or any hazardous material on the PREMISES. In the event of an accidental spill, every effort will be made to protect the surface and groundwater supplies from contamination. All spills will be reported immediately to the PERMITTER and the Department of Interior, Bureau of Indian Affairs.

12. Upon expiration, revocation or abandonment of operations, PERMITTEE agrees to remove all equipment from the land and notify the PERMITTER and the Fairbanks Agency, Bureau of Indian Affairs in writing that cleanup operations have been completed.

13. PERMITTEE agrees to conduct operations in compliance with all applicable Federal, State and local laws, ordinances or regulations, including but not limited to those pertaining to fire, sanitation, conservation, water pollution, fish and game.

14. The PERMITTEE will comply with the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470), the Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001-03013), the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa-470ll), and all implementing regulations.

15. During the term of this Permit, if any previously unknown archeological or historic remains are discovered during the life of this permit or in the course of associated activities, they shall be protected from disturbance pending further recommendations from the BIA Area Archeologist (36 CFR § 800.11). Work should be halted immediately and the office listed below contacted. Any person who knows of the discovery of human remains or cultural items must provide notification in writing to the BIA Area Archeologist (43 CFR § 10.4).

16. No person may excavate, remove, damage, or otherwise alter or deface any archeological resource on Indian lands (43 CFR § 7.4). This includes any historic or prehistoric cultural materials. The Federal land manager may assess a civil penalty against any person who has violated any term or condition included in § 7.4 or who has violated any term or condition in a permit issued in accordance with the Act and this part (43 CFR § 7.15).

17. Notices and communications shall be in writing and shall be personally delivered, or mailed by Certified Mail, Return Receipt Requested, and addressed to:

Native Village of Point Hope
Realty Department
P.O. Box 109
Point Hope, AK 99766-0109
(907) 368-3117

PERMITTER:
Ella Kowunna
P.O. Box 21
Point Hope, AK 99766-0021

PERMITTEE:
HDL
3335 Arctic Blvd.
Anchorage, AK 99503

It is further understood and agreed that this instrument is not a lease and is not to be taken or construed as granting any leasehold interest or right in or to the PREMISES herein described, but is merely a temporary Permit terminable and revocable at the discretion of the PERMITTER, with the approval of the Secretary of the Interior.

This Permit may be extended upon written request to the Native Village of Point Hope, Realty Department, P.O. Box 109, Point Hope, AK, 99766-0109.

This Permit shall terminate upon the breach of any of the conditions herein. In the event of such termination prior to expiration through failure on the part of the PERMITTEE, demands shall be made for payment of obligations pursuant to 25 CFR § 162.14. Any advance payments made shall become the property of the PERMITTER.

Nothing contained in this lease shall operate to delay or prevent a termination of Federal trust responsibilities with respect to the land by the issuance of a fee patent or otherwise during the term of the lease; however, such termination shall not serve to abrogate the lease. The owners of the land and the lessee and his surety or sureties shall be notified of any such change in the status of the land.

Accepted by:

PERMITTER:

Ella Kowunna

Ella Kowunna, heir of
Native Allotment Number F-13558

10/12/10
Date

PERMITTEE:

Scott L. Hattenburg
HDL

10-18-10
Date

UNITED STATES
DEPARTMENT OF THE INTEIROR
BUREAU OF INDIAN AFFAIRS

The within Permit is hereby approved this ______ day of _______________, 20_____, pursuant to the authority delegated by 209 DM 8, 230 DM1, 3 IAM 4 and Addendum to 10 BIAM 3.

Kathy B. Wilson
Superintendent
Fairbanks Agency - BIA

RIGHT OF ENTRY

Point Hope Emergency Evacuation Road & Materials Source Study
North Slope Borough

Purpose: The purpose of this right-of-entry is to permit temporary access to private property for the purposes of conducting surveying, geotechnical investigations engineering, and environmental and/or cultural studies for the study and design of the Point Hope Emergency Evacuation Road and Materials Source Study.

Tikigaq Corporation does hereby grant permission for LCMF, Hattenburg Dilley & Linnell, their personnel and vehicles and subcontractors, to enter onto Tikigaq Corporation properties for the purposes of conducting surveying, geotechnical investigations, engineering and environmental studies.

This right-of-entry does not grant any exclusive use of the land. This right-of-entry does not allow the permittee to alter, change, damage, or impact the property in any way, other than the excavation of test pits. Test pits will be backfilled.

The PERMITTEE shall carry insurance and shall be responsible for any damage, or injuries that occur on the landowner's property.

This right of entry automatically expires December 31, 2011.

PERMISSION GRANTED:

Land Dept. Aug 19, 2010

Authorized Representative Date

APPENDIX F

Cultural Resources Report

CULTURAL RESOURCE SURVEY OF PROPOSED KUUKPAK ROAD EXTENSION AT POINT HOPE, ALASKA

Northern Land Use Research, Inc.

November 2010

CULTURAL RESOURCE SURVEY OF PROPOSED KUUKPAK ROAD EXTENSION AT POINT HOPE, ALASKA

Report prepared for:
HDL-Hattenburg, Dilley & Linnell, Engineering Consultants
3335 Arctic Boulevard, Suite 100
Anchorage, Alaska 99503

Report prepared by:
Richard O. Stern Ph.D.
Senior Project Archaeologist

Northern Land Use Research, Inc.
Peter M. Bowers, M.A., R.P.A., Principal Investigator
P.O. Box 83990
Fairbanks, Alaska 99708

November 2010

Confidentiality Notice

The locations of cultural resources given in this report are provided to facilitate environmental and engineering planning efforts only. Under the provisions of the Archaeological Resources Protection Act and the National Historic Preservation Act, site location information is confidential; disclosure of such information is exempt from requests under Federal and State freedom of information laws. This report is not a public document. It is intended for release to HDL Engineering Consultants, the North Slope Borough, the community of Point Hope, the Alaska Office of History and Archaeology, and other appropriate permitting agencies only.

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1.0 INTRODUCTION

1.1 Project Description

The North Slope Borough constructed the Kuukpak Road from Point Hope to its terminus on the tundra, approximately seven miles east of the community. The two lane gravel road provides access to the pumphouse for the community water supply at the eastern end of the road, as well as access to Native Allotments, subsistence harvest sites, and trails across the tundra to more distant locations. The community of Point Hope itself is located at an elevation of 13 to 18 feet above sea level two and a half miles out on an exposed gravel spit. Flood events in the past have damaged or destroyed homes and other structures (Lowenstein 2008).

The modern community of Point Hope moved from its historic location in 1975 in part because of repeated floods and the threat of continued flooding. Flood events in the Marryat Inlet behind the village occurred during spring breakups of 2006 and 2007 causing village residents to be concerned for their safety. The Kuukpak Road is particularly important to the community because it is their sole means of egress inland to higher ground in the event of a major flood event. The Kuukpak Road extension project proposes to extend the road to the higher ground by adding three to five more miles of gravel road eastward. Hattenburg, Dilley, Linnell (HDL), Engineering Consultants subcontracted the cultural resource investigation for this project to Northern Land Use Research, Inc. (NLUR), with technical support from HDL.

Due to the necessity of federal permits and funding, the project must be completed in accordance with Section 106 of the National Historic Preservation Act (NHPA 1966, as amended) and its implementing regulations codified in 36 CFR 800 (as amended 2004). These regulations provide a process through which the potential of an undertaking to affect “historic properties” (a regulatory term used to define both prehistoric and historic sites, buildings, structures, and objects) is considered. This is accomplished through identification and evaluation of cultural resource sites within the Area of Potential Effect (APE), herein referred to as the Project Study Area, for inclusion on the National Register of Historic Places (NRHP). NRHP eligibility is a key management concept, as National Register eligible sites may require the development of mitigation measures prior to project commencement.

The APE is identified as the Project Area on Figures 1, 2, and 3. It consists of an elongated oval area north of the numerous Native Allotments which line the southern shore of the Tigara Peninsula (Figure 2). The northern boundaries of the allotments form the southern margin of the APE. The APE is approximately 5.2 miles in length from west to east, and varies in width from 1,500 to 4,000 feet, being narrower at its western end where it meets the existing Kuukpak Road, and widening towards the east. A tentative road extension alignment is depicted in light brown on Figure 3.

1.2 Project Setting

Point Hope, Alaska lies on the Tigara Peninsula, north of the Arctic Circle, and 150 miles northwest of Kotzebue, Alaska, the nearest major transportation and service hub. The Tigara

Peninsula forms the westernmost point of land in the continental United States. The mainland of Russia on the Chukotka Peninsula is 170 miles southwest of Point Hope (Figure 1). Point Hope is situated at the end of the 15-mile long Tigara Peninsula extending westward into the Chukchi Sea from the Lisburne Peninsula (Figure 1). *Tigara* means "finger" in the Iñupiaq language, and, indeed, the peninsula resembles a long curving finger (Figure 1). Terrain at Point Hope is quite low and flat. Immediately inland from the village is Marryat Inlet (*Tasiq*), the largest body of water on the point. The inlet drains into the Chukchi Sea through Sinuk (*Sinŋaq*), a relatively small channel opening in the otherwise continuous spit that forms most of the north shore of the point. Figure 3 depicts the Iñupiaq place names in the project vicinity.

The project is located within portions of sections 13, 14, 23, and 24, Township 34 North, Range 34 West, Kateel River Meridian and sections 12-21 Township 34 North, Range 33 West, Kateel River Meridian. The area is depicted on U.S. Geological Survey (USGS) quadrangle map Point Hope, Alaska B-3 (1:63,360 scale).

The climate at Point Hope is characterized by long, severe winters, with cool, windy, and frequently wet summers. Average temperatures in the summer range from 32° F to 52° F, while winter temperatures range from -16° F to 0° F. Extreme recorded temperatures are -49° F and +72° F. Precipitation is 9.7" per year, including 36" of snow. The relatively small amount of snow must be considered in the context of winds which blow nearly constantly along the Point Hope Peninsula. The winds produce drifting snow and affect the formation and movement of sea ice, which in turn influences people's travel patterns, and ability to hunt marine resources, including the important bowhead whale hunts in spring and fall. Daylight is also a climate factor with continuous daylight conditions during summer months followed by several weeks of nearly complete night conditions around the winter solstice at December 21st. The Chukchi Sea freezes up in November remaining frozen through June, although open water leads allow for bowhead whale hunting in April through May (Selkregg 1976:16).

Point Hope is a community of 750 people, most of whom are Iñupiat Eskimo (Burch 2006). The modern community was constructed for the 1975 move from the "Old Village" site on the westernmost tip of the Peninsula. The community today consists of wood frame and metal buildings, including residences, businesses, a K-12 school, churches, corporation offices, and public facilities support for water, sewer, road maintenance, public safety, health clinic, and community buildings. A large geodesic dome building is a community hall which also houses the city and tribal government offices and hosts bingo games and community meetings. The airport has a single paved 4,000 foot runway and ramp area. The airport provides year-round access to the major regional centers at Kotzebue and Barrow. Barges deliver bulk goods during the ice-free summer months.

The economy of the community is a mixed wild resources harvest and cash-based system. Subsistence hunting follows traditional patterns throughout the year, hunting marine mammals from the sea ice during the fall, early winter, and spring, caribou on the mainland throughout the year, and a major community effort to harvest bowhead whales from camps on the ice at leads in the spring and from shore in the fall. Waterfowl are taken when available during spring and fall migrations. The tundra surrounding the community offers a wide variety of plants and berries which are gathered as they ripen and are ready to harvest. Fish and small game are taken throughout the year when available. Wage labor opportunities are available seasonally in construction and maintenance programs. Year round employment includes positions with various Native business organizations, the community stores, the school, administrative positions with non-profit organizations, and entrepreneurial businesses. Some families and individuals produce native handicrafts for sale (Burch 1981; 1984a).

2.0 PREVIOUS RESEARCH AND METHODOLOGY

2.1 Previous Archaeological Research[1]

Archaeological research at Point Hope started in the early twentieth century with limited investigations by Diamond Jenness (Jenness 1914), Knud Rasmussen (Rasmussen 1927), Henry B. Collins (Collins 1937), and Ales Hrdlicka (Hrdlicka 1930). The discovery and excavations at the Ipiutak site from 1939 to 1941 by Helge Larsen and Froelich Rainey (Larsen and Rainey 1948) redefined the culture history sequence for northwestern Alaska. The Ipiutak site was declared a National Historic Landmark in 1961. Table 1 presents a summary of previous cultural resources investigations at Point Hope.

The extensive archaeological deposits at Point Hope are widely known but poorly understood. Knud Rasmussen (1999), on the final leg of his epic dogsled journey from Greenland to Alaska in 1924, observed 122 house depressions at the "Old Village", now known as Old Tigara (Alaska Heritage Resources Survey [AHRS] designation XPH-001). Rasmussen collected archaeological specimens from the site (Mathiassen 1930) and indicated that Old Tigara was the most interesting and largest collection of ruins along the Alaskan coast.

In 1939, researchers interested in Eskimo origins were drawn to Point Hope by Rasmussen's report and excavated there between 1939 and 1941 (Larsen and Rainey 1948). In addition to Late Prehistoric Eskimo materials at Old Tigara and Jabbertown some five miles to the east, Larsen and Rainey (1948:47) excavated at the nearby Ipiutak site thought to contain as many as 700 houses. The Ipiutak site contains materials Larsen and Rainey designated Near Ipiutak, now known as Norton culture, and Ipiutak culture with the latter accounting for most of the material excavated. The enormous size of the site and the spectacular, if bizarre, artwork found there has made the Ipiutak site one of the most widely recognized archaeological sites in the entire Western Arctic.

Larsen and Rainey (1948:16-17) excavated a total of 63 of the 575 houses they mapped at Ipiutak and excavated over 500 graves from a series of burial sites extending eastward from the site. Unfortunately, in the more than 60 years that have elapsed since the work of Larsen and Rainey at Point Hope, and despite the importance of the archaeological deposits found there, little purely research-oriented work has been conducted at Point Hope. Subsequent work has been carried out prior to various construction projects conducted in compliance with the National Historic Preservation Act or other federal legislation. From the 1960s to date, almost every development or construction project at Point Hope has had an associated cultural resources survey.

In 1967, Hosley (1972) conducted an archaeological survey at Ipiutak locating thirteen additional houses and excavating three of them as part of an Army Corps of Engineer shoreline erosion study. By the 1970s, it was apparent that the contemporary village would have to be moved

[1] Material in this section is taken largely from Slaughter (2006), and Stern and Ream (2008).

because of recurring flooding brought about by erosion of the north shore of the point. In 1975, an archaeological survey of the new village site, located two miles east of the then current village (XPH-008), was conducted before construction activity began there (Shinkwin 1977). Additionally, Shinkwin surveyed a road from the new village site to Jabbertown three miles to the east, and conducted extensive excavations at Old Tigara. As a result of Shinkwin's efforts, the Ipiutak Archaeological District was established (AHRS XHP-011) consisting of Old Tigara (XPH-001), Jabbertown (XPH-002), Ipiutak (XPH-003), and the recently abandoned settlement or historic village (XPH-008). Lastly, Shinkwin (1978) in conjunction with the North Slope Borough established a preservation plan for the village of Point Hope.

Ten houses were tested in 1975 in a study of the reliability of aerial photography as an archaeological survey method (Andrews et al. 1977). A study of previous archaeological research at Point Hope by Dekin and Cassedy (1986) also involved limited archaeological testing. Wooley (1989) conducted a brief reconnaissance survey prior to road construction. Hall (1990) surveyed the road to the community water source excavating more than 2000 test pits with few positive results, although this road (Kuukpak Road) headed east, away from the concentration of archaeological sites near the tip of the Point Hope peninsula.

Gal (1991) surveyed two *nalukataq* (whaling feast) sites near the present village location finding Near Ipiutak and Ipiutak materials. Jensen (1990) conducted archaeological surveys in areas affected by an erosion control project and, more recently, excavated an Ipiutak house exposed by erosion (Mason 2006:106). Northern Land Use Research investigated the proposed road improvements and evacuation staging areas in 2007 (Reuther 2008). The two memorials of former graves (relocated to the main Point Hope cemetery) and two existing graves were noted by Reuther. In summer, 2008, NLUR conducted reconnaissance testing in the toe of the road where repairs were planned to mitigate damage from storm-induced erosion (Stern and Ream 2008).

Recent academic interest in Ipiutak culture has increased, as evidenced by research by Newton (2002) and Giardini and Eggers (2002), but this interest has been confined to the restudy of materials previously excavated. Mason (2006) provides an excellent summary of past and contemporary thought on Ipiutak culture and offers suggestions for future research.

Table 1. Previous cultural resources investigations at Point Hope.

Investigator (1)	***Year (2)***	***Activity (3)***	***Sources (4)***
D. Jenness	1914 (?)	Limited testing; site unknown	Jenness, field notes
K. Rasmussen	1924	Described erosion at Old Tigara Site; purchased/excavated artifacts	Rasmussen 1927; Ostermann 1952
H. Collins	1927 (?)	Unknown	Collins 1937
H. Larsen and F. Rainey	1939-1941	Excavated at Old Tigara, Ipiutak, and Jabbertown	Larsen and Rainey 1948; Rainey 1971
J. VanStone	1955-1956	Ethnographic study of modern Point Hope	VanStone 1960, 1962
D. C. Foote and B. Foote	1958-1961	Cultural geography studies at Point Hope, Kivalina, Noatak	Foote 1965; Foote and Williamson 1961, 1966; B. Foote 1992, 2009
E. S. Burch	1959 to date	Ethnohistory and subsistence studies	Burch 1981, 1998,

Investigator (1)	*Year (2)*	*Activity (3)*	*Sources (4)*
		northern Alaska	2005, 2008
E. Hosley	1967	Studied erosion at Old Tigara and Ipiutak sites	Hosley 1967
National Park Service	1961	Ipiutak site declared National Historic Landmark	
R. Nelson	1966-1968	Study of modern sea ice hunting techniques	Nelson 1969, 1981
J. Bockstoce	1970s to date	Historic and contemporary studies of subsistence and commercial whaling and trading	Bockstoce 1977, 1986, 2009; Bockstoce and Botkin 1982
S. R. Braund and others	1970s to date	Studies of historic and contemporary subsistence whale harvests	Alaska Consultants 1984; Braund 1977;
R. L. Costa	various	Studies of dental pathology in Ipiutak skeletal series	Costa 1977, 1980a, 1980b, 1982
A. Shinkwin	1975	Archaeological survey of new Point Hope townsite; excavations at Old Tigara	Shinkwin 1977
G. Bacon, E. J. Dixon	1976	Survey of airport improvements	Bacon and Dixon 1976
NSB, ICHLC	1977	Point Hope TLUI	NSB 1977
E. Andrews	1977	Test excavations to validate features identified on aerial photographs	Andrews 1977
G. S. Smith	1978	Monitoring of clean up at old Point Hope site	Smith 1978
	1979	Nomination of Old Tigara, Tigara, Ipiutak and Jabbertown to National Register of Historic Places as Ipiutak Archaeological District (XPH-011)	
J. Cook	1979	Survey of proposed construction areas near new townsite	Cook 1979
R. Peterson and R. Newell	1983	Monitoring of construction area near new townsite	Peterson, field notes
R. Newell	1984	Inventory of structures at Tigara site	Newell 1985
A. Dekin	1984	Inspection and evaluation of the Tigara Ipiutak sites	Dekin and Cassedy 1986
T. Lowenstein	1970s to date	Ethnohistory and studies of sea ice hunting techniques	Lowenstein 1981, 1992, 2003, 2008
S. Pedersen and others	1970s to date	Subsistence studies	Pedersen 1979; Pedersen et al. 2009
E. S. Hall and others	1986	Field examinations of TLUI sites in Point Hope vicinity	Koonuk et al. 1987
C. Wooley	1989	Brief reconnaissance survey prior to road construction	Wooley 1989
E. S. Hall	1990	Excavated more than 2000 test pits along road alignment to the community water source with few positive results	Hall 1990
A. Jensen	1990?	Archaeological surveys in areas affected by an erosion control	Jensen 1990
R. Gal	1990 or 1991	Surveyed two *nalukataq* (whaling feast) sites finding Near Ipiutak and Ipiutak materials	Gal 1991
J. Newton	2001	Laboratory examination of published physical anthropology burial data	Newton 2002

Investigator (1)	***Year (2)***	***Activity (3)***	***Sources (4)***
L. Giardini and S. Eggers	Various	Laboratory examination of published epidemiological and physical anthropological data	Giardini and Eggers 2002, 2005
M. A. Larson	2003	Study of qalgi in post-epidemic Point Hope	Larson 2004
D. C. Slaughter (NLUR)	2006	Monitored erosion repairs to sea wall along Marryat Lagoon	Slaughter 2006
A. Jensen	1997	Excavated an Ipiutak house exposed by erosion	Mason 2006:106
J. Reuther (NLUR)	2007	Surveyed the proposed road improvements and evacuation staging areas	Reuther 2008
R. O. Stern (NLUR)	2008	Test excavations adjacent to road repair locations	Stern and Ream 2008
Various investigators	Various	Examination of dental and skeletal materials from contemporary and Ipiutak series data	Waugh 1930; Lester and Shapiro 1968; Schwartz et al. 1995; Keenleyside 2003; Guatelli-Steinberg et al. 2004; El-Zaatari 2008a, 2008b; Holliday and Hilton 2009
R. O. Stern (NLUR)	2010	Survey and testing of Kuukpak Road extension	this report

Table after Koonuk et al. 1987:9 (Table 1) through 1984.
Northern Land Use Research, Inc. (2010) from 1984 to present.

(1) Investigator is the principal investigator, when known.
(2) Year(s) covers the period of time of the investigations.
(3) Activity is summarized from available reports.
(4) The primary source of information only is listed. Subsequent reports may provide additional information. These are listed in the References Cited section.

2.2 Research Methodology

The primary objective of the 2010 proposed Kuukpak Road extension cultural resources survey is to comply with legal and regulatory mandates, especially Section 106 of the National Historic Preservation Act (as amended) and 36 CFR 800 and to maximize the discovery and identification of cultural resources within the Area of Potential Effects (APE) of the proposed road extension corridor. Methods included standard archaeological professional procedures for a project of this nature, including background literature review and field survey. The 2010 survey was guided in part by NLUR’s prior research at Point Hope with several projects in the same general vicinity.

Research methods used prior to the background study included an examination of aerial photographs, maps, and literature. NLUR’s private research library served as the primary source of literature relating to the history and archaeology of Northern Alaska. The Alaska Heritage Resource Survey (AHRS) files, maintained at the Alaska Department of Natural Resources Office of History and Archaeology (OHA), were also consulted. The AHRS files, a database of recorded archaeological and historic site locations within Alaska, provided information about reported sites in the project vicinity.

2.3 Survey Methods

The field survey was conducted by Richard O. Stern, Ph.D. and Molly Odell, M.A. of Northern Land Use Research, Inc. on August 31 through September 2, 2010. Both archaeologists meet the Secretary of the Interior's standards as qualified professional archaeologists.

The survey and site discovery procedures employed both pedestrian survey and visual survey via four-wheelers. Mr. Saul Lisbourne of Point Hope provided local guide and bear guard services during the survey. The daily procedure was to travel via fourwheelers from Point Hope east on the existing Kuukpak Road to the Kuukpak Road extension corridor. Within the corridor we drove via four-wheeler observing the ground surface and the surrounding terrain. The vast majority of the corridor consists of moist to wet tundra, including numerous areas with standing water, and slow-flowing watercourses. Only the southernmost strip of the survey corridor and parts of the eastern corridor have enough elevation to allow for drainage. In those areas which were high and dry enough to have some archaeological potential, we made short, pedestrian surveys, consisting of the two archaeologists walking parallel transects, spaced approximately 5 to 10 meters (m) apart, to provide sufficient inspection of the tundra tussock ground surface.

The majority of the road extension corridor consists of low probability wet to moist tundra areas where no subsurface tests were conducted. Standard archaeological field recording methods such as written field notes, GPS waypoints, and photo documentation were utilized. No sites were identified during the surface survey or subsurface testing. The survey meets the Alaska SHPO's definition of a Level I or "Identification Phase" survey designed to identify and describe sites within the project study area as defined by the Alaska Office of History and Archaeology (OHA) (Historic Preservation Series No. 11, revised 2003).

3.0 CULTURAL SETTING

3.1 Cultural Chronology of Northwestern Alaska[2]

The prehistory of the Arctic Coast and western Brooks Range regions is poorly understood. Along the coast, sites predating the historic period (pre-1820) are rare. The resource base is severely compromised because much of the Beaufort and Chukchi Sea coasts have been eroded, or are actively degrading, thereby damaging or altogether removing an important coastal element of the region's archaeology (Mason et al. 1997). The coastal environments of the Chukchi Sea region have been inhabited for at least the last 4000 years (Giddings and Anderson 1986). The interior of the western Brooks Range may have been populated as early as 11,000, or more, years ago (Rasic 2000).

Archaeological research has been carried out at several sites in the region, most notably at Cape Espenberg, Cape Krusenstern, Deering, Kotzebue, Tuluaq Hill, Onion Portage, and Point Hope (Larsen and Rainey 1948; Giddings 1952; Giddings and Anderson 1986; Bowers et al. 1999; Bowers et al. 2010; Rasic 2000; Larsen 2001). This research indicates a seemingly complex series of occupations that span thousands of years with at least five different traditions and ten prehistoric cultures or complexes identified in the Chukchi Sea region. Prehistoric traditions and cultures are defined by similarities in artifact types, materials and house construction, and are chronologically sequenced using both relative and absolute dating methods, such as dendrochronology, stratigraphic position, and radiocarbon analysis. A review of the known prehistory of the Chukchi Sea region, with a broad reference to sites located within the regions of the Arctic Coast, Brooks Range, and North Slope, is provided below.

3.1.1 Paleoindian Tradition (11,800 to 8800 years ago)

The oldest well-documented sites in northern Alaska belong to what some archaeologists refer to as the Paleoindian tradition, dating to perhaps as old as 11,800 years and as recent as 8800 years ago. The oldest sites in the Brooks Range are Mesa and Tuluaq Hill (Kunz and Reanier 1994, 1995; Rasic 2000; Kunz et al. 2003). Information from these sites, along with others such as the fluted points at the Putu and Lisburne sites (Alexander 1987; Bowers 1982), imply temporal and cultural connections with early sites in more temperate latitudes such as the Great Plains and the American Southwest (Kunz and Reanier 1994, 1995; Clark and McFayden-Clark 1983; Loy and Dixon 1998; Kunz et al. 2003). During three seasons of test excavations at the Raven Bluff site (49-DEL-00402), some 40 miles northeast of Kivalina, BLM researchers have obtained fluted points, well preserved faunal materials, and radiocarbon dates from the Late Pleistocene (10,750 rcy B.P.[3]) (Hedman 2010).

[2] This section is based on materials presented in Stern, Reuther, Bowers, Gelvin-Reymiller, and Hays (in prep.) which is based on previous NLUR reports by McIntosh and Bowers (2000), Reuther (2003), Reuther and Betts (2005) and Potter et al. (2000).

[3] *Before Present*, written as "B.P." is specifically "radiocarbon years, before present time" (by convention, the year 1950). Due to fluctuations in the natural carbon cycle, this may differ from actual calendar years.

Remarkable similarities exist in artifact forms (especially large, thick projectile points, scrapers and spurred gravers), site settings, and implied subsistence patterns. Organic remains are not well preserved in these sites. Lack of organic remains forces subsistence system comparisons and interpretations to be made entirely from the identification of protein residues adhering to lithic artifacts (Loy and Dixon 1998). Alternatively, archaeologists hypothesize an indirect association to fauna present within a broad region during the time period of site occupancy (Kunz et al. 2003). Thus, archaeologists hypothesize that Brooks Range Paleoindians hunted late Pleistocene mega-fauna such as mammoth, bison, and caribou (Loy and Dixon 1998; Kunz et al. 2003).

3.1.2 American Paleoarctic Tradition (10,000 to 7000 years ago)

The American Paleoarctic tradition appeared after or is possibly contemporaneous with the Paleoindians (Anderson 1970). American Paleoarctic assemblages are generally thought to date between about 10,000 and at least 7000 years ago (Anderson 1988). Several stone tool types, especially distinctive cores, blades, and burins found in American Paleoarctic sites are remarkably similar to stone technologies from Northeast Eurasia, suggesting cultural connections across the Bering Land Bridge. American Paleoarctic tool kits are oriented toward the production of composite antler and stone projectiles, used to dispatch late Pleistocene-early Holocene fauna (Larsen 1968).

American Paleoarctic sites from the Brooks Range include the Onion Portage Akmak and Kobuk complexes (Anderson 1988), Gallagher Flint Station (Dixon 1975; Bowers 1983), Lisburne Site (Bowers 1982), and sites DEL-166 and DEL-168 from the Red Dog Mine area (Gerlach and Hall 1996). The exact timing of the American Paleoarctic in the Brooks Range is open to question, with suggestions by some archaeologists that it persisted into the late Holocene (Ferguson 1997; Bowers 1999).

3.1.3 Northern Archaic Tradition (6000 to 2000 years ago)

Sometime between about 5000 and 6000 years ago, side-notched projectile point forms begin to appear in northern Alaska archaeological assemblages, a hallmark of the Northern Archaic Tradition (Anderson 1968). The broad occurrence of this point type throughout interior and northern Alaska and Yukon Territory, along with distinctive scraping implements and other lithic tools, may represent the spread of a new boreal forest-oriented cultural tradition (Anderson 1988). The Northern Archaic is represented at the Palisades site in Cape Krusenstern National Monument (Giddings and Anderson 1986), DEL-342 in the Red Dog area (Bowers et al. 1998), and in well dated contexts at Onion Portage on the Kobuk River (Anderson 1988). The Northern Archaic is also represented on the coast of the North Slope at sites such as Kuparuk Pingo (Lobdell 1986) and the Putuligayuk River Delta Overlook site (Lobdell 1981). Little is known of the Northern Archaic subsistence economy, although it is presumed that caribou hunting and other hunting and gathering activities were important (Anderson 1968, 1988).

3.1.4 Arctic Small Tool Tradition (4500 to 900 B.P.) and the Old Whaling Culture (3000 B.P.)

Beginning roughly around 4500 years ago, and possibly as early as 5500 years ago, is an archaeologically defined tradition known as the Arctic Small Tool tradition (ASTt; Harritt 1998). William Irving (1962, 1964) defined ASTt as a tradition encompassing several already defined complexes over a broad geographic range from western Alaska to Greenland, including the Denbigh Flint Complex (Denbigh or DFC). Denbigh, the earliest (4100-3700 Before Present [B.P.]) and most fully documented ASTt complex, was first discovered and defined at the Iyatayet site, located on Cape Denbigh in eastern Norton Sound (Giddings 1951, 1964). Denbigh lithic tool kits are characterized by the presence of microblades, microcores, burins, small bifacially chipped side and end blades, unifacial flake tools called 'flake knives,' and a specific style of end scraper.

Denbigh Flint Complex sites are identified as far north as the Walakpa site near Barrow. DFC is considered the earliest marine oriented subsistence adaptation known in Northern Alaska (Anderson 1984: 84). In the Chukchi Sea region, DFC sites are located at Cape Espenberg, Cape Krusenstern, Onion Portage, and the Choris Peninsula (Giddings 1964; Giddings and Anderson 1986; Anderson 1988). In Alaska, Denbigh sites lack organic artifacts likely due to preservation issues; however, archaeologists working in the Canadian Arctic have recovered organic implements from a few sites thought to relate to ASTt (McGhee 1979; Helmer 1991). The dramatic change in stone tool technology from the earlier Northern Archaic to the later ASTt assemblages may mark the introduction of the bow and arrow. Many archaeologists interpret Denbigh as a direct ancestral lineage to modern Eskimo people on the North Slope and in the arctic regions of Canada and Greenland (Giddings 1967; Irving 1964; Dumond 1987; for a another view see Gerlach and Mason 1992).

The archaeologically defined cultures known as Choris, Norton, and Ipuitak succeeded Denbigh in the Alaskan arctic. Each of these cultures' lithic assemblages display similarities to each other; the later cultures are separated and defined primarily based on presence or absence of pottery, differences in the style of pottery and organic artifacts, and inferred subsistence systems (Giddings 1957, 1964; Larsen and Rainey 1948). Anderson (1968) expanded Irving's (1962, 1964) original definition of ASTt to include Choris, Norton, and Ipiutak, which extended the time period for ASTt to c. 900 B.P. (Gerlach and Hall 1988). Dumond (1982, 1987) subscribes to the original definition of the tradition. Like Irving, Dumond separates ASTt from the later archaeological entities, lumping Choris, Norton and Ipiutak under the designation of the "Norton tradition." Each of these archaeologically defined cultures and the intrusive Old Whaling culture are summarized below.

A small, apparently isolated culture designated Old Whaling was identified at Cape Krusenstern in the Kotzebue Sound region (Anderson 1984:85; Giddings and Anderson 1986:231-267). Represented by a tight cluster of five winter and five summer house pits containing tools indicative of a whaling economy - large lance heads, harpoon blades, and long-bladed butchering tools - as well as whalebones and an obviously butchered whale skull, the Old Whaling culture is dissimilar to contemporaneous ASTt complexes or cultures. Instead, it was postulated that sometime around 3000 radiocarbon years B.P. a community of whalers moved to the beach at Cape Krusenstern from an unknown area, leaving without a trace sometime later (Anderson 1984:85). Recent reinvestigations at the Old Whaling site (Darwent 2006; Darwent and Darwent 2005) suggest that the occupants of the Old Whaling site were not actually whalers at all, but rather were seasonal residents from the Interior who traveled to the coast for the winter to hunt ring seals.

At most sites in the Chukchi Sea region, Denbigh was supplanted by the Choris culture at around 3100 B.P. The Choris culture exhibited many similarities to the previous Denbigh culture in terms of manufacture, but is characterized by a lack of Denbigh-specific chipped and ground burins, and flake knives and the presence of pottery, burin spalls from irregular flake cores, chipped adze blades, and several new styles of projectile points (Anderson 1984: 86). Choris sites also differed from Denbigh in that they showed regional variation with regard to resource procurement. Sites located inland, such as at Onion Portage on the middle Kobuk River, contained artifacts specific to caribou hunting and fishing. Coastal Choris sites included these tools and also contained artifacts used for sea mammal processing. Overall, the Choris economy appears to be based on caribou, as the majority of faunal remains from all sites are of the genus *Rangifer*.

The Norton culture followed Choris at around 2500 B.P. In the Chukchi Sea region, Norton is not well represented, with only a single house pit identified at both Onion Portage and Cape Krusenstern (Anderson 1984:88). Norton artifacts include undeveloped ground slate technology, end and side blades used as insets, drills, discoidal scrapers, chipped adze blades, unifacial flake knives, labrets, net sinkers, pecked stone vessels, and pottery with a fiber temper (Anderson 1984:87; Dumond 1984; Giddings 1967:18; Bockstoce 1979:58). Faunal remains indicate a coastal preference, and include small seal (non-species specific), bearded seal, beluga, walrus and caribou, although bone and antler fish/bird spears have also been identified (Dumond 1984:99). Archaeologists speculate that Norton people were predominantly coastal dwellers who occasionally exploited interior resources (Dumond 1984; Anderson 1984).

Larsen and Rainey (1948) first identified the Ipiutak culture at Point Hope in Northwest Alaska in 1939. Ipiutak existed along the northern coast of the Seward Peninsula from about A.D. 400–900, possibly contemporaneously with the later stages of Norton at its southerly extent (Giddings and Anderson 1986:33; Larsen 2001). Ipiutak sites within the Chukchi Sea region have been found at a number of locations, including Cape Espenberg, Cape Krusenstern and Deering (Bowers et al. 1999; Bowers 2010; Giddings and Anderson 1986; Larsen 2001). Ipiutak is characterized by elaborately carved burial goods with highly stylized engravings, the use of iron, and the absence of pottery. Typical artifacts include antler arrow and harpoon heads with inset end and side blades, uniface flake knives, discoidal scrapers and lunate knife bifaces (Anderson 1984: 88). Some have suggested that Ipiutak peoples participated in a seasonal round consisting of living in the interior during the winter and moving to the coast in the summer (Larsen and Rainey 1948; Giddings and Anderson 1986). The Ipiutak Archaeological District at Point Hope is situated on a series of beach ridges within an area of about 3,100 acres at Point Hope. The four site areas within the district are Ipiutak (XPH-003), Old Tigara (XPH-001), Tigara (XPH-008), and Jabbertown (XPH-002). Together, these sites represent an over 2000 year history of aboriginal occupation of the point. Cultures represented include Norton (600-100 B.C.), Ipiutak (A.D. 400), Birnirk (A.D. 500-700), Thule (post-A.D. 900), and late prehistoric and historic Iñupiat.

3.1.5 Northern Maritime Tradition (1500 to 50 B.P.)

The trend toward an increased reliance on the hunting of marine resources by the inhabitants of Northwest Alaska and the Arctic Coast continued, and is reflected in the name of the most recent archaeological tradition present in the area – the Northern Maritime tradition (Collins 1964). Analysis of detailed excavations at the Cape Krusenstern, Birnirk, and Walakpa sites indicates that sea mammal hunting from strategic promontories along the coast may have become a preferred subsistence strategy (Giddings and Anderson 1986; Ford 1959; Stanford 1976). In the Chukchi Sea region, the Northern Maritime tradition encompasses three archaeological complexes or cultures: Birnirk, Western Thule, and Kotzebue.

Birnirk is found at various sites along the coast between Cape Nome, Cape Lisburne and Point Barrow and dates between 1500-1000 B.P. (Gerlach and Mason 1992; Mason 2003). Birnirk sites are usually located on headlands and promontories, and are associated with coastal pursuits such as the hunting of seals or walrus. Birnirk artifacts include ground slate and chipped stone points and tools, multiple spurred harpoon heads with single barbs and opposing chert side-blade insets, decorated and plain clay lamps and cooking pots, and a particular design style that is found on many ivory objects (Anderson 1984: 90). Also characteristic of Birnirk are small human figurines carved out of wood or bark, and animal figurines made of ivory. At Cape Krusenstern, the excavation of two small Birnirk houses indicated that caribou continued to be an important economic resource (Anderson 1984: 91).

The Western Thule culture dates between about 1000-1500 B.P. Included are those people present along the coast at the time of Russian contact. Western Thule follows Birnirk in the Northern Maritime tradition. Western Thule is characterized by ground slate tools including polished ulu blades, projectile blades, and long barbed slate knives or lance blades, pottery with a heavy gravel temper, and a large number of organic implements like wood knife handles, birch bark baskets, grass matting and snowshoes (Anderson 1984; Giddings and Anderson 1986). Western Thule subsistence consisted of land hunting, fishing and seal hunting, with a strong reliance on small seals. Late prehistoric coastal material culture also shows a well-developed and complex technology based on harpooning whales from skin boats. Western Thule houses were semi-subterranean with sunken entrance tunnels that served to keep cold air out (Anderson 1984: 91).

The Kotzebue complex is a regional late prehistoric culture that bridges the span of time between Western Thule and the early historic period (Giddings and Anderson 1986:35). The complex was identified by Giddings in 1941 and 1947 based on excavations at two sites named Old Kotzebue and Intermediate Kotzebue, located near or within the present-day town of Kotzebue, (Giddings 1952:105-110). Using tree-ring data obtained from the Kotzebue sites and other excavations located on the Kobuk River, Giddings was able to establish a chronology of the past

1000 years. The Kotzebue complex (or “culture”) is considered a coastal manifestation of the Arctic Woodland Culture, a regional cultural development that practiced a combination marine-river-land subsistence economy (Giddings 1952; VanStone 1955). Subsequent research has designated the time period between A.D. 1400 and contact as the “Kotzebue period”. Many archaeologists consider the “Kotzebue period” as a local manifestation of Western Thule (Giddings and Anderson 1986).

3.2 Northwest Alaska Ethnohistory and History

The written history of northwest Alaska begins with the observations of Russian explorers Vasil’ev and Shishmarev (Ray 1983) and with the writings of the Russian explorer Kashevarov in 1838 (Burch 1998). From that time period to the present, the Iñupiat residents of the region have undergone numerous changes in response to availability of new material goods, effects of contact with missionaries, whalers, traders, disease, alcohol, the military, and oil and gas development. This transition is illustrated archaeologically at the historic site of *Quuqpaq* (Kuukpak, XPH-00084, Point Hope TLUI #153), on the lower Kuukpak River. *Quuqpaq* contains the modern fishing cabins of several Point Hope families, as well as the ruins of older houses. The area is an important subsistence site for hunting, trapping, berry picking, and especially the fall fishery (Koonuk et al. 1987:82).

Northern Alaska is the traditional home of the Iñupiat Eskimo. During the period 1816 to 1842, there were 25 autonomous, traditional societies of Iñupiat in Northwest Alaska, a region that encompassed the coastline and drainages of Seward Peninsula, Kotzebue Sound, and the Chukchi and Beaufort Seas (Burch 1978, 1998). The traditional Point Hope Iñupiat are known as the Tikiġaġmiut. The Tikiġaġmiut nation occupied the area between Cape Beaufort on the north and Kisimilok Creek to the south in the nineteenth century, centered around Point Hope and Cape Lisburne (Burch 1981). Early nineteenth century population estimates range from 1,300 to 900 people in several dozen settlements within the district (Burch 1981:14, 1998). The Tikiġaġmiut seasonal round consisted of bowhead whale hunting in the spring at Tikirak, the large settlement at the tip of the Point Hope spit, although a few families hunted whales at Cape Lisburne (Uivok). Following whaling season, families dispersed along the coast continuing to hunt small marine mammals such as seals and walrus. As the ice broke up and left the coast, some families traveled to trade fairs at Sisualik, Niglik, or the mouth of the Utukok River while others moved inland to hunt caribou in the summer, harvest freshwater fish, pick berries, and hunt small and large game. Families returned to fall and winter settlements by freshwater freezeup, distributed along the coast, and on the lower and middle reaches of the Kuukpak (Kukpuk) River (Burch 1978:292). Caribou hunting inland, and seal hunting on the coast sustained families at their fall and winter settlements.

Rapid changes to traditional Iñupiat society began to take place with the advent of commercial whaling in the 1850s, activities which reached their peak in the 1880s, and lasted until about 1910 (Bockstoce 1986). The economy of the area during this period became increasingly cash-based, although traditional subsistence activities were never abandoned (Cassell 2000). Shore-based commercial whaling stations appeared from 1887 staffed with non-Natives and Natives who were outsiders to the Point Hope region. This marks the start of Jabbertown, named for the babble of languages and dialects spoken there (Lowenstein 2008). From the 1880s to the turn of the century, marine mammal resources and caribou herd numbers decreased, whether due to natural population cycles or resource depletion due to the increased use of firearms for hunting (Stern et al. 1980). In the 1880s (possibly 1881-1883), a "Great Famine" occurred in northwest Alaska, as caribou numbers were severely depleted. The Point Hope district was apparently spared, and members of other societies who fled to Point Hope apparently had higher survival rates than those who fled elsewhere (Burch 1998:48-49). The massive starvation may have also been accompanied by an epidemic, and Burch (1998: 48) estimates that as much as 50% of the northwestern Alaska population died of starvation or sickness by 1882. To the south of the Point Hope district Burch (1998:49) notes that "In the spring of 1883 there was probably not a single living person in the Kivalina district." By the winter of 1885-86, the whale, walrus, and caribou stocks had already declined significantly, and other Point Hope resources also failed. Dozens of Point Hope people died (Burch 1981:17).

During the 1890s, missions began to be established in Northwestern Alaska, and within twenty years Christianity was widespread (Burch 1994). An Episcopal mission was established in Point Hope in 1890, in part as an effort to stabilize the community after the disruptive events of a reign of terror by the shaman and murderer Ataŋauraq, the establishment of the shore-based whaling stations, alcohol obtained from whalers, and the movement of people from outside the Point Hope region into the society (Lowenstein 2008:139).

Reindeer herding was introduced to the Point Hope area in the mid-1890s, by Point Hopers who went to Teller to learn the skills and brought back reindeer for the Point Hope herd. Prior to the 1930s, people were still living in dispersed settlements during parts of the year; however, they centered increasingly year-round at the mission and school sites (Burch 1984: 314). By the time of the Great Depression, permanent communities such as Point Hope (old village) emerged due to a drop in the fur market and reindeer population (Burch 1984:314). In the 1940s, caribou began returning to the area and, by the 1950s the caribou population had substantially increased, absorbing the remaining reindeer herds (Stern et al. 1980).

With the onset of World War II, Euroamerican population numbers in the region increased bringing a new wave of diseases (VanStone 1962). The birth and mortality rate of the Native populations grew during the 1940 and 1950s. National Guard Armories were established throughout the rural Alaska territory and provided an extra wage income to those who enlisted. The difficulty and high cost of obtaining building materials resulted in few wood frame buildings being constructed in Point Hope until the 1940s. The Point Hope population was 265 in 1956, including 112 individuals under the age of 15 (Koonuk et al. 1987:52). As late as the early 1960s, some families were still living in sod houses (Burch 1984). Wage employment during the summers at DEW line stations and other construction sites provided cash incomes to support the increasing use of outboard motors, fuel purchases, and store-bought goods.

In 1957-58, United States Atomic Energy Commission began the Plowshare Program that led to the planning and study of nuclear-excavation technology, the "Atoms for Peace" program (Wilimovsky and Wolfe 1966). The proposed excavation of a harbor by nuclear explosion near Cape Thompson, Alaska, known as Project Chariot, was one such effort.

As a result of protests against Project Chariot, and in response to native land claim issues, Native groups in the North Slope region formed the non-profit Inupiat Community of the North Slope (O'Neill 1994). The passage of the Alaska Native Claims Settlement Act of 1971 (ANCSA) established thirteen regional corporations and over 200 village corporations to administer the lands and money to be received by Alaska Natives under the terms of the ANCSA (Burch 1984).

The Arctic Slope Regional Corporation (ASRC), Inc., became the for-profit regional corporation of which most Point Hope residents are shareholders.[4] Some health and social services at Point Hope are provided by Maniilaq Association, the NANA region social services organization, since health care facilities are closer at Kotzebue. The Native Village of Point Hope (NVPH) is the federally-recognized tribe in the community. Today, Point Hope residents practice a mixed cash-subsistence based economy (Pedersen, Kruse, and Braund 2009), and Native art production supplements many household incomes. The population is estimated at 713 residents as of 2009 (ADCED 2010).

3.3 Previously Known Cultural Resources

NLUR staff searched the AHRS prior to conducting the fieldwork portion of the cultural resources survey. The sites listed on the AHRS within the vicinity of the project are listed in Table 2 below. The sites are depicted on Figure 2. Note that AHRS site locations are approximate only, and some site boundaries encompass hundreds of acres or more (Ipiutak National Historic Landmark and Ipiutak Archaeological District, for example).

Table 2. Known Cultural Resources in the Kuukpak Road Extension Project Vicinity

AHRSNO	Name and Description	Location, Distance from Project
XPH-002	Jabbertown - the name "Jabbertown" was shown on an 1898 manuscript map; so called because of the multiple languages of the whalers and their families. In 1939 Larsen, Rainey, and Giddings excavated a large composite house of Western Thule affiliation, circa BP 1000. Hosley noted some 30 large dwellings features here. Burch noted the existence of two houses here during the 1800s. Koonuk, et al., (1987: 140) separated the locality into two sites, Jabbertown and Beacon Hill, one mile further east. At least 28 old houses, 9 more recent houses, 7 possible houses, and 16 cache pits were noted at the Jabbertown site. At least 13 houses, a number of unidentified depressions, a 1940s cabin, numerous graves, and "Cooper's house," the residence of the whaler Henry Koenig, were noted at Beacon Hill.	Within 2 miles of the project. Exact boundaries and definition of Jabbertown and Beacon Hill locations are unclear in the existing literature.
XPH-011	Ipiutak Archaeological District - This archaeological district is situated on a series of beach ridges within an area of about 3,100 acres at Point Hope. The four site areas within the district are	The project area lies east of the District.

[4] Point Hope is a member village (Tikigaq Corporation) of the Arctic Slope Regional Corporation. However, because of its closer proximity to Kotzebue, the main hub of the NANA Region, rather than Barrow, the main hub of ASRC, many transportation and social links exist between Point Hope and NANA Region communities. Point Hope is not within the Northwest Arctic Borough, based in Kotzebue, but is within the North Slope Borough, based in Barrow.

AHRSNO	Name and Description	Location, Distance from Project
	Ipiutak (XPH-003), Old Tigara (XPH-001), Tigara (XPH-008), and Jabbertown (XPH-002).	
XPH-065	*Ulugluk* (*Ulurluk*) - Koonuk, et al. (1987:164), located two houses with the appearance of some antiquity between two large lakes off the west end of Aiautak Lagoon, about 300 feet from the ocean. Burch (1981:164) noted that this lagoon is named after Ulurluk, who is buried here.	Within 1 mile of the project.
XPH-066	*Ayagutaq* – Koonuk (Koonuk, et al. 1987), located six house mounds, several cache pits, and scattered piles of cut reindeer antler 100-200 feet from the ocean. The site was reportedly used into the 1940s and was the site of the first Point Hope reindeer corral. Burch noted this as a fall-winter and summer settlement site with two houses during the 1800s.	Within 1 mile of the project.
XPH-067	*Sinigruaq* - During a brief stop here, Koonuk et al. (1987:172) noted at least one house here. Burch (1981:42, 72) noted this as a fall-winter settlement site with two houses during the 1800s. A clay mining area is reportedly located on Sinigrok Point, the opposing spit.	Within 3 miles of the project.
XPH-064	*Nuvugaluaq* (*Nuvugalak*, *Nuvuraluaq*) - Koonuk et al. (1987:108-112) located one old sod house ruin on the south edge of a short spit, about 25 ft above the beach. Bone and fire cracked rock were noted in several blowouts in the vicinity. Burch (1981:71) noted this as a fall-winter settlement site with one house during the 1800s.	Within 4 miles of the project.
XPH-075	*Sululpauraqtuuq* - Burch (1981:40, 74) noted this as a fall-winter settlement site, in a major fishing and berry picking area, with one house during the 1800s.	Within 5 miles of the project.
XPH-063	*Sinnaq* - Koonuk et al. (1987) located one old sod house ruin on the highest spot on the barrier island on the south side and east end of the entrance to Marryat Inlet. A coastal trading boat, the *Ada*, is beached nearby. Across from Sinuk Entrance, on the south bank of the mouth of Kukpuk River, historic debris associated with a house which has eroded away were also noted. Burch (1981:43, 71) noted this as a fall-winter settlement site with one house during the 1800s. It is an excellent fishing area, with spotted seals during the summer.	Within 4 miles of the project.
XPH-076	*Itsurvik* - Burch (1981:40, 74) noted this as a fall-winter settlement site with one house during the 1800s. The area provided fishing and spotted seal hunting in summer and early fall.	Within 4 miles of the project.
XPH-077	*Qanniq* - Burch (1981:40, 74) noted this as a fall-winter settlement site with one house during the 1800s.	Within 4 miles of the project.
XPH-148	Cold War Cache - Site consists of the remains of a Cold War era military survival cache. The structure was one of several constructed by the Air Force in the Point Hope vicinity. It was constructed below grade and measured 10 ft x 20 ft x 6 ft deep. The cache was apparently cribbed with wooden planks and the wood roof was held up by 6 in x 6 in square posts. (USDOD, ACE 2006)	Within 1 mile of the project.

Northern Land Use Research, Inc. 2010
Data from AHRS (July, 2010) and published and unpublished reports.

The Ipiutak National Historic Landmark (NHL) was designated on January 21, 1961 (www.nps.nhl.gov/ak/ipiutak). The Landmark covers 200 acres of land on the Point Hope spit. The Ipiutak Archaeological District (XPH-011) is west of the project area. Several of the sites listed in the table above, as well as the Ipiutak NHL and the Ipiutak Archaeological District are large localities, without clearly marked, surveyed boundaries on the ground.

4.0 SURVEY RESULTS

4.1 Survey Results

Conditions during the field survey varied each day. August 31 was clear and warm, with calm winds. September 1 was clear in the morning, but clouded over with light rain and light winds by afternoon. September 2 had low overcast with wind and rain in the morning, clearing by afternoon. Conditions made traveling by four-wheeler cold, but did not adversely affect the ability to travel and survey for surface indications of cultural resources. Temperature was estimated to be in the mid to upper 40s F. Figure 3 presents the preliminary road design within the study area in light tan on the figure. Figure 4 shows the field survey tracks in yellow which largely followed the tentative road design location. Figure 5 is a panorama across moist sedge-tussock tundra showing typical weather and travel conditions.

During the four-wheeler travel we noted numerous four-wheeler trails across the tundra and wetlands areas. Repeated travel across the same location by four-wheelers causes the tundra to become flattened, water-saturated, and more difficult to traverse by four-wheelers following. The result is that trails tend to spread wider and wider, impacting more and more surface area. Figure 6 illustrates this braiding phenomena. The best trail we encountered in the project study area is located at the base of the east-west trending hill where the vegetation changes from moist to dry tundra on the hillside to wet tundra and standing water in the low-lying flatter terrain. These trails are a cultural feature, albeit a recent one. The trails are used for travel to and from Point Hope and outlying camps and cabins, and to access berry picking areas. The project area has numerous patches of *aqpiik* (*Rubus chamaemorus*, “cloudberries”, “salmonberries). (Figure 7 and Figure 8).

We were looking for any evidence of human utilization of the area, such as ice cellars, above-ground box burials or grave fences, sod houses, caches, camps, drying racks, lithic scatters, or other artifacts or features. These types of features are visible across the tundra at Beacon Hill one mile to the west of the project study area, and at various locations further away from the project area that we surveyed.

The only cultural features noted during the survey are modern, recent artifacts or features. Archaeologists have coined the term “modern artifact scatters” (MAS) for the numerous beverage containers, 55 gallon drums, scrap metal and wood, broken or abandoned transportation items, and other recent materials left across the tundra landscape by local travelers, oil and mineral exploration parties, and recreational hikers and campers. We noted several of these sorts of scatters during the survey, including aluminum beverage cans, candy bar wrappers, and discarded food packaging. We found a small backpack with a Stanley ® Thermos bottle inside. The local owners name was printed on the thermos, so our local guide returned it to him at the end of the day.

The remains of caribou were noted at several locations consisting of crania with antlers attached, rib cages, and various long bones.

South of the project survey area, located at the northern edge of a Native Allotment, we observed one collapsed sod house or cache. Several walrus skulls are visible scattered around the sod mound. The structure is on the side of the long east-west trending hill which rises to over 50 feet above sea level (asl), paralleling the south shore of the Tigara Peninsula. The view from the structure across the low-lying tundra and lakes to the north makes it a fine vantage point for observing game. As the structure is outside of the project area, no affects to it are anticipated from the road extension work.

An abandoned wooden snowmachine sled is located on the tundra in the western end of the project survey area (Figure 10). The sled is made with dimension lumber and plywood, with solid wooden runners sheathed with white p-tex plastic on the bottom. Cross slats are placed across the runners with a one inch gap between each of the 17 cross slats. A longitudinal strip is nailed on top of the cross slats. The gap between the slats and the longitudinal strip creates an opening to attach lashing ropes to tiedown the load. The sled had weathered yellow polypropylene rope attached through a number of these tiedown holes. At the rear of the sled, plywood sheets were attached with nails and reinforced with angle brackets to create support sidewalls and an endwall. A metal pipe and wooden hitch projected forward of the front edge of the upright angled runners. Overall dimensions of the sled are 8 feet (1.75 m) long by 24 inches (60 cm) wide by 8 inches (21 cm) high runners. The sled is modeled on the aboriginal *qamum* sled with similar dimensions, but manufactured from driftwood and utilizing sealskin, ugruk, or baleen twine for lashings (Burch 2006:252). Propulsion power was people or dogs in traditional times.

Another category of observed features are remains from cadastral survey parties. We located the remains of an airphoto panel, consisting of pieces of wood, and the ripped up pieces of the white plastic cross as well as the 2 inch aluminum cap on rebar in the center,
Labeled:

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1991

In addition, the corners of Native Allotments on the southern coast of Tigara Peninsula have all been surveyed by the U.S. Bureau of Land Management (BLM). The aluminum survey monuments for the corners of the allotments were noted during the cultural resources survey, as we were required to stay north of those allotments within the road extension corridor.

None of these recent cadastral survey monuments meet any eligibility requirements for placement on the National Register of Historic Places.

U.S. Coast and Geodetic Survey monument “Pt Hope Astro” is noted on the U.S. Geological Survey quadrangle for the project study area. We located the monument and two associated reference monuments on the tundra. The blown down remnants of wooden tripods marking the survey monument are located on the tundra around the monument. The tripod measures 5’-10”

(170 cm) tall and 32” (80 cm) wide at the base. Figure 9 depicts the vicinity of the monument and shows the monument at center and the tripod wood remains on the ground around it.

5.0 Summary and Recommendations

5.1 Summary

In summary, NLUR archaeologists conducted pedestrian and four-wheeler visual survey of the Kuukpak Road extension study area. We located a number of modern artifact scatters (MAS) consisting of recent (twentieth century) materials relating to transportation, travel, hunting, and cadastral survey. Materials noted included discarded beverage cans, food wrappers, a wooden sled, caribou antlers and bone, cadastral survey monuments and associated wooden marker boards, and broken Styrofoam insulation pieces blown across the tundra. Repeated use by four-wheelers has established an ad hoc trail system along the northern base of the east-west trending hill which borders the northern shore of Alautak Lagoon.

None of the resources noted during the survey of the project study area meet criteria of significance or integrity for eligibility for listing on the National Register of Historic Places.

5.2 Recommendations

Northern Land Use Research, Inc. recommends that a finding "No Historic Properties Affected" for the 2010 study area be forwarded to the State Historic Preservation Officer (SHPO) by the North Slope Borough (the project proponent).

5.3 Human Remains

Because archaeological materials, features, and other potentially significant cultural remains are commonly buried, they may not be identifiable from the surface or revealed in limited subsurface sampling. Should indications of additional potentially significant cultural resources be encountered during ground-disturbing activities, all work in that area should cease until the discovery can be fully evaluated by a qualified archaeologist, and the Alaska SHPO notified. In the event that human remains or other indications of burials are found on federal or tribal lands during ground-disturbing activities, the protocol established under the Native American Graves Protection and Repatriation Act (NAGPRA) must be followed. Immediate steps should be taken to secure and protect the human remains and cultural items, including stabilization or covering, as appropriate. The Project Manager/Superintendent should immediately notify both the SHPO and the local Native American organizations likely to be culturally affiliated with the discovered remains.

The name and address of the SHPO is:	Native American and Municipal Organizations:
Judith Bittner State Historic Preservation Officer Alaska Department of Natural Resources Office of History and Archaeology 550 West 7th Ave., Suite 1310 Anchorage, Alaska 99501-3565 Phone: 907-269-8715 or 269-8720	**Village Council** - Native Village of Point Hope P.O. Box 109 Point Hope, AK 99766 Phone 907-368-2330 Fax 907-368-2332 E-mail lilyh.tuzroyluke@tikigaq.org Web http://www.tikigaq.com
	Borough - North Slope Borough

	P.O. Box 69 Barrow, AK 99723 Phone 907-852-2611 Fax 907-852-0337 E-mail sheila.burke@north-slope.org; jeannie.brower@north-slope.org Web http://www.north-slope.org/
	Village Corporation - Tigara Corporation 2121 Abbott Road Anchorage, AK 99507- Phone 907-365-6299 Fax 907-365-6250 E-mail rrock@tikigaq.com
	City - City of Point Hope P.O. Box 169 Point Hope, AK 99766-0169 Phone 907-368-2537 Fax 907-368-2835 E-mail akphogov@hotmail.com

5.4 Limitations

This project was carried out, and this report prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of HDL, the community of Point Hope, the State Historic Preservation Officer, other appropriate permitting agencies, interested Tribes and Native American organizations, and other authorized agencies or individuals for specific application to the referenced project. It should be noted that NLUR relied upon written information and/or verbal accounts provided by the agencies and individuals indicated in the report. NLUR can only relay this information and cannot be responsible for its accuracy or completeness. This report is not meant to represent a legal opinion.

We do not warrant that we have identified all potentially significant cultural resources present at the study area through literature review and field examination. Cultural resources may be hidden in such a way that only extensive excavations, use of remote sensing equipment (e.g., ground penetrating radar, magnetometer), or other technologies or methods not included in our scope of work will reveal them. No other warranty, express or implied, is made. Any questions regarding our work and this report, the presentation of the information, and the interpretation of the data are welcome and should be referred to Project Archaeologist Richard Stern in Anchorage (907) 345-2457 or to NLUR Project Manager Burr J. Neely, or Principal Investigator-NLUR Peter M. Bowers in Fairbanks at (907) 474-9684.

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7.0 FIGURES

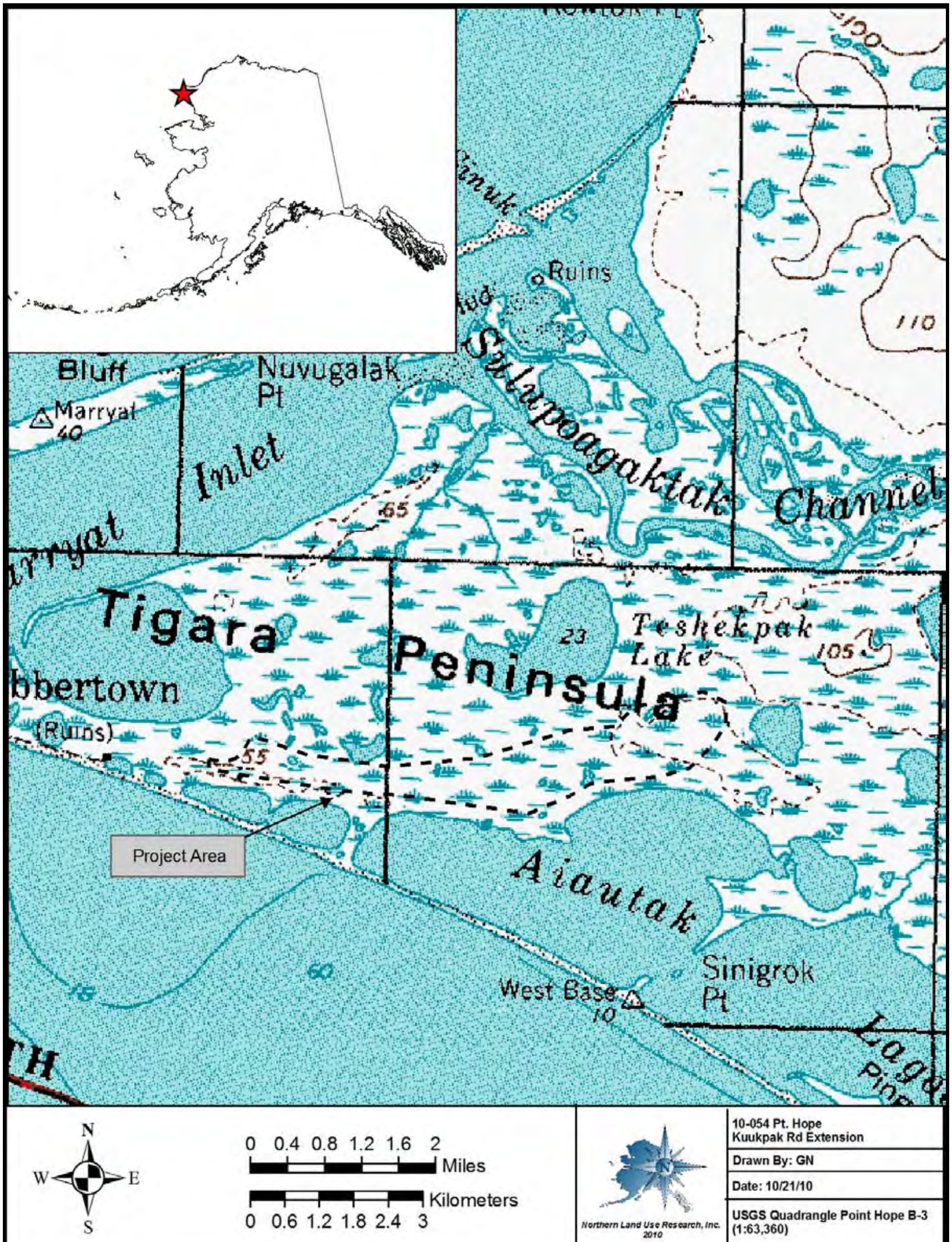

Figure 1. General project vicinity map, Point Hope, Alaska .

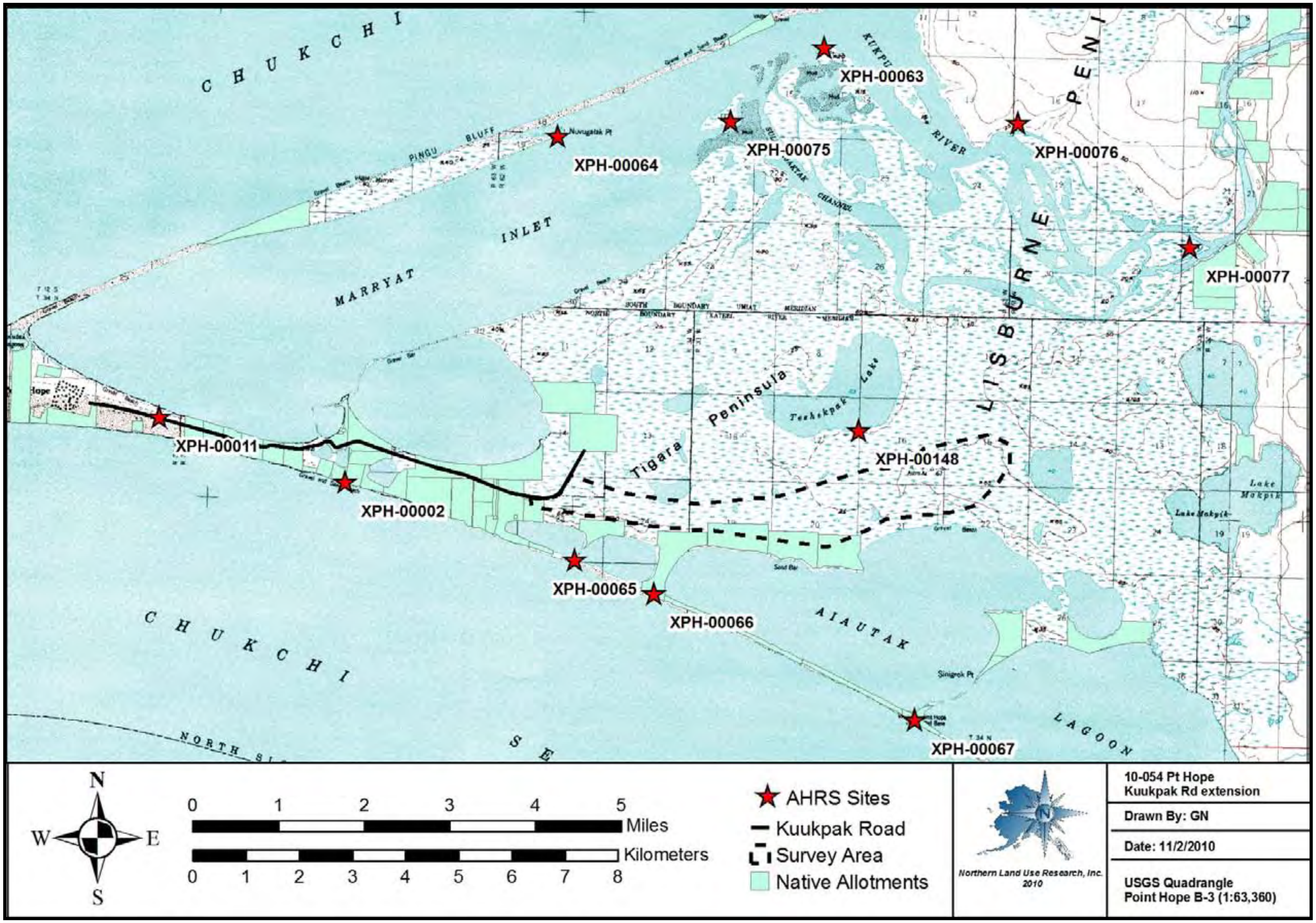

Figure 2. Project location map and AHRS sites in vicinity of the project survey area.

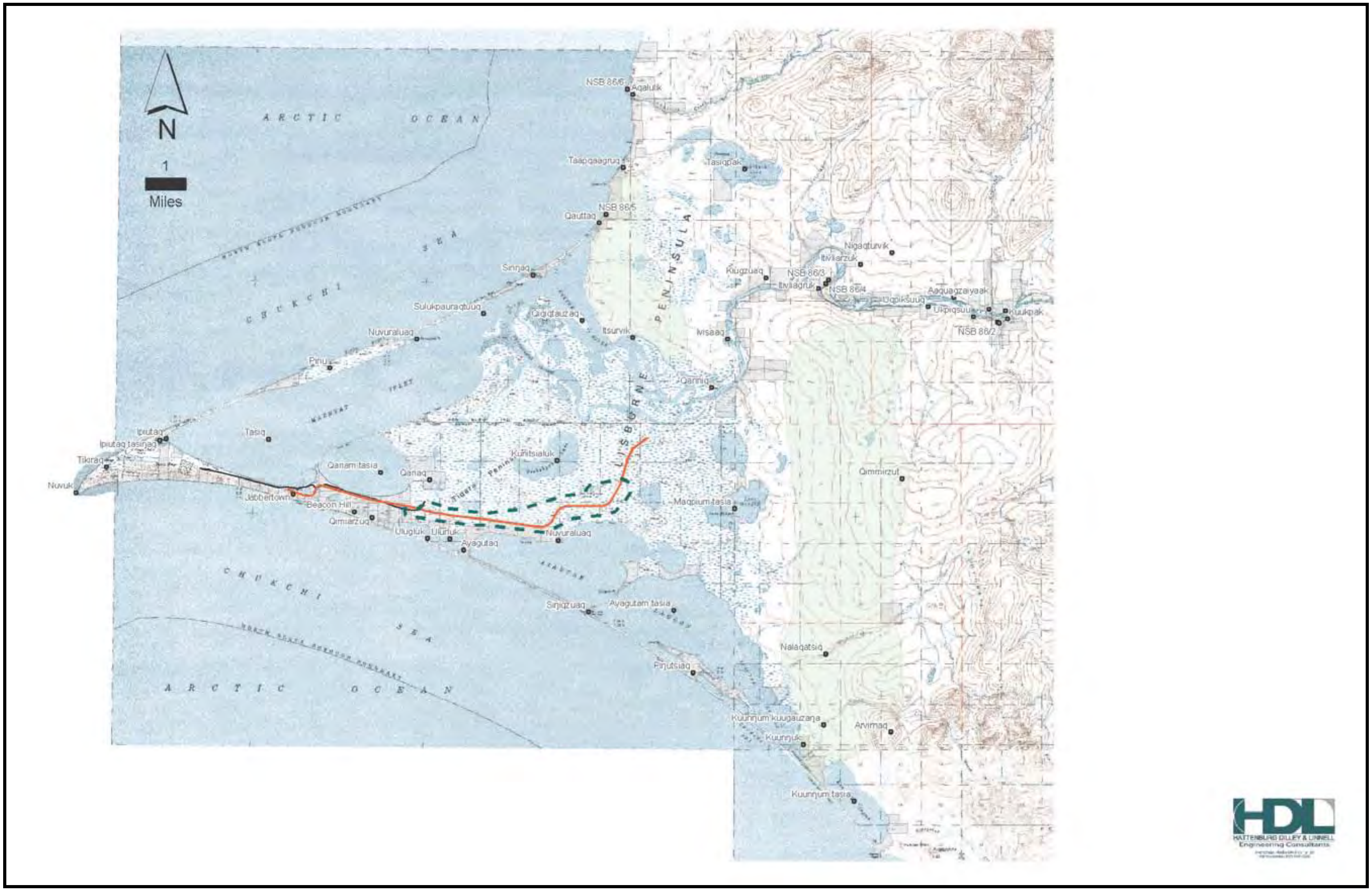

Figure 3. Iñupiaq place names, project location, and preliminary road design to terminus 1. (Figure courtesy of HDL)

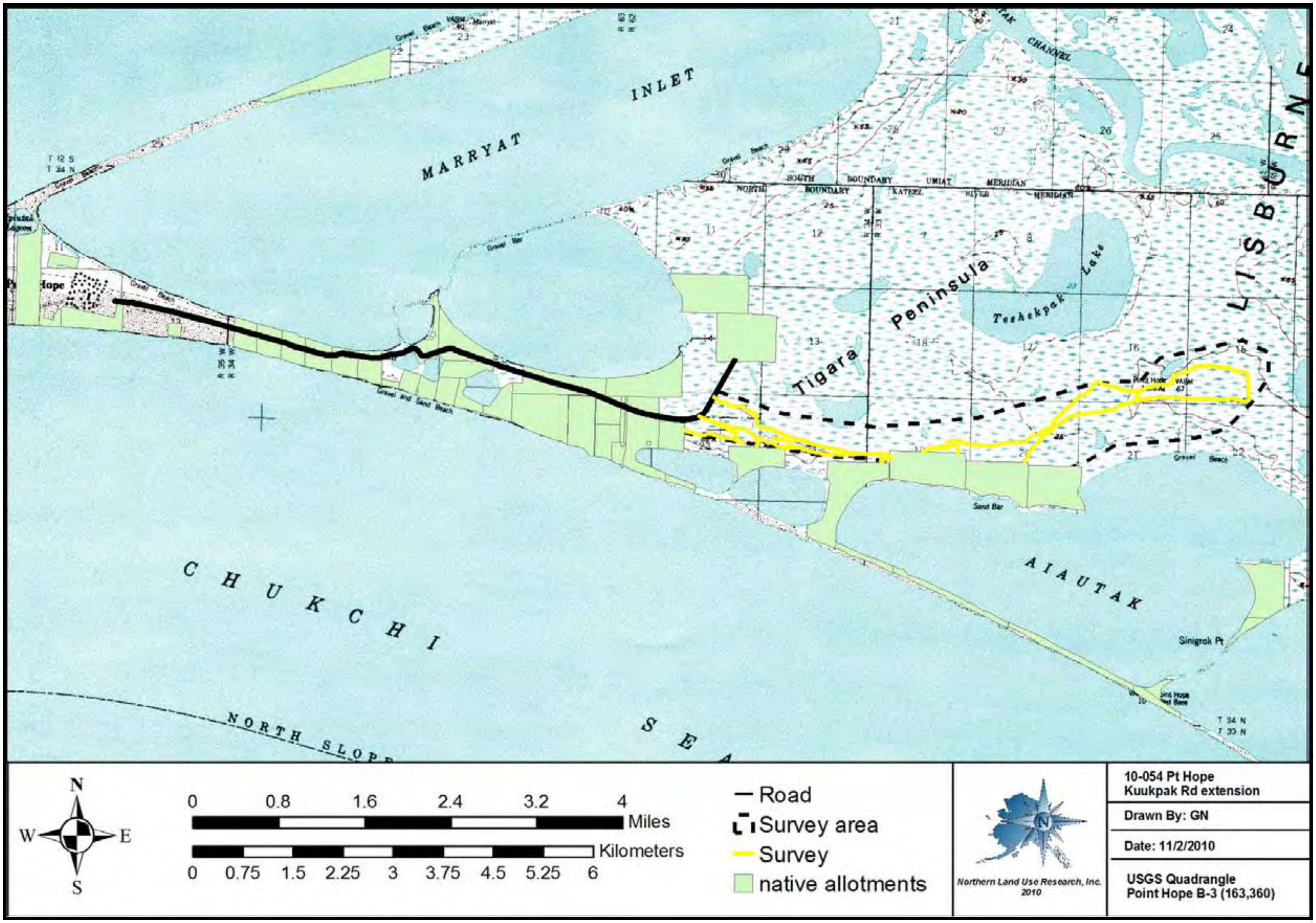

Figure 4. Project study area and pedestrian and four-wheeler survey tracks (in yellow).

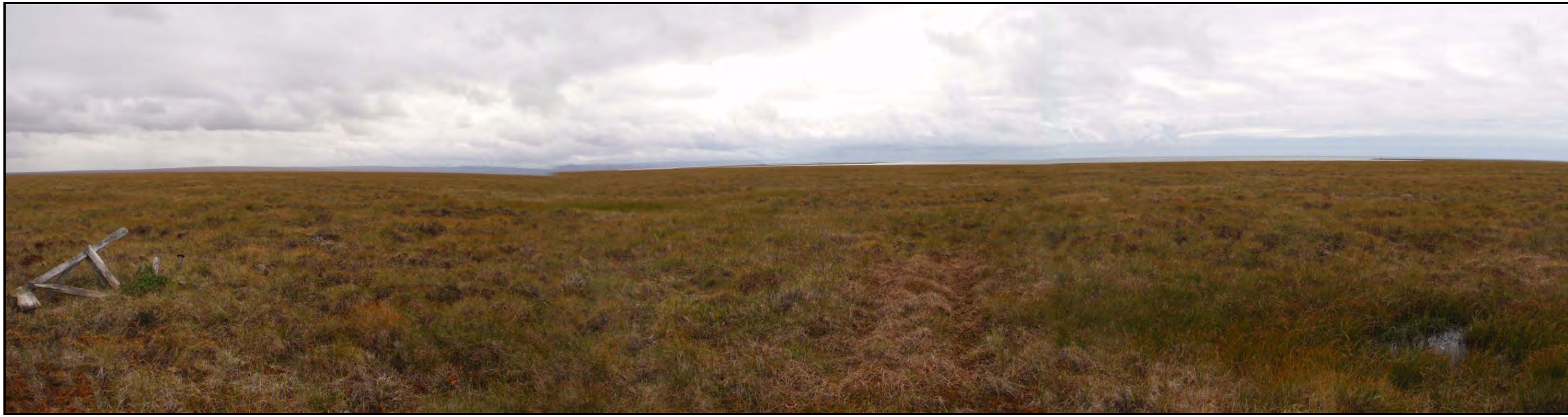

Figure 5. Tundra panorama with USCGS ASTRO at left, looking northwest through north, showing typical moist sedge-tussock tundra. (NLUR photo)

Figure 6. Repeated four-wheeler travel across wet tundra and standing water causes "trail spread", as shown by multiple four-wheeler tracks. (NLUR photo)

Figure 7. Salmonberry patch (Rubus chamaemorus). NLUR photo

Figure 8. Trails through the project area lead to ripe salmonberry picking locations. (NLUR photo)

Figure 9. USCGS monument Point Hope ASTRO AZ and wooden marker tripod. (NLUR photo)

Figure 10. Abandoned snowmachine sled on the tundra. (NLUR photo)

APPENDIX G

Cost Estimates

Initial Project Estimate
Point Hope Evacuation Road
Alignment Option "A"

Table 5 Estimated Construction Cost, (9.43 Road Miles)

Material Source	PHRK04	PHRK07	Barged Gravel
18' Width w/TOs, 3:1 Slopes	$74,723,800	$53,040,800	$389,699,900
18' Width w/ TOs, 2:1 Slopes	$63,066,500	$45,190,900	$325,228,600
24' Width no TOs, 3:1 Slopes	$82,447,800	$58,318,900	$434,595,000
24' Width no TOs, 2:1 Slopes	$70,790,500	$50,469,100	$370,123,700

In Millions	74.7	53.0	389.7
	63.1	45.2	325.2
	82.4	58.3	434.6
	70.8	50.5	370.1

Initial Project Estimate
Point Hope Evacuation Road
Alignment Option "A"

18' Width w/ Turnouts
3:1 Slopes
Material Source PHRK04

5/2/2017

ITEM	ESTIMATED QUANTITY	DESCRIPTION	UNIT BID PRICE	TOTAL BID PRICE
1	1 Ea.	Mobilization, Surveying, Misc	7,000,000.00	7,000,000
		Road:		
2	28,300 C.Y.	Crushed Aggregate Surface Course	75.00	2,122,500
3	622,900 C.Y.	Subbase	73.00	45,471,700
4	2,900 L.F.	24" Culvert	175.00	507,500
5	305,400 S.Y.	Geotextile, Separation	3.00	916,200
6	10,246,900 B.F.	Insulation Board	1.00	10,246,900
		Staging Area:		
2	11,500 C.Y.	Crushed Aggregate Surface Course	75.00	862,500
3	17,200 C.Y.	Subbase	73.00	1,255,600
4	0 L.F.	24" Culvert	175.00	0
5	0 S.Y.	Geotextile, Separation	3.00	0
6	0 B.F.	Insulation Board	1.00	0
		Subtotal Construction		$68,382,900

Land Acquisition		0
Owner Administration	@ 0%	0
Design	@ 0%	0
Construction Management	@ 0%	0
Project Contingency	@ 0%	0
3 Years Inflation	@ 3%	6,340,900
Total		$74,723,800

Initial Project Estimate
Point Hope Evacuation Road
Alignment Option "A"

18' Width w/ Turnouts
2:1 Slopes
Material Source PHRK04

5/2/2017

ITEM	ESTIMATED QUANTITY	5/2/2017	UNIT BID PRICE	TOTAL BID PRICE
1	1 Ea.	Mobilization, Surveying, Misc	7,000,000.00	7,000,000
		Road:		
2	27,400 C.Y.	Crushed Aggregate Surface Course	75.00	2,055,000
3	510,500 C.Y.	Subbase	73.00	37,266,500
4	2,300 L.F.	24" Culvert	175.00	402,500
5	239,000 S.Y.	Geotextile, Separation	3.00	717,000
6	8,155,700 B.F.	Insulation Board	1.00	8,155,700
		Staging Area:		
2	11,500 C.Y.	Crushed Aggregate Surface Course	75.00	862,500
3	17,200 C.Y.	Subbase	73.00	1,255,600
4	0 L.F.	24" Culvert	175.00	0
5	0 S.Y.	Geotextile, Separation	3.00	0
6	0 B.F.	Insulation Board	1.00	0

Subtotal Construction		$57,714,800
Land Acquisition		0
Owner Administration	@ 0%	0
Design	@ 0%	0
Construction Management	@ 0%	0
Project Contingency	@ 0%	0
3 Years Inflation	@ 3%	5,351,700
Total		$63,066,500

Initial Project Estimate
Point Hope Evacuation Road
Alignment Option "A"

24' Width w/o Turnouts
3:1 Slopes
Material Source PHRK04

5/2/2017

ITEM	ESTIMATED QUANTITY	5/2/2017	UNIT BID PRICE	TOTAL BID PRICE
1	1 Ea.	Mobilization, Surveying, Misc	7,000,000.00	7,000,000
		Road:		
2	36,800 C.Y.	Crushed Aggregate Surface Course	75.00	2,760,000
3	695,100 C.Y.	Subbase	73.00	50,742,300
4	3,100 L.F.	24" Culvert	175.00	542,500
5	332,000 S.Y.	Geotextile, Separation	3.00	996,000
6	11,292,500 B.F.	Insulation Board	1.00	11,292,500
		Staging Area:		
2	11,500 C.Y.	Crushed Aggregate Surface Course	75.00	862,500
3	17,200 C.Y.	Subbase	73.00	1,255,600
4	0 L.F.	24" Culvert	175.00	0
5	0 S.Y.	Geotextile, Separation	3.00	0
6	0 B.F.	Insulation Board	1.00	0

Subtotal Construction		$75,451,400
Land Acquisition		0
Owner Administration	@ 0%	0
Design	@ 0%	0
Construction Management	@ 0%	0
Project Contingency	@ 0%	0
3 Years Inflation	@ 3%	6,996,400
Total		$82,447,800

Initial Project Estimate
Point Hope Evacuation Road
Alignment Option "A"

24' Width w/o Turnouts
2:1 Slopes
Material Source PHRK04

5/2/2017

ITEM	ESTIMATED QUANTITY	5/2/2017	UNIT BID PRICE	TOTAL BID PRICE
1	1 Ea.	Mobilization, Surveying, Misc	7,000,000.00	7,000,000
		Road:		
2	35,900 C.Y.	Crushed Aggregate Surface Course	75.00	2,692,500
3	582,700 C.Y.	Subbase	73.00	42,537,100
4	2,500 L.F.	24" Culvert	175.00	437,500
5	265,600 S.Y.	Geotextile, Separation	3.00	796,800
6	9,201,300 B.F.	Insulation Board	1.00	9,201,300
		Staging Area:		
2	11,500 C.Y.	Crushed Aggregate Surface Course	75.00	862,500
3	17,200 C.Y.	Subbase	73.00	1,255,600
4	0 L.F.	24" Culvert	175.00	0
5	0 S.Y.	Geotextile, Separation	3.00	0
6	0 B.F.	Insulation Board	1.00	0

Subtotal Construction		$64,783,300
Land Acquisition		0
Owner Administration	@ 0%	0
Design	@ 0%	0
Construction Management	@ 0%	0
Project Contingency	@ 0%	0
3 Years Inflation	@ 3%	6,007,200
Total		$70,790,500

Initial Project Estimate
Point Hope Evacuation Road
Alignment Option "A"

18' Width w/ Turnouts
3:1 Slopes
Material Source PHRK07

5/2/2017

ITEM	ESTIMATED QUANTITY	5/2/2017	UNIT BID PRICE	TOTAL BID PRICE
1	1 Ea.	Mobilization, Surveying, Misc	7,000,000.00	7,000,000
		Road:		
2	28,300 C.Y.	Crushed Aggregate Surface Course	75.00	2,122,500
3	622,900 C.Y.	Subbase	42.00	26,161,800
4	2,900 L.F.	24" Culvert	175.00	507,500
5	305,400 S.Y.	Geotextile, Separation	3.00	916,200
6	10,246,900 B.F.	Insulation Board	1.00	10,246,900
		Staging Area:		
2	11,500 C.Y.	Crushed Aggregate Surface Course	75.00	862,500
3	17,200 C.Y.	Subbase	42.00	722,400
4	0 L.F.	24" Culvert	175.00	0
5	0 S.Y.	Geotextile, Separation	3.00	0
6	0 B.F.	Insulation Board	1.00	0

Subtotal Construction		$48,539,800
Land Acquisition		0
Owner Administration	@ 0%	0
Design	@ 0%	0
Construction Management	@ 0%	0
Project Contingency	@ 0%	0
3 Years Inflation	@ 3%	4,501,000
%		
Total		$53,040,800

Initial Project Estimate
Point Hope Evacuation Road
Alignment Option "A"

24' Width w/o Turnouts
3:1 Slopes
Material Source PHRK07

5/2/2017

ITEM	ESTIMATED QUANTITY	5/2/2017	UNIT BID PRICE	TOTAL BID PRICE
1	1 Ea.	Mobilization, Surveying, Misc	7,000,000.00	7,000,000
		Road:		
2	36,800 C.Y.	Crushed Aggregate Surface Course	75.00	2,760,000
3	695,100 C.Y.	Subbase	42.00	29,194,200
4	3,100 L.F.	24" Culvert	175.00	542,500
5	332,000 S.Y.	Geotextile, Separation	3.00	996,000
6	11,292,500 B.F.	Insulation Board	1.00	11,292,500
		Staging Area:		
2	11,500 C.Y.	Crushed Aggregate Surface Course	75.00	862,500
3	17,200 C.Y.	Subbase	42.00	722,400
4	0 L.F.	24" Culvert	175.00	0
5	0 S.Y.	Geotextile, Separation	3.00	0
6	0 B.F.	Insulation Board	1.00	0
		Subtotal Construction		$53,370,100

Land Acquisition		0
Owner Administration	@ 0%	0
Design	@ 0%	0
Construction Management	@ 0%	0
Project Contingency	@ 0%	0
3 Years Inflation	@ 3%	4,948,800
Total		$58,318,900

Initial Project Estimate
Point Hope Evacuation Road
Alignment Option "A"

18' Width w/ Turnouts
2:1 Slopes
Material Source PHRK07

5/2/2017

ITEM	ESTIMATED QUANTITY	5/2/2017	UNIT BID PRICE	TOTAL BID PRICE
1	1 Ea.	Mobilization, Surveying, Misc	7,000,000.00	7,000,000
		Road:		
2	27,400 C.Y.	Crushed Aggregate Surface Course	75.00	2,055,000
3	510,500 C.Y.	Subbase	42.00	21,441,000
4	2,300 L.F.	24" Culvert	175.00	402,500
5	239,000 S.Y.	Geotextile, Separation	3.00	717,000
6	8,155,700 B.F.	Insulation Board	1.00	8,155,700
		Staging Area:		
2	11,500 C.Y.	Crushed Aggregate Surface Course	75.00	862,500
3	17,200 C.Y.	Subbase	42.00	722,400
4	0 L.F.	24" Culvert	175.00	0
5	0 S.Y.	Geotextile, Separation	3.00	0
6	0 B.F.	Insulation Board	1.00	0
		Subtotal Construction		$41,356,100

Land Acquisition		0
Owner Administration	@ 0%	0
Design	@ 0%	0
Construction Management	@ 0%	0
Project Contingency	@ 0%	0
3 Years Inflation	@ 3%	3,834,800
Total		$45,190,900

Initial Project Estimate
Point Hope Evacuation Road
Alignment Option "A"

24' Width w/o Turnouts
2:1 Slopes
Material Source PHRK07

5/2/2017

ITEM	ESTIMATED QUANTITY	5/2/2017	UNIT BID PRICE	TOTAL BID PRICE
1	1 Ea.	Mobilization, Surveying, Misc	7,000,000.00	7,000,000
		Road:		
2	35,900 C.Y.	Crushed Aggregate Surface Course	75.00	2,692,500
3	582,700 C.Y.	Subbase	42.00	24,473,400
4	2,500 L.F.	24" Culvert	175.00	437,500
5	265,600 S.Y.	Geotextile, Separation	3.00	796,800
6	9,201,300 B.F.	Insulation Board	1.00	9,201,300
		Staging Area:		
2	11,500 C.Y.	Crushed Aggregate Surface Course	75.00	862,500
3	17,200 C.Y.	Subbase	42.00	722,400
4	0 L.F.	24" Culvert	175.00	0
5	0 S.Y.	Geotextile, Separation	3.00	0
6	0 B.F.	Insulation Board	1.00	0
		Subtotal Construction		$46,186,400

Land Acquisition		0
Owner Administration	@ 0%	0
Design	@ 0%	0
Construction Management	@ 0%	0
Project Contingency	@ 0%	0
3 Years Inflation	@ 3%	4,282,700
Total		$50,469,100

Initial Project Estimate
Point Hope Evacuation Road
Alignment Option "A"

18' Width w/ Turnouts
3:1 Slopes
Material Source BARGE

5/2/2017

ITEM	ESTIMATED QUANTITY	DESCRIPTION	UNIT BID PRICE	TOTAL BID PRICE
1	1 Ea.	Mobilization, Surveying, Misc	7,000,000.00	7,000,000
		Road:		
2	28,300 C.Y.	Crushed Aggregate Surface Course	450.00	12,735,000
3	622,900 C.Y.	Subbase	500.00	311,450,000
4	2,900 L.F.	24" Culvert	175.00	507,500
5	305,400 S.Y.	Geotextile, Separation	3.00	916,200
6	10,246,900 B.F.	Insulation Board	1.00	10,246,900
		Staging Area:		
2	11,500 C.Y.	Crushed Aggregate Surface Course	450.00	5,175,000
3	17,200 C.Y.	Subbase	500.00	8,600,000
4	0 L.F.	24" Culvert	175.00	0
5	0 S.Y.	Geotextile, Separation	3.00	0
6	0 B.F.	Insulation Board	1.00	0

Subtotal Construction		$356,630,600
Land Acquisition		0
Owner Administration	@ 0%	0
Design	@ 0%	0
Construction Management	@ 0%	0
Project Contingency	@ 0%	0
3 Years Inflation	@ 3%	33,069,300
Total		$389,699,900

Initial Project Estimate
Point Hope Evacuation Road
Alignment Option "A"

18' Width w/ Turnouts
2:1 Slopes
Material Source BARGE

5/2/2017

ITEM	ESTIMATED QUANTITY	DESCRIPTION	UNIT BID PRICE	TOTAL BID PRICE
1	1 Ea.	Mobilization, Surveying, Misc	7,000,000.00	7,000,000
		Road:		
2	27,400 C.Y.	Crushed Aggregate Surface Course	450.00	12,330,000
3	510,500 C.Y.	Subbase	500.00	255,250,000
4	2,300 L.F.	24" Culvert	175.00	402,500
5	239,000 S.Y.	Geotextile, Separation	3.00	717,000
6	8,155,700 B.F.	Insulation Board	1.00	8,155,700
		Staging Area:		
2	11,500 C.Y.	Crushed Aggregate Surface Course	450.00	5,175,000
3	17,200 C.Y.	Subbase	500.00	8,600,000
4	0 L.F.	24" Culvert	175.00	0
5	0 S.Y.	Geotextile, Separation	3.00	0
6	0 B.F.	Insulation Board	1.00	0

Subtotal Construction		$297,630,200
Land Acquisition		0
Owner Administration	@ 0%	0
Design	@ 0%	0
Construction Management	@ 0%	0
Project Contingency	@ 0%	0
3 Years Inflation	@ 3%	27,598,400
Total		$325,228,600

Initial Project Estimate
Point Hope Evacuation Road
Alignment Option "A"

24' Width w/o Turnouts
3:1 Slopes
Material Source BARGE

5/2/2017

ITEM	ESTIMATED QUANTITY	DESCRIPTION	UNIT BID PRICE	TOTAL BID PRICE
1	1 Ea.	Mobilization, Surveying, Misc	7,000,000.00	7,000,000
		Road:		
2	36,800 C.Y.	Crushed Aggregate Surface Course	450.00	16,560,000
3	695,100 C.Y.	Subbase	500.00	347,550,000
4	3,100 L.F.	24" Culvert	175.00	542,500
5	332,000 S.Y.	Geotextile, Separation	3.00	996,000
6	11,292,500 B.F.	Insulation Board	1.00	11,292,500
		Staging Area:		
2	11,500 C.Y.	Crushed Aggregate Surface Course	450.00	5,175,000
3	17,200 C.Y.	Subbase	500.00	8,600,000
4	0 L.F.	24" Culvert	175.00	0
5	0 S.Y.	Geotextile, Separation	3.00	0
6	0 B.F.	Insulation Board	1.00	0

Subtotal Construction		$397,716,000
Land Acquisition		0
Owner Administration	@ 0%	0
Design	@ 0%	0
Construction Management	@ 0%	0
Project Contingency	@ 0%	0
3 Years Inflation	@ 3%	36,879,000
Total		$434,595,000

Initial Project Estimate
Point Hope Evacuation Road
Alignment Option "A"

24' Width w/o Turnouts
2:1 Slopes
Material Source BARGE

5/2/2017

ITEM	ESTIMATED QUANTITY	DESCRIPTION	UNIT BID PRICE	TOTAL BID PRICE
1	1 Ea.	Mobilization, Surveying, Misc	7,000,000.00	7,000,000
		Road:		
2	35,900 C.Y.	Crushed Aggregate Surface Course	450.00	16,155,000
3	582,700 C.Y.	Subbase	500.00	291,350,000
4	2,500 L.F.	24" Culvert	175.00	437,500
5	265,600 S.Y.	Geotextile, Separation	3.00	796,800
6	9,201,300 B.F.	Insulation Board	1.00	9,201,300
		Staging Area:		
2	11,500 C.Y.	Crushed Aggregate Surface Course	450.00	5,175,000
3	17,200 C.Y.	Subbase	500.00	8,600,000
4	0 L.F.	24" Culvert	175.00	0
5	0 S.Y.	Geotextile, Separation	3.00	0
6	0 B.F.	Insulation Board	1.00	0
		Subtotal Construction		$338,715,600
		Land Acquisition		0
		Owner Administration	@ 0%	0
		Design	@ 0%	0
		Construction Management	@ 0%	0
		Project Contingency	@ 0%	0
		3 Years Inflation	@ 3%	31,408,100
		Total		$370,123,700

Comparative Costs
Point Hope
Material Source Development
5/2/2017

Material Source PHRK04

1	All Reqd	Mob and Demob	0	0
2	10.0 Mi.	Construct Ice Road	30,000	300,000
3	70,000 C.Y.	Rip and Remove Over Burden	2.00	140,000
4	700,000 C.Y.	Shoot Rock	4.50	3,150,000
5	700,000 C.Y.	Process Shot Rock	10.00	7,000,000
6	700,000 C.Y.	Mine/Haul/Place Gravel	54.15	37,905,000
7	700,000 C.Y.	Royalty	3.00	2,100,000
8	1 Job	Construction Surveying	0.00	0
			Subtotal	$ 50,595,000
			Unit Cost Per Cubic Yard	**$72.28**

Material Source PHRK07

1	All Reqd	Mob and Demob	0	0
2	9.4 Mi.	Construct Ice Road	30,000	282,000
3	70,000 C.Y.	Rip and Remove Over Burden	2.00	140,000
4	700,000 C.Y.	Shoot Rock	4.50	3,150,000
5	700,000 C.Y.	Process Shot Rock	10.00	7,000,000
6	700,000 C.Y.	Mine/Haul/Place Gravel	23.47	16,429,000
7	700,000 C.Y.	Royalty	3.00	2,100,000
8	1 Job	Construction Surveying	0.00	0
			Subtotal	$ 29,101,000
			Unit Cost Per Cubic Yard	**$41.57**

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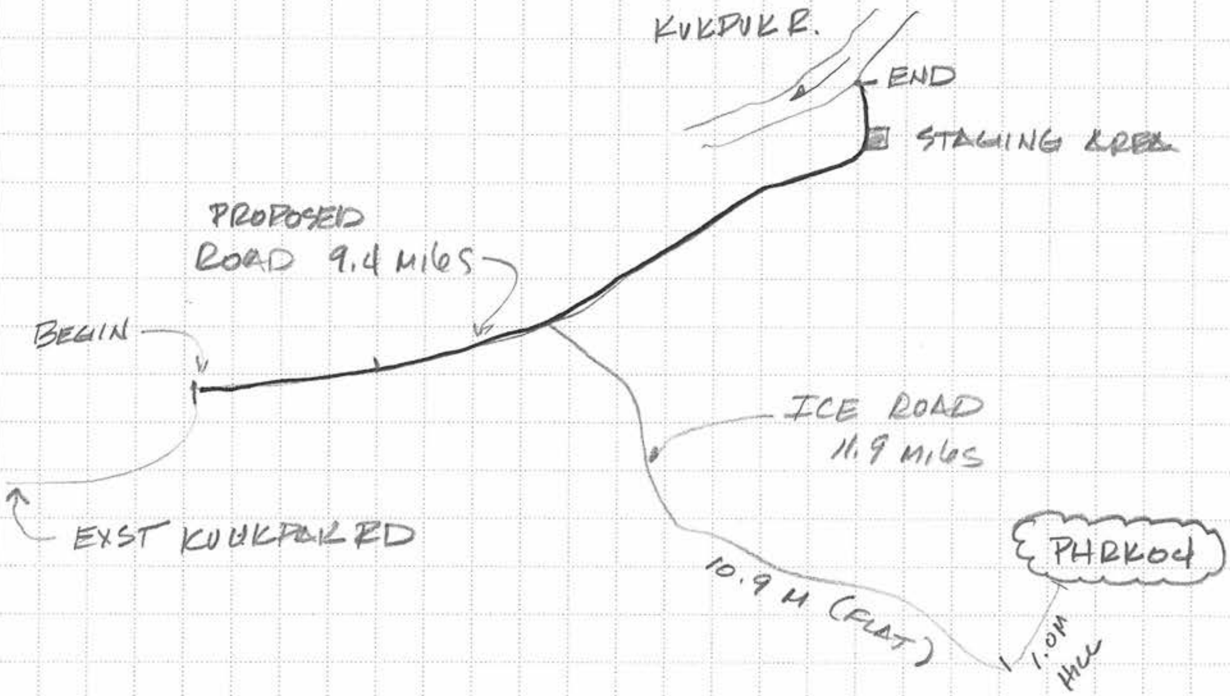
105 Trading Bay Unit 1 Kenai, Ak. 99611 (907) 564-2120
www.hdlalaska.com

JOB: POINT HOPE EVAC. ROAD
SHEET NO: 1 OF: 5
CALCULATED BY: SH DATE:
CHKD BY: DATE: 2 May 17
DESCRIPTION: PHRK04 SCALE:



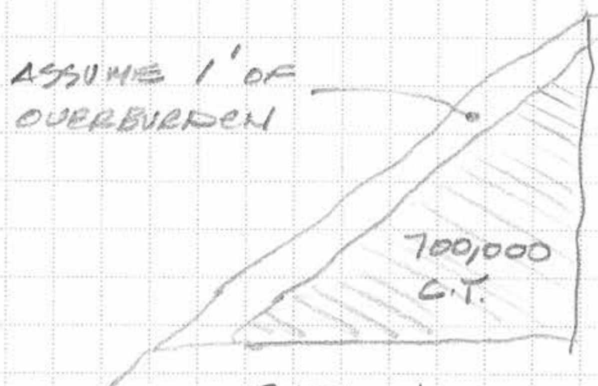
HAUL CYCLE

1.0 Miles @ 15 MPH (UPHILL)

10.9 mi. + 1/4 (9.4 M) = 13.25 M @ 25 MPH.

FIGURE TRIP TIMES

LOAD	= 3 min
1.0 @ 25 MPH X 60	= 3 min
13.3 @ 25 MPH X 60	= 32 min
UNLOAD	= 3 min
13.3 @ 25 MPH X 60	= 32 min
1.0 @ 15 MPH X 60	= 4 min
	77 Min. R.T.



PHRK04
MATERIAL SOURCE

FIGURE 8 EA 25 C.Y. TRUCKS, 10 hour Shifts

CAT D350 ARTIC.

PRODUCTION = 8 trucks x 10 hrs x 25 C.Y. x 60/77 TRIPS/HR·TRUCK

= 1560 C.Y./SHIFT

+ 30% OH&P = $54.15 PER C.Y.

Project Name:	Point Hope Material Source PHRK04	Computed Unit Cost:	$41.65 per Unit (Neat Line)
Project Number:	15-108		
Work Item:	Mine, Haul and Place		

EQUIPMENT

Rate Type (H,D,W, or M):	M
Blue Book Rate Factor (0.5 to 2.0):	1.80
Rate Basis (EOC or Dry):	DRY
Fuel Cost Per Gallon:	$7.00

LABOR

Work Efficiency:	90%
Hours per Shift:	10.0
Shifts per Day:	2
Days per Week:	6.0

QUANTITY/PRODUCTION

Neat Line Takeoff Quantity:	700,000	
Units:	C.Y.	
% Increase for Overage:	0.0	
Production per Shift:	1560.00	C.Y.

OUTPUT

Total Quantity:	700,000	C.Y.
Fuel Required:	840,598	Gallons
Shifts Required:	498.58	Shifts
Estimated Task Duration:	41.55	Weeks
Fuel Usage:	Med	

COST ESTIMATE

Prepared by HDL

QUAN	DESCRIPTION	LABOR	EQUIP RENT	RATE TYPE	FUEL OR EOC	PERMANENT MATERIALS	FREIGHT	TOTAL
1	Superintendent	466,368						
9	Truck Driver	3,633,494						
9	Operator	3,766,015						
1	Oiler	384,011						
1	Mechanic	418,446						
1	Laborer - General	352,094						
2	Party Chief - Surveyor	831,591						
1	Camp Cook	261,686						
2	D7G LGP		1,132,429	M	516,524			
2	D9L		2,453,164	M	1,053,989			
1	988B		605,121	M	460,684			
1	Welder's Truck		129,687	M	55,840			
3	Pickup		311,249	M	167,521			
9	CAT D350C (6x6)		3,945,087	M	2,732,692			
1	14G		402,290	M	195,442			
2	Hitachi EX700		3,124,813	M	279,202			
1	Cat 235D		814,501	M	282,692			
1	Dynapac CH47		241,996	M	139,601			
	0					0		
	Freight						0	
	TOTAL	$10,113,704	$13,160,338		$5,884,188	$0	$0	**$29,158,229**

2/5

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JOB: POINT HOPE EVAC. ROAD
SHEET NO: 3 OF: 5
CALCULATED BY: SH DATE:
CHKD BY: DATE: 2 MAY 17
DESCRIPTION: PHRK07 SCALE:

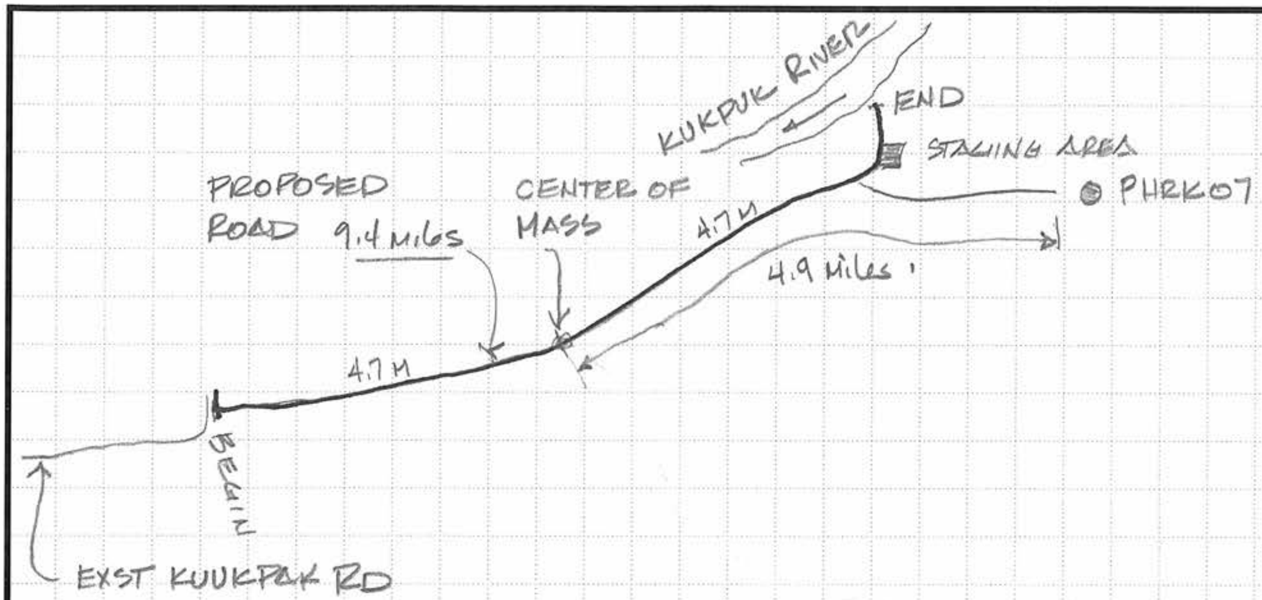

FIGURE TRIP TIMES

LOAD @ PIT = 3 MIN
4.9 MILES @ 22 MPH x60 = 13.4 MIN
UNLOAD = 3 MIN
4.9 MILES @ 22 MPH x60 = 13.4 MIN

33 MINUTES.

FIGURE 8 TRUCKS @ 25 C.Y./TRUCK, 10 HRS SHIFTS

PRODUCTION = 8 TRUCKS x 10 HRS x 25 C.Y. x $\frac{60}{33}$ =

= $\boxed{3600 \text{ C.Y./SHIFT}}$

+ 30% OH&P = $ $\boxed{23.47 / C.Y.}$

Project Name: Point Hope Material Source PHRK07
Project Number: 15-108
Work Item: Mine, Haul and Place

Computed Unit Cost: $18.05 per Unit (Neat Line)

EQUIPMENT

Rate Type (H,D,W, or M):	M
Blue Book Rate Factor (0.5 to 2.0):	1.80
Rate Basis (EOC or Dry):	DRY
Fuel Cost Per Gallon:	$7.00

LABOR

Work Efficiency:	90%
Hours per Shift:	10.0
Shifts per Day:	2
Days per Week:	6.0

QUANTITY/PRODUCTION

Neat Line Takeoff Quantity:	700,000	
Units:	C.Y.	
% Increase for Overage:	0.0	
Production per Shift:	3600.00	C.Y.

OUTPUT

Total Quantity:	700,000	C.Y.
Fuel Required:	364,259	Gallons
Shifts Required:	216.05	Shifts
Estimated Task Duration:	18.00	Weeks
Fuel Usage:	Med	

COST ESTIMATE

Prepared by HDL

QUAN	DESCRIPTION	LABOR	EQUIP RENT	RATE TYPE	FUEL OR EOC	PERMANENT MATERIALS	FREIGHT	TOTAL
1	Superintendent	202,093						
9	Truck Driver	1,574,514						
9	Operator	1,631,940						
1	Oiler	166,405						
1	Mechanic	181,327						
1	Laborer - General	152,574						
2	Party Chief - Surveyor	360,356						
1	Camp Cook	113,397						
2	D7G LGP		490,719	M	223,827			
2	D9L		1,063,038	M	456,728			
1	988B		262,219	M	199,630			
1	Welder's Truck		56,198	M	24,198			
3	Pickup		134,875	M	72,593			
9	CAT D350C (6x6)		1,709,538	M	1,184,167			
1	14G		174,326	M	84,691			
2	Hitachi EX700		1,354,085	M	120,988			
1	Cat 235D		352,950	M	122,500			
1	Dynapac CH47		104,865	M	60,494			
	0					0		
	Freight						0	
	TOTAL	$4,382,605	$5,702,813		$2,549,815	$0	$0	**$12,635,233**

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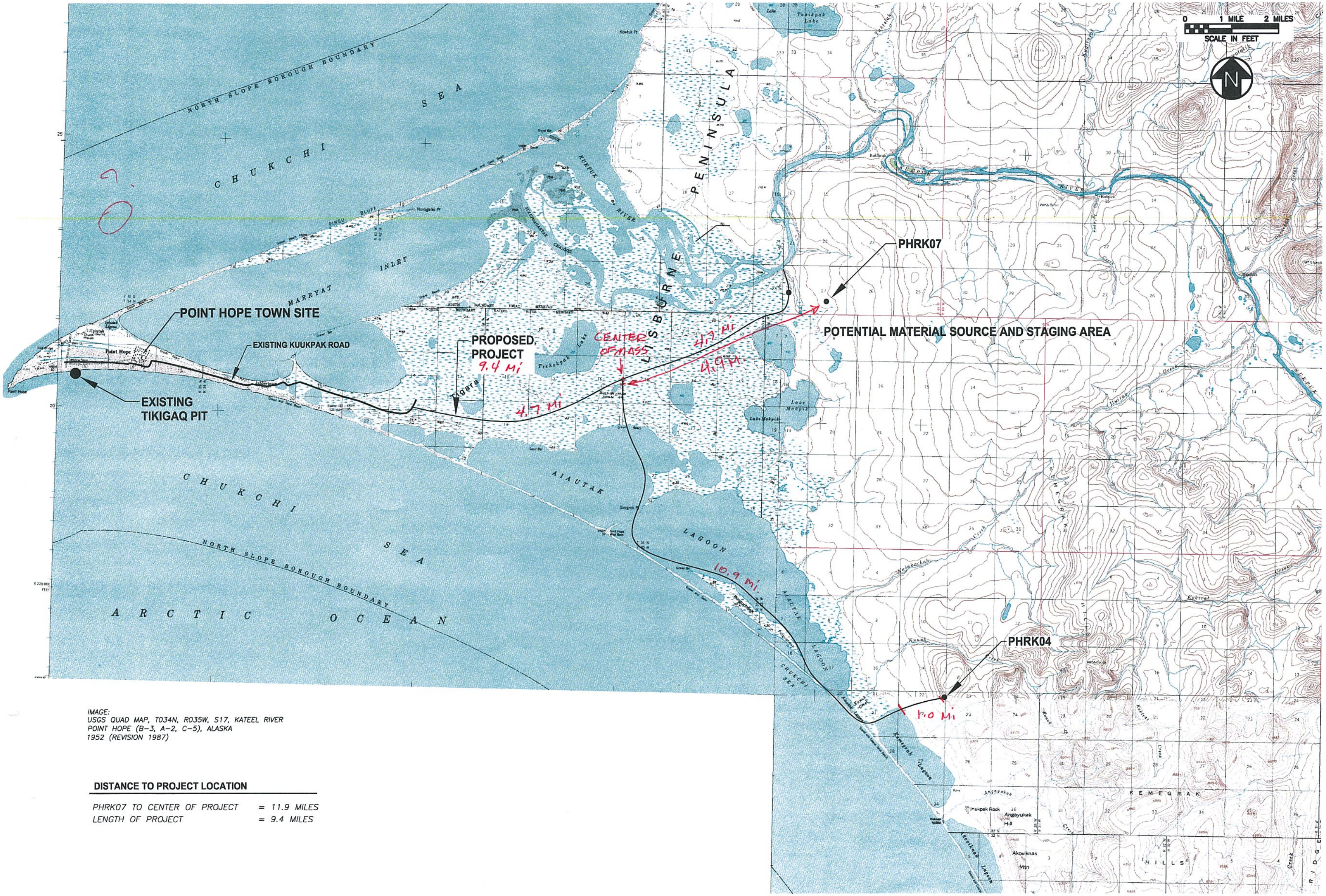

IMAGE:
USGS QUAD MAP, T034N, R035W, S17, KATEEL RIVER
POINT HOPE (B-3, A-2, C-5), ALASKA
1952 (REVISION 1987)

DISTANCE TO PROJECT LOCATION

PHRK07 TO CENTER OF PROJECT	=	11.9 MILES
LENGTH OF PROJECT	=	9.4 MILES

REVISIONS

MARK	DATE	DESCRIPTION
1		
2		
3		
4		
5		

NOT FOR CONSTRUCTION

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NORTH SLOPE BOROUGH
POINT HOPE MATERIAL SOURCE STUDY
POINT HOPE, ALASKA

SHEET TITLE: POTENTIAL MATERIAL SITES

SHEET: FIGURE 2

DRAWN BY: KK | CHECKED BY: LMD
DATE: 12/10/10 | SCALE: 1" = 1 MILE
JOB NUMBER: 10-018-1

WRONG FILE TAG

H:\Jobs\10-018 P... Material Source Recon. (LCMF)\10-018-1 Material Site\Cad\Drawings\10018_01_fig-2, 1=1, 12...0 at 16:42 by jkk
LAYOUT: Layout1

Alaska Title 36, Pamphlet 600, Sept 2016, burden at 32%

CODE	POSITION	PREMIUM	(WAGE) BASIC	FRINGE	BURDEN
L01	Superintendent	95.04	$45.00	$27.00	23.04
L02	Concrete Worker	76.57	37.50	20.51	18.56
L03	Ironworker - Bridge and Structural	87.89	36.25	30.33	21.31
L04	Ironworker - Welder	87.89	36.25	30.33	21.31
L05	Crane Operator	81.00	39.26	22.10	19.64
L06	Piledriver	83.99	38.34	25.29	20.36
L07	Drill Operator	82.01	40.03	22.10	19.88
L08	Piledriver - Certified Welder	91.33	43.90	25.29	22.14
L09	Truck Driver	81.85	39.59	22.42	19.84
L10	Operator	84.33	41.79	22.10	20.44
L11	Oiler	78.34	36.93	22.42	18.99
L12	Mechanic	84.33	41.79	22.10	20.44
L13	Electrician	87.42	39.49	26.74	21.19
L14	Painter	69.79	32.59	20.28	16.92
L15	Carpenter - Journeyman	83.99	38.34	25.29	20.36
L16	Laborer - General	74.41	30.00	26.37	18.04
L17	Laborer - Pipelayer	81.25	35.18	26.37	19.70
L18	Pipe Welder - Journeyman	87.13	40.18	25.83	21.12
L19	Pipefitter - Journeyman	87.13	40.18	25.83	21.12
L20	Boilermaker - Journeyman	96.51	44.26	28.85	23.40
L21	Chief of Parties	86.10	42.81	22.42	20.87
L22	Party Chief - Surveyor	84.00	41.22	22.42	20.36
L23	Camp Cook	52.68	26.22	13.69	12.77
L24	Housekeeper	47.93	22.62	13.69	11.62
L25					
L26					
L27					
L28					
L29					
L30					
L31					
L32					
L33					
L34					
L35					
L36					
L37					
L38					
L39					
L40					
L41					
L42					
L43					
L44					
L45					
L46					
L47					
L48					

Equipment Rental Rates

Red = Soft Rates   Black = Blue Book Rental Per Equipment Watch 2017

CODE	DESCRIPTION	HOURLY	DAILY	WEEKLY	MONTHLY	EOC	LOW	MED	HIGH	WEIGHT
	Tractor/Dozers									
E01	D-3B LGP	42.00	280.00	1,125.00	4,020.00	25.05	1.8	2.4	3.0	
E02	D-5B LGP	61.00	405.00	1,625.00	5,795.00	35.05	2.6	3.6	4.5	
E03	D-5B	56.00	375.00	1,500.00	5,355.00	34.20	2.6	3.6	4.5	
E04	D-6D	69.00	460.00	1,840.00	6,570.00	39.15	3.7	4.9	6.1	
E05	D-6D LGP	81.00	540.00	2,165.00	7,740.00	44.40	3.7	4.9	6.1	
E06	D7G LGP	115.00	765.00	3,055.00	10,915.00	59.50	5.6	7.4	9.3	
E07	D8L	145.00	970.00	3,885.00	13,870.00	79.80	8.1	10.8	13.5	
E08	D9L	250.00	1,655.00	6,620.00	23,645.00	132.45	11.3	15.1	18.8	
	Loaders									
E09	950B	37.00	245.00	975.00	3,485.00	27.00	3.4	4.6	6.3	
E10	966C	55.00	365.00	1,455.00	5,205.00	30.75	4.5	6.2	8.4	
E11	966D	47.00	315.00	1,265.00	4,525.00	35.05	4.5	6.2	8.4	
E12	988B	120.00	815.00	3,265.00	11,665.00	73.80	9.6	13.2	18.0	
	Trucks									
E13	Dump Truck	25.00	170.00	850.00	3,500.00	20.45	3.9	6.5	9.1	50,000
E14	Boom Truck	50.00	380.00	1,900.00	8,000.00					
E15	Drill Rig	55.00	420.00	2,100.00	9,000.00					
E[illegible]	Welder's Truck	15.00	120.00	580.00	2,500.00	4.25	1.4	1.6	2.0	5,800
E17	Pickup	15.00	95.00	470.00	2,000.00	4.25	1.4	1.6	2.0	5,800
E18	Tool Van	10.00	60.00	280.00	1,200.00	4.25	1.4	1.6	2.0	5,800
E19	CAT D300B	80.00	535.00	2,140.00	7,635.00	42.75	5.4	7.4	10.5	
E20	CAT D350C (6x6)	89.00	590.00	2,365.00	8,450.00	45.50	6.2	8.7	12.4	
E21	T 725 Rear Dump (14-18 cy)	110.00	735.00	2,945.00	10,520.00	40.65	4.8	5.5	6.5	
E22	P.U. 4x4 (Diesel) 3/4T	9.00	60.00	240.00	855.00	16.30	1.4	1.6	2.0	
	Motor Grader									
E23	120-G	62.00	410.00	1,645.00	5,875.00	31.25	2.9	4.1	5.5	
E24	130-G	49.00	325.00	1,305.00	4,655.00	28.55	3.2	4.4	6.1	
E25	140-G	55.00	365.00	1,465.00	5,225.00	31.70	3.6	5.0	7.0	
E26	12G	55.00	365.00	1,450.00	5,170.00	30.05	3.3	4.6	6.3	
E27	14G	82.00	545.00	2,170.00	7,755.00	42.85	4.0	5.6	7.5	
E28	16G	115.00	770.00	3,085.00	11,020.00	58.95	5.4	7.5	10.2	
	Scrapers									
E29	613C	100.00	665.00	2,650.00	9,460.00	60.00	3.7	4.9	6.1	
E30	615C	140.00	930.00	3,720.00	13,290.00	84.65	6.5	8.6	10.8	
E31	621B	64.00	425.00	1,695.00	6,050.00	78.30	8.6	11.4	14.3	
E32	623B	155.00	1,045.00	4,170.00	14,895.00	100.55	8.6	11.4	14.3	
E33	627B	140.00	930.00	3,715.00	13,275.00	102.85	12.6	16.8	21.0	
E34	631D	165.00	1,090.00	4,350.00	15,540.00	115.80	11.9	15.8	19.8	
E35	637D	195.00	1,310.00	5,230.00	18,675.00	162.05	18.7	24.9	31.3	
E36	651E	300.00	1,985.00	7,945.00	28,370.00	162.55	14.3	19.0	23.8	
	Backhoes									
E[illegible]	Cat 416	23.00	150.00	590.00	2,105.00	18.20	3.0	4.0	5.0	
E38	John Deere 410B	23.00	155.00	610.00	2,185.00	19.45	3.0	4.0	5.0	

E39	Cat 436B	40.00	265.00	1,055.00	3,775.00	21.35	4.3	8.1	9.7
E40	Cat 416	50.00	250.00	1,000.00	4,000.00	6.00	3.0	4.0	5.0
E41	Hitachi EX700	313.95	2,108.93	8,435.70	30,118.73	125.90	3.0	4.0	5.0
E42	Cat 235D	165.90	1,102.05	4,396.35	15,701.25	71.60	4.3	8.1	9.7
E43	Cat 330C L w/thumb	169.20	1,106.79	4,415.61	15,779.07	63.00	7.2	13.5	16.2
	Compactors								
E44	mag BW122D (Single Drum)	16.00	105.00	415.00	1,475.00	12.30	4.0	4.0	4.0
E45	Dynapac CH47	49.00	325.00	1,305.00	4,665.00	42.50	4.0	4.0	4.0
	Miscellaneous								
E46	C.S Johnson 30 Series (6-9 CY) Concrete Mixer Truck	41.00	275.00	1,095.00	3,910.00	14.10			
E47	American 5300 Crane	165.00	1,105.00	4,410.00	15,755.00	70.95			
E48	Ditch Witch (3210 - Diesel)	20.00	135.00	530.00	1,895.00	8.55			
	Crusher								
E49	Cone Crusher (60 inch)	115.00	750.00	2,995.00	10,690.00	31.10			
E50	on Feeder (15 HP, 36" x 28')	53.00	355.00	1,415.00	5,055.00	11.30			
E51	Triple Deck Screennig Plant (42" x 50' conveyor, 5' x 16' screen)	62.00	415.00	1,660.00	5,920.00	34.20			
E52	Double Deck Screening Plant (42" x 50' conveyor, 5' x 16' screen)	50.00	335.00	1,345.00	4,810.00	17.85			

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JOB: Point Hope Evacuation Road
SHEET NO: OF:
CALCULATED BY: SLH DATE: 5/2/17
CHKD BY: DATE:
DESCRIPTION: Updated Cost Estimate SCALE: None

(HDL Project # 15-108)

POINT HOPE
BARGING COSTS

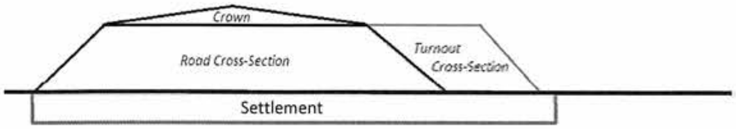
IN 2014, Bering Pacific Shipped 10,600 C.Y. OF CRUSHED Aggreage FROM Nome to Wainwright for 435.00/C.Y

- Pt. Hope is closer.
- Subbase is not crushed

FIGURE 400/C.Y. TODAY. TO Barge

+ Haul & Place \$50.00 = 450/C.Y

+ Crushing \$50.00 = 500/C.Y.



Inputs

Road			
Embankment Depth at Shoulder	6	ft	
Side Slope	3	:1	
Settlement Depth	1.5	ft	
Road Top Width	18	ft	
Road Crown	3.00%		
Turnouts			
Turnout Length, Ave. Length	100	ft	(including tapers)
Turnout top width	12	ft	(Perpendicular to road)
Turnout Side slope	3	:1	
Turnout frequency 1 per	1000	ft	
Waste and Loss factor	1.2		

Solution:

Embankment Footprint Area (Acre per mile)	6.6909	<< Includes turnouts
Road width at toe	54	ft
Road Volume	8.001	CY/LF
Crown Volume	0.090	CY/LF
Road Settlement Volume	3.000	CY/LF
Turnout Volume	0.267	CY/LF
Turnout settlement Volume'	0.067	CY/LF
Total CY per LF	11.424	CY/LF

Gravel Quantity	72,384 C.Y per mile

Table 4

Side Slope	6' Embankment Depth	8' Embankment Depth	10' Embankment Depth
18' Width w/ TOs, 3:1 Slopes	72,400	105,300	143,900
24' Width no TOs, 3:1 Slopes	81,300	116,500	157,300
18' Width w/ TOs, 2:1 Slopes	59,700	84,700	113,400
24' Width no TOs, 2:1 Slopes	68,600	95,800	126,800

Road Footprint, Acres per Mile of Road (No staging Area)

Side Slope	6' Embankment	8' Embankment	10' Embankment
18' Width w/ TOs, 3:1 Slopes	7.8	9.2	10.7
24' Width no TOs, 3:1 Slopes	8.4	9.8	11.3
18' Width w/ TOs, 2:1 Slopes	6.0	6.9	7.9
24' Width no TOs, 2:1 Slopes	6.5	7.5	8.5

Total Footprint, Alternative # 1 (9.43 Miles of road + Staging Area (10.6 acres))

Side Slope	6' Embankment Depth	8' Embankment Depth	10' Embankment Depth
18' Width w/ TOs, 3:1 Slopes	84.2	97.4	111.5
24' Width no TOs, 3:1 Slopes	89.8	103.0	117.2
18' Width w/ TOs, 2:1 Slopes	67.2	75.7	85.1
24' Width no TOs, 2:1 Slopes	71.9	81.3	90.8

Road Footprint, Alternative # 2 (9.35 Miles of Road + Staging Area(10.6 acres))

Side Slope	6' Embankment	8' Embankment	10' Embankment
18' Width w/ TOs, 3:1 Slopes	83.4	96.5	110.5
24' Width no TOs, 3:1 Slopes	89.0	102.1	116.2
18' Width w/ TOs, 2:1 Slopes	66.6	75.0	84.4
24' Width no TOs, 2:1 Slopes	71.3	80.6	90.0

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JOB:
SHEET NO: 1 OF:
CALCULATED BY: DATE:
CHKD BY: DATE:
DESCRIPTION: SCALE:

ALT 1 FOOTAGE

FROM BRIAN YARMAK'

46,959 L.F. ROAD
2,836 L.F. END SPUR

49,795 L.F.

= 9.43 Miles

ALT 2 FOOTAGE

47,957 L.F. MAINLINE RD
1,431 L.F. SIDE SPUR

49,388 L.F.

= 9.35 MILES