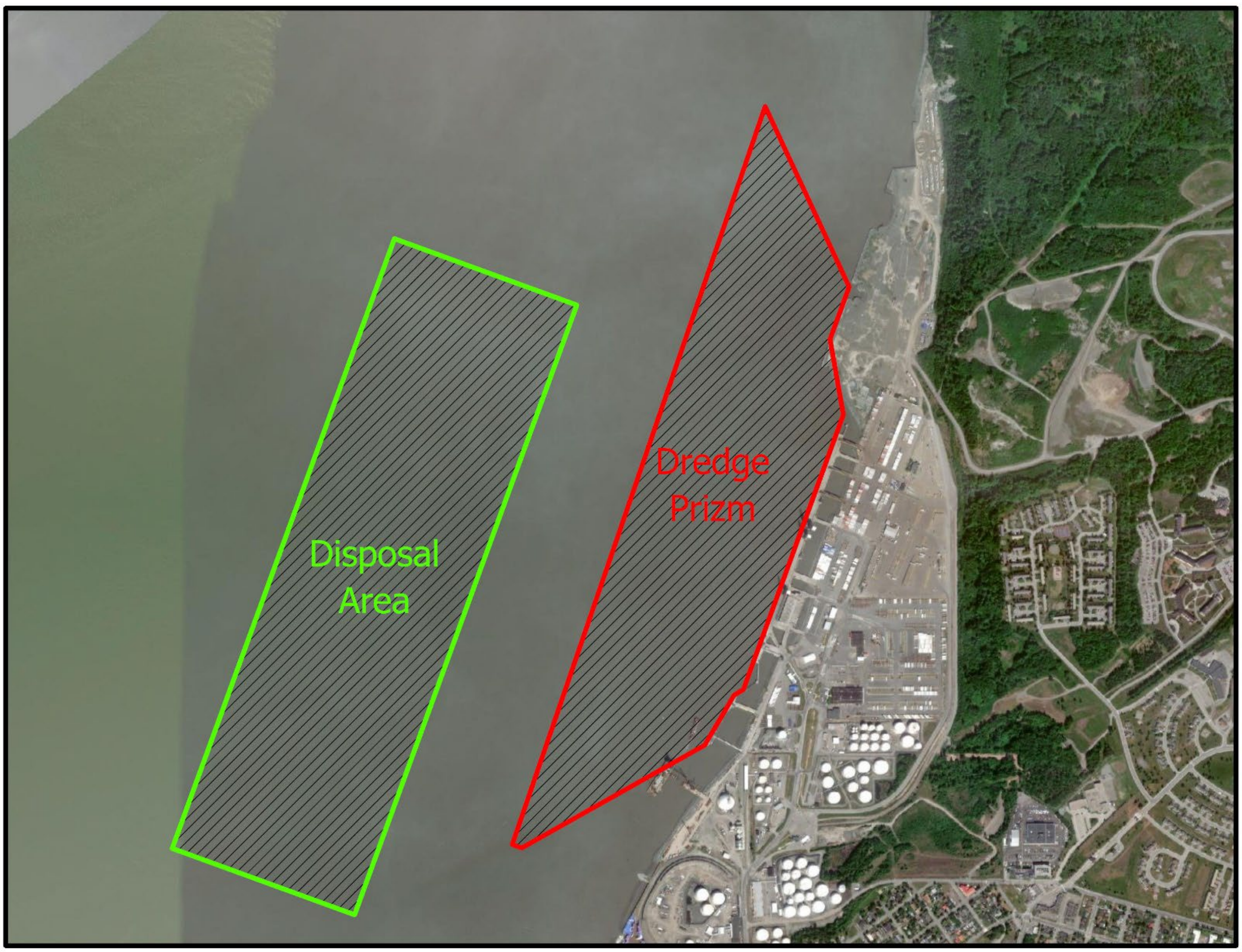
US Army Corps of Engineers
Alaska District

Environmental Assessment and Finding of No Significant Impact

Maintenance Dredging, Anchorage Harbor, Anchorage, Alaska



May 2022

FINDING OF NO SIGNIFICANT IMPACT

In accordance with the National Environmental Policy Act of 1969, as amended, the U.S. Army Corps of Engineers, Alaska District (USACE) has assessed the environmental effects of the following action:

Perform maintenance dredging to minus 35 feet mean lower low water in Anchorage Harbor and dispose of dredged material in the Anchorage Harbor open water disposal site

The Corps April 2022 *Maintenance Dredging, Anchorage Harbor, Anchorage, Alaska, Environmental Assessment* (EA) defined the proposed action and addressed the environmental effects of that action. The Anchorage Harbor was authorized in 1958 and the Corps has dredged Anchorage Harbor since 1965 to maintain adequate depths for shipping. Dredging typically begins in April and ends in October. Annual maintenance dredging volumes vary substantially and have approached 2 million cubic yards.

Anchorage Harbor (the Port of Alaska, previously known as the Port of Anchorage) is on Knik Arm near its junction with Turnagain Arm at the head of Cook Inlet in Southcentral Alaska. The proposed action will maintain the -35 MLLW project depth for Anchorage Harbor and manage the dredged material in the same manner as described in the previous (2017) *Transition and Maintenance Dredging, Anchorage Harbor, Anchorage, Alaska Environmental Assessment*.

Principal resources of concern identified in the EA process were salmon and beluga whales, the species they prey on, and their habitat. These resources were evaluated in the Corps April 2022 *Maintenance Dredging, Anchorage Harbor, Anchorage Alaska, Environmental Assessment*. Those assessments led to the following conclusions:

- Adult salmon are not substantially affected. They tend to migrate closer to the shore. Noise and activity comparable to that of dredging does not prevent them from reaching spawning habitat in Knik Arm or elsewhere.
- Juvenile salmon may be present in the Knik Arm for more than a month during the dredging period and feed successfully at the surface during their residence. All dredged material and overflow water from dredging will be discharged beneath the surface to avoid impacts on juvenile salmon feeding.
- Sounds generated by dredging and related activities are similar in intensity to those associated with other harbor activities, and most are close to ambient noise levels. To protect marine mammals, dredging activities will be suspended any time marine mammals are within 50 meters of a stationary activity and 100 meters of a moving vessel.
- To protect marine mammals from vessel strikes, transiting vessels shall use appropriate avoidance measures to prevent marine mammals from approaching or entering a 100 meter radius of the vessel. Support vessels will be restricted to 13 knots and the dredge will be restricted to 6 knots.
- Activities at and near the Port of Alaska, including dredging, do not prevent marine mammals from feeding actively near the Port of Alaska.

- Dredging and dredged material disposal will affect a maximum of about 650 acres of Knik Arm bottom habitat that may be used by prey organisms. Alteration of habitat is unlikely to substantially affect beluga whale feeding because: (1) potential prey organisms are mobile and able to repopulate affected areas, (2) the affected area is a small part of available habitat in the Cook Inlet beluga whale winter range, and (3) winter habitat in the Cook Inlet belugas' range supported a much larger population just a few years ago.

The continuation of annual maintenance dredging in the Anchorage Harbor will cause a less than significant impact on the resources present in the project area. Dredging at the Port of Alaska will not affect Cook Inlet beluga whales or the waters and substrate necessary for the feeding, spawning, breeding, or rearing of federally managed fish species such as the five species of Pacific salmon.

On 30 January 2019, the Alaska Department of Environmental Conservation issued the Corps a Certificate of Reasonable Assurance under Section 401 of the Clean Water Act, Alaska Water Quality Standards, and other applicable state laws. The certification expires 5 years after the date of issuance.

This proposed action complies with the Endangered Species Act, the Clean Water Act, the Magnuson-Stevens Fishery Conservation and Management Act, the National Historic Preservation Act, and the National Environmental Policy Act. The EA supports the conclusion that the action does not constitute a major Federal action significantly affecting the quality of the human and natural environment. An environmental impact statement is therefore not necessary for the maintenance dredging at the Anchorage Harbor.

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Damon Delarosa
Colonel, U.S. Army
Commanding

Date

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List of Acronyms

ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
ACMP	Alaska Coastal Management Program
AHRS	Alaska Heritage Resources Survey
APE	Area of Potential Effect
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CINC	Cook Inlet Navigation Channel
CO	Carbon Monoxide
CWA	Clean Water Act
CY	Cubic Yards
CZMA	Coastal Zone Management Act
dB	Decibel
DPS	Distinct Population Segment
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ER	Engineer Regulation
ESA	Endangered Species Act
GOA	Gulf of Alaska
Hz	Hertz
JBER	Joint Base Elmendorf-Richardson
Kcy	Thousand cubic yards
Mcy	Million cubic yards
MHW	Mean High Water
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
MOA	Municipality of Anchorage
MPRSA	Marine Protection, Research, and Sanctuaries Act
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NMML	National Marine Mammal Laboratory
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Unit
Pa	Pascal
PCT	Petroleum and Concrete Terminal
BGEPA	Bald and Golden Eagle Protection Act
PIEP	Port Intermodal Expansion Project
PM_{10}	Particulate Material smaller than 10 microns

$PM_{2.5}$	Particulate Matter smaller than 2.5 microns
POA	Port of Anchorage
POL	Petroleum, Oils, & Lubricants
PSU	Practical Salinity Units
R	Range
RHA	Rivers and Harbors Act of 1899
RL	Received Level
RMS	Root Mean Squared
SDDC	Surface Deployment & Distribution Command
SHPO	State Historic Preservation Officer
SPL	Sound Pressure Level
TL	Transmission Loss
USC	United States Code
USACE	United States Army Corps of Engineers

1.0 Purpose and Need

1.1 Introduction

In accordance with the National Environmental Policy Act (NEPA) of 1969, this environmental assessment (EA) assesses the potential environmental impacts related to the proposed maintenance dredging of the Federal dredging project at Anchorage Harbor, now known as the Port of Alaska (POA), previously known as the Port of Anchorage, and the related disposal at the Anchorage in-water disposal area. The Anchorage Harbor is in the Municipality of Anchorage (MOA), Alaska, near the confluence of the Knik Arm and Turnagain Arm of Cook Inlet and is the state of Alaska's primary commercial port. The Consolidated Appropriations Act, 2005, P.L. 108-447, Title I, Division C, 118(a) and 118(d) modified the original and amended project authorizations for the POA, directing the Secretary of the Army to construct a harbor depth to -45 feet MLLW for a length of 10,860 feet. Federal maintenance shall be in accordance with Section 101 of the River and Harbor Act of 1958, except that the project is to be maintained at a depth of -45 feet MLLW for a length 10,860 feet. The project is currently maintained at -35 feet MLLW, as the funding for dredging to minus 45 feet mean lower low water has not been appropriated. Dredged materials are transported to the Anchorage in-water disposal site located 3,000 feet abeam the dock face. The POA is connected to lower Cook Inlet by the Cook Inlet Navigation Channel (CINC), a channel 11,000 feet long and 1,100 feet wide, constructed to a depth of -38 feet MLLW in 2000.

The maintenance dredging in the Anchorage Harbor is executed by contract, typically on a three-year cycle. The United States Army Corps of Engineers (USACE) began dredging the Anchorage Harbor in 1965 to maintain the Federally authorized required depth, and currently dredges to -35 feet MLLW as required by the Water Resources Development Act of 1976. Dredging generally begins in April of each year (depending on ice hazard) and continues through October. Dredging may occur continuously during the season, as indicated by semiweekly bathymetric surveys. The maintenance dredging has been conducted in a substantially similar manner (hopper dredge) since the early 2000s.

The environmental consequences of the maintenance dredging were described, most recently, in the 2008 *Anchorage Harbor Dredging & Disposal Anchorage, Alaska, Environmental Assessment* (2008 EA) and the 2017 *Transition and Maintenance Dredging Anchorage Harbor, Anchorage, Alaska, Environmental Assessment* (2017 EA). The 2017 EA referenced an informal Endangered Species Act (ESA) consultation for Cook Inlet beluga whales effective from 2017-2022. After the 2017 EA was prepared and consultation completed, the Alaska District procured and deployed a hydrophone in the Anchorage Harbor to better understand the hydroacoustic environment and intensity of the underwater sound produced by the maintenance dredging operation. The new information regarding the environmental consequences of the proposed action justifies the preparation of a new EA. The resulting analysis is summarized in the appropriate sections 3 and 4, and a detailed description is included in Appendix A. Most of the remaining sections of the EA remain substantially unchanged from 2017, as the project description and impacts to other resource areas has not changed.

This EA has been prepared in accordance with the NEPA of 1969, the implementing regulations of the Council on Environmental Quality (CEQ) (Title 40 *Code of Federal Regulations* [CFR] Parts 1500 through 1508), and the USACE procedures for implementing NEPA, 33 CFR 230 and Engineer Regulation (ER) 200-2-2, Procedures for Implementing NEPA (USACE 1988).

1.2 Authority

The Corps has been dredging the POA since 1965 under the following authorities:

1. Cook Inlet, navigation improvements, River and Harbor Act of 1958, P.L. 85-500, Section 101 (authorizing the project as described in House Doc. 34, 85th Congress, 1st Session)
2. Water Resources Development Act of 1976, P.L. 94-587, Section 199.

1.3 Purpose of the Action

The purpose of the maintenance dredging is to maintain authorized depths of the Federal entrance channel and harbor basin at the Anchorage Harbor. The Federal project accommodates three dry cargo berths and two petroleum handling facilities. It is the main supply and distribution center for the southcentral and interior areas and Joint Base Elmendorf-Richardson (JBER) that lies within the MOA. The POA is the largest cargo port in Alaska, handling 74% of all in-bound non-petroleum freight that enters south-central Alaska. Approximately 4,987,806 tons of cargo (all commodities) passed through the port in 2021.

Maintenance dredging at Anchorage Harbor is needed for national security. The Anchorage Harbor was designated as a Military Surface Deployment & Distribution Command (SDDC) Strategic Seaport in 2006, one of 19 commercial seaports in the United States. Strategic Seaports are designated for use in moving surge military cargos in time of crisis. Anchorage Harbor is the only Strategic Seaport outside the continental United States and one of six on the West Coast of the United States. Anchorage Harbor supports certain military functions and requirements which cannot be met elsewhere in the State and the Anchorage Harbor maintenance dredging could impact military operations if it were delayed or otherwise impacted.

This EA considers the effects of maintenance dredging for the POA for years 2023 through 2028. The USACE will re-evaluate the maintenance dredging project prior to the 2029 dredging season to determine whether new information or changes to the project require further NEPA analysis.

1.4 Scope of the Action

The scope of analysis for the NEPA and environmental compliance evaluations is the impacts associated with the maintenance dredging in the Anchorage Harbor basin and the in-water disposal of dredged material at the Anchorage disposal area. The MOA's proposed application to do work in navigable waters and place fill materials into waters of the United States associated with the Port of Alaska Modernization Program (PAMP) under Section 10 of the Rivers and Harbors Act (RHA) of 1899 (33 CFR Part 403) and Section 404 of the Clean Water Act (CWA, 40 CFR Part 230) are not included in the scope of this environmental assessment. Those activities require Department of the Army authorization by the USACE Regulatory Division and are evaluated independently of the maintenance dredging project assessed here.

1.5 Description of the Project Area

The POA is in Southcentral Alaska at the upper end of Cook Inlet. It is adjacent to downtown Anchorage on the southeastern shoreline of Knik Arm at approximately latitude 61º 13.3’ N, longitude 149º 54.6’ W (Figure 1). Anchorage, the state's largest city and center of transportation, is at the inlet's northeast end, between the Knik Arm and Turnagain Arm. Nearly half the state’s population resides in Anchorage. The CINC connects the POA to the Lower Cook Inlet and the Gulf of Alaska (GOA).

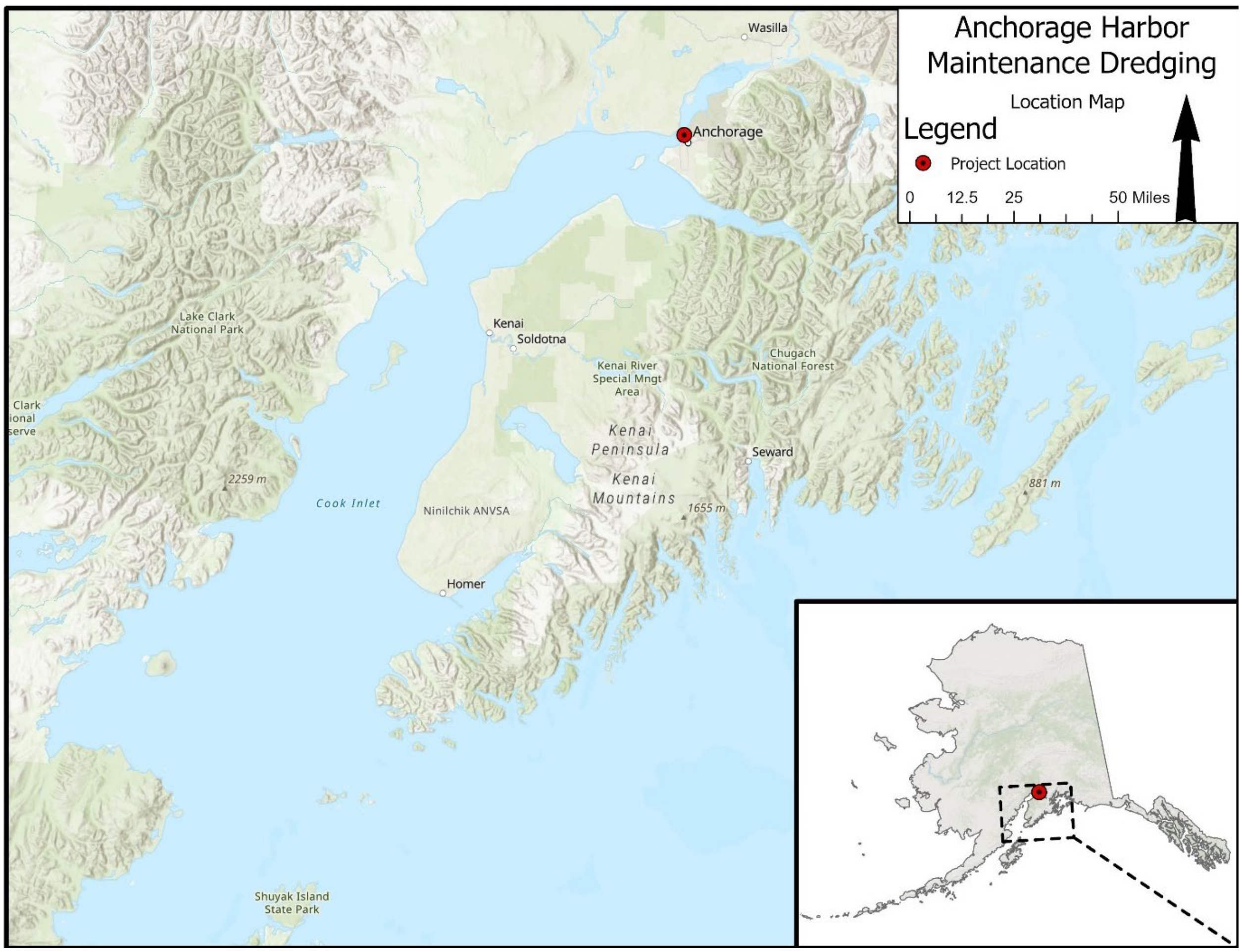


Figure 1. Anchorage Harbor Location Map

Cook Inlet is a large estuary on the southcentral coast of Alaska, bordered on three sides by rugged mountains, tidal flats, marshlands, and rolling lowlands. Figure 1 shows the inlet and the topographic features that surround it. The inlet is approximately 200 miles long, from the upper ends of Knik Arm and Turnagain Arm in the north, to the southern tip of the Kenai Peninsula. Both the Knik Arm and Turnagain Arm, at the northern extreme of Cook Inlet near Anchorage, are more than 37 miles from their confluence to the limits of their tidelands.

The majority of freshwater that enters Upper Cook Inlet is from three rivers at its northern end. The Matanuska, Susitna, and Knik Rivers contribute nearly 70 percent of the fresh water discharged annually into the inlet (Gatto 1976). These glacier-fed rivers carry a heavy sediment load into Cook Inlet, particularly during summer. Rivers entering Turnagain Arm discharge nearly 3 million tons of sediment annually, while the rivers entering Knik Arm discharge about 20 million tons (Gatto 1976). This sediment fills the upper inlet. The finest material in this sediment is carried into the southern inlet and some of it is goes out into the GOA.

Upper Cook Inlet above the East and West Forelands is a shallow basin, with depths generally less than 65 feet. The Knik Arm averages about 50 feet in depth for about half its length and then rapidly shoals to a tidal flat. Turnagain Arm shoals within the first 10 miles to a large tidal flat cut by many tidal channels.

The Cook Inlet area is in a transition zone between Alaska's maritime and interior climates. The lower inlet has a more maritime climate, with cooler summers and milder winters than in the upper reaches of the inlet. A comparison of temperatures between two cities located at opposite ends of the inlet demonstrates the differing climates. Anchorage, at the head of the inlet, has an average winter temperature of 16 °F and a summer average of 55 °F, while Homer, near the southern end of the inlet, averages 19 °F in winter and 50 °F in the summer.

The mean daily tide range is about 30 feet at Anchorage. The tides are two unequal high tides and two unequal low tides per tidal day. A tidal (lunar) day is 24 hours and 50 minutes. The greatest tides are in the spring, with high and low tides exceeding the mean by more than 5 feet. Currents in the upper inlet are classified as reversing currents because the flow changes to the opposite direction and is briefly near zero velocity at each high and low tide. Extreme tides can cause currents in Upper Cook Inlet to exceed 4 knots in some areas. Each tidal cycle in the upper inlet creates strong turbulence and vertical mixing, so in most areas water properties tend to be more uniform from the surface to the bottom.

The upper inlet is so shallow that wave heights seldom exceed 10 feet. The Knik Arm waves are further constrained east of Fire Island by limited fetch. Strong tidal currents in Cook Inlet can oppose wind-generated waves. This can make waves steeper and more chaotic, a dangerous condition for small boats.

1.6 Current Operations

Port of Alaska. Anchorage Harbor was authorized by Section 101 of the Rivers and Harbor Act of 1958 (as Cook Inlet navigation improvements), as modified by Section 199 of the Water Resources Development Act of 1976. The project accommodates three dry cargo berths and two petroleum handling facilities. The POA serves as Alaska’s regional port and as a SDDC Strategic Seaport providing services to approximately 80 percent of the total population of Alaska, including four military installations. Vessels with drafts up to 40 feet dock during high tide and offload their cargo. Annual maintenance dredging allows the -35 feet MLLW congressionally authorized 2007 depth to be available 90 percent of the time.

The U.S. Army Corps of Engineers has dredged the POA annually at full Federal expense to its authorized depth of -35 feet MLLW since the 1960's. Dredging limits run the length of the existing 3,000-foot dock face. Federal maintenance dredging starts 5 feet from the dock face and currently extends about 2,000 feet seaward. The annual maintenance dredging period has expanded from 3 months per year in earlier years to 7 months per year today. Figure 2 depicts the configuration of the current dredging project.

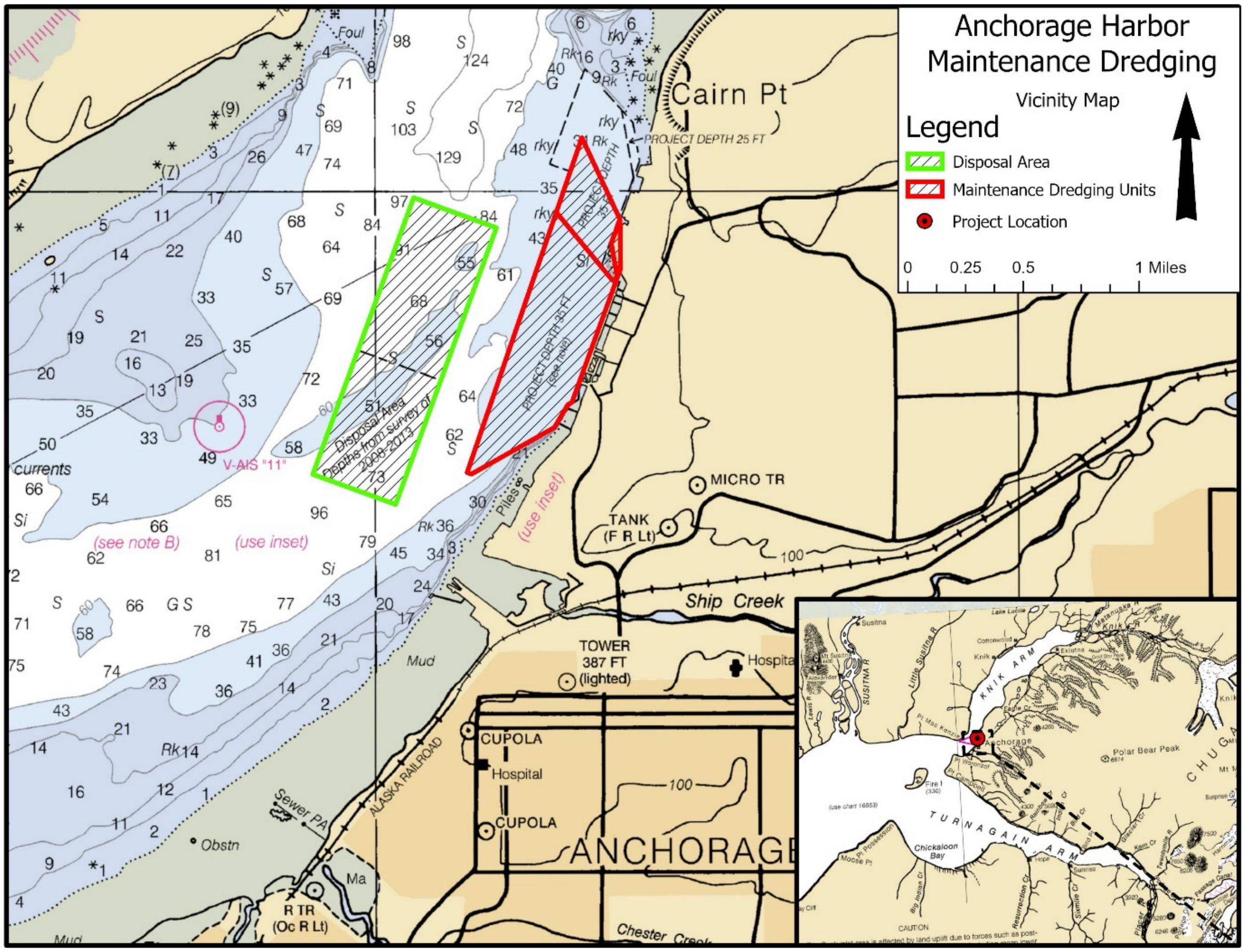


Figure 2. Anchorage Harbor Vicinity Map

Dredging quantities in Anchorage Harbor are unpredictable. Annual amounts have ranged between 450,000 and 2,500,000 cubic yards per year since the current POA configuration was completed with the construction of the POL-2 dock in 1992. The mean dredged quantity from 2011-2021 is 967,154 cubic yards (CY). Associated dredging costs have ranged from $7 to $18 million per year. The variability in sedimentation seems to be caused by one or more natural occurrences. For example, increases may result from unusually warm winters in which glacial-fed rivers do not freeze for the normal length of time leading to shoaling in the late November through January timeframe. Increased sedimentation can also result from exceptionally warm summers where the Matanuska and Knik glaciers discharge abnormally large amounts of silt into upper Knik Arm where the POA is located. Figure 3 shows dredging quantities from 2011-2021.

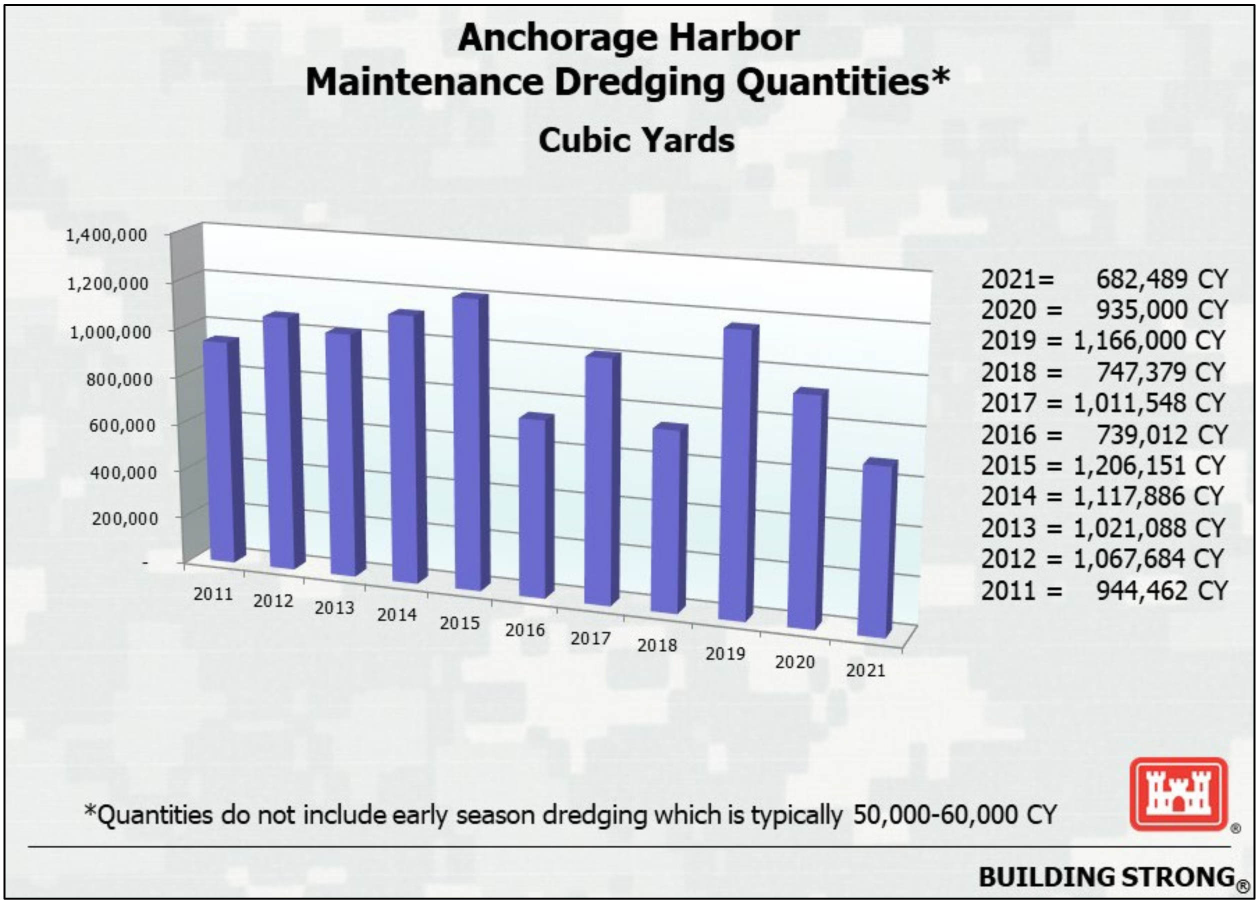


Figure 3. Anchorage Harbor Maintenance Dredging Quantities (2011-2021)

As a result of the partially completed construction of the North Extension segment of the Port Intermodal Expansion Project (PIEP), an increase in shoaling was experienced because of the altered hydrodynamic process in front of the POA. The seaward protrusion of fill created a pocket of heavy siltation at Terminal 3 of the existing dock, which now requires more repetitive dredging than before. In addition, excessive shoaling is occurring at Terminal 3 during winter periods when floating dredges are not able to operate due to ice conditions. In 2010, dredging from the dock with a clamshell was attempted during the winter, but it could not keep up with the infill.

In 2013, annual maintenance dredging started in April, which at the time, was the earliest start date for Anchorage dredging. In 2014 and 2015, the high rate of shoaling between November and March resulted in additional costs to mobilize a clamshell dredge in mid-March to dredge until normal operations with the contract hopper dredge could begin in late April. In 2016, early dredging was also required due to shoaling at Terminal 3, but the 2015-2016 winter was warmer than normal and ice conditions allowed for early mobilization of the summer hopper dredge in mid-March in lieu of mobilizing a separate clamshell dredge. The cost to perform "winter dredging" in advance of normal summer maintenance dredging has ranged from $1.2 - $2 million per year.

2.0 Alternatives

2.1 Range of Alternatives

Based on the needs described in Section 1, the objective of the project is to provide safe navigation and access to the POA. In addition, 40 CFR 1502.14 requires that an environmental assessment evaluate a full range of reasonable alternatives based on the stated project purpose and need, including a No-Action Alternative.

Based on the project purpose, the following suite of alternatives were considered:

- No-Action Alternative
- Preferred Alternative: Perform maintenance dredging to -35 MLLW in Anchorage Harbor and dispose of dredged material in the Anchorage Harbor open water disposal site.

2.2 Alternatives

2.2.1 No-Action Alternative

Section 1502.14(c) of the NEPA regulations requires an analysis of the No-Action Alternative, as does the USACE ER 1105-2-100 and ER 200-2-2.

Under the No-Action Alternative, neither dredging of the POA nor disposal of dredged material would occur. The Anchorage Harbor would be silted in, beginning at Terminal 3 and progressing towards the southwest. Vessel access would be restricted and eventually precluded due to draft requirements. The accumulated sediments that currently restrict deep draft navigational access would not be removed, and no window would be provided within which additional materials could accumulate before additional negative impacts to navigational access occurred. Shoaling would likely continue at the current rate and lead to additional shipping restriction in terms of timing and eventually lack of access at all tide stages for larger vessels.

2.2.2 Preferred Alternative

The Preferred Alternative consists of performing maintenance dredging to -35 MLLW in Anchorage Harbor and disposing of dredged material in the Anchorage Harbor open water disposal site.

The USACE Alaska District proposes to perform maintenance dredging of the Anchorage Harbor basin to -35 feet MLLW and dispose of dredged material in the POA open water disposal area located 3,000 feet abeam of the main terminals. Dredging would be conducted April through November. Maintenance dredging quantities are highly variable in the harbor, with the volumes fluctuating between about 682,000 CY and 1,200,000 CY in the decade between 2011 and 2021. The 10-year mean volume from 2011 to 2021 was 967,154 CY.

The dredging prism in the POA is a roughly trapezoidal shape occupying 266 acres with the shorter parallel segment extending in the east along 3,600 feet of pile supported dock and another 1,100 feet of North Extension bulkhead. The western margin of the dredging project is 8,000 feet long and lies about 1,800 feet from the face of the main terminal. Figure 4 depicts the proposed project footprint.

The POA aquatic disposal site is a rectangular area of 320 acres beginning 1,200 feet beyond the western edge of the dredging prism. The water over the site is 70 to 100 feet deep and is subject to powerfully dispersive tidal currents. Surveys of the disposal area demonstrate dredged material does not accumulate.

Dredged material would be transported to the disposal site by tug and barge, or by the dredge, in the case of a hopper dredge, in increments of approximately 1,500 CY. Two to four daily transits would be required for normal operations.

Figure 4. Anchorage Harbor Dredge Prism and Disposal Area

3.0 Affected Environment

The affected environment section succinctly describes the existing environmental resources that would be affected in the Anchorage Harbor project area if any of the alternatives were implemented. This section describes only those environmental resources that are relevant to the decision to be made and that would affect or be affected by the alternatives if they were implemented. It does not describe the entire existing environment. This section, in conjunction with the description of the No-Action Alternative, forms the baseline conditions for determining potential environmental impacts of the proposed action and reasonable alternatives.

3.1 Air Quality

The POA is approximately one-half mile north of downtown Anchorage. Overall, Anchorage enjoys very clean air, with an Air Quality Index rating of "good" on 92 percent of monitored days in 2007 (EPA 2007). The city maintains levels of regulated pollutants within the National Ambient Air Quality Standards (NAAQS) established under the Clean Air Act. The air quality standards include concentration limits on the "criteria pollutants" carbon monoxide (CO), ozone, sulfur dioxide, nitrogen oxides, lead, and particulate matter.

Anchorage has historically experienced elevated CO concentrations during the winter, when cold temperatures and the nearby mountains can result in temperature inversions that trap pollutants close to the ground. As in most urban areas, CO emissions are generated primarily by vehicles, with cars and trucks accounting for around three-quarters of the annual CO emissions in Anchorage (ADEC 2004). Monitoring indicated that the majority of the CO originated in residential areas of the city, presumably a result of morning commuters cold-starting vehicles and idling them to operating temperature. A large part of metropolitan Anchorage was designated a "Non-Attainment" area for CO in November 1990. Anchorage Harbor is approximately half a mile north of the MOA CO Non-Attainment Area northern boundary.

Anchorage has been in compliance with the NAAQS for CO since 1997, and the city was re-designated from "Non-Attainment" to "Maintenance" status for CO in July 2004, largely through a program of vehicle inspection and emission control. The state maintenance plan specifies measures the state will take to maintain compliance with air quality standards. The United States Environmental Protection Agency (EPA) requires a demonstration of maintenance for 10 years following re-designation.

In the period between 2000 and 2010, Anchorage exceeded the NAAQS promulgated by the EPA for CO one time, particulate matter smaller than 10 microns (PM_{10}) four times, and particulate matter smaller than 2.5 microns ($PM_{2.5}$) one time. The American Lung Association ranked Anchorage fourth on the list of cleanest U.S. cities for year-round $PM_{2.5}$ pollution in their annual report published in 2010. (ADEC 2012)

3.2 Noise

The POA is an area of relatively high ambient noise levels, a result of both natural and anthropogenic sources. Ice, tides, waves, precipitation, and currents are the main sources of natural ambient noise; while vessels, dredging, oil and gas platforms, sonar, and aircraft create the bulk of anthropogenic ambient noise. Site specific noise data was collected in August and September of 2021. The data is described and discussed more in-depth than this section within Appendix A.

The most powerful sounds recorded August 30, 2021, were associated with aircraft overflight and a small craft operated by the POA bumping into the floating dock where the recordings were being collected. Max sound pressure level (SPL) measurements associated with aircraft overflight were in the 150 to 160 decibels (dB) re 1 micro pascal (µPa) range with most of the energy in the 675 to 1,500 Hertz (Hz) range. Very brief exposures reaching 122 dB were measured up to 40 kHz. On September 12, 2021, while the dredge was on standby, the cargo ship *North Star* was unloaded and pulled away from the dock face by a tugboat 50 meters from the hydrophone. SPL reached 154 dB root-mean-squared (RMS) with most of the energy between 160 to 2,200 Hz, but also briefly produced sound exceeding 120 dB_{RMS} at 20 kHz. The tug sound level (SL) is estimated to reach 187.9 dB_{RMS} if Transmission Loss (TL) = 20 and Radius (R) = 50 m. The tug and cargo ship continued to produce received levels (RLs) exceeding 120 dB for over 13 minutes until the vessel was 1,000 meters from the hydrophone. The basis for determining these values come from the equation used for determining RL as follows:

$$RL = SL - [TL \times Log_{10}(R)]$$

The received SPL over 15 minutes on September 12, 2021, while the dredge was on standby and the *North Star* was at the dock was 145.033 dB_{RMS}. The most quiescent period within that time series (after loading was finished and before the tug began to pull the ship away from the dock) was 127.54 dB_{RMS}. The SPL of 128 dB_{RMS} can be used as the background level, because it represents the received background noise level for a normal day. The USACE Alaska District's recorded background noise level of 128 dB_{RMS} is consistent with the background noise levels reported by JASCO; which described a mean SPL of 138.8 dB_{RMS} from May 27-30, 2016, within a range of L_{95} =106.8 dB_{RMS} (level exceeded for 95% of the time and representation of background level without any construction noise present) and L_{MAX} 164.7 dB_{RMS} (peak noise level reached by a single aircraft event; JASCO 2016).

3.3 Water Quality

The waters of Knik Arm are brackish, with salinities ranging from 10 to 12 practical salinity units (PSU; equivalent to grams of dissolved solids per kilogram of seawater) at Fire Island (Gatto 1976) and 4 to 6 PSU north of Cairn Point. Water temperatures range from freezing (about 31°F) to 63°F or more (in surface pockets observed during the summer months). Measurements of suspended sediment at several locations near the river mouths tend to be similar, showing concentrations of up to 1,000 mg/L between water surface and depths of 15 feet, then increasing to more than 4,000 mg/L at greater depths (Smith et al. 2005). The average natural turbidity of Upper Cook Inlet and Knik Arm typically ranges from 400 to 600 nephelometric turbidity units (NTUs). The turbulent nature of the system mixes the water and maintains relatively high dissolved oxygen concentrations through the entire water column.

At the mouths of the streams and rivers that flow into Knik Arm, freshwater interacts with the seawater to create an identifiable zone. Since the seawater is denser, the freshwater will float on top until it is mixed by tides and currents, creating a freshwater lens that is sometimes less turbid than the sea water. The lenses extend relatively short distances out from the river mouths in the direction of the current and may provide important fish habitat.

The significant streams flowing into the Knik Arm near the POA include Ship Creek, Chester Creek, Campbell Creek, Fish Creek, and Little Campbell Creek. All these streams flow through urban areas and are identified as CWA Section 303(d) impaired water bodies (ADEC 2008).

Ship Creek is the closest stream to the POA. It is a non-glacial stream that originates at Ship Lake in the Chugach Mountains. Water is diverted from Ship Creek at several locations as it flows through JBER and Anchorage before it discharges into the Cook Inlet about a mile south of the POA. Chester Creek, Campbell Creek and Little Campbell Creek pass through other highly urbanized watersheds before discharging farther south of Ship Creek.

The sediments dredged by existing annual maintenance operations and the sediment that would be dredged from the proposed dredging footprint have been evaluated to determine the presence of contaminants (USACE 2017b). Sediments in the proposed Anchorage Harbor dredging area were collected in 2016 and evaluated to determine their suitability for in-water disposal in accordance with protocols in the 2016 *Dredged Material Evaluation and Disposal Procedures User Manual*. No analytes exceeded screening values. The Anchorage Harbor is on a 10-year sediment chemistry review cycle, so the USACE will collect and characterize the dredged material with respect to applicable sediment evaluation criteria prior to the 2027 dredging season.

3.4 Water Circulation Patterns and Sedimentation

The primary hydrodynamic mechanism in the Knik Arm is the bidirectional flow of the largest tides in the United States. The ebb tide appears to have the greatest impact on the Anchorage Harbor project; Cairn Point and the North Extension influence sediment deposition in localized regions within the harbor area. Figure 5 is a depiction of dredging intensity during the 2016 dredging season; the yellow pixels represent higher intensity of the dredging operation. Dredging intensity can be used to infer sedimentation patterns.

The USACE dredges sediment every year to maintain the -35-foot MLLW depth in the approach channel and in the berthing areas of the POA. Dredging starts in the spring along the existing dock, progressively moving seaward to the extent of the dredged area; approximately 800 feet seaward of the dock face. Dredged material is transported to the in-water disposal site, approximately 3,000 feet abeam the dock face. The dredged material is very cohesive; the bulk of the material reaches the seafloor 70 feet below MLLW in the disposal area rather than being dispersed as it moves through the water column. The deposited dredged material is dispersed through Knik Arm by the strong tidal currents over the course of the year. Contractor surveys of the area and bathymetric measurements conducted every year show material has not remained at the disposal site. The volumes of material that have been dredged from the POA between 2011 and 2021 are shown in Figure 3.

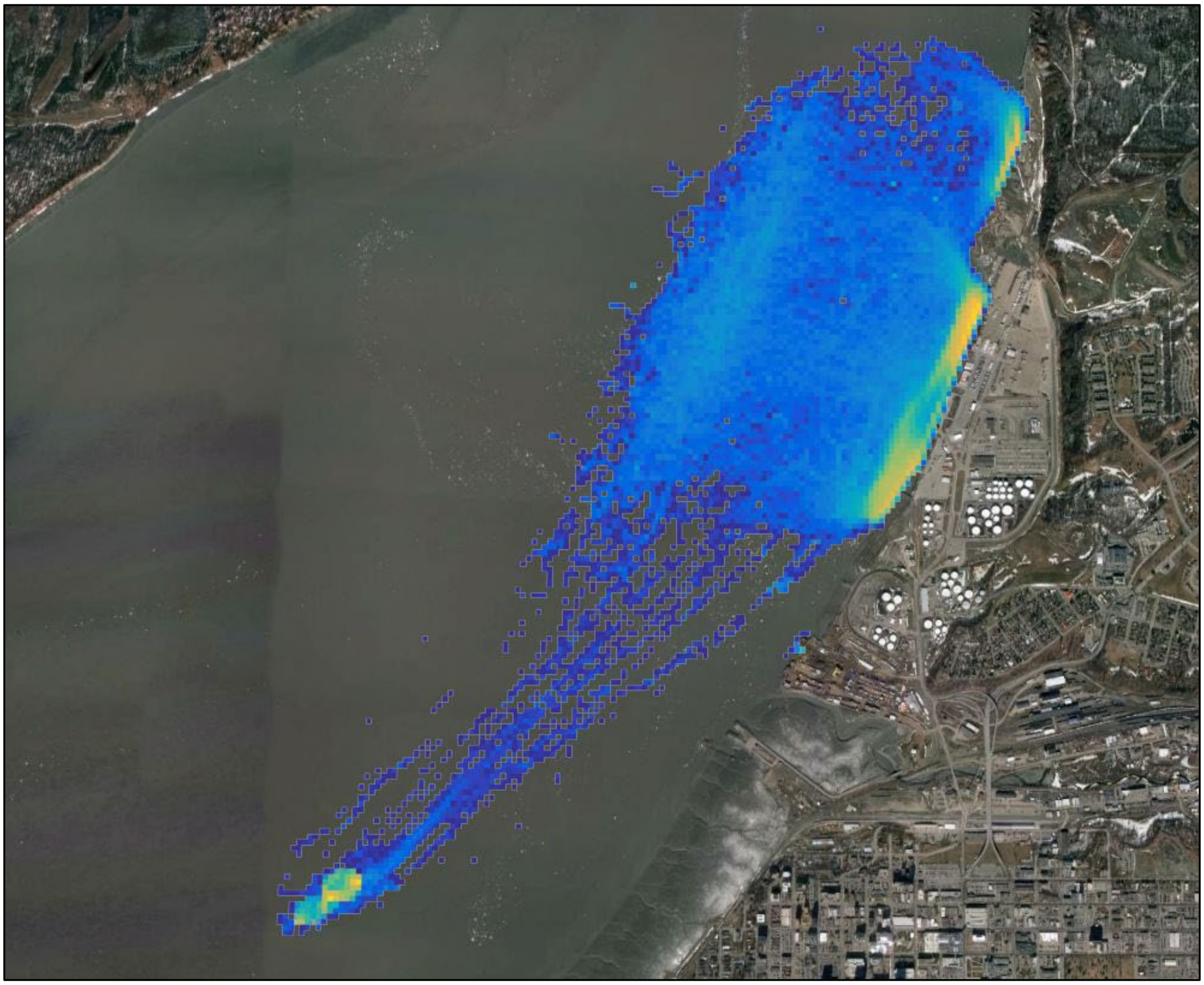


Figure 5. Dredge Intensity during 2016 POA Dredging Season (The high intensity area in the southwestern quadrant of the figure is the dredger's standby location)

The current configuration of the North Extension creates a gyre off the southwestern corner of the bulkhead, which results in the accretion of large amounts of sediment at Terminal 3. This infill has required the early mobilization of the dredge contractor to remove the infill. Warm winters have reduced the extent and duration of ice in rivers flowing into the Cook Inlet in recent years, likely exacerbating the accretion problem at the POA. In 2010, shoaling at Terminal 3 reached the extent that winter dredging was required to retain the use of the terminal, but ice in Cook Inlet prevented the mobilization of water-based dredging. These conditions prompted a land-based attempt to remove the shoal. A crane was stationed on the dock to remove sediment for upland disposal, but the crane was not able to keep up with the infill nor able to achieve project depth of 100 feet from the dock face.

3.5 Cultural Resources

This project will dredge material from the seabed and dispose the material farther off shore in deeper water. Initial data review identified a sunken anomaly that eventually was determined to be concrete connected with rebar. In 2008, the USACE determined that the feature is not an historic property, and the State Historic Preservation Officer (SHPO) concurred. In 2010 the dredge contractor removed two 120-ton World War II era concrete pillboxes and placed them in the disposal area below 109 feet of water. Prior consultation with the SHPO had addressed the possibility that a pillbox might be discovered but determined that it would not be eligible for the National Register of Historic Places (NRHP), because the pillbox would be out of its original context and no longer retain historic integrity. Construction of the POA began in 1958 and was completed in 1961. The port was designed by the New York Company Tippetts-Abbett-McCarthy-Stratton (Anchorage Daily Times 1962). Since its construction, the Port of Alaska has been modified multiple times to address changing and expanding transportation needs.

The Alaska Heritage Resources Survey (AHRS) database identifies five known cultural resources at the POA: the Port of Alaska Dock (ANC-02883), the Port of Alaska Transit Shed (ANC-02884), the SeaLand Stevedore Building (ANC-02885), the Tote Stevedore Building (ANC-02886), and the Port of Alaska Breakwater Shipwreck Site (ANC-04073). None of these cultural resources have been evaluated for the NRHP; none are within the current USACE dredging area or dredged material disposal area. The shipwreck at the POA Breakwater Shipwreck Site was visible in 1992; it was approximately 17 by 100 meters long and oriented north/south. The AHRS describes the shipwreck as possibly one of two Liberty Ships, either the *Edward A. Filene* or diesel screw *Howell Cobb*; however, both of those ships were scuttled in 1966 to create part of the Arness Terminal in Nikiski (USACE 2017a). The Wrecks and Obstructions Database maintained by the State Office of Coast Survey of the National Oceanic and Atmospheric Administration (NOAA) identifies a shipwreck in the same location as ANC-04073; no other shipwrecks are noted in the area (NOAA 2022).

3.6 Vegetation

Grasses, sedges, and other vascular plants in the estuarine POA area do not survive at elevations much below the upper tidal range. Arrow grass, silverweed, and salt grass are reported growing on upper mud beaches (Pentec 2005) along with clumps of vegetation eroded from adjacent shorelines. Macrophytes (seaweed) assemblages are sparse in the muddy intertidal zone of the Knik Arm, but some types of seaweed, including green algae (*Enteromorpha linza, E. intestinalis, E. prolifera*) and rockweed (*Fucus gradneri*) are reported on hard substrates of the rockier shores of the western Knik Arm within a few miles of the POA (Pentec 2005, Nemeth et al. 2007). Hard substrates are uncommon near the POA except for man-made structures and debris, and attached seaweed is rare. The Knik Arm does has not had living, attached seaweed reported at depths below the intertidal zone. The highly turbid waters of the Knik Arm would keep sunlight from reaching seaweed, so they could not manufacture food through photosynthesis and could not survive.

Marine phytoplankton (unattached algae) are present throughout Cook Inlet. Phytoplankton in Upper Cook Inlet are primarily diatoms (Pentec 2005). Diatoms are single-cell algae that are particularly well adapted to surviving in turbid waters and other difficult environments. They are among the most adaptive of the algaes. Some are capable of surviving transition from fresh- to saltwater, and rivers can be a source of diatoms in estuaries. As could be expected in very turbid waters, none of the studies conducted in the Knik Arm have reported substantial phytoplankton biomass. Phytoplankton would have the greatest chance of survival and reproduction near the surface, where they can absorb sunlight for photosynthesis.

3.7 Marine Invertebrates

Marine invertebrates include forms like polychaete worms that burrow into the bottom, snails, and bottom-dwelling crustaceans that live on the top of the seafloor, and the many forms of sea life in the water column like shrimp, smaller crustaceans, and the sub-adults forms of bottom-living species. Diversity of marine invertebrates in the Kink Arm is extremely limited. Pentec (2005) summarizing extensive studies between 1982 and 2004 for a Knik Arm bridge, identified fewer than a dozen species of marine invertebrates from both the bottom and the water column. The collections also were unusual because most of the same species were collected both from the bottom and from the water column.

Knik Arm has often been described as a "sterile" environment, almost devoid of fish and invertebrates except for anadromous fish moving through the Knik Arm to and from spawning habitat. Collections in a net towed through two transects in deeper water near the USACE' historically used dredged material disposal site collected an average of about 250 invertebrates per tow. (Table 1).

The Pentec (2005) report suggested that severe scouring, mixing, and sediment transport may carry normally bottom-dwelling polychaete worms, mysid and crangonid shrimp, and amphipods up into the water column. Densities of these small organisms were about the same in most places sampled, which also indicates an unusual degree of mixing. The only notable stratification in the deeper waters was one species of amphipod that was unusually abundant just beneath the surface in pockets and lenses of water with less suspended sand and silt than most Knik Arm water.

Kink Arm collection data suggest that in the spring, summer, and autumn periods when invertebrates were collected, the numbers of invertebrates present in the Knik Arm are low for marine waters and the diversity is extremely low. There are, however, invertebrates that could be prey for birds and fish. The most promising habitat for predators that might feed on the amphipods is in the small pockets of surface water with comparatively little sediment where sight-feeding birds and fish might be able to locate them. While marine invertebrates are relatively limited in availability to predators, terrestrial insects are relatively abundant on the surface of Knik Arm waters. Aphids, dipterans (flies, mosquitoes, midges, and associated flying insects), and other insects are predominant terrestrial insects.

Table 1. Marine Invertebrate Species Collected in Knik Arm Net Transects

Common Name	Species Name
California Bay shrimp	*Crangon franciscorum*
Blacktail Bay shrimp	*Crangon nigricauda*
Bay Shrimp	*Crangon spp.*
Baltic macoma (clam)	*Macoma baltica*
Gammarid amphipod	*Lagunogammarus setosus*
Aquatic sow bug	*Sadura entomon*
Mysid shrimp	*Mysis litoralis*
Opossum shrimp	*Neomysis mercedis*
Mysid shrimp	*Neomycis rayii*
Gammarid amphipod	*Onisimus spp.*
Nereid polychaete worm	*Neathes limnicola*

3.8 Fish

Five species of Pacific salmon and two species of smelt migrate through Knik Arm to and from spawning habitat. Recent studies by Pentec (2005) reported other species that are occasionally or seasonally present, including herring larvae drifting in the water column as plankton. Table 2 lists the species identified in Knik Arm from those studies.

The Knik Arm has long been identified as habitat for migrating anadromous fish, but only more recently have biologists shown that juvenile salmon can survive and grow in Upper Cook Inlet including the Knik Arm (Moulton 1997, Pentec 2005) at rates that may not be too different from those in Prince William Sound.

Table 2. Fish Species Collected in Knik Arm Transects

Common Name	Species Name
Pink salmon	*Oncorhynchus gorbuscha*
Chum salmon	*Oncorhynchus keta*
Coho salmon	*Oncorhynchus kisutch*
Chinook salmon	*Oncorhynchus tshawytscha*
Sockeye salmon	*Oncorhynchus nerka*
Rainbow trout	*Oncorhynchus mykiss*
Dolly Varden	*Salvelinus malma*
Saffron cod	*Eleginus gracilis*
Longfin smelt	*Spirinchus thaleichthys*
Threespine stickleback	*Gasterostreus aculeatus*
Ninespine stickleback	*Pungitius pungitius*
Bering cisco	*Coregonus laurettae*
Pacific herring	*Clupea pallasii*
Ringtail snailfish	*Liparis rutteri*
Pacific Staghorn sculpin	*Leprocottus armatus*
Straw flounder	*Platichthys stellatus*
Eulachon	*Thaleichthys pacificus*
Pacific Tom cod	*Microgadus proxirnus*
Walleye pollock	*Theragra chalcogramma*
Snake stickleback	*Lumpenus sagitta*
Unidentified flatfish	
Unidentified larval fish	

Juvenile salmon were not substantially more abundant close to shore in the Knik Arm, which is somewhat unusual. Pentec (2005) attributed this to the cover provided by the turbid water, which protected them from predators. The same source also noted that juveniles did not school in the Knik Arm, presumably because they did not need the protection from predation or because they could not see each other well enough to maintain a cohesive school.

All the juvenile salmon reported in the Knik Arm literature were collected from within 10 feet of the water surface. Seasonal abundance matched well with times when juvenile salmon typically migrate out from their home streams and occupy nearby marine waters. Collections in Knik Arm and nearby waters show that pink and chum salmon juveniles, which out-migrate in their first year, are seasonally abundant, but move rapidly through the area, presumably to clearer waters farther south in Cook Inlet and eventually the Pacific Ocean. The juveniles of those species are not particularly well-adapted to feeding on surface prey and are too small to eat most of the available marine invertebrates, so they need to get to waters where food is available farther south in Cook Inlet. Chinook, sockeye, and coho salmon, however, are adapted to feed on surface prey and apparently survive and grow well in the waters around Anchorage, including the Knik Arm. The most common food organisms in their stomachs were terrestrial insects, particularly aphids and dipterans. They also consumed other insects, herring larvae, polychaete worms, and a variety of other invertebrates. Those juvenile salmon were collected from the time they out-migrated into Knik Arm until well into the autumn. They were reported to be well fed and growing.

Adult salmon returning to spawning streams in the Knik Arm drainage may be in Upper Cook Inlet and Knik Arm for days or weeks before entering their spawning streams. Pentec (2005) reported that adults tended to remain close to shore, often in less than 2 feet of water. They suggested this nearshore orientation was to avoid beluga whales, which prey on adult salmon.

The most common fish in the Knik Arm collections were sticklebacks. Both three-spined and nine-spined were collected, but three-spined sticklebacks were far more numerous. These small and extremely hardy little fish are abundant in the fresh and brackish marshes around the Knik Arm and may do well in estuarine waters. They, like the juvenile salmon, were widely distributed in both nearshore and deeper waters.

Pacific herring were present both as adults in the spring and as juveniles throughout the seasons sampled. They were most abundant as small larvae drifting as plankton with the tide and currents and were not abundant as larger juveniles. No important habitat was identified.
Two smelt species were seasonally abundant. Eulachon return to the area each spring to spawn in coastal beaches, and longfin smelt return to spawn in the autumn. Both migrate through the general project area, but the only identified important habitats are the coastal streams and nearby beaches. Bering cisco are whitefish that are generally associated with coastal waters with less than marine salinity. Several species of marine fishes move into nearshore or estuarine waters when conditions are favorable. Among them are saffron cod, Pacific tom cod, ringtail snailfish, Pacific staghorn sculpin, starry flounder, walleye pollack, and snake prickleback that were occasionally collected in the Knik Arm or nearby waters. Most were collected in relatively small numbers and were most abundant during the winter or at least were most abundant in collections after sediment loads had begun to drop in early autumn. Saffron cod was the most abundant of these fish and were reported to be in spawning condition and well-fed. Dolly Varden and rainbow trout can be freshwater fish or can be anadromous. Since they were not collected in any abundance, they probably were passing through the Knik Arm to or from freshwater habitat.

3.9 Birds

Bird habitat involved with the dredging and disposal activities is aquatic. The USACE activities would be offshore in water that has suspended sediment concentrations as high as 2,400 mg/L in the summer and early fall when dredging and disposal would take place. The USACE biologists surveyed the intertidal and shallow subtidal habitat from the Anchorage boat launch ramp (i.e. about 300 meters south of the mouth of Ship Creek) from one to four times per month from spring through late fall in 2006. The survey area extended from the boat ramp to approximately one-half mile south. One sector which covered approximately the lowest 300 feet of intertidal habitat and the nearest 300 feet of subtidal aquatic habitat (both distances measured horizontally) was routinely surveyed during this period, although depending on the tide level, the entire sector was sometimes completely submerged or nearly completely exposed. Bird activity observed in this survey sector provides insight into the nearshore bird habitat near the POA. Other than a single observation of 78 Canada geese, most birds observed were mew gulls (36 total in 10 surveys), followed by Bonaparte's gulls (13 in 10 surveys), and followed by lesser numbers of herring gulls, mallards, arctic terns and a single western sandpiper. Many of the gulls counted were flying, and the Canada geese and mallards were foraging on either the exposed mudflats or at the tide line.

3.10 Marine Mammals

Fourteen species of marine mammals (Table 3) protected under the Marine Mammal Protection Act (MMPA) are reported to occur at least occasionally in Cook Inlet, but only harbor seal (*Phoca vitulina*) and beluga whale (*Delphinapterus leucas*) are commonly observed in Upper Cook Inlet and will be discussed in detail (NOAA 2003, Sheldon *et al.* 2003, NMML 2004, Calkins and Curatolo 1979). Steller sea lions (*Eumetopias jubatus)*, killer whales *(Orcinus orca)*, and harbor porpoises *(Phocoena phocoena)* occur rarely and will be discussed briefly.

Table 3. Marine Mammals Observed in Cook Inlet

Common Name	Species Name
Steller Sea Lion	*(Eumetopias jubatus)*
Northern Fur Seal	*(Callorhinus ursinus)*
Beluga Whale	*(Delphinapterus leucas)*
Harbor Porpoise	*(Phocoena phocoena)*
Humpback Whale	*(Megaptera novaeangliae)*
Fin Whale	*(Balaenoptera physalus)*
North Pacific Right Whale	*(Eubalaena japonica)*
Gray Whale	*(Eschrichtius robustus)*
Killer Whale	*(Orcinus orca)*
Sea Otter	*(Enhydra lutris)*
Harbor Seal	*(Phoca vitulina)*
Minke Whale	*(Balaenoptera acutorostrata)*
Sei Whale	*(Balaenoptera borealis)*
Dall Porpoise	*(Phocoenoides dalli)*

Beluga Whale. In western U.S. waters, beluga whales comprise five stocks: Beaufort Sea, Eastern Chukchi Sea, Eastern Bering Sea, Bristol Bay, and Cook Inlet (Angliss and Outlaw 2006). Belugas in Upper Cook Inlet are of the Cook Inlet stock. This population stays in Cook Inlet and is geographically separated from others (Hobbs et al. 2006). A small population (probably numbering 10 to 20 animals) is present year-round in Yakutat Bay but are believed to be demographically and genetically isolated from the Cook Inlet stock. (Lowry et al. 2006).

The Cook Inlet beluga's range is believed to be largely confined to Cook Inlet with a high occurrence of animals in the Upper Inlet and the Knik Arm during the spring, summer, and fall seasons. These whales demonstrate site fidelity to regular summer concentration areas (Seaman et al. 1985), typically near river mouths and associated shallow, warm, low-salinity waters (Moore et al. 2000).

Fourteen belugas were satellite-tagged in Upper Cook Inlet and Knik Arm between late July and early September 2000–2002. The tags provided location and movement data through the autumn and winter and into May. During summer and autumn, belugas were concentrated in river and bays within Upper Cook Inlet, traveling back and forth between Knik Arm, Chickaloon Bay, and upper Turnagain Arm, although some also spent time offshore. When in those areas, belugas often remained in one area for many weeks followed by rapid movement to another area. Those movements often were between distinct bays or river mouths (moving either to the east or to the west of Fire Island, past Point Woronzof and the POA). One beluga tracked in 2001 moved back and forth between those three bodies of water seven times in three months. Beluga area use in August was the most limited of all months. Approximately 50 to 75 percent of the recorded August locations were in Knik Arm and were concentrated near Eagle River. In September they continued to use the Knik Arm and increased use of the Susitna delta, Turnagain Arm and Chickaloon Bay, and also extended use along the west coast of the Upper Inlet to Beluga River. In October, beluga whales ranged widely down the Inlet in coastal areas, reaching Chinitna Bay and Tuxedni Bay as well as continued to use the Knik Arm, Turnagain Arm, Chickaloon Bay, and Trading Bay (MacArthur River). November use was similar to September. In December, belugas moved offshore with locations distributed throughout the upper to mid-Inlet. In January, February, and March, they used the central offshore waters moving as far south as Kalgin Island and slightly beyond. Belugas also ranged widely during February and March with excursions to the Knik and Turnagain Arms, in spite of greater than 90 percent ice coverage. Average daily travel distance ranged from about 7 to 19 miles. Belugas were not tracked by satellite tags from April through mid-July (Hobbs et al. 2005).

Beluga whales are opportunistic feeders. They eat octopus, squid, crabs, shrimp, clams, mussels, snails, sandworms, and fish such as capelin, cod, herring, smelt, flounder, sole, sculpin, lamprey, lingcod, and salmon (Perez 1990, Haley 1986, Klinkhart 1966). Belugas capture and swallow their prey whole, using their blunt teeth only to grab. They often feed cooperatively. Hazard (1988) hypothesized that beluga whales were more successful feeding in rivers where prey were concentrated than in bays where prey were dispersed. Concentrations of Cook Inlet belugas offshore from several important salmon streams in the Upper Cook Inlet are assumed to be a feeding strategy that takes advantage of the bathymetry. The fish are funneled into the channels formed by the rivers where they are more vulnerable to the waiting belugas. At the POA, belugas have been observed to position one whale along a rip-rap dock, while a second whale herded salmon along the structure toward the stationary beluga.

Cook Inlet beluga distribution has narrowed as their population declined (Rugh et al. 2000); however, there is obvious and repeated use of certain habitats. From April through November, whales concentrate at river mouths and tidal flat areas, moving in and out with the tides. The timing and location of eulachon and salmon runs affect beluga whale feeding behavior and have a strong influence on their summer movements. Beluga and prey distribution are heavily influenced by tides in the Knik Arm. Monitoring data in 2006 reported approximately 70 percent of sightings at POA were around low tide.

National Marine Fisheries Service (NMFS) has estimated the relative value of four habitats as part of the management and recovery strategy in the *Draft Conservation Plan for the Cook Inlet Beluga Whale* (*Delphinapterus leucas*) (Federal Register 2008). These are sites where beluga whales are most consistently observed, where feeding behavior has been documented, and where dense numbers of whales use a relatively confined area of the Inlet. Type 1 habitat is termed "High Value / High Sensitivity" and includes what NMFS believes to be the most important and sensitive areas of the Inlet for beluga whales. Type 2 is termed "High Value," and includes summer feeding areas and winter habitats in waters where whales typically are in lesser densities or in deeper waters. Type 3 habitat is in the offshore areas of the mid and upper Inlet and also includes wintering habitat. Type 4 habitat describes the remaining areas of their range in Cook Inlet. The habitat that would be dredged and used for disposal at the POA is considered to be Type 2 habitat. The area surrounding the POA is Type 1.

Beluga peak hearing sensitivity underwater is between 10 and 100 kHz (summarized in Richardson et al. 1995); at the most sensitive frequencies within that range their hearing threshold approaches 42 dB re 1 μPa. The bandwidth of their hearing extends to as high as 150 kHz, but above 100 kHz their sensitivity drops off rapidly (Au 1993). Below 8 kHz, the decrease in sensitivity is more gradual, approximately 11 dB per octave (Awbrey et al. 1988). Beluga whales are able to hear frequencies as low as 40-75 Hz (Johnson et al. 1989), but at those frequencies their sensitivity is quite poor (the threshold level at 40 Hz is on the order of 140 dB re 1 μPa). For comparison, humans with the keenest hearing have a bandwidth about one-eighth that of beluga whales (Au 1993).

The Cook Inlet beluga whale stock may once have numbered as many as 1,300 individuals but declined dramatically during the 1990's. Population abundance surveys indicated a decline of 47 percent between 1994 and 1998. Annual population abundance surveys from 1999 to 2014 estimated abundance ranging between 278 and 435 belugas, with a 2014 estimated abundance of 340 individual beluga whales. Since 1999, the population has declined by 1.3 percent annually with a 10-year decline (2004-2014) of 0.4 percent annually. Effective 2013 and based upon an analysis of the ability to detect changes in population trends using alternative aerial survey schedules, NMFS decided to switch from conducting abundance aerial surveys every year to conducting them every other year. The first year with no aerial survey was in 2013. NMFS's 2020 Cook Inlet beluga whale biennial abundance estimate is between 250 and 317 individuals, with a median estimate of 279.

In response to the significant population decline, NOAA's NMFS designated the Cook Inlet stock of beluga whales as depleted under the MMPA on May 31, 2000. Subsistence harvests have been severely restricted, with only five whales harvested between 1999 and 2005. Due to the lack of recovery and the low population abundance, no subsistence harvest has been allowed since 2006. On October 22, 2008, NMFS listed this stock of beluga whale found in Cook Inlet as endangered under the ESA of 1973, as amended. On April 11, 2011, NMFS designated critical habitat for the Cook Inlet beluga whale under the ESA. Two areas comprising 3,016 square miles (7,809 square kilometers) of marine and estuarine environments considered to be essential for the whales' survival and recovery were designated as critical habitat (Figure 6; from NMFS).

NMFS excluded both the POA and the Eagle River Flats Range on JBER from critical habitat for reasons of national security, and the benefit to beluga whales under the existing Department of Defense Integrated Natural Resource Management Plan, respectively.

In 2016, NMFS published a Recovery Plan for the Cook Inlet beluga whale, as required by the ESA. The recovery plan is available online at (NMFS 2016):

> https://www.fisheries.noaa.gov/resource/document/recovery-plan-cook-inlet-beluga-whale-delphinapterus-leucas.

Harbor Seal. Harbor seals are important upper trophic marine predators that occupy a broad range in Alaska, from approximately 130ºW to 172ºE (more than 2,000 miles east to west) and from 61ºN to 51ºN (more than 600 miles north to south). Harbor seals in Alaska are in three stocks: Bering Sea, GOA, and Southeast Alaska.

While new genetic information may lead to a reassessment of this delineation, harbor seals in Upper Cook Inlet belong to the GOA stock. Based on aerial GOA and Aleutian Islands surveys in 1996 and 1999, the current abundance estimate for this stock is 45,975 (CV = 0.04), with a minimum population estimate of 44,453 (Federal Register, 2008).

Harbor seals haul out on rocks, reefs, beaches, and drifting glacial ice. They feed in marine, estuaries, and occasionally fresh waters. They are generally non-migratory, with local movements associated with tides, weather, season, food availability, and reproduction; however, some long-distance movements have been recorded from tagged animals (mostly juveniles). The major haul-out sites for harbor seals are in Lower Cook Inlet. The identified harbor seal haul-out closest to the POA is approximately 25 miles south along Chickaloon Bay in southern Turnagain Arm. They sometimes are observed around the POA. From 2004 to 2005, 22 harbor seal sightings were reported over a 13-month period comprising of 14,000 survey hours. From these surveys, it is estimated that about 1.7 harbor seals are in the Knik Arm per month (LGL unpubl. data).

Steller Sea Lion. Steller sea lions are the largest eared seals and members of the family Otariidae. The NMFS ESA mapper for the Alaska Regions does not indicate the presence of Steller sea lions in the project area, but their range is described as including the proposed project area. Steller sea lions are occasionally seen in the Port of Alaska area, including three observations in 2009 (Federal Register, 2016). There are no known haulouts near the Port of Alaska.

Killer Whale. The killer whale, also known as orca, is the ocean's top predator. It is the largest member of the Delphinidae family, or dolphins. Killer whales are cetaceans and found in every ocean of the world. The killer whales that could be present in Upper Cook Inlet are not part of an endangered population. No killer whales were sighted during previous monitoring programs for the Knik Arm Crossing and POA construction projects, based on a review of monitoring reports. The infrequent sightings of killer whales that are reported in upper Cook Inlet tend to occur when their primary prey (anadromous fish for resident killer whales and beluga whales for transient killer whales) are also in the area (Shelden et al. 2003).

Harbor Porpoise. Harbor porpoises are small cetaceans common in bays, estuaries, harbors, and fjords. Harbor porpoises are present in Cook Inlet, but rare in the Knik Arm. Estimated density of harbor porpoises in Cook Inlet is only 7.2 per 1,000 square kilometers. (Nemeth et al., 2007). Harbor porpoises in the United States are not threatened or endangered.

3.11 Essential Fish Habitat

In accordance with the Magnuson-Stevens Act, the NOAA Fisheries Division establishes Essential Fish Habitat (EFH) for federally managed species; describing all waters and substrate necessary for fish spawning, breeding, feeding, or growth to maturity. Nearly 1,000 species, at multiple life stages, have an EFH description. Section 305(b)(2) of the Magnuson-Stevens Act requires all Federal agencies to consult with the Secretary on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH. Sections 305(b)(3) and (4) direct the Secretary and the Councils to provide comments and EFH Conservation Recommendations to Federal or State agencies on actions that affect EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH resulting from actions or proposed actions authorized, funded, or undertaken by that agency. Section 305(b)(4)(B) requires Federal agencies to respond in writing to such comments. NMFS EFH online mapping utility indicated the following fish species with Federal Management Plans (FMP) are present in the project area for at least part of their life cycle (Table 4).

Table 4. Federally Managed Fish Species Present in the Project Area

Common Name	Species Name
Chinook Salmon	*Oncorhynchus tshawytscha*
Chum Salmon	*Oncorhynchus keta*
Coho Salmon	*Oncorhynchus kisutch*
Sockeye Salmon	*Oncorhynchus nerka*
Pink Salmon	*Oncorhynchus gorbuscha*

3.12 Threatened and Endangered Species

The Anchorage Harbor lies within the range of two ESA-listed marine species, Cook Inlet beluga whales and the Western Distinct Population Segment (DPS) Steller sea lions. Steller sea lions primarily inhabit lower Cook Inlet. However, they occasionally venture to the Upper Cook Inlet and Knik Arm and may be attracted to salmon runs in the region.

The USFWS Information for Planning and Consulting (IPaC) tool suggested Short-tailed Albatross (*Phoebastria albatrus)* may be present in the project area (Appendix D). The project area is outside the range of Short-tailed Albatross described by ADFG. The Short-tailed albatross recovery plan indicates no opportunistic sightings of Short-tailed albatross in Cook Inlet between 1940-2004.The Knik Arm does not contain appropriate nesting or foraging habitat for Short-tailed albatross. Short-tailed albatross are dismissed from further consideration.

The western DPS Steller sea lion includes all Steller sea lions originating from rookeries west of Cape Suckling. They were listed in the ESA in 1990 and critical habitat was designated in 1993. Primary constituents of Steller sea lion critical habitat include terrestrial, air, and aquatic areas. NMFS also identified 105 major haulouts in Alaska; there are no haulouts in upper Cook Inlet.

Detailed information regarding the Cook Inlet beluga whale is located in Section 3.10 of this EA. In accordance with the ESA, NMFS was required to designate critical habitat for the Cook Inlet beluga whale; the NMFS proposed two areas consisting of a combined 3,013 square miles in December 2009 (Figure 6). In April 2011, NMFS published their final rule designating critical habitat, stratifying the area according to importance to the whales, and defining areas of Cook Inlet excluded from critical habitat.

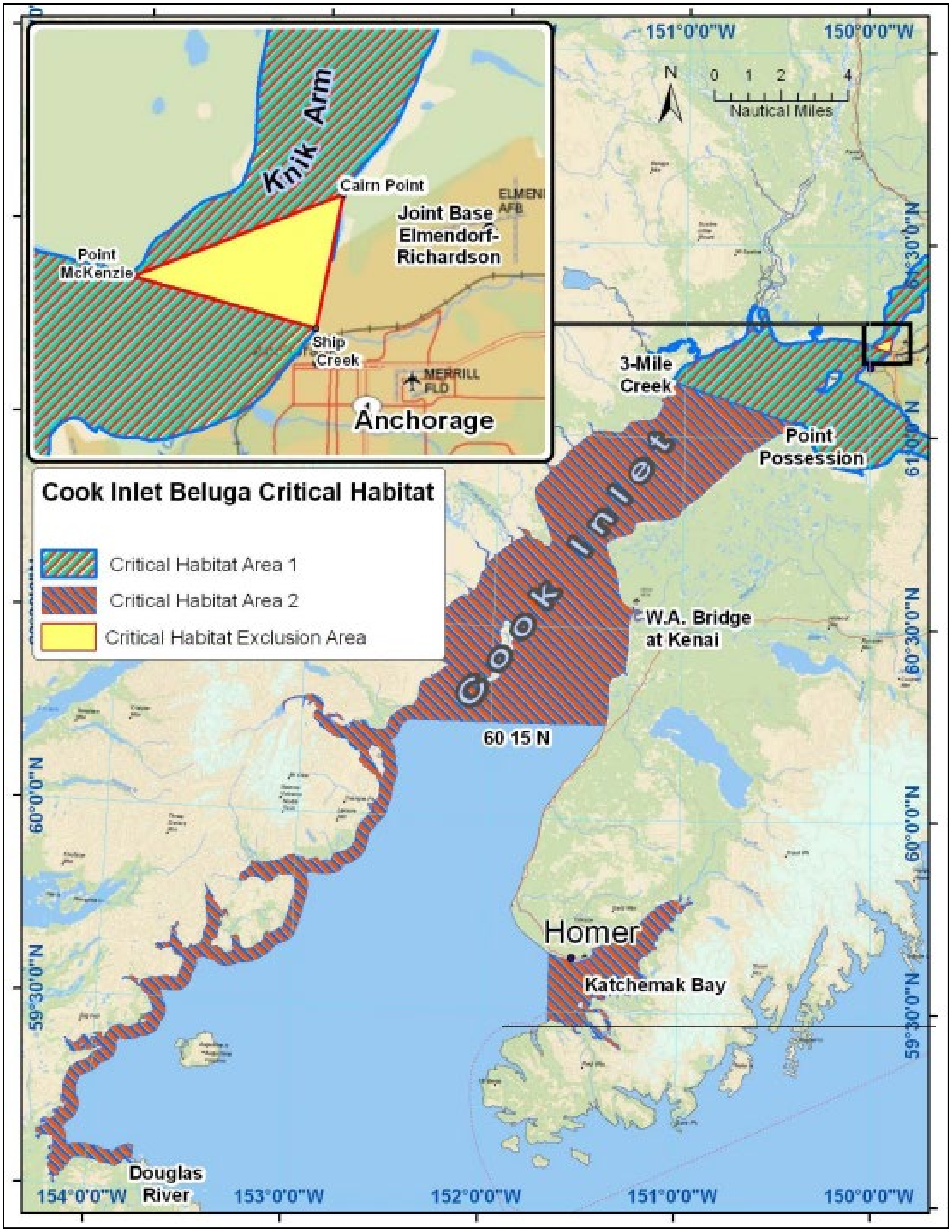


Figure 6. Cook Inlet Beluga Whale Critical Habitat Map

The following is excerpted from 50 CFR 226.220 critical habitat for the Cook Inlet beluga whale (*Delphinapterus leucas*):

> "Critical habitat includes two specific marine areas in Cook Inlet, Alaska. These areas are bounded on the upland by Mean High Water (MHW) datum, except for the lower reaches of four tributary rivers. Critical habitat shall not extend into the tidally influenced channels of tributary waters of Cook Inlet, with the exceptions noted in the descriptions of each critical habitat area.
>
> 1. *Area 1.* All marine waters of Cook Inlet north of a line from the mouth of Threemile Creek (61°08.5′ N., 151°04.4′ W.) connecting to Point Possession (61°02.1′ N., 150°24.3′ W.), including waters of the Susitna River south of 61°20.0′ N., the Little Susitna River south of 61°18.0′ N., and the Chickaloon River north of 60°53.0′ N.
> 2. *Area 2.* All marine waters of Cook Inlet south of a line from the mouth of Threemile Creek (61°08.5′ N., 151°04.4′ W.) to Point Possession (61°02.1′ N., 150°24.3′ W.) and north of 60°15.0′ N., including waters within 2 nautical miles seaward of MHW along the western shoreline of Cook Inlet between 60°15.0′ N. and the mouth of the Douglas River (59°04.0′ N., 153°46.0′ W.); all waters of Kachemak Bay east of 151°40.0′ W.; and waters of the Kenai River below the Warren Ames Bridge at Kenai, Alaska."

In response to comments received during the public notice period, the NMFS withdrew two areas within the Cook Inlet from the critical habitat designation. The exclusion of these areas was determined to be in the interest of national security and the benefits of exclusion were determined to outweigh the benefits of inclusion. The excluded areas are depicted in Figure 6 and described as:

1. All property and overlying waters of Joint Base Elmendorf-Richardson between Mean Higher High Water and Mean High Water; and
2. All waters off the Port of Anchorage which are east of a line connecting Cairn Point (61º15.4' N., 149º52.8' W.) and Point MacKenzie (61º14.3' N., 149º59.2' W.) and north of a line connecting Point MacKenzie and the north bank of the mouth of Ship Creek (61º13.6′ N., 149º53.8′ W.).

Notwithstanding the exclusion of the POA from critical habitat, Cook Inlet beluga extensively utilize the POA area.

4.0 Environmental Consequences

The marine mammals, essential fish habitat, threatened and endangered species, and cultural resources will use statutory language for the assessments of potential effects.

All other resource categories' the magnitude of the effects will be evaluated using best professional judgement and these criteria that are tiered as follows:

- Minor: effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.
- Moderate: effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
- Major: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

4.1 Air Quality

Preferred Alternative. The operation of any dredge emits air pollutants; however, the vessel would not contribute to a violation of Federal or State ambient air quality standards and would not be distinguishable from other vessel emissions in the project area. The POA has been dredged annually for decades, and Anchorage has still been able to maintain very good air quality. Dredge emissions would be indistinguishable from other commercial vessel emissions using the harbor. The potential impact of the Preferred Alternative on air quality is assessed as **minor**.

No-Action Alternative. Under the No-Action Alternative, the USACE would not dredge the area. Anchorage Harbor would be unable to accommodate deep draft vessels, and large vessel activity in the harbor would be impacted. Deposition at the face of the terminal would prevent access at lower tidal stages, requiring deeper draft vessels to pull away at low tide. Acceleration away from the dock face would load engines and produce higher air emission levels than idling during cargo offload currently produces. The cargo berths would eventually become inaccessible, and cargo would have to be brought in overland, likely increasing emissions due to the relative inefficiency of trucking cargo compared to shipping. The No-Action Alternative is assessed as having a **minor** potential impact on air quality.

4.2 Noise

Preferred Alternative. Suction dredging and clamshell dredging can produce sound pressure levels high enough to injure and drive marine organisms away from the project area, reducing their ability to use resources and potentially increasing mortality. The high levels of ambient noise in the POA and the recurring nature of dredging indicate that biological resources present in the project area are habituated or adapted to the levels of noise produced by dredging operations. Additional information regarding the impacts of subsurface noise on marine organisms is located in the pertinent sections of this chapter and Appendix A.

The Preferred Alternative would not generate sub-surface noise levels exceeding those produced by natural and anthropogenic sources and would not appreciably increase above surface noise levels. The potential impact on noise from the Preferred Alternative is assessed as **minor**.

No-Action Alternative. Under the No-Action Alternative, the USACE would not dredge the area. Anchorage Harbor would be unable to accommodate deep draft vessels and anthropogenic activity in the harbor would decline. The presence of small craft may increase in order to support offload but would likely represent a reduction in noise and lower impact on noise levels. The potential impact on noise from the No-Action Alternative is assessed as **minor**, and likely would be beneficial.

4.3 Water Quality

Preferred Alternative. Dredging in the POA could temporarily increase turbidity by suspending additional sediments in the water column and could mobilize contaminants and establish additional pathways for harmful chemicals to impact biological resources. The Knik Arm contains suspended sediment concentrations of up to 4,000 mg/L and turbidity up to 600 NTU, and sediment sampling conducted during the 2016 dredging season indicated no chemicals of concern above screening levels. Although the sediment does not contain significant contaminant concentrations, dredging and disposal activities create localized increases in suspended sediment concentrations and turbidity and slightly lower dissolved oxygen concentrations at the dredging and disposal sites.

Considering the high turbidity and absence of contamination in the dredge prism sediment, maintenance dredging potential impact on water quality is assessed as **minor**.

No-Action Alternative. Under the No-Action Alternative, the USACE would not dredge the area. Energetic, bidirectional tidal currents would naturally suspend sediments and thoroughly mix the water column. Anchorage Harbor would be unable to accommodate deep draft vessels and anthropogenic activity in the Harbor would be impacted. Cargo could be lightered ashore, creating conditions for accidents and spills of hazardous materials. Safe operation of additional small vessels would be more difficult to enforce, and unsafe conditions could be more prevalent due to the difficulty of inspecting more vessels. The No-Action Alternative potential impact on water quality is assessed as **minor**.

4.4 Water Circulation Patterns and Sedimentation

Preferred Alternative. Maintenance dredging is not expected to appreciably impact water circulation patterns and sedimentation, and its potential impact on water circulation patterns and sedimentation is assessed as **minor**.

No-Action Alternative. Under the No-Action Alternative, the USACE would not dredge the area. Energetic, bi-directional tidal currents would naturally suspend sediments and thoroughly mix the water column. There would be a reduction of anthropogenic sediment suspension and the subsequent deposition of material, resulting in a beneficial impact on sedimentation. The Knik Arm is highly turbulent and shoals unpredictably, with significant variability from year to year. The No-Action Alternative is assessed as having a **minor**, likely beneficial, potential impact on water circulation patterns and sedimentation.

4.5 Cultural Resources

Preferred Alternative. There are no known historic properties within the Area of Potential Effect (APE). Maintenance dredging of the POA is unlikely to affect unknown cultural resources because the loose sediment of the substrate has been removed and redeposited in the disposal area annually for many decades. Maintenance dredging would remove undisturbed sediments from 13.5 acres. It is possible that unknown cultural resources may be buried in these sediments; however, it is unlikely. Review of the AHRS and shipwreck database indicate no known historic properties within the APE of the Preferred Alternative. Dredging the APE is expected to have **no effect** on cultural resources.

No-Action Alternative. Under the No-Action Alternative, the USACE would not dredge the area. There would be **no effect** on cultural resources.

4.6 Vegetation

Preferred Alternative. Dredging and disposal would be confined to unvegetated areas with naturally high sediment load suspended by tidal action. The Preferred Alternative potential impact on vegetation is assessed as **minor**.

No-Action Alternative. Under the No-Action Alternative, the USACE would not dredge the area. Marine vegetation would be unaffected, as it would continue to be unable to grow in the affected area due to high natural sediment load and tidal energy. The No-Action Alternative potential impact for vegetation is assessed as **minor** on vegetation.

4.7 Marine Invertebrates

Preferred Alternative. Marine invertebrates in the POA area are discussed in section 3.7. The principal identified concern related to those invertebrates was related to their availability at the surface where they would be available as prey to birds and small fish that may feed in less turbid water at the surface. The bottom material that would be dredged consists of silty sediments that have been deposited after the previous year's dredging event. The Anchorage Harbor basin is dominated by heavy vessel traffic and other features of industrial waters, making the area of limited value as benthic habitat regardless of dredging activity. The rapid shoaling rate (~1 million CY per year) limits infaunal establishment and it is unlikely very many marine invertebrates inhabit the sediment that would be removed by the maintenance dredging.

Benthic infauna and epifauna could be entrained into a suction dredge or excavated along with bottom material in a clamshell dredge. The only relatively abundant animals living in the bottom material in the Knik Arm are polychaete worms in the shallower waters nearer to shore. There is no indication that they or any other invertebrate are present in substantial numbers in bottom material that would be dredged or in the disposal site.

Small bottom-dwelling shrimp and other small crustaceans collected in the Knik Arm could be in the areas to be dredged in at least small numbers. Those bottom-dwelling invertebrates could be injured or killed by the mechanical effects of dredging or could be smothered in the disposal site.

Direct impacts to benthic habitat would be temporary due to the rapid sedimentation rate. Organisms inhabiting the project area are adapted to turbulent conditions and unpredictable accretion/scouring. Because the area to be dredged supports few living resources and has little habitat value, potential impact of the Preferred Alternative on marine invertebrates is assessed as **minor**.

No-Action Alternative. Under the No-Action Alternative, the USACE would not dredge the POA. Benthic organisms would not be displaced or smothered by disposal and could eventually become established, and the No-Action Alternative would have a beneficial impact on marine invertebrates. The No-Action Alternative potential impact on marine invertebrates is assessed as **minor** and likely beneficial.

4.8 Fish

Preferred Alternative. The principal concerns of dredging and disposal are temporary and are associated with local increases of suspended sediment over the already high ambient levels near the POA and their potential effects on juvenile salmon (USACE 2008). Suspended solids in estuarine waters have been reported to injure juvenile salmon and could reduce their ability to sight-feed on surface and near-surface invertebrates. Individual fish could be physically impacted by entrainment into the drag arm of a suction dredge but would likely be able to avoid injury from the bucket of a clamshell dredge.

Effects of turbidity and suspended solids on juvenile salmon are summarized in a comprehensive compilation by Bash et al. (2001). The impacts of high suspended solids concentrations on salmonids have been reported to include mortality, reduced survival, reduced growth, reduced feeding, stress, disease, avoidance, displacement, change in body color, alerted behavior, and reduced tolerance to salt water (Loyd 1987 in Bash et al. 2001). Potential severity of effects is related to: (1) duration of exposure, (2) frequency of exposure, (3) toxicity, (4) temperature, (5) life stage of fish, (6) angularity of particles, (7) size of particles, (8) type of particles, (9) severity and magnitude of pulse, (10) natural background turbidity, (11) time of occurrence, (12) other stressors and general condition of biota, and (13) availability of and access to areas with less suspended material.

Much of the research on juvenile salmonids and turbidity was done in laboratory settings. Applicability to field situations has not been thoroughly verified. Other research applies to headwaters and systems that are normally clear except for seasonal and infrequent sediment. Turbidity values reported by some research may not be a consistent and reliable tool for determining the effects of suspended solids on salmonids. Bash et al. concluded that, "salmonids encounter naturally turbid conditions in estuaries and glacial streams," but that this does not necessarily mean that salmonids in general can tolerate increases of suspended sediments over time. Relatively low levels of anthropogenic turbidity may adversely affect salmonid populations that are not naturally exposed to relatively high levels of natural turbidity (Gregory 1992 in Bash et al. 2001). Bash et al. also noted that managers are interested in learning whether there is something inherent in "natural" turbidity sources that make them somehow less harmful to fish than anthropomorphic sources of turbidity, because it is apparent that salmonids are able to cope with some level of turbidity at certain life stages. Evidence of their ability to cope is illustrated by the presence of juvenile salmonids in turbid estuaries and local streams with high natural levels of glacial silt (Gregory and Northcote 1993 in Bash et al. 2001).

Feeding efficiency of juvenile salmonids has been shown to be impaired by turbidities in excess of 70 NTU (Bisson and Bilby 1982), well below typical and persistent levels in the Knik Arm (Pentec 2005). Section 3.8 discussed reports that juvenile salmon and saffron cod may feed and grow in surface water microhabitats in Knik Arm where short periods (minutes) of relative quiescence in the generally turbulent water allow partial clearing.

Section 3.8 presented information indicating that dredging would have little effect on surface and near-surface invertebrates. Dredging would have equally little effect on any fish sight-feeding on those invertebrates. Collection data indicate that juvenile salmon are largely or entirely in the upper 10 feet of water in the Knik Arm, so mechanical effects of dredging and turbidity produced by dredging at project depths also would be unlikely to surface, and peak tidal currents might be able to lift some of the material to the surface where it could increase near-surface local turbidity for short periods. This could affect the ability of juvenile fish to feed at or near the surface in small areas when dredged material was being dumped. Near-surface turbidity will be monitored during dredging for the Preferred Alternative to see whether it is affected by disposal activity. Effects on fish near-surface habitat use will be determined or dredging and disposal methodology will be modified to avoid effects if near-surface turbidity is higher.

Adult salmon in the project areas of the Knik Arm could be subjected to higher suspended solids concentrations from dredging and dispersion of disposed material. Pentec (2005) and other sources indicate that returning adults tend to run in shallow water, probably to reduce predation by beluga whales. This shallow water orientation would tend to keep them away from dredging and dredged material disposal, which would be largely in deeper water.

There is no indication that noise and turbidity, both natural and from dredging at the POA, are affecting salmon migration. Salmon regularly return to Ship Creek, which terminates adjacent to the POA, and to other area streams. This lack of apparent effect could be expected because near-shore and upper water column natural suspended material concentrations are comparable to those being dredged and at disposal sites. The apparent lack of effect at the POA is consistent with the literature, which indicates a similar lack of effect in other areas where salmon migrate near dredging and other activity.

Natural turbidity exceeds the threshold determined to be injurious to feeding efficiencies, so apparently fish occurring in the project area are adapted to high levels of suspended sediments. Individual fish may be killed or injured by dredging operations; but fish that feed on benthic invertebrates may benefit from enhanced foraging opportunities after the dredge has passed, as injured, uncovered, or killed invertebrates could more easily be captured. Because most fish would avoid the dredging operation and are adapted to life in high suspended sediment concentrations, may benefit from benthic faunal disturbance, and physical injury would be limited to individual fish, the Preferred Alternative potential impact on fish is assessed **minor**.

No-Action Alternative. Under the No-Action Alternative, the USACE would not dredge the area. Energetic, bi-directional tidal currents would naturally suspend sediments and thoroughly mix the water column. The Anchorage Harbor would be unable to accommodate deep draft vessels and anthropogenic activity in the harbor would be impacted. Cargo could be lightered ashore, creating conditions for accidents and spills of hazardous materials. Safe operation of additional small vessels would be more difficult to enforce and unsafe conditions could be more prevalent due to the difficulty of inspecting more vessels. The No-Action Alternative potential impact on fish is assessed as **minor**.

4.9 Birds

Preferred Alternative. Dredging would occur in areas that are not critical or important bird habitat and are used only sparsely by birds. The area that would be dredged is not intertidal, so the birds most likely to occur in the project area would be gulls that are either flying or resting. Given the water depth and high suspended sediment loads, it is unlikely that ducks or geese would be found in the project area in appreciable numbers on a regular basis. Small numbers of gulls and waterfowl would be temporarily displaced by tug, barge, and ship traffic associated with dredging, but this area is not nesting habitat and there is no indication that is it especially important to any species of bird.

The Preferred Alternative potential impact on birds is assessed as **minor,** because individuals will avoid dredging operations and the areas affected by dredging are not heavily used or of particular value to avifauna.

No-Action Alternative. Under the No-Action Alternative, the USACE would not dredge the area. Energetic, bi-directional tidal currents would naturally suspend sediments and thoroughly mix the water column. The Anchorage Harbor would be unable to accommodate deep draft vessels and anthropogenic activity in the harbor would be impacted. A greater density of smaller, faster vessels could be used to transfer cargo ashore in the event accretion precludes deep draft vessels at low tidal stages. These small, faster vessels could be more disturbing to birds than the large, slow vessels that currently off-load at the terminal. As a result, the No-Action Alternative potential impact on bird is assessed as **minor**.

4.10 Marine Mammals

Preferred Alternative.

Beluga Whale. There are no consistent observed threshold levels at which belugas, and marine mammals in general, respond to introduced sound. Beluga whale peak hearing sensitivity is between 10 and 100 kHz, decreasing at a rate of 11 dB per octave below 8 kHz. (Blackwell and Greene 2002) Mean detection thresholds in the dredging bandwidth are 121 dB at 125 Hz, 118 dB at 250 Hz, 108 dB at 500 Hz, and 101 dB at 1 kHz. (Awbrey et al. 1988). Beluga responses to sound stimuli are reported to be highly dependent upon their behavioral state and their motivation to remain in or leave an area. Few field studies involving industrial sounds have been conducted on beluga whales. Reactions of belugas in those studies varied. In Awbrey and

Stewart (1983) (as summarized in Southall et al. 2007), recordings of noise from SEDCO 708 drilling platform (non-pulse) were projected underwater at a source level of 163_{RMS}. Beluga whales less than 1.5 km from the source usually reacted to onset of the noise by swimming away (RLs approximately 115.4 dB_{RMS}). In two instances groups of whales that were at least 3.5 km from the noise source when playback started continued to approach (RLs approximately 109.8 dB_{RMS}). One group approached to within 300 m (RLs approximately 125.8 dB_{RMS}) before all or part turned back. The other group submerged and passed within 15 meters of the projector (RLs approximately 145.3 dB).

Man-made sounds can mask whale calls or other sounds potentially relevant to whale vital functions. Masking occurs when the background noise is elevated to a level that reduces an animal's ability to detect relevant sounds. Experiments on captive belugas indicated that the critical detection ratio for noise below 1 kHz is about 16-17 dB; meaning sound pressure would have to exceed ambient noise in the reference bandwidth by the critical ratio to be detectable by beluga whales (Johnson et al. 1989). For reference, this critical ratio is about 3 dB lower than that of bottlenose dolphin, and Tursiops truncates. Belugas have been known to increase their levels of vocalization as a function of background noise by increasing call repetition and shifting to higher frequencies (Lesage et al. 1999, Scheifele et al. 2005). Low tonal frequencies of construction noise and the ability of belugas to adapt vocally to increased background noise would tend to minimize masking potential interruption of behaviors such as feeding and communication.

It has been demonstrated that marine mammals exposed to repetitious sounds will become habituated and tolerant after initial exposure to these sounds, as demonstrated by beluga vessel tolerance (Richardson et al. 1995, Blackwell and Green 2002). Beluga whales are regularly observed within a few meters of the docked cargo freighter, including during the 12 September 2021 hydroacoustic data collection, as shown in Figure 7.

The Alaska District, Environmental Resources Section recorded dredging sounds produced in the Anchorage Harbor, as well as background sounds while the dredge was on standby, on three instances in August and September 2021 (also discussed in Section 3.2). The dredge was estimated to produce SPL equal to 161.5 dB_{RMS} at 1 m from the source. Dredging noise is estimated to propagate spherically, decaying to 133.6 dB_{RMS} at 25 m and 127.6 dB_{RMS} at 50 m. As previously mentioned, the Alaska District's recorded background noise level of 128 dB_{RMS} is consistent with the background noise levels reported by JASCO (a mean SPL of 138.8 dB_{RMS} within a range of L_{95} =106.8 and L_{MAX} 164.7 dB_{RMS}; JASCO 2016). Dredging noise is estimated to attenuate below the background noise level within 50 m of the noise source. Additional information about hydroacoustic impacts of dredging on beluga whales is in Appendix A.


Figure 7. Two Cook Inlet Beluga Whales Swimming Alongside Docked Freighter

Although the POA is a highly industrialized area supporting a large volume of ship traffic, belugas are present almost year-round. Belugas evidently have become habituated to Port operations and annual dredging activities. Belugas are routinely sighted near dredges used each summer for maintenance at the POA. Over 1,500 beluga sightings were reported by the dredging crew in 2021, indicating the animals continue to use the area in high numbers. Belugas also demonstrate tolerance to ship traffic around the POA, as documented in numerous surveys conducted by LGL in that area. The Preferred Alternative potential impact on beluga whales is assessed as **no effect**.

Steller Sea Lion, Harbor Seal, Orca Whale, and Harbor Porpoise. Given the low density of these marine mammals in Upper Cook Inlet and near the POA, impacts from dredging noise are unlikely. No marine mammals, aside from beluga whales, were observed by the dredging contractor during the 2021 dredging season. The infrequent occurrence decreases the likelihood of negative effects to marine mammals from underwater noise at the POA. The assessment of potential impacts to Steller sea lions, harbor seals, killer whales, and harbor porpoise was inferred from the beluga whale analysis.

The proposed activity would have no effect on marine mammals, because commercial shipping traffic in the POA produces sound pressure in the same bandwidth and intensity that dredging would, marine mammals in the POA are apparently habituated to anthropogenic disturbances such as vessel traffic, the high natural sediment load increase the rate of sound attenuation in the Knik Arm, the USACE's mitigation would prevent marine mammals from being exposed to underwater noise exceeding the background level, and the areas affected by dredging are not of particular importance for marine mammals in any life stage. The potential impact of the Preferred Alternative on marine mammals aside from belugas is assessed as **no effect**.

No-Action Alternative. Under the No-Action Alternative, the USACE would not dredge the area. The Anchorage Harbor would be unable to accommodate deep draft vessels and anthropogenic activity in the harbor would decline. Large vessels would be forced to pull away from the terminal at low tidal stages and small vessels may become more numerous. The increased movement of vessels caused by limited access to the dock is assessed to potentially have **is not likely to adversely affect** marine mammals.

4.11. Essential Fish Habitat

Preferred Alternative. Reintroduction of sediments into the Knik Arm water column during dredging and disposal is not expected to adversely impact EFH. The Knik Arm is a highly turbid ecosystem with high and variable suspended sediment concentrations and mobile soft-bottom sediments that are shifted consistently by extreme tidal forces. Pacific salmon and other EFH species that might be in the area have adapted to high suspended sediment levels and would likely avoid the immediate area near the discharge without suffering adverse impacts. The Preferred Alternative would **not adversely affect** EFH.

No-Action Alternative. Under the No-Action Alternative, the USACE would not dredge the area. The Anchorage Harbor would be unable to accommodate deep draft vessels at all tidal stages, substrate would not be removed and redeposited, and suspended sediments would be reduced, producing a beneficial impact on EFH. The No-Action Alternative would **not adversely affect** EFH.

4.12 Threatened and Endangered Species

Preferred Alternative. In October 2008, the Cook Inlet DPS of beluga whale was listed as endangered under the ESA of 1973. Three years later, in April 2011, critical habitat for this DPS was designated under the ESA. The POA Federal dredging project and disposal area lies within the external boundary of this critical habitat, but the harbor was excluded from the designation due to its importance as a Department of Defense strategic port. The POA exclusion zone from Cook Inlet beluga whale critical habitat is shown in Figure 6. The proposed Federal dredging project and disposal area in relation to the Cook Inlet beluga whale critical habitat exclusion is shown in Figure 8.

Coordination with the NMFS ESA division in conjunction with the 2008 *Anchorage Harbor Dredging and Disposal Environmental Assessment* concluded that:

- Sounds generated by dredging and related activities are similar in intensity to those associated with other harbor activities and most are close to ambient noise levels. To protect beluga whales, dredging activities will be suspended any time beluga whales are within 50 meters of the activity.

- Activities at and near POA, including dredging, do not prevent beluga whales from feeding actively near the POA. During the winter, beluga whales may feed on fish and invertebrates on and near the bottom that are not available in Knik Arm at other times. Dredging and dredged material disposal will affect a maximum of about 650 acres of Knik Arm bottom habitat that may be used by prey organisms. Alteration of habitat is unlikely to substantially affect beluga whale feeding because: (1) potential prey organisms are mobile and able to repopulate affected areas; (2) the affected area is a small part of available habitat in the Cook Inlet beluga whale winter range; and (3) because winter habitat in Cook Inlet belugas' range supported a much larger population just a few years ago.

Beluga whales are frequently observed within the POA and have apparently become habituated to the noise and activity associated with an industrial port facility. Beluga whales were observed over 1,500 times during 2021 Anchorage Harbor dredging season, in groups varying between 1 and 30 animals, and did not exhibit detectable behavioral alteration. This indicates that the operation of the dredge does not deter beluga whales from using the area. The Preferred Alternative, including applicable mitigation, is assessed as having **no effect** on ESA species because of the high ambient noise level present in the Anchorage Harbor, the consistency of dredging noise and commercial shipping noise, high levels of naturally suspended sediments, and capacity of beluga whales to adapt and become habituated to anthropogenic activities.

Detailed description of the analysis supporting the affects determination can be found in Appendix A.

No-Action Alternative. Under the No-Action Alternative, the USACE would not dredge the area. The Anchorage Harbor would be unable to accommodate deep draft vessels at all tidal stages. The restricted access to large vessels could result in more vessel movement to avoid grounding at low tide. Tug boats are among the loudest vessels in the POA and their use could increase as a function of the additional maneuvering. The No-Action Alternative is **not likely to adversely affect** ESA-listed species.

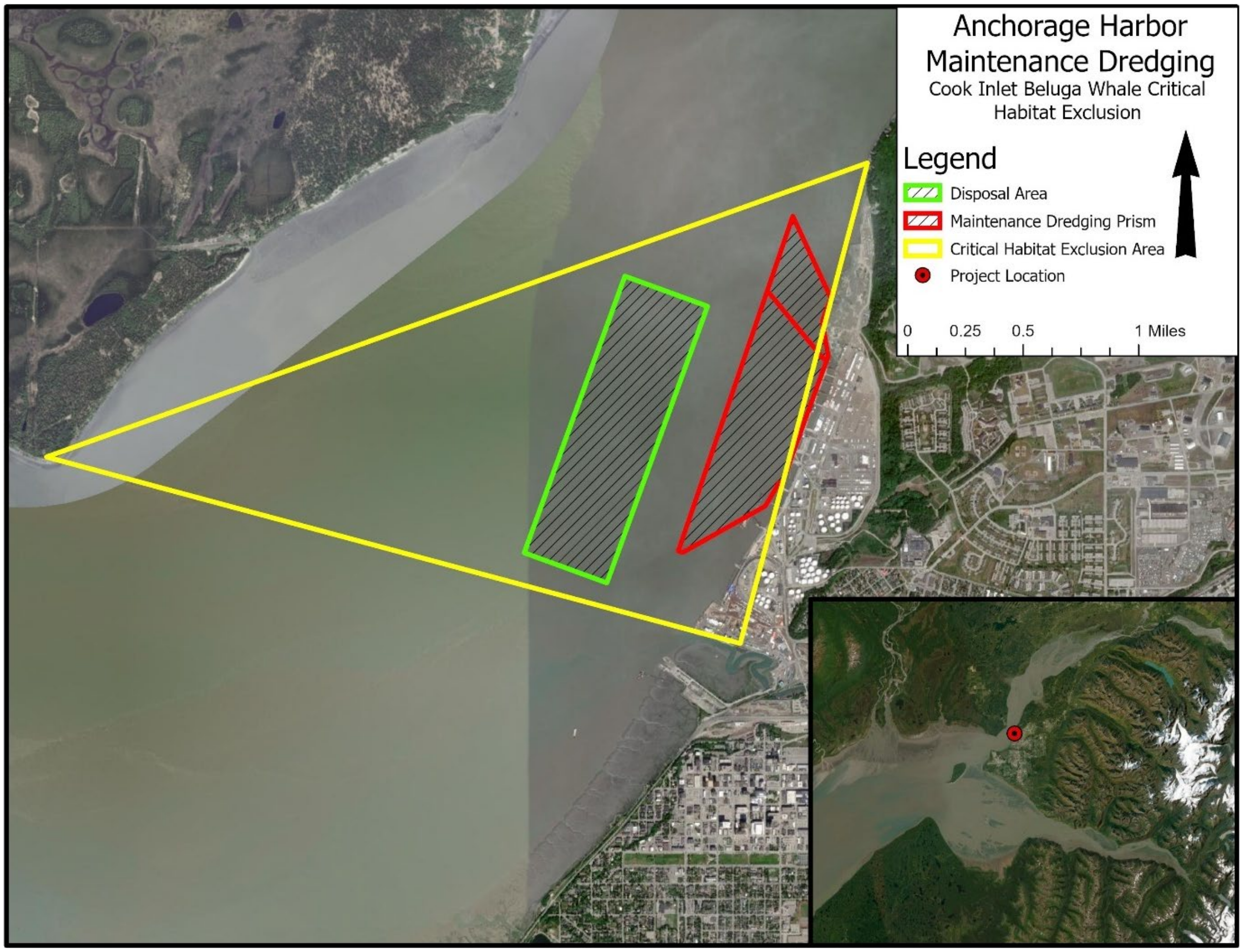


Figure 8. Proposed Dredge Limits in Relation to the Anchorage Strategic Seaport Cook Inlet Beluga Whale Critical Habitat Exclusion Area

5.0 Mitigation

The USACE would incorporate the following mitigation measures into the project design:

1. The USACE will continue to collect project specific and background noise data throughout the dredging season to enhance the understanding of project-related effects.
2. The USACE will establish exclusion (i.e., shutdown) zones as follows:
   a. For stationary dredging operations, the shutdown (exclusion) zone will include all marine waters within 164 ft. (50 m) of the noise source;
   b. For moving vessels, the shutdown (exclusion) zone will include all marine waters within 328 ft. (100 m) of the noise source.
3. The USACE will stop work when a marine mammal is observed approaching or within the 164 ft. (50 m) exclusion zone of the stationary dredging operations by:
   a. Ensuring that the exclusion zone is continuously scanned during in-water work to help ensure that marine mammals do not enter the exclusion zone;
   b. Ensuring that stationary dredge operations may resume when marine mammals have been observed leaving the exclusion zone of their own accord. If one or more marine mammals are not observed leaving the exclusion zone, in-water work may begin 30 minutes after the animal was last observed in that exclusion zone;
   c. Ensuring that for the Trailing Suction Hopper Dredge, when circumstances make it impossible to immediately stop dredging, work will be stopped as soon as practicable in order to prevent exposing marine mammals to sounds capable of causing harassment.
4. The USACE will ensure that stationary dredging activities will not be initiated or resumed after a shutdown of 30 or more minutes until observations indicate that marine mammals have not been present in the exclusion zone for at least 30 minutes prior to commencing dredging activities.
5. The USACE will stop work when a marine mammal is observed approaching or within the 328 ft. (100 m) exclusion zone of a moving vessel by:
   a. Ensuring that the exclusion zone is continuously scanned when a vessel is underway to help ensure that marine mammals do not enter the exclusion zone;
   b. Ensuring that moving vessels take appropriate avoidance measures, which include but are not limited to delay of vessel departure and alteration of vessel speed and/or heading provided doing so does not compromise human safety;
   c. Ensuring that barges will not travel at speeds exceeding 6 knots (7 mph);
   d. Ensuring that support and survey vessels will not operate at speeds exceeding 13 knots (15 mph).
6. If a marine mammal enters the exclusion zone before the sound producing activity can be safely shut-down (e.g., a marine mammal surfaces inside the 164 ft. [50 m] exclusion zone radius for stationary dredge activities or occurs within 328 ft. [100 m] of a moving vessel), it will be reported to the USACE at within one business day and an investigation will be conducted to determine the appropriate corrective action.
7. The USACE will ensure that pilots of the dredge and barge, and pilots of the support vessels will have clear views of the exclusion zones around each vessel to facilitate effective monitoring for all protected species. These pilots will enforce the established exclusion zones for both stationary and moving vessels. The exclusion zone for stationary

dredging operations will include all marine waters within 164 ft. (50 m) of the noise source. The exclusion zone for all moving vessels will include all marine waters within 328 ft. (100 m) of the noise source.

8. The USACE will ensure that dredging crews maintain radio communication with support boats, when present, so that information on marine mammal observations can be exchanged.
9. The USACE will prepare a memorandum for record (see item 13 below) by the 15th day of each month following a month during which dredging occurred. The report will detail the dredging activities, and marine mammal observations and interactions that occurred during that month. The report will contain the following information:
   a. Number of marine mammals observed in or near the exclusion zones (ex., 164 ft. [50 m] exclusion zone radius for stationary dredge activities and the 328 ft. [100 m] exclusion zone radius for moving vessels), or report the absence of sightings;
   b. The date, duration, and time of each marine mammal observation;
   c. The closest approach distance of the marine mammal(s) to the noise source (vessels);
   d. Vessel operations that occurred at the time of the marine mammal(s) observation;
   e. Whether marine mammal(s) entered the exclusion zone(s);
   f. Mitigation measures taken to avoid marine mammal(s);
   g. Dredge and barge location for each observation of a marine mammal within 164 ft. (50 m) of a stationary dredge activities and within 328 ft. (100 m) exclusion zone radius for moving vessels;
   h. In addition, the contractor will complete a "Marine Mammal Sighting Form" each day that dredging or vessel movements occur.
10. The USACE will prepare an annual report that summarize sightings of marine mammals (or confirmed absence of sightings), estimated distance from dredging operations when each marine mammal was first observed, the closest point of approach to the in-water sound source, and any shutdowns during in-water work that was due to marine mammals approaching or occurring within the exclusion zone(s). This report will be prepared within 90 days of the completion of field operations each year and adding to the project file.

6.0 Regulatory Compliance and Agency Coordination

The Preferred Alternative was considered in relation to compliance with Federal environmental review and consultation requirements. The following paragraphs document compliance with applicable Federal statutes, Executive Orders, and policies.

BALD AND GOLDEN EAGLE PROTECTION ACT, (BGEPA) AS AMENDED

This act prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." Disturbance of eagles can include any action causing interference with normal breeding, nesting, or feeding activities.

There is no indication that the project would have an impact on eagles or their habitat. The project is in compliance with the BGEPA.

CLEAN WATER ACT OF 1972, AS AMENDED

The objective of the Federal Water Pollution Control Act of 1972, as amended by the CWA of 1977 (Public Law 92-500), is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Specific sections of the CWA control the discharge of pollutants and wastes into aquatic and marine environments.

Dredging and disposal in waters of the United States is an activity regulated by the CWA and analysis under Section 404(b)(1) was performed in conjunction with the 2008 USACE EA evaluating the harbor expansion project. The maintenance dredging project description is substantially similar to the 2008 project description and the 2008 Section 404(b)(1) analysis is incorporated by reference. The project is in compliance with the CWA.

On 30 January 2019, the Alaska Department of Environmental Conservation (ADEC) issued the USACE a Certificate of Reasonable Assurance under Section 401 of the CWA, Alaska Water Quality Standards, and other applicable state laws. The certification expires 5 years after the date of issuance. That certificate is appended to this EA.

COASTAL BARRIER RESOURCES ACT

This Act is not applicable. The study area is not in a designated Coastal Barrier Resources Act unit.

COASTAL ZONE MANAGEMENT ACT OF 1972, AS AMENDED

As of July 1, 2011, the Coastal Zone Management Act (CZMA) Federal consistency provision no longer applied in Alaska. Federal agencies shall no longer provide the State of Alaska with CZMA Consistency Determinations or Negative Determinations pursuant to 16 United States Code (USC) 1456(c)(1) and (2), and 15 CFR part 930, subpart C. Persons or applicant agencies for Federal authorizations or funding shall no longer provide to the State of Alaska CZMA Consistency Certifications pursuant to 16 USC 1456(c)(3)(A), (B) and (d), and 15 CFR part 930, subparts D, E and F.

ENDANGERED SPECIES ACT OF 1973, AS AMENDED
The Cook Inlet beluga whale is present in the project area, a species listed as "endangered" under the ESA. The proposed activity would potentially cause minor impacts on endangered species, because commercial shipping traffic in the POA produces sound pressure in the same bandwidth and intensity that dredging would, beluga whales in the POA have apparently become habituated to anthropogenic disturbances such as vessel traffic, and the areas affected by dredging are not of particular significance or used for breeding or rearing. The proposed project was assessed to have no effect on ESA species and thus no consultation was required. The project is in compliance with the ESA.

MARINE MAMMAL PROTECTION ACT OF 1972
The MMPA of 1972 prohibits the "taking" of marine mammals and enacts a mortarium on the import, export, and sale of any marine mammal, along with any marine mammal part or product in the United States. The proposed project was assessed to have no effect on marine mammals within the Cook Inlet, and there should be zero incidental takings of marine mammals. No consultation was required due to the no effect determination. The project is in compliance with the MMPA.

ESTUARY PROTECTION ACT OF 1968
Cook Inlet is a large estuary on the south-central coast of Alaska, bordered on three sides by rugged mountains, tidal flats, marshlands, and rolling lowlands. The preferred alternative would have a less than significant impact on the Cook Inlet estuary due to the natural levels of suspended sediments and ambient noise. The project is in compliance.

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT
The NOAA NMFS works with the regional fishery management councils to identify the essential habitat for every life stage of each federally managed species using the best available scientific information. EFH has been described for approximately 1,000 managed species to date. The project would is not likely to adversely affect waters and substrate required for federally managed fish species' spawning, breeding, feeding, or growth to maturity; known as EFH. The USACE is not required to consult on projects that would have no adverse impact on EFH, but the USACE notified NMFS of the determination and received acknowledgement via email on 1 April 2022 that the NMFS had no EFH concerns about the proposed action. The project is in compliance with the Magnuson-Stevens Act.

MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972, AS AMENDED
Titles I and II of the Marine Protection, Research, and Sanctuaries Act (MPRSA), also referred to as the Ocean Dumping Act, generally prohibits (1) transportation of material from the United States for the purpose of ocean dumping, (2) transportation of material from anywhere for the purpose of ocean dumping by U.S. agencies or U.S.-flagged vessels, and (3) dumping of material transported from outside the United States into the U.S. territorial sea. The POA dredging and disposal project lies wholly within the territorial seas of the United States, so the MPRSA does not apply to this project.

MIGRATORY BIRD TREATY ACT AND MIGRATORY BIRD CONSERVATION ACT
Under the Migratory Bird Treaty Act, project construction shall not destroy migratory birds, their active nests, their eggs, or their hatchlings. The preferred alternative would have a less than significant impact on the migratory birds because individuals would avoid dredging operations and the areas affected by dredging are not heavily used or of particular value to avifauna. The project is in compliance.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) OF 1969, AS AMENDED
This Act requires that environmental consequences and project alternatives be considered before a decision is made to implement a Federal project. NEPA established the requirements for preparation of an Environmental Impact Statement (EIS) for projects potentially having significant environmental impacts and an EA for projects with no significant environmental impacts. This EA has been prepared to address impacts and propose avoidance and minimization steps for the proposed project, as discussed in the CEQ regulations on implementing NEPA (40 CFR 1500 et seq.). This document presents sufficient information regarding the generic impacts of the proposed construction activities at the proposed project to guide future studies and is intended to satisfy all NEPA requirements.

NATIONAL HISTORIC PRESERVATION ACT OF 1966
The purpose of the National Historic Preservation Act (NHPA) is to preserve and protect historic properties that may be impacted by a Federal undertaking. Under this Act, Federal agencies are required to identify historic properties that may be affected by an undertaking and assess that effect in consultations with the SHPO, Federally-recognized Tribes, and any other interested parties. The APE has been identified by the Alaska District, and the USACE has determined that no historic properties exist within the APE.

RIVER AND HARBOR APPROPRIATION ACT OF 1899
The POA dredging project consists of work within navigable waters of the United States, and correspondingly falls within the purview of the RHA. The project purpose is to provide safe navigation, authorized by Section 118 of Public Law 108-447. The preferred alternative would allow for safe navigation required by legislation and accommodate the planned expansion of the Port of Anchorage as directed by Public Law 108-447. The proposed work would not obstruct navigable waters of the United States. The project is in compliance.

UNIFORM RELOCATION ASSISTANCE AND REAL PROPERTY ACQUISITION POLICIES ACT OF 1970 (PUBLIC LAW 91-646)
The Preferred Alternative does not require the procurement of private lands for public use. The provisions of this Act do not apply to the project.

WILD AND SCENIC RIVER ACT OF 1968, AS AMENDED
No rivers designated under the Act are in the project area. This Act is not applicable.

EXECUTIVE ORDER (EO) 11990, PROTECTION OF WETLANDS
The Preferred Alternative would not result in impacts to wetlands. The EA is in compliance with the goals of this EO.

EXECUTIVE ORDER 12898, ENVIRONMENTAL JUSTICE
EO 12898 requires agencies of the Federal Government to review the effects of their programs and actions on minorities and low-income communities. Maintenance dredging at the Port of Alaska currently allows the delivery of 74% of all non-petroleum cargo (including food and basic subsistence goods) bound for Southcentral Alaska. Ocean transport is generally the most cost-effective method of transporting cargo, so the selection of the no-action alternative would likely increase the cost of delivering food and goods to Southcentral Alaska as alternative and more costly means would be required. The increased cost of food and basic subsistence goods would disproportionately affect low-income communities because those communities are most sensitive to price increases on basic goods. The preferred alternative is not expected to have disproportionately high impacts low-income populations. The project complies with EO 12898.

EXECUTIVE ORDER 13045, PROTECTION OF CHILDREN
EO 13045, requires each Federal agency to "identify and assess environmental risks and safety risks [that] may disproportionately affect children" and ensure that its "policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks." This project has no environmental or safety risks that may disproportionately affect children. The project is in compliance.

EXECUTIVE ORDER 13653, CLIMATE CHANGE CONSIDERATIONS
EO 13653 requires Federal agencies to review the effect of climate change on their programs. Coastal uplift in the Cook Inlet is predicted to range from approximately 0.7 meters to 1.1 meters by 2100. When uplift is combined with eustatic sea level rise predictions of 0.4 meters to 1.3 meters, relative sea level rise is expected to range from -0.7 meters and 1.3 meters by 2100 (Glick et al. 2010). Warming temperatures could have the effect of releasing additional sediment into the Knik Arm due to glacial retreat. Elevated sediment inputs could increase the rate of accretion in tidal flats, which would increase resilience to eustatic sea level rise but could also increase the volume of dredged material generated in the POA. Increased volume of material as a result of accelerated glacial retreat could occur in the presence or absence of the preferred alternative. Dredged material removed from the POA is redeposited in Knik Arm, resulting in no change to its capacity. Given the extent of variability in dredged quantities, an increase in sedimentation would not significantly impact the POA dredging project. The project is in compliance.

7.0 Public and Agency Involvement

The Alaska District issued a Public Notice on May X, XXXX, for the 2022 *Maintenance Dredging, Anchorage Harbor, Anchorage, Alaska, Environmental Assessment* in order to elicit input from the public and resource agencies. Public Notice ##### was available on the Alaska District's website for 30 days, expiring on June X, XXXX, in "Operations and Maintenance" under "Documents Available for Review" on the USACE Website at:

https://www.poa.usace.army.mil/Library/Reports-and-Studies/

A media release was also prepared and provided to local media. During the Public Notice period, the USACE received (if no comments received) no comments / (if comments received) description of comments.

The Alaska District requested Agency comments on the draft EA and FONSI concurrently with the public notice. The Agencies contacted are listed below:

- Alaska Department of Environmental Conservation, Division of Air Quality
- Alaska Department of Environmental Conservation, Division of Spill Response and Prevention
- Alaska Department of Environmental Conservation, Division of Water
- Alaska Department of Fish and Game, Division of Wildlife Conservation
- Alaska Department of Natural Resources, Division of Land, Mining, and Water
- Alaska Department of Natural Resources, State Historic Preservation Office
- Matanuska-Susitna Borough, Port MacKenzie Director
- Municipality of Anchorage, Anchorage Community Development Authority
- Municipality of Anchorage, Port of Alaska Director
- National Marine Fisheries, Protected Resource Division
- National Marine Fisheries, Habitat Conservation Division
- United States Environmental Protection Agency, Aquatic Resource Unit
- United States Fish and Wildlife Service, Ecological Services Branch

Copies of the public notice, media release, notice of availability, comments, and responses can be found in Appendix E

8.0 Preparers and Acknowledgements

This Environmental Assessment was prepared by Matt Ferguson of the Environmental Resources Section at the Alaska District, United States Corps of Engineers. Additional USACE personnel, including Kelly Eldridge, archaeologist; Kayla Campbell, biologist; and Donna West, project manager, were also involved in contributing content to this EA.

9.0 Works Cited

Alaska Department of Environmental Conservation (ADEC). 2004. Amendments to the State Air Quality Control Plan, Vol. II: Analysis of Problems, Control Actions, Section III.B: Anchorage Transportation Control Program, Adopted January 2, 2004.

Alaska Department of Environmental Conservation (ADEC). 2012. State of Alaska 2010 Ambient Air Quality Network Assessment. Anchorage, Alaska: Monitoring and Quality Assurance, Division of Air Quality, Department of Environmental Conservation.

Alaska Heritage Resources Survey (AHRS). 2022. Alaska Heritage Resources Survey Database. Office of History & Archaeology, Alaska Department of Natural Resources. Online Document, https://dnr.alaska.gov/ohasecurity/portal.

Anchorage Daily Times. 1962. History Folio #1, Section 1: 1958-1962, Page 56. The Port of Anchorage: A Masterpiece of Engineering. Online Document, https://www.portofalaska.com/port_history/folio1/section1/1_1_56_183.pdf.

Angliss, R.P. and R.B. Outlaw. 2006. Cook Inlet Beluga Stock Assessment. NMFS. NOAA-TM-AFSC-168. Online Document, http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2006_whbg-ci.pdf.

Au, W.W.L. 1993. The Sonar of Dolphins. Springer-Verlag, New York. 277 p.

Awbrey, F.T., J.A. Thomas and R.A. Kastelein. 1988. Low-frequency underwater hearing sensitivity in belugas, *Delphinapterus leucas*. *J. Acoust. Soc. Am.* 84(6):2273-2275.

Bash J., Berman C., and S. Bolton. 2001. Effects of Turbidity and Suspended Solids on Salmonids. Center for Streamside Studies. Univ. of Washington, Seattle. November 2001.

Bisson, P.A., Bilby R.E. 1982. Avoidance of Suspended Sediment by Juvenile Coho Salmon. *North American Journal of Fisheries Management* Vol. 2 Issue 4. pp. 371–374.

Blackwell, S.B., C.R. Greene. 2002. Acoustic Measurements in Cook Inlet, Alaska During August 2001. Prepared for National Marine Fisheries Service under contract number 40HANF100123. Greeneridge Report 271-1. 41 p.

Calkins, D.G. and Curatolo, J.A. 1979. Marine Mammals of Lower Cook Inlet and the Potential for Impact from Outer Continental Shelf Oil and Gas Exploration, Development and Transport. Alaska Department of Fish and Game.

Environmental Protection Agency (EPA). 2007. 2007 Air Quality Index data for the Municipality of Anchorage Borough as reported by the US EPA AirData system. Online Webpage, www.epa.gov/air/data/reports.htm.

Federal Register. Vol. 73, No.53, Tuesday, March 18, 2008. p14447.

Federal Register. 2016. Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental To Implementation of a Test Pile Program in Anchorage, Alaska. Vol. 81, No. 54. Monday, March 21, 2016. p15058

Gatto, L.W. 1976. Baseline data on the oceanography of Cook Inlet, Alaska. CRREL Rep. 76-25 prep. for NASA by U.S. Army Corps Engr., Cold Reg. Res. Engr. Lab., Hanover, N.H., 81.

Glick, P., Clough, J. and Nunley, B. 2010. Assessing the Vulnerability of Alaska's Coastal Habitats to Accelerating Sea-level Rise Using the SLAMM Model: A Case Study for Cook Inlet. National Wildlife Federation.

Gregory, R.S. 1992. The influence of ontogeny, perceived risk of predation, and visual ability on the foraging behavior of juvenile salmon. Theory and Application of Fish Feeding Ecology 18:271-284. Cited in: Bash J. Berman C. and S. Bolton. 2001. Effects of Turbidity and Suspended Solids on Salmonids. Center for Streamside Studies. Univ. of Washington, Seattle. November 2001.

Gregory, R.S. and T.G. Northcote. 1993. Surface, planktonic, and benthic foraging by juvenile chinook salmon (*Oncorhynchus tshawytscha*) in turbid laboratory conditions.

Haley, Delphine. 1986. Marine Mammals. Second edition. Seattle: Pacific Search Press.

Hazard, K. 1988. Beluga whale, *Delphinapterus leucas*. Pp. 195-235 In J. W. Lentfer (ed.), Selected marine mammals of Alaska. Species accounts with research and management recommendations. Marine Mammal Commission, Washington, D.C.

Hobbs, R.C., Laidre, K.L., Vos, D.J., Mahoney, B.A., and Eagelton, M. 2005. Movements and Area Use of Belugas, *Delphinapterus leucas,* in a Subarctic Estuary. *Arctic,* Vol. 58, No. 4 (December 2005), pp 331-340.

JASCO. 2016. Hydroacoustic Monitoring Report: Anchorage Port Modernization Project Test Pile Program. JASCO Applied Sciences (Alaska) Inc, 19 September 2016.

Johnson, C.S., M.W. McManus and D. Skaar. 1989. Masked tonal hearing thresholds in the beluga whale. *J. Acoust. Soc. Am.,* 85(6):2651-2654.

Khalil, M.A.K. and Rasmussen, R.A. 1995. Composition, Chemistry, and Climate of the Atmosphere, H. B. Singh, Ed. (Van Nostrand Reinhold, New York, 1995), pp. 50-87.

Klinkhart, E.G. 1966. The beluga whale in Alaska. Alaska Department of Fish and Game, Federal Aid in Wildlife Restoration Project Report, Vol. VII, Projects W-6-R and W-14- R, 11p.

Lesage V., Barrette C., Kingsley M.C.S., Sjare B. 1999. The effect of vessel noise on the vocal behavior of belugas in the St. Lawrence River Estuary, Canada. *Marine mammal science,* vol. 15, no. 1, pp. 65-84.

LGL Associates. 2004. A Proposal to Assess the Use of Knik Arm, Cook Inlet, Alaska by Beluga Whales in July-October 2004, Record Sounds from Pile-driving Construction Activities at the Point MacKenzie Dock Modification, and Develop a Mitigation Strategy for Construction of the Knik Arm Bridge. Knik Arm Bridge and Toll Authority. June.

Lowry, L., O'Corry-Crowe, G., and Goodman, D. In press (2006). *Delphinapterus leucas* (Cook Inlet population). In: IUCN 2006. *2006 IUCN Red List of Threatened Species.*

Moore, S.E., K.E.W. Shelden, L.K. Litzky, B.A. Mahoney, and D.J. Rugh. 2000. Beluga, *Delphinapterus leucas*, habitat associations in Cook Inlet, Alaska. Mar. Fish. Rev. 62(3): 60-80.

Moulton, L.L. 1997. Early Marine Residence, Growth, and Feeding by Juvenile Salmon in Northern Cook Inlet, Alaska. *Alaska Fishery Research Bulletin,* 4:154–177.

Nemeth, M.J., C.C. Kaplan, A.P. Ramos, G.D. Wade, D.M. Savarese, and C.D. Lyons. 2007. Baseline studies of marine fish and mammals in Upper Cook Inlet. April through October 2006. Final report prepared by LGL Alaska Research Associates, Inc. Anchorage, Alaska for DRven Corporation. Anchorage, Alaska.

National Oceanographic and Atmospheric Administration Fisheries (NOAA). 2003. Draft 2003 Stock Assessment Reports. Office of Protected Resources. Alaska. Online Webpage, Http://www.nmfs.noaa.gov/prot_res/PR2/Stock_Assessment_Program/sars_draft.html.

National Oceanic and Atmospheric Administration (NOAA). 2022. Wrecks and Obstructions Database. Office of Coast Survey. Online Document, https://wrecks.nauticalcharts.noaa.gov/viewer/.

National Marine Fisheries Service (NMFS). 2016. Cook Inlet Beluga Whale Recovery Plan. Alaska Regional Office. Online Webpage, https://alaskafisheries.noaa.gov/pr/cib-recovery-plan. Accessed 23 November 2016.

National Marine Mammal Laboratory (NMML). 2004. Personal communication from Christy Sims, Marine Mammal Data Specialist. Regarding opportunistic marine mammal sightings (1999¬2002) and beluga aerial survey data (1993-2004).

Pentec. 2005. 2004-2005 Marine Fish and Benthos Studies – Port of Anchorage. Anchorage, Alaska. Prepared for Integrated Concepts and Research Corporation. #12618-01 Nov 15, 2005.

Perez, Michael A. NOAA Technical Memorandum NMFS F/NWC-186. Review of Marine Mammal Population and Prey Information for Bering Sea Ecosystem Studies, 1990.

Richardson, W.J., C.R. Greene, Jr., C.I. Malme and D.H. Thomson. 1995. Marine Mammals and Noise. Academic Press, San Diego, CA. 576 p.

Ridgway, S.H., D.A. Carder, T. Kamolnick, R.R. Smith, C.E. Schlundt and W.R. Elsberry. 2001. Hearing and whistling in the deep sea: depth influences whistle spectra but does not attenuate hearing by white whales (*Delphinapterus leucas*) (Odontoceti, Cetacea). *J. Exp. Bio*l. 204:3829-3841.

Rugh, D.J., K.T. Goetz, and C.L. Sims. 2006. Aerial Surveys of Belugas in Cook Inlet, Alaska, May 2006. NMFS, NOAA.

Scheifele, P.M., Andrew. S, Cooper, R.A., Darre M., Musiek, F.E., Max, L. 2005. Indication of a Lombard vocal response in the St. Lawrence River beluga. *Journal of the Acoustical Society of America*. Vol. 117, no. 3, pt. 1, pp. 1486-1492.

Schusterman, R. J. (1974). Low false-alarm rates in signal detection by marine mammals. *J. Acoust. Soc. Am*. 55, 845–848.

Seaman, G.A., K.J. Frost, and L.F. Lowry. 1985. Distribution, abundance, and movements of belukha whales in western and northern Alaska. Draft final rep. Prepared for U.S. Dep. Commer., NOAA, Natl. Ocean Serv., Anchorage, Alaska. Alaska Dep. Fish and Game, Fairbanks.

Sheldon, K.E.W., R.A. Mahoney, and M.E. Dahlheim. 2003. Killer Whale Predation on Belugas in Cook Inlet, Alaska: Implications for a Depleted Population. *Marine Mammal Science* 19:529-544.

Smith, Orson P., et al. 2005. Water Property, Sediment, Tide, and Current Measurement Analyses in the Vicinity of the Proposed Knik Arm Bridge. Prepared for URS and HDR, sponsored by the Knik Arm Bridge and Toll Authority (KABATA). Anchorage, AK: URS and HDR. October 3.

Southall, B.L., AE Bowles, WT Ellison, JJ Finneran. 2007. Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. *Aquatic Mammals*. Vol. 33(4).

United State Army Corps of Engineers (USACE). 1988. ER 200-2-2: Procedures for Implementing NEPA. U.S. Army Corps of Engineers, Department of the Army.

United State Army Corps of Engineers (USACE). 2008. Anchorage harbor dredging & disposal Anchorage, Alaska. Environmental Assessment and Finding of No Significant Impact. August, 2008.

U.S. Army Corps of Engineers (USACE). 2017a. Letter to SHPO (Judith Bittner) from USACE (Kelly Eldridge) re: Port of Anchorage dredging. January 25, 2017.

United State Army Corps of Engineers (USACE). 2017b. Transition and Maintenance Dredging, Anchorage Harbor, Anchorage, Alaska. Environmental Assessment and Finding of No Significant Impact. March, 2017.

Appendix A
Impact of Port of Anchorage Maintenance Dredging Noise on Cook Inlet Beluga Whales

Impact of Port of Anchorage Maintenance Dredging on Cook Inlet Beluga Whales

30 March 2022

Introduction

The United States Army Corps of Engineers (Corps) is responsible for maintaining navigable depths in the Anchorage Harbor, pursuant to:

1. River and Harbors Act of 1958, P.L. 85-500 (House Doc. 34, 85th Congress, 1st Session), Section 101
2. Water Resources Development Act of 1976, P.L. 94-587, Section 199.
3. Consolidated Appropriations Act, 2005, P.L. 108-447, Title I, Division C, 118(a) and 118(d) modified the project authorization for the Port of Anchorage in Anchorage, Alaska, directing the Secretary of the Army to construct a harbor depth to minus 45 feet mean lower low water for a length of 10,860 feet. Federal maintenance shall be in accordance with Section 101 of the River and Harbor Act of 1958, except that the project shall be maintained at a depth of minus 45 feet mean lower low water for a length 10,860 feet.
4. Water Resources Development Act of 2007, P.L. 110-114, Section 3002, Cook Inlet, Alaska modifies Section 118(a)(3) by inserting "as part of the operation and maintenance of such project modification" after "by the Secretary".

The maintenance dredging in the Anchorage Harbor is executed by contract, typically on a three-year cycle. The Corps began dredging the Anchorage Harbor in 1965 and has dredged it annually since then to maintain the Federally authorized required depth of -35 feet MLLW. Dredging generally begins in April of each year (depending on ice hazard) and continues through October. Dredging may occur continuously during the season, as indicated by bathymetric surveys conducted twice weekly. Dredged material volumes range between approximately 600,000 to 1,200,000 cubic yards (cy) annually.

Underwater noise has the potential to effect marine mammals in the form of death, injury, hearing threshold shift, masking, or behavioral disturbance. Sound exposure data available from dredging operations indicate that underwater dredging sounds are typically low-intensity (i.e., sound pressure levels (SPLs) less than 190 dB re 1μPa at 1 meter) and non-impulsive, with frequencies below 1,000 kHz. Literature regarding the effects of dredging noise indicate dredging does not pose a significant risk of higher order effects like death, injury, or permanent threshold shift; however, low-frequency sounds produced by dredging overlap with the hearing range of mid-frequency cetaceans (beluga whales) and the potential non-lethal responses to dredging noise has not been fully characterized. The Alaska District (Corps), Environmental Resources Section purchased a hydrophone to perform sound-source verification studies on authorized maintenance projects and complete the characterization of hydroacoustic dredging impacts on biological resources.

Dredging Activity

The past four maintenance dredging contracts (every contract since 2012) have been awarded to Manson Construction and the work has been performed by the dredge *Westport,* the tug *Gladys M*¸ and the crew boat *Lester M.* The *Westport* is a trailing suction hopper dredge (TSHD) and the subsequent descriptions, observations, and conclusions are relevant to the *Westport,* and potentially applicable to the discussion of acoustic impacts of similar vessels. Trailing suction hopper dredges (TSHD) are ships with propulsion and large hoppers for containing dredged material. The *Westport* has a hopper capacity of 2,000 cy, and typical loads are less than 1,500 cy. During dredging, long intake pipes, termed drag arms, extend from the ship and drag along the bottom. The fixed teeth and water jets of the drag arms erode and loosen the material that the pumps suck from the Knik Arm bottom into the hopper. When the hopper is full, dredging stops and the ship travels to a dredged material placement site where the material is discharged from the bottom of the ship or pumped out through a discharge pipeline. The length of time dredging stops is dependent on the haul distance to the placement site (Suedel et al., 2019). The *Westport's* transit to the placement site usually takes about 20 minutes, depending on the tide, wind, and water current. Sound sources associated with TSHD operation is shown in Figure 1.

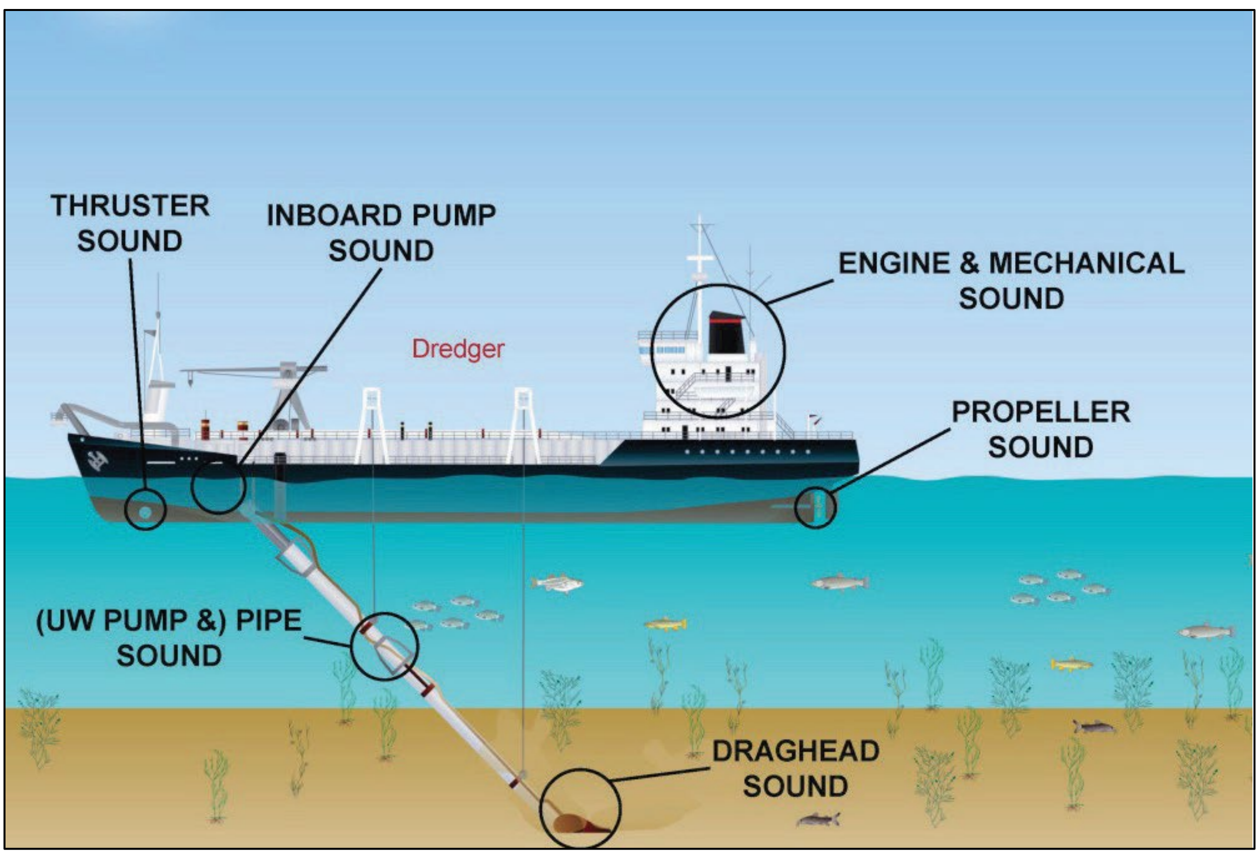


Figure 1. Sounds Emitting from a Trailing Suction Hopper Dredge (CEDA 2011).

The *Westport* is a TSHD with an overall length of 180 feet and a 50-foot beam. The dredge draws 11 feet of water when loaded and 3 feet when unloaded. The *Westport* has a 16-inch diameter and a 20-inch diameter trailing drag arm for hydraulically dredging unconsolidated material into the hopper for partial dewatering and transport to the disposal site. The disposal site is 3,000 feet from the face of the Anchorage Harbor dock. A disposal operation typically takes the dredge out of operation for about 20 to 30 minutes while the vessel transits to the disposal site, opens the scow doors to dump the sediment, and returns to the project (Figure 2).

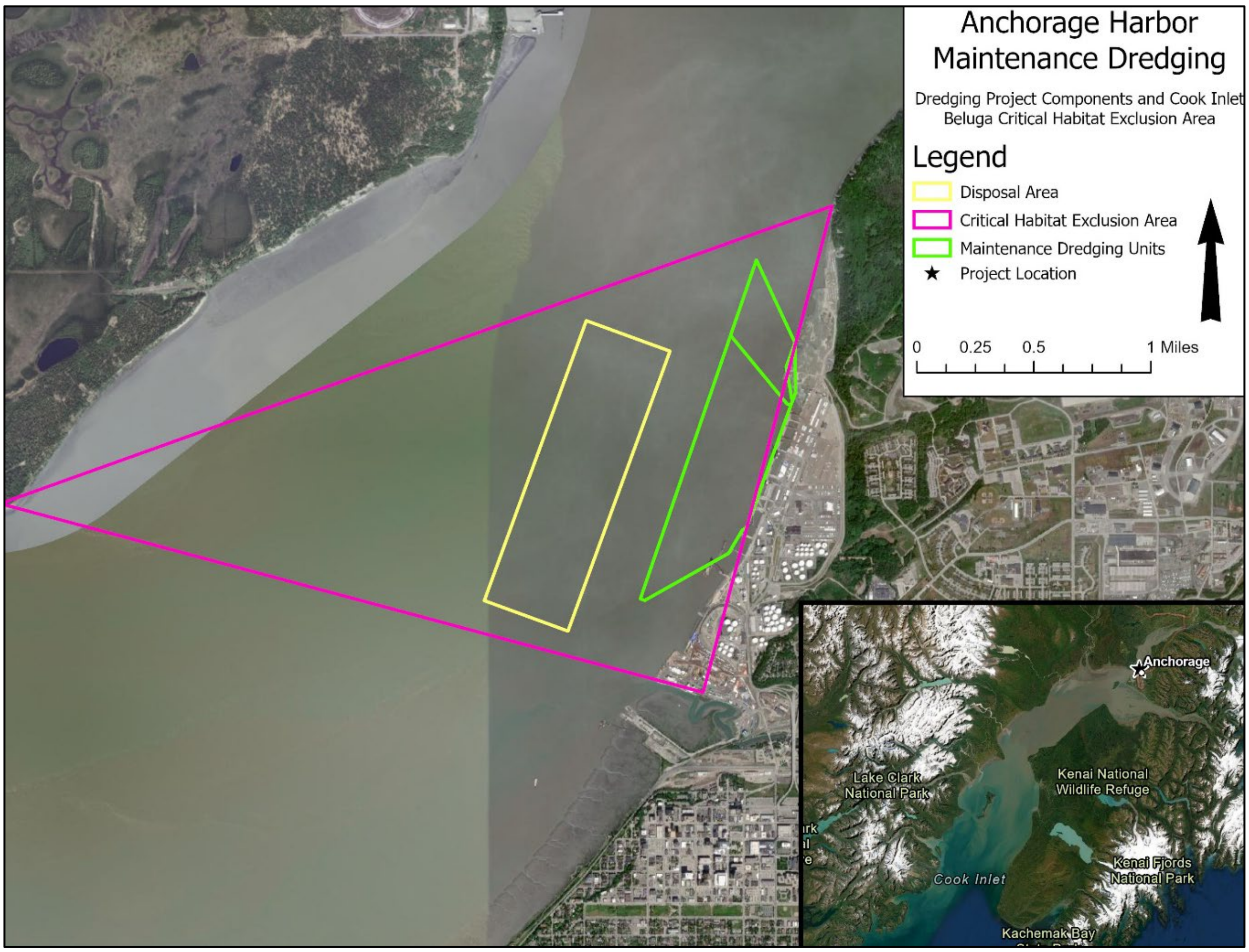


Figure 2. Maintenance Dredging Project Features

Continuous TSHD sounds are produced from the ship's propulsion during dredging and transit to the placement site. Some sounds associated with dredging are considered discontinuous and cyclic, because dredging stops when the hopper is full and as the ship moves to and from the dredging area and the placement site. During dredging, the head of the drag arm produces continuous sounds when it makes contact with the bottom substrate and trails beneath the dredge during advancement. The sound produced during filling of the hopper is associated with propeller and engine sound as well as additional sounds emitted by pumps, generators, and sounds produced by the discharge of dredged sediments into the hopper. Most of the produced sound energy falls within the 70 to 1,000 Hz range (Clarke et al., 2002). The mean frequency for the peak spectral level of five TSHDs described by Suedel is 188 Hz.

Observations

The Alaska District, Environmental Resources Section recorded dredging sounds produced by the *Westport* on three instances in August and September 2021. The first recording day was Monday August 30, 2021 (Figure 3), while the dredge was operating and no cargo ships using the Anchorage Harbor north terminal. The hydrophone was deployed in about 50 feet of water off the North Float on the flood tide at approximately +20 feet MLLW. The hydrophone was attached 3 feet from the end of a weighted line and hung off the seaward face of the float. Foam insulation was wrapped around the hydrophone cable to isolate the hydrophone from terrestrial noises. Peak high tide was +22.9 feet MLLW at 1:40 PM, Alaska Standard Time.

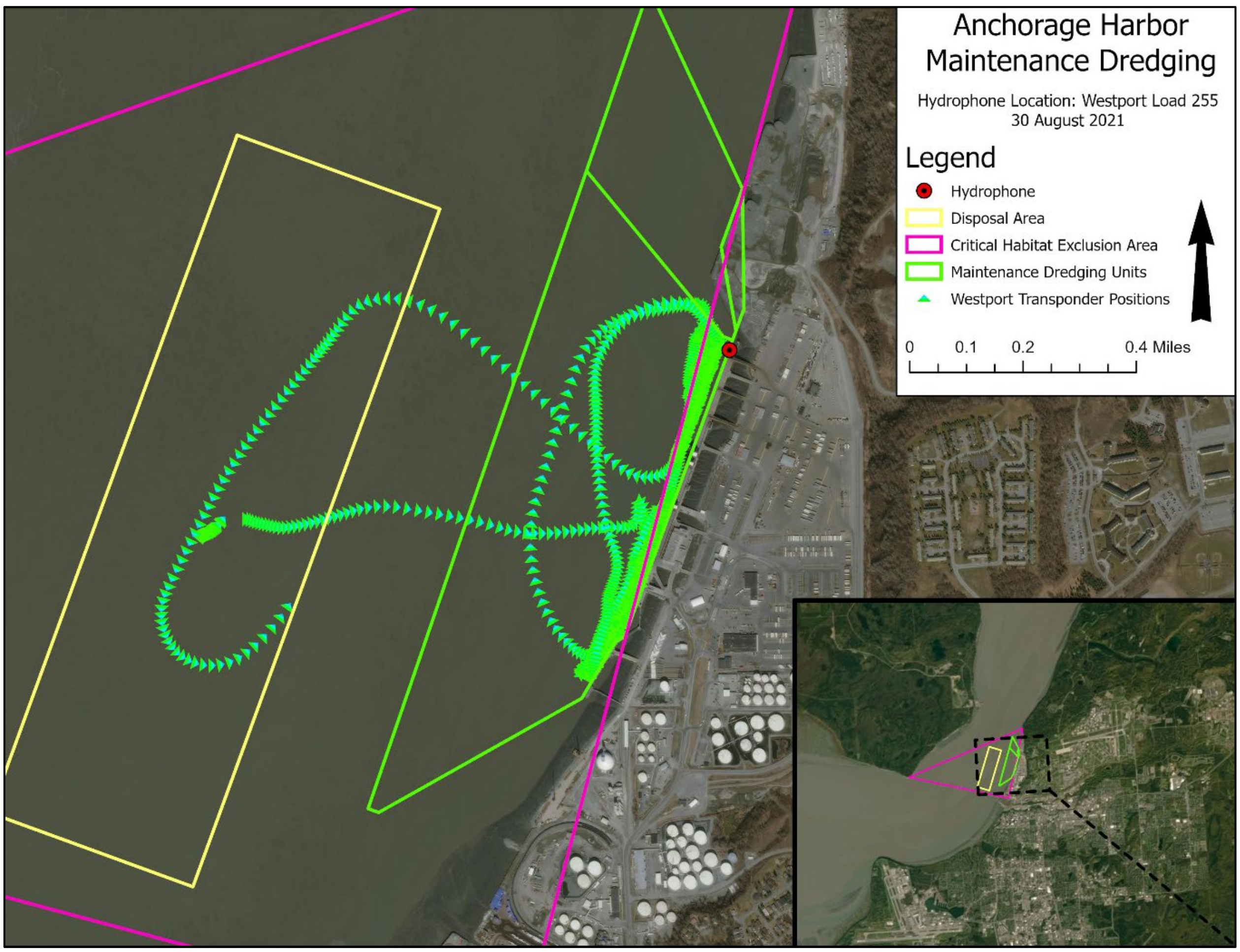


Figure 3. Hydrophone Location with Respect to Typical Dredging Pattern

Typical weekday flight operation from Joint Base Elmendorf-Richardson (JBER) was a salient component of the underwater soundscape, shown in Figure 4. F-22 Raptor fighter aircraft based at JBER use the 06/24 runway located 1.4 miles east of the Anchorage Harbor for operations all year, but F-22 operations occur more frequently during the dredging season than outside of it. Approximately 11,000 F-22 events associated with in-water SPL above 120 dB occur each year, of which approximately 2,500 are associated with the 06/24 runway. F-22 operations peak in June and decrease slightly in July before increasing again in August. Heavy aircraft, such as C-17 Globemaster cargo planes, also use the 06/24 runway, but their flight frequency and schedule are currently unavailable.

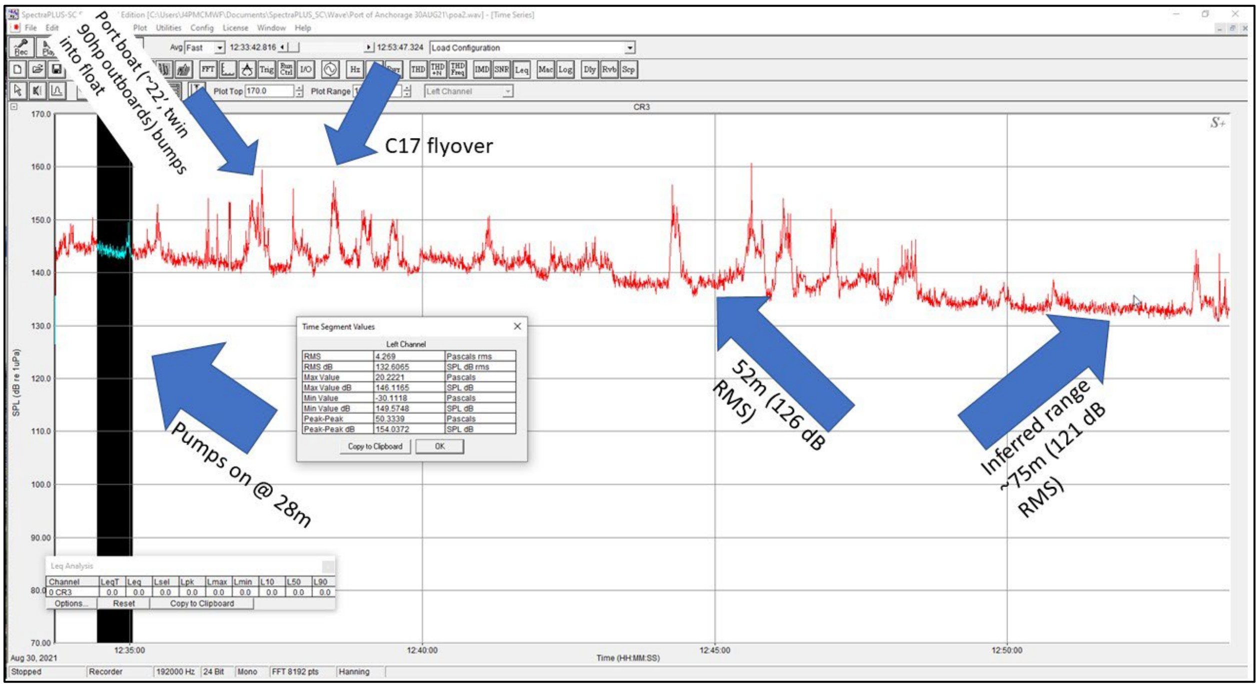


Figure 4. Annotated Time Series on August 30, 2021

The most powerful sounds recorded August 30, 2021, were associated with aircraft overflight and a small craft operated by the Port of Alaska bumping into the floating dock where the recordings were being collected. Max sound pressure level measurements associated with aircraft overflight were in the 150 to 160 dB re 1 µPa range with most of the energy in the 675 to 1,500 Hz range. Very brief exposures reaching 122 dB were measured up to 40 kHz (Figure 5).

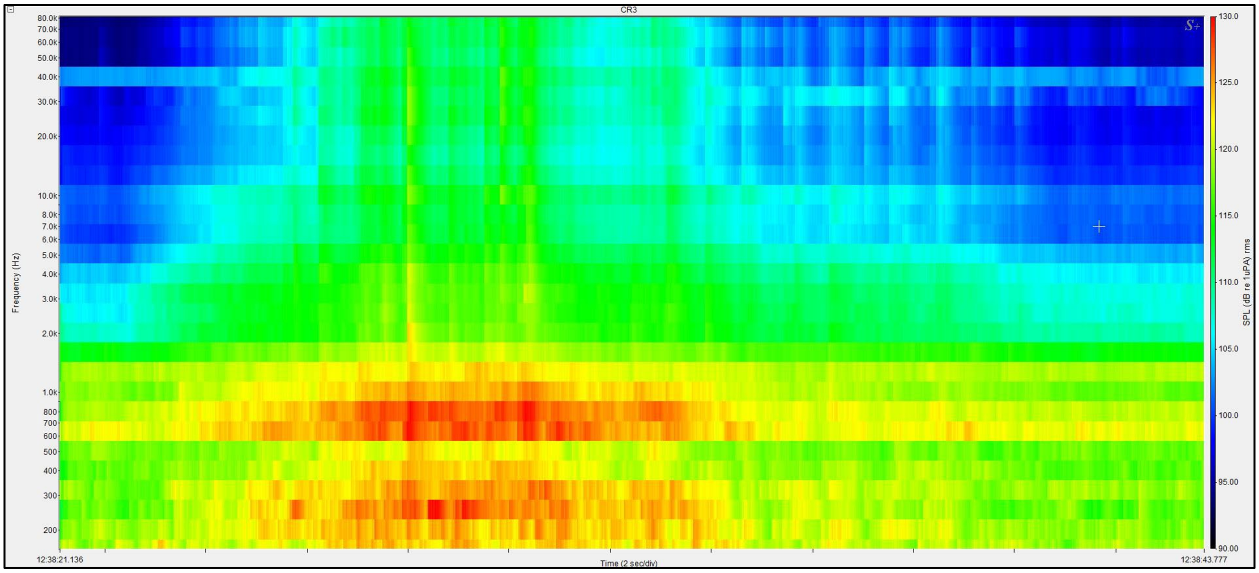


Figure 5. C-17 Flyover on August 30, 2021

The dredge approached within 28 meters of the hydrophone while the dredge pumps were operating, and sediment was being excavated. The mean received sound pressure level (SPL) was 132.6 dB root-mean-squared (dB_{RMS}). Most of the energy was in the160 to 175 Hz and 575 to 1,500 Hz ranges, with brief exposures around 10 kHz reaching 108 dB (Figure 6)

The Alaska District estimated a range of source levels (SL) based on the 132.6 dB RL, TL between 10 and 20, and a source-to-receiver range of 28 meters. The TL were selected based on NMFS guidance for coastal, shallow water projects with spherical spreading (20), a hybrid of spherical and cylindrical spreading (15), and cylindrical spreading (10) in order to cover a range of potential TL coefficients in the absence of simultaneous site-specific recording (Table 1).

TL coefficient of 20 is appropriate and conservative based on extrapolation of the 2016 JASCO data, which included TL ranging between 13 and 20.6 for pile driving, which would present a cylindrical propagation pattern. Dredging noise propagates in a spherical pattern because the noise sources are points; the propellor and engine noise, inboard pumps, and, to a lesser extent, the drag-head (Figure 1). Spherical propagation attenuates more rapidly than cylindrical propagation because the sound waves emanate in all directions, striking reflective surfaces such as the water surface and substrate at oblique angles. Energy is absorbed and refracted upon striking reflective surfaces, allowing relatively rapid attenuation compared to sound emanating from a cylindrical source such pile driving noise. The engine/propellor noise is believed to be the single greatest contributor to underwater noise levels associated with TSHD operation, while the Anchorage Harbor maintenance dredging is unlikely to contribute substantial noise from the drag-head because there are no moving parts, and the sediment is unconsolidated. Inboard pumps are also unlikely to contribute substantial underwater noise because the pumps are well above the waterline.

Table 1 Estimated Source Sound Level (at 1m) Emitted by the *Westport* during Dredging Based on a Range of Transmission Loss Coefficients

Transmission Loss (TL) Coefficient	Estimated Source Level (SL)
20	161.5 dB
15	154.3 dB
10	147.1 dB

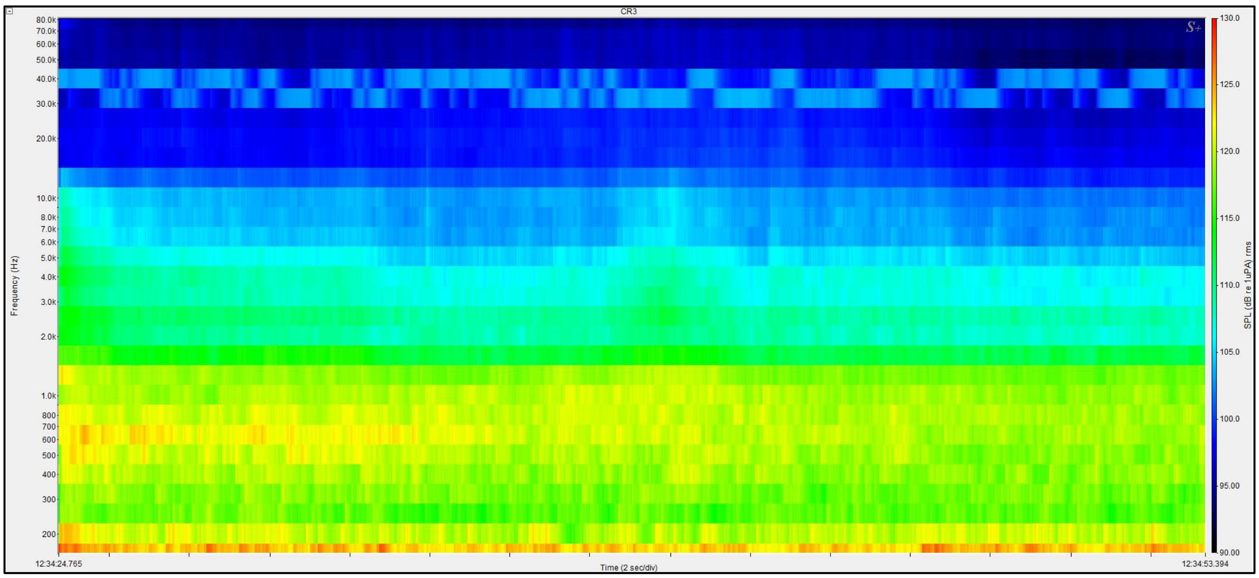


Figure 6. Dredging Noise from 28 Meters

The non-impulsive permanent threshold shift (PTS) onset threshold for mid-frequency cetaceans is 198 dB, and the non-impulsive Temporary Threshold Shift (TTS) onset threshold is 178 dB; so, based off the hydrophone data collected, there is no indication that dredging noise approaches the onset of either threshold shift. TTS is generally accepted as a reliable metric for estimating sound related injury. Because dredging noise does not approach the TTS onset threshold it can be assumed that dredging operations are non-injurious to marine mammals.

The most powerful noises produced by the dredge plant occur during maneuvering. The dredge was recorded approaching the north end of the terminal on return from the disposal site. As the tug increased power to swing the stern of the plant around to parallel the dock face, SPL equaling 138.7 dB_{RMS} was recorded 30 meters from the dredge (Figure 7). The SL during maneuvering is estimated to equal 168.2 dB, if TL=20. Most of the sound energy was measured between 160 to 1,800 Hz, and the maneuvering produced powerful sound for about a minute, after which, the dredge continued along parallel to the dock face producing a measured SPL around 128 dB_{RMS} as the pumps were turned on and dredging began.

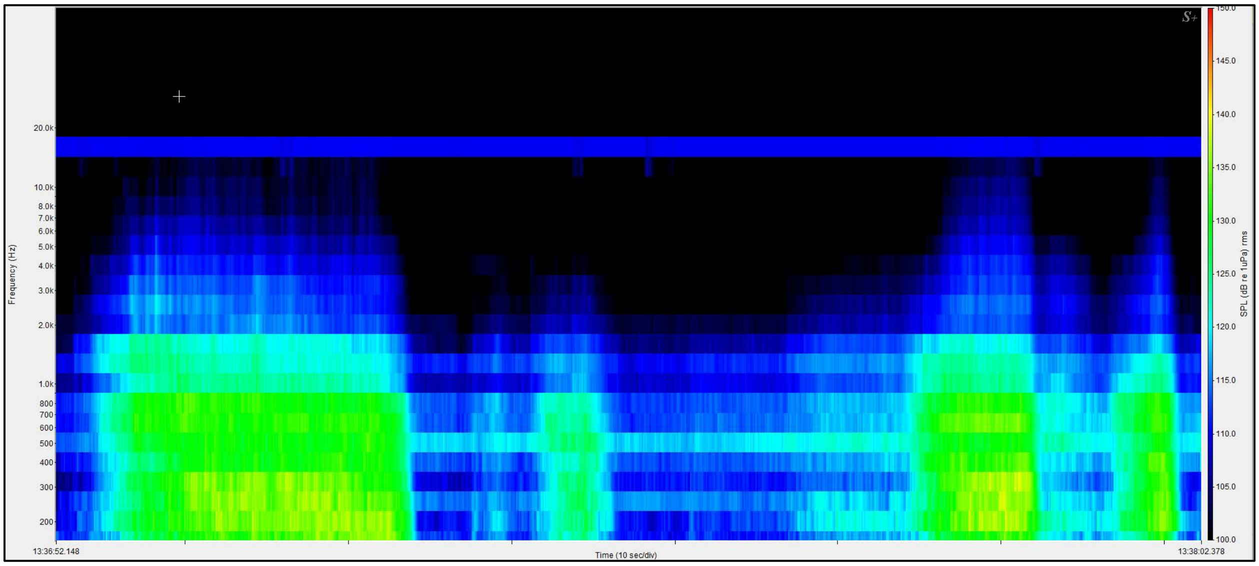


Figure 7. Dredge Maneuvering Noise from 30 Meters

The noise profile produced by dredge maneuvering is similar to commercial shipping and tugboats, but significantly less powerful. On September 12, 2021, while the dredge was on standby, the cargo ship *North Star* was unloaded and pulled away from the dock face by a tugboat 50 meters from the hydrophone. SPL reached 154 dB_{RMS} with most of the energy between 160 to 2,200 Hz, but also briefly produced sound exceeding 120 dB_{RMS} at 20 kHz (Figure 8). The tug SL is estimated to reach 187.9 dB_{RMS} if TL=20 and R=50. The tug and cargo ship continued to produce RL exceeding 120 dB for over 13 minutes until the vessel was 1,000 meters from the hydrophone.

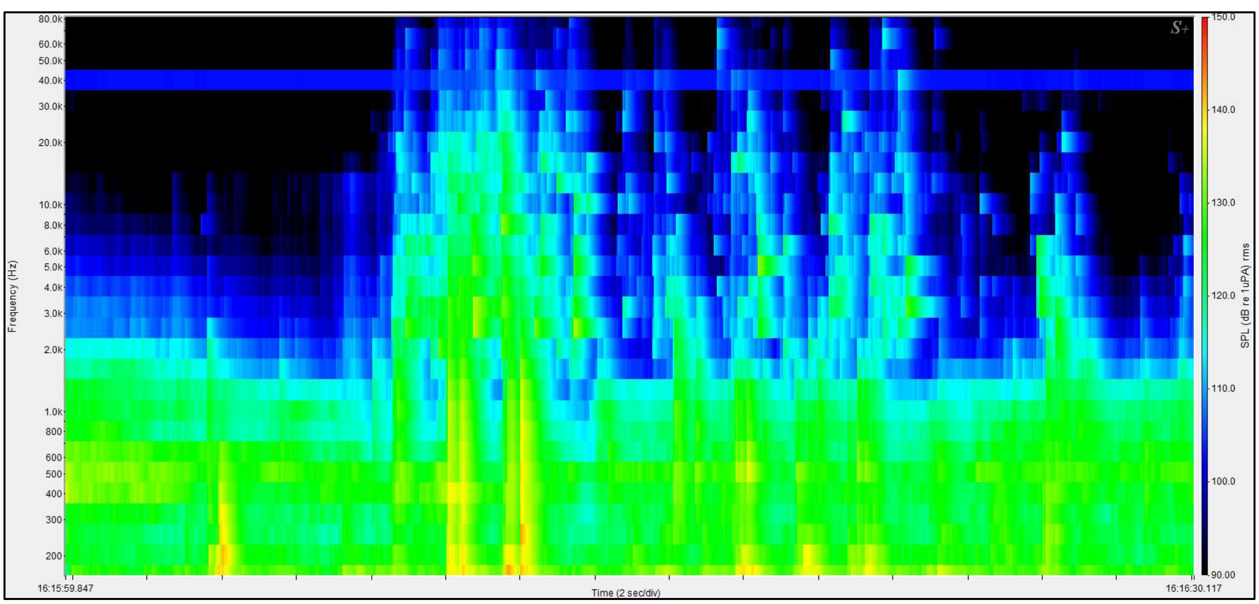


Figure 8. Cargo Vessel Maneuvering Noise from 50 Meters

The noise produced by unloading ships does not appear to impact beluga whales to the degree that would cause them to avoid anthropogenic activities in the Anchorage Harbor. Six whales were observed traveling south on the ebb tide at 7:45 AM, Alaska Standard Time, on September 12, 2021, while the *North Star* was being unloaded. The beluga whales were about 50 meters from the hydrophone and about 25 meters from the centerline of the *North Star,* but they did not take any action to avoid the area. Four container ships call on the Anchorage Harbor each week (two from Tote and two from Matson), generally staying for about 12-18 hours at a time as they are unloaded. The average week also includes port calls from two fuel tankers, which are similar in size to container ships. Barges, cement ships, and military vessels regularly call on the Anchorage Harbor throughout the year. Leisure cruise ships have historically called on the Anchorage Harbor during the summer, but the COVID pandemic caused a moratorium on cruise ship port calls during the 2020 and 2021 tourist season. The 2022 season may result in record Alaskan cruises as pandemic restrictions are lifted, but rising fuel costs may dampen the outlook.

Marine mammal observation logs from the Anchorage Harbor 2021 maintenance dredging describe the observation 1,527 beluga whales between 40 feet (12.2m) and 1,500 feet (457.2m) of the observer. Most of the observations (1,090) were recorded in August, including four instances where groups of belugas swam within 150 feet of the dredge during operation. Groups of belugas swam within 40 feet of the dredge on two occasions before they surfaced and were spotted by the dredging crew, who immediately shut the pumps down in accordance with the mitigation practices. The belugas have not been observed to make any significant behavioral changes to avoid the dredge or any other vessels in the Anchorage Harbor area.

Literature Review

Literature review indicates a beluga whale's audio detection threshold is lowest at 54 kHz (54.6 dB) and their detection threshold rises above 70 dB steeply beyond 90 kHz and more gradually below around 36 kHz (Figure 9 (Klishin et al., 2000)).

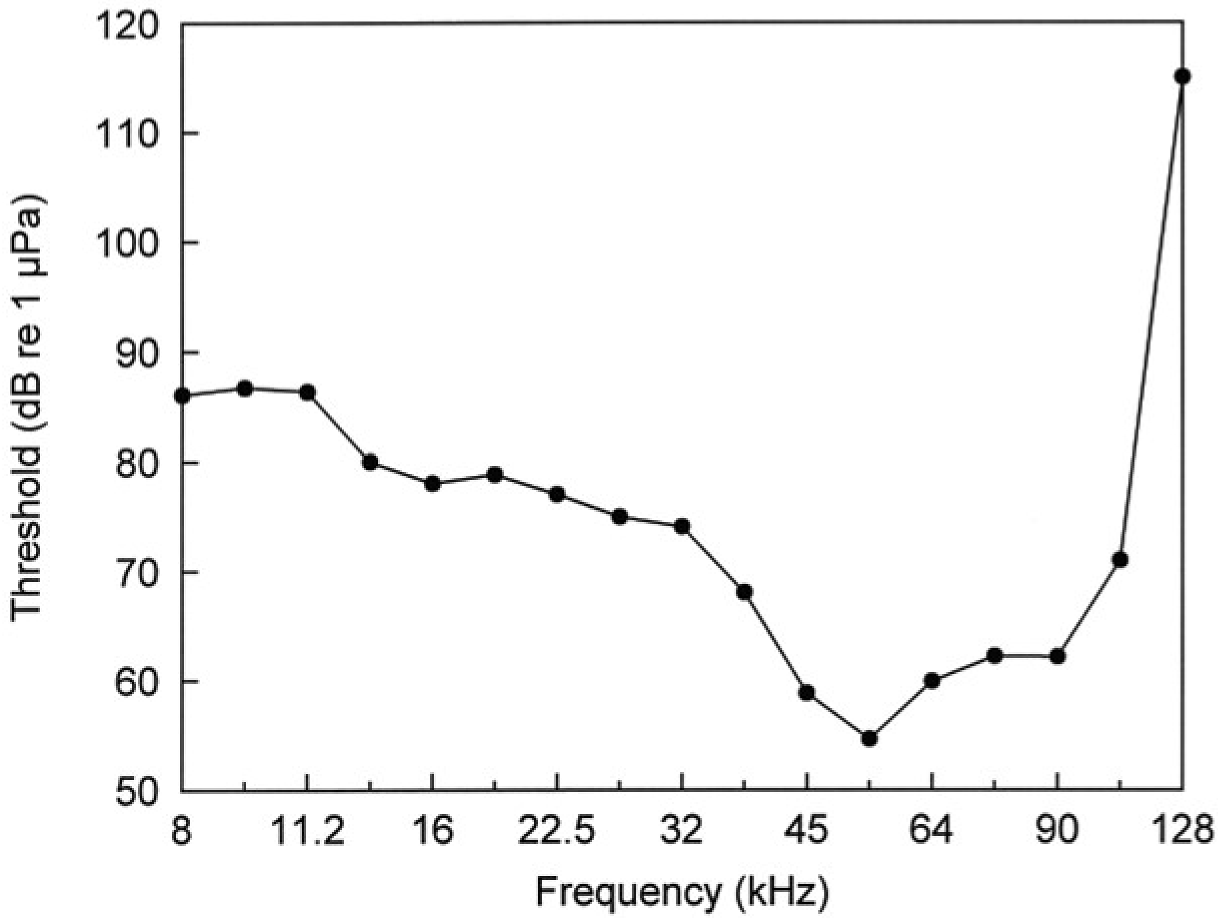


Figure 9 Audiogram of a Beluga Whale. Thresholds in dB re 1 µPa (from Klishin et al., 2000)

According to Mooney et al. 2016, the beluga whale audio detection threshold decreases at a rate of -0.61 dB kHz^{-1} from peak sensitivity at 54 kHz to 4 kHz, so the theoretical detection threshold at 2 kHz (the upper extent of powerful noises emanating from dredging propulsion) is 90.32 dB. This linear calculation does not account for the typical U-shape of marine mammal hearing thresholds and reflected in the M-weighting function. Mooney described the peak beluga whale hearing sensitivity of wild Bristol Bay beluga whales to be 58.6 dB at 54 kHz, generally agreeing with the peak sensitivity identified by Klishin. Awbrey 1988 describes low frequency captive beluga whale hearing by octave as between 125 Hz and 8 kHz; suggesting, below 8 kHz hearing threshold decreases from 65 dB by 11 dB per octave and the mean detection threshold at 2 kHz is 101 dB.

Multiple sources seem to agree that dredging noise is detectable by beluga whales, but it is generated in frequencies below their optimal hearing range. The normal appearance of belugas near activities that produce noise within their hearing range, such as the maintenance dredging operation and commercial shipping in the Anchorage Harbor, suggests that the beluga whales can hear the noise but may be unbothered by it. There are no records of beluga whale strandings or other injuries directly associated with human activities at the Anchorage Harbor. Interviews with the dredging crew include observation of beluga whales swimming in a straight line close to the dredge during dredging operations with no apparent heading changes to avoid passing close to the noise source. McQueen et al, summarized a review of marine mammal effects data for dredge-specific sounds and found no observations of adverse auditory impacts to low or medium frequency cetaceans.

A potential indirect consequence of noise in the underwater environment is masking; when a loud sound drowns out a softer sound or when noise is the same frequency as a sound signal. Masking can impact an animal's ability to communicate with conspecifics or to forage for food. Beluga whales in the Anchorage Harbor vicinity generally occur in pods consisting of 2 to 35 individuals, with a median pod size of 8, according to USACE observation data. Beluga whales in the pod communicate and find prey using echolocation. Beluga whale vocalizations cover a broad range of frequencies; but social communication is generally lower frequency (below 10 kHz) and echolocation is much higher frequency (peaks at 40, 80, and 120 kHz) (Gurevich and Evans, 1976).

Social communications are composed of three types of signals:

1. Narrowband frequency modulated tones; termed whistles
2. Broadband bursts of pulses; termed calls
3. Combination of these two previous types, emitted simultaneously; termed mixed or combined calls

The mean frequency of beluga whale whistles is 2.0 to 5.9 kHz, while their broadband calls occupy a frequency range of 800 Hz to 9.4 kHz with a mean frequency of 3.4 kHz (Sjare and Smith, 1986). Dredging noise (70 to 1,000 Hz) overlaps the lower end of the broadband call frequency range but is below the frequency range of whistles and mean frequency of calls.

Belugas are reported in literature to be very tolerant of continuous sources of noise, such as propulsion nose (similar acoustic profile to dredging noise). Blackwell and Greene photographed belugas swimming meters away from the *Northern Lights* during their acoustic data recording, apparently unbothered by "visual or auditory stimuli from the ship or other harbor activities" (Blackwell and Greene, 2003). Burns and Seaman (1985) described beluga whales as often tolerant of the frequent passages of large vessels in Cook Inlet, as well.

Beluga whales are known to exhibit the "Lombard response" in direct response to changes in the noise field. This response includes producing falling tonal calls and pulsed calls, increasing the repetition of calls, shifting call frequency, and increasing call level to account for potential masking due to elevated underwater noise levels (Sheifele et al., 2004). The Lombard response also occurs in the absence of anthropogenic noise, suggesting it is an inherent capability to allow animals to communicate with conspecifics in areas of elevated noise, natural or manmade.

Beluga whales are apparently capable of producing vocalizations in frequencies higher than dredging noise and hearing in frequency ranges higher than dredging noise. Beluga whales in the Saint Lawrence Estuary have been observed modifying their vocalization level and frequency in the presence of anthropogenic sounds (commercial shipping and ecotourism noise). The elevated background noise in the Knik Arm associated with aircraft operations likely elicits the Lombard response in beluga whales throughout the year and the comparatively small area ensonified by low acoustic intensity maintenance dredging operations may not constitute a substantially different acoustic environment from a social vocalization perspective.

Beluga whale echolocation frequencies do not overlap with the frequencies produced by dredging noise, so it is unlikely that dredging noise would cause any direct impacts to beluga whale predation efficiency due to masking. Fish do not audibly communicate, so it is unlikely that low frequency noise in the Anchorage Harbor would mask any sounds beluga whales could use to track fish. Beluga whale fish-predation is understood to be primarily enabled by echolocation in the highly turbid waters of Upper Cook Inlet. Peak beluga observation in the Anchorage Harbor coincides with annual salmon migrations, suggesting the whales may be hunting fish. Salmon are known to return to Eagle River, Sixmile Creek, and Ship Creek; which are respectively 13, 7, and 1 kilometer from the Anchorage Harbor. Returning salmon generally move towards natal streams with the tide, and beluga whale observations from the last two years indicate the most beluga whales are entering the harbor from the north on the ebb tide; thus, it is unlikely they are actively chasing fish in the maintenance dredging project location.

Acoustic risk functions can be used to estimate the probability of a behavioral harassment response from an animal; considering the risk transition sharpness of the animal (A), the received level of noise (L), the appropriate received level "basement" for behavioral pattern abandonment or significant alteration (B), and the received level risk point parameter where 50 percent of exposed animals receive Level B Harassment (K). Beluga whales, as odontocetes, are assigned a risk transition sharpness parameter (A) of 10, and precedent allows the designation of a risk point parameter (K) of 45 dB (Federal Register, 2010).

The received SPL over a 15-minute period on August 30, 2021 while the dredge was on a disposal run was 128.397 dB_{RMS}. The received SPL over a 13-minute period on August 30, 2021 while the dredge was not dredging and transiting to the disposal site while there was only a single F-22 flyover was 123.357 dB_{RMS}. The received SPL over 15 minutes on September 12, 2021, while the dredge was on standby and the *North Star* was at the dock was 145.033 dB_{RMS}. The most quiescent period within that time series (after loading was finished and before the tug began to pull the ship away from the dock) was 127.54 dB_{RMS}. Detailed hydroacoustic data regarding the noise produced by unloading is not available, but the log file indicates a total power (flat) level between 139 to140 dB. The SPL of 128 dB_{RMS} can be used as the basement level (B), because it represents the received background noise level for a normal day. The Alaska District's recorded background noise level of 128 dB_{RMS} is consistent with the background noise levels reported by JASCO; which described a mean SPL of 138.8 dB_{RMS} from May 27-30, 2016, within a range of $_{L95}$ =106.8 and L_{MAX} 164.7 dB_{RMS} (JASCO, 2016).

Background noise levels in Upper Cook Inlet are elevated compared to many other areas due to turbulence and bedload movement caused by the extreme tides, air traffic associated with Ted Stevens International Airport and Elmendorf Field, and vessel noise.

The maximum estimated source level of the dredge based on an RL of 132.6 dB and a TL of 20 is 161.5 dB. The estimated risk of behavioral harassment if a beluga whale approached within 1 meter of the dredge is 0.0483%, which is obviously very low even when including unlikely assumptions about the minimum range a beluga whale might come within to the dredge during operations. The risk becomes even more negligible considering the applicable mitigation measures taken by the dredge upon sighting a whale; i.e., shutting down the pumps and holding stationary to the extent practicable when a whale is expected to close within 50 meters (Table 2).

Table 2 Received SPL and Associated Risk of Harassment at a Various Distances from Dredge

Range	Received Level	Risk of Harassment
1 meter	161.5 dB	0.0483%
25 meters	133.6 d B	$6.2x10^{-10}$%
50 meters	127.6 bB	Below basement level

$$R = \frac{1-\left(\frac{L-B}{K}\right)^{-A}}{1-\left(\frac{L-B}{K}\right)^{-2A}}$$

Where:
R=Risk (0-1.0)
L=Received level (dB re: 1 μPa)
B=Basement received level = 128.397 dB re: 1 μPa
K=Received level increment above B where 50-percent risk =45 dB re: 1 μPa
A=Risk transition sharpness parameter=10 (odontocetes and pinnipeds)

Figure 10. Acoustic Risk Function Formula for Odontocetes and Pinnipeds

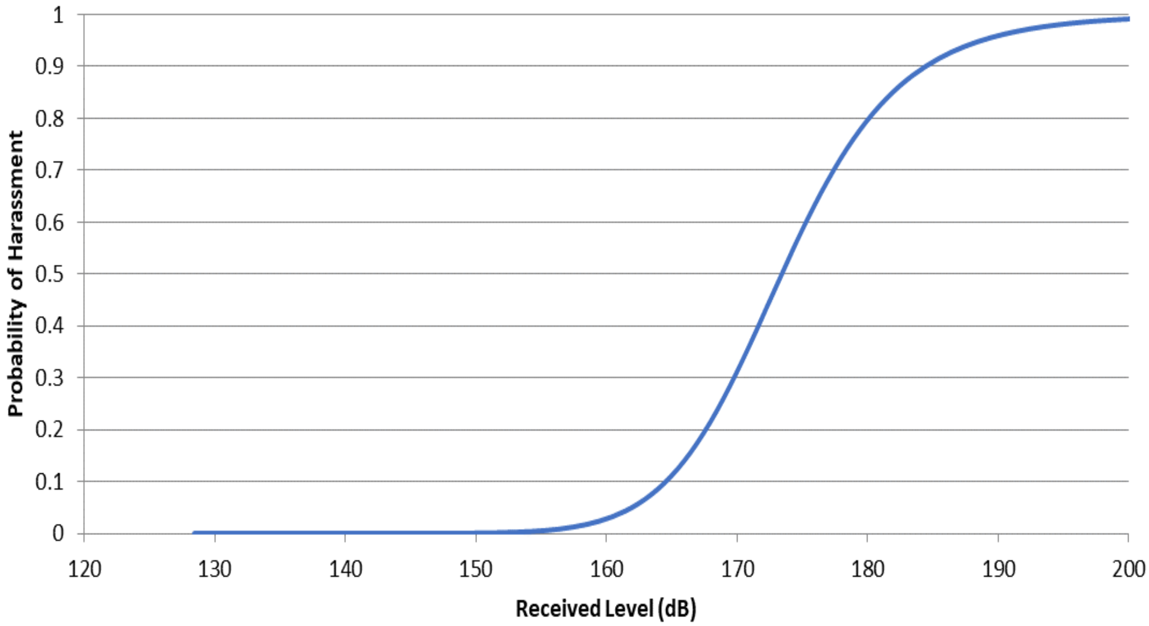


Figure 11. Acoustic Risk Function Curve for Odontocetes and Pinnipeds

Conclusion

In general, the noise produced by dredging operations appears to be less powerful than common sources of noise within the Anchorage Harbor. The sound pressure level of dredging is not powerful enough to cause direct physical impacts to beluga whales, because dredging noise does not approach the TTS onset threshold. Additionally, while beluga whales can hear the noise produced by dredging operations, it is below their optimal hearing range, and they are believed to modify their social vocalizations to adapt to noisy (both natural and anthropogenic) soundscapes to avoid masking effects. The Anchorage Harbor area is affected by numerous sources of natural and anthropogenic noise; including military and civilian aircraft, flow noise, rock movement, vessel traffic, and Port activities, so belugas would modify their social vocalizations in the absence of dredging. Noise produced from dredging operations does not overlap beluga whale echolocation frequencies. Considering the non-critical frequency range of noise produced by dredging within the context of beluga whale vocalization, as well as sound levels produced by dredging, there is no indication that dredging noise would have an impact on beluga whales' ability to communicate or capture prey.

Beluga whales also do not appear to be bothered by noises of similar amplitude, as demonstrated by the proximity whales come within during ship unloading activities. The Anchorage Harbor is unconstrained in terms of maneuvering room and whales are free to give anthropogenic activities a wide berth if they were bothered by the sounds produced by vessels. Numerous anecdotal accounts from the dredging crew describe whales swimming alongside the dredge with no indication of behavioral changes. The very low probability of harassment based on the acoustic risk function calculations agree with the anecdotal observations of the dredge crew.

The Anchorage Harbor and disposal site lie within the Cook Inlet beluga whale critical habitat exclusion area. Port of Alaska is one of 19 National Strategic Ports whose functions include the mobilization and embarkation of military vessels for quick deployment around the world. NMFS determined in their Final Rule designating CIBW critical habitat that Anchorage Harbor supports certain military functions and requirements which cannot be met elsewhere in the State and the Anchorage Harbor maintenance dredging could impact military operations if it were delayed or otherwise impacted by designation. Therefore, NMFS has acknowledged that the maintenance dredging at the Anchorage Harbor is a component of military readiness activities. In the context of military readiness activities, harassment means (16 U.S.C. 1362(18)(B), quoted in whole) -

> (i) any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild; or
>
> (ii) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or

sheltering, to a point where such behavioral patterns are abandoned or significantly altered.

The incorporation of mitigation measures including a 50-meter shut-down radius around dredging operations would prevent any impacts to beluga whales by ensuring the dredge ceases operation before whales come within the basement isopleth (128 dB_{RMS}), which would equal 45 meters based on SL=161.5 and TL=20. In the event a beluga whale did breach the shut-down zone unobserved, the risk of being exposed to noise capable of causing harassment would be $6.2x10^{-10}$% at 25 meters from the dredge and 0.0483% at 1 meter from the dredge. Beluga whales came within 12-meters of the dredge during dredging twice during the 2021 dredging season, which would result in an estimated RL of 139.956 dB_{RMS} and did not exhibit any signs of disturbance such as behavioral alteration. The estimated risk of harassment at 139.986 dB_{RMS} is $1.1x10^{-6}$%.

The probability of harassment is insignificant and discountable when considered with applied mitigative measures. Observational data from the maintenance dredging and other Port of Alaska activities indicates CIBW are not abandoning or otherwise significantly altering their behavioral patterns in the vicinity of the dredge, agreeing with the modeled risk probability and confirming that maintenance dredging does not constitute harassment under the military readiness definition. There is no evidence to suggest that dredging activities at the Port are affecting beluga whale use of Knik Arm as evidenced by the consistency of timing, location, and numbers of belugas (including calves) in the area each year (Prevel et al. 2006; Markowitz and McGuire 2007; Cornick and Kendall 2008; POA monthly monitoring reports 2021). Considering the definition of “affect” is to bring about a change and there is no evidence that maintenance dredging changes anything about beluga use of the Project area or their behavior, the USACE has concluded that maintenance dredging has no affect on Cook Inlet beluga whales.

References

Awbry, F.T., Thomas, J.A., and Kastelein, R.A. 1988. Low-frequency underwater hearing sensitivity in belugas, *Delphinapterus leucas*. J. Acoust. Soc. Am. 84(6), December 1988

Blackwell, S.B. and Greene, C.R. Acoustic measurements in Cook Inlet, Alaska, during August 2001. Greenridge Sciences, Inc. prepared for National Marine Fisheries Service, Protected Resource Division.

Burns, J.J. and G.A. Seaman. 1985. Investigations of belukha whales in coastal waters of western and northern Alaska. II. Biology and ecology. Rep. from Alaska Dep. Fish & Game, Fairbanks, AK, for U.S. Natl. Oceanic & Atmos. Admin. (R.U. 612, Contr. No. NA 81 RAC 00049). 129 p.

Cornick, L.A. and L.S. Kendall 2008. Distribution, Habitat Use, and Behavior of Cook Inlet Beluga Whales in Knik Arm, Fall 2007. Final Annual Report for 2007 from Alaska Pacific University. Prepared for Integrated Concepts & Research Corporation, Anchorage, Alaska.

Federal Register. 2010. Taking and importing marine mammals; training activities conducted within the Gulf of Alaska (GoA) Temporary Maritime Activities Area (TMAA). Department of Commerce, 75(201) 19 October 2010. 64555-64559

Gurevich, V.S., and Evans, W.E., 1976. Echolocation discrimination of complex planar targets by the beluga whale, *Delphinapterus leucas*. J. Acoust. Soc. Am., Suppl. 1, 60:S5 (A).

JASCO. 2016. Hydroacoustic Monitoring Report: Anchorage Port Modernization Project Test Pile Program. JASCO Applied Sciences (Alaska) Inc, 19 September 2016.

Klishin, V.O., Popov, V.V., and Supin, A.Ya. 2000. Hearing capabilities of a beluga whale, *Delphinapterus leucas.* Aquatic Mammals 2000, 26.3, 212-228

Markowitz, T.M. and T.L McGuire 2007. Temporal-spatial Distribution, Movements and Behavior of Beluga Whales Near the Port of Anchorage, Alaska. Final Report from LGL Alaska Research Associates, Inc. Prepared for Integrated Concepts & Research Corporation for the U.S. Department of Transportation Maritime Administration and the Port of Anchorage. 93 pp.

McQueen, A.D., Suedel, B.C., and Wilkens, J.L. 2019. Review of the adverse biological effects of dredging-induced underwater noise. Western Dredging Association (WEDA) Journal of Dredging. 18(1), March 2019.

Mooney, T.A., Castellote, M., Quakenbush, L., Hobbs, R., Goertz, C., and Gaglione, E. 2016. Measuring hearing in wild beluga whales. The Effects of Noise on Aquatic Life II, Advances in Experimental Medicine and Biology 875, DOI 10.1007/978-1-4939-2981-8_88

Prevel, Ramos, et al. 2006. (Prevel Ramos, A.P., T.M. Markowitz, D.W. Funk, and M.R. Link.). Monitoring Beluga Whales at the Port of Anchorage: Pre-expansion Observations, August-November 2005. Report from LGL Alaska Research Associates, Inc., Anchorage, Alaska, for Integrated Concepts & Research Corporation, the Port of Anchorage, Alaska, and the waterfront Department of Transportation Maritime Administration.

Scheifele, P.M., Andrew, S., Cooper, R.A., Darre, M., Musiek, F.E., and Max, L. 2004. Indication of a Lombard vocal response in the St. Lawrence River beluga. Acoustical Society of America 2005. Pp 1486-1492

Sjare BL, Smith TG. 1986. The vocal repertoire of white whales, Delphinapterus leucas, summering in Cunningham Inlet, Northwest Territories. Can J Zool 1986; 64:407–415.

Appendix B
ADEC Certificate of Reasonable Assurance

THE STATE of ALASKA
GOVERNOR MICHAEL J. DUNLEAVY

Department of Environmental Conservation

DIVISION OF WATER
Wastewater Discharge Authorization Program

555 Cordova Street
Anchorage, Alaska 99501-2617
Main: 907.269.6285
Fax: 907.334.2415
www.dec.alaska.gov/water/wwdp

January 30, 2019

U.S. Army Corp of Engineers, Alaska District
Attention: Mr. Michael Salyer, CEPOA-PM-C-ER
P.O. Box 6898
JBER, AK 99506-0898

Re: U.S. Army Corp of Engineers, Alaska District, Maintenance Dredging Anchorage Harbor
ER-17-03, Cook Inlet

Dear Mr. Salyer:

In accordance with Section 401 of the Federal Clean Water Act of 1977 and provisions of the Alaska Water Quality Standards, the Department of Environmental Conservation (DEC) is reissuing the enclosed Certificate of Reasonable Assurance for placement of dredged and/or fill material in waters of the U.S., including wetlands and streams, associated with maintenance dredging in the upper Cook Inlet, Anchorage Harbor.

DEC regulations provide that any person who disagrees with this decision may request an informal review by the Division Director in accordance with 18 AAC 15.185 or an adjudicatory hearing in accordance with 18 AAC 15.195 – 18 AAC 15.340. An informal review request must be delivered to the Director, Division of Water, 555 Cordova Street, Anchorage, AK 99501, within 20 days of the permit decision. Visit http://dec.alaska.gov/commish/ReviewGuidance.htm for information on Administrative Appeals of Department decisions.

An adjudicatory hearing request must be delivered to the Commissioner of the Department of Environmental Conservation, 410 Willoughby Avenue, Suite 303, PO Box 111800, Juneau, AK 99811-1800, within 30 days of the permit decision. If a hearing is not requested within 30 days, the right to appeal is waived.

By copy of this letter we are advising the U.S. Army Corps of Engineers of our actions and enclosing a copy of the certification for their use.

Sincerely,

James Rypkema
James Rypkema
Program Manager, Storm Water and Wetlands

Enclosure: 401 Certificate of Reasonable Assurance

cc: (with encl.)
Matt Ferguson, USACE, Anchorage
Megan Marie, ADF&G
USFWS Field Office Anchorage
Heather Dean, EPA Operations, Anchorage

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
CERTIFICATE OF REASONABLE ASSURANCE

In accordance with Section 401 of the Federal Clean Water Act (CWA) and the Alaska Water Quality Standards (18 AAC 70), a Certificate of Reasonable Assurance, is reissued to U.S. Army Corp of Engineers, Alaska District, Attention: Mr. Michael Salyer, at P.O. Box 6898, JBER, AK 99506-0898, for placement of dredged and/or fill material in waters of the U.S. including wetlands and streams in association with maintenance dredging in the upper Cook Inlet, Anchorage Harbor.

The U.S. Army Corps of Engineers, Alaska District (Corps) proposes to perform maintenance dredging of the Anchorage Harbor basin in Upper Cook Inlet. The Corps plans to dredge to -35 feet mean lower low water (MLLW) and dispose of the dredged material in the Port of Anchorage open water disposal area located 3,000 feet abeam from the main terminals. Dredging would be conducted April through November. Maintenance dredging quantities are highly variable in the harbor, with the volumes fluctuating between 600,000 cubic yards and 1.8 million cubic yards in the decade between 2005 and 2015. The 5-year mean volume from 2010 to 2015 is 1.1 million cubic yards. The planned maintenance dredging project is 52 acres smaller (from 318 acres to 266 acres) than the area that has been dredged since 2008 and has been reconfigured so that both the dredged area and the disposal site avoid Cook Inlet beluga whale critical habitat.

The dredging prism in the Port is a roughly trapezoidal shape occupying 266 acres with the shorter parallel segment extending in the east along 3,600 feet of pile supported dock and another 1,100 feet of North Extension bulkhead. The western margin of the dredging project is 8,000 feet long and lies about 1,800 feet from the face of the main terminal.

The proposed action and anticipated environmental effects were discussed in the environmental assessment (EA) and Finding of No Significant Impact (FONSI), dated March 10, 2017, which was available for public review and comments on the Corps website. The disposal area is bounded by the following coordinates:

Latitude	Longitude
61.249640	-149.911526
61.247752	-149.900802
61.230472	-149.913917
61.232361	-149.924632

The Port of Anchorage open water disposal site is a rectangular area of 320 acres beginning 1,200 feet beyond the western edge of the dredging prism. The water over the site is 70 to 100 feet deep and is subject to powerfully dispersive tidal currents. Surveys of the disposal area demonstrate dredged material does not accumulate. Dredged material would be transported to the disposal site by tug and barge, or by the dredger in the case of a hopper dredge, in increments of approximately 1,500 cubic yards. Two to four daily transits would be required for normal operations.

A state issued water quality certification is required under Section 401 because the proposed activity will be authorized by a U.S. Army Corps of Engineers permit (ER-17-03) and a discharge of pollutants to waters of the U.S. located in the State of Alaska may result from the proposed activity. Public notice of the application for this certification was given as required by 18 AAC 15.180 in the Corps Public Notice ER-17-03 posted from March 10, 2017 to April 9, 2017.

The proposed activity is located within Section 7, T. 13 N., R. 4 W., Seward Meridian in Anchorage, Alaska.

The Department of Environmental Conservation (DEC) reviewed the application and certifies that there is reasonable assurance that the proposed activity, as well as any discharge which may result, will comply with applicable provisions of Section 401 of the CWA and the Alaska Water Quality Standards, 18 AAC 70, provided that the following additional measures are adhered to.

1. Reasonable precautions and controls must be used to prevent incidental and accidental discharge of petroleum products or other hazardous substances. Fuel storage and handling activities for equipment must be sited and conducted so there is no petroleum contamination of the ground, subsurface, or surface waterbodies.

2. During dredging operations spill response equipment and supplies such as sorbent pads shall be available and used immediately to contain and cleanup oil, fuel, hydraulic fluid, antifreeze, or other pollutant spills. Any spill amount must be reported in accordance with Discharge Notification and Reporting Requirements (AS 46.03.755 and 18 AAC 75 Article 3). The applicant must contact by telephone the DEC Area Response Team for Central Alaska at (907) 269-3063 during work hours or 1-800-478-9300 after hours. Also, the applicant must contact by telephone the National Response Center at 1-800-424-8802.

3. All dredging shall be conducted so as to minimize the amount of dredge material and suspended sediments that enter Cook Inlet. Appropriate best management practices (BMPs) will be employed to minimize sediment loss and turbidity generation during dredging. BMPs may include, but are not limited to, the following:

   - Eliminating multiple bites while the bucket is on the seafloor
   - No stockpiling of dredged material on the seafloor
   - No seafloor leveling
   - Slowing the velocity (i.e., increasing the cycle time) of the ascending loaded clamshell bucket through the water column
   - Pausing the dredge bucket near the bottom while descending and near the water line while ascending
   - Placing filter material over the barge scuppers to clear return water
   - If dewatering runoff is discharged from the barge, silts must be removed prior to direct or indirect discharge to Cook Inlet.

This certification expires five (5) years after the date the certification is signed. If your project is not completed by then and work under U.S. Army Corps of Engineers Permit will continue, you must submit an application for renewal of this certification no later than 30 days before the expiration date (18 AAC 15.100).

Date: January 30, 2019

James Rypkema, Program Manager
Storm Water and Wetlands

Appendix C
Chemical Data Report: Port of Anchorage Sediment Sampling, February 2017

US Army Corps of Engineers
Alaska District

Chemical Data Report (Final)

Port of Anchorage Sediment Sampling (16-046)

Anchorage Boat Harbor
Anchorage, Alaska

February 2017

Prepared By:
U.S. Army Corps of Engineers - Alaska District
Environmental Engineering Branch
P.O. Box 6898
Joint Base Elmendorf Richardson, Alaska 99506-0898

Executive Summary

A total of four port locations and five background (north of the harbor) locations were sampled at the sediment surface in order to evaluate sediments in and around the Port of Anchorage. Samples were collected in April 2016 from surface sediments prior to dredging and from the freshly dredged sediments in September 2016. Sample locations were chosen to characterize the dredged material based on the Dredged Material Management Program (DMMP) and Alaska Department of Environmental Conservation (ADEC) criteria. Eleven sediment samples (four harbor samples, five background samples, and two duplicate samples) were collected for chemical analysis of the area sediments.

No exceedance of the DMMP limits for marine environments were noted. Therefore, based on the information from this chemical investigation, the in-water disposal method of the dredge material remains environmentally acceptable.

Table of Contents

Chemical Data Report

1. Introduction

This report presents the analytical results of sediment samples collected during the April and September 2016 sampling effort which occurred during the maintenance dredging at the Port of Anchorage. The Alaska District U.S. Army Corps of Engineers, Engineering and Construction Division, Environmental Engineering Branch (CEPOA-EC-EE) prepared this report at the request of the Operations Branch (CEPOA-EC-O).

The purpose of the sampling was to determine whether sediments in the area have been impacted by chemical contamination and to confirm that open water disposal of the dredged sediment is still environmentally acceptable. A limited background investigation was also attempted to compare concentrations in the harbor sediments to concentrations in naturally occurring sediments in Cook Inlet, north of the current dock.

Sample results were compared to the current Dredged Material Management Program (DMMP) marine guidelines specified in Table 8-3 (USACE 2016); these criteria were used to determine if unrestricted offshore disposal will be suitable for future dredging efforts. A statistical analysis of the background sample results was planned but was not performed as harbor sample results exhibited no DMMP criteria exceedances.

2. Site Background Information

2.1 Location

The Port of Anchorage is located in Anchorage, Alaska. Anchorage is the largest city in Alaska with a population of approximately 300,000. The harbor/dock area is the main supply and distribution center for the south-central and interior areas of the state and the large joint military base (Joint Base Elmendorf Richardson, or JBER) which lies within the Municipality of Anchorage. The Port of Anchorage is the largest cargo port in Alaska; 4,358,766 tons of cargo (all commodities) passed through the port in 2008. There were 2.7 million tons of cargo reported for 2010 (USACE 2015). See Figure 1 for the project location.

2.2 Site History and Known Contamination

The Anchorage Harbor was sanctioned by Congress in 1958. The City of Anchorage constructed the first dry cargo berth and city dock in 1959. The approach to this dock was dredged to -35 Mean Lower Low Water (MLLW). In the 1964 earthquake, an Army dock was destroyed, and Terminal 1 and the fuel docks were damaged. From 1968-1977, Terminals 2 and 3 were constructed and Congress approved extending the original 2,000 foot project limit baseline to the present 3,000 foot length. In 1992, a new fuel dock, POL-2, was constructed.

Due to rapid sedimentation, dredging has been nearly constant since the dock was built. In 2015, over 1.2 million cubic yards of material were removed (USACE 2015).

Sampling and chemical testing of the harbor sediments occurred in June 1994. Those samples were analyzed for volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, metals, total organic carbon, and mechanical characteristics. The only findings of this sampling event were levels of arsenic levels as high as 17 mg/kg, chromium at 47 mg/kg, barium at 167 mg/kg, and lead at 13 mg/kg. These metal levels were determined to be below the cleanup standards, and the material was determined to be suitable for open water disposal (USACE 1994).

Another sampling event occurred in October 2006. A Corps of Engineers team performed a Rapid Optical Screening Tool (ROST) investigation of the sediments in the port. Analytical samples were analyzed for VOCs, polynuclear aromatic hydrocarbons (PAHs), and total organic carbon (TOC). Fuel contamination was not encountered during this study, and associated sediment samples showed the material was suitable for open water disposal. (USACE 2007).

Lastly, another sampling event occurred in September 2007 which supplemented the work in 2006 and an expected port expansion. Twelve samples were collected and analyzed for VOCs, SVOCs, PCBs, metals, pesticides, and TOC. All results were below the screening levels established in the Puget Sound Dredge Disposal Analysis (PSSDA) program. (USACE 2008).

2.3 Limitations

This project is not intended to be a comprehensive environmental investigation of the site, and changes in the condition of the site may occur with time due to natural processes or human activities. The findings presented in this report are based on site conditions existing at the time of the investigation.

3. Field Activities and Observations

3.1 Summary of Field Activities

On 8 April 2016, five background samples plus a duplicate were collected from the area surrounding the Port of Anchorage (see Figure 2 for locations). In addition, three primary samples were collected from within the dredge basin in an attempt to characterize the sediment within the project dredging area. All samples were collected with a Van Veen sampler at various locations (see Figure 2) from a boat supplied by the dredge contractor. The samples consisted mainly of silt, though some small gravels were present in sample PA02.

It should be noted that originally, eight background samples were planned, but site conditions deteriorated quickly (significantly rising tide) and the sampler malfunctioned. The three remaining planned background samples (locations south of the current harbor) could not be collected.

On 13 September 2016, another sample and a duplicate were collected from the dredge itself (see Photo 3 in Appendix A). The sample was collected by using a hand shovel to collect the sediment from the hopper, placing it into an aluminum pan, and filling the jars from the aluminum pan.

3.2 Scope of Analytical Methods

Table 3-1 summarizes the analytical methods that were performed on the sediment samples submitted for chemical analysis.

Table 3-1 Scope of Sampling

Sample Type	Parameter	Analytical Method	Target Contaminant	Number of Samples Submitted[1]
Background (6) Port (5)	Metals: antimony, arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc	SW846 6020A & 7471A	Regulated metals from fuels, paints, batteries, etc.	11
Background (6) Port (5)	Polynuclear Aromatic Hydrocarbons (PAHs)	SW846 8270D-SIM	Fuel constituent compounds.	11
Background (6) Port (5)	Chlorinated Pesticides	SW846 8081B	Pesticides (e.g., DDT) residues from previous pest control activities	11
Port (3)	Gasoline/Diesel/Residual Range Organics (GRO/DRO/RRO)	AK101/102/103	Light fuels/heavy fuels/lube oil	3
Port (3)	Volatile Organic Compounds (VOCs)	SW8260B	Solvents, light fuels	3
Background (2) Port (1)	Grain Size	ASTM D422	Particle size distribution	3

[1] Numbers include duplicate samples.

3.3 Investigation Derived Waste

Investigation derived waste generated during this sampling event consisted entirely of disposable sampling equipment (sampling spoons, plastic bags, paper towels, etc.). These items were brushed clean of sediment on site, bagged, and disposed of at the local solid waste landfill.

4. Results of Chemical Analyses

4.1 Overview

The results of the chemical analyses were screened against the DMMP levels for marine environments (USACE 2016). Tabular results compared to the DMMP screening levels are presented in Appendix B.

4.2 Chemicals Detected

Various metals analytes were detected in both the background and harbor samples, as expected. However, no analyte was detected above DMMP screening criteria. PAHs were also detected in both background and harbor samples, albeit at trace levels; all concentrations were at least two orders of magnitude below DMMP screening criteria.

VOCs were analyzed in three of the five harbor samples, and all results were nondetect. Likewise, pesticides were analyzed in all five harbor samples (including the duplicate), and all results were nondetect.

4.3 Geotechnical Evaluation

A laboratory testing program was established to classify and determine the physical and engineering properties of the encountered sediments. The tests were performed in accordance with the current version of ASTM D 422. The soils laboratory test results are included in Appendix B.

The sediments encountered in these samples are a wet, highly frost-susceptible, low strength, gray, nonplastic to medium plasticity silt (ML). Relative density for this soil type can vary from very soft to stiff. This type of material is consistent with sediment encountered during previous dredging operations and should be anticipated during future dredging operations.

5. Data Quality Review and Usability Assessment

After analysis at the project laboratory, the project data was reviewed for deviations to the requirements presented the appropriate ADEC guidance (ADEC 2009) and the Department of Defense (DoD) Quality Systems Manual (QSM, DoD 2013) in the following areas – precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS). Elements reviewed include sample handling, holding times, method and trip blanks, laboratory control sample (LCS) recoveries and relative percent differences (RPDs), matrix spikes and matrix spike duplicates (MS/MSD) recoveries and RPDs, surrogate recovery, and field duplicate comparability. Laboratory narratives were reviewed for issues related to calibration curves and continuing calibration standard recoveries (i.e. instrument specific quality control). Results which are impacted by a control deviation are qualified in the comprehensive data tables in Appendix B. Note that quality control deviations which do not impact data quality (e.g. a high LCS recovery associated with a nondetect result) are not discussed.

The following qualifiers, listed below in order of increasing severity, are used in the data tables to indicate quality control deficiencies:

Table 5-1: Qualifier Definitions

Qualifier	**Definition**
J	Analyte result is considered an estimated value because the level is below the laboratory LOQ but above the DL.
B	Analyte result is considered a high estimated value due to contamination present in the method blank.
QH, QL, QN	Analyte result is considered an estimated value biased (high, low, uncertain) due to a quality control failure.
R	Analyte result is rejected - result is not usable.

All samples were sent to SGS Environmental Services in two Sample Delivery Groups (SDGs). This lab is validated by the State of Alaska through the Contaminated Sites Program and is approved through the DoD Environmental Laboratory Accreditation Program (ELAP) for all methods and analytes reported herein. Laboratory certifications are available upon request. Details of the data review are presented in the ADEC Laboratory Data Review Checklists presented in Appendix C. A summary of the data review is presented below:

5.1 Data Review Details

5.1.1 Sample Handling: Samples were received at the lab in Anchorage in two sample delivery groups (SDGs), each consisting of one cooler. The sample receipt temperature was recorded as 5.8°C for cooler "FIRST_ONE" (SDG 1161744) and at 0.9° C for cooler "SECOND" (SDG 1165441), which is in compliance with regulatory criteria. In SDG 1161744, sample BKG03[1] was identified as the sample to be used for MS/MSD, but the lab did not see that request until later, so the lab used sample BKG01 instead. However, since BKG01 and BKG03 received the same analyses, this discrepancy does not impact data quality or usability. No other deviations were noted.

5.1.2 Holding Times: All samples were analyzed within the method specified holding times.

5.1.3 Blanks: Method blanks were analyzed at the proper frequency. Target analytes were not detected in any method or trip blank, or deviations do not impact data quality/usability.

5.1.4 Laboratory Control Samples: Laboratory Control Samples/Laboratory Control Sample Duplicates (LCS/LCSD) were analyzed at the required frequency. Recoveries were within the QSM acceptance limits or any deviations do not impact data quality/usability except for the following:

- An LCS was not run for toxapene in either SDG, thus extraction recovery for this compound cannot be evaluated. However, all of the other similar single component compounds (pesticides) met recovery limits, and the toxaphene calibration verification standard also met recovery limits. Therefore, this deviation does not impact data usability, and results are not further flagged.

5.1.5 Laboratory Control Sample Precision: The LCS precision as measured by relative percent difference (RPD) was within QSM or method acceptance limits or deviations do not impact data quality/usability.

5.1.6 Matrix spikes: Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples were analyzed at the required frequency and recoveries were within QSM acceptance limits or deviations do not impact data quality/usability except for the following:

[1] All sample designations are preceded by '16-ANC-" in laboratory reports

- An MS/MSD was not run for toxapene in either SDG, thus matrix extraction recovery for this compound cannot be evaluated. However, all of the other similar single component compounds (pesticides) met MS/MSD recovery limits, and the toxaphene calibration verification standard also met recovery limits. Therefore, this deviation does not impact data usability, and results are not further flagged.
- Antimony recovered slightly below QSM acceptance limits in the MS and MSD associated with sample PA04. Since the LCS recovered within limits (and a post digested spike was not reported), the primary result in the parent sample is flagged "QL" to account for the decreased accuracy (low bias). Antimony results were reported as nondetect at a level more than two orders of magnitude below the screening limit. Therefore, results are not significantly impacted by this deviation.

5.1.7 Matrix Spike precision: The reported MS/MSD precision was within QSM acceptance limits or deviations do not impact data quality/usability.

5.1.8 Surrogates: Surrogate recoveries for all samples were within the QSM acceptance limits or deviations do not impact data quality/usability with the following exceptions:

- The surrogate for GRO (method AK101) recovered below method control limits in sample PA04; impacted results are flagged “QL”. However, the GRO result was nondetect at 1.89 mg/kg, corresponding to a screening limit of 230 mg/kg; therefore, data usability is not significantly impacted.

5.1.9 Field Duplicate Summary: A total of 11 samples were submitted for this project, and two field duplicates were submitted, meeting the required duplicate frequency of 10%. Sample BKG99 is a field duplicate of BKG05 and sample PA05 is a field duplicate of PA04. All results are compliant with the criteria specified in ADEC guidance (ADEC 2009; all soil/sediment RPDs less than 50%).

5.1.10 Reporting Limit Assessment: The laboratory reporting limits are based on the QSM definition of Limit of Detection (LOD). The LOD is defined as the smallest amount or concentration of an analyte that must be present in a sample in order to be detected with a high level of confidence (99%), and the false negative rate (Type II error) is 1%. This limit represents the very least that the laboratory can reliably detect. Consequently, any nondetect result with an LOD greater than the associated screening value cannot be used to prove the absence of that analyte.

Hexachlorobutadiene had LODs above project screening limits in five of five project samples. Heptaclor was reported with LODs above project screening limits in nine of eleven project samples. 4,4’-DDT was reported with LODs above project screening limits in one of eleven project samples. As noted above, these results cannot be used to prove the absence of these compounds at the project site; however, there is no known source or historical evidence suggesting the potential presence of these compounds in the Port of Anchorage area.

5.2 Overall Assessment

All data is usable as flagged. The ADEC Laboratory Data Review Checklists containing details of the data review are presented in Appendix C.

6. Summary and Recommendations

6.1 Summary

No analytes exceeded the DMMP screening limits, which are used to evaluate in-water disposal impacts. Although a few compounds could not be detected at levels specified in the DMMP, there is no historical or anecdotal evidence suggesting the presence of these analytes in the Port of Anchorage area.

6.2 Recommendations

The Anchroage Harbor sediments are considered suitable for in-water disposal. It is recommended that in-water option continue to be the preferred method of dredge material disposal.

7. References

Alaska Department of Environmental Conservation (ADEC) 2013. Dredge Material Guidance, June.

ADEC 2009. Technical Memorandum, Environmental Laboratory Data and Quality Assurance Requirements, March.

Department of Defense (DoD) 2013. Quality Systems Manual for Environmental Laboratories, Final Version 5.0, July.

SGS Environmental Services (SGS) 2016. Analytical Report SDG # 1161744 and 1165441, Anchorage SBH (16-046), October.

U.S. Army Corps of Engineers (USACE), 1994. Final Chemical Report, Port of Anchorage, Anchorage, AK. September.

USACE 2007. Chemical Data Report – Anchorage Harbor ROST Study (NPDL 06-046). January.

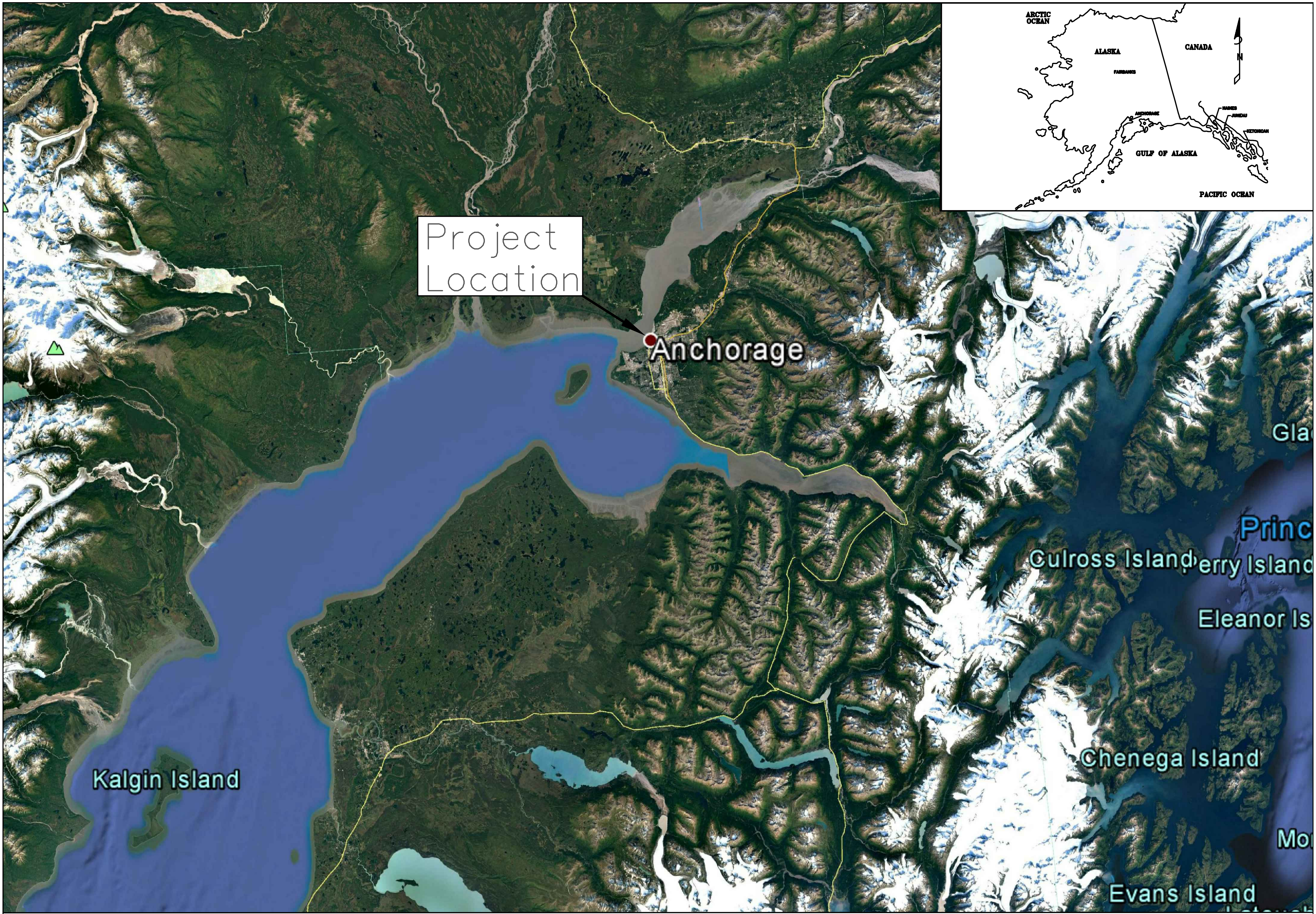
USACE 2008. Chemical Data Report – Anchorage Port Expansion Study, Anchorage Alaska (NPDL 07-083). March.

USACE 2015. http://www.poa.usace.army.mil/Portals/34/docs/operations/RH/anchorage/2015AnchorageHarborPI20161017.pdf?ver=2017-01-18-145703-227. Accessed 13 January 2017.

USACE 2016. Dredged Material Evaluation and Disposal Procedures, User's Manual, August.

Appendix A

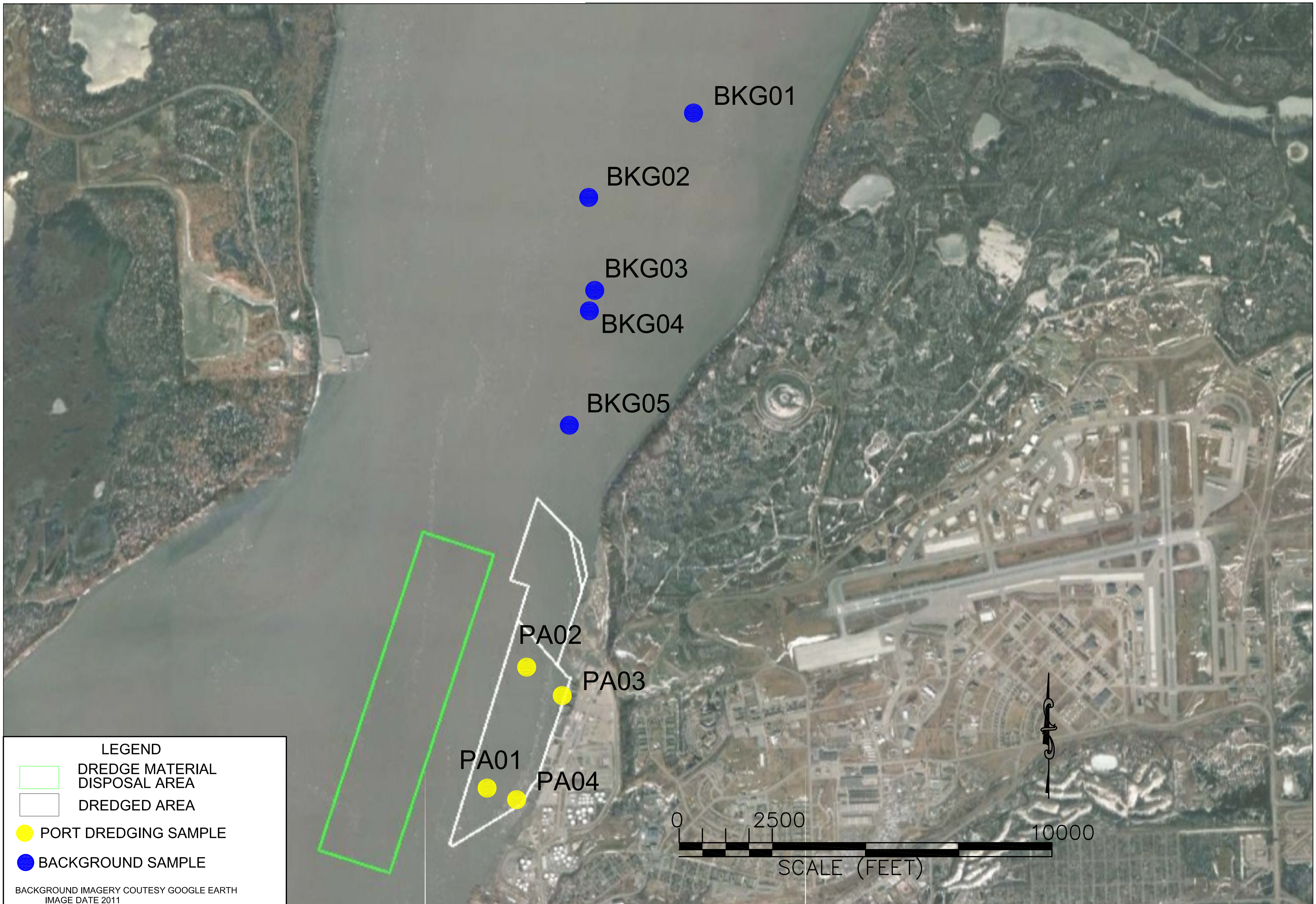
Figures and Site Photographs



ALASKA DISTRICT
CORPS OF ENGINEERS
ENV. ENGINEERING

LOCATION AND VICINITY MAP
PORT OF ANCHORAGE SEDIMENT SAMPLING
ANCHORAGE, ALASKA

SCALE: GRAPHICAL
DATE: 27 FEB 2017
DRWN/RVW: MU/SK
FIGURE 1



ALASKA DISTRICT
CORPS OF ENGINEERS
ENV. ENGINEERING

SAMPLE LOCATIONS
PORT OF ANCHORAGE SEDIMENT SAMPLING
ANCHORAGE, ALASKA

SCALE: GRAPHICAL
DATE: 28 FEB 2017
DRWN/RVW: MU/SK
FIGURE 2

ALASKA DISTRICT
CORPS OF ENGINEERS
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PORT SAMPLE LOCATIONS
PORT OF ANCHORAGE SAMPLING
ANCHORAGE, ALASKA

SCALE: GRAPHICAL
DATE: 1 MAR 2017
DRAWN/RVW: MU/SK
FIGURE 3

Photo 1: NE towards dock, near sample point PA01


Photo 2: Sampling crew, looking S (photo by M. Utley)

Photo 3: Dredge at work near PA04, looking NW

Photo 4: Cargo barges waiting for loading (taken from near location PA01, looking NE

Photo 5: Docking after sample collection, looking NNE from skiff

Photo 6: Skiff used for transportation to and from dredge, looking SSW from dock

Appendix B

Chemical and Geotechnical Results

Anchorage Harbor Sediment Sampling
Sample Summary

SDG	LocationID	ClientSampleID	LabSampleID	CollectedDate	MatrixID	LabName	QCType	6020A	8260B	8270DSIM	8270DSIM_PEST	A2540G	AK101	AK102	AK103
1161744	BKG01	16-ANC-BKG01	1161744001	04/08/2016 14:22:00	Sediment	SGS Environmental Services, Inc.	Field_Sample	X		X	X	X			
1161744	BKG02	16-ANC-BKG02	1161744002	04/08/2016 15:05:00	Sediment	SGS Environmental Services, Inc.	Field_Sample	X		X	X	X			
1161744	BKG03	16-ANC-BKG03	1161744003	04/08/2016 15:15:00	Sediment	SGS Environmental Services, Inc.	Field_Sample	X		X	X	X			
1161744	BKG04	16-ANC-BKG04	1161744004	04/08/2016 15:27:00	Sediment	SGS Environmental Services, Inc.	Field_Sample	X		X	X	X			
1161744	BKG05	16-ANC-BKG05	1161744005	04/08/2016 15:40:00	Sediment	SGS Environmental Services, Inc.	Field_Sample	X		X	X	X			
1161744	BKG99	16-ANC-BKG99	1161744006	04/08/2016 15:20:00	Sediment	SGS Environmental Services, Inc.	Duplicate	X		X	X	X			
1161744	PA01	16-ANC-PA01	1161744007	04/08/2016 16:20:00	Sediment	SGS Environmental Services, Inc.	Field_Sample	X		X	X	X			
1161744	PA02	16-ANC-PA02	1161744008	04/08/2016 15:50:00	Sediment	SGS Environmental Services, Inc.	Field_Sample	X		X	X	X			
1161744	PA03	16-ANC-PA03	1161744009	04/08/2016 15:59:00	Sediment	SGS Environmental Services, Inc.	Field_Sample	X	X	X	X	X	X	X	X
1165441	PA04	16-ANC-PA04	1165441001	09/13/2016 15:20:00	Sediment	SGS Environmental Services, Inc.	Field_Sample	X	X	X	X	X	X	X	X
1165441	PA05	16-ANC-PA05	1165441004	09/13/2016 15:30:00	Sediment	SGS Environmental Services, Inc.	Duplicate	X	X	X	X	X	X	X	X
1161744	TB01	16-ANC-TB01	1161744010	04/08/2016 12:00:00	Sediment	SGS Environmental Services, Inc.	Trip Blank		X				X		
1165441	TB02	16-ANC-TB02	1165441005	09/13/2016 12:00:00	Sediment	SGS Environmental Services, Inc.	Trip Blank		X				X		

Anchorage Harbor Sediment Sampling
Background Samples

			Sample ID	16-ANC-BKG01	16-ANC-BKG02	16-ANC-BKG03	16-ANC-BKG04	16-ANC-BKG05	16-ANC-BKG99
			Location ID	BKG01	BKG02	BKG03	BKG04	BKG05	BKG99
			Collection Date	04/08/2016 14:22	04/08/2016 15:05	04/08/2016 15:15	04/08/2016 15:27	04/08/2016 15:40	04/08/2016 15:20
			Labortory Sample ID	1161744001	1161744002	1161744003	1161744004	1161744005	1161744006
			Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
Method	**Units**	**Analyte**	**DMMP**						**Duplicate**
6020A	mg/Kg	Antimony	150	ND [0.710]	ND [0.660]	ND [0.690]	ND [0.630] QL	ND [0.705]	ND [0.685]
6020A	mg/Kg	Arsenic	57	7.54 [0.710]	6.37 [0.660]	7.98 [0.690]	7.24 [0.700]	7.81 [0.705]	7.61 [0.685]
6020A	mg/Kg	Cadmium	5.1	ND [0.142]	ND [0.132]	ND [0.138]	ND [0.141]	ND [0.141]	ND [0.137]
6020A	mg/Kg	Chromium	260	21.8 [0.284]	21.9 [0.264]	26.4 [0.276]	23.7 [0.281]	25.0 [0.281]	24.3 [0.273]
6020A	mg/Kg	Copper	390	23.5 [0.427]	15.5 [0.396]	30.3 [0.413]	23.0 [0.421]	29.4 [0.421]	24.6 [0.410]
6020A	mg/Kg	Lead	450	4.59 [0.142]	3.84 [0.132]	5.03 [0.138]	4.55 [0.141]	4.78 [0.141]	4.67 [0.137]
6020A	mg/Kg	Mercury	0.41	0.0453 [0.0285] J	0.0281 [0.0264] J	0.0614 [0.0276]	0.0392 [0.0281] J	0.0544 [0.0281] J	0.0445 [0.0273] J
6020A	mg/Kg	Nickel	--	22.2 [0.142]	20.8 [0.132]	25.6 [0.138]	22.5 [0.141]	24.6 [0.141]	23.6 [0.137]
6020A	mg/Kg	Selenium	--	ND [0.710]	ND [0.660]	ND [0.690]	ND [0.700]	ND [0.705]	ND [0.685]
6020A	mg/Kg	Silver	6.1	ND [0.142]	ND [0.132]	ND [0.138]	ND [0.141]	ND [0.141]	ND [0.137]
6020A	mg/Kg	Zinc	410	54.3 [1.78]	52.3 [1.65]	62.1 [1.72]	60.0 [1.75]	61.4 [1.75]	57.7 [1.71]
8270DSIM	mg/Kg	1-Methylnaphthalene	--	ND [0.00373]	0.00224 [0.00346] J	0.00219 [0.00344] J	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	2-Methylnaphthalene	0.67	ND [0.00373]	0.00277 [0.00346] J	0.00284 [0.00344] J	0.00242 [0.00380] J	0.00251 [0.00379] J	ND [0.00376]
8270DSIM	mg/Kg	Acenaphthene	0.5	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	Acenaphthylene	0.56	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	Anthracene	0.96	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	Benzo(a)anthracene	1.3	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	Benzo(a)pyrene	1.6	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	Benzo(b)fluoranthene	3.2	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	Benzo(g,h,i)perylene	0.67	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	Benzo(k)fluoranthene	3.2	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	Chrysene	1.4	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	Dibenzo(a,h)anthracene	0.23	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	Fluoranthene	1.7	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	Fluorene	0.54	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	Indeno(1,2,3-cd)pyrene	0.6	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	Naphthalene	2.1	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	Phenanthrene	1.5	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM	mg/Kg	Pyrene	2.6	ND [0.00373]	ND [0.00346]	ND [0.00344]	ND [0.00380]	ND [0.00379]	ND [0.00376]
8270DSIM_PEST	mg/Kg	4,4'-DDD	0.016	ND [0.00149]	ND [0.00138]	ND [0.00137]	ND [0.00152]	ND [0.00151]	ND [0.00150]
8270DSIM_PEST	mg/Kg	4,4'-DDE	0.009	ND [0.00149]	ND [0.00138]	ND [0.00137]	ND [0.00152]	ND [0.00151]	ND [0.00150]
8270DSIM_PEST	mg/Kg	4,4'-DDT	0.012	**ND [0.0298]**	ND [0.00690]	ND [0.00685]	ND [0.00760]	ND [0.00755]	ND [0.00750]
8270DSIM_PEST	mg/Kg	Aldrin	0.01	ND [0.00112]	ND [0.00103]	ND [0.00103]	ND [0.00114]	ND [0.00113]	ND [0.00113]
8270DSIM_PEST	mg/Kg	alpha-BHC	--	ND [0.00112]	ND [0.00103]	ND [0.00103]	ND [0.00114]	ND [0.00113]	ND [0.00113]
8270DSIM_PEST	mg/Kg	alpha-Chlordane	0.0028	ND [0.00112]	ND [0.00103]	ND [0.00103]	ND [0.00114]	ND [0.00113]	ND [0.00113]
8270DSIM_PEST	mg/Kg	beta-BHC	--	ND [0.00112]	ND [0.00103]	ND [0.00103]	ND [0.00114]	ND [0.00113]	ND [0.00113]
8270DSIM_PEST	mg/Kg	delta-BHC	--	ND [0.00112]	ND [0.00103]	ND [0.00103]	ND [0.00114]	ND [0.00113]	ND [0.00113]
8270DSIM_PEST	mg/Kg	Dieldrin	0.0019	ND [0.00149]	ND [0.00138]	ND [0.00137]	ND [0.00152]	ND [0.00151]	ND [0.00150]

DMMP - Dredge Material Management Program (2016)
[ ] - Laboratory LOD
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Anchorage Harbor Sediment Sampling
Background Samples

			Sample ID	16-ANC-BKG01	16-ANC-BKG02	16-ANC-BKG03	16-ANC-BKG04	16-ANC-BKG05	16-ANC-BKG99
			Location ID	BKG01	BKG02	BKG03	BKG04	BKG05	BKG99
			Collection Date	04/08/2016 14:22	04/08/2016 15:05	04/08/2016 15:15	04/08/2016 15:27	04/08/2016 15:40	04/08/2016 15:20
			Labortory Sample ID	1161744001	1161744002	1161744003	1161744004	1161744005	1161744006
			Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
Method	**Units**	**Analyte**	**DMMP**						**Duplicate**
8270DSIM_PEST	mg/Kg	Endosulfan I	--	ND [0.00112]	ND [0.00103]	ND [0.00103]	ND [0.00114]	ND [0.00113]	ND [0.00113]
8270DSIM_PEST	mg/Kg	Endosulfan II	--	ND [0.00149]	ND [0.00138]	ND [0.00137]	ND [0.00152]	ND [0.00151]	ND [0.00150]
8270DSIM_PEST	mg/Kg	Endosulfan sulfate	--	ND [0.00149]	ND [0.00138]	ND [0.00137]	ND [0.00152]	ND [0.00151]	ND [0.00150]
8270DSIM_PEST	mg/Kg	Endrin	--	ND [0.00149]	ND [0.00138]	ND [0.00137]	ND [0.00152]	ND [0.00151]	ND [0.00150]
8270DSIM_PEST	mg/Kg	Endrin aldehyde	--	ND [0.00149]	ND [0.00138]	ND [0.00137]	ND [0.00152]	ND [0.00151]	ND [0.00150]
8270DSIM_PEST	mg/Kg	Endrin ketone	--	ND [0.0186]	ND [0.0173]	ND [0.0172]	ND [0.0190]	ND [0.0189]	ND [0.0188]
8270DSIM_PEST	mg/Kg	gamma-BHC (Lindane)	0.01	ND [0.00112]	ND [0.00103]	ND [0.00103]	ND [0.00114]	ND [0.00113]	ND [0.00113]
8270DSIM_PEST	mg/Kg	gamma-Chlordane	0.0028	ND [0.00112]	ND [0.00103]	ND [0.00103]	ND [0.00114]	ND [0.00113]	ND [0.00113]
8270DSIM_PEST	mg/Kg	Heptachlor	0.0015	**ND [0.00745]**	**ND [0.0276]**	**ND [0.0275]**	**ND [0.0304]**	**ND [0.0302]**	**ND [0.0301]**
8270DSIM_PEST	mg/Kg	Heptachlor epoxide	--	ND [0.00149]	ND [0.00138]	ND [0.00137]	ND [0.00152]	ND [0.00151]	ND [0.00150]
8270DSIM_PEST	mg/Kg	Methoxychlor	--	ND [0.0298]	ND [0.0276]	ND [0.0275]	ND [0.0304]	ND [0.0302]	ND [0.0301]
8270DSIM_PEST	mg/Kg	Toxaphene	--	ND [0.0745]	ND [0.0690]	ND [0.0685]	ND [0.0760]	ND [0.0755]	ND [0.0750]
A2540G	PERCENT	Total Solids	--	66.4 []	72.1 []	72.2 []	65.7 []	65.3 []	66.2 []

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Anchorage Harbor Sediment Samples
Harbor Samples

			Sample ID	16-ANC-PA01	16-ANC-PA02	16-ANC-PA03	16-ANC-PA04	16-ANC-PA05
			Location ID	PA01	PA02	PA03	PA04	PA04
			Collection Date	04/08/2016 16:20	04/08/2016 15:50	04/08/2016 15:59	09/13/2016 15:20	09/13/2016 15:30
			Labortory Sample ID	1161744007	1161744008	1161744009	1165441001	1165441004
			Matrix	Sediment	Sediment	Sediment	Sediment	Sediment
Method	**Units**	**Analyte**	**DMMP**					**Duplicate**
6020A	mg/Kg	Antimony	150	ND [0.655]	ND [0.715]	ND [0.630]	ND [0.630] QL	ND [0.645]
6020A	mg/Kg	Arsenic	57	6.81 [0.655]	6.48 [0.715]	8.60 [0.630]	7.28 [0.630]	6.80 [0.645]
6020A	mg/Kg	Cadmium	5.1	ND [0.132]	ND [0.142]	ND [0.126]	ND [0.126]	ND [0.129]
6020A	mg/Kg	Chromium	260	23.5 [0.263]	21.9 [0.285]	26.9 [0.252]	23.9 [0.252]	23.9 [0.257]
6020A	mg/Kg	Copper	390	19.9 [0.394]	21.2 [0.428]	26.9 [0.378]	18.0 [0.378]	17.7 [0.386]
6020A	mg/Kg	Lead	450	4.24 [0.132]	4.16 [0.142]	5.70 [0.126]	3.80 [0.126]	3.84 [0.129]
6020A	mg/Kg	Mercury	0.41	0.0329 [0.0262] J	0.0429 [0.0285] J	0.0534 [0.0252]	0.0302 [0.0251] J	0.0319 [0.0257] J
6020A	mg/Kg	Nickel	--	22.9 [0.132]	21.7 [0.142]	25.6 [0.126]	23.2 [0.126]	22.2 [0.129]
6020A	mg/Kg	Selenium	--	ND [0.655]	ND [0.715]	ND [0.630]	ND [0.630]	ND [0.645]
6020A	mg/Kg	Silver	6.1	ND [0.132]	ND [0.142]	ND [0.126]	ND [0.126]	ND [0.129]
6020A	mg/Kg	Zinc	410	54.8 [1.64]	53.5 [1.78]	65.3 [1.58]	57.2 [1.58]	57.7 [1.61]
8260B	mg/Kg	1,1,1,2-Tetrachloroethane	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	1,1,1-Trichloroethane	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	1,1,2,2-Tetrachloroethane	--			ND [0.0100]	ND [0.00945]	ND [0.00930]
8260B	mg/Kg	1,1,2-Trichloro-1,2,2-trifluoroethane	--			ND [0.0800]	ND [0.0755]	ND [0.0745]
8260B	mg/Kg	1,1,2-Trichloroethane	--			ND [0.00800]	ND [0.00755]	ND [0.00745]
8260B	mg/Kg	1,1-Dichloroethane	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	1,1-Dichloroethene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	1,1-Dichloropropene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	1,2,3-Trichlorobenzene	--			ND [0.0401]	ND [0.0378]	ND [0.0373]
8260B	mg/Kg	1,2,3-Trichloropropane	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	1,2,4-Trichlorobenzene	0.031			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	1,2,4-Trimethylbenzene	--			ND [0.0401]	ND [0.0378]	ND [0.0373]
8260B	mg/Kg	1,2-Dibromo-3-chloropropane	--			ND [0.0800]	ND [0.0755]	ND [0.0745]
8260B	mg/Kg	1,2-Dibromoethane	--			ND [0.00800]	ND [0.00755]	ND [0.00745]
8260B	mg/Kg	1,2-Dichlorobenzene	0.035			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	1,2-Dichloroethane	--			ND [0.00800]	ND [0.00755]	ND [0.00745]
8260B	mg/Kg	1,2-Dichloropropane	--			ND [0.00800]	ND [0.00755]	ND [0.00745]
8260B	mg/Kg	1,3,5-Trimethylbenzene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	1,3-Dichlorobenzene	0.17			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	1,3-Dichloropropane	--			ND [0.00800]	ND [0.00755]	ND [0.00745]
8260B	mg/Kg	1,4-Dichlorobenzene	0.11			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	2,2-Dichloropropane	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	2-Butanone	--			ND [0.201]	ND [0.189]	ND [0.187]
8260B	mg/Kg	2-Chlorotoluene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	2-Hexanone	--			ND [0.201]	ND [0.189]	ND [0.187]
8260B	mg/Kg	4-Chlorotoluene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	4-Isopropyltoluene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	4-Methyl-2-pentanone	--			ND [0.201]	ND [0.189]	ND [0.187]

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Anchorage Harbor Sediment Samples
Harbor Samples

Method	Units	Analyte	DMMP	16-ANC-PA01	16-ANC-PA02	16-ANC-PA03	16-ANC-PA04	16-ANC-PA05
			Location ID	PA01	PA02	PA03	PA04	PA04
			Collection Date	04/08/2016 16:20	04/08/2016 15:50	04/08/2016 15:59	09/13/2016 15:20	09/13/2016 15:30
			Labortory Sample ID	1161744007	1161744008	1161744009	1165441001	1165441004
			Matrix	Sediment	Sediment	Sediment	Sediment	Sediment
								Duplicate
8260B	mg/Kg	Benzene	--			ND [0.0100]	ND [0.00945]	ND [0.00930]
8260B	mg/Kg	Bromobenzene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	Bromochloromethane	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	Bromodichloromethane	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	Bromoform	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	Bromomethane	--			ND [0.161]	ND [0.152]	ND [0.149]
8260B	mg/Kg	Carbon disulfide	--			ND [0.0800]	ND [0.0755]	ND [0.0745]
8260B	mg/Kg	Carbon tetrachloride	--			ND [0.0100]	ND [0.00945]	ND [0.00930]
8260B	mg/Kg	Chlorobenzene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	Chloroethane	--			ND [0.161]	ND [0.152]	ND [0.149]
8260B	mg/Kg	Chloroform	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	Chloromethane	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	cis-1,2-Dichloroethene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	cis-1,3-Dichloropropene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	Dibromochloromethane	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	Dibromomethane	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	Dichlorodifluoromethane	--			ND [0.0401]	ND [0.0378]	ND [0.0373]
8260B	mg/Kg	Ethylbenzene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	Hexachlorobutadiene	0.011			**ND [0.0401]**	**ND [0.0378]**	**ND [0.0373]**
8260B	mg/Kg	Isopropylbenzene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	Methylene chloride	--			ND [0.0800]	ND [0.0755]	ND [0.0745]
8260B	mg/Kg	Methyl-tert-butyl ether (MTBE)	--			ND [0.0800]	ND [0.0755]	ND [0.0745]
8260B	mg/Kg	Naphthalene	2.1			ND [0.0401]	ND [0.0378]	ND [0.0373]
8260B	mg/Kg	n-Butylbenzene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	n-Propylbenzene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	o-Xylene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	sec-Butylbenzene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	Styrene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	tert-Butylbenzene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	Tetrachloroethene (PCE)	0.057			ND [0.0100]	ND [0.00945]	ND [0.00930]
8260B	mg/Kg	Toluene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	trans-1,2-Dichloroethene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	trans-1,3-Dichloropropene	--			ND [0.0201]	ND [0.0189]	ND [0.0187]
8260B	mg/Kg	Trichloroethene (TCE)	0.16			ND [0.0100]	ND [0.00945]	ND [0.00930]
8260B	mg/Kg	Trichlorofluoromethane	--			ND [0.0401]	ND [0.0378]	ND [0.0373]
8260B	mg/Kg	Vinyl acetate	--			ND [0.0800]	ND [0.0755]	ND [0.0745]
8260B	mg/Kg	Vinyl Chloride	--			ND [0.00800]	ND [0.00755]	ND [0.00745]
8260B	mg/Kg	Xylene, Isomers m & p	--			ND [0.0401]	ND [0.0378]	ND [0.0373]
8260B	mg/Kg	Xylenes	--			ND [0.0600]	ND [0.0565]	ND [0.0560]

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Anchorage Harbor Sediment Samples
Harbor Samples

Method	Units	Analyte	DMMP	16-ANC-PA01	16-ANC-PA02	16-ANC-PA03	16-ANC-PA04	16-ANC-PA05
			Location ID	PA01	PA02	PA03	PA04	PA04
			Collection Date	04/08/2016 16:20	04/08/2016 15:50	04/08/2016 15:59	09/13/2016 15:20	09/13/2016 15:30
			Labortory Sample ID	1161744007	1161744008	1161744009	1165441001	1165441004
			Matrix	Sediment	Sediment	Sediment	Sediment	Sediment
								Duplicate
8270DSIM	mg/Kg	1-Methylnaphthalene	--	ND [0.00358]	ND [0.00367]	0.00308 [0.00360] J	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	2-Methylnaphthalene	0.67	ND [0.00358]	0.00244 [0.00367] J	0.00395 [0.00360] J	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Acenaphthene	0.5	ND [0.00358]	ND [0.00367]	ND [0.00360]	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Acenaphthylene	0.56	ND [0.00358]	ND [0.00367]	ND [0.00360]	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Anthracene	0.96	ND [0.00358]	ND [0.00367]	ND [0.00360]	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Benzo(a)anthracene	1.3	ND [0.00358]	ND [0.00367]	ND [0.00360]	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Benzo(a)pyrene	1.6	ND [0.00358]	ND [0.00367]	ND [0.00360]	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Benzo(b)fluoranthene	3.2	ND [0.00358]	ND [0.00367]	ND [0.00360]	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Benzo(g,h,i)perylene	0.67	ND [0.00358]	ND [0.00367]	ND [0.00360]	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Benzo(k)fluoranthene	3.2	ND [0.00358]	ND [0.00367]	ND [0.00360]	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Chrysene	1.4	ND [0.00358]	ND [0.00367]	ND [0.00360]	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Dibenzo(a,h)anthracene	0.23	ND [0.00358]	ND [0.00367]	ND [0.00360]	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Fluoranthene	1.7	ND [0.00358]	ND [0.00367]	ND [0.00360]	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Fluorene	0.54	ND [0.00358]	ND [0.00367]	ND [0.00360]	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Indeno(1,2,3-cd)pyrene	0.6	ND [0.00358]	ND [0.00367]	ND [0.00360]	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Naphthalene	2.1	ND [0.00358]	ND [0.00367]	0.00234 [0.00360] J	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Phenanthrene	1.5	ND [0.00358]	ND [0.00367]	0.00298 [0.00360] J	ND [0.00341]	ND [0.00335]
8270DSIM	mg/Kg	Pyrene	2.6	ND [0.00358]	ND [0.00367]	ND [0.00360]	ND [0.00341]	ND [0.00335]
8270DSIM_PEST	mg/Kg	4,4'-DDD	0.016	ND [0.00145]	ND [0.00146]	ND [0.00144]	ND [0.00135]	ND [0.00135]
8270DSIM_PEST	mg/Kg	4,4'-DDE	0.009	ND [0.00145]	ND [0.00146]	ND [0.00144]	ND [0.00135]	ND [0.00135]
8270DSIM_PEST	mg/Kg	4,4'-DDT	0.012	ND [0.00725]	ND [0.00725]	ND [0.00720]	ND [0.00675]	ND [0.00670]
8270DSIM_PEST	mg/Kg	Aldrin	0.01	ND [0.00109]	ND [0.00109]	ND [0.00108]	ND [0.00101]	ND [0.00101]
8270DSIM_PEST	mg/Kg	alpha-BHC	--	ND [0.00109]	ND [0.00109]	ND [0.00108]	ND [0.00101]	ND [0.00101]
8270DSIM_PEST	mg/Kg	alpha-Chlordane	0.0028	ND [0.00109]	ND [0.00109]	ND [0.00108]	ND [0.00101]	ND [0.00101]
8270DSIM_PEST	mg/Kg	beta-BHC	--	ND [0.00109]	ND [0.00109]	ND [0.00108]	ND [0.00101]	ND [0.00101]
8270DSIM_PEST	mg/Kg	delta-BHC	--	ND [0.00109]	ND [0.00109]	ND [0.00108]	ND [0.00101]	ND [0.00101]
8270DSIM_PEST	mg/Kg	Dieldrin	0.0019	ND [0.00145]	ND [0.00146]	ND [0.00144]	ND [0.00135]	ND [0.00135]
8270DSIM_PEST	mg/Kg	Endosulfan I	--	ND [0.00109]	ND [0.00109]	ND [0.00108]	ND [0.00101]	ND [0.00101]
8270DSIM_PEST	mg/Kg	Endosulfan II	--	ND [0.00145]	ND [0.00146]	ND [0.00144]	ND [0.00135]	ND [0.00135]
8270DSIM_PEST	mg/Kg	Endosulfan sulfate	--	ND [0.00145]	ND [0.00146]	ND [0.00144]	ND [0.00135]	ND [0.00135]
8270DSIM_PEST	mg/Kg	Endrin	--	ND [0.00145]	ND [0.00146]	ND [0.00144]	ND [0.00135]	ND [0.00135]
8270DSIM_PEST	mg/Kg	Endrin aldehyde	--	ND [0.00145]	ND [0.00146]	ND [0.00144]	ND [0.00135]	ND [0.00135]
8270DSIM_PEST	mg/Kg	Endrin ketone	--	ND [0.0181]	ND [0.0181]	ND [0.0180]	ND [0.00337]	ND [0.00336]
8270DSIM_PEST	mg/Kg	gamma-BHC (Lindane)	0.01	ND [0.00109]	ND [0.00109]	ND [0.00108]	ND [0.00101]	ND [0.00101]
8270DSIM_PEST	mg/Kg	gamma-Chlordane	0.0028	ND [0.00109]	ND [0.00109]	ND [0.00108]	ND [0.00101]	ND [0.00101]
8270DSIM_PEST	mg/Kg	Heptachlor	0.0015	**ND [0.0290]**	**ND [0.0291]**	**ND [0.0288]**	ND [0.00135]	ND [0.00135]
8270DSIM_PEST	mg/Kg	Heptachlor epoxide	--	ND [0.00145]	ND [0.00146]	ND [0.00144]	ND [0.00135]	ND [0.00135]
8270DSIM_PEST	mg/Kg	Methoxychlor	--	ND [0.0290]	ND [0.0291]	ND [0.0288]	ND [0.00675]	ND [0.00670]
8270DSIM_PEST	mg/Kg	Toxaphene	--	ND [0.0725]	ND [0.0725]	ND [0.0720]	ND [0.0675]	ND [0.0670]

DMMP - Dredge Material Management Program (2016)
[ ] - Laboratory LOD
Solid shade indicates screening value exceedance
Data Flags are defined at the end of the table

Anchorage Harbor Sediment Samples
Harbor Samples

			Sample ID	16-ANC-PA01	16-ANC-PA02	16-ANC-PA03	16-ANC-PA04	16-ANC-PA05
			Location ID	PA01	PA02	PA03	PA04	PA04
			Collection Date	04/08/2016 16:20	04/08/2016 15:50	04/08/2016 15:59	09/13/2016 15:20	09/13/2016 15:30
			Labortory Sample ID	1161744007	1161744008	1161744009	1165441001	1165441004
			Matrix	Sediment	Sediment	Sediment	Sediment	Sediment
Method	**Units**	**Analyte**	**DMMP**					**Duplicate**
A2540G	PERCENT	Total Solids	--	68.8 []	68.0 []	68.6 []	73.2 []	74.2 []
AK101	mg/Kg	Gasoline Range Organics	230			ND [2.00]	ND [1.89] QL	ND [1.87]
AK102	mg/Kg	Diesel Range Organics (C10-C25)	250			ND [14.6]	9.24 [13.7] J	ND [13.4]
AK103	mg/Kg	Residual Range Organics (C25-C36)	9000			44.8 [14.6]	26.5 [13.7] J	17.5 [13.4] J

DMMP - Dredge Material Management Program (2016)
[ ] - Laboratory LOD
Solid shade indicates screening value exceedance
Data Flags are defined at the end of the table

Anchorage Harbor Sediment Samples
Harbor Samples

			Sample ID	16-ANC-TB01	16-ANC-TB02
			Location ID	TB01	TB02
			Collection Date	04/08/2016 12:00	09/13/2016 12:00
			Labortory Sample ID	1161744010	1165441005
			Matrix	Sediment	Sediment
Method	**Units**	**Analyte**	**DMMP**		
6020A	mg/Kg	Antimony	150		
6020A	mg/Kg	Arsenic	57		
6020A	mg/Kg	Cadmium	5.1		
6020A	mg/Kg	Chromium	260		
6020A	mg/Kg	Copper	390		
6020A	mg/Kg	Lead	450		
6020A	mg/Kg	Mercury	0.41		
6020A	mg/Kg	Nickel	--		
6020A	mg/Kg	Selenium	--		
6020A	mg/Kg	Silver	6.1		
6020A	mg/Kg	Zinc	410		
8260B	mg/Kg	1,1,1,2-Tetrachloroethane	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	1,1,1-Trichloroethane	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	1,1,2,2-Tetrachloroethane	--	ND [0.00630]	ND [0.00635]
8260B	mg/Kg	1,1,2-Trichloro-1,2,2-trifluoroethane	--	ND [0.0505]	ND [0.0505]
8260B	mg/Kg	1,1,2-Trichloroethane	--	ND [0.00505]	ND [0.00505]
8260B	mg/Kg	1,1-Dichloroethane	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	1,1-Dichloroethene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	1,1-Dichloropropene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	1,2,3-Trichlorobenzene	--	ND [0.0253]	ND [0.0253]
8260B	mg/Kg	1,2,3-Trichloropropane	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	1,2,4-Trichlorobenzene	0.031	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	1,2,4-Trimethylbenzene	--	ND [0.0253]	ND [0.0253]
8260B	mg/Kg	1,2-Dibromo-3-chloropropane	--	ND [0.0505]	ND [0.0505]
8260B	mg/Kg	1,2-Dibromoethane	--	ND [0.00505]	ND [0.00505]
8260B	mg/Kg	1,2-Dichlorobenzene	0.035	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	1,2-Dichloroethane	--	ND [0.00505]	ND [0.00505]
8260B	mg/Kg	1,2-Dichloropropane	--	ND [0.00505]	ND [0.00505]
8260B	mg/Kg	1,3,5-Trimethylbenzene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	1,3-Dichlorobenzene	0.17	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	1,3-Dichloropropane	--	ND [0.00505]	ND [0.00505]
8260B	mg/Kg	1,4-Dichlorobenzene	0.11	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	2,2-Dichloropropane	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	2-Butanone	--	ND [0.127]	ND [0.127]
8260B	mg/Kg	2-Chlorotoluene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	2-Hexanone	--	ND [0.127]	ND [0.127]
8260B	mg/Kg	4-Chlorotoluene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	4-Isopropyltoluene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	4-Methyl-2-pentanone	--	ND [0.127]	ND [0.127]

DMMP - Dredge Material Management Program (2016)
[ ] - Laboratory LOD
Solid shade indicates screening value exceedance
Data Flags are defined at the end of the table

Anchorage Harbor Sediment Samples
Harbor Samples

			Sample ID	16-ANC-TB01	16-ANC-TB02
			Location ID	TB01	TB02
			Collection Date	04/08/2016 12:00	09/13/2016 12:00
			Labortory Sample ID	1161744010	1165441005
			Matrix	Sediment	Sediment
Method	**Units**	**Analyte**	**DMMP**		
8260B	mg/Kg	Benzene	--	ND [0.00630]	ND [0.00635]
8260B	mg/Kg	Bromobenzene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	Bromochloromethane	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	Bromodichloromethane	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	Bromoform	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	Bromomethane	--	ND [0.101]	ND [0.102]
8260B	mg/Kg	Carbon disulfide	--	ND [0.0505]	ND [0.0505]
8260B	mg/Kg	Carbon tetrachloride	--	ND [0.00630]	ND [0.00635]
8260B	mg/Kg	Chlorobenzene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	Chloroethane	--	ND [0.101]	ND [0.102]
8260B	mg/Kg	Chloroform	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	Chloromethane	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	cis-1,2-Dichloroethene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	cis-1,3-Dichloropropene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	Dibromochloromethane	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	Dibromomethane	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	Dichlorodifluoromethane	--	ND [0.0253]	ND [0.0253]
8260B	mg/Kg	Ethylbenzene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	Hexachlorobutadiene	0.011	**ND [0.0253]**	**ND [0.0253]**
8260B	mg/Kg	Isopropylbenzene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	Methylene chloride	--	ND [0.0505]	ND [0.0505]
8260B	mg/Kg	Methyl-tert-butyl ether (MTBE)	--	ND [0.0505]	ND [0.0505]
8260B	mg/Kg	Naphthalene	2.1	ND [0.0253]	ND [0.0253]
8260B	mg/Kg	n-Butylbenzene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	n-Propylbenzene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	o-Xylene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	sec-Butylbenzene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	Styrene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	tert-Butylbenzene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	Tetrachloroethene (PCE)	0.057	ND [0.00630]	ND [0.00635]
8260B	mg/Kg	Toluene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	trans-1,2-Dichloroethene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	trans-1,3-Dichloropropene	--	ND [0.0127]	ND [0.0127]
8260B	mg/Kg	Trichloroethene (TCE)	0.16	ND [0.00630]	ND [0.00635]
8260B	mg/Kg	Trichlorofluoromethane	--	ND [0.0253]	ND [0.0253]
8260B	mg/Kg	Vinyl acetate	--	ND [0.0505]	ND [0.0505]
8260B	mg/Kg	Vinyl Chloride	--	0.00707 [0.00505] J	ND [0.00505]
8260B	mg/Kg	Xylene, Isomers m & p	--	ND [0.0253]	ND [0.0253]
8260B	mg/Kg	Xylenes	--	ND [0.0379]	ND [0.0380]

DMMP - Dredge Material Management Program (2016)
[ ] - Laboratory LOD
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Data Flags are defined at the end of the table

Anchorage Harbor Sediment Samples
Harbor Samples

			Sample ID	16-ANC-TB01	16-ANC-TB02
			Location ID	TB01	TB02
			Collection Date	04/08/2016 12:00	09/13/2016 12:00
			Labortory Sample ID	1161744010	1165441005
			Matrix	Sediment	Sediment
Method	**Units**	**Analyte**	**DMMP**		
8270DSIM	mg/Kg	1-Methylnaphthalene	--		
8270DSIM	mg/Kg	2-Methylnaphthalene	0.67		
8270DSIM	mg/Kg	Acenaphthene	0.5		
8270DSIM	mg/Kg	Acenaphthylene	0.56		
8270DSIM	mg/Kg	Anthracene	0.96		
8270DSIM	mg/Kg	Benzo(a)anthracene	1.3		
8270DSIM	mg/Kg	Benzo(a)pyrene	1.6		
8270DSIM	mg/Kg	Benzo(b)fluoranthene	3.2		
8270DSIM	mg/Kg	Benzo(g,h,i)perylene	0.67		
8270DSIM	mg/Kg	Benzo(k)fluoranthene	3.2		
8270DSIM	mg/Kg	Chrysene	1.4		
8270DSIM	mg/Kg	Dibenzo(a,h)anthracene	0.23		
8270DSIM	mg/Kg	Fluoranthene	1.7		
8270DSIM	mg/Kg	Fluorene	0.54		
8270DSIM	mg/Kg	Indeno(1,2,3-cd)pyrene	0.6		
8270DSIM	mg/Kg	Naphthalene	2.1		
8270DSIM	mg/Kg	Phenanthrene	1.5		
8270DSIM	mg/Kg	Pyrene	2.6		
8270DSIM_PEST	mg/Kg	4,4'-DDD	0.016		
8270DSIM_PEST	mg/Kg	4,4'-DDE	0.009		
8270DSIM_PEST	mg/Kg	4,4'-DDT	0.012		
8270DSIM_PEST	mg/Kg	Aldrin	0.01		
8270DSIM_PEST	mg/Kg	alpha-BHC	--		
8270DSIM_PEST	mg/Kg	alpha-Chlordane	0.0028		
8270DSIM_PEST	mg/Kg	beta-BHC	--		
8270DSIM_PEST	mg/Kg	delta-BHC	--		
8270DSIM_PEST	mg/Kg	Dieldrin	0.0019		
8270DSIM_PEST	mg/Kg	Endosulfan I	--		
8270DSIM_PEST	mg/Kg	Endosulfan II	--		
8270DSIM_PEST	mg/Kg	Endosulfan sulfate	--		
8270DSIM_PEST	mg/Kg	Endrin	--		
8270DSIM_PEST	mg/Kg	Endrin aldehyde	--		
8270DSIM_PEST	mg/Kg	Endrin ketone	--		
8270DSIM_PEST	mg/Kg	gamma-BHC (Lindane)	0.01		
8270DSIM_PEST	mg/Kg	gamma-Chlordane	0.0028		
8270DSIM_PEST	mg/Kg	Heptachlor	0.0015		
8270DSIM_PEST	mg/Kg	Heptachlor epoxide	--		
8270DSIM_PEST	mg/Kg	Methoxychlor	--		
8270DSIM_PEST	mg/Kg	Toxaphene	--		

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Data Flags are defined at the end of the table

Anchorage Harbor Sediment Samples
Harbor Samples

			Sample ID	16-ANC-TB01	16-ANC-TB02
			Location ID	TB01	TB02
			Collection Date	04/08/2016 12:00	09/13/2016 12:00
			Labortory Sample ID	1161744010	1165441005
			Matrix	Sediment	Sediment
Method	**Units**	**Analyte**	**DMMP**		
A2540G	PERCENT	Total Solids	--		
AK101	mg/Kg	Gasoline Range Organics	230	1.10 [1.27] J	ND [1.27]
AK102	mg/Kg	Diesel Range Organics (C10-C25)	250		
AK103	mg/Kg	Residual Range Organics (C25-C36)	9000		

DMMP - Dredge Material Management Program (2016)
[ ] - Laboratory LOD
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Data Flags are defined at the end of the table

Data Flag Explanations

ND - Analyte is not detected;   [ ] - Laboratory Limit of Detection (LOD)

Qualifier	Definition
J	Analyte result is considered an estimated value because the level is below the laboratory LOQ but above the DL
B	Analyte result is considered a high estimated value due to contamination present in the method blank.
QH, QL, QN	Analyte result is considered an estimated value biased (high, low, uncertain) due to a quality control failure
R	Analyte result is rejected - result is not usable.

Flags may be combined when more than one quality deficiency exists

DOWL

Client: US Army Corps of Engineers
Project: Harbors
Work Order: A34689

Particle Size Distribution

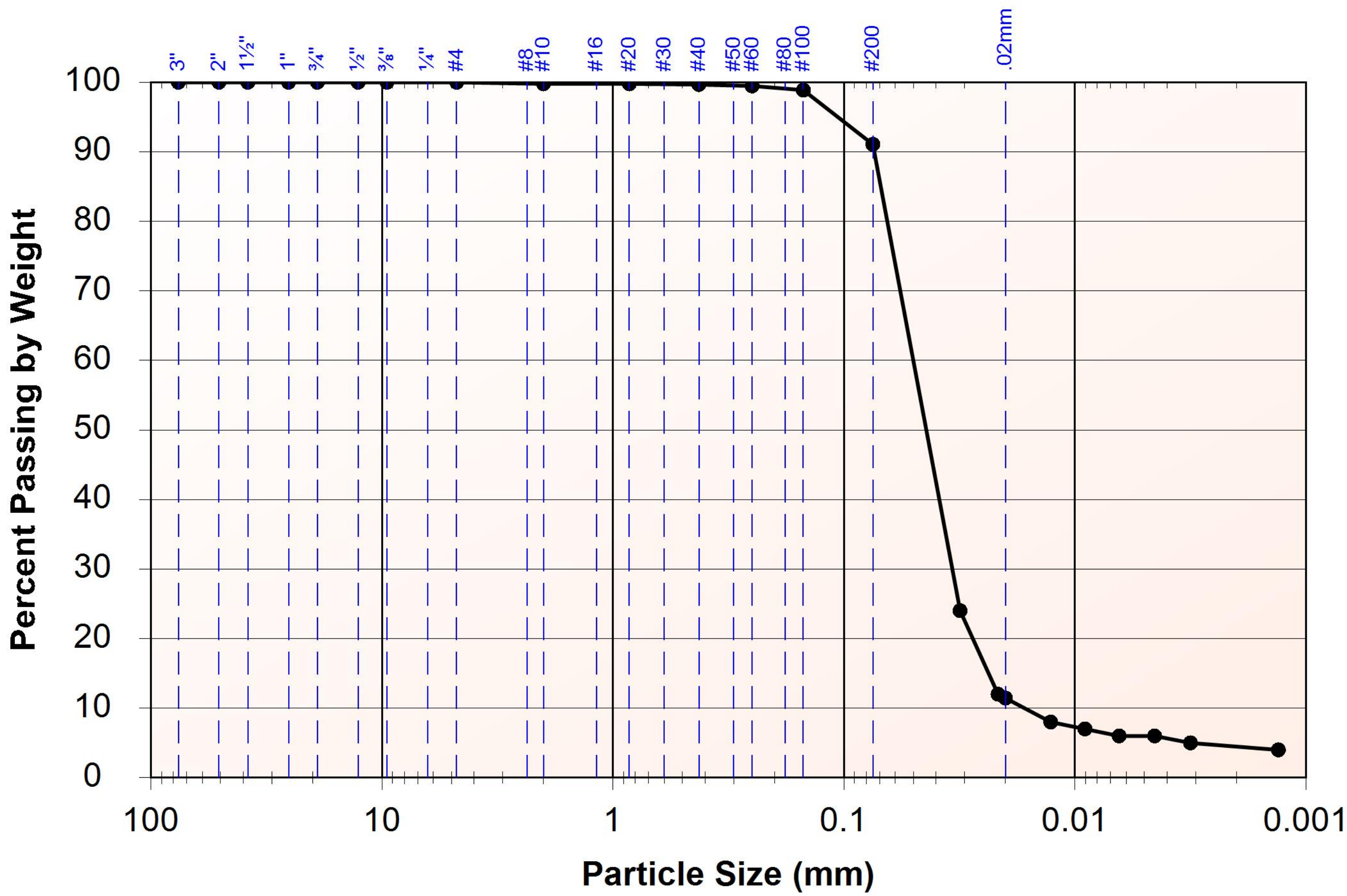
ASTM D422

Lab Number	2016-333
Received	5/23/2016
Reported	6/3/2016

Location: PA03 Sample ANC-PA03 4/8/2016 1559

Engineering Classification: Silt, ML

Frost Classification: F4



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	100%	
¾"	100%	
½"	100%	
⅜"	100%	
#4	100%	
#10	100%	
Total Weight of Sample 309.6g		
#20	100%	
#40	100%	
#60	99%	
#100	99%	
#200	91.1%	
Total Weight of Fine Fraction 99.7g		
0.02 mm	11.5%	

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Client: US Army Corps of Engineers
Project: Harbors
Work Order: A34689

Particle Size Distribution

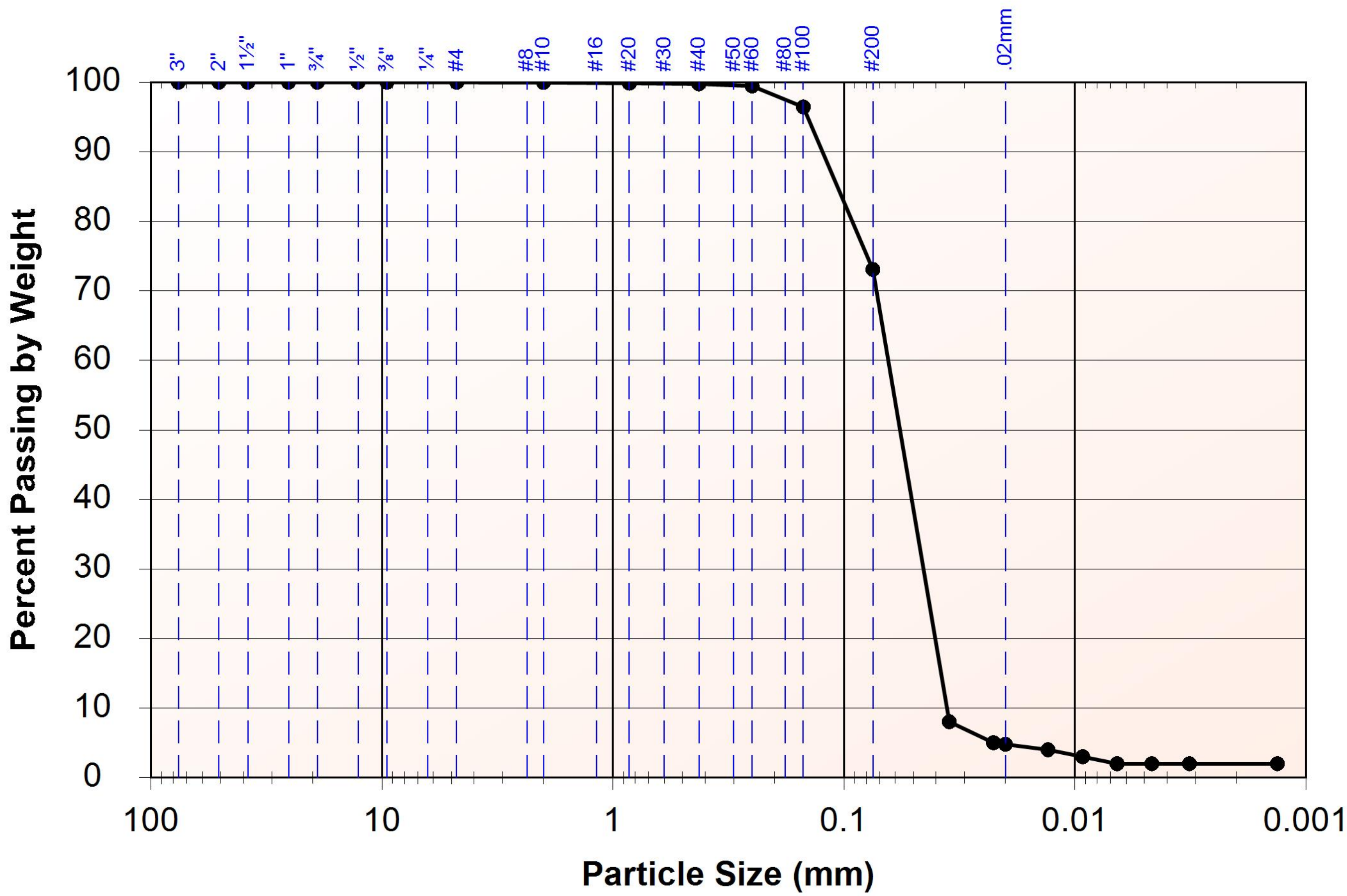
ASTM D422

Lab Number	2016-332
Received	5/23/2016
Reported	6/3/2016

Location: BKG04 Sample ANC-BKG04 4/8/16 1527

Engineering Classification: Silt with Sand, ML

Frost Classification: F4



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	100%	
¾"	100%	
½"	100%	
⅜"	100%	
#4	100%	
#10	100%	
Total Weight of Sample 1289.4g		
#20	100%	
#40	100%	
#60	99%	
#100	96%	
#200	73.1%	
Total Weight of Fine Fraction 99.3g		
0.02 mm	4.8%	

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DOWL

Client: US Army Corps of Engineers
Project: Harbors
Work Order: A34689

Particle Size Distribution

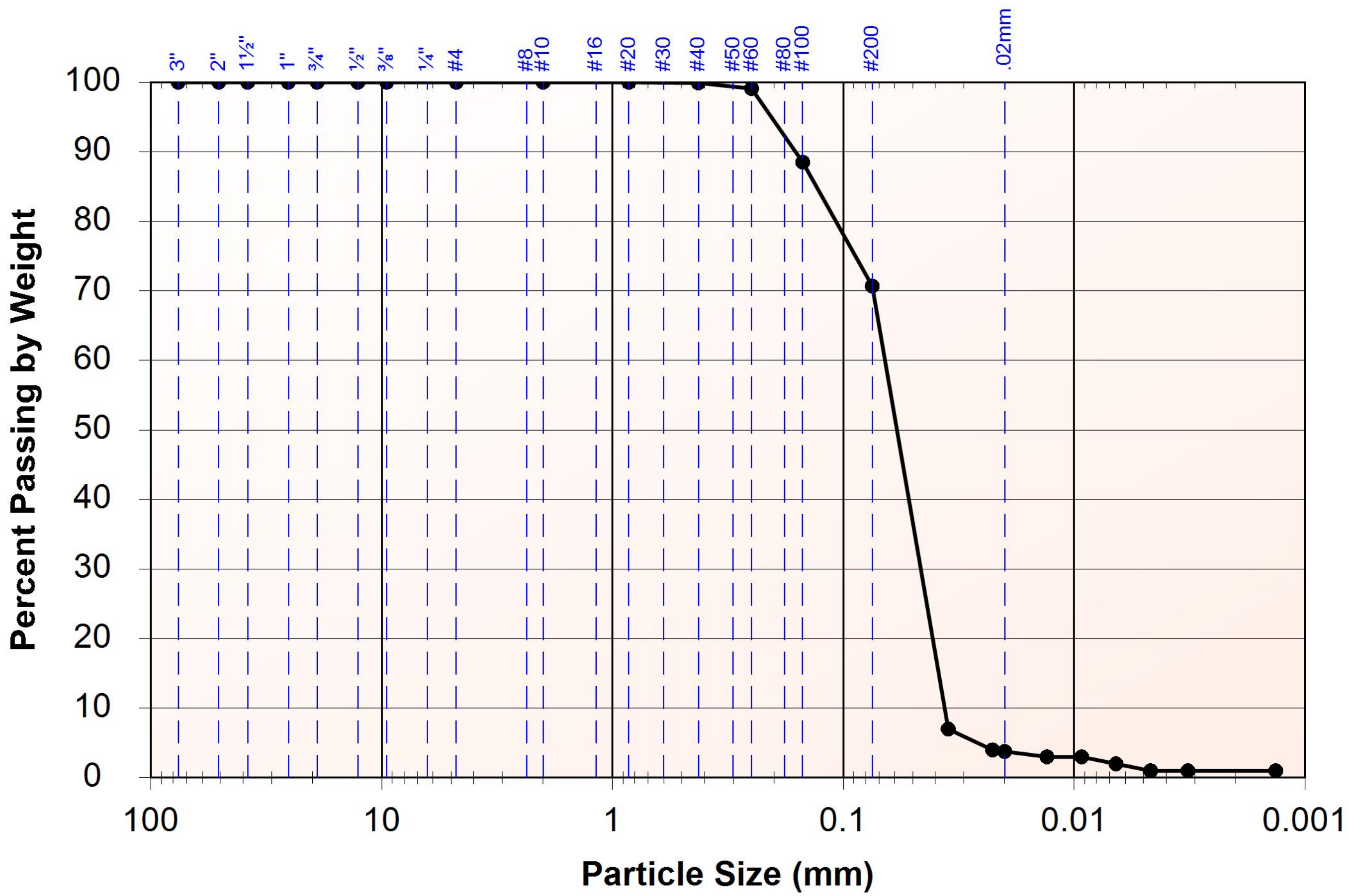
ASTM D422

Lab Number	2016-331
Received	5/23/2016
Reported	6/3/2016

Location: BKG02 Sample:ANC-BKG02 4/8/16 1505

Engineering Classification: Silt with Sand, ML

Frost Classification: F4



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	100%	
¾"	100%	
½"	100%	
⅜"	100%	
#4	100%	
#10	100%	
Total Weight of Sample 224.7g		
#20	100%	
#40	100%	
#60	99%	
#100	88%	
#200	70.7%	
Total Weight of Fine Fraction 100g		
0.02 mm	3.8%	

Appendix C

ADEC Data Quality Checklists

Laboratory Data Review Checklist

Completed by: Mike Utley

Title: Chemist | Date: January 19, 2017

CS Report Name: Anchorage Harbor | Report Date: January 20, 2017

Consultant Firm: US Army Corps of Engineers

Laboratory Name: SGS Environmental Services | Laboratory Report Number: 1161744

ADEC File Number: NA | ADEC RecKey Number: NA

1. Laboratory
   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
      ☒Yes ☐No ☐NA (Please explain.) Comments:

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?
      ☐Yes ☐ No ☒NA (Please explain.) Comments:

      Samples were not transferred to another laboratory.

2. Chain of Custody (COC)
   a. COC information completed, signed, and dated (including released/received by)?
      ☒Yes ☐No ☐NA (Please explain.) Comments:

   b. Correct analyses requested?
      ☒Yes ☐No ☐NA (Please explain.) Comments:

3. Laboratory Sample Receipt Documentation
   a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
      ☒Yes ☐No ☐NA (Please explain.) Comments:

      Samples arrived at the laboratory with a temperature of 5.8° C in one cooler (ANCHBR-01)

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?
      ☒Yes ☐No ☐NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
☐ Yes ☐ No ☒ NA (Please explain.) Comments:

MS/MSD analysis was requested on sample 16-ANC-BKG03, but lab ran MS/MSD on 16-ANC-BKG01 instead.

e. Data quality or usability affected? (Please explain.)
Comments:

Since BKG01 and BKG03 received the same analyses, this discrepancy does not impact data quality or usability.

4. Case Narrative

a. Present and understandable?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

b. Discrepancies, errors or QC failures identified by the lab?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

c. Were all corrective actions documented?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

d. What is the effect on data quality/usability according to the case narrative?
Comments:

For nearly all the deviations, laboratory narrative indicates that results are not impacted, either due to a CCV biased high associated with nondetect sample results or a hit on an instrument blank which is associated with a nondetect method blank result.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

b. All applicable holding times met?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

c. All soils reported on a dry weight basis?
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?
☐ Yes ☒ No ☐ NA (Please explain.) Comments:

The LOD for 4,4'-DDT was above the project screening limit in one sample;
the LOD for Heptachlor was above the project screening limit for all samples;
and the LOD for Hexachlorobutadiene was above the project screening limit in two samples.

e. Data quality or usability affected?
Comments:

This data cannot be used to prove the definitive absence of the above compounds at the project screening limits.

6. <u>QC Samples</u>
   a. Method Blank
      i. One method blank reported per matrix, analysis and 20 samples?
      ☒ Yes ☐ No ☐ NA (Please explain.) Comments:

      ii. All method blank results less than PQL?
      ☒ Yes ☐ No ☐ NA (Please explain.) Comments:

      iii. If above PQL, what samples are affected?
      Comments:

No deviations noted.

      iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?
      ☐ Yes ☐ No ☒ NA (Please explain.) Comments:

No deviations noted.

v. Data quality or usability affected? (Please explain.)

Comments:

No deviations noted.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

☐ Yes ☒ No ☐ NA (Please explain.) Comments:

An LCS was not analyzed for Toxaphene. A MS and MSD was not run for Toxaphene, GRO, DRO, or RRO.

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

☐ Yes ☒ No ☐ NA (Please explain.) Comments:

A duplicate was not run for metals or Total Solids.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

☐ Yes ☒ No ☐ NA (Please explain.) Comments:

LCS: All recoveries met requirements. MS/MSD: Antimony recovered slightly below QSM acceptance limits. Chloroethane recovered above QSM acceptance limits. 4,4'-DDT and Methoxychlor did not recover in the MS/MSD due to sample dilution (spike amount was diluted beyond quantification range.)

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

☐ Yes ☒ No ☐ NA (Please explain.) Comments:

Analytes 1,2,3-trichlorobenzene, naphthalene, and trichlorofluoromethane all exceeded the MS/D RPD limits of 20%.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

LCS failures impact all samples in the batch. MS/MSD failures impact only the primary sample (the sample that was spiked).

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☐ Yes ☐ No ☒ NA (Please explain.) Comments:

Toxaphene is a multi-component compound that requires multiple analyses to quantify with other pesticides. For this reason, regulators typically accept a valid calibration and analysis of a calibration standard to verify control, and do not require a separate LCS. Therefore, results are not further flagged.
GRO/DRO/RRO are all analyzed in an LCS and LCSD, so precion in the batch can be evaluated. Results are not further flagged.
The lack of a duplicate for metals does not impact data usability, as precision can be evaluated from the MS/MSD. Results are not further flagged.
Antimony recovered slightly below QSM acceptance limits in the MSD. However, the LCS, the MS, and the post digest spike all recovered within QSM limits; therefore, this deviation is deemed an anomoly, and antimony results are not further flagged.
Chloroethane recovered above QSM acceptance limits in the MS and the MSD, but this compound was not detected in the original sample; therefore, results are not impacted by this deviation and are not further qualified.
Methoxychlor and 4,4'-DDT did not recover in the MS and the MSD; however, these compounds were reported at a 20X dilution, which effectively diluted out the injected spike. Since accurate recovery for these compounds is exhibited in the LCS for this batch, results are not further qualified.
1,2,3-trichlorobenzene, naphthalene, and trichlorofluoromethane exceeded the RPD limits in the MS/MSD; however, all imapcted results are nondetect and are not further flagged.

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

Data quality is not imapcted by the devations noted above.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

☐ Yes ☐ No ☒ NA (Please explain.) Comments:

No deviations noted.

iv. Data quality or usability affected? (Use the comment box to explain.)

Comments:

No deviations noted.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)

☒Yes ☐No ☐NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

☒Yes ☐No ☐NA (Please explain.) Comments:

iii. All results less than PQL?

☐Yes ☒No ☐NA (Please explain.) Comments:

Vinyl chloride and GRO were detected in the trip blank associated with this SDG.

iv. If above PQL, what samples are affected?

Comments:

No samples are impacted, as vinyl choride and GRO were not detected in the project samples.

v. Data quality or usability affected? (Please explain.)

Comments:

Data quality/usability are not affected by this deviation.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

☒Yes ☐No ☐NA (Please explain.) Comments:

ii. Submitted blind to lab?

☒Yes ☐No ☐NA (Please explain.) Comments:

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

$$RPD\ (\%) = \text{Absolute value of: } \frac{(R_1 - R_2)}{((R_1 + R_2)/2)} \times 100$$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☒Yes ☐No ☐NA (Please explain.) Comments:

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

No deviations noted.

f. Decontamination or Equipment Blank (If not used explain why).

☐Yes ☒No ☐NA (Please explain.) Comments:

Sample equipment was rinsed and used on site.

i. All results less than PQL?

☐Yes ☐No ☒NA (Please explain.) Comments:

Not applicable.

ii. If above PQL, what samples are affected?

Comments:

Not applicable

iii. Data quality or usability affected? (Please explain.)

Comments:

Not applicable

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

   a. Defined and appropriate?

      ☒ Yes   ☐ No   ☐ NA (Please explain.)   Comments:

Laboratory Data Review Checklist

Completed by: Mike Utley

Title: Chemist   Date: February 06, 2017

CS Report Name: Anchorage Harbor   Report Date: February 07, 2017

Consultant Firm: US Army Corps of Engineers

Laboratory Name: SGS Environmental Services   Laboratory Report Number: 1165441

ADEC File Number: NA   ADEC RecKey Number: NA

1. Laboratory
   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
      ☒Yes ☐No ☐NA (Please explain.)   Comments:

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?
      ☐Yes ☐No ☒NA (Please explain.)   Comments:

      Samples were not transferred to another laboratory.

2. Chain of Custody (COC)
   a. COC information completed, signed, and dated (including released/received by)?
      ☒Yes ☐No ☐NA (Please explain.)   Comments:

   b. Correct analyses requested?
      ☒Yes ☐No ☐NA (Please explain.)   Comments:

3. Laboratory Sample Receipt Documentation
   a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
      ☐Yes ☒No ☐NA (Please explain.)   Comments:

      Samples in Cooler "SECOND" were rec'd at 0.9° C. However, no indications of ice were present in the receipt documents. Data usability is not impacted by this deviation.

b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

Lab noted temperature of receipt on COC and receiving documents.

e. Data quality or usability affected? (Please explain.)

Comments:

No indications of ice were present in the receipt documents. Data usability is not impacted by the temperature deviation.

4. Case Narrative

a. Present and understandable?

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

b. Discrepancies, errors or QC failures identified by the lab?

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

c. Were all corrective actions documented?

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

d. What is the effect on data quality/usability according to the case narrative?

Comments:

For nearly all the deviations, laboratory narrative indicates that results are not impacted.

5. Samples Results
   a. Correct analyses performed/reported as requested on COC?
      ☒ Yes ☐ No ☐ NA (Please explain.) Comments:

   b. All applicable holding times met?
      ☒ Yes ☐ No ☐ NA (Please explain.) Comments:

   c. All soils reported on a dry weight basis?
      ☒ Yes ☐ No ☐ NA (Please explain.) Comments:

   d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?
      ☐ Yes ☒ No ☐ NA (Please explain.) Comments:

      The LOD for Hexachlorobutadiene was above the project screening limit in three of three samples.

   e. Data quality or usability affected?
      Comments:

      This data cannot be used to prove the definitive absence of the above compounds at the project screening limits. However, there is no reason to suspect the presence of this compound at this site.

6. QC Samples
   a. Method Blank
      i. One method blank reported per matrix, analysis and 20 samples?
      ☒ Yes ☐ No ☐ NA (Please explain.) Comments:

      ii. All method blank results less than PQL?
      ☒ Yes ☐ No ☐ NA (Please explain.) Comments:

      iii. If above PQL, what samples are affected?

      No deviations noted.

Comments:

iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?
☐ Yes ☐ No ☒ NA (Please explain.) Comments:

No deviations noted.

v. Data quality or usability affected? (Please explain.)
Comments:

No deviations noted.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)
☐ Yes ☒ No ☐ NA (Please explain.) Comments:

An LCS was not analyzed for Toxaphene.
A MS and MSD was not run for Toxaphene.

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?
☐ Yes ☒ No ☐ NA (Please explain.) Comments:

A duplicate was not run for metals or Total Solids.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)
☐ Yes ☒ No ☐ NA (Please explain.) Comments:

LCS: All recoveries met requirements.
MS/MSD: Antimony recovered slightly below QSM acceptance limits in the MS and MSD on sample 16-ANC-PA04.

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)
☐ Yes ☒ No ☐ NA (Please explain.) Comments:

LCS: All recoveries met precision requirements.
Analyte Endosulfan Sulfate exceeded the MS/D RPD limits of 20%.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

LCS failures impact all samples in the batch. MS/MSD failures impact only the primary sample (the sample that was spiked).

Comments:

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?
☒Yes ☐ No ☐NA (Please explain.) Comments:

Toxaphene is a multi-component compound that requires multiple analyses to quantify with other pesticides. For this reason, regulators typically accept a valid calibration and analysis of a calibration standard to verify control, and do not require a separate LCS. Therefore, results are not further flagged.
The lack of a duplicate for metals does not impact data usability, as precision can be evaluated from the MS/MSD. Results are not further flagged.
Antimony recovered slightly below QSM acceptance limits in the MS and MSD. Since the LCS recovered within limits (and a post digested spike was not reported), the primary result in the parent sample (16-ANC-PA04) is flagged "QL" to account for the decreased accuracy (low bias).
Endosulfan Sulfate exceeded the RPD limits in the MS/MSD; however, the impacted results are nondetect and are not further flagged.

vii. Data quality or usability affected? (Use comment box to explain.)
Comments:

Data quality is not imapcted as discussed above; antimony is the only flagged result. Antimony results were reported as nondetect at a level more than two orders of magnitude below the screening limit. Therefore, results are not significantly impacted by this deviation.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?
☒Yes ☐ No ☐NA (Please explain.) Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)
☐Yes ☒ No ☐NA (Please explain.) Comments:

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?
☒Yes ☐No ☒NA (Please explain.) Comments:

Sample 16-ANC-PA04 reported a surrogate below ADEC acceptance limits for method AK101 (42% vs 50% LCL).

iv. Data quality or usability affected? (Use the comment box to explain.)
Comments:

GRO was nondetect at 1.89 mg/kg in the sanple. The applicable Project Action limit is 230 mg/kg; therefore, data usability is not significantly impacted by this deviation.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)
☒Yes ☐No ☐NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)
☒Yes ☐No ☐NA (Please explain.) Comments:

iii. All results less than PQL?
☒Yes ☐No ☐NA (Please explain.) Comments:

iv. If above PQL, what samples are affected?
Comments:

Not applicable.

v. Data quality or usability affected? (Please explain.)
Comments:

Not applicable.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?
☒Yes ☐No ☐NA (Please explain.) Comments:

Sample 16-ANC-PA05 is a duplicate of 16-ANC-PA04.

ii. Submitted blind to lab?

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

$$RPD (\%) = \text{Absolute value of: } \frac{(R_1 - R_2)}{((R_1 + R_2)/2)} \times 100$$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

No deviations noted.

f. Decontamination or Equipment Blank (If not used explain why).

☐ Yes ☒ No ☐ NA (Please explain.) Comments:

Sample equipment was rinsed and used on site.

i. All results less than PQL?

☐ Yes ☐ No ☒ NA (Please explain.) Comments:

Not applicable.

ii. If above PQL, what samples are affected?

Comments:

Not applicable

iii. Data quality or usability affected? (Please explain.)

Comments:

Not applicable

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

   a. Defined and appropriate?

      ☒ Yes ☐ No ☐ NA (Please explain.) Comments:

Appendix D

Field Notebook

Rite in the Rain

ALL-WEATHER

FIELD

№ 351

Anchorage Harbor

16-046

INCH

1

2

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4

5

6

Rite in the Rain®
ALL-WEATHER WRITING PAPER

Name ______________________________

____

Address ______________________________

____

Phone ______________________________

Project ______________________________

____

____

____

CONTENTS

PAGE	REFERENCE	DATE

4/8/16 Anch. Harbor

0730 @ office, prep for sampling

Ⓐ

1300 arrive @ port

Ⓐ - picked up glassware (SGS)
prepped GPS.

1315 - Captain won't go North of Pt 04.
Never been up there
low tide
Considers unsafe.

Safety Mtg w/ USACE COR
Captain, Dock hand
(Names from QAR).

1400 - 1st grab - No Sample
just further north than planned
2nd - grab - No Sample
GPS coordinate saved.
No description

PG Fine sands silts

BKG07

Pt 1 - 61 17.206 (#7)
1422 149 51.924
1 x 500mL CG

Pt 2 => #8 GPS (furthest north)

1445 Can't get enough sample here. Cancel location

* where bottom is scoured, dredge cannot penetrate & no sediment is collected.

Move to Pt 3 (#6) BKG06
gradation sample here
Pt 3 on phone GPS isn't right.
Shallow pts are not working - No sample
Try deeper, still working
Pt 6 on map.

1505 61 16.835
149 52.885

Pt 5 - lotsa sample
N 61 16.426 + dup.
1515 W 149 52.831

Dt 4 61 16.336
149 52.880

1527 1 x 250 mL CG

Dt 4 A 61 15.833
149 53.065

1540 Gradation #2 +
250 mL AG.

Dredge Area

PA02
61 14.768
1550 149 53.459

Small Rocks
apparent.

PA03

1559 61. 14.643
149 53.134

2 x 250 mL
1 x 125 mL 8260
RIGHT ON DOCK
+ 422

DA01 61 14.236
1620 149 53.822

MTLS ONLY
1 x 250 mL

BYC 1->3

Can't get many
samples
current too fast

Plus lost Spring Pin

done @ 1644

9/13 Anchor HRB

1500 Don Johnson
(Dredge Captain)

Chris Hoffman, Mike Tolley
on dredge @ 1515

Collect single Sample while
dredging from dredging spoils.

=> only way to collect a
sample.

1520 - 1 x 4oz AG - AK101/8260
(MS/D) 2 x 8oz AG - MX/S/PAH
Pest /AK102/103

1530 - Duplicate -
1 x 4oz AG - AK101/8260
1 x 8oz AG - MX/S/PAH
Pest /AK102/103

1600 - done w/ project

Rite in the Rain

Appendix D
USFWS Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Anchorage Fish & Wildlife Field Office
4700 Blm Road
Anchorage, AK 99507
Phone: (907) 271-2888 Fax: (907) 271-2786

In Reply Refer To: April 14, 2022
Project Code: 2022-0031950
Project Name: Anchorage Harbor Maintenance Dredging

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, and proposed species, designated critical habitat, and some candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Please note that candidate species are not included on this list. We encourage you to visit the following website to learn more about candidate species in your area:

http://www.fws.gov/alaska/fisheries/fieldoffice/anchorage/endangered/candidate_conservation.htm

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Endangered Species: The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see:

https://www.fws.gov/birds/policies-and-regulations.php

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a Federal nexus) or a Bird/Eagle Conservation Plan (when there is no Federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see:

https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php

In addition to MBTA and BGEPA, Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at:

http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm
http://www.towerkill.com
http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

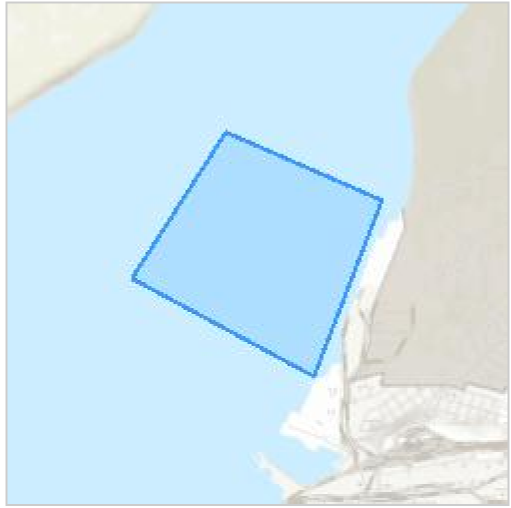
Anchorage Fish & Wildlife Field Office
4700 Blm Road
Anchorage, AK 99507
(907) 271-2888

Project Summary

Project Code:	2022-0031950
Event Code:	None
Project Name:	Anchorage Harbor Maintenance Dredging
Project Type:	Disposal Dredge Material
Project Description:	The Preferred Alternative consists of performing maintenance dredging to authorized depth in Anchorage Harbor and disposing of dredged material in the Anchorage Harbor open water disposal site. The USACE Alaska District proposes to perform maintenance dredging of the Anchorage Harbor basin to -35 feet MLLW and dispose of dredged material in the POA open water disposal area located 3,000 feet abeam of the main terminals. Dredging would be conducted April through November. Maintenance dredging quantities are highly variable in the harbor, with the volumes fluctuating between about 682,000 CY and 1,200,000 CY in the decade between 2011 and 2021. The 10-year mean volume from 2011 to 2021 was 967,154 CY. The dredging prism in the POA is a roughly trapezoidal shape occupying 266 acres with the shorter parallel segment extending in the east along 3,600 feet of pile supported dock and another 1,100 feet of North Extension bulkhead. The western margin of the dredging project is 8,000 feet long and lies about 1,800 feet from the face of the main terminal. Figure 4 depicts the proposed project footprint. The POA aquatic disposal site is a rectangular area of 320 acres beginning 1,200 feet beyond the western edge of the dredging prism. The water over the site is 70 to 100 feet deep and is subject to powerfully dispersive tidal currents. Surveys of the disposal area demonstrate dredged material does not accumulate. Dredged material would be transported to the disposal site by tug and barge, or by the dredge, in the case of a hopper dredge, in increments of approximately 1,500 CY. Two to four daily transits would be required for normal operations.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@61.24356925,-149.90554686412986,14z



Counties: Anchorage County, Alaska

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Short-tailed Albatross *Phoebastria (=Diomedea) albatrus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/433	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Black-legged Kittiwake *Rissa tridactyla* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Common Loon *gavia immer* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/4464	Breeds Apr 15 to Oct 31

NAME	BREEDING SEASON
Common Murre *Uria aalge* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Apr 15 to Aug 15
Red-breasted Merganser *Mergus serrator* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Red-necked Phalarope *Phalaropus lobatus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Red-throated Loon *Gavia stellata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Surf Scoter *Melanitta perspicillata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
White-winged Scoter *Melanitta fusca* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

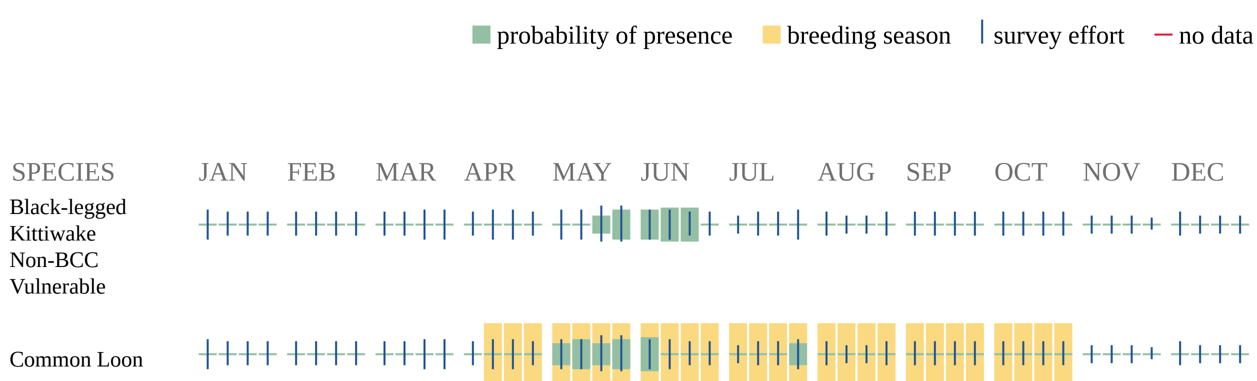
1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

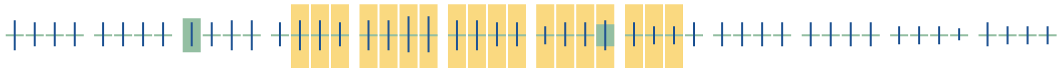
No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Non-BCC
Vulnerable

Common Murre
Non-BCC
Vulnerable



Red-breasted
Merganser
Non-BCC
Vulnerable

Red-necked
Phalarope
Non-BCC
Vulnerable

Red-throated Loon
Non-BCC
Vulnerable

Surf Scoter
Non-BCC
Vulnerable

White-winged
Scoter
Non-BCC
Vulnerable

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles)

potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

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