

**WRRDA 7001 Submissions Package**  
**U.S. Army Corps of Engineers**

Proposal Name: Barrow Coastal Erosion Mitigation Project Feasibility Study

Submission Date: 09/19/2016

Proposal ID Number: a8f4d31a-6768-4e1b-b3df-c216aae9aed4

Purpose of Proposal: Barrow is extremely vulnerable coastal storms (flooding and waves), ice runs, and erosion. The impacts of storm surge with wave action and erosion have increased as a result of declining sea ice, as offshore winds have a greater distance of uninterrupted open-water to drive waves onshore with increasing intensity.

Erosion rates and shoreline flood protection have been evaluated to varying degrees under previous studies, including a 2010 USACE Report and a separate study funded by the Borough (2016). Non-structural alternatives, such as relocation of buildings and infrastructure, also have been analyzed previously but were not considered to be cost effective.

The Borough has reinitiated discussions with the USACE Alaska District regarding Barrow's increasingly expensive coastal erosion challenge, economic factors considered in the 2010 USACE Report that must be reevaluated, and economic and noneconomic factors that were not considered in the 2010 Report. The Borough seeks to re-start the project feasibility study (however, the Alaska District has confirmed that we need to select "feasibility study," not "modification to...") and ultimately pursue project construction pursuant to Section 116 of the Energy and Water Development Appropriations Act of 2010, which authorizes coastal erosion projects in Alaska. Cost sharing funds are currently available for the non-federal share of the proposed feasibility study.

*1. Administrative Details*

**Proposal Name: Barrow Coastal Erosion Mitigation Project Feasibility Study**

**by Agency: North Slope Borough, Alaska**

**Locations: AK**

**Date Submitted: 09/19/2016**

**Confirmation Number: a8f4d31a-6768-4e1b-b3df-c216aae9aed4**

*Supporting Documents*

<b>File Name</b>	<b>Date Uploaded</b>
Figure-B-1—Borough-Boundaries-200dpi-normal.pdf	09/19/2016
Preliminary Design Alternatives.pdf	09/19/2016
NSB Statement of Support.pdf	09/19/2016
North Slope Borough Erosion - USACE (January 26, 2016 Presentation).pdf	09/19/2016
Vicinity Map 8.5x11.pdf	09/19/2016
Phasing Plan 11x17.pdf	09/19/2016

**2. Provide the name of the primary sponsor and all non-Federal interests that have contributed or are expected to contribute toward the non-Federal share of the proposed feasibility study or modification.**

Sponsor	Letter of Support
<p>North Slope Borough, Alaska. Cost sharing funds are currently available for the non-federal share of the proposed feasibility study.(Primary)</p>	<p>The Borough is a coastal political subdivision of the State of Alaska, and the largest municipality in the U.S., encompassing over 89,000 square miles, including more than 8,000 miles of Arctic coastline. Eight villages are located within the Borough, with Barrow serving as the regional hub community. Barrow, which has been inhabited for more than 2,500 years, has approximately 4,200 residents, accounting for over half of the Borough’s population. As the U.S. Army Corps of Engineers (USACE) has recognized, Barrow has intrinsic value much greater than the population and size of the city. Its continued existence as a viable community is essential for all the smaller Borough villages that rely on Barrow to serve as a hub. Preserving Barrow helps preserve the Iñupiat culture, which has existed in arctic Alaska for thousands of years. For decades, erosion has threatened Barrow’s coastline. The threat of coastal storm damage and flooding has become acute in recent years because ice no longer protects the shoreline in the fall when storms on the Chukchi and Beaufort Seas are common. Over the last two decades, a number of damage reduction measures have been implemented by the Borough, with varying degrees of success. In the 1990s, the Borough pursued a beach nourishment program. The Borough also annually constructs and repairs gravel beach berms that provide limited protection to the beach frontage road and development in its vicinity. Additionally, the Borough participated in a USACE feasibility study of alternative solutions to flooding and erosion problems in Barrow. The Borough has since re-initiated discussions with the Alaska District regarding Barrow’s increasingly expensive coastal erosion challenge, economic factors that must be reevaluated and economic and noneconomic factors that were not considered previously. Please see the attached Statement of Support for the Barrow Coastal Erosion Mitigation Project Feasibility Study for more detail.</p>

**3. State if this proposal is for a feasibility study, a modification to an authorized USACE feasibility study or a modification to an authorized USACE project. If it is a proposal for a modification, provide the authorized water resources development feasibility study or project name.**

[x] Feasibility Study

***4. Clearly articulate the specific project purpose(s) of the proposed study or modification. Demonstrate that the proposal is related to USACE mission and authorities and specifically address why additional or new authorization is needed.***

Barrow is extremely vulnerable coastal storms (flooding and waves), ice runs, and erosion. The impacts of storm surge with wave action and erosion have increased as a result of declining sea ice, as offshore winds have a greater distance of uninterrupted open-water to drive waves onshore with increasing intensity.

Erosion rates and shoreline flood protection have been evaluated to varying degrees under previous studies, including a 2010 USACE Report and a separate study funded by the Borough (2016). Non-structural alternatives, such as relocation of buildings and infrastructure, also have been analyzed previously but were not considered to be cost effective.

The Borough has reinitiated discussions with the USACE Alaska District regarding Barrow's increasingly expensive coastal erosion challenge, economic factors considered in the 2010 USACE Report that must be reevaluated, and economic and noneconomic factors that were not considered in the 2010 Report. The Borough seeks to re-start the project feasibility study (however, the Alaska District has confirmed that we need to select "feasibility study," not "modification to...") and ultimately pursue project construction pursuant to Section 116 of the Energy and Water Development Appropriations Act of 2010, which authorizes coastal erosion projects in Alaska. Cost sharing funds are currently available for the non-federal share of the proposed feasibility study.

*5. To the extent practicable, provide an estimate of the total cost, and the Federal and non-Federal share of those costs, of the proposed study and, separately, an estimate of the cost of construction or modification.*

	<b>Federal</b>	<b>Non-Federal</b>	<b>Total</b>
<b>Study</b>	\$1,500,000	\$1,500,000	\$3,000,000
<b>Construction</b>	\$221,000,000	\$119,000,000	\$340,000,000

### **Explanation (if necessary)**

Based on our discussions with Alaska District, the estimated cost of the Barrow Coastal Erosion Mitigation Project Feasibility Study is \$3 million, half of which would be funded by the Federal Government and half of which would be funded by the Borough, in accordance with regular cost-sharing arrangements for feasibility studies. Cost sharing funds are currently available for the non-federal share of the proposed feasibility study.

The Borough, in 2014, undertook a design study for shore protection in Barrow. This study included background research, analysis, gathering of environmental and archaeological information, field studies, an alternatives analysis, public involvement, and preliminary/concept-level design, cost estimates and logistics of shore and flood protection.

Based on the Borough study, construction costs for flood and shore protection alternatives ranged from \$200 million to \$340 million, depending on the alternative selected. This cost included engineering, permitting, project management, and archeological and cultural resources mitigation.

The 2010 USACE “Coastal Storm Damage Reduction Technical Report” provided a shoreline erosion and flood protection recommendation that would total approximately \$486 million to protect the same portion of the community as proposed in the Borough study.

We estimate total construction costs at \$340 million, of which 65 percent (\$221 million) would be funded by the Federal Government and 35 percent (\$119 million) would be funded by the Borough.

***6. To the extent practicable, describe the anticipated monetary and nonmonetary benefits of the proposal including benefits to the protection of human life and property; improvement to transportation; the national economy; the environment; or the national security interests of the United States.***

The proposed project would protect Barrow's critical infrastructure, including the Barrow Utilidor System, the potable water source at Isatkoak Lagoon, and the water treatment intake at the Lower Isatkoak Lagoon, all of which are critical to the health and safety of the community. Floodwater entering the Utilidor is a major concern as many of the access manholes and other potential entry points, such as pump stations, are below anticipated flood level of major storms. If sea water breaches the Utilidor—as it nearly did in 2015—the Borough estimates that repair costs could reach \$59 million. If the Utilidor is destroyed, the replacement value of the Utilidor has been estimated at more than \$544 million. The Borough currently spends more than \$1 million annually to protect community infrastructure.

We estimate the replacement cost of other Borough-owned structures threatened by erosion (other than the Utilidor) at more than \$265 million. This does not include potential damages to roads, other government structures or private property.

Also at risk is the old Barrow landfill, which contains a large amount of military waste. In 1972 alone, the Navy deposited approximately 48,000 steel drums. The landfill is located just landward of a gravel road along the coast.

The proposed project also has significant implications for the protection of human life. The current practice of flood fighting during storms places equipment operators in extremely hazardous conditions.

Erosion also threatens the Utqiagvik Village Site, an archeological site that has been occupied for over 2,500 years.

Finally, Barrow is the hub for the region's eight communities, with the Borough serving as the regional government. Disruption of critical services would not only affect Barrow but also would have serious consequences for the outlying communities.

Please see the attached Statement of Support for the Barrow Coastal Erosion Mitigation Project Feasibility Study for more detail.

**7. Does local support exist? If ‘Yes’, describe the local support for the proposal.**

Yes

### **Local Support Description**

Erosion and flooding threaten the community of Barrow, Barrow’s potable water source, ancient cultural resources, and public and private property. There is strong community support for taking all steps necessary to protect the community.

The project would benefit many local stakeholders, including the Native Village of Barrow; the Iñupiat Community of the Arctic Slope, a regional Alaska Native tribal government; Ukpeagvik Iñupiat Corporation, the Alaska Native village corporation for Barrow; Arctic Slope Regional Corporation, the Alaska Native regional corporation for the North Slope; Arctic Slope Native Association, an Alaska Native owned nonprofit corporation that operates the Samuel Simmonds Memorial Hospital; Tagiugmiullu Nunamiullu Housing Authority, which provides housing assistance services to Barrow; Barrow Utilities & Electric Cooperative, Inc., Barrow’s nonprofit cooperative that provides electricity, natural gas, water, and sewer services; the United States Air Force, which operates a network of 19 radar stations forming the Alaska Radar System, including the Barrow radar site; and the National Oceanic and Atmospheric Administration, which operates the Point Barrow Observatory for their Earth System Research Laboratory just south of the Air Force radar site.

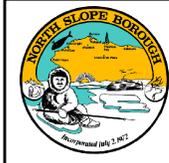
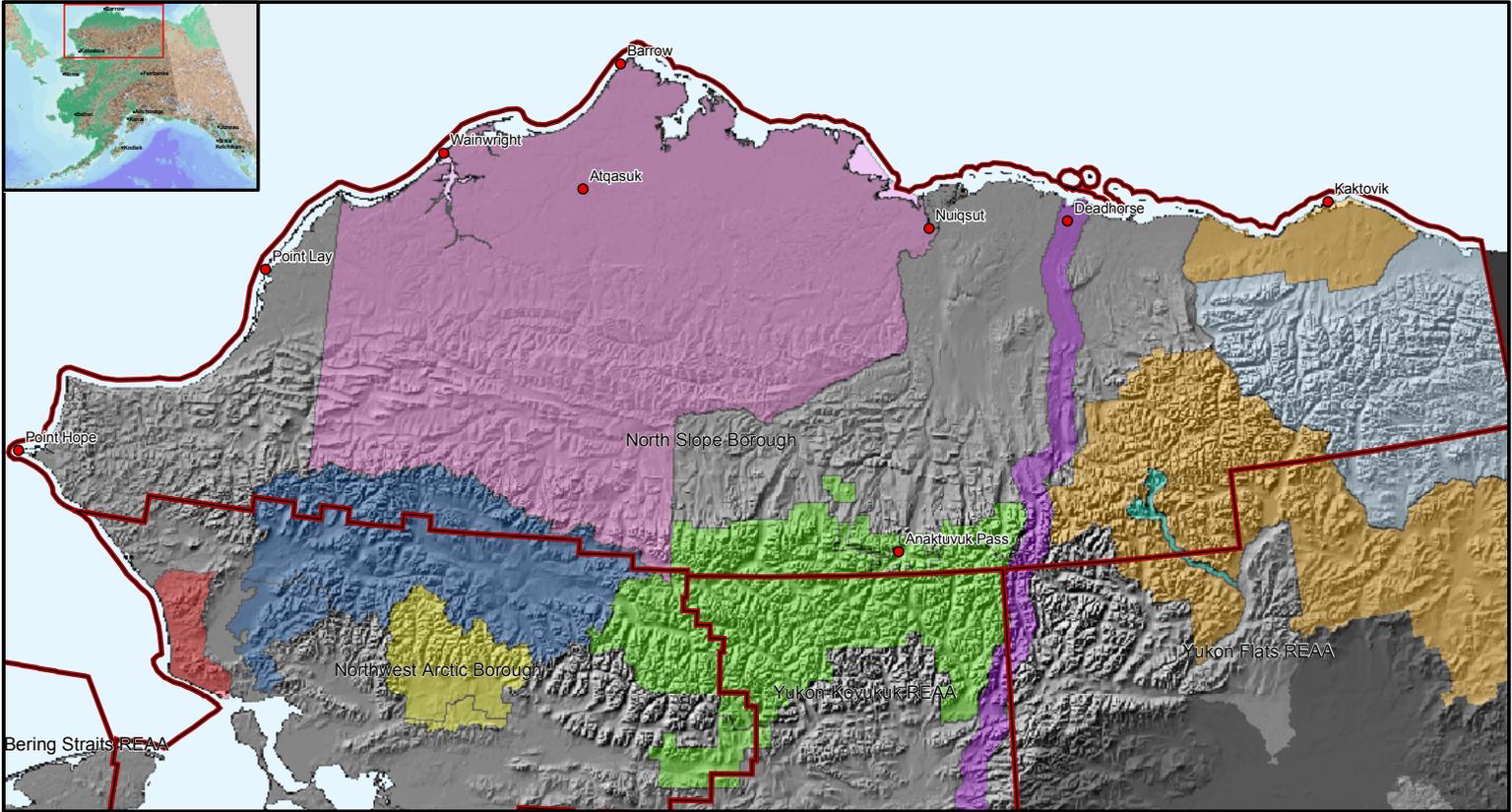
**8. Does the primary sponsor named in (2.) above have the financial ability to provide for the required cost share?**

Yes

# Map Document

(This is as uploaded, a blank page will show if nothing was submitted)

Figure\\_B-1\\_ -\\_Borough\\_Boundaries\\_200dpi\\_normal.pdf



Boroughs & Rural Education Areas	Nizak National Preserve
<b>Land Management Units</b>	National Petroleum Reserve
Arctic National Wildlife Refuge (NWR)	Wind Wild & Scenic River
Arctic NWR Wilderness Area	Cape Krusenstern National Monument
Yukon Flats National Wildlife Refuge	James Dalton Highway Corridor
Kobuk Valley National Park	
Gates of the Arctic National Park & Preserve	



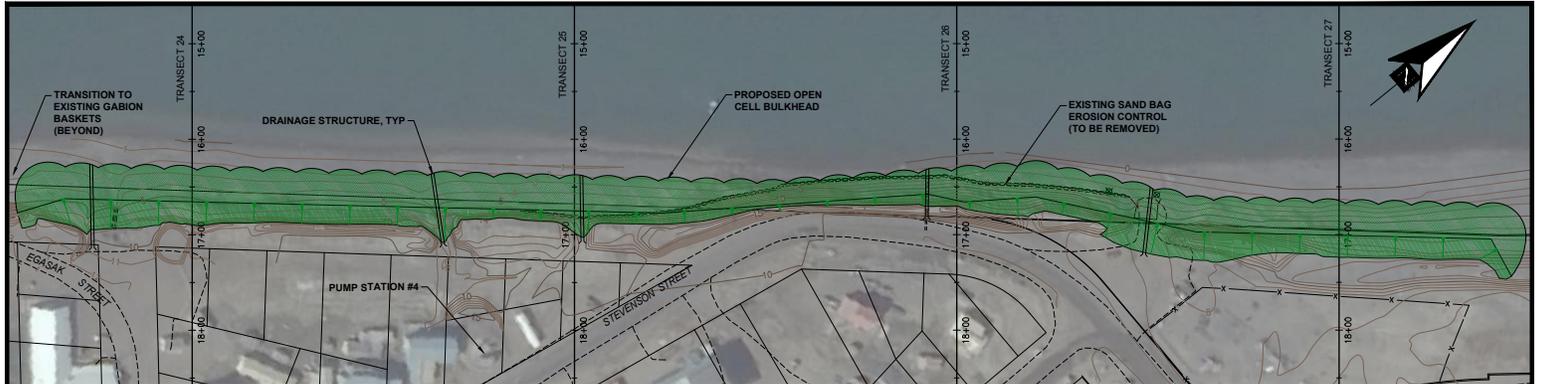
Data Sources: ADNR, USGS

<b>NORTH SLOPE BOROUGH NORTH SLOPE BOROUGH COMPREHENSIVE PLAN</b>			
<b>BOROUGH BOUNDARIES AND NORTH SLOPE BOROUGH COMMUNITIES</b>			
<b>NORTH SLOPE BOROUGH, ALASKA</b>			
JOB NO:	26219652	DRAWN:	MCM
DATE:	SEPTEMBER 2025	FILE:	BOROUGH_BOUNDARIES_2025
<b>FIGURE B-1</b>			

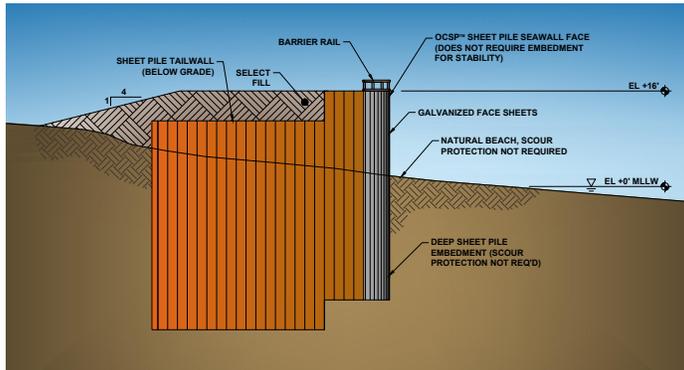
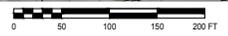
# Additional Proposal Information

(This is as uploaded, a blank page will show if nothing was submitted)

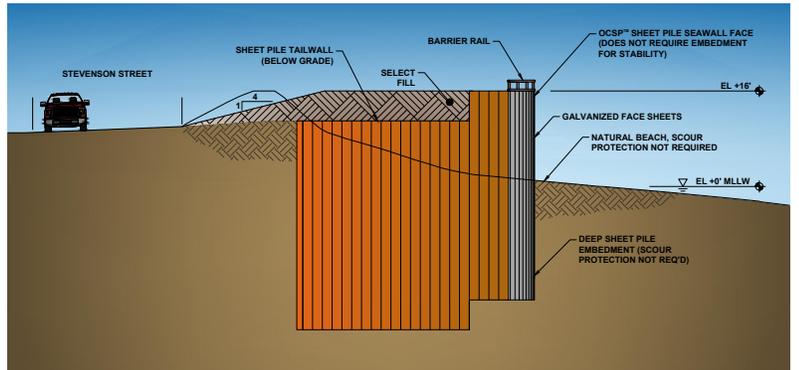
## Preliminary Design Alternatives.pdf



**SITE PLAN - PHASE 1**



**ALTERNATIVE #1 - TRANSECT 25**



**ALTERNATIVE #1 - TRANSECT 26**

**CONCEPT**  
01/04/2016



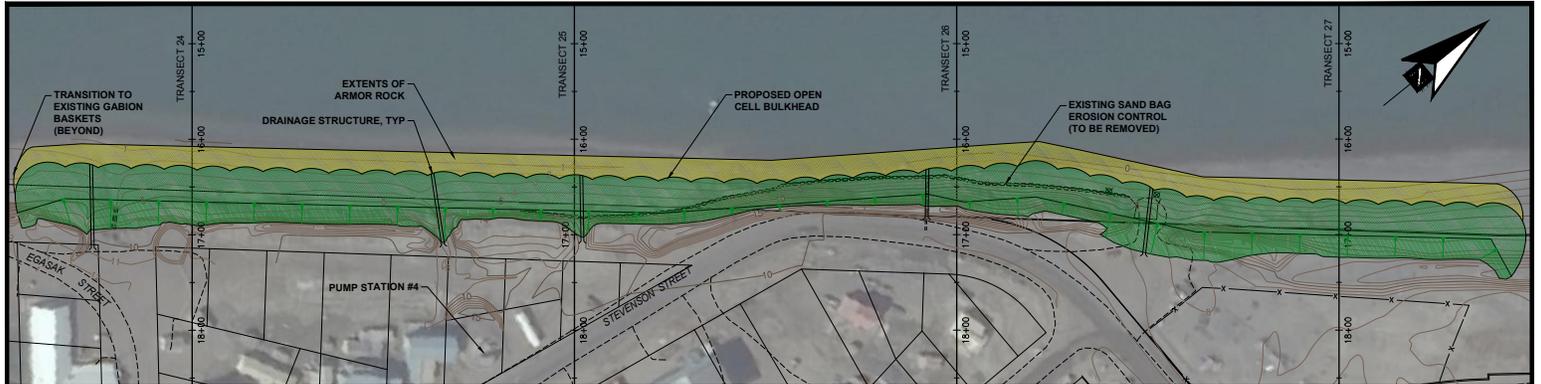
PND Engineers, Inc. (PNE) is not responsible for safety programs, methods or procedures of operation, or the construction of the design shown on these drawings. Where specifications are general or not called out, the specifications shall conform to standards of industry. Drawings are for use on this project only and are not intended for reuse without written approval from PNE. Drawings are also not to be used in any manner that would constitute a detriment directly or indirectly to PNE.

REV	DATE	DESCRIPTION	DATE

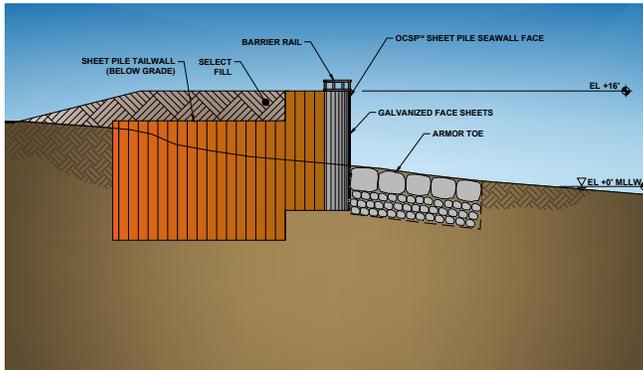
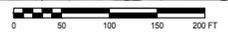
1506 West 36th Avenue  
Anchorage, Alaska 99503  
Phone: 907.561.1011  
Fax: 907.563.4220  
www.pndengineers.com



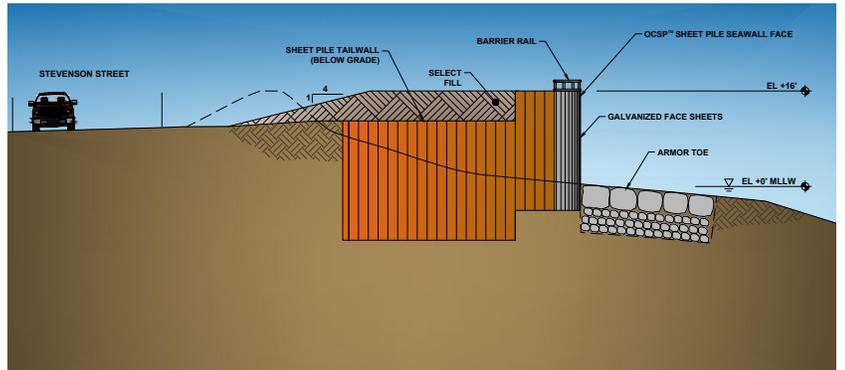
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<b>DATE</b>		ALTERNATIVE 1 - PHASE 1	
<b>TITLE</b>		STEEL SHEET PILE SEAWALL WITHOUT SCOUR PROTECTION	
<b>DESIGNED BY:</b>	<b>DATE:</b>	<b>DATE:</b>	<b>1</b>
<b>CHECKED BY:</b>	<b>DST</b>	<b>PROJECT NO.:</b>	<b>141034</b>
		<b>of 4</b>	



**SITE PLAN - PHASE 1**



**ALTERNATIVE #2 - TRANSECT 25**



**ALTERNATIVE #2 - TRANSECT 26**

**CONCEPT**  
01/04/2016



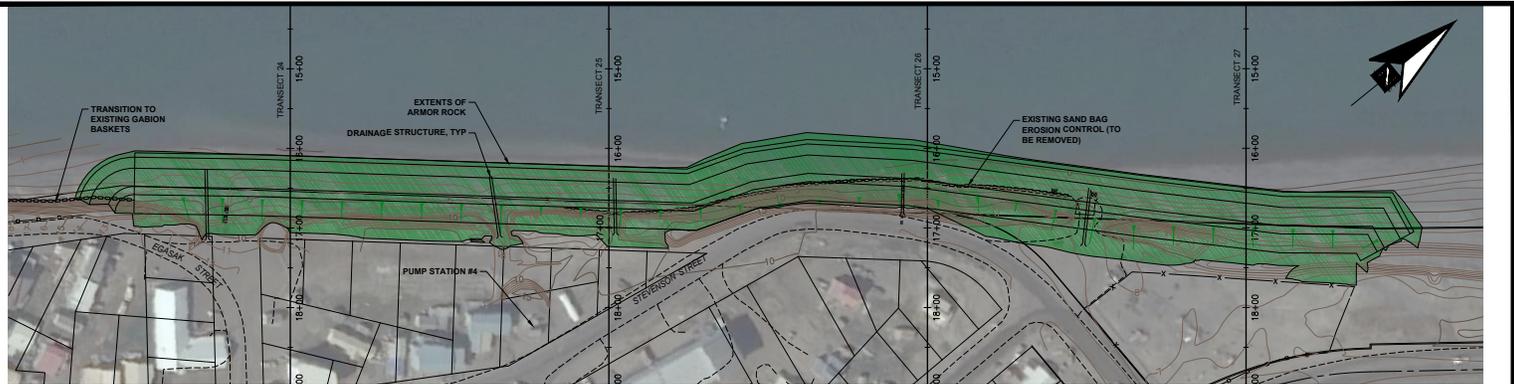
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REV	DATE	DESCRIPTION	DATE

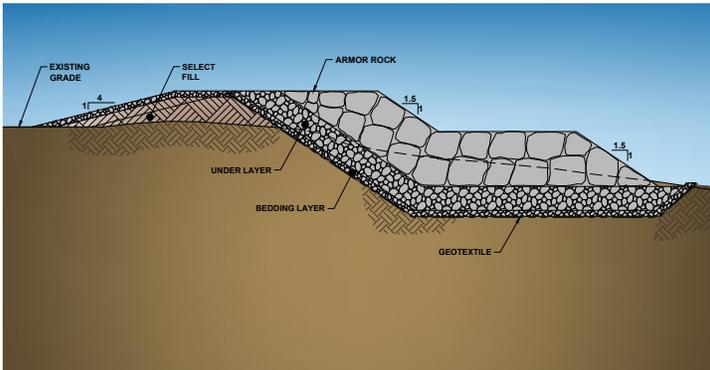
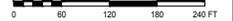
1506 West 36th Avenue  
Anchorage, Alaska 99503  
Phone: 907.561.1011  
Fax: 907.563.4220  
www.pndengineers.com



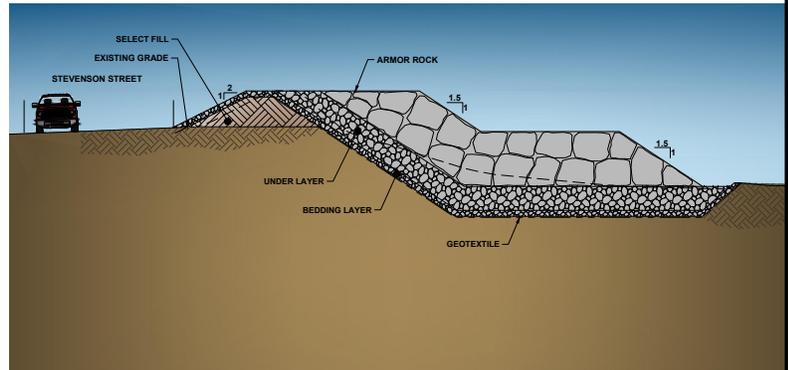
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<b>DATE</b>		ALTERNATIVE 2 - PHASE 1	
<b>DESCRIPTION</b>		STEEL SHEET PILE SEAWALL WITH SCOUR PROTECTION	
<b>DESIGNED BY:</b>	<b>BY:</b>	<b>DATE:</b>	<b>1/04/2016</b>
<b>CHECKED BY:</b>	<b>DST</b>	<b>PROJECT NO.:</b>	<b>141034</b>
			<b>2</b> of <b>4</b>



**SITE PLAN - PHASE 1**



**ALTERNATIVE #3 - TRANSECT 25**



**ALTERNATIVE #3 TRANSECT 26**

**CONCEPT**  
 01/04/2016



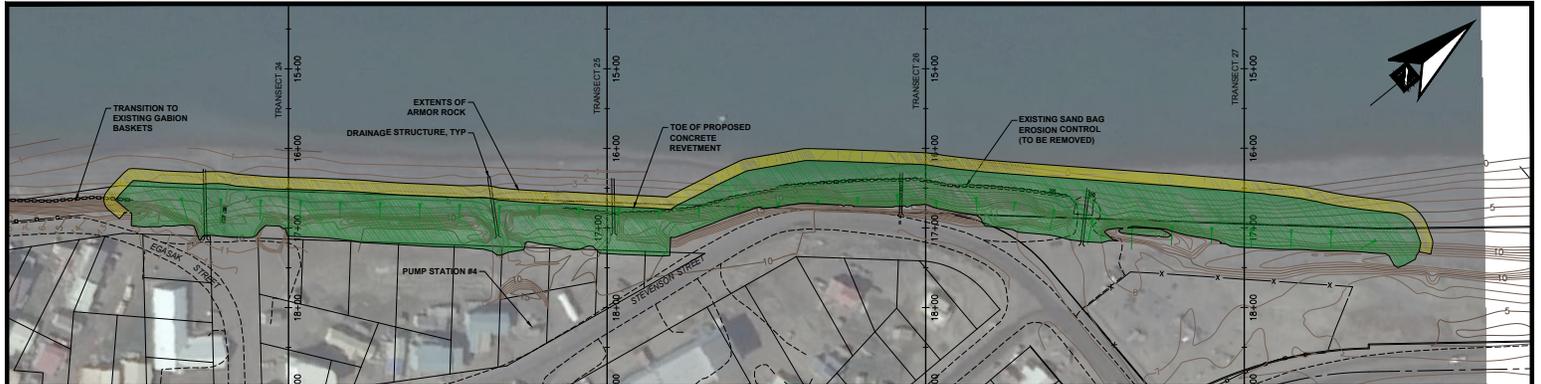
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REV	DATE	DESCRIPTION	DATE

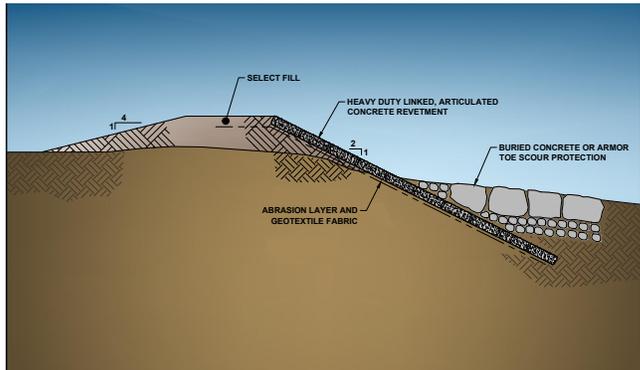
1506 West 36th Avenue  
 Anchorage, Alaska 99503  
 Phone: 907.561.1011  
 Fax: 907.563.4220  
 www.pndengineers.com



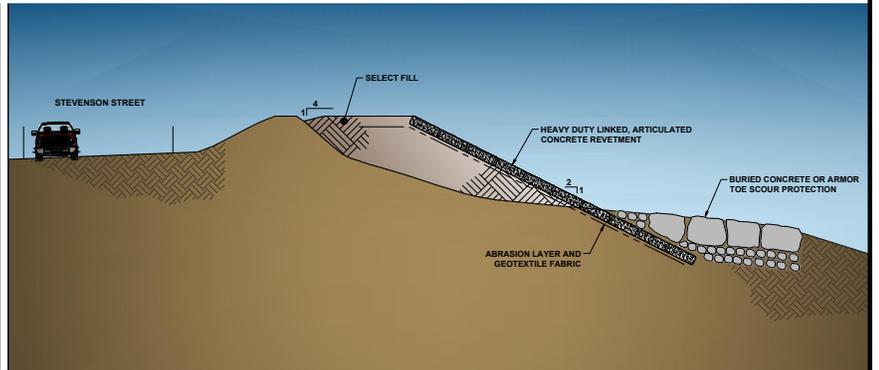
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<b>DATE</b>		<b>ALTERNATIVE 3 - PHASE 1 ARMOR ROCK REVETMENT</b>	
<b>DESIGNED BY:</b>	<b>BH</b>	<b>DATE:</b>	01/04/2016
<b>CHECKED BY:</b>	<b>DST</b>	<b>PROJECT NO.:</b>	141034
			<b>3</b> of <b>4</b>



**SITE PLAN - PHASE 1**



**ALTERNATIVE #4 TRANSECT 25**



**ALTERNATIVE #4 TRANSECT 26**

**CONCEPT**  
01/04/2016



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REV	DATE	DESCRIPTION	DATE

1506 West 36th Avenue  
Anchorage, Alaska 99503  
Phone: 907.561.1011  
Fax: 907.561.4220  
www.pndengineers.com



<b>PROJECT</b>		<b>BARROW SHORE PROTECTION PRELIMINARY DESIGN ALTERNATIVES</b>	
<b>DATE</b>		<b>ALTERNATIVE 4 - PHASE 1 CONCRETE REVETMENT MAT</b>	
DESIGNED BY:	BH	DATE:	01/04/2016
CHECKED BY:	DST	PROJECT NO.:	141034
			<b>4</b> of <b>4</b>

# Primary Sponsor Letter of Support

(As uploaded)

**NSB Statement of Support.pdf**

# North Slope Borough

## OFFICE OF THE MAYOR

P.O. Box 69  
Barrow, Alaska 99723  
Phone: 907 852-2611 or 0200  
Fax: 907 852-0337 or 2595  
Email: [harry.brower@north-slope.org](mailto:harry.brower@north-slope.org)



*Harry K. Brower, Jr., Mayor*

September 19, 2016

U.S. Army Corps of Engineers  
Attn: CECW-CE (Lisa Kiefel)  
441 G Street, NW  
Washington, DC 20314-1000

RE: North Slope Borough Statement of Support for the Barrow Coastal Erosion Mitigation Project Feasibility Study

Dear Ms. Kiefel:

In response to the U.S. Army Corps of Engineers (USACE) request for proposals by non-federal interests for feasibility studies and for modifications to authorized water resources development projects or feasibility studies, the North Slope Borough ("Borough") requests that the Barrow Coastal Erosion Mitigation Project Feasibility Study be included in the USACE annual report to Congress on future water resources development under Section 7001 of the Water Resources Reform and Development Act (WRRDA) 2014.

### Background

The Borough is a coastal political subdivision of the State of Alaska and a county-level government. The Borough is the largest municipality in the United States, encompassing over 94,000 square miles, including more than 8,000 miles of Arctic coastline. The Borough stretches from the U.S.-Canada border to the west coast of Alaska, adjacent to the Beaufort and Chukchi Seas.

The majority of Borough residents are Iñupiat. Our unique culture, our traditions, and our links to our ancestors and history are tied to our subsistence lifestyle, to our custom of

sharing with others, and to celebrating our connection to the land and ocean.

Eight villages are located within the Borough, with Barrow serving as the regional hub community. Barrow has been occupied for over 2,500 years. In the modern era, Barrow has a long history of interaction with the Federal Government, hosting one of the old Distant Early Warning (DEW) sites, a National Weather Service facility, and the former Naval Arctic Research Laboratory.

For decades now, erosion has threatened Barrow's coastline. The concern has become particularly acute in recent years because ice no longer protects the shoreline during the fall when storms on the Chukchi and Beaufort Seas are common.

In 2010, the USACE Alaska District ("Alaska District") completed a feasibility study for Barrow, which looked at potential solutions to flooding and erosion problems, and produced a "Coastal Storm Damage Reduction Technical Report" ("2010 Report"). The Borough has since re-initiated discussions with the Alaska District regarding Barrow's increasingly dire coastal erosion challenge, economic factors considered in the 2010 Report that need to be reevaluated, and economic and noneconomic factors that were not considered in the 2010 Report. The Borough also has worked with PND Engineers to develop a sea wall design alternative that was not considered in the 2010 Report.

The Borough seeks to resume the Barrow feasibility study and ultimately pursue project construction pursuant to Section 116 of the Energy and Water Development Appropriations Act of 2010 ("Section 116"), which authorizes coastal erosion projects in Alaska. Implementation guidance issued for Section 116 indicates that the USACE may evaluate and select a recommended project based in part or wholly on non-monetary units. While we believe that a new feasibility study, including the consideration of alternative project designs, will show that a Barrow coastal erosion mitigation project is justified using the National Economic Development (NED) objectives, we also think that an analysis of economic and noneconomic considerations together will clearly demonstrate that the Barrow coastal erosion mitigation project is a national priority.

#### Statement of Need

On an annual basis, the Borough expends more than \$1 million in prevention and response costs to fight coastal erosion and flooding in Barrow, which includes the cost of constructing and reconstructing gravel berms to protect the community. However, a significant storm event could be truly disastrous for Barrow, resulting in significant and costly damage to public and private property and threatening human life and safety.

The 2010 Report estimated that costs associated with damages and repairs to beach berms and Barrow's shoreline road cost \$677,200 annually (in 2007 prices) and are expected to continue on an annual basis until an erosion mitigation project is in place. In fact, on an annual basis, the Borough now expends more than \$1 million annually in prevention and response costs. These costs are rising and we expect these costs to continue to rise. We expect costs over a 50-year period to easily exceed \$50 million in current dollars. These

costs do not account for the fact that the Borough has diminishing gravel resources available to it for building beach berms, which will become increasingly problematic, and the fact that emergency flood fighting pulls Borough employees away from other vital community projects, further impacting the community.

In October 2015, Barrow suffered damage during a relatively moderate fall storm. The Federal Emergency Management Agency (FEMA) declared a disaster for the Borough and committed to provide disaster assistance “for emergency work and the repair or replacement of disaster-damaged facilities” in Barrow, and to a lesser degree in the village of Wainwright, resulting from the storm. Total costs associated with the 2015 storm are projected to reach more than \$7.2 million. Another 1-2 feet of storm surge would have flooded Barrow’s Utilidor, disrupting water and sewer service for the entire city of Barrow. With an additional 18 inches of storm surge, sea water would have breached Barrow’s fresh water lagoon, and the entire community would have been left without potable water. Barrow also lost use of the only road that connects Barrow to the Naval Arctic Research Laboratory, Ilisagvik College, local residences, and an important subsistence hunting area.

Unique among communities in Alaska, Barrow’s water and sewer system runs through a system called the Barrow Utilidor System (“Utilidor”), a 3.2 mile wood tunnel which runs below Barrow through permafrost and services all of Barrow with potable water, sewage collection, telephone lines, and electric service lines. As noted above, sea water nearly breached the Utilidor system during a storm event in 2015. If sea water breaches the Utilidor system during a major storm event, emergency response and repair or replacement costs will be extraordinarily high. In the event of a major flood event, the Borough estimates that total de-watering, cleanup, and equipment repair and replacement costs could reach \$59,274,390. In the event that all or a significant portion of the Utilidor is destroyed by a flood, a new system would need to be constructed to serve community needs. The replacement value of the Utilidor has been estimated at \$544,623,197. These amounts do not include the cost of providing services (water, sewer, etc.) to the community through alternate means while the Utilidor is out of service. Additionally, if Barrow should experience a storm event of such intensity that it destroys all or a part of the Utilidor, we expect that above-ground assets also will sustain significant losses, potentially forcing the community to partially rebuild further inland as part of a long and difficult recovery process.

We also estimate that the replacement value of Borough-owned structures threatened by extreme flooding (other than the Utilidor) totals more than \$265 million. While some properties would suffer more damage than others as a consequence of major flooding, the potential for property damage and loss is certainly significant. Moreover, our estimate of the replacement costs of Borough-owned structures threatened by erosion does not include repair or replacement costs associated with the Utilidor, roads, other government (tribal, local, and federal) structures that may be at risk, or private property.

While the 2010 Report was thorough in many respects, we think damage estimates need to be updated or revised. For example, the 2010 Report noted that a storm in October of 1963 caused extensive damage to Barrow, primarily from flooding, with seawater reported to

have moved 400 feet inland in parts of Barrow. The reported damages from the 1963 storm alone totaled \$25,090,000 in 2007 dollars. However, the 2010 Report estimated that total expected erosion damages over the next 50-year period will total \$19,021,000, while storm damages will total \$2,928,200. In short, the 2010 Report estimated that erosion and storm damages over the next 50-year period will be less than the damages associated with the 1963 storm, even though Barrow is now under greater threat by erosion due to the absence of sea ice in the fall and Barrow's protective coastline has eroded significantly over the last 50 years.

Several noneconomic considerations also should be considered in an evaluation of the proposed Barrow Coastal Erosion Mitigation Project. For example, the 2010 Report recognized Barrow's value within the region as a regional hub and cultural center:

Barrow has intrinsic value much greater than the population and size of the city. Its continued existence as a viable community is essential for all the smaller [Borough] villages that rely on Barrow to serve as a hub. Preserving Barrow helps preserve the Inupiat culture, which has existed in arctic Alaska for thousands of years.

A major storm that destroys essential infrastructure and disrupts services in Barrow would have serious, wide-ranging impacts beyond the local community. As the 2010 Report recognized, Barrow serves as the hub community for the distribution of essential goods and services to seven villages across Alaska's North Slope. No other Alaskan community is capable of providing the same level of support as Barrow. Barrow would serve as a key staging point for a regional emergency, including an oil spill response operation along the Beaufort or Chukchi Sea coastline. A major storm and flooding event could cause Barrow's residents to lose utilities with cold temperatures setting in, access to potable water, and the use of major roads.

The 2010 Report also concluded that failing to construct the project poses a serious risk to human life and safety in Barrow:

Frigid flood waters during storms in the study area result in unusually dangerous conditions. Additionally, the current practices of flood fighting during storms place equipment operators in extremely hazardous conditions to protect the community.

Continued erosion also will seriously undermine employment and income growth for the community of Barrow. The 2010 Report found that "expected coastal storm/flood damages would likely result in negative employment and income impacts in the study area." The Report concluded that "the risk of coastal storm damage serves as a disincentive for businesses to invest in the community, further reducing the potential for future employment and income growth in Barrow."

Barrow's historical and cultural values also are threatened by continued erosion. The Utqiagvik Village site, in particular, is an historic/archeological site in northwestern Barrow that has been occupied for over 2,500 years. The remaining archeological site, which is eligible for the National Register of Historic Places, is located along the coast and suffers occasional damage from coastal erosion of the Barrow bluff. If the project cannot be completed, cultural resources and opportunities will be negatively impacted by further damage to the Utqiagvik Village archeological site.

Finally, erosion also threatens the old Barrow landfill, which contains a large amount of Navy and Air Force waste. The landfill was used as the waste disposal site for Barrow, the Air Force, and the Navy starting in the 1950s. The Navy dumped a variety of solid and hazardous wastes into the landfill from the early 1950s until 1981. These wastes included oil drilling waste, waste oil, anti-freeze, paint, battery acid and batteries, dry cleaning solvents, asbestos, and other waste chemicals. In 1972 alone, the Navy approximately 48,000 steel drums and other materials into the landfill.

While the Borough now owns and is responsible for maintaining the old Barrow landfill, we strongly encourage USACE to consider the local, public health and safety, cultural, social and environmental costs of a potential breach of the landfill. The landfill is located just landward of a gravel road that runs along the coast, which itself is threatened by erosion; in fact, a section of road to the north of the old Barrow landfill was washed out during the 2015 storm. While the 2010 Report recognized the possibility of having to relocate the landfill, it was not clear to us that the seriousness of a potential breach was considered in the 2010 Report. A breach of the landfill would cause a large amount of environmental contamination, which would have a huge impact on a community that depends on subsistence hunting for their food security.

This project has the strong support of Alaska's congressional delegation, the State of Alaska, and public, private and nonprofit stakeholders in Barrow and throughout the region. Cost sharing funds are currently available for the non-federal share of the proposed feasibility study. We urge you to include the Barrow Coastal Erosion Mitigation Project Feasibility Study in the USACE Annual Report to Congress, and look forward to working with the Alaska District to address the significant threats posed by coastal erosion to the community of Barrow.

Sincerely,

A handwritten signature in blue ink that reads "Henry Brauer". The signature is written in a cursive style with a large initial "H".

# Additional Proposal Information

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**North Slope Borough Erosion - USACE (January 26, 2016  
Presentation).pdf**



# North Slope Borough Shore Protection in Barrow, Alaska

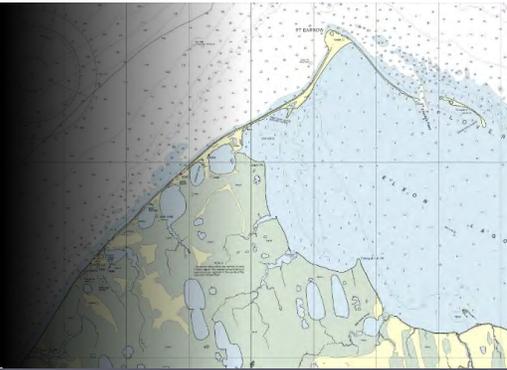
Flooding, Erosion and Ivu Hazard Reduction  
January 26, 2016



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January 26, 2016

# Presentation Overview



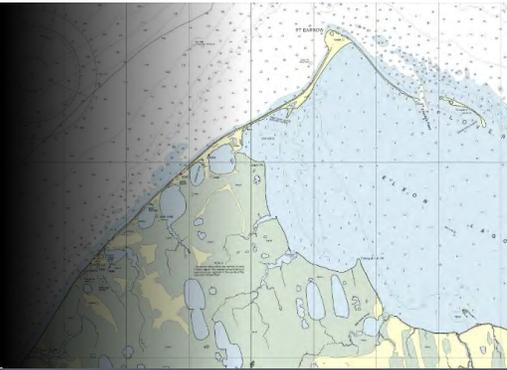
- Project Purpose
- Current Conditions
- Project Scope
- Coastal Erosion and Flood Protection Alternatives
- Planned Future Tasks
- Open Discussion



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# Project Purpose



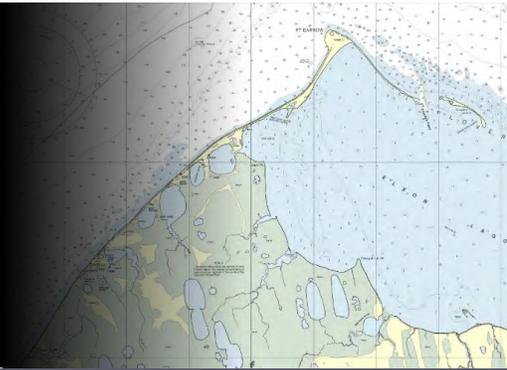
- Provide Protection From Coastal Flooding, Erosion, and Ivu Events for:
  - Community and Infrastructure
  - Utqiagvik Village Archeological Sites
  - Active Contaminated Sites



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# Current Conditions

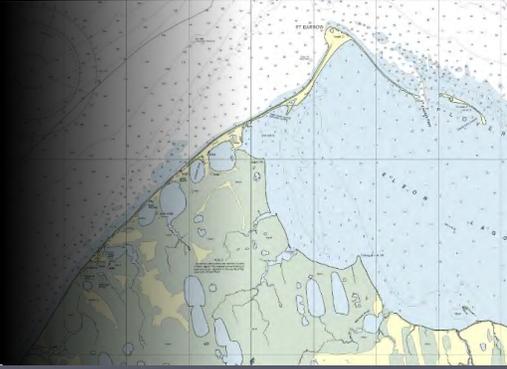


- Threat of Storm Flooding and Coastal Erosion
  - Reduced Seasonal Ice – longer storm season
  - Global Climate Change – thawing/eroding permafrost
  - “Net shoreline erosion of 2.2 feet per year” (USACE, July 2010)
- Multiple Active Contaminated Sites Along the Shoreline
- Recent Major Storms
  - October 1963 – Extensive erosion, loss of homes, loss of utilities
  - August 2000 – Extensive erosion, loss of beach nourishment dredge and homes.
  - August 2015 – Major efforts to mitigate damage



January 26, 2016

# Current Conditions



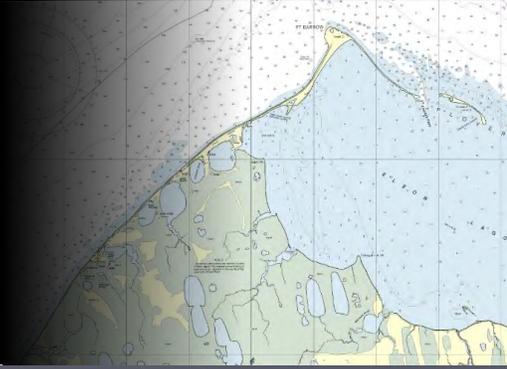
- Shoreline Erosion likely affected by Beach Excavation Activities
  - Trucks hauling beach materials for runway construction
  - Drag line dredge
  - Excavation by local community



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# Current Conditions



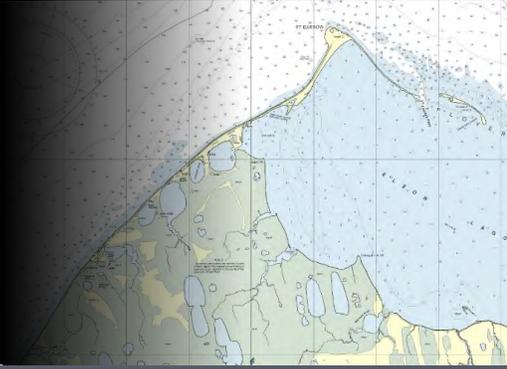
- October 1963 Storm, largest on record
  - Flood Damage



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# Current Conditions



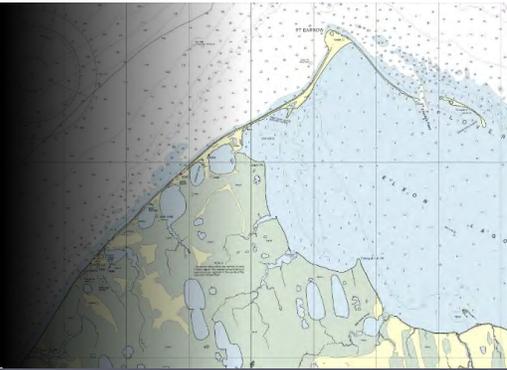
- Current Operations to Protect Community and Infrastructure
  - Haul and Place Temporary Berms ~ \$1MM to \$2MM Annually



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# Current Conditions



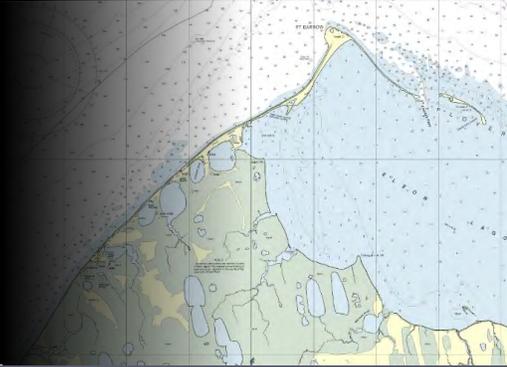
- Current Systems Used to Protect Community and Infrastructure
  - Tar barrels, Concertainers (Gabions), Geotextile Bags, and Concrete Mats



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# Current Conditions



- Flood Inundation - +14'



Inundation Map – Stillwater Elevation +14'

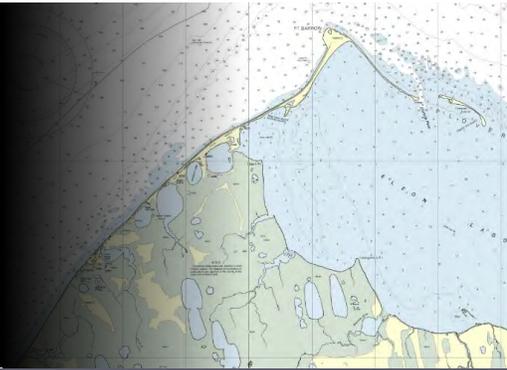


Barrow Underground Utilidor Map  
(Barrow Comprehensive Plan, 2015)



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# Project Scope

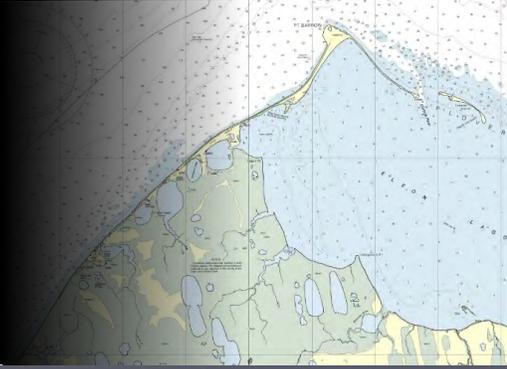


- Barrow Erosion and Flood Protection Status
  - Public Involvement Complete
  - Shoreline Historic Erosion Analysis Complete
  - Design Criteria Complete
  - Alternatives Analysis Complete
  - Preliminary Design and Cost Est. Complete
  - Archeological Research – UIC Science Complete



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# Project Scope

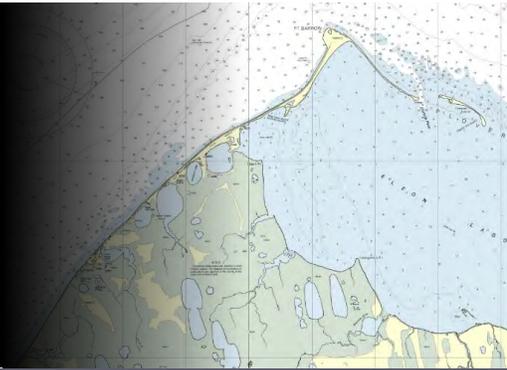


- Design Criteria and Considerations
  - Design Life – 50+ years
  - Design Storm and Ice – 200-year return
  - Sea Level Rise - +2 feet in 50 years (actual rise is inconclusive)
  - Beach Access – Subsistence Activities
  - Shoreline Erosion and Retreat – Resist, halt, or reverse
- Non Technical Considerations
  - Project Phasing
  - Logistics
  - Archeological and Historical Resources
  - Location of Shoreline Protection

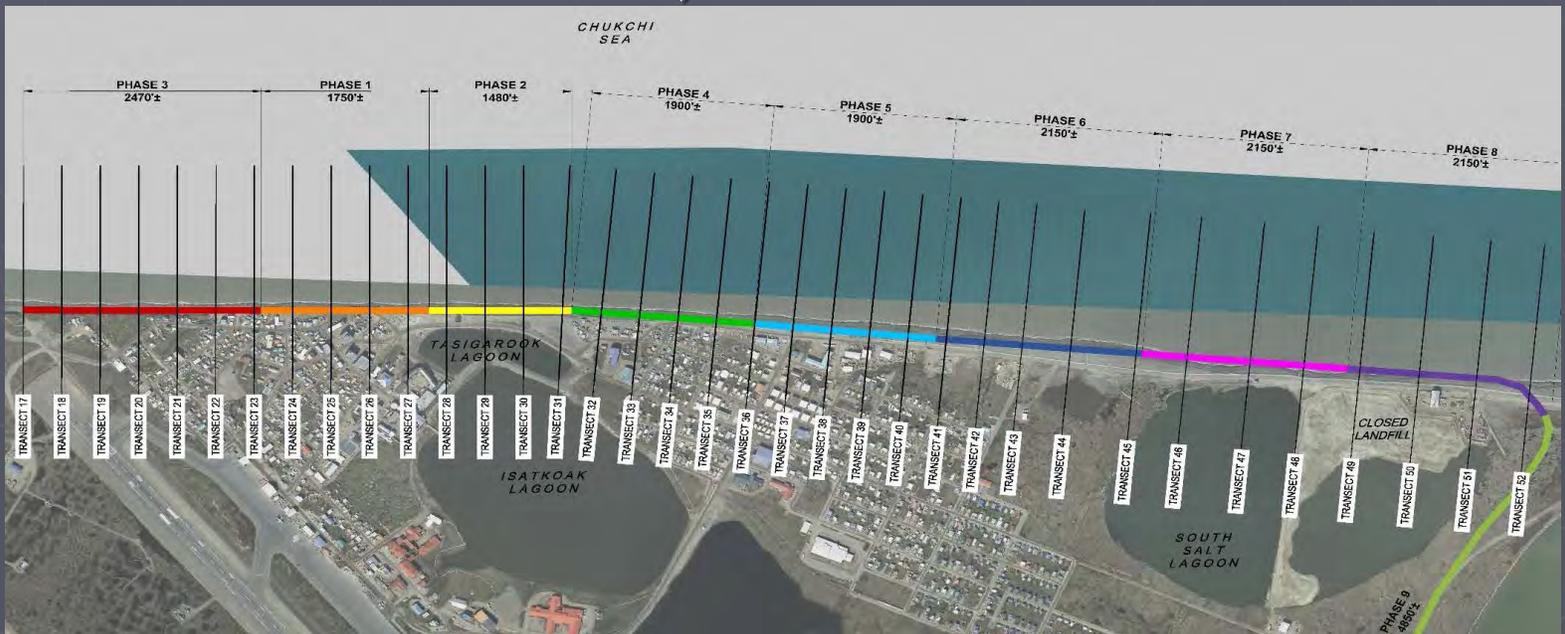


January 26, 2016

# Project Scope



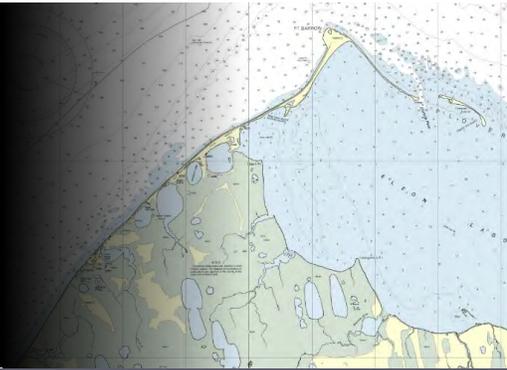
## Project Overview



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January 26, 2016

# Coastal Erosion and Flood Protection Alternatives



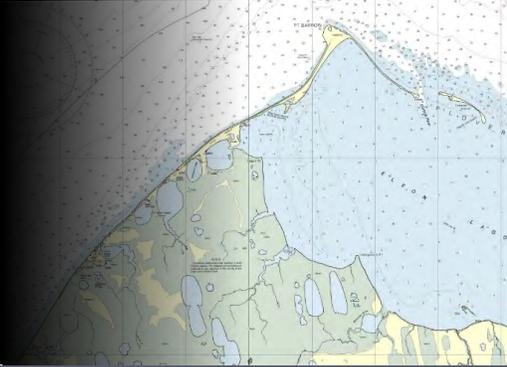
- Multiple Alternatives Considered – Ruled out for not meeting criteria
  - Beach Nourishment
  - Vegetation/Plantings
  - Concrete Armor Units
  - Geotextile Sacks
  - Cobble Beach
  - MSE Wall
  - Gravel-filled Wire Baskets
  - Breakwaters
  - Groins
  - Dikes and Berms
- Concept Alternatives Selected for Further Development
  - Armor Rock Revetment – Protected Sand/Gravel Berm Core
  - Concrete Revetment Slope - Protected Sand/Gravel Berm Core
  - Sheet Pile Wall (2 Variations)



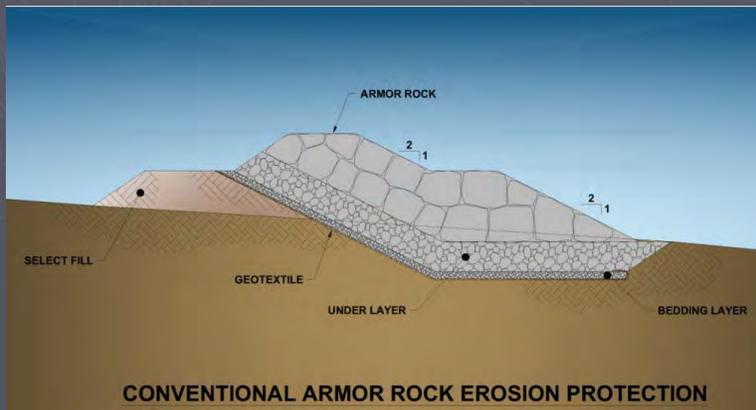
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# Coastal Erosion and Flood Protection Alternatives



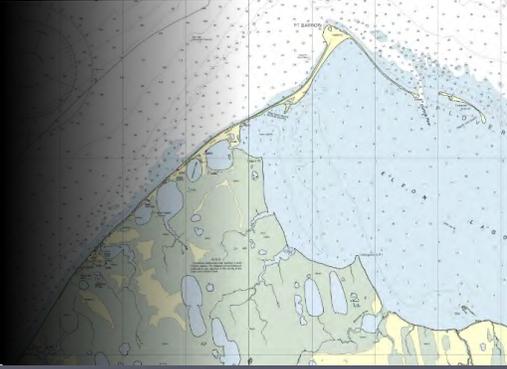
- **ARMOR ROCK REVETMENT**
  - Sized for Ice – 8 Ton
  - TIC ROM ~ \$21,000 per l.f.



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# Coastal Erosion and Flood Protection Alternatives



Nome, Alaska (12 – 20 Ton Rock)



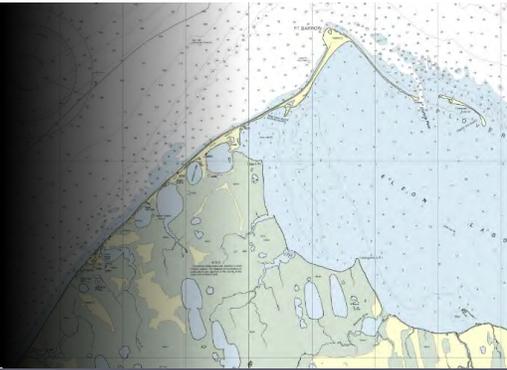
Wainwright, Alaska (2 Ton Rock)



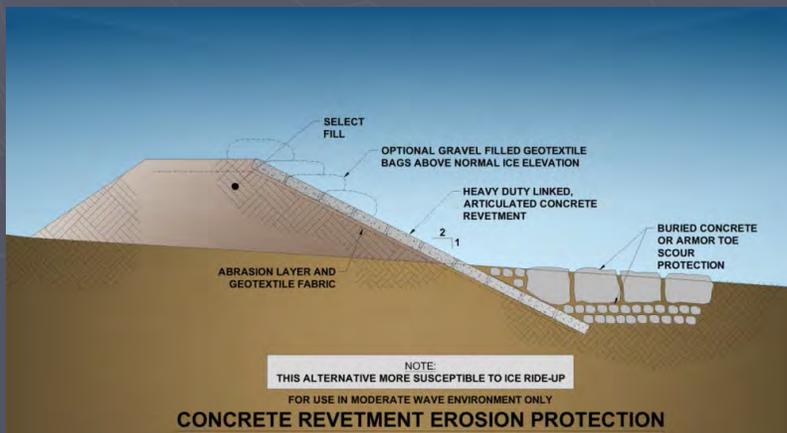
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# Coastal Erosion and Flood Protection Alternatives



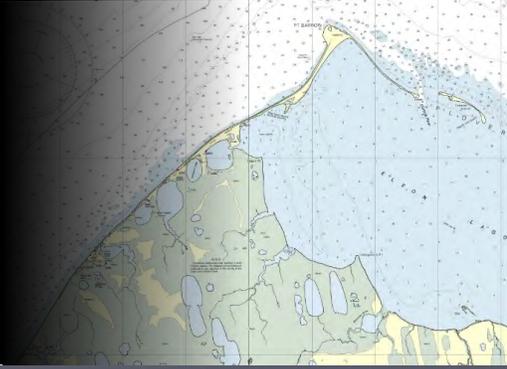
- CONCRETE REVETMENT MAT
  - TIC ROM ~ \$14,200 per l.f.



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# Coastal Erosion and Flood Protection Alternatives



Kuparuk River Bridge Approach

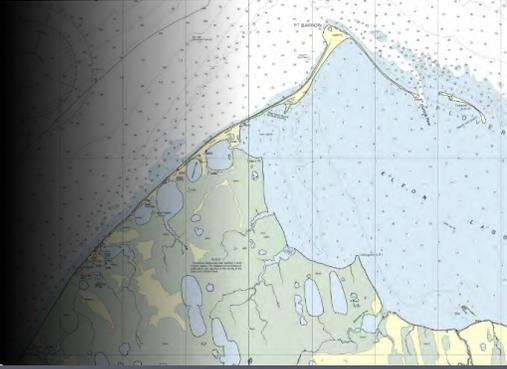
Offshore Island, North Slope, AK



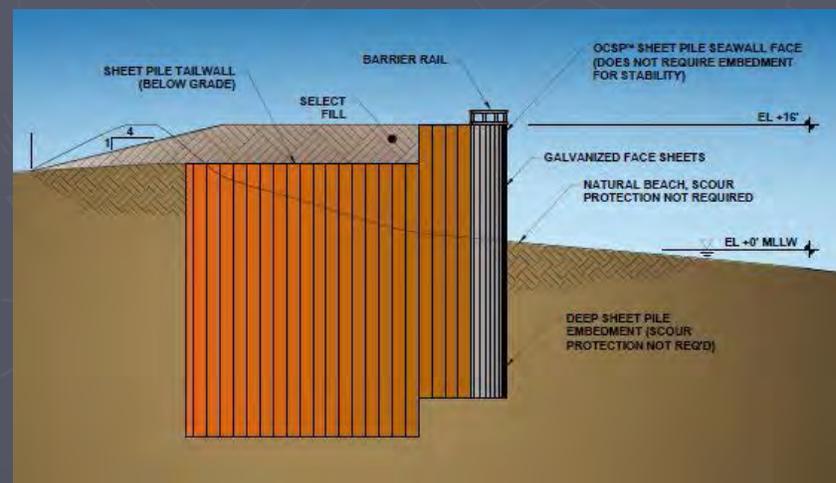
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# Coastal Erosion and Flood Protection Alternatives



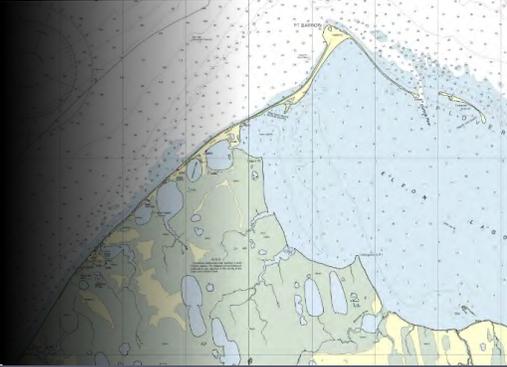
- SHEET PILE
  - TIC ROM ~ \$12,200 per l.f.



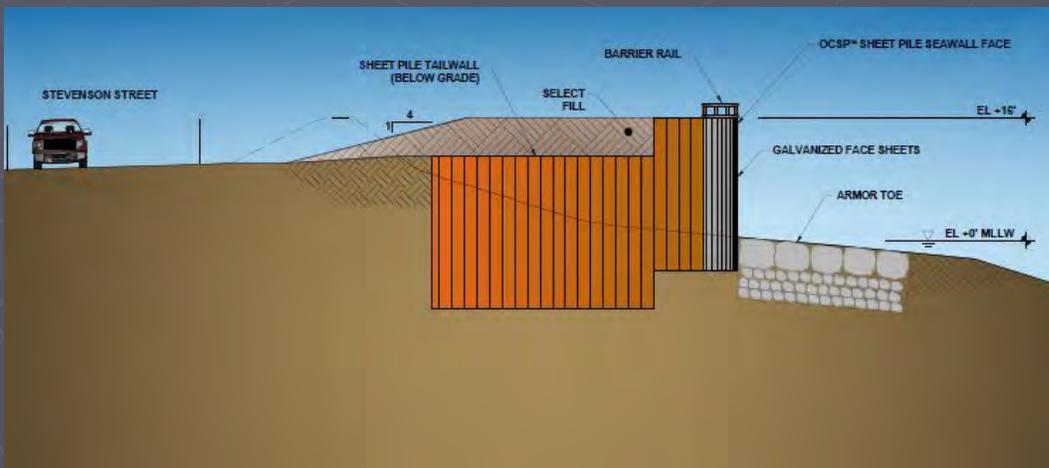
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# Coastal Erosion and Flood Protection Alternatives



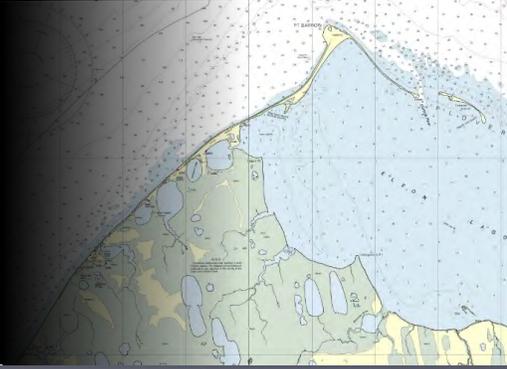
- SHEET PILE W/ SCOUR PROTECTION
  - TIC ROM ~ \$13,000 per l.f.



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# Coastal Erosion and Flood Protection Alternatives



Sheet Pile Seawall, Kotzebue, AK



Liberty SDI, North Slope, AK



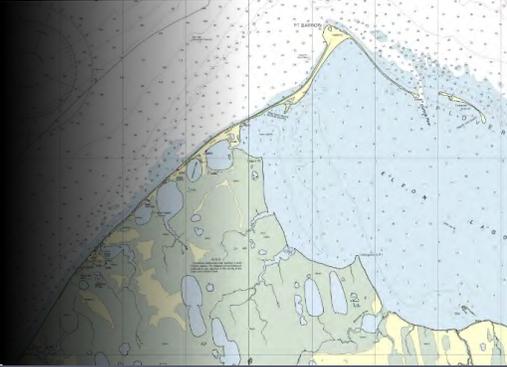
Sheet Pile, Lake Charles, Louisiana



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# Coastal Erosion and Flood Protection Alternatives



## Contaminant Considerations

- Sheet Pile Alternatives
  - Reduce permeability
  - USACE approved OPEN CELL SHEET PILE™ as an acceptable contaminant containment system
- Old Barrow Landfill
- Hydrocarbons along shoreline
- Soil Investigation at landfill may be needed

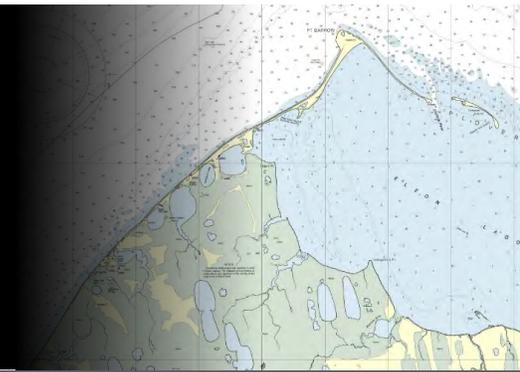


Waste Isolation Bulkhead Construction at Alameda, California (October 7, 2014)

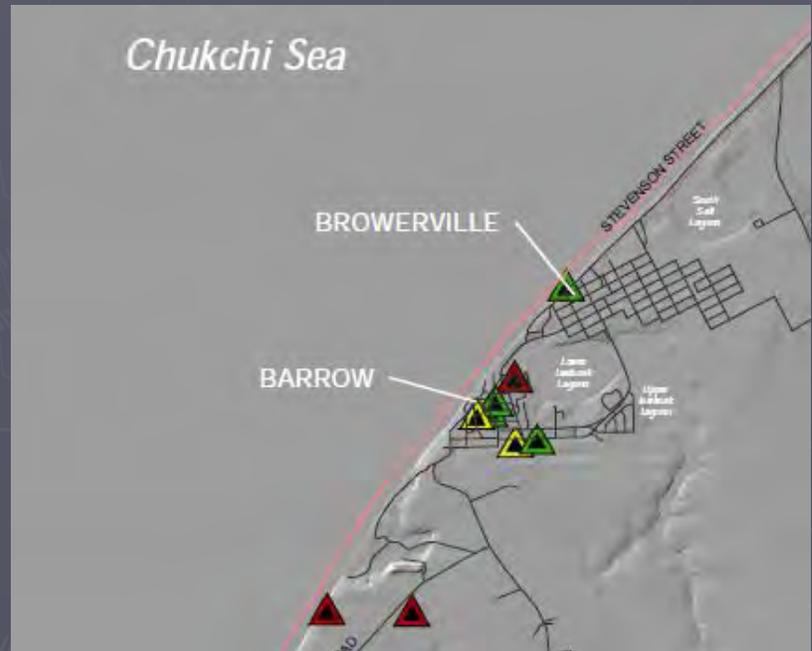


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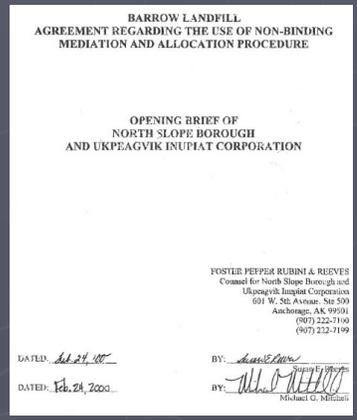
# Coastal Erosion and Flood Protection Alternatives



## Contaminant Considerations



Alaska DEC Contaminated Sites



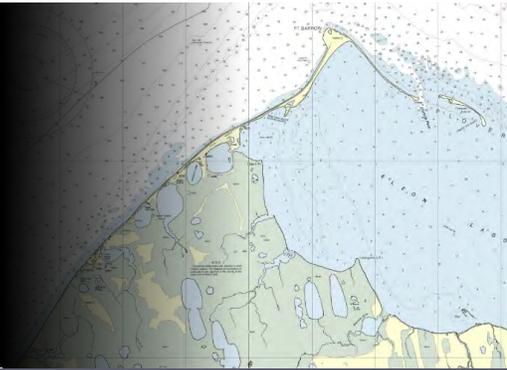
over 13,000 tons of industrial waste and debris, including some 48,000 barrels, into the lagoon during the "cleanup" of the Naval Petroleum Reserve in 1972-73. A 1983 Navy report shows DoD and its contractors routinely dumped into the lagoon large quantities of anti-freeze, waste batteries and battery acid, grease, waste oil, and waste paints and thinners, and they were still dumping hazardous substances into the lagoon at the time of the report. The documentation is



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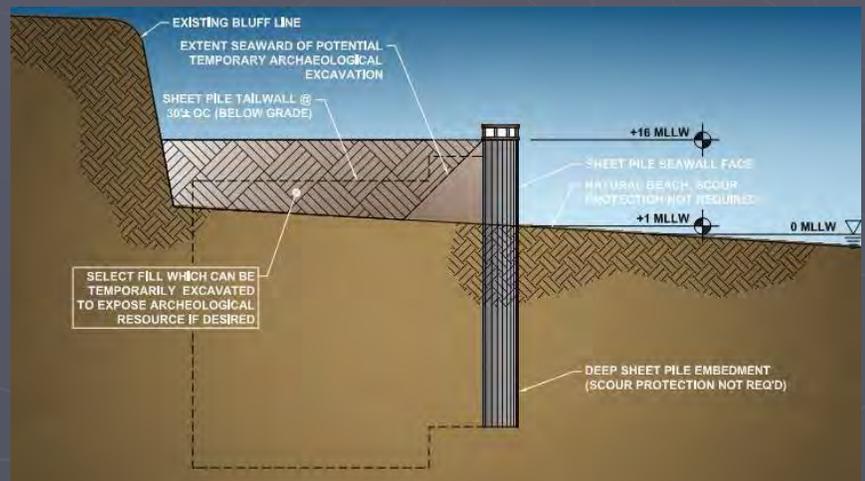
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# Coastal Erosion and Flood Protection Alternatives



## Archeological Considerations

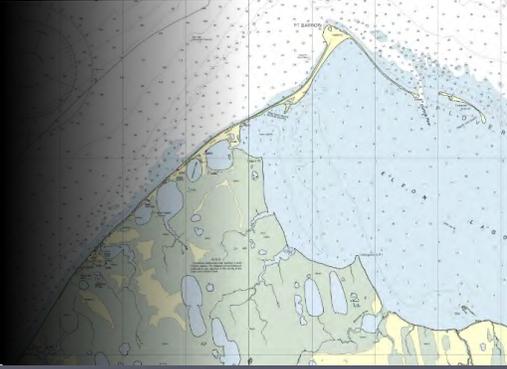
- UIC Sciences – Archeological Resources Report
  - Cost impacts dependent on the anticipated resource and the desired type/placement of the shore protection alternative selected for construction.
  - Archeological Mitigation cost varies from \$20,000-\$800,000 per 500 LF transect
  - Sheet pile allows deferred excavation if needed/desired



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# Coastal Erosion and Flood Protection Alternatives



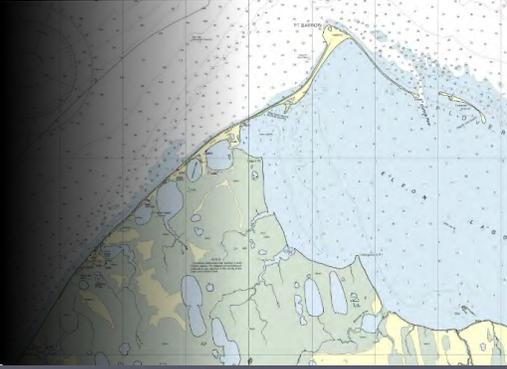
## Property Ownership Considerations

- Armor Rock Revetment
  - Largest footprint
  - Requires bluff excavation
  - Will require procurement of private properties
- Sheet Pile Seawall
  - Smallest footprint
  - Alignment can be adjusted to avoid sensitive areas
  - Will likely not require bluff excavation or private property procurement



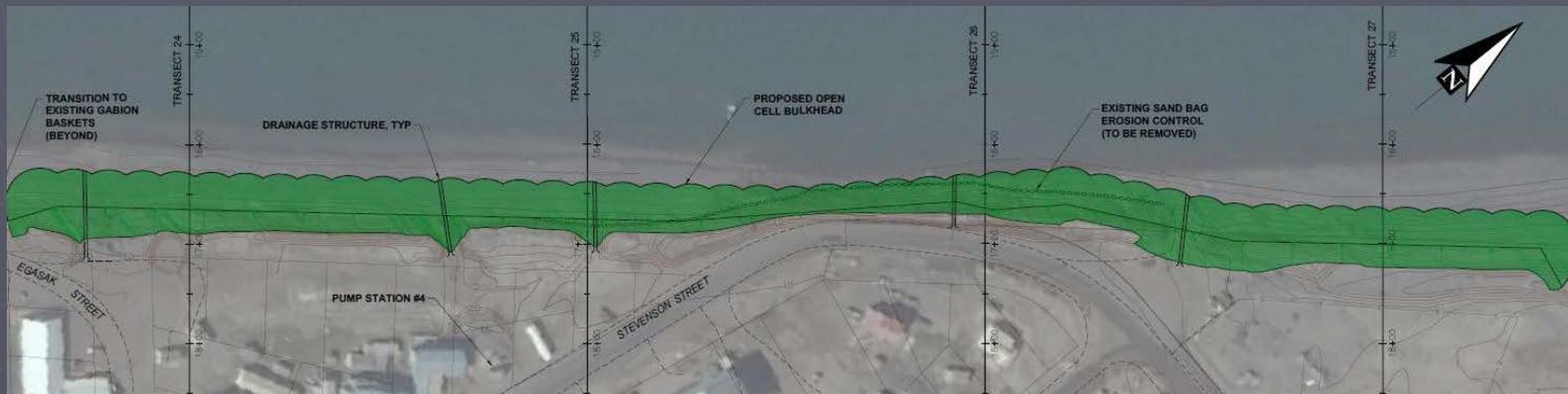
January 26, 2016

# Planned Future Tasks



## Barrow Shoreline Protection Project – Phase 1

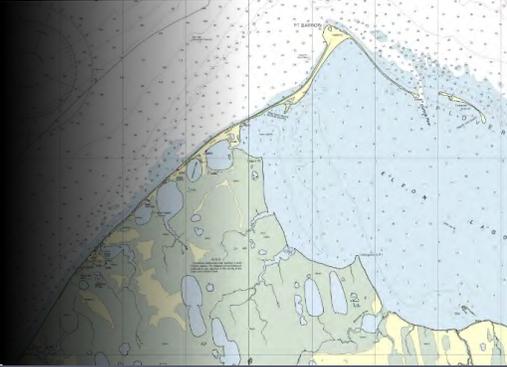
- OCSP Concept Design Complete ~ 1,750 LF



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# Planned Future Tasks

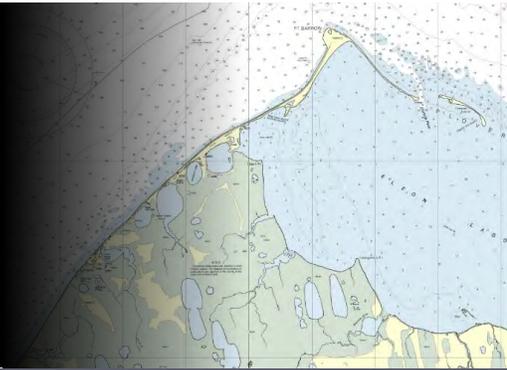


## Barrow Shoreline Protection Project – Phase 1

- Begin Phase 1 Design – May 1, 2016
  - Geotechnical Investigation
    - Note that contaminated soils may be discovered
    - Depending on contamination type and levels, OCSP may allow for soils to remain in place since excavation is not required for this alternative
  - Retrieve and Analyze ADCP (wave and ice) Data
  - Design Package for Bidding and Construction
  - Permit Applications
- Begin Archeological Identification and Delineation – May 1, 2016
  - Potential for Mitigation
- Begin Construction – May 1, 2017



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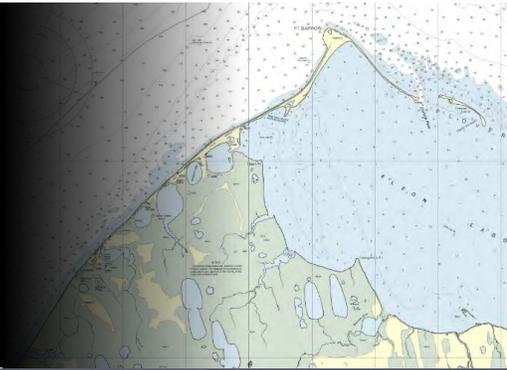
# Planned Future Tasks

## Barrow Shoreline Protection Project – Phase 1

- BSPP-1 TIC ROM Cost Estimate

ITEM NO.	DESCRIPTION	QUANTITY	UoM	ROM COST
1.1	MOBILIZATION / DEMOBILIZATION	1	LS	\$ 1,900,000
1.2	OCSP BULKHEAD CONSTRUCTION	1750	LF	\$ 11,000,000
1.3	CONTRACTOR SUPPORT & INDIRECTS	1	LS	\$ 2,000,000
1.4	ENGINEERING, PERMITTING, & PROJECT MGMT.	1	LS	\$ 3,000,000
1.5	ARCHAEOLOGICAL & CULTURAL RESOURCES	1	LS	\$ 100,000
1.6	CONTINGENCY	PRCT	20%	\$ 3,600,000
<b>BSPP PHASE 1 - ROM COST =</b>				<b>\$ 21,600,000</b>





# Planned Future Tasks

## Barrow Shoreline Protection Project

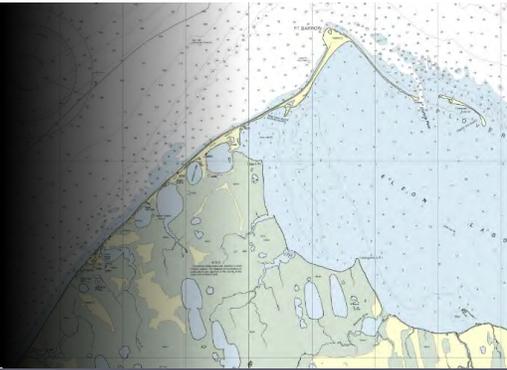
- BSPP Phase 1-9 TIC ROM Cost Estimate

ITEM NO.	DESCRIPTION	QTY	UoM	ROM COST
A	ENGINEERING, PERMITTING, & PROJECT MGMT.	1	LS	\$ 28,300,000
B	ARCHAEOLOGICAL & CULTURAL RESOURCES (Pha. 1,3,4)	1	LS	\$ 200,000
C	PROJECT CONSTRUCTION	1	LS	\$ 138,500,000
D	PROJECT CONTINGENCY 20%	1	LS	\$ 33,400,000
<b>BSPP PHASE 1-9 - TOTAL ROM COST =</b>				<b>\$ 200,400,000</b>



January 26, 2016

# Open Discussion



Questions or Comments?

Thank You

Dempsey Thieman, P.E.

[dthieman@pndengineers.com](mailto:dthieman@pndengineers.com)

PND Engineers, Inc.

1506 W. 36th Ave.

Anchorage, Alaska

Phone 907.561.1011

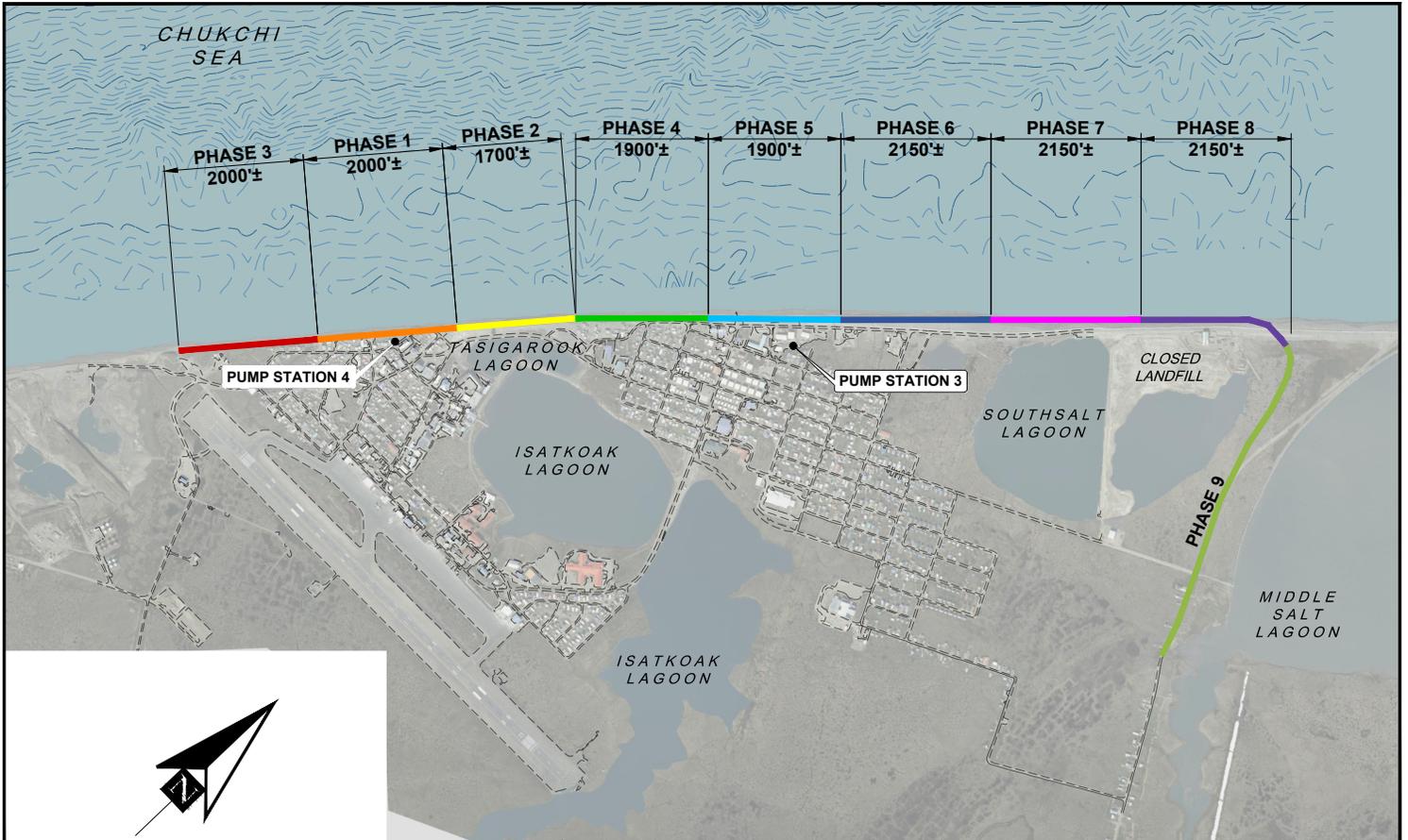


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# Additional Proposal Information

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**Vicinity Map 8.5x11.pdf**



1506 West 36th Avenue  
 Anchorage, Alaska 99503  
 Phone: 907.561.1011  
 Fax: 907.563.4220  
 www.pndengineers.com



PROJECT: BARROW FLOOD/EROSION PROTECTION		
TITLE: PHASING PLAN		
DESIGNED BY: JK	DATE: 09/2016	SHEET NO: 1
CHECKED BY: DT	PROJECT NO: 141034	OF 1

# Additional Proposal Information

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## Phasing Plan 11x17.pdf

CHUKCHI  
SEA

PHASE 3  
2470'±

PHASE 1  
1750'±

PHASE 2  
1480'±

PHASE 4  
1900'±

PHASE 5  
1900'±

PHASE 6  
2150'±

PHASE 7  
2150'±

PHASE 8  
2150'±

TASIGAROOK  
LAGOON

ISATKOAK  
LAGOON

SOUTH  
SALT  
LAGOON

CLOSED  
LANDFILL

PHASE 9  
4850'±

MIDDLE  
SALT  
LAGOON

TRANSECT 17

TRANSECT 18

TRANSECT 19

TRANSECT 20

TRANSECT 21

TRANSECT 22

TRANSECT 23

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