CHAPTER 3

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 ANALYSIS APPROACH

NEPA requires focused analysis of the areas and resources potentially affected by an action or alternative. It also indicates that an EA should consider, but not analyze in detail, those areas or resources not potentially affected by the proposal. Therefore, an EA should not be encyclopedic; rather, it should be succinct and focused. This EA focuses on those resources that would be affected by land acquisition, construction, and operation of the proposed Project at the POA.

CEQ regulations (40 CFR Parts 1500-1508) for NEPA also require an EA to discuss impacts in proportion to their significance and present only enough discussion of other than significant issues to show why more study is not warranted. The analysis approach in this EA considers the current conditions of the affected environment based upon best available information and compares those to conditions that might occur should the proposed action be implemented.

Evaluation and analysis of the potential impacts from the proposed action reveal that the construction and operation through 2025 of the Project is the major driver for potential impacts. Therefore, the affected environment for this EA centers principally on the area at and immediately adjacent to the POA. Due to projections relating to truck traffic outside the POA, the analysis also focuses on traffic and air emissions in the adjacent area of the community. Socioeconomics effects also are examined for the entire Anchorage area.

Table 3-1 presents the results of the process of identifying the resources considered in this EA. Three major categories – Physical, Natural, and Human – subsume 16 resources warranting analysis. Physical resources analyzed include air quality, noise, hazardous materials and waste, and safety. Natural resources are comprised of geology and soils, hydrodynamics and sedimentation, water quality, biological resources (vegetation, fisheries, wildlife, and special status species), and EFH. The category of Human resources addresses land use and coastal zone consistency, recreation and visual resources, transportation, 4(f)/106 resources, public services and utilities, socioeconomics and environmental justice, and cultural resources. Each of these resources has the potential to be affected by one or more components of the proposed Project.

Table 3-1 Resources Assessed in the Environmental Analysis		
	Project Components	
Categories/Resources	**Construction**	**Operations**
Physical Resources		
Air Quality	✓	✓
Noise	✓	✓
Hazardous Materials and Waste	✓	✓
Safety	✓	✓
Natural Resources		
Geology and Soils	✓	
Hydrodynamics and Sedimentation	✓	✓
Water Quality	✓	✓
Biological Resources	✓	✓
EFH	✓	✓
Human Resources		
Land Use and Coastal Zone Consistency	✓	✓
Recreation and Visual Resources	✓	✓
Transportation/Traffic	✓	✓
4(f)/106 Resources	✓	✓
Public Services and Utilities	✓	✓
Socioeconomics and Environmental Justice	✓	✓
Cultural Resources	✓	✓

3.2 PHYSICAL RESOURCES

3.2.1 Air Quality

Air quality in a given location is defined by the concentration of various pollutants in the atmosphere. A region's air quality is influenced by many factors including the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions.

The significance of the concentration of a particular pollutant is determined by comparing it to the federal and state ambient air quality standards. The Clean Air Act (CAA) and its subsequent amendments established the National Ambient Air Quality Standards (NAAQS) for seven "criteria" pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter of less than ten microns in diameter (PM_{10}), particulate matter of less than 2.5 microns ($PM_{2.5}$), and lead (Pb). These standards (Table 3-2) represent the maximum allowable atmospheric concentrations that may occur while ensuring protection of public health and welfare, with a reasonable margin of safety. Short-term standards (1-, 8-, and 24-hour periods) are established for pollutants contributing to acute health effects, while long-term standards (quarterly and annual averages) are established for pollutants contributing to chronic health effects. The ADEC adopted the NAAQS as the standards for the state.

Table 3-2 Alaska and NAAQS[a]

CRITERIA POLLUTANT	*AVERAGING TIME*	*PRIMARY*[b,c]	*SECONDARY*[d]
O_3	1 Hour	0.12 ppm[e]	Same as Primary
	8 Hours	0.08 ppm	
CO	8 Hours	9.0 ppm	None
	1 Hour	35 ppm	
NO_2	Annual Arithmetic Mean	0.053 ppm	Same as Primary
SO_2	Annual Arithmetic Mean	0.03 ppm	None
	24 Hours	0.14 ppm	
	3 Hours	---	0.5 ppm
PM_{10}	Annual Arithmetic Mean	50 µg/m[3e]	Same as Primary
	24 Hours	150 µg/m³	
$PM_{2.5}$[f]	Annual	15 µg/m³	Same as Primary
	24 Hours	65 µg/m³	---
Pb	Quarterly Arithmetic Mean	1.5 µg/m³	Same as Primary

Notes a: These standards, other than for ozone and those based on annual averages, must not be exceeded more than once per year. The ozone standard is attained when the expected number of days per calendar year with a maximum hourly average concentration above the standard is equal to or less than one.
b: Concentration is expressed first in units in which it was adopted and is based upon a reference temperature of 25 °C and a reference pressure of 760 mm of mercury. All measurements of air quality must be corrected to a reference temperature of 25 °C and a reference pressure of 760 mm of Hg (1,013.2 millibars); ppm in this table refers to ppm by volume, or micromoles of regulated air pollutant per mole of gas.
c: National primary standards are the levels of air quality necessary, with an adequate margin of safety, to protect the public health.
d: National secondary standards are the levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a regulated air pollutant.
e: ppm = parts per million by volume, µg/m³ = micrograms per cubic meter.
f: Currently under review by the U.S. Supreme Court.

Based on measured ambient criteria pollutant data, the U.S. Environmental Protection Agency (USEPA) designates all areas of the United States as having air quality better than (attainment) or worse than (nonattainment) the NAAQS. Although a part of Anchorage previously was designated as a nonattainment area for CO, Anchorage now meets the NAAQS for all criteria pollutants. On July 23, 2004, the USEPA approved the State of Alaska CO maintenance plan for the Anchorage nonattainment area and redesignated the Anchorage area from nonattainment to attainment (USEPA 2004a).

Affected Environment

The location of the proposed Project lies approximately 1.5 to 2 miles north of downtown Anchorage, within the Anchorage Bowl (refer to Figure 1-1). Anchorage enjoys relatively good air quality, with levels of most pollutant emissions within required standards. However, the MOA historically experiences elevated CO concentrations during the winter months, resulting primarily from incomplete combustion of fossil fuels. Table 3-3 presents total annual emissions of pertinent pollutants for the Anchorage area. Included with these totals are emissions generated by the POA.

Table 3-3 Total Pollutant Emissions in the Anchorage Area (tons/year)

	CO	*VOCs*[1]	*NO_x*	*SO_x*	*PM_{10}*
TOTAL	123,883	5,764	10,740	920	19,856

[1] *Volatile Organic Compounds*
Source: USEPA 2000

In Anchorage, like many urban areas, cars and trucks form the predominant sources of CO emissions, contributing 75 percent of the annual CO inventory (MOA 2001b). Low winter temperatures cause inefficient engine operation and result in higher winter emissions. Idling emissions also contribute significantly to CO emissions during the winter, because Anchorage drivers spend a considerable amount of time warming-up their vehicles before driving. Further, cold winter temperatures, coupled with shape of the Anchorage Bowl, result in winter temperature inversions that trap the pollutants close to the ground. These winter inversion episodes produce the conditions during which the Anchorage area has experienced CO pollution problems in the past. A portion of Anchorage was formerly designated as a nonattainment area for CO (Figure 3-1), but was reclassified as an attainment area in July 2004. This area included downtown Anchorage, Ted Stevens Anchorage International Airport, and locations as far south as O'Malley Road and east to Muldoon Road. The northern boundary extended westward along the Glenn Highway to about Pine Street, then continued in a straight westward line to the Knik Arm on the northern side of the Ship Creek Basin, approximately 0.5 mile south of the POA limits. This area is now a maintenance area for CO.

In addition, the community of Eagle River, which is a part of the MOA, lies ten miles north of downtown Anchorage but is still within the bowl. Emissions from Eagle River have contributed to air pollution problems associated with PM_{10}. PM_{10} emissions commonly result from dust that is often associated with unpaved roads, construction, and other soil exposing activities. Given the substantial distance between the POA and Eagle River within the Anchorage Bowl, no aspects of the Project (i.e., the fill phase of construction operations) would have the potential to affect air emissions in Eagle River. However, MOA representatives did express concern about the amount of PM_{10} that could be generated during construction. Therefore, given that a substantial portion of Anchorage has been recently redesignated as in attainment for CO and because of expressed concerns by MOA officials regarding PM_{10}, impacts associated with those two pollutants are evaluated in detail in this EA.

The action to redesignate the Anchorage nonattainment area to attainment for CO is based on monitoring data and projections of ambient air quality in the maintenance plan. Air quality data show no recorded

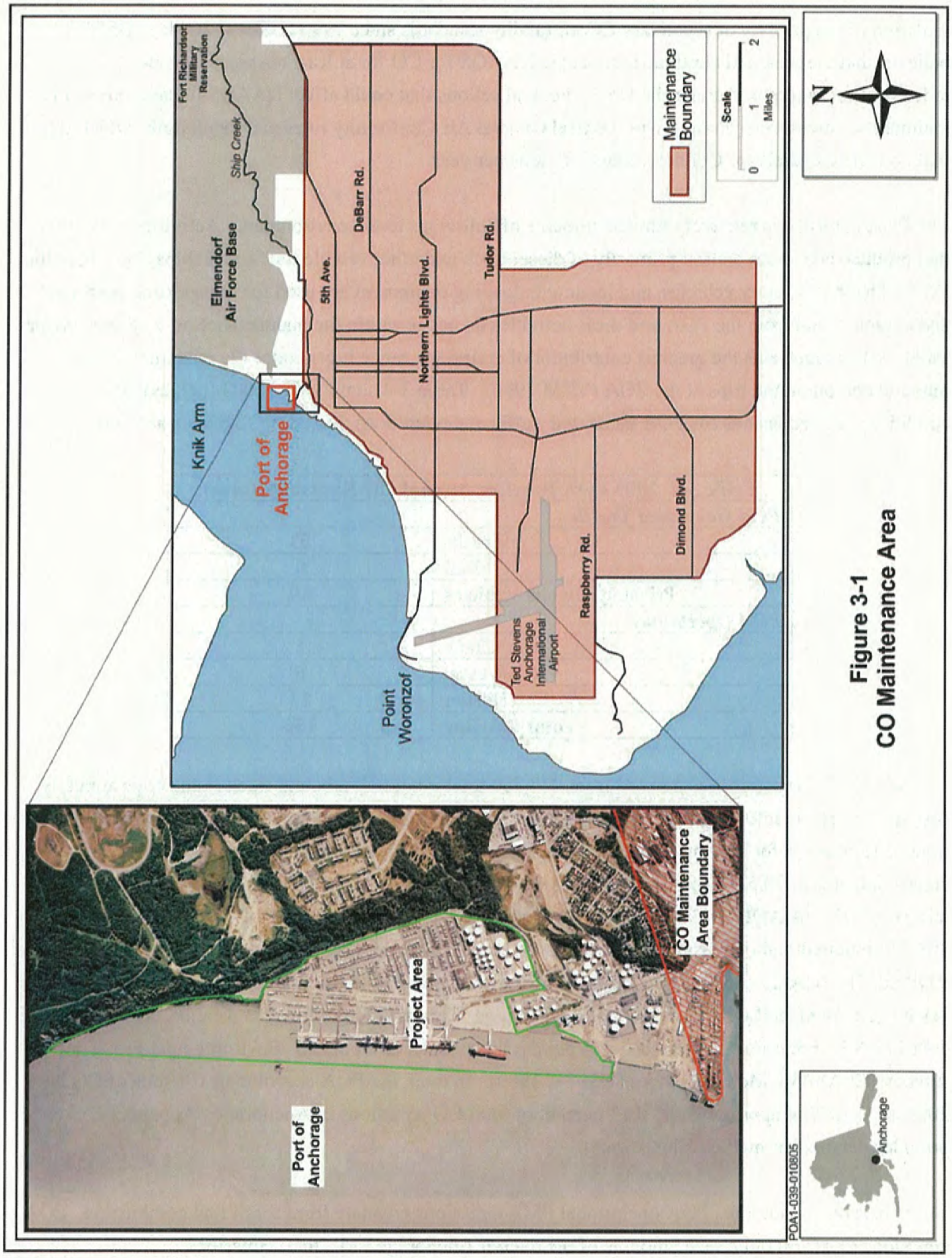


Figure 3-1
CO Maintenance Area

violation of the primary or secondary CO air quality standards since 1996 (USEPA 2004a). USEPA believes that the area will continue to meet the NAAQS for CO for at least ten years beyond this redesignation as required under the CAA. Federal actions that could affect NAAQS nonattainment or maintenance areas must comply with Federal General Air Conformity rules and regulations, which state that *de minimis* levels for CO not exceed 100 tons per year.

The POA contributes relatively limited amounts of emissions to the environment. Activities at the POA that produce emissions consist primarily of diesel truck and other vehicle traffic and ships docking at the POA. The trucks, other vehicles, and loading/unloading equipment are used for transporting personnel and cargos to and from the POA and these activities do occur within the maintenance area. Semi-tractor trailer traffic represents the greatest contributor of emissions, since it generates the most numerous inbound and outbound trips at the POA (VZM 1996). Table 3-4 summarizes 2003 (i.e., existing conditions) CO emissions for POA generated traffic and operations, including ship calls and uses.

Table 3-4 2003 POA Baseline Annual CO Emissions (tons)	
POA Generated Traffic	
Trucks	63
Rail	0
Privately Owned Vehicles	69
POA Operations	
Crane	5
Vessel	6
Hostler	13
Total Baseline	**156**

The baseline information was derived from 277,700 total inbound/outbound truck round-trips annually (using 2003 traffic information, there are an estimated 5,340 per-week truck trips). Assuming an idle time of 15 minutes for loading or unloading, ten miles roundtrip within the maintenance area, and an emission factor of 20.51 grams per mile for heavy duty trucks, the total contribution for trucks was 63 tons of CO (MOA AQP 2003). Privately owned vehicles contributed 69 tons of CO in 2003 based on 303,576 inbound/outbound round-trips, within an estimated ten miles of the CO maintenance area (MOA AQP 2003). POA operations contributed 24 tons of CO from crane loading/unloading (five tons), marine vessels (six tons), and yard hostler transfer operations (13 tons). Ship estimates were based on 491 vessel calls in 2003. Emissions factors (per ship per day) were derived from U.S. Environmental Protection Agency (EPA)-450, Mobile Sources (USEPA 1989). In total, the POA contributed 156 tons of CO in 2003, representing approximately 0.13 percent of total CO emissions in Anchorage. Appendix C provides detailed air quality calculations.

Under baseline conditions, POA operational PM_{10} emissions emanate from fossil fuel combustion. POA emissions represent only trace amounts of the overall Anchorage PM_{10} total emissions.

Environmental Consequences

Proposed Action

<u>The Preferred Alternative/Alternative A</u>

The air quality analysis for Alternative A quantifies the changes (increases and decreases) due to the Project activities that would include demolition, fill transport, dock construction, and construction-related travel of trucks and privately owned vehicles. The CAA prohibits federal agencies from supporting activities that do not conform to the State Implementation Plan (SIP) that has been approved by the USEPA. To assess the effects of the proposed action, analysis must include direct and indirect emissions from all activities that would affect the regional air quality. Emissions from a proposed action are either "presumed to conform" (based on emissions levels which are considered not significant in the context of overall regional emissions) or must demonstrate conformity with approved SIP provisions.

Emissions from Alternative A would include both temporary demolition/construction and permanent operational emissions. Demolition, fill, transport, dock construction, and construction travel-related emissions associated with the proposed action focus on CO and PM_{10} emissions. Traffic related to the Project would occur in an area of Anchorage designated by the USEPA as being a maintenance area for CO. There also could be the potential to elevate PM_{10} levels within the Anchorage Bowl during fill activities. Emissions for the Project are evaluated for a construction year in which all activities (demolition, fill, transport, dock construction) would take place during a construction season and therefore, would have the greatest potential for generating CO and PM_{10} emissions. Total *additional* Project CO emissions of 100 tons (above the 156 tons generated in baseline) would be considered as exceeding the general conformity levels for a maintenance area, and 100 tons of PM_{10} would be the threshold for an attainment area, as stipulated in the SIP. Even though analysis and general conformity levels are based on annual totals, it should be recognized that the construction and generation of most of the pollutants would occur during the summer and not during the winter when CO levels are highest.

Emissions were calculated using heavy-duty diesel construction equipment (e.g., trucks, barges, backhoes, pile drivers, tugboats, and trains). Appendix C provides details on the type of equipment and emission factors used in the calculations. Construction emissions estimates were based on the following conservative assumptions for the most likely maximum construction year. It assumes that demolition, fill, and construction would occur in the same season. Estimates of the length of time to conduct each activity were based on these activities taking place in Area 5, the largest construction area (35 acres in size). Demolition of the existing dock would take approximately 70 days using a bulldozer, backhoe, and dump truck. Fill activities would occur during a 137-day (or about five months) time period. Fill transport would occur for a total of 137 days using one train and two barges per day. In addition, 160 trucks per day (one truck for every six minutes) would bring fill to the POA for nine days. Dock construction would include a barge-mounted vibratory pile driver for 128 days, with concurrent dredging activities using two dredges, two hopper barges, and two tugboats for 130 days. Compaction of fill (using a barge-mounted pile driver or vibro hammer) would take place for approximately 60 days. Other construction and improvements would occur in other construction years, however, the length of time and the types and numbers of equipment required to conduct those activities are not expected to exceed those analyzed and, if emissions remained below those levels found in the analysis, it can be assumed that the Project construction emissions would remain in conformity with the SIP during all years of construction.

Table 3-5 summarizes CO emissions during the demolition, fill, dock construction, and construction travel-related activities in the maximum construction year for Alternative A. Construction emissions in other years would be approximately 15 to 35 percent less per year based on size of the construction area to be filled, with the smallest amount probably occurring during construction of Area 1. Construction emissions in the last year of construction would be less than half the total of the maximum year because they would be derived primarily from backland improvements and not from filling or demolition. Operations information was derived from projected transportation increases based on increases in cargo through the POA. However, the number of vessels projected in future years is a conservative figure. Fewer vessels may call at the POA due to larger ship sizes and the ability to carry more cargo. Table 3-5 provides a summary of the estimated CO emissions from POA-generated traffic and operations emissions from 2010, 2015, 2020, and 2025.

Table 3-5 Projected CO Emissions Contributions (Tons/Year)

	Maximum Construction Year /2010 Operations	*2015*	*2020*	*2025*
Construction	73	0	0	0
Truck	3	10	18	26
Rail	1	1	1	2
Privately Owned Vehicles	15	24	33	44
Operations				
Crane	1	1	2	3
Vessel	1	2	2	3
Hostler	2	4	5	7
Total Contribution	**96**	**42**	**61**	**85**

Source: Mobile 6.6 Mobile Source Emission Factor Model (MOA AQP 2003).

Under Alternative A, impacts to air quality for construction associated with demolition, fill transport, dock construction, and construction related traffic, combined with projected POA operations and traffic would be short-term; no long-term increases in emissions would occur. While CO and PM_{10} emissions during the construction period (Years 1 through 7) would increase, they would be below the regional CO threshold and, therefore, would not be regionally significant.

Under Alternative A, total CO emissions from the Project in the maximum construction year and POA-generated traffic and operations in 2010 (the year when operations coinciding with construction likely would be the highest) would be 96 tons, below the *de minimis* level of 100 tons established by the federal general conformity rule and SIP. Total CO emissions from both construction and POA operations and traffic from 2005 to 2025 would not exceed 96 tons in any single year and would not exceed federal general conformity CO levels. Therefore, emissions generated from the Project would not have a significant adverse impact on air quality standards in a maintenance area. Projected PM_{10} emissions for fill activities would total 71.4 tons in the maximum construction year, below *de minimus* levels of 100 tons established by the USEPA for areas in attainment for this criteria pollutant. In addition, BMPs would be implemented during construction to further reduce PM_{10} emissions from construction activities. Therefore, PM_{10} emissions generated during fill activities should not present significant adverse impacts to the air quality under Alternative A.

Alternative B

Under the same calculation procedures as for Alternative A, construction emissions during a maximum construction year under Alternative B would be less than 73 tons. Combined with CO emissions for POA operations and traffic through 2025, total CO emissions would not exceed 96 tons in any one year, and would not exceed federal general conformity CO levels. PM_{10} levels would be less than 71 tons, below *de minimus* standards of 100 tons. In addition, BMPs would be implemented during construction to further reduce PM_{10} emissions from construction activities. Therefore, no significant adverse impacts would result to air quality from Project activities.

Alternative C

Using the same calculation procedures as for Alternative A, construction emissions during a maximum construction year under Alternative C would be less than 73 tons. Combined with CO emissions for POA operations and traffic through 2025, total CO emissions would not exceed 96 tons in any one year, and would not exceed federal general conformity CO levels. PM_{10} levels would be less than 71 tons, below *de minimus* standards of 100 tons. In addition, BMPs would be implemented during construction to further reduce PM_{10} emissions from construction activities. Therefore, no significant adverse impacts would result to air quality from Project activities.

No Action

POA operations would continue to increase as population and demand increases in Alaska. To maintain service at its current level, the POA would need to be repaired and maintained. As noted above, construction activities would include replacing all of the steel piles, replacing the cathodic protection system, and implementing deferred maintenance projects and ongoing maintenance programs. The no-action alternative would not provide environmental enhancements as included in the proposed action. Emissions from the no-action alternative would include both short-term demolition/construction and long-term operational emissions.

Construction. Demolition, dock construction, and other construction travel-related emissions associated with the no-action alternative focus on CO and PM_{10} emissions. Construction emissions estimates were based on assumptions for an average construction year described above (demolition and replacement of 400 feet of dock space and replacement of 166 steel piles, construction of dock area) over a 180-day construction season. CO emissions from demolition, pile replacement, and dock construction are estimated to total approximately 14 tons per year (Appendix C).

Operations. Estimated CO emissions from POA-generated traffic and operations emissions from 2010, 2015, 2020, and 2025 total 23, 41, 62, 85 tons, respectively. The similarity to the operations calculations for the proposed action is accounted for by the increase in trucks, ships, cars, and trains despite the lack of increase in capacity. Although idle times for trucks, trains, and vessels could increase under the no-action alternative, when there is a conflict in berth space, vessels are more likely to remain in a distant port than to wait for berth space to be available in the channel. However, emissions from vessels would not decrease over time through new technology because the POA would not be able to accommodate newer, larger ships with a requirement of -45-foot MLLW depths at berthing areas.

Total impacts to air quality for construction associated with demolition, pile replacement, and dock construction, combined with projected POA operations and traffic, would be short-term; no long-term increases in emissions would occur. Total CO emissions from construction and POA generated traffic and operations in 2010 (the year when operations coinciding with repair and maintenance activities likely would be the highest) would be 37 tons, below the *de minimis* level of 100 tons established by the federal general conformity rule and SIP. Total CO emissions from both repair and maintenance and POA operations and traffic from 2005 to 2025 would not exceed 85 tons in any single year and would not exceed federal general conformity CO levels. Therefore, emissions generated from the no-action alternative would not have a significant adverse impact on air quality standards in a maintenance area. Projected PM_{10} emissions would be similar to baseline, since fill of tidelands is not required for dock repair and pile replacement. Therefore, PM_{10} emissions would not result in significant adverse impacts to the air quality under the no-action alternative.

3.2.2 Noise

Air Transmitted Noise

Sound level is measured in units called decibels (dB). The dB system of measuring sound provides a simplified relationship between sound level and its perceived loudness to the human ear. The dB scale is logarithmic; therefore, sound level increases or decreases exponentially with each dB of change. For example, ten dB yields a sound level ten times more intense than one dB, while a 20-dB level equates to 100 times more intense, and a 30-dB level is 1,000 times more intense. When the basic dB unit is adjusted to correct for the relative frequency response of the human ear, the unit is referred to as the

"A-weighted' decibel (dBA). Figures 3-2 and 3-3 show various sound levels corresponding to typical sources, both indoor and outdoor.

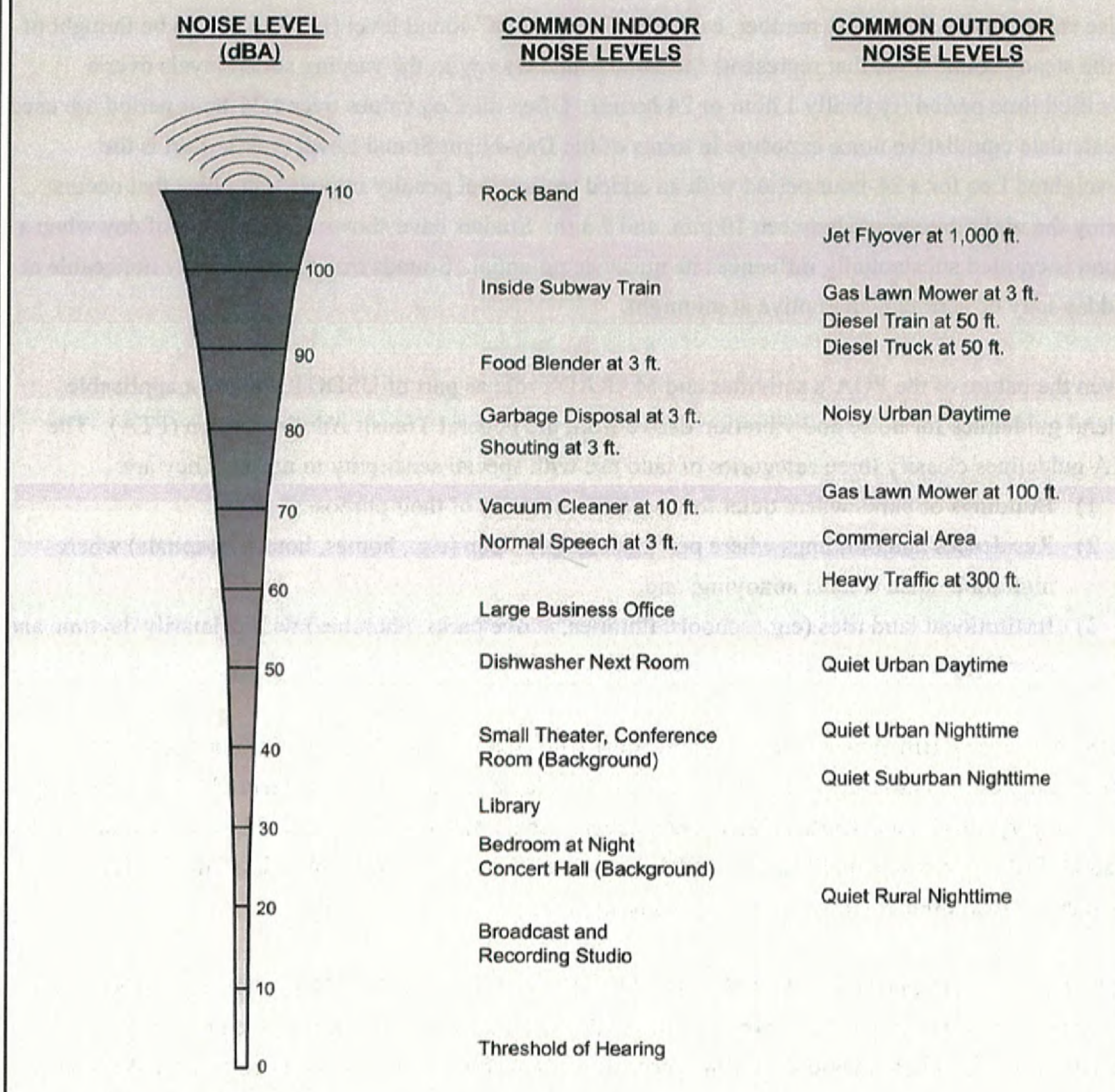
Because environmental noise fluctuates from moment to moment, it is common practice to describe the noise environment in a single number, called the "equivalent" sound level (Leq). Leq can be thought of as the steady sound level that represents the same sound energy as the varying sound levels over a specified time period (typically 1 hour or 24 hours). Often the Leq values over a 24-hour period are used to calculate cumulative noise exposure in terms of the Day-Night Sound Level (Ldn). Ldn is the A-weighted Leq for a 24-hour period with an added ten-decibel penalty imposed on noise that occurs during the night time hours between 10 p.m. and 7 a.m. Studies have shown that the time of day when a sound is emitted substantially influences its nuisance potential. Sounds that may be barely noticeable at midday may be seriously disruptive at midnight.

Given the nature of the POA's activities and MARAD's role as part of USDOT, the most applicable federal guidelines for noise and vibration derive from the Federal Transit Administration (FTA). The FTA guidelines classify three categories of land use with special sensitivity to noise. They are:

1) Buildings or parks where quiet forms a basic element of their purpose;
2) Residences and buildings where people normally sleep (e.g., homes, hotels, hospitals) where nighttime noise is most annoying; and
3) Institutional land uses (e.g., schools, libraries, active parks, churches) with primarily daytime and evening use.

Except for Cherry Hill Housing area on Elmendorf AFB, the POA neither includes nor abuts land assigned to any of these categories. Rather, as detailed later in this section, residential locations falling into Category 2 and parks (institutional areas) occur at some distance from the POA (approximately 1,500 to 2,000 feet). For residential locations, FTA guidelines characterize noise by using Ldn. Noise in Category 3 (institutional areas) locations are characterized with the Leq metric.

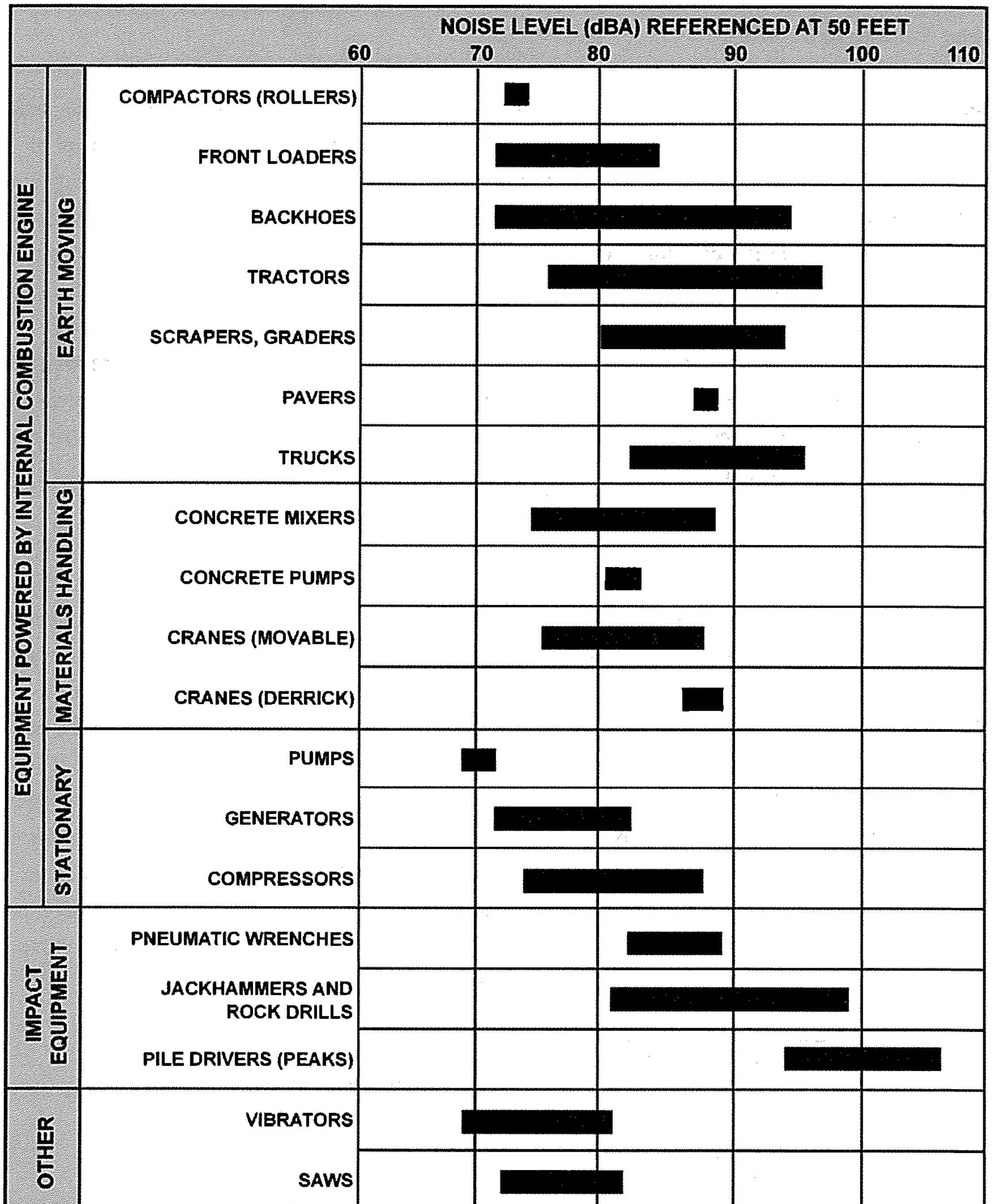
Anchorage also has a noise control ordinance (GAAB 16.85.010; AO No. 78-48) that establishes limits on construction noise depending upon the time of day and the zoning of the receiving property. The ordinance prohibits construction noise in excess of a Leq of 80 dBA during any one hour at or within a residential real property boundary or within a noise sensitive zone (e.g., hospitals) between the hours of 10:00 p.m. and 6:00 a.m. during the construction season (April 1 through October 31). It also prohibits creating a "noise disturbance" in a residential area between 10:00 p.m. and 6:00 a.m. However, the MOA may grant noise exemption permits if the applicant demonstrates that the compliance of this statute would "constitute an unreasonable hardship" on the applicant or the community.



Source: Caltrans Noise Manual, California Department of Transportation, March, 1980

POA1-025-010805

Figure 3-2
Common Noise Levels



NOTE: Based on limited available data samples
SOURCE: EPA, 1971 "Noise from Construction Equipment and Operations, Building Equipment and Home Appliances," NTID 300-1.
POA1-026-090203

Figure 3-3
Typical Construction Equipment Noise Levels

Water Transmitted Noise

In addition to noise in the air, underwater noise can be produced by dredging, filling, pile driving, and other construction activities. A specific noise can be measured as a ratio of that noise to the level of ambient noise. For underwater environments, ambient noise could include tides, currents, floating ice, as well as noise produced by marine mammals and by humans. Human-caused noise can be generated from operation of vessels, aircraft, dredging, and other activities. Human-caused noise tends to dominate noise levels in the 50 to 500 hertz (Hz) ranges. Low frequency noise levels tend to carry long distances in the water. Noise levels can be measured according to peak (or maximum) levels or by averaging noise levels over a period of time. Underwater noise is also attenuated by distance from the source. Underwater noise is referenced as dB relative to one micropascal (re 1 µPa). Average measurements are in root-mean-squared (rms) values. The rms value is a kind of mathematical average value, which is directly related to the energy contents of the sound.

Ground Vibration and Noise

Vibration consists of an oscillating shaking of the ground that can cause buildings to shake and rumblings to be heard inside structures. For example, train wheels rolling on tracks produce the vibrations that typically are transmitted through the ground. Many factors, including the weight and speed of the train, rail smoothness, and the types of soils or rock underlying the tracks, influence the degree of vibration and the distance it travels. However, vibrations generally cannot be perceived farther than approximately 300 feet from the tracks (HMMH 2003). Vibration velocity level, or VdB (relative to 10^{-6} inches per second), comprise the metric used to evaluate vibration. At 65 VdB or less, people rarely feel vibration, whereas vibration becomes annoying to people at 80 VdB. Minor cosmetic damage to structures can occur at 100 VdB. Vibration issues and annoyance tend to occur only with frequent (more than 70 per day) events at a location; infrequent events generally fail to result in perceptible VdB levels. Annoyance from vibrations caused by common construction devices (CNSSTC 2002) are presented in Table 3-6.

Table 3-6 Construction Equipment Vibration Impact Distances

Equipment	*Distance to Vibration Annoyance (feet)*
Pile Driver, Impact	Less than 525
Pile Driver, Vibratory	Less than 330
Large Bulldozer	Less than 85
Caisson Drilling	Less than 85
Loaded Trucks	Less than 85
Wheel Impactor	Less than 200
Vibratory Roller	Less than 265

Affected Environment

Vehicles, including tractor-trailers, hostlers, and fork lifts, represent the primary airborne noise sources currently affecting the POA. Other nearby sources include ships berthed at the POA, cranes for loading/unloading, and low-flying military aircraft departing and arriving at Elmendorf AFB immediately to the east. Vehicle and related equipment noise is transient and infrequent, generating very low (under 45 Ldn), short-term, and localized (within approximately 100 feet) noise levels. Both the ship noise (e.g., generators, on-board cranes) and cranes produce localized noise restricted to the berthing area next to the water. While the ship noise occurs consistently over the period of berthing (24 hours or less) and averages less than 75 dBA at 50 feet, the extent of its perceptibility remains limited to within a few hundred feet of the berthing area within the POA. Similarly, crane noise (approximately 95 dBA at 50 feet) comprises a localized effect. For example, over the distance to the eastern edge of the POA boundary, noise levels can decrease by 30 dBA or more due to attenuation. Aircraft operations at Elmendorf AFB produce the highest noise levels over the greatest extent of the POA. Noise levels of 65 dBa to 75 dBa due to aircraft affect the northern two-thirds of the POA (Air Force 2001).

The POA lies within an industrial area bounded primarily by military lands, including Elmendorf AFB, and industrial activities. The nearest residential areas (Category 2 locations) consist of Cherry Hill family housing on Elmendorf AFB, located approximately 1,500 feet east of the POA limits, and the Government Hill community situated roughly 1,500 feet southeast of the POA. Both these residential areas occupy hills or bluffs approximately 100 feet above the surface of the POA. For Cherry Hill family housing, jet noise from Elmendorf AFB dominates; for Government Hill, local and city traffic with a background of jet noise dominate the noise environment. Some of this local traffic consists of tractor-trailer trips between the POA and the ARRC intermodal yard for cargo loading/unloading. These diesel trucks produce about 90 dbA at 50 feet during a single passby. Recent noise measurement studies in the Ship Creek area (HMMH 2003) have measured existing noise levels south of the POA in an industrial area and in downtown Anchorage at an Ldn of 57 to 71 dBA (Table 3-7).

Table 3-7 Existing Noise Levels in POA Vicinity (HMMH 2003)

Location	***Noise Exposure Level (dBA) Ldn***
311 F Street	64
Anchorage Grand Hotel	64
2nd Ave and Barrow Street	64
Comfort Inn	71
K and 3rd Streets	57
A Street and 3rd Avenue (residence)	64
ARRC Yard	59
Western Drive and North C Street	67

In order to provide more precise baseline information on existing noise levels for the Project, the POA initiated a study at eight noise monitoring locations within the POA and in adjacent residential areas (Table 3-8; Figure 3-4). Existing noise levels at the POA ranged from 66 dBa to 75 dBA (Leq [24]), while noise levels in adjacent residential areas were from 60 to 65 dBA (refer to Appendix D).

Table 3-8 Noise Monitoring Locations and Proximity to Proposed Construction

Noise Location	*Elevation (feet MSL)*	*Minimum Distance from Proposed Construction (feet)*	*Line of Sight to the POA*	*Baseline Noise Level (dBA)*
North Port	10	10	On Dock	70
POA Administration Building	10	10	On Dock	66
South Port	10	10	On Dock	75
Port Gate	10	600	Within POA	70
Government Hill/Suzan Nightingale McKay Park	100	1,500	View partially obstructed by vegetation in summer and by elevation difference year-round at points away from the bluff edge	63
Government Hill/Brown's Point Park	100	1,800	View obstructed by trees in summer and by elevation difference year-round at points away from the bluff edge	60
Cherry Hill Housing North	160	1,500	View somewhat obstructed by vegetation in summer	65
Cherry Hill Housing South	160	1,900	View somewhat obstructed by vegetation in summer	63

Ambient, human-caused, underwater noise levels were derived from a literature review of noise measurements taken in the area and from measurements of similar activities (i.e., vibrating pile driving) taken elsewhere. Underwater noise in the POA area is produced by dredging and ship traffic. Dredging underwater noise can be produced by a dredge, barges, or tugboats. Past studies have indicated that underwater noise levels in the one-third octave range, centered at 250 hertz, from clamshell dredging has varied from an average of 150 to 162 dB re 1 μPa at 375 feet, with the strongest noise coming from

Figure 3-4
Noise Monitoring Locations

the winch motor that pulls the dredge to the surface. Tugs pulling barges tended to produce more noise than the hopper or clamshell dredge itself (USACE 2001). Acoustic recordings of the Knik Shoals dredging operations (using a clamshell dredger) in 1999 and 2000 indicated that dredging noise is low to moderate in intensity (peak levels of 124 dB re 1 μPa at 375 feet) (USACE 2001). Dredging noise tends to be strongest at low frequencies, but because of the rapid attenuation of low frequencies in shallow water, it is normally undetectable at ranges farther than 12 to 15 miles. In the Knik Shoals area, sound was recorded only up to a distance of about 3.4 miles from the dredging operations.

Existing underwater noise measurements in the POA area included seven recordings of underwater sounds produced by small and large vessels in Anchorage in August 2001. Recorded sound sources included the cargo-freight ship *Northern Lights* while docked at the POA during loading or unloading (peak value of 126 dB re 1 μPa at 342 feet, average of 125 dB re 1 μPa); the cargo-bulk carrier *Emerald Bulker* while being held at the dock by two tugs immediately preceding its departure, and then during its departure from POA (peak value of 134 dB re 1 μPa at 1,620 feet, average of 133 dB re 1 μPa); the tug *Leo* while pushing the gravel barge *Katie II* towards a dock, and then while maneuvering and holding the barge against the dock (peak value of 149 dB re 1 μPa at 25 feet, average of 143 dB re 1 μPa); and a drive-by at full speed of two small craft, a Boston Whaler and an Avon rubber boat (peak value of 142 dB re 1 μPa at 300 feet) (Blackwell and Greene 2002). These studies indicate fairly high, short-term noise close to sources with a rapid drop off in noise levels away from the source. Ambient noise levels in nonindustrial areas of Cook Inlet are measured at an average of 50 dB re 1 μPa (Blackwell and Greene 2002). Existing noise levels at the POA on ship days are much higher, from 136 to 149 dB re 1 μPa (peak) and 134 to 143 dB re 1 μPa (average).

Environmental Consequences

The noise assessment for the proposed action was performed by estimating the noise levels that would be caused by Project activities and comparing these predicted noise levels with established criteria for noise impacts. The proposed action would generate noise primarily from two sources: construction activities and operations.

Noise from construction and operations are described in Leq and Ldn sound levels respectively, based on the noise generated by specific pieces of equipment (e.g., pile driver, bulldozer, train) and by the amount the sound level varies with distance (Appendix D). Each source is described in terms of a measured sound pressure level at a specified distance. Most researchers use a distance of feet to characterize the sound pressure level of construction equipment, trains, cars, and trucks. Noise levels resulting from POA activity are presented at 100 feet from the source and for the closest residential areas—points at Cherry Hill housing (1,500 to 2,000 feet away from the proposed major construction areas) and at two points on Government Hill (1,500 to 2,400 feet away from proposed major construction areas). Overall noise levels for construction were estimated conservatively based on the cumulative of the noise generated from the noisiest equipment or vehicles used during the activity. General activities for construction are pile driving and dock construction, filling, and dredging. It was conservatively assumed that these activities were conducted simultaneously even though in most cases, they would not occur at the same time. Therefore, the noise analysis was based on the maximum estimated noise created during construction. Noise from operations in 2025 were estimated based on the sum of the noise generated by the type of vehicle (truck, car, train, ship) and the projected number of vehicle trips per day.

Noise impacts were examined using criteria established by the FTA as well as the Anchorage noise ordinance. FTA criteria consider both the amount of change in noise levels and the cumulative noise level resulting from a project (FTA and ARRC 2003; FHWA 2000). To result in an impact, projected noise levels must exceed these criteria (see Appendix D, Figure D-1). The Anchorage noise ordinance prohibits construction noise of a Leq (1) greater than 80 dBA in residential areas.

This section focuses on effects on human hearing, land uses, and structures. This focus is based on federal (USEPA, FTA) and local noise regulations, as well as issues raised by the public regarding effects on communities. In addition, evaluation demonstrates that such effects represent those likely to result from the proposed action and alternatives. Effects of noise on wildlife, including marine mammals, are described in section 3.3.4, Biological Resources.

Proposed Action

The Preferred Alternative/Alternative A

The existing noise environment at locations near the Project area is dominated by noise from railroad operations, motor vehicle traffic on nearby and distant roads, aircraft overflights and general community noise. It is predicted that there would be no significant adverse impact from the Project at any of the residential areas.

Construction noise was determined for the anticipated maximum construction year in Leq (24) (Appendix D). Noise levels were determined by general activities (construction, dredging, train and other traffic) and were then summed to provide a conservative estimate of the noise levels if all activities took place simultaneously. Since construction activities (dredging, filling, pile driving) would be the same for all construction years, noise levels during any construction day remain around 81 dBA (Leq) at 100 feet (within the POA) and 61 to 65.5 dBA at 1,000 to 2,000 feet in any given year. What varies by construction year is the duration of the loudest contributor of the noise—pile driving. Pile driving associated with dock construction is anticipated to range from a high of 130 days in Area 5 to a low of 106 days in Area 1. Although some hourly noise levels would exceed 85 dBA, daily noise levels from construction at the POA would not exceed the 85 dBA eight-hour time-weighted level in which a hearing conservation program for on-site workers is required under the Occupational Safety and Health Administration (OSHA 2004). Despite this, personnel at construction sites would implement a hearing conservation program when appropriate.

Maximum noise levels from construction at the POA in nearby residential areas would not exceed the Anchorage noise ordinance requirements of 80 (Leq [1]) dBA during any of the construction years. Residential areas would not be impacted by construction noise levels. Noise levels in Ldn at areas closest to construction at Cherry Hill housing and parks and residential areas on Government Hill are projected to be between 61.0 and 65.5 dBA during a construction day (Table 3-9), increasing 0.5 to 1.0 dBA over baseline levels. This amount of change falls below the threshold for cumulative noise levels. Therefore, construction noise would not have a significant adverse impact on adjacent residential areas.

Table 3-9 Baseline and Maximum Projected Noise Levels (dBA) for Alternatives

Monitoring Location	*Type of Land Use*	*Baseline Noise*	*Alternative A Construction*	*Alternative B Construction*	*Alternative C Construction*	*Operations 2025*	*No Action Construction*
Suzan Nightingale McKay Park	Park	63	63.8/+0.8	65.2/+2.2	63.8/+0.8	63.2/+0.2	66.0/+3.0
Brown's Point Park	Park/ Residential	60	61.0/+1.0	62.2/+2.2	61.0/+1.0	60.1/+0.1	64.1/+4.1
Cherry Hill Housing North	Residential	65	65.5/+0.5	66.5/+1.5	65.5/+0.5	65.1/+0.1	67.1/+2.1
Cherry Hill Housing South	Residential	63	63.5/+0.5	64.2/+1.2	63.5/+0.5	63.1/+0.1	65.6/+2.6

Underwater noise sources during construction would increase through the addition of dredges, tugboats, barges, and pile driving equipment. Underwater noise from clamshell dredges like those used at the POA has been measured at 124 dB re 1 μPa to 162 dB re 1 μPa (peak) at 375 feet, while tugs and barges have been measured at 149 dB re 1 μPa (peak) and 143 dB re 1 μPa (average) at 25 feet at the POA (Blackwell and Greene 2002). During construction, existing ship traffic associated with the POA could increase by as many as two dredges, five barges, and two tugboats per day for dredging and construction associated with Areas 5 and 1. Smaller increases of one dredge, three barges, and one tugboat could occur in other years for construction of Areas 6, 4, 2, and 3. These additional ships would be added to an area with maximum ship traffic of three per day during summer months. However, vibratory pile driving at an average of approximately 160 dB re 1 μPa (Betke *et al.* 2004) and a peak of 192 dB re 1 μPa at 30 feet would increase underwater noise levels under Alternative A to an average of 165 dB re 1 μPa and a peak of 192 dB re 1 μPa.

Above ground annoyance from vibrations is expected to be minimal. Vibration annoyance from pile driving equipment and other construction equipment should not occur at distances greater than 525 feet and should be confined to the POA. No significant adverse impacts due to vibrations are expected in any construction year.

Operations in 2025 at the POA would increase over current levels by 272 ships per year (four average per day during the summer), 324 train trips (two per day), and 116,142 truck trips (517 peak daily trips). Noise levels (in Ldn) due to increased operations in 2025 would be 75 dBA per day at the POA (an increase of 0.1 to 0.4 dB) with trains accounting for 44 dBA per day at 50 feet, trucks and cars accounting for 52 dBA at 50 feet, and ships accounting for 51 dBA at 50 feet. Additional noise from operations associated with train and truck traffic in 2025 are estimated to be 65.1 dBA at Cherry Hill housing and 63.1 to 63.2 dBA at parks and residential areas on Government Hill. These levels would represent an increase of less than 0.2 dBA above existing noise levels for either location and would not be a significant adverse impact on these communities.

Alternative B

Noise levels for construction would increase under Alternative B because of the noise associated with impact pile driving. Construction of the pile-supported dock would involve the use of an impact pile hammer to drive steel piles into the sediment as opposed to a vibratory hammer to be used for driving sheet piles under Alternative A. Maximum airborne construction noise is expected to be 83.9 dBA at 100 feet (within the POA) and 66 to 62 dBA or less at 1,000 to 2,000 feet. Pile driving associated with dock construction would occur the longest number of days for construction in Area 5 and for the shortest number of days in Area 1. Although some hourly noise levels (Leq) would exceed 85 dBA, daily noise levels from construction at the POA would not exceed the 85 dBA eight-hour time-weighted level in which a hearing conservation program is required by OSHA (OSHA 2004).

Maximum noise levels from construction at the POA in nearby residential areas would not exceed the Anchorage noise ordinance requirements of 80 dBA during any of the construction years. Residential areas would not be significantly impacted by construction noise levels. Noise levels at areas closest to construction at Cherry Hill housing and parks and residential areas on Government Hill are projected to be between 66.5 and 62.2 dBA (Ldn) during a construction day (Table 3-9). This 1.5 to 2.2 dBA increase would remain below the threshold for impacts.

Underwater noise levels would be higher than Alternative A because of the contribution of impact pile driving. Impact pile driving has been measured at an average of 194 dB re 1 μPa (Nedwell *et al.* 2003) and a peak of 209 dB re 1 μPa at ten feet (NOAA Fisheries 2004f). This noise will dominate noise from ship traffic, increasing average underwater noise levels to 194 dB re 1 μPa and peak noise levels to 209 dB re 1 μPa.

No annoyance from vibrations is expected at distances greater than 525 feet. Noise levels associated with operations are the same as for Alternative A. These levels are an increase of less than 0.4 dBA at the POA and 0.2 dBA at nearby residential areas, and would not be a significant adverse impact on any of these areas.

Alternative C

Noise levels for construction would be the same as for Alternative A, with the exception of the construction of Area 4. Maximum construction noise is expected to be around 81 dBA (Leq [24]) at 100 feet (within the POA) and 61 to 65.5 dBA at 1,000 to 2,000 feet for each of the years during which construction activities occur. Area 4 construction noise would be the same as for Alternative B, with maximum construction noise at the POA of 83.9 dBA. Although some hourly noise levels would exceed 85 dBA (Leq), daily noise levels from construction at the POA would not exceed the 85 dBA eight-hour time-weighted level in which a hearing conservation program is required by OSHA (OSHA 2004). Maximum noise levels at nearby residential areas are expected to be 66.5 dBA during construction of Area 4 and 65.5 dBA during construction of the other areas. Projected noise levels for construction would not exceed the threshold for significant adverse impacts.

Underwater noise levels would be the same as for Alternative A, with an increase in underwater noise levels from additional ships and from pile driving during construction.

No annoyance from vibrations is expected at distances greater than 525 feet. Noise levels associated with operations are the same as for Alternative A. These levels show an increase of less than 0.4 dBA at the POA and 0.2 dBA at nearby residential areas, and would not be a significant adverse impact on any of these areas.

No Action

Noise levels from demolition, pile replacement and dock construction are estimated at 76 to 85 dBA Ldn at the POA and 67.1 to 64.1 at nearby residential areas (see Appendix D). Based on the significance criteria, an increase in noise levels of 2.5 dBA or more above baseline in Category 2 or 3 areas are considered to be an impact. Noise levels would increase from 2.1 dBA at the north end of Cherry Hill housing to between 2.6 and 4.1 dBA for Suzan Nightingale McKay Park, south end of Cherry Hill housing, and Brown's Point Park. Therefore, noise levels associated with pile replacement and repair at the POA under the no-action alternative would have an adverse impact on nearby residential areas. These adverse impacts could be minimized through the use of sound barriers during construction.

Although some hourly noise levels at the POA do exceed 85 dBA, daily noise levels from repair and maintenance activities at the POA would not exceed the 85 dBA eight-hour time-weighted level in which a hearing conservation program is required under the OSHA for on-site workers (OSHA 2004).

Underwater noise sources during repair and maintenance activities would increase primarily through the addition of pile driving. Noise levels associated with impact pile driving are estimated at an average of 194 dB re 1 μPa and a peak of 209 dB re 1 μPa at ten feet.

No annoyance from above ground vibrations is expected at distances greater than 525 feet. Noise levels associated with operations are the same as for Alternative A. These levels are an increase of less than 0.4 dBA at the POA and 0.2 dBA at nearby residential areas and would not be a significant adverse impact on any of these areas.

3.2.3 Hazardous Materials and Waste

Hazardous materials are identified and regulated under the Comprehensive Environmental Response, Compensation, and Liability Act; the Occupational Health and Safety Act; the Emergency Planning and Community Right-to-Know Act; and 49 CFR 105 and 107 for transportation projects. Hazardous materials have been defined to include any substance with special characteristics that could harm people, plants, or animals when released.

Hazardous waste is defined in the Resource Conservation and Recovery Act as "any solid, liquid, contained gaseous or semi-solid waste, or any combination of wastes, that could or do pose a substantial hazard to human health or the environment." Waste may be classified as hazardous because of its toxicity, reactivity, ignitibility, or corrosivity. In addition, certain types of waste are "listed" or identified as hazardous in 40 CFR 263. Within the Project area, hazardous waste is regulated by both the MOA and the ADEC (ADEC and DESC 2003). The bulk POL facilities are also specifically regulated by ADEC. Non-hazardous solid waste is regulated under the Resource Conservation and Recovery Act, and by ADEC and MOA.

Affected Environment

Management of hazardous materials and waste at the POA is conducted by POA personnel and other POA users, including operators of lease facilities. Although lessees and other POA users are responsible for complying with all rules and regulations applicable to their facilities and operations, the POA confirms that those users comply with applicable permits and regulations via lease agreements and active oversight of POA users.

As an industrial area, the entire POA contains numerous buried POL lines and large fuel storage tanks along its south and southeast boundaries. In addition, many large, above ground, petroleum storage tanks currently are adjacent to the southern and southeastern boundary of the POA. The POA's liquid-bulk terminals are equipped to handle more than three million tons of bulk liquid petroleum products per year (VZM 1999). The terminals are connected via pipelines to all the major petroleum storage areas in Anchorage, including Elmendorf AFB and the Ted Stevens Anchorage International Airport. The POL lines extend from the POA's main fuel terminal to the main fuel tanks of the various bulk fuel storage facilities located in the area (Figure 3-5). To reach these tanks, the lines parallel and cross under the

Figure 3-5
Pipelines and Storage Tanks

existing roads at a number of points within the POA. Much of the construction of the existing petroleum storage and transfer facilities was completed in the 1960s and early 1970s, prior to current, more stringent environmental regulations. Much remedial tank lining and similar work has been done more recently to bring facilities up to date with current regulations.

Past poor storage and transfer practices from the 1940s through the 1960s and damage from the 1964 earthquake have impacted the soils and/or groundwater at the POA. The POA, along with regulated operators, is actively managing these sites in cooperation with the ADEC. More information is presented in the Site Contamination discussion later in this section.

Currently, the POA implements an aggressive pollution prevention program as part of the POA's stormwater management program. Significant spills and leaks on POA property since March 1992 are documented in the 2004 *POA Stormwater Pollution Prevention Plan*. The Stormwater Pollution Prevention Plan identifies potential pollution sources at the POA and provides measures and controls to reduce the discharge of pollutants, such as hazardous materials and wastes, into the stormwater drainage system. No significant spills and leaks have occurred at POA or lessee facilities since 1999. Non-POA activities have created POL contaminated sites on adjacent Army and Air Force property (VZM 1999). These past contamination events have been investigated and are being actively managed by ADEC and the regulated operators (see Site Contamination discussion later in this section) to ensure containment of the contaminated areas.

Limited amounts of hazardous waste are generated at the POA from equipment and vehicle maintenance by either the POA or tenant operations. Procedures for handling hazardous materials and waste to effectively minimize contamination from maintenance activities and to assure proper management of hazardous materials and waste are required from each of the POA's tenants. Each tenant maintains a *Hazardous Materials Pollution Prevention Plan* addressing hazardous materials storage locations at the POA. This plan also details proper handling procedures for all hazardous materials to minimize the potential for spills and releases, and to respond to releases. In addition, each tenant has a *Hazardous Waste Management Plan* outlining receipt, storage, issue, use, and eventual disposal of the hazardous waste according to all local and federal regulations and laws.

Table 3-10 lists additional plans related to hazardous materials and waste management by the POA and lessees.

Table 3-10 Existing Plans to address Hazardous Materials and Waste at the POA	
Plan Holder	***Name of Plan(s)***
POA	Emergency Response Plan (includes Spill Response) Community Right-to-Know Plan Stormwater Pollution Prevention Plan
ASIG	Spill Prevention, Control and Countermeasures Plan Oil Discharge Prevention and Contingency Plan
Tesoro	Spill Prevention, Control and Countermeasures Plan Oil Discharge Prevention and Contingency Plan Corporate Emergency Plan for the Port Terminal Stormwater Pollution Prevention Plan
Horizon	Spill Prevention, Control and Countermeasures Plan Oil Discharge Prevention and Contingency Plan Maintenance and Inspection Plans
TOTE	Crisis Management Plan (includes Spill Prevention)

Source: POA 2004b

Solid Waste

There are no active landfills at the proposed Project location (POA 2003a and POA 2003b). All solid waste is collected by commercial contract and disposed of at the MOA Regional Landfill (POA 2003a and POA 2003b). The military's former Knik Bluff Landfill (LF04) is partially located within the northern portion and at the eastern boundary of the Project site, east of the Knik Arm Bluff and on the west side of Elmendorf AFB (see Site Contamination below for a discussion of the former landfill).

On-Site Contamination

Within the POA, past spills and releases of petroleum hydrocarbons have been documented over time at each of the bulk fuel facilities. The U.S. Army Defense Fuels property adjacent to the POA and Chevron and Tesoro properties is known to have been impacted by past fuel releases prior to implementation of current regulations and management plans (POA 2003a and POA 2003b). These spills resulted from broken valves, overfilling of trucks, tanks and railcars, leaking pipelines, and other sources (VZM 1999). Documented petroleum contaminated soils and/or water are located within the parcels leased by each of the bulk fuel facilities within the POA. To address petroleum contamination issues, an organization of POA area landowners and users formed a Petroleum Users Group in 1991. This group, now inactive, gathered and summarized existing site assessment data for the POA and adjacent areas. It also worked with the ADEC and USEPA in a risk assessment process to develop risk-based clean up standards (VZM 1999). Remediation is not being actively conducted currently because of such factors as high water table, tidal influences, and lack of downstream receptors. The landowners and operators continue actively managing the sites with ADEC oversight (POA 2004b).

Off-Site Contamination

POLs

Adjacent to the POA, Elmendorf AFB is listed on the National Priorities List with known or threatened releases of hazardous substances, pollutants, or contaminants. Possible sources of contamination within the Project footprint could originate from off-site spills.

Elmendorf AFB LF04

LF04, the Knik Bluff Landfill, is located on the west side of Elmendorf AFB and was used as a surface dump from 1945 to 1957 (Air Force 2003). LF04 is located along the beach and adjacent bluff, beginning approximately 600 feet north of the POA, and continues to an area approximately 450 feet past Cairn Point. The entire landfill parallels Knik Arm for a distance of approximately 3,500 feet and is approximately 600 feet wide (Air Force 2003), paralleling and partially overlapping Areas 5 and 6 of the proposed action. Landfill debris is currently eroding onto part of the beach that is included within the Project area (Figures 3-6 and 3-7).

Figure 3-6 LF04 Site Debris on Slope

Figure 3-7
Hazardous Waste Sites

Waste deposited at LF04 includes old cars, construction rubble, small quantities of general refuse, an unknown number of 55-gallon drums, pesticides, automotive and aviation batteries, and transformers. Some disposed material has drifted down slope from the landfill onto the beach. Tidal action has eroded the bluff material and exposed portions of the landfill (see Figure 3-6). Preliminary analyses have indicated that the bluff is eroding at a rate of three feet per year. At such a rate, new waste materials would be exposed annually until the entire landfill area was eroded, over the next 200 years (Air Force 2003).

Knik Bluff Landfill is one of six source areas within Operable Unit 6 on Elmendorf AFB. Elmendorf AFB completed the Operable Unit 6 Remedial Investigation/Feasibility Study in 1996. Soil contaminants detected at LF04 included pesticides, dioxins and furans, metals, PCBs, semi-volatile organic compounds, and fuel related constituents. Similar contaminants, as well as halogenated VOCs, were identified in the groundwater.

Contaminants of Concern (COCs) in soil or groundwater are based on both human and ecological risks. Based upon those risk assessments, the following groundwater contaminants were determined to be COCs at LF04: benzene; ethylbenzene; toluene; 1, 2 dichloromethane; and methylene chloride. Exposed landfill waste was identified as a shallow soil COC.

Remedial actions were selected and presented in the Operable Unit 6 and Source Area SS19 ROD (Air Force 1996). The LF04 Operations and Management Plan (Air Force 2003) establishes protocols and schedules for site access, debris monitoring and classification, erosion monitoring, receptor monitoring, contamination monitoring, and debris removal.

The selected remedy for LF04 is long-term monitoring with institutional controls and product removal. The Operations and Management Plan for LF04 identifies a series of required activities to be executed at LF04. These activities, to be implemented by the Air Force, include:

- <u>Debris Monitoring and Classification.</u> Identify and track visible debris at the landfill to further characterize the properties and contents of LF04.
- <u>Erosion Monitoring.</u> Proactively monitor for significant geological changes in the landfill and evaluating the rate of erosion.
- <u>Receptor Monitoring.</u> Monitor for the presence and frequency of visitation by humans and wildlife to the LF04 beach area.
- <u>Contaminant Monitoring.</u> Monitor chemical concentrations in the soil and sediment, and determine if contaminant concentrations are related to individual landfill cells.
- <u>Debris Removal.</u> Perform annual debris removal to prevent the accumulation of excess debris on the beach and reduce the chance of contact between the debris and humans or wildlife.

In 2003, 16.88 tons of general debris were removed from the beach and disposed of in a local landfill, along with two pieces (0.42 tons) of asbestos containing material (Air Force 2004). Table 3-11 lists materials identified and removed since program implementation.

Table 3-11 Materials Removed During Beach Sweeps at Elmendorf AFB LF04 Site, 1997-2003

Fiscal Year	*Quantity of Debris Removed (tons)*	*Items of Interest / Disposal of Hazardous Substances, Pollutants or Contaminants*
1997	98	• Debris, mostly weathered metal • One roll of asbestos wrap, one large battery, two small transformers, 25 five-gallon drums and five five-gallon drums with unknown contaminants
1998	25	• General refuse and recyclable material
1999	29	• General refuse including small arms shells and casings and a howitzer case
2000	12	• Non-hazardous solid waste car parts, electrical parts, and other miscellaneous debris • One steel cylinder
2001	34	• Non-hazardous waste, including vehicle parts, electrical parts, wire, rubber products, and metallic slag
2002	18	• Non-hazardous waste, including wire, pipes, cans, concrete, rebar, steel, rubber products, vehicle parts, electrical components, large chunks of melted metal, and other miscellaneous debris • 40 rifle casings
2003	17	• Debris, including weathered metal debris (crushed drums, wire, pipes, slag, rebar, vehicle parts, etc.), miscellaneous rubber and rubber-coated material, electrical components, melted materials, wood, two glass medical syringes, one 30-caliber and one 50-caliber brass shell casing, and two pieces of asbestos pipe

Cherry Hill Ravine

Cherry Hill Ravine comprises a natural drainage located on Elmendorf AFB up gradient of the Tesoro and Horizon backlands lease areas. This drainage becomes Cherry Hill Ditch through the lower section of the ravine and adjacent to the POA. Approximately forty 55-gallon drums with unknown contents were documented within the ravine. The DoD identified Cherry Hill Ravine as an area of concern under a federal program to address historical hazardous waste contamination problems (POA 2003b). This area was long used as an unofficial dumping ground since the opening of Elmendorf AFB in the 1940s. During 1997, 2000, and 2001, activities focused on characterizing the contents of drums and the area's contaminated sediment, surfacewater, and seep water. During sampling within the area of concern, VOCs, pesticides, PCBs, gasoline-range organics, diesel-range organics, benzene, toluene, ethyl benzene and xylenes compound, methylene chloride, arsenic, cadmium, and chromium were found, no further action was recommended because "it is unlikely that the presence of contaminants in sediment or seep water in the Cherry Hill Ravine will pose an unacceptable risk (AFCEE 2002: ES-6)."

Former Army Defense Fuels Property

The former Army Defense Fuels property and bulk fuel tank farms, also known as the Anchorage Fuel Terminal, suffered numerous documented fuel releases in the past (see Figure 3-7). Some of the releases resulted from damage to pipelines during the 1964 earthquake. The pipelines were subsequently replaced or abandoned. There were also 27 documented releases of arctic grade diesel fuel, JP-4, JP-5, unleaded regular gasoline, slop fuel, and transformer fluid at the Defense Fuels property between 1960 and 1989. In addition, after removal of bulk fuel tanks, additional contamination was found.

Active remediation of the property included excavation of over 30,000 tons of contaminated soil that was replaced with clean backfill (POA 2003a). Contaminants of concern in the soil, surfacewater, and groundwater are diesel range organics, gasoline range organics, benzene, toluene, ethyl benzene, and xylene (POA 2003a).

Groundwater in this area still contains contamination above ADEC clean-up levels; however, risks to human health have been mitigated to ADEC-acceptable levels (ADEC and DESC 2003). The water is monitored semi-annually to confirm that offsite contaminant migration is not occurring. Monitoring wells that border the current POA boundary have not contained contaminants of concern above laboratory detection limits (ADEC and DESC 2003). A site-specific risk assessment (Shannon and Wilson 1999) identified skin exposure to remaining diesel-range organics contamination in the groundwater as the only pathway where human health risk exceeds ADEC acceptable risk levels (ADEC and DESC 2003).

Studies by the USACE (2003) of dredged materials west of the POA and within the channel indicate that tidelands and offshore sediments in the Knik Arm are not contaminated (see section 3.3.2). No volatile or semi-volatile compounds, PCBs, or petroleum hydrocarbons have been detected in sediment samples.

Environmental Consequences

The nature and magnitude of potential impacts associated with hazardous materials and wastes depends on the toxicity, transportation, storage, and disposal of these substances. Hazardous materials and hazardous waste impacts are considered significant if the storage, use, transportation, or disposal of these substances substantially increases the human health risk or environmental exposure.

Proposed Action

The Preferred Alternative/Alternative A

During construction activities, all hazardous materials and waste would be managed, procured, handled, stored, and disposed of under existing management plans in compliance with federal, state, and municipal laws and regulations. Construction debris and dredged fill material would be recycled when feasible, or disposed of off-site at approved locations.

Preliminary design for the Project includes placing fill to an elevation of +38 feet MLLW adjacent to and into the western edge of the area encompassed by LF04 boundaries. Placing this fill, and the associated management practices, would have three primary effects on the ability and need for Elmendorf AFB to comply with the requirements of the ROD with respect to LF04. It would mitigate erosional action by ordinary high tides on the toe of the bluff supporting LF04, stabilize the bluff above the dock expansion, and continue to restrict public access.

Placement of fill for the Project would extend the POA and dock surface to above ordinary high tide along the boundary of LF04. The preliminary design elevation roughly corresponds with the toe of the bluff. Placing fill for the Project would alleviate undercutting and reduce the amount of debris sloughing from the bluff, thereby reducing the need to conduct annual beach sweeps.

Even without tidal erosion, soil and debris would continue to fall from the bluff until the bank reaches its natural angle of repose. Therefore, stabilization via sheet pile or similar means would be implemented (see section 2.2.2). This stabilization would have the benefit of containing hazardous waste materials from LF04 at the stabilization wall boundary. Continued restricted access for debris removal and groundwater monitoring along the beach and bluff would be provided.

The Project design would include necessary institutional controls limiting general access to LF04. LF04's designation as a restricted use area, as well as restrictions for drilling into the underlying shallow aquifer, would be incorporated in order to protect human health and to comply with the ROD. For the reasons described above adverse impacts to human health and safety associated with proximity to LF04 would not be significant.

Although no sediment contamination has been identified, contamination potentially could be encountered within the POA tidelands during construction. The POA would be responsible for preparing a *Soils Management Plan* in the event that contamination is encountered in soils managed by the POA during construction. Likewise, the USACE would prepare a plan in the event that contaminated soils are encountered during their dredging. The plan would stipulate procedures for managing contaminated sites. If deemed necessary by the POA or regulators, periodic testing of soil by a hazardous waste professional would occur during construction to characterize material for disposal. Personnel would be trained in methods and procedures to reduce the likelihood of exposure to hazardous materials and wastes.

The POA plans no introduction of new types of hazardous materials or waste. The projected increase in POA operations after implementation of the proposed action would result in an increase in POL throughput and use. However, all hazardous materials and waste would be managed, procured, handled, stored, and disposed of under existing management plans in conformance with federal, state, and municipal laws and regulations. Construction of new POL pipelines would increase the efficiency of POL transport and would comply with existing laws and regulations for construction materials, thereby providing beneficial impacts to POL safety. Expanded draft and increased dock length with new cranes would allow newer ships, built with more stringent environmental controls, to call on the expanded POA, further mitigating the potential for an increase in spills with expanded operations.

A *Spill Prevention Control and Countermeasures Plan* would be updated to reflect expanded operations and would continue to be implemented under the proposed action to prevent oil, fuel, lubricants, or other pollutant leaks or spills from reaching the waters of the Knik Arm or contaminating other sites at the POA. Marine spill response equipment (i.e., absorbent pads, containment booms, etc.) would be stored at various convenient locations on site in case of accidental spills. Furthermore, POA operators and personnel are trained in methods and procedures to reduce the likelihood of fuel and other hazardous material spills. These procedures also address the cleanup and storage of hazardous materials used during routine operations.

The POA also would continue implementation of its NPDES permit for municipal separate storm sewers. This would include updating the *POA Stormwater Pollution Prevention Plan* and reporting progress of program implementation annually to USEPA Region 10 and the ADEC.

Maintenance and monitoring plans and procedures would also be implemented and amended as necessary to reduce hazardous materials and waste impacts associated with facility operations and vessel activities under the proposed action. In addition, contractors would be required to identify and implement BMPs to control spills and for handling hazardous materials and wastes in accordance with federal, state, and local regulations. Therefore, implementation of Alternative A of the proposed action would not result in significant adverse impacts with respect to hazardous materials and wastes. The alternative would have a positive impact by mitigating potential waste release from LF04 at Elmendorf AFB.

Alternative B

Construction and operational impacts for Alternative B would be the same as those described under Alternative A. Therefore, with respect to hazardous materials and wastes, implementation of Alternative B would not result in significant adverse impacts. The alternative would have a positive impact by mitigating potential waste release from LF04 at Elmendorf AFB.

Alternative C

Construction and operational impacts for Alternative C would be the same as those described under Alternative A. Therefore, with respect to hazardous materials and wastes, implementation of Alternative C would not result in significant adverse impacts. The alternative would have a positive impact by mitigating potential waste release from LF04 at Elmendorf AFB.

No Action

Similar procedures would be followed for repair or replacement of POA structures as those discussed under the proposed action, where applicable. Existing procedures for the management, procurement, handling, storage, and disposal of hazardous materials would remain unchanged. Following existing procedures, no significant adverse impacts associated with hazardous materials and waste would occur under the no-action alternative.

During construction activities all hazardous materials and waste would be managed, procured, handled, stored, and disposed of under existing management plans in conformance with federal, state, and municipal laws and regulations. Under the no-action alternative, POA capacity would be further restricted and levels of service further reduced during extended periods of construction necessary to repair and/or replace corroded steel piles and other structural elements at each berth. In addition, the POA would not be able to accommodate the newer, larger, more efficient ships that are built with more stringent environmental controls. The increased congestion associated with time delays in off-loading would increase potential environmental impact risks from spills and accidents. Operations under the no-action alternative could result in adverse, but not significant adverse, impacts with respect to hazardous materials and wastes.

3.2.4 Safety

Issues related to human health and safety are analyzed in several sections of the EA. The potential for landslides and earthquake hazards are discussed in section 3.3.1, while the effects of construction in formerly contaminated soils is discussed in section 3.2.3. This safety section will focus on potential conflicts relating to aircraft safety issues with Elmendorf AFB and possible interference with communications at the FLR-9 antenna.

Aircraft Safety

Aircraft safety procedures have been established for all Air Force installations. Approximately 75 percent of aircraft accidents occur on or adjacent to the runway and in a corridor extending out from the end of a runway for 15,000 feet. Three zones within this corridor are established based on aircraft mishap patterns: the Clear Zone (CZ); Accident Potential Zone (APZ) I; and APZ II. Within the CZ, which covers a 3,000-by-3,000 foot area at the end of each runway, the overall accident risk is highest. APZ I, which extends for 5,000 feet beyond the CZ, is an area of reduced accident potential. In APZ II, which is 7,000 feet long, accident potential is lowest. APZs I and II for the approach end of runway 34 at Elmendorf AFB curve to the east in a semicircular fashion. Portions of APZ II extending west from runway 9 overlie the POA (Air Force 2001). Although it is not an incompatible land use, the POA also lies within the approach/departure corridor for Elmendorf AFB.

According to Air Force and FAA requirements, objects within the approach and departure corridor (Figure 3-8) exceeding an elevation of 360 feet MSL would protrude into Elmendorf AFB's approaches. Upward lighting in this area would also obstruct a pilot's vision and could pose a safety hazard.

Electromagnetic Interference

DoD Directive 3222.5, Electromagnetic Compatibility Management Program, is designed to prevent interference between civilian and military use of the frequency spectrum of the FLR-9 antenna on Elmendorf AFB. In this directive, construction within one to two miles of an electromagnetic source could conflict with operations and is restricted. The proposed action would occur between one and two miles of the FLR-9 antenna. Per the DoD directives, any construction above the three degree look-angle of FLR-9 could obstruct reception. Based upon DoD calculations, the three degree look-angle at one mile from the antenna is 276 feet above ground level, or 437 feet MSL. Any structure below 400 feet MSL and outside a one-mile radius from the FLR-9 antenna would not obstruct reception.

The Air Force has provided the following additional guidelines to reduce the possibility of electromagnetic interference (EMI): 1) using low-pressure sodium lighting; 2) using shielded or buried power sources, which would prevent the generation of electromagnetic noise; 3) all wireless communications systems would be in good working order and operate above 30 MHz at all times; 4) minimizing use of Industrial, Scientific, and Medical (ISM) equipment, such as arc welders, microwave ovens, switching power relays and ignition-type devices during construction and operation; 5) any ISM equipment would be shielded from the line of sight of the FLR-9 antenna at the elevation of 161 feet to minimize the impact of unintentional emissions; and 6) maximization of the separation distance between the FLR-9 antenna and the location of electrical and electronic devices. Table 3-12 provides minimum separation distances from the edge of the antenna.

The Air Force has also requested a point of contact during construction to rapidly address any EMI problems (Hendrickson 2004).

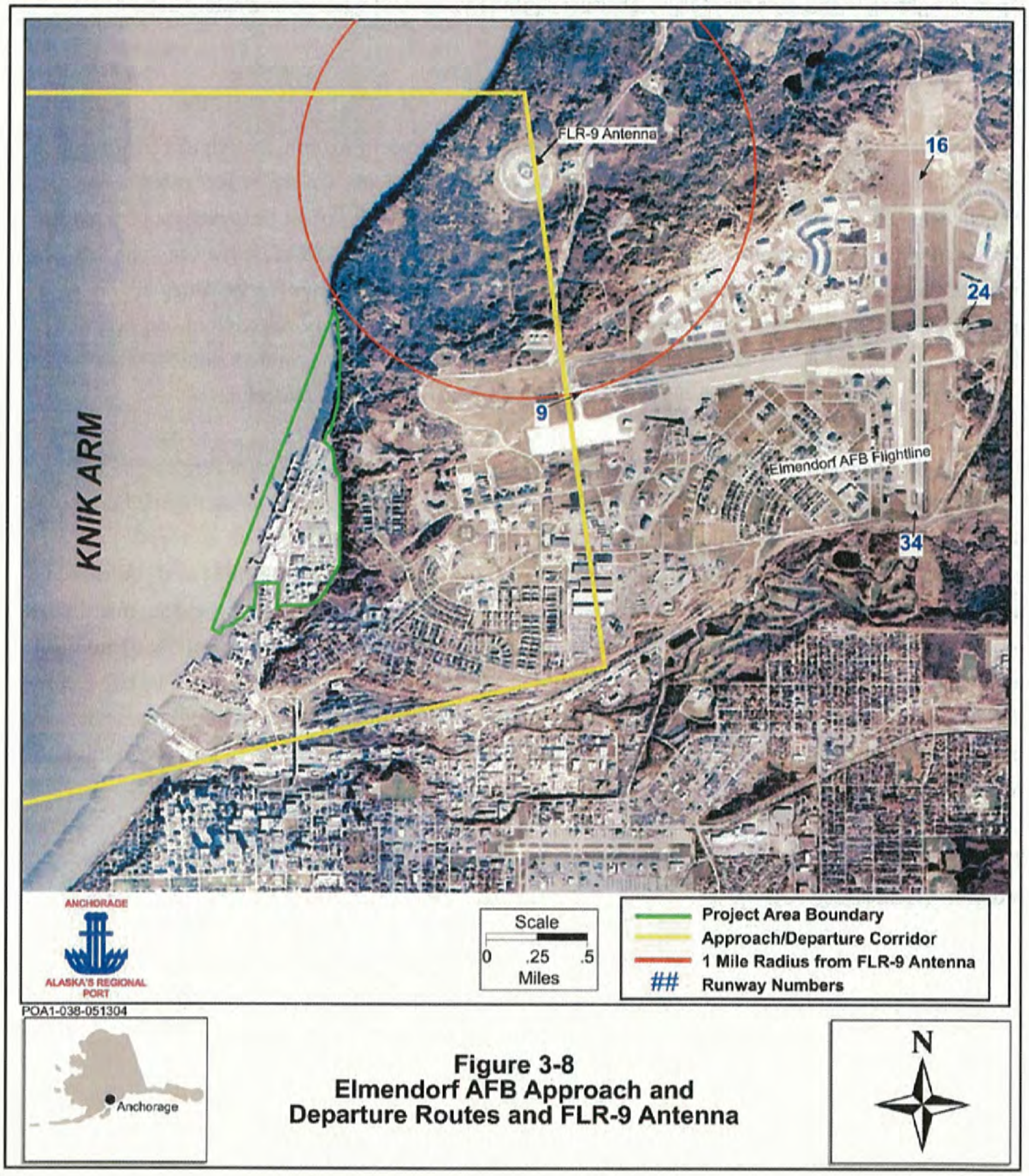


Figure 3-8
Elmendorf AFB Approach and Departure Routes and FLR-9 Antenna

Table 3-12 Minimum Separation Distances from FLR-9 Antenna

Standard	*Frequency < 30 MHz*	*Frequency at or above 30 MHz*
Federal Communications Commission Standards		
Part 18 RF Lights	0.42 miles (0.7 km)	0.42 miles (0.7 km)
Part 15 Class A	1.38 miles (2.3 km)	2.4 miles (4.0 km)
Part 15 Class B	0.42 miles (0.7 km)	0.42 miles (0.7 km)
Part 15, Subpart C	1.32 miles (2.2 km)	3.84 miles (6.4 km)
Part 18, High Power ISM	9.6 miles (16.0 [line of sight] km)	9.6 miles (16.0 [line of sight] km)
EN Standards[1]		
EN 55022 Class A and ISM	0.3 miles (0.5 km)	0.48 miles (0.8 km)
EN 55022 Class B	0.18 miles (0.3 km)	0.24 miles (0.4 km)

[1] EN Standards pertain to European equipment

Environmental Consequences

Proposed Action – Alternatives A, B, and C

Implementation of the proposed action would result in no adverse safety impacts under Alternatives A, B, or C. All aircraft safety procedures, guidelines, and separation distances would be followed during construction of the Project and POA operations in the future. The POA would appoint a contact person available to quickly address potential EMI issues. New cranes installed with the proposed action would reach approximately 220 feet in height. Cranes would be mounted on the dock, which would sit at no higher than 38 feet above MLLW, resulting in the tallest structures being less than 258 feet MLLW or 274 feet MSL in elevation. Construction equipment necessary for the Project would be much lower than this height. Neither cranes nor construction equipment would intrude into Elmendorf AFB's approach and departure corridors nor interfere with electromagnetic reception requirement. Therefore, no adverse safety impacts would occur due to implementation of the proposed action.

No Action

Under the no-action alternative, the POA would not expand. However, continued operations would require repairs and maintenance to the existing dock. In addition, the POA would need to accommodate growth in shipping. No conflicts with EMI or aircraft safety would occur.

3.3 NATURAL RESOURCES

3.3.1 Geology and Soils

Geological resources are defined as the geology, soils, and topography of a given area. The principal geologic factors influencing stability of structures are soil stability and seismic properties. Soil, in general, refers to unconsolidated earthen materials overlying bedrock or other parent material. Soil structure, elasticity, strength, shrink-swell potential, and erodibility all determine the ability for the ground to support structures and facilities. Relative to development, soils typically are described in terms of their type, slope, physical characteristics, and relative compatibility or limitations with regard to particular construction activities and types of land use. Long-term geological, erosional, and depositional processes typically influence the topographic relief of an area.

Affected Environment

Geological and Soil Formations

The bedrock beneath Anchorage consists of Tertiary clastic sedimentary rocks, which to the east form a wedge overlying Mesozoic metamorphic rocks of the Chugach Mountains. Geologic formations at the POA are the result of combined depositional processes including glacial, fluvial, lacustrine, still water, and colluvial processes occurring during the late Pleistocene and Holocene Epochs. No bedrock is exposed within several miles of the POA. Quaternary deposits (Pleistocene and Holocene) at the POA and adjacent areas are believed to be several hundred feet thick, based on boreholes drilled outside the POA.

The POA occupies silty Holocene tidal deposits and as much as 40 feet of artificial fill. To the east, the POA is bounded by a steep 150-foot high bluff of stratified Pleistocene sediments. The bluff is capped by 15 to 65 feet of coarse-grained glaciofluvial sediments. Underlying these coarse sediments is the Bootlegger Cove Formation. The Bootlegger Cove is characterized by well-stratified layers of glaciomarine and glaciolacustrine silty clay, clayey silt, silty fine sand, and scattered coarse-grained sediments (Updike 1986). This formation represents the majority of the soils present at the Project site, which directly influences the stability of the POA structures (Terracon 2003). The silt and clay of the Bootlegger Cove Formation in the Project area is over consolidated, has low to moderate plasticity, and exhibits a uniform to increasing shear strength with depth. As shown in Table 3-13, there are three primary geologic formations below the POA Project site.

High sedimentation rates in Knik Arm and the POA vicinity create the requirement for annual dredging to maintain adequate depths for berthing ships. USACE currently performs annual operations and maintenance dredging of 206 acres within the POA area (Figure 2-17). This has resulted in the removal of an average of 720,000 cubic yards of sediment per year from 1998 to 2003. Annual volumes dredged exhibit an increasing trend, with 2,100,000 cubic yards of materials dredged in the summer of 2004. This represents a 300 percent increase over the annual average from the previous five years.

Table 3-13 Soil Formations below the POA Project Site	
Soil Formation	***Soil Description***
Glaciofluvial or Glaciodeltaic Deposits	Dense sand and gravel outwash deposits with interbedded hardpan clay soils. Soils are found near 100 feet MLLW and 150 feet MLLW. The depth of the soils range from 500 to 600 feet at the Project locations and overlie metamorphic rock.
Glacioestuarine or Glaciolustrine Bootlegger Cove Foundation	Seven different soil types ranging from over consolidated firm to stiff lean clays and dense medium sand deposits. Soil thickness ranges from approximately 50 to 100 feet at the Project location with only the lower two soil types present.
Holocene Tidal Flats and Fluvial Deposits	Sand, gravel, and silt deposits. These deposits vary in composition, density, and consistency due to erosion, tidal action, pre-consolidation, and desiccation. Most of the Holocene silt deposits have been removed over the years by dredging and have been replaced with silts and sands from tidal action and sedimentation.

Source: Terracon 2003

Seismicity

The POA is located near the mouth of Knik Arm at the northeast edge of Cook Inlet, and lies in a tectonic basin bounded by the Bruin Bay-Castle Mountain fault system to the west and the Denali fault system to the north. This is an active tectonic setting, with seismic events along both fault systems as well as the underlying Benioff Zone. This zone results from forces pushing the Pacific tectonic plate beneath the North American plate (known as subduction). Intermediate to shallow seismic incidents related to the fault systems, as well as deeper events associated with the subduction, are common.

The 1964 earthquake triggered numerous landslides in the Anchorage area, including the vicinity of the POA. The sliding was attributed both to failures in sensitive clays and the liquefaction of the sandy layers in the upper portions of Bootlegger Cove Formation in the bluffs near MSL, and to the unusually long duration of the earthquake. Numerous ground cracks and mud fountains in the POA area resulted from the earthquake. There is also evidence that similar sloughing of bluff deposits onto the tidal deposits has occurred during seismic events many times in the past. Geological maps from 1986 show the area adjacent to the bluff to contain both older and younger (but pre-1964), as well as 1964-era, landslide deposits on the surface (Updike 1986). Recent geotechnical studies related to the Road and Rail Extension Project indicated that bluff deposits on Cherry Hill on the eastern boundary of the POA could be unstable under seismic stresses (Golder 2004).

Recent geotechnical studies were performed to provide analysis for the MOA and the POA to determine the appropriate seismic risk profile and the estimated levels of damage to various dock structure designs when subjected to various levels of anticipated earthquakes. The program, undertaken in the spring of 2003, was designed to provide the majority of the data necessary to develop the marine geotechnical design parameters for the Project.

Twenty soil test borings were drilled and 38 Cone Penetrometer Tests were performed from an offshore jack-up platform for the subsurface exploration. The borings/Cone Penetrometer Tests were drilled to depths ranging from 150 to 210 feet below the mudline. They were generally located along two lines parallel to the existing dock, at about 200 feet and 400 feet seaward. One in-situ vane shear test hole, three seismic shear wave velocity tests and seven pore pressure dissipation characteristic tests were conducted during the field program (Terracon 2003). Subsequent laboratory analyses concentrated on Bootlegger Cove Formation clays and included index classification testing, Atterberg limits, water content, and gradation testing. In addition, approximately 30 triaxial tests, seven consolidation tests, and five direct sample shear tests were performed.

After this initial testing and analysis, additional computer modeling of POA-area soils and expansion structure concepts under varying seismic loads was conducted. FLAC 2-D software, which simulates the behavior of soil, rock, and structural members to evaluate the static or seismic performance of the model, was used to allow engineers and the POA to understand the consequences of construction activity and/or seismic shaking by predicting displacements throughout the modeled area to determine if various facility designs would remain serviceable. DEEPSOIL, a versatile 1-D site specific response analysis program for simulating effects of local soil on ground motion, was also used.

Results of the testing, analyses, and modeling performed will be used in the detailed design process of the final expansion design concept selected. In general, the natural near-surface sands and silty sands found along the Project site are dense and unlikely to liquefy. The natural Bootlegger Cove clays found beneath the POA are from the lower portions of the Bootlegger Cove Formation and do not appear to be susceptible to soil liquefaction. They appear to be of sufficient plasticity that significant build-up of pore pressures during cyclic earthquake loading is unlikely. However, there are isolated pockets and limited zones of loose silty sands and sands that potentially could liquefy during a large earthquake.

Environmental Consequences

This section presents the analysis for potential impacts to geology and soils from implementation of the proposed action and alternatives. First, construction effects due to both dredge and fill activities are analyzed, followed by effects due to post-construction operations.

Proposed Action

<u>The Preferred Alternative/Alternative A</u>

The Project would be developed in phases with major construction carried out in stages over a period of seven years. Within this period, approximately 135 acres of tidelands would be developed within the Project area (see Table 2-5) under Alternative A. This would require 12.3 million cubic yards of combined engineered and other suitable fill material. Fill material would be compacted using vibratory compaction methodology. Excavation of soil and placement of fill is common at the POA, where filled tidelands comprise a large portion of the POA.

Accomplishing this fill operation and subsequent dock construction would require dredging approximately 286 acres within the proposed Project footprint (see Table 2-1). Forty-eight percent of these acres are already dredged as part of the 206 acres of annual USACE dredging. Alternative A would require an additional 149 acres of dredging outside of the current USACE dredge area, mainly to the north and south. Sixty-six of those 149 acres would be in the construction fill area and 83 would be in the berthing area. However, because the required dredging footprint in the berthing area would be approximately 68 acres less than that currently used by the USACE, the net total additional dredging area for construction under Alternative A would be 81 acres. Soft material overlying the Project area would be removed prior to the fill operations. The material would then be moved to an approved disposal site.

The loose sands and soft silts that occur within isolated pockets and limited zones are subject to liquefaction under seismic loading conditions. Thus, geological limitations of construction include the potential for lateral movement during an earthquake greater than the intensity and duration of the 1964 earthquake. Site-specific geotechnical explorations were undertaken in 2003 to determine the structural bearing support capabilities of the soils and to aid appropriate engineering design. Based on the results of this testing and appropriate design specifications, the proposed action would improve seismic event resistance to withstand an earthquake greater than the intensity and duration of the 1964 earthquake. Proper design, including design to provide appropriate lateral stability, would preclude significant adverse impacts to existing infrastructure or planned improvements due to geologic, soils, or seismic conditions. Selective removal of the isolated pockets and limited zones of loose sands and soft silts by over-dredging could be performed, if necessary, to meet specifications.

During construction, sand and gravel from land-based pits would be used as backfill and fill materials. Dredge materials from construction or on-going maintenance dredging would also be reused for fill to the extent practicable. Based on the material selected, the sand and gravel gradation may range between fine to medium and medium to coarse. All sources are expected to include cobble to boulder size rock fragments. Although specific sources have not been selected, section 2.2.3 lists several commercial and non-commercial fill providers. In addition, Figure 2-18 illustrates the ADNR approved gravel borrow sites within approximately 70 miles of the proposed Project location. Included in this illustration is the maximum amount of gravel fill known to be extractable from the source site. Once potential fill sources have been identified that meet the commercial aggregate requirements and Project schedule, the provider must prove that the selected material is substantially free of contamination and complies with required laws and regulations, including cultural resources clearance from the Alaska SHPO as required under the NHPA. The fill provider would be responsible for that compliance. The selected construction contractor would ultimately determine the final logistics for fill sources.

The in-situ soils at the construction location would be subjected to stresses and strains during the various stages of construction. Pile driving during construction may result in minor, short-term vibratory and sedimentation impacts. However, these impacts would not result in significant adverse impacts to geology and soils. Long-term soil stresses may occur after construction when excess pore water pressures have stabilized and dissipated and where full consolidation of the underlying soils have taken place.

Disturbance of non-submerged soil during construction may increase the potential for short-term erosion and sedimentation. A *Stormwater Pollution Prevention Plan* would be prepared and implemented as part of the NPDES permit required for the Project (General Permit for Stormwater Discharges from Construction Sites). BMPs would be employed during construction to minimize the potential for erosion and sedimentation during construction and to protect adjacent properties and waterways from effects related to erosion, sedimentation, and flooding. With the implementation of the above procedures, Alternative A would have no significant adverse impacts during construction on geology or soils.

There also would be no significant adverse impacts to geology and soils from operations under Alternative A. There would be a total of 184 acres of annual maintenance dredging required in the berthing area. Because the annual maintenance dredging footprint of 206 acres would change as a result of the proposed action, implementation of Alternative A would result in a net decrease of 22 acres of annual maintenance dredging in the berthing area.

The POA will specify a structural design to withstand both an operational and contingency design earthquake. The contingency design would withstand an earthquake with a ten percent probability to occur in the next 50 years as recommended by the MOA Geotechnical Advisory Commission (GAC 2004).

Alternative B

Construction impacts for Alternative B would be similar to those described under Alternative A. However, approximately 110 acres of tidelands would be filled, requiring less fill material under Alternative B. The amount of dredging required would be the same as Alternative A, with a net increase of 81 acres. Approximately 280 feet from the existing dock, a sheet pile structure with fill, would be constructed; the remaining 120 feet of the dock structure in cross-section would be the extension of a concrete dock and pile supports. The piles would be driven in with an impact pile hammer. The same procedures for preventing effects due to erosion, soil stability, and acquiring fill material, would be followed as for Alternative A. With the implementation of these procedures, there would be no significant adverse impacts to geology and soils during construction.

For the same reasons as listed under Alternative A, and since the required maintenance dredging program would be the same, there would be no significant adverse impacts to geology and soils from operations under Alternative B.

As in Alternative A, the POA will specify a structural design to withstand both an operational and contingency design earthquake.

Alternative C

Construction impacts for Alternative C would be the same as those described under Alternative A. Alternative C would use the sheet pile design alternative for all areas except Area 4, which would incorporate the pile-supported dock. Slightly less fill material would be required for Alternative C in Area 4 (approximately 131 acres of tidelands would be filled). The amount of dredging required would be the same as Alternative A, with a net increase of 81 acres. Procedures as specified under Alternative A would be followed, and no significant adverse impacts to geology and soils would result from Alternative C.

For the same reasons as listed under Alternative A, and since the required maintenance dredging program would be the same, there would be no significant adverse impacts to geology and soils from operations under Alternative C.

As in Alternative A, the POA will specify a structural design to withstand both an operational and contingency design earthquake.

No Action

Any impacts to soils and local geology resulting from pile repairs and replacements would be similar to or less than those under the proposed action. In addition, all BMPs and other standard procedures would apply to this type of construction activity. Therefore, no significant adverse impacts to soils or geology would occur as a result of the no-action alternative. Although structural improvements for increased seismic stability would be implemented to the extent feasible under current design conditions, it would not be feasible to retrofit the current infrastructure to completely meet modern seismic design standards. The POA was designed almost 50 years ago, preceding many seismic engineering advancements, and relic seismic design deficiencies would persist, despite retrofitting. Therefore, under the no-action alternative, the POA would continue to be susceptible to earthquake damage due to design inadequacies.

During replacement, silt would need to be removed near the back of the existing dock, where the mudline is at or above MLLW. However, any disturbances to soils and local geology resulting from pile repairs would be equal to or less than effects discussed under the proposed action. No significant adverse effects to soils or geology would occur.

Current maintenance dredging operations would continue according to the same schedule and operational procedures currently implemented. Annual maintenance dredging of 206 acres would continue to occur. Any disturbances to soils and local geology resulting from continued maintenance dredging would be consistent with current dredging activities. Therefore, no significant adverse effects to soils or geology would occur.

3.3.2 Hydrodynamics and Sedimentation

Hydrodynamics examines the movement of tides and currents. In the Knik Arm, these movements directly impact the level of sedimentation. Where sediment is deposited is crucial to the operations of the POA and the ability of ships to navigate. It can also affect shoreline formation and wildlife habitats. The effects of the Project on the movement of currents and on sedimentation is examined in this section.

Affected Environment

Oceanographic Conditions

Several characteristics of the Knik Arm of Cook Inlet, including tidal range and currents, ice, and sedimentation, are atypical for marine environments.

Tides

Knik Arm experiences the second largest tidal range in the world, approximately 42 feet (FHWA and ADOT&PF 1984). Tides are diurnal, with two unequal high tides and two unequal low tides per day, separated by approximately 6 hours and 12 minutes.

The following tidal conditions exist in Knik Arm (NOAA Ocean Service 2003):

- Estimated Highest Water +34.59 feet MLLW
- Mean Higher High Water +29.16 feet MLLW
- Mean High Water +28.44 feet MLLW
- MSL (Average Tide) +16.47 feet MLLW
- Mean Tide Level +15.34 feet MLLW
- Mean Low Water +2.25 feet MLLW
- MLLW +0.00 feet MLLW
- Estimated Lowest Water -6.39 feet MLLW

Historically, the wide variation of tidal action in Knik Arm have constrained the arrival and departure times of vessels into and out of the POA. At low tide, many areas of the Knik Arm were not navigable. The USACE, Alaska District, has dredged the Knik Arm Shoal to an elevation of –40 feet MLLW, and, in the POA boundary, has dredged the dock fronts to -35 feet MLLW, eliminating many marine traffic constraints associated with the large tidal variation.

Currents

The tidal currents of Knik Arm are extreme, highly variable, and complex. Average tidal currents in Cook Inlet regularly exceed four knots (4.6 mph) in open areas and six knots (6.9 mph) near constrictions (Smith 2000). Unverified reports from ship captains report currents of up to nine knots (10.4 mph). Knik Arm bathymetry and tidal stage (i.e., ebb, flood) influence the direction and magnitude of the current. Current velocities are near zero when the tides are changing from ebb to flood and flood to ebb. Currents in the main channel of Knik Arm between Cairn Point and Point Woronzof are generally stronger on the ebb tide and are strongest on the western side of the Knik Arm. Additionally, currents farther up Knik Arm have a moderate velocity near the west shore and are strong in the mid-channel. Tidal currents are more extensively discussed in the following section.

Models

Both physical and numerical modeling of the Knik Arm and POA areas were performed to assess hydrometric impacts of the Project. The information gained from these models was then used to assess the impacts on the physical and biological environment.

Physical Models

Two Flow Table Models of Cook Inlet, sponsored by the USACE Alaska District, were constructed at the U.S. Army Engineer Research and Development Center's Coastal and Hydraulics Laboratory (CHL) from March through December 2002 (ERDC 2003). These physical models were used to determine sources of sediment and the process of sedimentation into the POA, develop a means to predict sedimentation, and assess the impact of the Project. A large area model, covering a 31-mile stretch of Knik Arm to examine the complex flows in Upper Cook Inlet, and a small area model, covering 9.5 miles centered on the POA, were both constructed. Alaska District personnel remarked that the model "… appeared to reproduce reasonably well known surface conditions. The most important of these conditions are the gyres/eddies around the POA, Point Woronzof, and Point MacKenzie" (ERDC 2003).

Generally, the flood and ebb surface currents moved as expected with large gyres forming in the lee of Point Woronzof, Point MacKenzie, and Cairn Point. Tracer material was placed in "feeder" piles on the bottom of the model and allowed to move according to prevalent flow patterns. Deposition patterns that formed in the model at the POA and on the Woronzof Shoal were noted to be similar to those deposition patterns historically seen at those locations. Deposition of tracer material at the POA during flood flow occurred as a crescent-shaped berm starting on one end and extending to the other end. Monthly condition surveys indicated that shoaling at the POA occurred in much the same way.

Ebb-tidal simulations indicated that Cairn Point plays an important role in sedimentation of the POA. A stationary eddy was formed in the lee of Cairn Point as flow separation occurred at the point. According to the USACE Alaska District engineers, "The outer edge of the eddy appeared to coincide with the historical development of sediment accumulation in the vicinity of the dock face" (ERDC 2003). Injected dye captured by the eddy exhibited long residence time in the immediate vicinity of the POA, allowing time for fine silts in the water column to settle, contributing to sedimentation at the POA.

During ebb flow, the model showed that modifying the upstream channel configuration could change the geometry of the eddy affecting the POA, but the eddy persisted at nearly the same location.

Flow patterns recognized in the large-area model were replicated in the small-area model to see if the more detailed bathymetry altered any of the flow patterns substantially. The small area model produced similar flow patterns as the large-area model, particularly the three large flow separation and eddy formation features at Point Woronzof, Point MacKenzie, and Cairn Point. The bottom crosscurrent, flowing diagonally between Point Woronzof and Point MacKenzie, was also evident.

The two physical models of Cook Inlet proved to be valuable in understanding the complex flow patterns in the vicinity of Anchorage. The conclusions drawn from physical modeling efforts are as follows:

- Tidal flow in Upper Cook Inlet features large, three dimensional gyres formed by flow separation at major headlands. The gyres exhibited vertical and lateral mixing, and regions of reduced flow velocity magnitude corresponded well with shoal areas observed in the prototype.
- Turbulent flow separation at Cairn Point during ebb tide was shown to be instrumental in causing shoaling of the POA.
- Dye injection during flood and ebb tide demonstrated that dredge disposal practices could be improved by choice of disposal sites and timing dump releases to correspond with tidal flow direction. This reduces the possibility of dredged material being immediately carried back into the POA area.
- Dredging along the dock face without leaving a pathway to the deeper channel could promote trapping of suspended sediment and increased sedimentation in the POA region.
- Modifying the Fire Island shoals did not appear to affect flow patterns farther upstream around Anchorage during flood tide.

<u>Numerical Modeling</u>

A numerical tidal circulation study was also performed to examine the tidal circulation in Cook Inlet and POA area (Appendix E). This model was used to evaluate tidal circulation patterns for both existing and Project conditions. Accuracy of the model was checked for this study by comparing calculated water level values to measured water levels at NOAA stations.

The ADvanced CIRCulation (ADCIRC-2DDI) model was used to calculate water surface and depth of average currents in the study area. Model input data consisted of bathymetric data, tidal currents, river flows from the Knik, Matanuska, Susitna, and Kenai Rivers and wind information. Model simulation for a spring-neap tidal cycle was conducted with and without the Project. The model was based on tidal constituents along its ocean boundary and river flow at the locations where major freshwater discharges enter Upper Cook Inlet. Water level and current speed and direction at selected stations in the study area were examined to assess the impact of the expansion at full buildout on the tidal circulation. Also, circulation patterns in the POA vicinity and surrounding area were studied with and without the Project using a number of graphical display products and animations.

The ADCIRC model was upgraded to address issues of sedimentation. The ADCIRC model upgrade included the following tasks:

- Improving representation of the irregular shoreline and structures in the POA area and along the Inlet shoreline between Cairn Point and Point Woronzof;
- Incorporating available depth survey data in the POA vicinity;
- Improving the representation of the tidal flat elevations along the shoreline between Cairn Point and Point Woronzof;
- Referencing upgraded grid depths to ADCIRC datums;
- Increasing grid resolution in the POA vicinity; and
- Improving grid quality in the study area.

The model was checked by comparing measured and calculated water levels at four NOAA stations, (Anchorage, Nikiski, Seldovia, and Kodiak). The Anchorage comparison is shown on Figure 3-9. The comparison shows very good agreement between measured and calculated water levels.

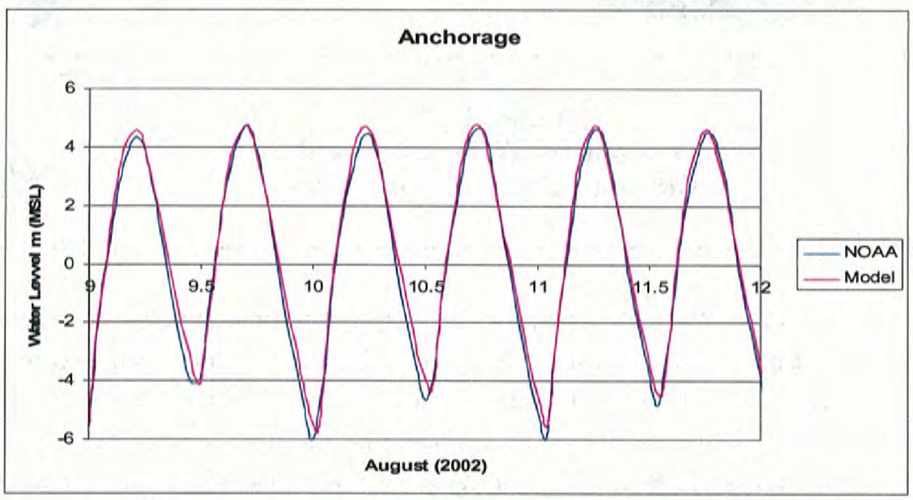


Figure 3-9 Comparison of Measured and Calculated Water Level at Anchorage During Spring Tide

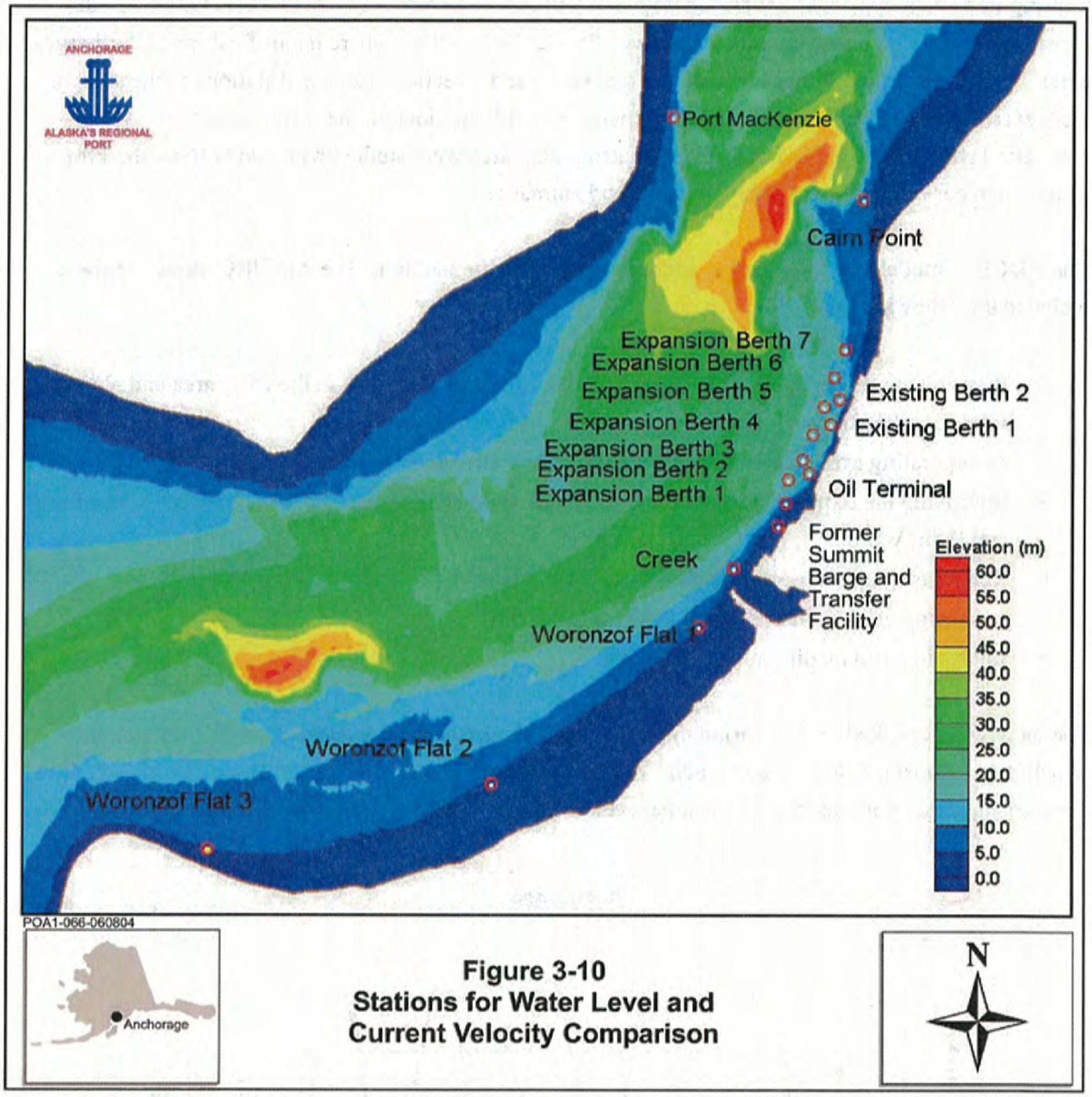


Figure 3-10
Stations for Water Level and Current Velocity Comparison

Figure 3-10 shows the location of seventeen points in the study area where comparisons of water level and current velocity were made with and without the proposed Project. Locations at the existing and proposed dock face were chosen to provide information about changes to current speeds at the proposed dock, compared to conditions that exist for the existing dock configuration. Model results were also examined at several locations along the tidelands, at wetlands south of the POA, at the entrance to Ship Creek, and at Port MacKenzie, in order to address concerns about the impact of the Project at these locations. Flow at Ship Creek primarily reflects tidal flow conditions at the seaward entrance to the creek.

In summary, the results of the existing conditions provided by this model coincide extremely well with the measured tidal height and velocity data throughout Knik Arm and within the POA area. Based on this outcome, it is reasonable to assume that the predictive results provide an accurate assessment of the changes to the tidal elevations and velocities and can serve as the basis for assessing the changes in sediment movement and dredging operations.

There exist three-dimensional (3-D) numeric models that assess the same functions as the two-dimensional (2-D) model used for this analysis. The main difference in these models is that the 3-D model does not use depth averaged data, but would use varying tidal data at various depths throughout the water column. There would need to be a very extensive, and expensive, data collection program to acquire the additional data to run this model. Based on the above information, it is believed that the 2-D model provides the results required to assess the impacts of the proposed Project. Since the model correlated extremely well with the field data, it is believed that the results from the additional data collection and 3-D modeling efforts would not be significantly different and the predicted impacts of the Project would not change. Therefore, additional modeling was not recommended or performed for this EA.

During a typical spring tidal cycle at the POA, water moves from south to north during flood flow. Starting at low slack water (low tide), flow is slow and directed toward the north along the dock face. As the flooding tide progresses, the north-directed currents along the dock face grow in strength and then wane in strength as high water slack tide is reached. During ebb flow, the water flows primarily to the south along the dock face, in response to the ebbing tide. However as the ebb flow past Cairn Point strengthens, the strong ebb current forms a large eddy, or gyre, south of Cairn Point, in which water circulates in a counterclockwise motion. The shape, extent, and strength of the eddy change during the ebb portion of the tidal cycle. The evolving counterclockwise flowing eddy causes the initially south-directed ebb flow to stop, and then reverse direction. At peak ebb flow, water moves to the north along the dock face, not to the south as one might expect during an ebbing tide. This eddy grows in size with time on the ebb cycle, and by the time low tide slack water occurs, the eddy extends slightly past the south end of the POA. The northerly-flowing water at the dock face due to the eddy gives way to increasingly stronger flood flow on the next incoming tide. The center of the gyre initially migrates southward toward the northern edge of the POA, then reverses direction. Figure 3-11 shows the counterclockwise eddy that exists during spring ebb conditions to the north of the dock and to the south of Cairn Point.

Thus modeling results indicate that the proposed action would slightly modify current conditions at the POA, and that those small modifications, while not significant to the overall environment, may actually be beneficial in terms of reduced dredging activities (See Sedimentation section below). The modeling also indicated that there will be no significant adverse impacts to current patterns in other parts of Upper Cook Inlet, including at the mouth of Ship Creek, approximately one mile south of the Project limits.

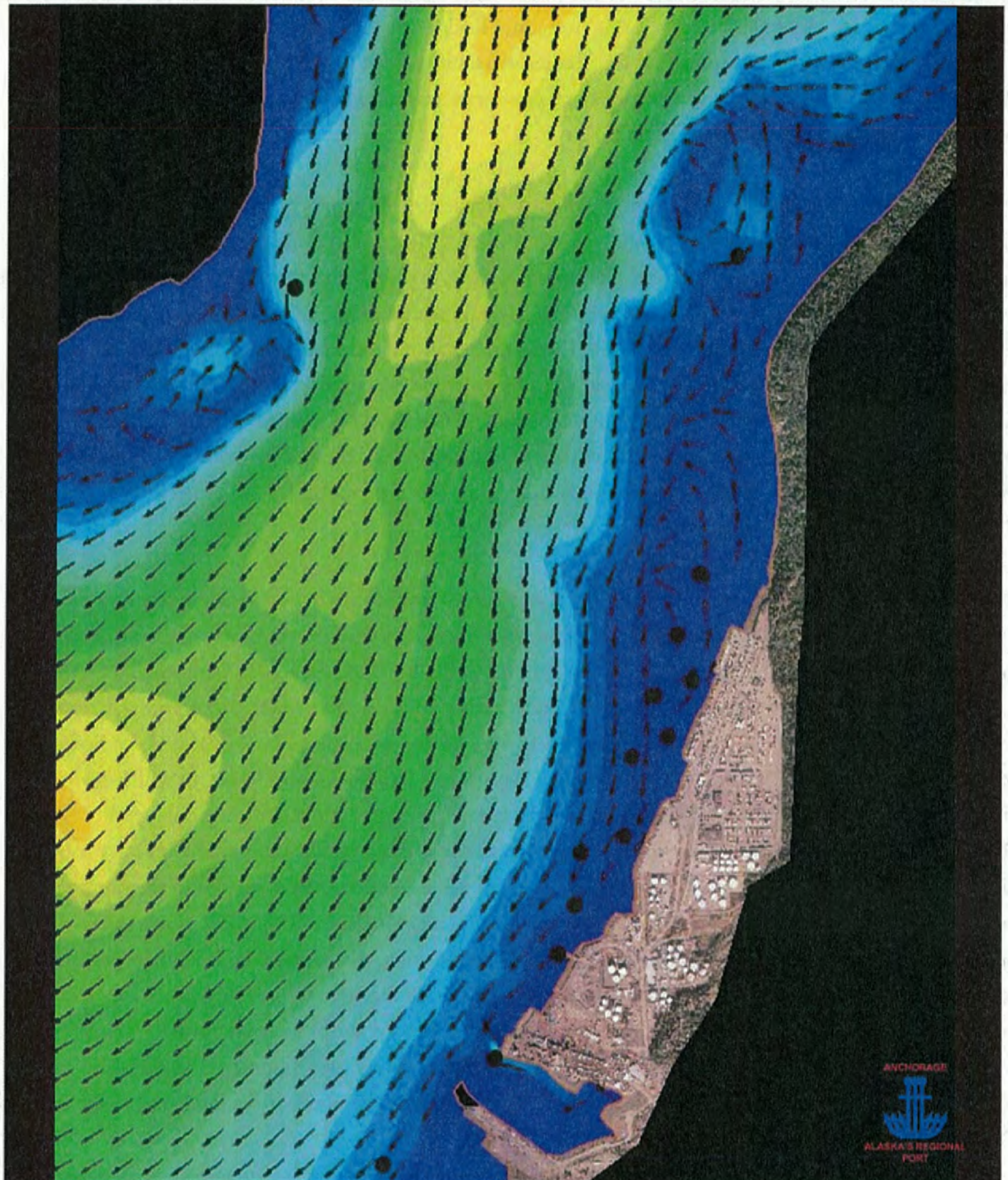


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Figure 3-11
Existing Circulation Pattern During Ebb Tide

Ice

The Marine Ice Atlas for Cook Inlet indicates that Knik Arm (along with Turnagain Arm) has the highest potential for ice occurrence in Cook Inlet (Mulherin *et al.* 2001). The ice in Cook Inlet is of four different types: sea ice; beach ice; stamukhi; and estuary and river ice. None of these result in a solid frozen layer. Rather, the ice is a combination of floes that move with the tide and shore-fast ice. Sea ice is the predominant type in Cook Inlet, and forms in seawater. Beach ice is composed of frozen mud exposed to the air by the ebbing tide. At flood tide, water in contact with the frozen mud also freezes. Stamukhi are composed of beach ice that has broken free, been deposited higher on the mudflats, and frozen to the underlying mud. Ice floes floating toward the beach are caught on top of other ice and, as the tide recedes, the overhanging pieces break off, leaving a stack of layered ice. Estuary ice forms in estuaries and river ice in rivers in freshwater. River ice typically remains in the river until spring breakup, when it washes into Cook Inlet. It is much harder than sea ice (LaBelle *et al.* 1983).

Because of its northern-most location in the Inlet and because it receives a considerable amount of freshwater (which tends to reduce the salinity and facilitate the growth of ice), ice in Knik Arm forms quickly. Ice can begin forming when the temperature drops below about 25° F and starts to disappear at about 27° F. Below 15° F, the ice can develop in substantial quantities within a couple of days. With the onset of spring, the pack ice is flushed out of Knik Arm quickly. The beach ice remains considerably longer and is generally present until mid-April. Tides, currents, and wind determine the density and distribution of sea ice in Knik Arm. Coherent sea ice floes are relatively small in Knik Arm due to the high level of turbulence. Most floes that appear large are, in fact, amalgamations of small floes loosely bound together near their edges. It is likely that the maximum single floe size in the Project area is about 2,000 feet in diameter. The thickness of ice typically is between 18 and 24 inches in Knik Arm; beach ice and ice that has thickened by overriding or other means can be several feet thick, but usually remains immobile near shore. As the tide rises and falls, the currents carry ice up and down Knik Arm. Ice floes that are moved by tides and winds can gouge shorelines, causing shoreline erosion.

Sedimentation

Knik Arm is generally characterized by high suspended sediment concentrations. The highest concentrations of sediments are recorded near the mouths of the Matanuska and Knik Rivers. Originating from glaciers, these rivers are the primary source of materials that are deposited on the extensive tidelands of Knik Arm and are the main contributors of suspended sediment to Knik Arm (Colonel and Jones 1990). The maximum daily suspended sediment loads recorded for the Matanuska and Knik Rivers are 1.3 million tons and 2.0 million tons, respectively. Approximately 60 percent of the ten million tons of suspended sediment entering Knik Arm annually is transported outside the Arm by active currents. The remaining 40 percent of the sediment load is likely deposited in the Knik/Matanuska River Delta. The Matanuska and Knik Rivers have large seasonal fluctuations in discharge and suspended sediment load.

Typically 80 percent of the annual discharge occurs from June through September, ten percent between November and March, five percent in May, and five percent in October. The seasonal variation in suspended sediment load from the contributing rivers produces a cyclic process of sedimentation and erosion within the Knik Arm. During high discharge and high suspended sediment load periods, deposition can occur due to the "carrying capacity" of the water column being exceeded. Conversely, during periods of low suspended sediment concentrations, erosion can occur due to the water column being "starved" of suspended load. Bottom sediments in Knik Arm are comprised mostly of sand and glacial silt and are distributed in patterns directly related to the circulation of the water. Knik Arm, from Cairn Point to Point Woronzof, generally has an established channel with depths ranging from exposed shallow mudflats to -160 feet MLLW.

Shoals that form at the north and south ends of the POA have distinctly different growth characteristics. At the south end, the shoal begins to form as a more elongated, shore-parallel feature, and its extent grows primarily in the alongshore direction, starting at the south wing cut and gradually growing in a northerly direction. The shoal's major axis is primarily oriented in the alongshore direction, at least initially. The southern shoal begins to form in May, and by July, the crest elevation of the feature reaches five to six feet above the authorized depth (the current authorized depth of -35 feet MLLW). The shape of the northern shoal is different; it is fan-shaped and not elongated. It typically begins to form in May as a deposit in the corner where the dock face meets the wing cut and expands radially outward along and away from the dock face. This deposit does not have a well-defined major axis of orientation. In terms of area extent, the northern shoal is larger than the southern shoal, and by July, its crest elevation can reach ten feet above authorized depth. As each of the two shoals grows in size during the summer, a ridge, or sill, begins to form between them. In the absence of dredging, the sill forms a bridge between the two shoals.

Sediment dynamics at the POA and in the vicinity are complex and not well defined. Sedimentation is due to several factors, including alongshore movement of sand, silt, and fluid muds that are formed on the shallow tidelands, as well as sediments that settle to the bottom during relatively quiescent times in the tidal cycle.

Dredging

The USACE Alaska District has the dredging responsibility for the POA. The USACE conducts maintenance dredging every year to maintain the -35-foot MLLW authorized federal depth both in the approach channel and in the berthing area. The material is usually dredged starting in the spring along the existing dock outward for approximately 1,100 feet, to a depth of -40 feet MLLW. The material has been disposed of approximately 3,000 feet away from the dock face, in approximately 70 feet of water. The dredged material is very cohesive and, when released from the barge, it is deposited in a large mass at the disposal site. A large percentage reaches the bottom where it is dispersed by the strong currents. In 2003, the material was disposed off the southern end of the POA in 70 feet of water.

Sediments and water have been examined in the POA area for organic compounds, hydrocarbons, heavy metals, pesticides and PCBs (USACE 2003). No volatile or semi-volatile compounds were detected in the samples. No total recoverable petroleum hydrocarbons, cadmium, mercury, selenium, or silver were detected. Detected arsenic, barium, chromium, and lead concentrations in samples were below screening levels (State of Washington, Department of Ecology, Sediment Management Standards Minimum Clean-up Levels-Chemical Criteria). No PCBs or pesticides were detected in the samples. The material was classified as silt. The native soils at the disposal site are classified as silty gravel.

The deposited dredged material is dispersed through Knik Arm by the strong tidal currents. As confirmed by contractor surveys of the area and bathymetric measurements conducted every year, there has been no build up of material at the disposal site. The volumes of material that have been dredged from the POA since 1989 are shown in Table 3-14.

Table 3-14 Volumes of Material Dredged from the POA Since 1989

Year	*Volume (cubic yards)*
1989	200,284
1990	290,686
1991	221,863
1992	227,559
1993	229,358
1994	251,968
1995	244,530
1996	197,322
1997	196,162
1998	356,000
1999	438,800
2000	1,458,236
2001	451,431
2002	763,268
2003	844,968
2004	2,100,000 (USACE Estimate)

As can be seen from the historic dredging records, the average shoaling per year within the POA area between 1989 and 1997 was approximately 229,000 cubic yards of material; between 1998 and 2003, the average shoaling was approximately 720,000 cubic yards per year. Reported results for 2004 dredging from USACE indicate that 2,100,000 cubic yards were removed, a 300 percent increase from the annual average for the previous five years. Although there are no published studies on this change in shoaling rate, glacial runoff heavily laden with sediments may be attributable to some extent to mild winters, but also to a substantial extent to recent construction within the Inlet (see Appendix E).

Environmental Consequences

Proposed Action

Possible effects from the Project include changes in tide, currents, flows, and other regimes at full buildout and during construction that could affect sedimentation at the POA, at nearby areas, and in the channel. Effects due to the full buildout operations are examined first, followed by localized effects, due to the phasing of construction.

The Preferred Alternative/Alternative A

Oceanographic Conditions

Tides

Using the models discussed previously, impacts to tidal fluctuations for the Project at full buildout were analyzed for the full spring-neap tidal cycle. For the seventeen locations, there were no significant changes to the tidal elevations for the proposed Project conditions, and the Project did not significantly impact tides in Upper Cook Inlet. A representative sample (POA, Ship Creek, Port MacKenzie, Cairn Point, and Woronzof Flat) of the existing conditions versus the proposed Project conditions are shown on Figures 3-12 through 3-16.

Currents

At the northern end of the expanded dock face, the current speed on flood flow would increase less than four inches (0.1 meter) per second. This slight increase was observed throughout the spring-neap cycle. During spring tide conditions at the early stages of ebb flow, Alternative A produced a decrease in ebb current strength of less than four inches (0.1) meter per second. In the later stages of the spring ebb cycle, the character of the tide changed at this location. An eddy that forms under existing conditions in the lee of Cairn Point during strong ebb flows was suppressed with the expanded dock face in place. Alternative A doubled the time during which the current was in the ebb direction and reduced the time during which the current was in the flood direction (creating more balance between duration of flood and ebb). Ebb flows were generally stronger with Alternative A in place, compared to existing conditions.

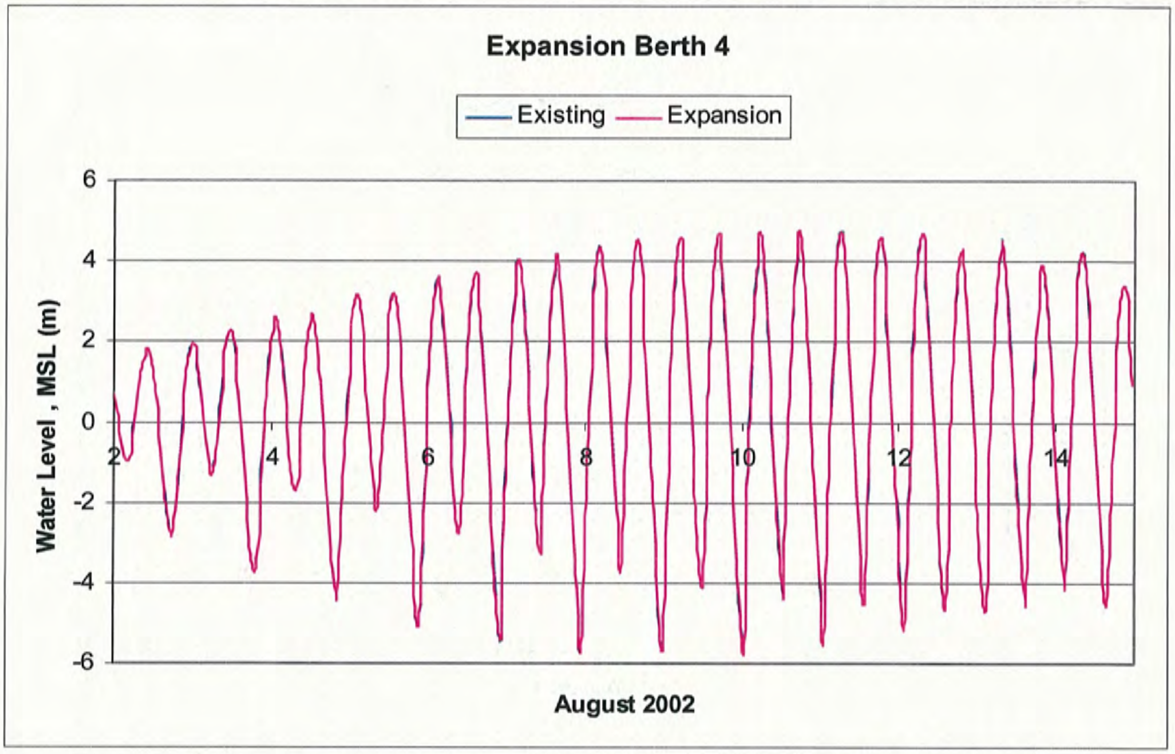

Figure 3-12 Time Series of Existing and Alternative A Water Levels at Expansion Berth 4

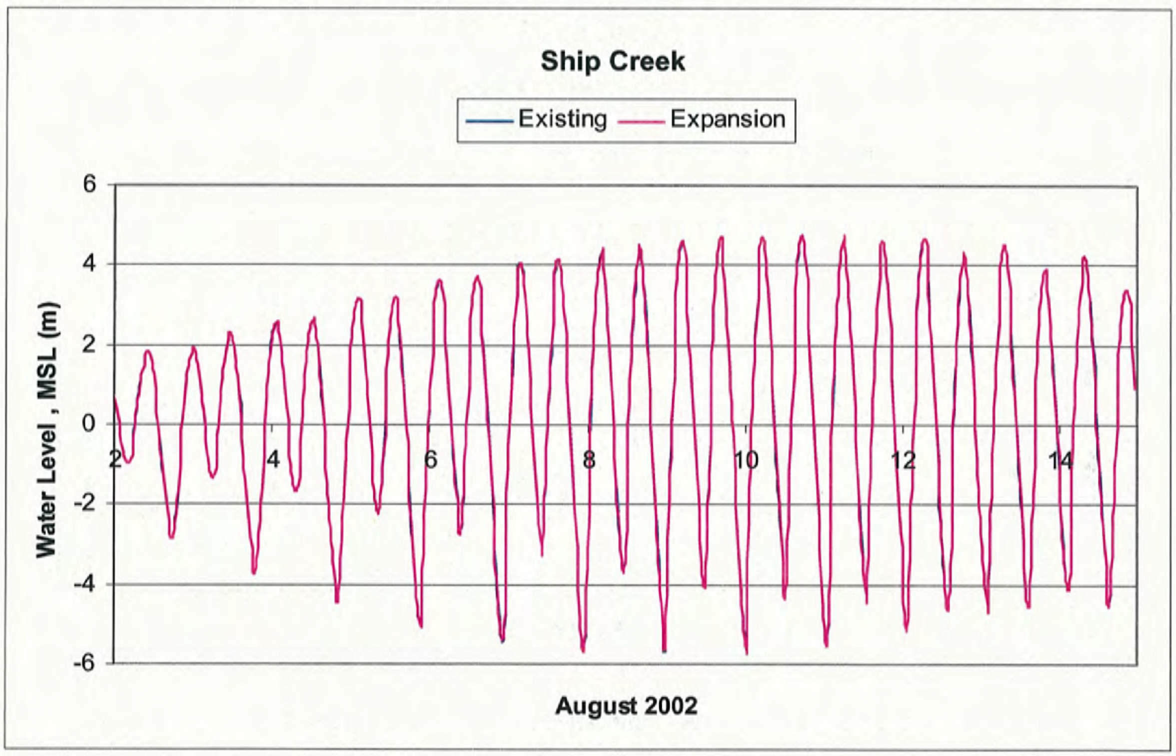

Figure 3-13 Time Series of Existing and Alternative A Water Levels at Ship Creek

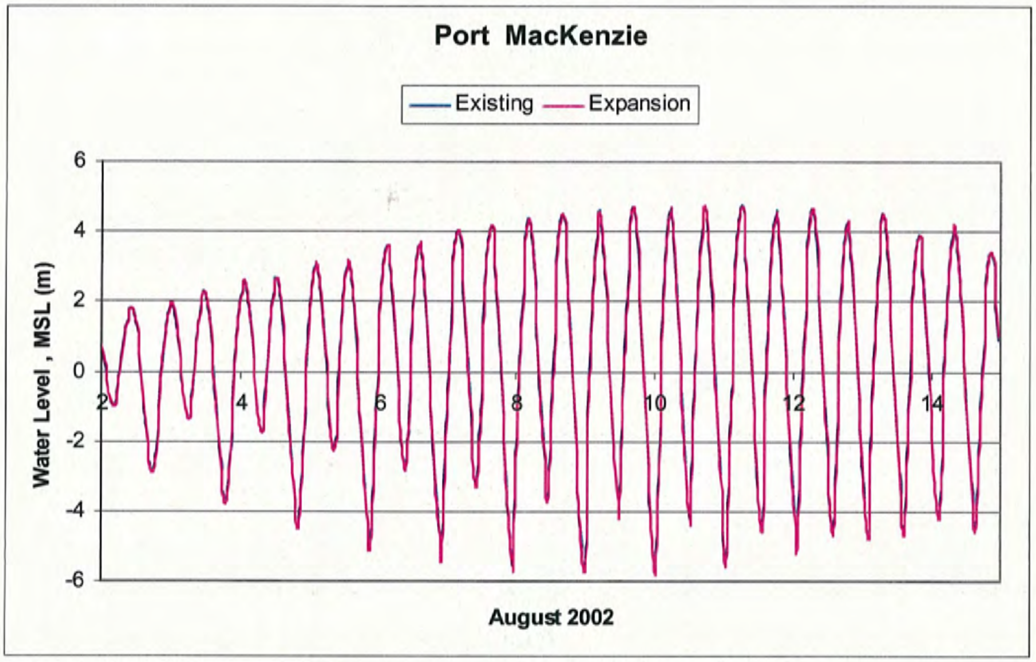

Figure 3-14 Time Series of Existing and Alternative A Water Levels at Port MacKenzie

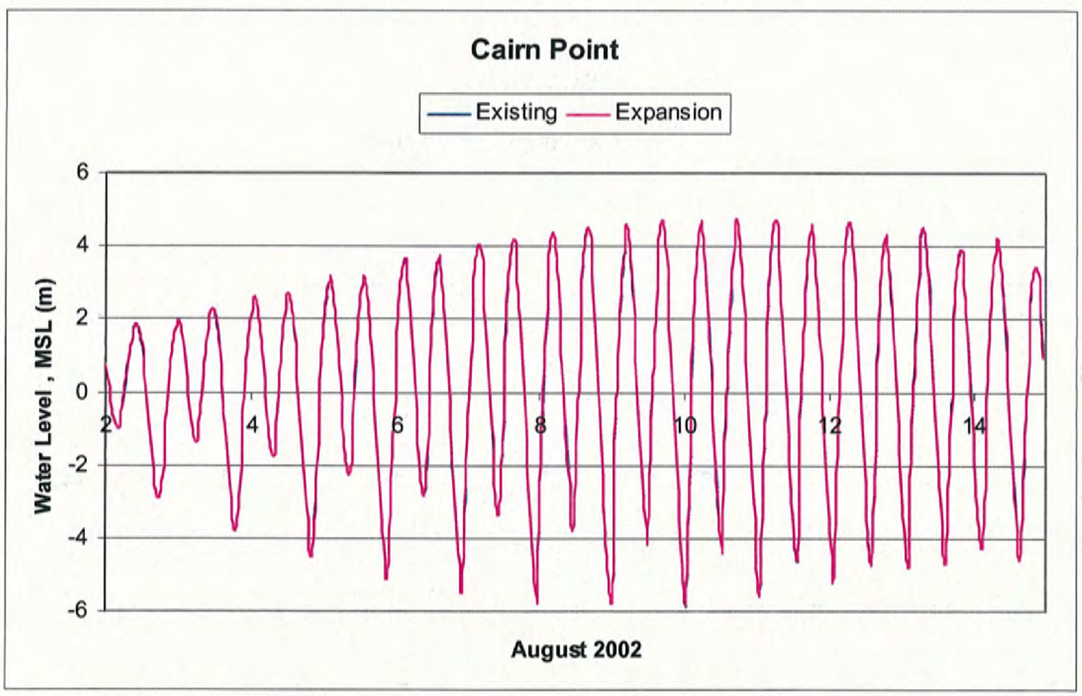

Figure 3-15 Time Series of Existing and Alternative A Water Levels at Cairn Point

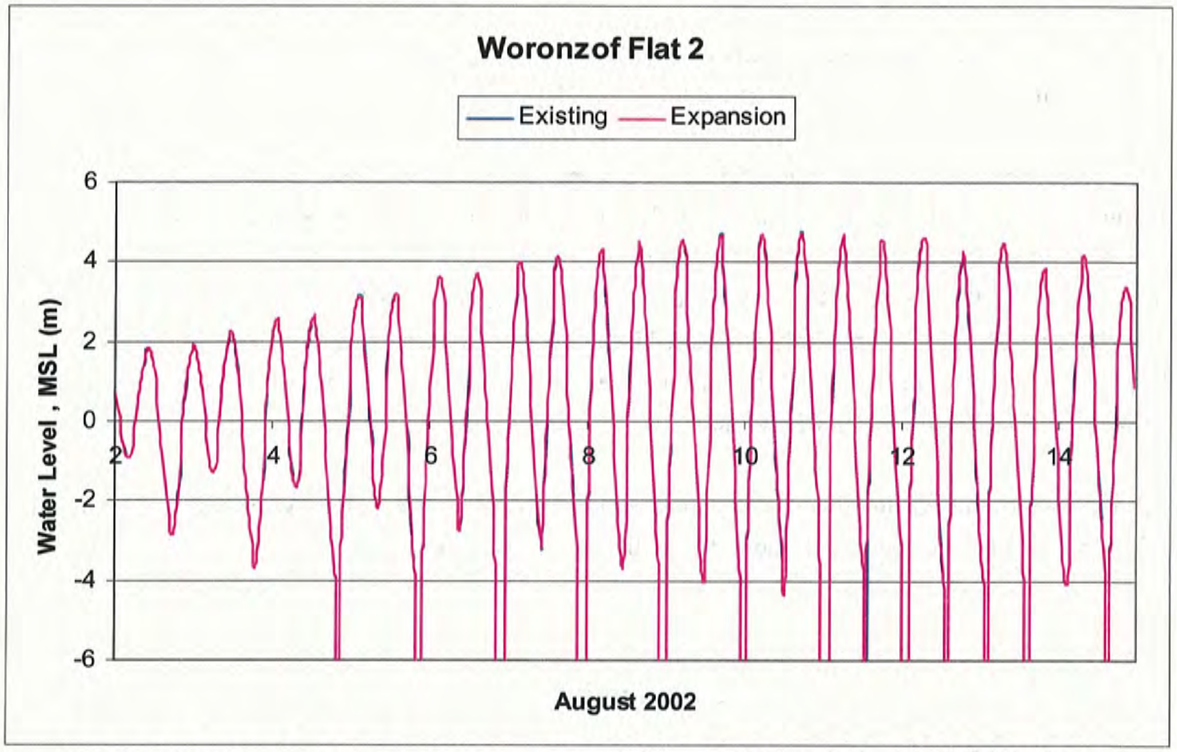

Figure 3-16 Time Series of Existing and Alternative A Water Levels at Woronzof Flat 2

Slightly south along the dock face (Expansion Berth 6, see Figure 3-10), the current speed did not change during the spring-neap cycle, except at the end of ebb tide, where the eddy structure was suppressed during spring tide conditions. Flood flows throughout the entire spring-neap cycle were essentially unaltered. The early peak ebb flows were reduced slightly at this location. The period of ebb flow increased slightly and the period of flood flow decreased slightly.

At Expansion Berth 4 and 5 stations, the current speed increased approximately four inches (0.1 meter) per second on both flood and ebb flows. The existing eddy was suppressed and current speed increased at the end of ebbing tide. The divergence in current direction during ebb tide associated with the eddy was eliminated.

At Expansion Berth 2 and 3 stations, the current speed during flood flow decreased during most of the spring-neap cycle. Peak ebb flows were generally the same as for existing conditions, except at the end of ebb flow, when suppression of the eddy resulted in ebb flows increasing by less than four inches (0.1 meter) per second.

At the Berth 1 and 2 and the former Summit Barge and Transfer Facility stations, the flood tide currents were reduced by four to eight inches (0.1 to 0.2 meters) per second. The momentum of the flood tidal flow in the deeper portions of the Inlet appeared to outweigh this effect further north along the proposed dock face, and currents increased slightly on flood flow. Again, at the end of the ebb tide, current speeds increased slightly due primarily to suppression of the eddy.

At the Ship Creek station, Alternative A had little effect on currents, changing speeds slightly and not altering the directional pattern. Alterations to the current field were most pronounced at the POA, and changes were substantially reduced just a short distance to the south of the POA. At Woronzof Flat 1, 2, and 3 stations, further south of the POA, the current speed was not altered. Also, current direction in general did not change, except rarely in isolated instances for very brief periods of time. In general, changes in velocity at the three tidal flat locations can be considered to be minimal. Changes were also slight at Port MacKenzie and at Cairn Point.

A comparison of the existing tidal current conditions at POA, Ship Creek, Port MacKenzie, Cairn Point, and Woronzof Flat and conditions under Alternative A are shown in Figures 3-17 through 3-21.

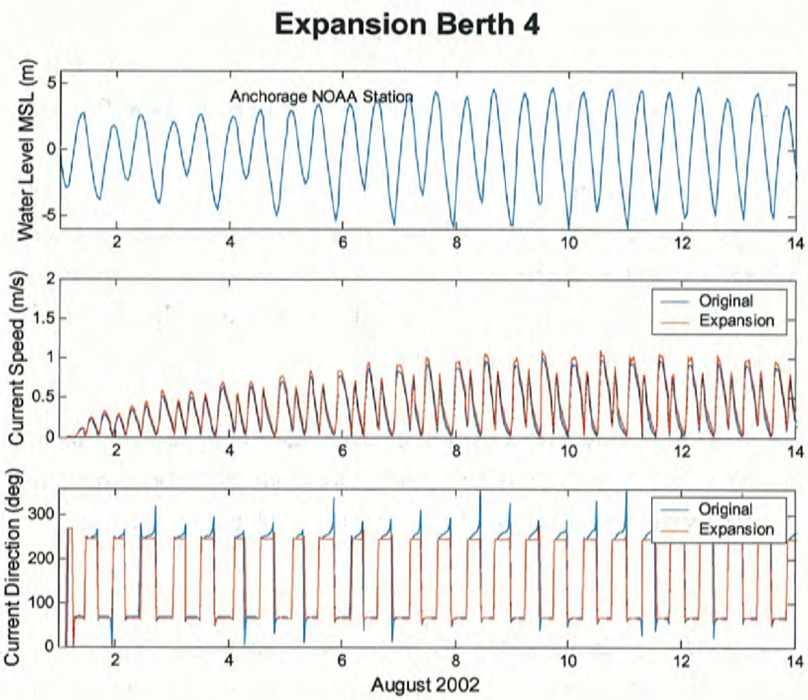

Figure 3-17 Time Series of Existing and Alternative A Current Speeds and Directions at Expansion Berth 4

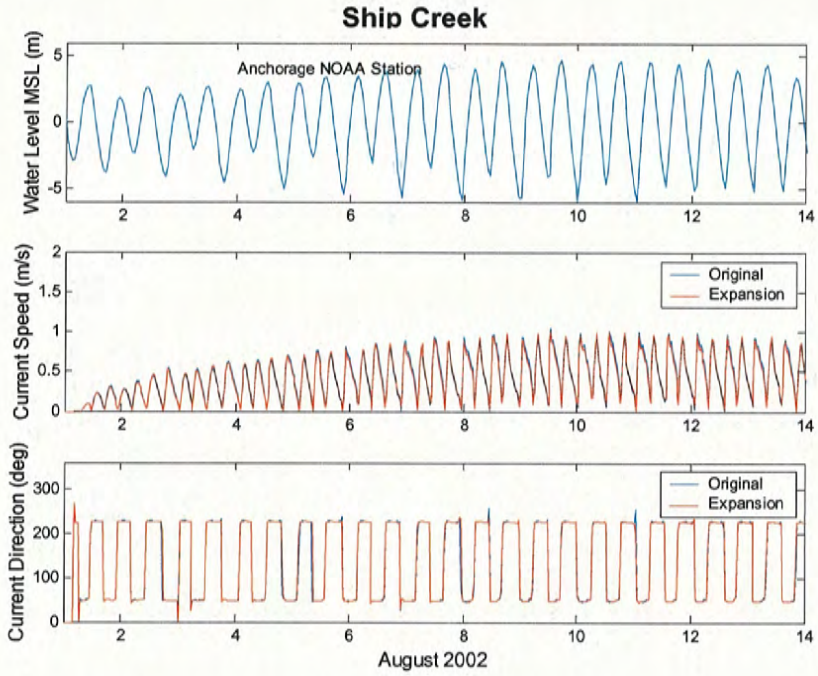

Figure 3-18 Time Series of Existing and Alternative A Current Speeds and Directions at Ship Creek

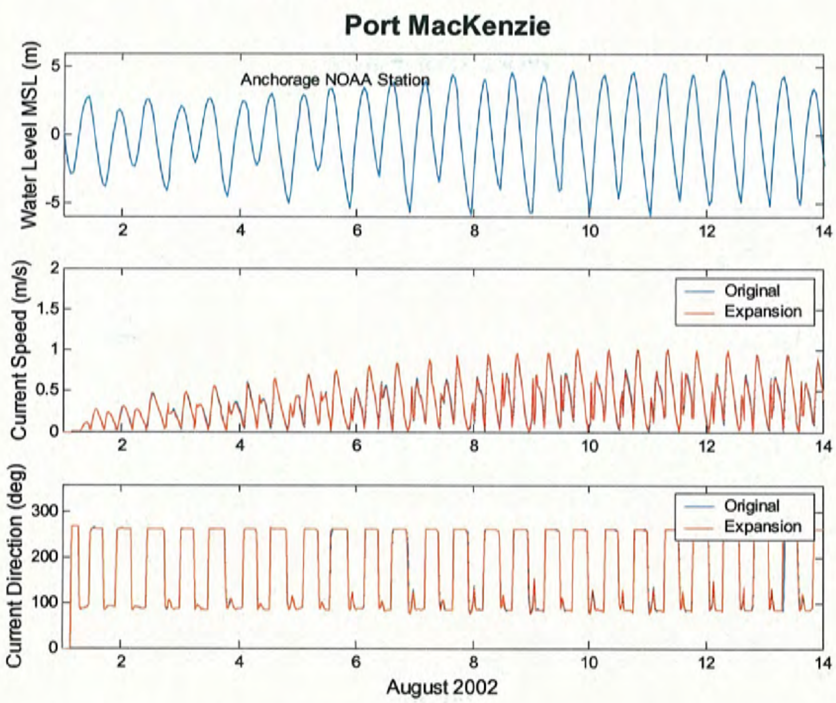

Figure 3-19 Time Series of Existing and Alternative A Current Speeds and Directions at Port MacKenzie

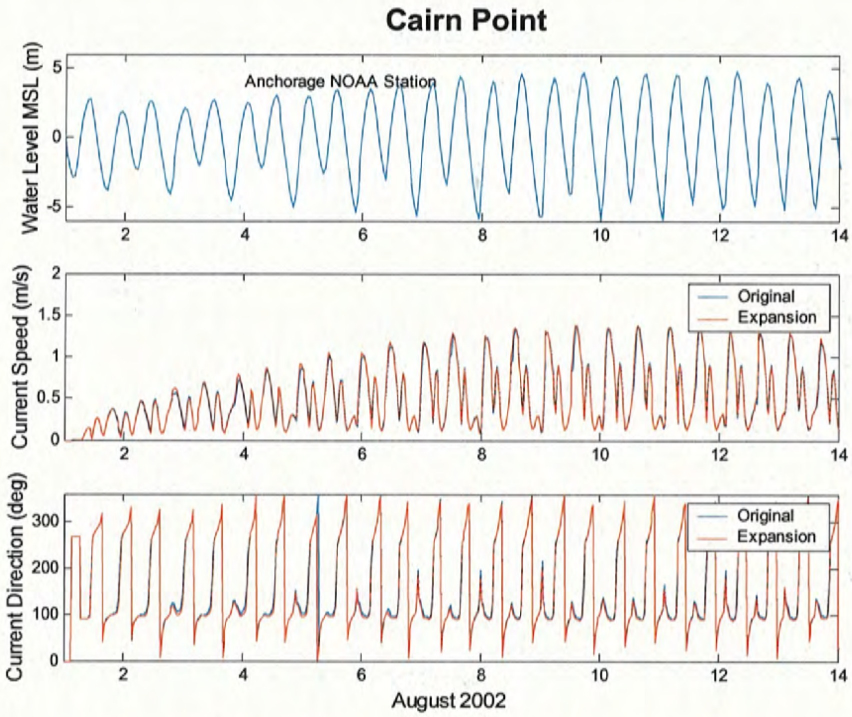

Figure 3-20 Time Series of Existing and Alternative A Current Speeds and Directions at Cairn Point

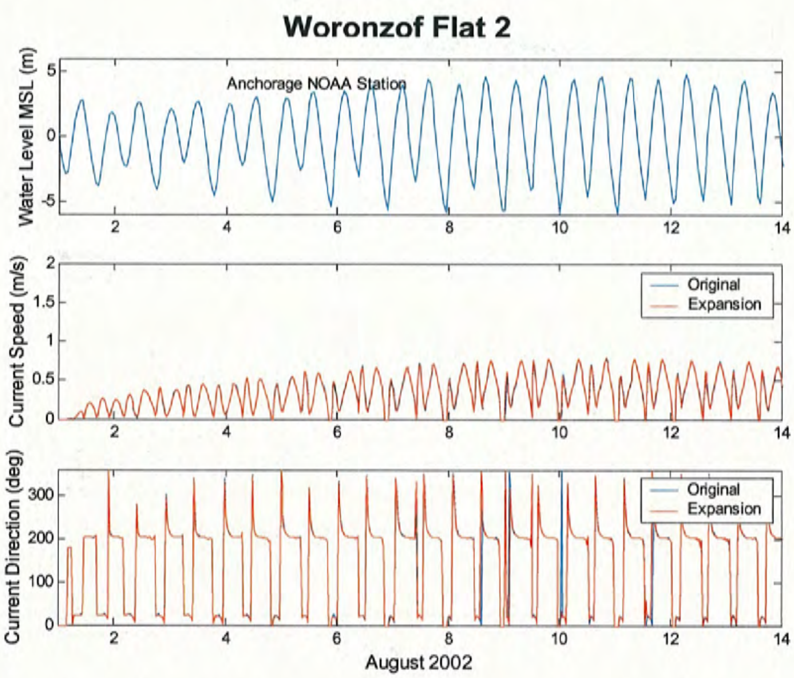

Figure 3-21 Time Series of Existing and Alternative A Current Speeds and Directions at Woronzof Flat 2

One difference between the existing condition and Alternative A occurs with an eddy at the north end of the POA. The eddy lagged in time by approximately three hours and did not extend as far south as it did in the existing conditions case. The eddy at the north end of the POA may influence sedimentation in that area. Figure 3-22 below shows the circulation pattern with Alternative A on the ebb tide.

Figure 3-23 shows the typical current speed difference between the existing and proposed conditions in the POA vicinity during flood, high water slack, and ebb tides, respectively. Note that the scale shows changes in current speed of between + and - eight inches/sec. Only in a few areas did the magnitude of the changes exceed +/- eight inches/sec, and changes were generally restricted to the immediate vicinity of the expansion and at Cairn Point. The white areas in this figure indicate regions where the changes in current speed are minimal, less than 1.6 inches/sec. The current speed was reduced at the southern end of the dock face and increased in front of the dock face during flood tide. The current speed at Cairn Point was increased during flood tide. Alternative A also caused the current speed at Cairn Point to increase in some areas and decrease in another area during high water slack tide, and increased the current speed in front of the dock face during ebb tide.

In general, the largest effect in the POA vicinity was in front of the dock face and at Cairn Point. However, these changes would not represent a significant adverse impact on hydrodynamics at the POA or in Knik Arm. No discernable change to currents would occur at Ship Creek, Point Woronzof, Cairn Point, or Port MacKenzie. Thus, Alternative A would not create significant adverse impacts from current changes.

Ice

There are no anticipated impacts to the amount of ice or its flow patterns due to the changes in tidal circulation from Alternative A.

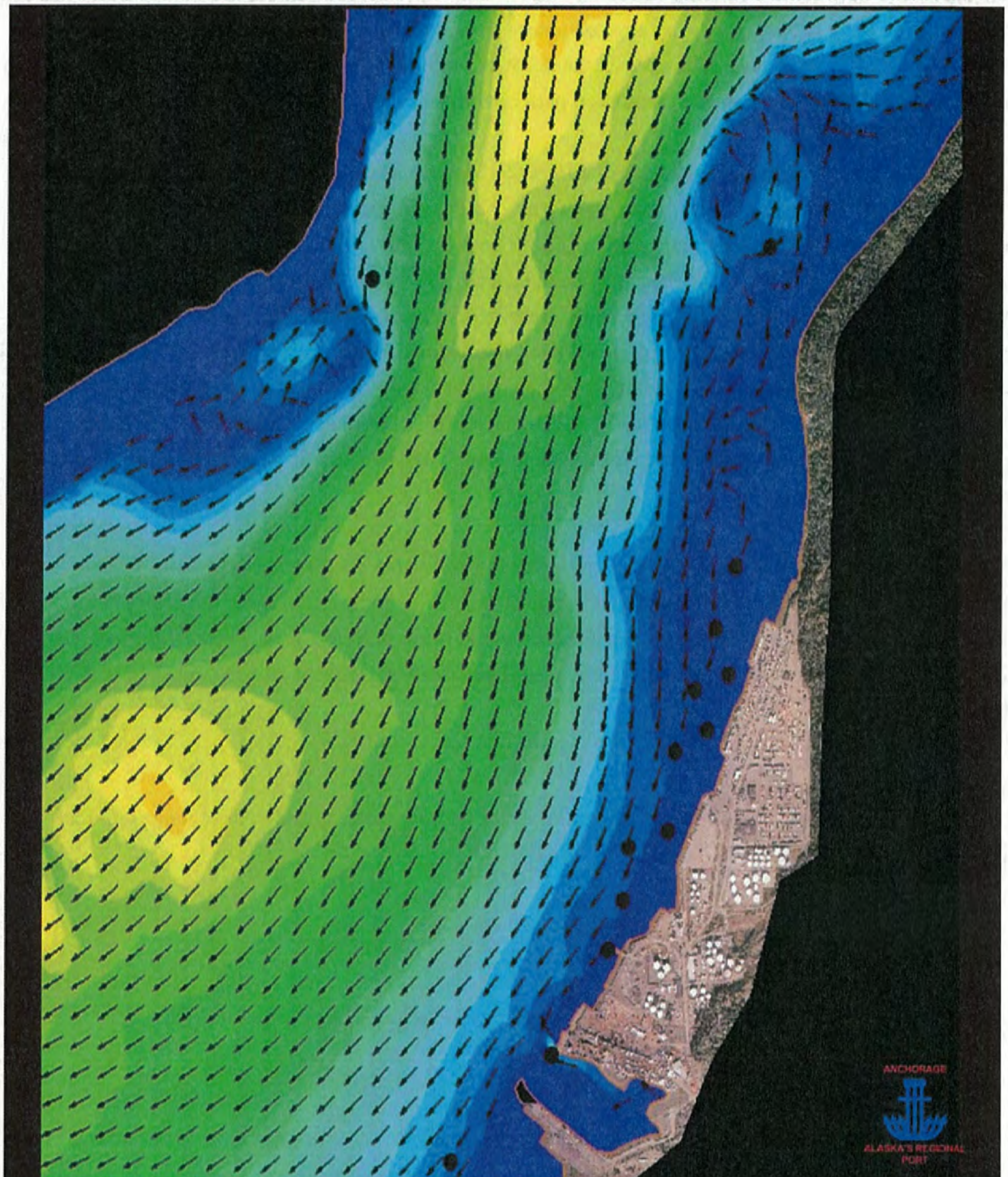

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Figure 3-22
Circulation Pattern with Expansion During Ebb Tide

N

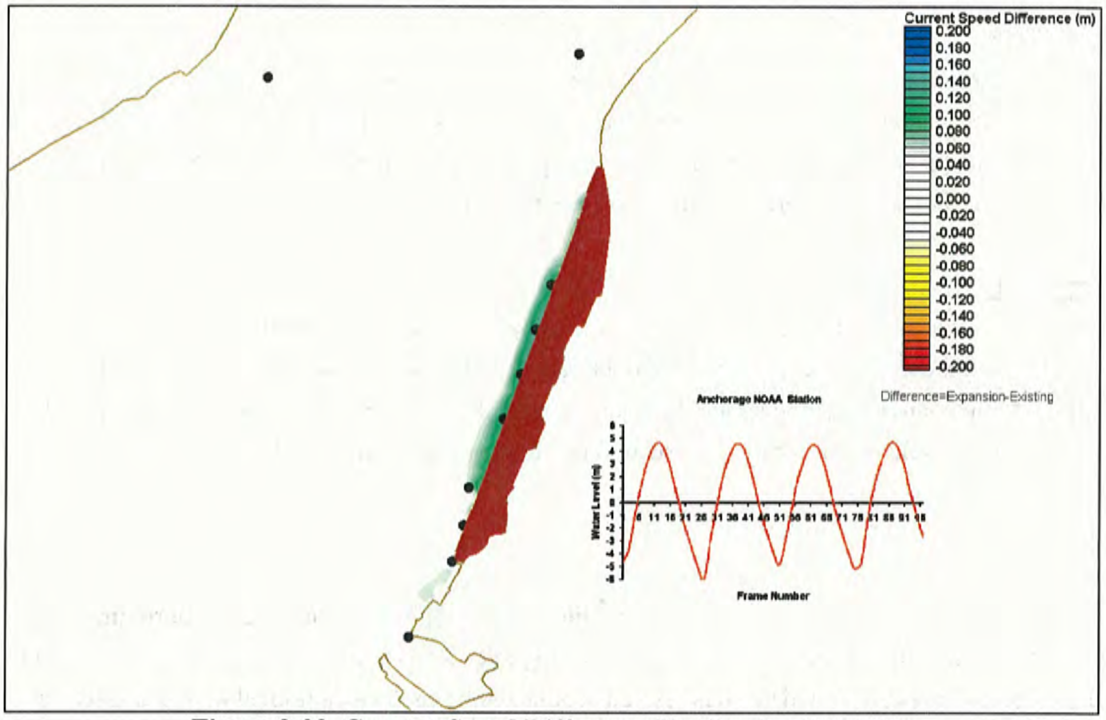

Figure 3-23 Current Speed Difference Plot During Ebb Tide

Sedimentation

Modeling indicates that flood flows increase along most of the proposed dock face, except at the south end, where current speeds on the flood tide decrease. This suggests that the potential for currents to transport sediment along the bed to the north and into the harbor basin also would be decreased. During flood tides, the Project would produce a pattern of increasing flood current strength from south to north along the dock face. This pattern generally suggests a divergent flow environment, which is expected to produce a reduction in potential sedimentation along much of the dock during flood flows. Along much of the dock face, flood currents would increase for the Project. Higher flows also suggest decreased likelihood that sediments can settle out of suspension.

Alternative A would suppress the formation of the gyre during the early part of the ebb tidal cycle. Flows along the dock face would be directed to the south for a larger percentage of time, and with greater velocity, as compared to the existing conditions. This would decrease the period during which gyre conditions would encourage sediment deposition. Thus, maintenance dredging should be reduced under Alternative A, providing a beneficial operational impact.

Because maintenance dredging would continue during the various construction phases, changes in sedimentation during construction would be temporary and would not represent a significant adverse impact to the operation of the POA.

Alternative B

Changes in currents and sedimentation are expected to be the same as described for Alternative A. Overall, less sedimentation is expected at the dock face than would accumulate under the existing operation. Maintenance dredging should be reduced, providing a beneficial impact. No significant adverse impacts should occur during construction due to increased sedimentation.

Alternative C

Changes in currents and sedimentation are expected to be the same as described for Alternative A. Overall, less sedimentation is expected at the dock face than would accumulate under the existing operation. Maintenance dredging should be reduced, providing a beneficial impact. No significant adverse impacts should occur during construction due to increased sedimentation.

No Action

Under the no-action alternative, all exposed steel piles supporting the existing POA (approximately 1,000 piles) would need to be repaired or replaced. Removing piles to accomplish this action would result in minor, temporary impacts to hydrodynamics and sedimentation in the area immediately surrounding individual pile(s) slated for replacement. Following pipe replacement, no impacts to hydrodynamics or sedimentation would remain.

Maintenance dredging would continue to occur according to the same schedule and operational procedures currently implemented; as such, existing conditions as related to hydrodynamics and sedimentation as described in the affected environment would continue to occur.

3.3.3 Water Quality

Water quality focuses on surfacewater, groundwater, and marine water quality within the Project area.

Affected Environment

Surfacewater Quality

There are four major stormwater drainage systems on the POA property, the North TOTE, TOTE, Horizon/Cherry Hill, and Tesoro systems. The Horizon/Cherry Hill drainage system provides storm runoff for approximately 80 percent of Elmendorf AFB and drains through the POA to Knik Arm (POA 2004a). However, this system is separate from POA systems and does not receive stormwater from the POA.

In Alaska, no formal water-quality criteria exist for sediment concentrations. However, sediment is considered a stormwater contaminant and may have other contaminants adsorbed onto it. A runoff study conducted in 1999 determined that the two drainages from Elmendorf AFB via the Cherry Hill drainage system contributed approximately 180 pounds of sediment/acre per inch of runoff during rainfall periods and approximately 21 pounds of sediment/acre per inch of runoff during snowmelt periods (USGS 1999).

The POA currently operates under an NPDES permit developed for the MOA (MOA 2002). It complies with specific pollution prevention measures during construction and operation and includes a stormwater management program and monitoring (POA 2004b). The POA coordinates with the USEPA and MOA for their own site-specific NPDES permit. The POA does not use any chemical means to clear snow, only sand and bulldozers. There are some snow storage areas at the POA. Current procedures that are implemented at the POA include:

- general litter control and cleanup;
- annual sweeping of parking areas;
- periodic inspections;
- construction and post-construction stormwater quality controls;
- preventative maintenance including inspection of above ground storage tanks, stormwater system, and vehicle refueling areas;
- restrictions on the use of pesticides, herbicides, and fertilizers; and
- training of employees to prevent spills.

Major natural surfacewater bodies in the vicinity of the POA include Ship Creek, approximately one mile to the south, which is listed on the 1998 USEPA Section 303(d) list of impaired water bodies due to high levels of fecal coliform, biological community alteration, and petroleum hydrocarbons from urban runoff and industrial activity (USEPA 1998). No other surfacewaters within the area are impaired as defined by the USEPA (USEPA 2004b).

Groundwater Quality

In the POA area, groundwater is encountered at a depth of three to eight feet below ground surface. There are two principle groundwater resources in the area of Cherry Hill Bluff east of the POA: a shallow, unconfined aquifer system and a deeper, artesian (confined) aquifer. The water in the shallow aquifer is brackish and therefore not of sufficient quality for use (POA 2004a).

Spills and releases of petroleum product have been recorded at the POA and on adjacent Army and Air Force property. In response, groundwater monitoring wells have been installed at the Army Anchorage Fuel Terminal (Defense Fuels property) south of the POA and at the northeastern border of the POA on

Elmendorf AFB property. Groundwater in these areas is within the ADEC minimum drinking water standards, although it is not used as a drinking water source (POA 2004a). Groundwater monitoring also occurs along the tidelands north of the POA. Associated with LF04, these monitoring wells are sampled as part of the remedial actions presented in the ROD for LF04 (Air Force 1997). Measured concentrations of benzene, ethylbenzene, and toluene exceeded clean up levels in groundwater and seep samples collected in 2002. Groundwater and seep contamination appear to be the result of upgradient fuel releases, possibly from drums (Air Force 2003).

Marine Water Quality

The Cook Inlet Subarea Contingency Plan is the guideline for establishing operations in the event of a major response effort to an oil spill or hazardous material release. This plan, in conjunction with the *Alaska Federal/State Preparedness Plan for Response to Oil and Hazardous Substance Discharges/Releases* known as the "Unified Plan" (AURT 1999), describes the strategy for a coordinated federal, state, and local response to a discharge or substantial threat of discharge of oil or a release of a hazardous substance from a vessel, offshore facility, or onshore facility operating within the boundaries of the Cook Inlet (ARRT 1997).

There are numerous streams and rivers that flow into Knik Arm. At the mouths of these streams and rivers there is a zone of water where the freshwater interacts with the seawater. Since the seawater is heavier than the freshwater, a situation is created where the freshwater will float on top of the saltwater, creating a freshwater lens. This phenomenon occurs at Ship Creek, a mile to the south of the POA, where the lens may be important for salmon migration (see section 3.3.4).

Environmental Consequences

Impacts to water resources could potentially occur if implementation of the proposed action resulted in changes to water quality or supply, threatened or damaged unique hydrologic characteristics, or violated established laws or regulations.

Proposed Action

Prior to implementing the proposed action, MARAD and the POA would require selected contractors to identify and implement BMPs to prevent erosion and sedimentation during construction and operation; to control specific on-site erosion and sedimentation; to protect adjacent properties and watercourses from effects related to erosion, sedimentation, and flooding; to control spills; and to handle potentially hazardous materials and waste in accordance with federal, state, and local requirements. In addition, the POA's Program Management Office would require all contractors to carefully monitor all facets of construction to ensure proper implementation of BMPs such as:

- Clearly marking construction limits with stakes and survey tape;
- Physically delineating fill areas to prevent unnecessary filling;
- Installing silt fencing in appropriate locations to reduce erosion and sedimentation;
- Reseeding slopes;
- Armoring slopes subject to flooding with riprap; and
- Performing maintenance of on-site capabilities to respond to spills of oils, fuels, or other similar materials.

The Preferred Alternative/Alternative A

Proposed construction activities would temporarily increase localized erosion rates, which could lead to short-term increases in sediment discharge rates to surfacewater resources. However, BMPs would be implemented to eliminate or reduce the amount of erosion and sediment transport such that less than significant adverse impacts to surfacewater resources would result. Monitoring would be conducted during the construction phase to ensure that established criteria are not exceeded. If this monitoring were to indicate that the criteria were being exceeded, additional BMPs would be implemented to bring the water quality into compliance. Proposed construction activities would not affect groundwater resources, as activities are not expected to reach depths that could affect usable groundwater resources. Fill material used (gravel, sand, and/or stone) would be tested prior to placement to certify that the fill material meets applicable standards for their designated use. Therefore, no significant adverse impacts to water quality would occur during construction activities.

Implementation of Alternative A would increase the amount of impervious surface at the POA, thereby reducing groundwater infiltration and groundwater recharge. However, there are no drinking water wells in the area, as the water in the shallow aquifer is brackish, therefore, not of sufficient quality for use (POA 2004a). Thus, there is no potential for reduced groundwater infiltration to affect drinking water sources.

Increased POA operation and maintenance activities would have the potential to add additional heavy metals, hydrocarbons, and sediment to stormwater runoff. To minimize potential impacts to surfacewaters, the Project would be designed and constructed to comply with the *Anchorage Erosion and Sediment Control and Materials Containment Guidance Manual* (MOA 1999a) and the *Stormwater Treatment Plan Review Guidance Manual* (MOA 1999b). The Project would include the design of drainage facilities to minimize pollution of water sources by appropriate management practices. BMPs that could be incorporated into this Project include those previously mentioned in the existing NPDES permit as part of the pollution prevention plan as well as:

- Constructing grassy swales or vegetated filter strips adjacent to the developed areas;
- Retaining natural vegetation wherever possible;
- Seeding slopes with natural vegetation or sod;

- Sweeping or vacuuming paved areas to minimize the runoff of sediment (e.g., sand applied for traction in icy conditions) before spring rains;
- Storing marine spill response equipment on-site; and
- Training.

Additional site drainage would be designed to maintain existing drainage patterns and use existing storm drain systems to accommodate increases in stormwater runoff. Prior to installing the capping material, additional multiple catch basins and underground drainage pipes would be installed. The storm drains would be designed to accommodate 100-year storm events and would collect and divert rainfall runoff and snowmelt to Knik Arm. The runoff would be collected and treated by appropriate management practices as required in MOA regulations (MOA 1999a, b). The POA would continue to follow the guidelines for establishing operations in the event of a major response effort to an oil spill or hazardous material release as defined in the Unified Plan (Alaska Unified Response Team 1999). Therefore, there would be no significant adverse impacts to water quality.

Ship Creek is located approximately one mile south of the POA. There are no anticipated impacts to the freshwater/saltwater lens at this location since there were no impacts to tidal circulation caused by the Project or by dredging at the mouth of the creek. Therefore, no significant adverse impacts to water quality would occur in this stream.

Alternative B

Under Alternative B, impacts to water quality would be similar to those described under Alternative A. Therefore, no significant adverse impacts to water resources would occur.

Alternative C

Under Alternative C, impacts to water quality would be similar to those described under Alternative A. Therefore, no significant adverse impacts to water resources would occur.

No Action

Under the no-action alternative, all exposed steel piles supporting the existing POA (approximately 1,000 piles) would need to be repaired or replaced. Removing piles would result in short-term impacts to water quality as sediment is disturbed and re-suspended in the water column. During pile replacement activities, care would be taken to minimize the potential for accidental releases of potential contaminants by employing site-specific BMPs. Following pile replacement, those short-term impacts would cease. Therefore, construction associated with the no-action alternative would not significantly impact water quality.

Maintenance dredging would continue to occur according to the same schedule and operational procedures currently implemented; as such, existing conditions as related to water quality would continue to occur. However, predicted future growth and an increase in throughput at the POA using existing facilities could lead to an increase in the potential for accidental discharge(s) of pollutants without an associated improvement in stormwater conveyance and treatment (i.e., BMPs) infrastructure. Under the no-action alternative, infrastructure improvements to POA facilities are not anticipated; therefore, potential adverse, but not significant adverse, impacts to water quality could result under the no-action alternative.

3.3.4 Biological Resources

Biological resources include native or naturalized plant and animal species and the vegetation communities within which they occur. Although the existence and preservation of biological resources are intrinsically valuable, these resources also provide aesthetic, recreational, and socioeconomic values to society. This analysis focuses on species or vegetation communities that are important to the functions of biological systems, of special public importance, or are protected under federal or state law or statute. For purposes of the EA, these resources are divided into four categories: vegetation and habitats; non-federally managed fisheries; wildlife; and special-status species. Fisheries managed by the federal government under the MSA are discussed in section 3.3.5.

Vegetation and habitats includes all existing terrestrial and marine plant communities as well as their individual component species. The area of potential effect (APE) for vegetation and habitats includes only those areas potentially subject to ground disturbance.

Fisheries includes all non-federally managed fish species. The assessment of potential impacts to EFH is included as an independent discussion in section 3.3.5.

Wildlife includes all animals with the exception of fish or those species identified as special-status species. Wildlife includes amphibians, reptiles, birds, and mammals. Wildlife also includes those bird species protected under the federal Migratory Bird Treaty Act. Assessment of a project's effects on migratory birds places an emphasis on "Species of Concern" as defined by EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*. Additional assessment of potential impacts to migratory birds that are regionally rare occurs under the special-status species category.

Special-status species are defined as those plant and animal species listed as threatened, endangered, or proposed as such, by the USFWS and NOAA Fisheries under the Endangered Species Act (ESA), or by the State of Alaska. In addition, those marine mammals not listed as threatened or endangered under the ESA are protected under the Marine Mammal Protection Act (MMPA); therefore, they are also considered special-status species and are discussed in this section.

The following discussion of the affected environment for biological resources is based upon the best available data for the Project area and region. Biological data for the Project area are limited and often 10 to 20 years old. To confirm the characterization of the marine environment within the Project area, POA, as a separate management practice, initiated marine fish and invertebrate sampling efforts in the fall of 2004. Data will be collected on the occurrence and distribution of fish and invertebrates in selected stations within and in the vicinity of the Project area. These fish and invertebrate sampling efforts will continue at least through the spring of 2005. If the data identify conditions different from those reported in the EA, unexpected resources, or potential unanticipated significant adverse impacts, the POA and MARAD will initiate supplemental NEPA actions.

Affected Environment

Vegetation and Habitats

Terrestrial

The POA is a developed industrial area composed of ship berths, terminals, cargo storage areas, petroleum and fuel storage tanks, and support facilities with little natural vegetation remaining. The majority of terrestrial vegetation around the periphery of the POA has been previously disturbed and consists primarily of alder shrub (*Alnus crispa*). The uplands and lowlands along Ship Creek, approximately one mile south of the POA, consist of scarce willow (*Salix* spp.) and alder.

Wetlands

The MOA defined three wetlands occurring within the POA (Figure 3-24). Two of the wetlands are designated as Class B wetlands by the MOA, and total approximately 7.4 acres. The northernmost wetland contains standing water. Class B wetlands, or conservation wetlands, contain some significant resources, but can be developed if the site key functions are maintained by minimizing fill and other disturbance. The narrow strip along the southernmost portions of Terminal Road is classified as type C wetlands or the lowest-valued wetlands. These are generally considered developable by MOA. This wetland is approximately 0.2 acres in size and has previously been disturbed.

Marine

The primary productivity of Upper Cook Inlet is limited due to cold temperatures and glacial silt. Phytoplankton and zooplankton are scarce, thus limiting marine food webs. A variety of diatoms are the most common phytoplankton and the most common zooplankton include copepods, cyclopods, and harpacticoids (USFWS 1995).

Figure 3-24
Port of Anchorage
Terrestrial Wetland Areas

(Data from Anchorage Bowl Wetlands Map Municipality of Anchorage, Division of Economic Development and Planning)

Although little site-specific information is available regarding the mudflats in the vicinity of the POA, general information on mudflats in the Anchorage area is available, particularly for those mudflats to the south of Ship Creek and extending around Point Woronzof. Intertidal and subtidal mudflats occur along the shoreline of the POA and Project area, primarily to the north of the existing POA operations and south of Cairn Point (Figure 3-25). Marine vegetation is restricted mainly to mats of algae (*Vaucheria longicaulis*) (USDOT 1983, ADFG 1991, USFWS 1995, FTA and MSB Susitna Borough 2003).

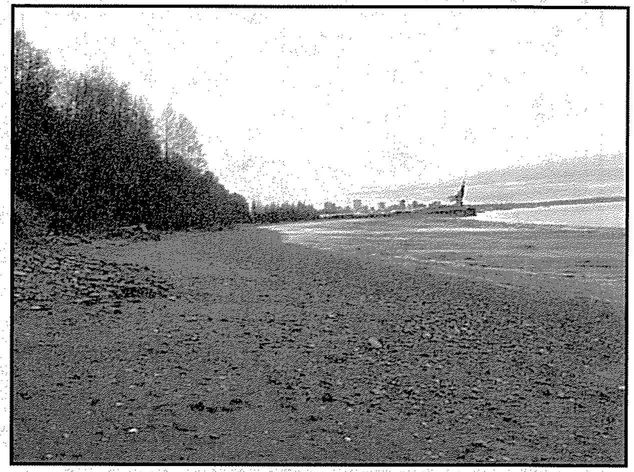

Figure 3-25 North Tidelands Area

Benthic and intertidal invertebrates are also scarce in the area. Invertebrates observed within the Anchorage Coastal Wildlife Refuge, more than five miles southeast of the POA, include mysids and gammarid amphipods, copepods, crangonid shrimp, and a number of species of marine worms (polychaetes) (USFWS 1995). Past invertebrate sampling efforts immediately to the north of the POA and south of Cairn Point found few marine invertebrates (USDOT 1983). In addition, current invertebrate sampling efforts at the station south of Cairn Point used during the USDOT (1983) study and at four new sampling stations at the POA, found few invertebrates, primarily crangonid shrimp and polychaetes (Pentec 2004a, b, c, d, e). Researchers noted that numbers of invertebrates at the POA were considerably lower than the average number taken at other stations. This was attributed to either differences in sampling methods (beach seining) or real differences in abundance due to the muddy bottom (Pentec 2004d).

Non-Federally Managed Fisheries

The non-salmonid fish species discussed below are representative forage and groundfish found in the Upper Cook Inlet/Knik Arm area and within the vicinity of the POA. There are very limited data on the distribution and occurrence of fish species in Knik Arm, particularly in the vicinity of the POA and Ship Creek. Based on fish sampling studies at sampling stations within the lower portion of Knik Arm, at least 20 species of fish inhabit the general area (USDOT 1983; Pentec 2004a, b, c, d, e). In 1983, a fish sampling effort was undertaken to support the Knik Arm Crossing Project and nine stations in the Lower Knik Arm were sampled. The primary sampling method was the beach seine, although an otter trawl was used for some stations (USDOT 1983). In 2004, fish sampling was initiated to support the proposed KABATA Project and the POA expansion. Beach seining was the primary means of sampling, with otter trawls being used secondarily. In addition to new sampling stations established in 2004, a number of the sampling stations used in 1983 were also sampled in the 2004 efforts (Pentec 2004a, b, c, d, e). Figure 3-26 depicts

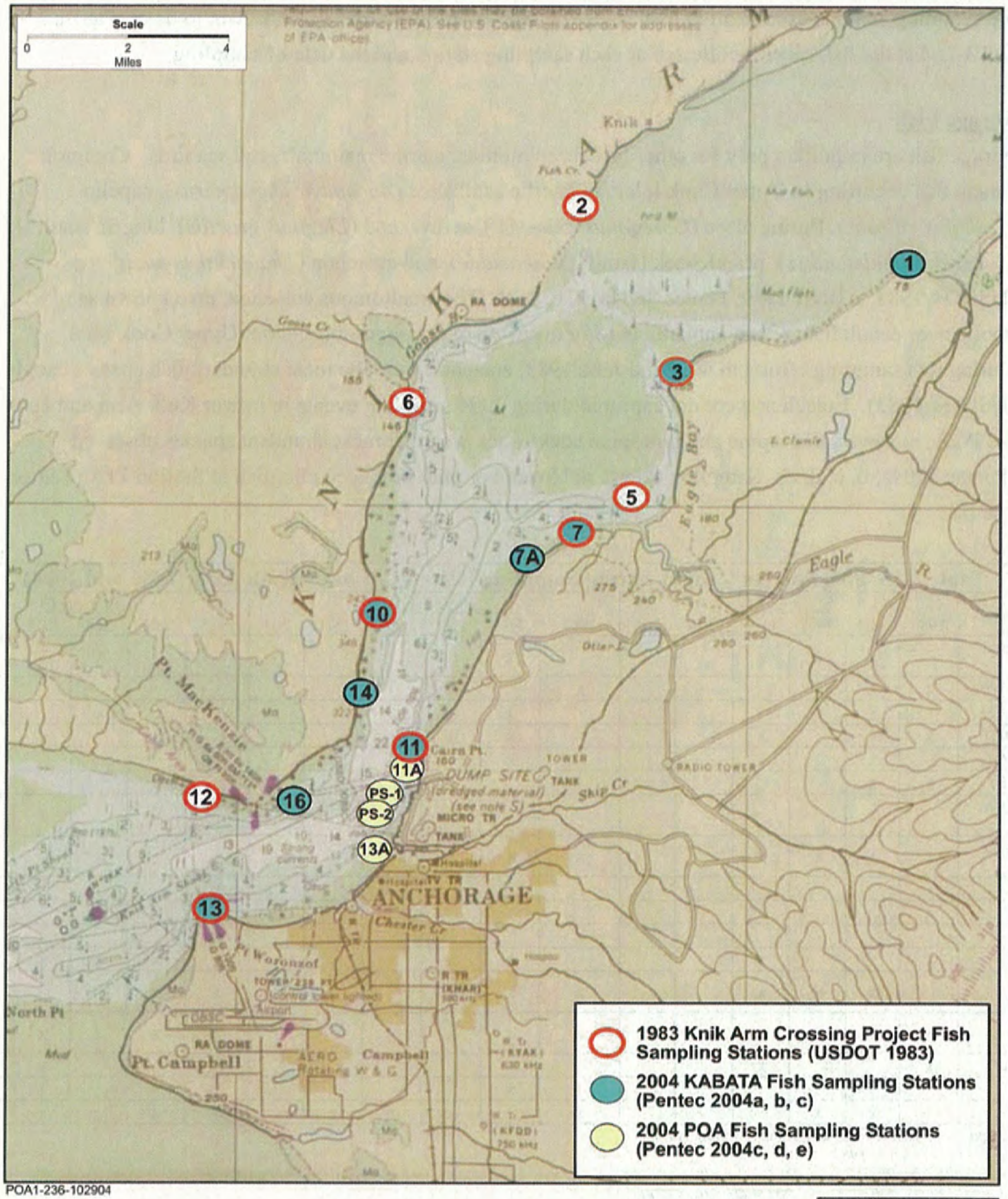

Figure 3-26
Historic and Current
Fish Sampling Stations in Knik Arm

the sampling stations used in all known scientific fish sampling studies in Knik Arm to date. Tables 3-15 and 3-16 list the fish species collected at each sampling station and the date of sampling.

Forage Fish

Forage fish are important prey for other finfish, salmonids, marine mammals, and seabirds. Common forage fish occurring in Upper Cook Inlet are Pacific sandlance (*Ammodytes hexapterus*), capelin (*Mallotus villosus*), Bering cisco (*Coregonus laurettae*), saffron cod (*Eleginus gracilis*), longfin smelt (*Spirinchus thaleichthys*), prickleback (family *Stichaeidae*), and eulachon (*Thaleichthys pacificus*) (USDOT 1983; ADNR 1999; Pentec 2004a, b, c, d, e). The anadromous eulachon, also known as hooligan or candlefish, return annually in May to spawn in drainages throughout Upper Cook Inlet. During fish sampling efforts in May and June 1983, eulachon were the most abundant fish species caught (USDOT 1983). Eulachon were not captured during 2004 sampling events in Lower Knik Arm and near the POA; however, threespine and ninespine stickleback were the most abundant species observed (Pentec 2004a, b, c, d, e). Sampling efforts in November only produced clingfish at Station 11A (Pentec 2004f).

Table 3-15 Fish Species Caught during Sampling Efforts in Lower Knik Arm (1983 and 2004)

	Station 10*						Station 11*						Station 13*					
Species	1983	A04	B04	C04	D04	E04	1983	A04	B04	C04	D04	E04	1983	A04	B04	C04	D04	E04
Chinook salmon (j)		x	x	x				x	x						x			
Chum salmon (j)	x	x					x						x					
Coho salmon (a)		x	x					x	x						x			
Coho salmon (j)	x	x		x			x	x	x	x			x	x		x		
Pink salmon (a)		x						x										
Pink salmon (j)	x	x											x					
Sockeye salmon (a)		x												x				
Sockeye salmon (j)	x	x	x	x			x	x					x		x			
Bering cisco	x						x						x					
Dolly varden	x																	
Eulachon	x						x						x					
Longfin smelt	x			x				x	x	x				x	x	x		
Ninespine stickleback		x	x	x			x	x	x				x	x		x		
Threespine stickleback	x	x	x	x				x	x	x			x	x	x	x		
Pacific herring	x			x									x			x		
Prickleback								x										
Saffron cod	x	x	x				x		x	x			x	x		x		

*Notes: *See Figure 3-26 for the locations of the sampling stations.*
1983 = May 11-Jun 8, 1983;
A04 = Jul 25-28, 2004; D04 = Sep 30-Oct 1, 2004;
B04 = Aug 23-25, 2004; E04 = Oct 20-23, 2004
C04 = Sep 20-22, 2004;
Sources: USDOT 1983; Pentec 2004a, b, c, d, e.

Table 3-16 Fish Species Caught during Sampling Efforts in Lower Knik Arm and the Vicinity of the POA (2004)

	Station 14*			Station 16*			Station 11A*			Station 13A*		Station PS-1*		Station PS-2*	
Species	A04	B04	C04	A04	B04	C04	C04	D04	E04	D04	E04	D04	E04	D04	E04
Chinook salmon (juvenile)	x			x	x							x			
Chum salmon (adult)	x														
Coho salmon (adult)	x			x								x			
Coho salmon (juvenile)				x	x			x	x					x	
Sockeye salmon (adult)	x						x								
Sockeye salmon (juvenile)	x	x		x	x				x			x			
Clingfish									x						
Bering cisco						x									
Rainbow trout										x		x			
Longfin smelt	x	x				x			Adult & larval	Larval		Subadult			Adult & larval
Ninespine stickleback	x	x		x	x				x			x	x		
Threespine stickleback	x	x		x	x		x	x				x	x	x	x
Pacific herring									x						
Pacific staghorn sculpin	x														
Saffron cod	x	x	x	x	x	x			x			x	x		x
Starry flounder									x	x					

Notes: **See Figure 3-26 for the locations of the sampling stations.*
A04 = Jul 25-28, 2004;
B04 = Aug 23-25, 2004;
C04 = Sep 20-22, 2004;
D04 = Sep 30-Oct 1, 2004;
E04 = Oct 20-23, 2004.
Sources: Pentec 2004a, b, c, d, e.

Groundfish

Common groundfish within Upper Cook Inlet include Pacific halibut (*Hippoglossus stenolepis*) and Pacific cod (*Gadus macrocephalus*). Other fish species that may be found in Upper Cook Inlet include walleye pollock (*Theragra chalcogramma*), greenling (*Hexagrammos* spp.), Pacific staghorn sculpin (*Leptocottus armatus*), clingfish (*Gobiesox maeandricus*), threespine stickleback (*Gasterosteus aculeatus*), ninespine stickleback (*Pungitius pungitius*) and smallmouth ronquils (*Bathymaster leurotepis*). Skates and the occasional shark may also be present (ADNR 1999). During the 1983 sampling efforts, sticklebacks were the most common species caught, followed by salmonids and saffron cod (USDOT 1983). During the 2004 sampling efforts, sticklebacks were the most common species caught, followed by salmonids, saffron cod, and longfin smelt (Pentec 2004a, b, c, d, e).

Salmonids are discussed under EFH at the end of this section.

Wildlife

Due to the high level of development at the POA, wildlife species found in the Project area are limited to those adapted to human presence and disturbance. Coyote (*Canis latrans*) and red fox (*Vulpes vulpes*) are seen occasionally at the POA. Meadow vole (*Microtus pennsylvanicus*), red squirrel (*Tamiasciurus hudsonicus*), porcupine (*Erethizon dorsatum*), black bear (*Ursus americanus*), and moose (*Alces alces*) are expected to be found along the eastern boundary of the POA on Elmendorf AFB, or outside fenced industrial areas along enhanced or protected segments of the riparian corridor associated with Ship Creek to the south of the POA (GLT 2000).

Common bird species found within the terrestrial environment of the POA and vicinity include rock dove (or pigeon) (*Columba livia*), Northwestern crow (*Corvus caurinus*), common raven (*Corvus corax*), black-billed magpie (*Pica hudsonia*), Arctic tern (*Sterna paradisaea*), herring gull (*Larus argentatus*), glaucous-winged gull (*Larus glaucescens*), mew gull (*Larus canus*), and European starling (*Sturnus vulgaris*). Species expected to occur along the riparian corridor of Ship Creek adjacent to the POA's southern boundary include Barrow's goldeneye (*Bucephala islandica*), common goldeneye (*Bucephala clangula*), common merganser (*Mergus merganser*), Harlequin duck (*Histrionicus histrionicus*), mallard (*Anas platyrhynchos*), great-horned owl (*Bubo virginianus*), belted kingfisher (*Ceryle alcyon*), alder flycatcher (*Empidonax alnorum*), Say's phoebe (*Sayornis saya*), violet-green swallow (*Tachycineta thalassina*), black-capped chickadee (*Poecile atricapilla*), American robin (*Turdus migratorius*), yellow warbler (*Dendroica petechia*), yellow-rumped warbler (*Dendroica coronata*), fox sparrow (*Passerella iliaca*), white-crowned sparrow (*Zonotrichia leucophrys*), and red-winged blackbird (*Agelaius phoeniceus*) (AAS 1993, GLT 2000).

In addition, a number of bird species are expected to be found in the marine waters in Upper Cook Inlet and include common loon (*Gavia immer*), horned grebe (*Podiceps auritus*), American wigeon (*Anas* *americana*), common goldeneye, Barrow's goldeneye, common merganser, and Harlequin duck (AAS 1993, Greater Land Trust 2000).

The Upper Cook Inlet is a major migration corridor for shorebirds on their spring (early April to mid-May) and fall (early July to mid-September) migrations, taking advantage of the extensive mudflats. Most of the major shorebird concentration areas are along the western shores of Upper Cook Inlet, associated with Redoubt Bay, Trading Bay, the flats of the Susitna and Little Susitna Rivers, and the flats of the Matanuska and Knik Rivers to the north of Anchorage (ADNR 1999, Gill and Tibbitts 1999). However, during the spring, summer, and fall, shorebirds, gulls, and waterfowl will use the intertidal mudflats associated with the mouth of Ship Creek and the tidelands to the north of Cairn Point. The area of coastal wetlands and mudflats south of the POA from Ship Creek to Potter Marsh, including Westchester Lagoon, has been nominated by the Audubon Society as an Important Bird Area (Anchorage Coastal Important Bird Area) due to its high concentrations of migrating waterfowl and shorebirds. It is noted that the area of designation terminates approximately one mile south of the POA, strongly indicating that the habitat that supports the bird species diversity does not extend northward to the Project area.

The proposed Anchorage Costal Important Bird Area supports some of the greatest numbers and diversity of birds in the Anchorage area, including Hudsonian godwits (*Limosa haemastica*), short-billed dowitchers (*Limnodromus griseus*), snow geese (*Chen caerulescens*), and sandhill cranes (*Grus canadensis*) (AAS 2004). Additional shorebird species known to occur within these areas include semipalmated plover (*Charadrius semipalmatus*), American golden-plover (*Pluvialis dominica*), greater yellowlegs (*Tringa melanoleuca*), lesser yellowlegs (*Tringa flavipes*), solitary sandpiper (*Tringa solitaria*), spotted sandpiper (*Actitis macularia*), western sandpiper (*Calidris mauri*), least sandpiper (*Calidris minutilla*), pectoral sandpiper (*Calidris melanotos*), surfbird (*Aphriza virgata*), and semipalmated sandpiper (*Calidris pusilla*) (AAS 1993, Gill and Tibbitts 1999).

Limited data are available on the bird use of the mudflats immediately to the north of the POA. Seven surveys conducted in late June through July 1991 by the USFWS found a total of 14 individuals comprising two species: spotted sandpiper (including an adult and non-fledged chick) and mew gull. Although the USFWS considers the intertidal areas at the mouth of Ship Creek and south to be high value waterbird habitat, it considered the area north of the POA to Cairn Point low value waterbird habitat (USFWS 1993).

Special-Status Species

<u>Threatened and Endangered Species</u>

Although not listed as threatened or endangered under the ESA or by the State of Alaska, smooth alkali grass (*Puccinellia glabra*) is considered imperiled in the State of Alaska by the Alaska Natural Heritage

Program. This grass occurs in the Ship Creek drainage to the south of the Project area (GLT 2000; ANHP 2003, 2004). There are no species listed by either the USFWS or NOAA Fisheries under the ESA that occur within the vicinity of the POA (Smith 2003 as cited in FTA 2003).

All West Coast salmon species (and associated Evolutionary Significant Units [ESUs]) currently listed as threatened or endangered under the ESA originate in freshwater habitat in Washington, Idaho, Oregon, and California. No stocks of Pacific salmon or steelhead originating from freshwater habitat in Alaska are listed under ESA. Although some of the listed species migrate as adults into marine waters off Alaska, none are likely to occur in Upper Cook Inlet.

Seven species of whales that are listed as endangered by the NOAA Fisheries under the ESA occur in Alaskan waters: sperm whale (*Physeter macrocephalus*); bowhead whale (*Balaena mysticetus*); humpback whale (*Megaptera novaeangliae*); northern right whale (*Eubalaena japonica*); fin whale (*Balaenoptera physalus*); sei whale (*Balaenoptera borealis*); and blue whale (*Balaenoptera musculus*) (NOAA Fisheries 2004a). Only the fin, sei, and humpback whales occur in the lower portion of Cook Inlet, but are considered very uncommon to rare in Upper Cook Inlet. The remaining four species are generally found in deeper offshore waters of the Gulf of Alaska, Bering Sea, and Beaufort Sea, and are not found in Upper Cook Inlet (NOAA Fisheries 2003a). None of these species have been observed in Upper Cook Inlet during previous aerial surveys (NMML 2004).

The endangered western population of Steller sea lion (*Eumatopias jubatus*) and the proposed threatened distinct population segment of northern sea otter (*Enhydra lutris kenyoni*) occur only in Lower Cook Inlet and are not known to occur in Upper Cook Inlet (NOAA Fisheries 2003b, NMML 2004, USFWS 2004a).

Marine Mammals

Of the 15 species of non-ESA listed (i.e., threatened or endangered or proposed as such) marine mammals that are residents or occur seasonally in Cook Inlet, only harbor seal (*Phoca vitulina*) and beluga whale (*Delphinapterus leucas*) are commonly observed in Upper Cook Inlet (NOAA Fisheries 2003a, Sheldon *et al.* 2003, NMML 2004).

Harbor seal

Harbor seals inhabit coastal and estuarine waters of Cook Inlet. They haul out on rocks, reefs, beaches, and drifting glacial ice, and feed on capelin, eulachon, cod, pollock, flatfish, shrimp, octopus, and squid in marine, estuarine, and occasionally fresh waters. Harbor seals are non-migratory, with local movements associated with tides, weather, season, food availability, and reproduction. The major haulout sites for harbor seals are located in Lower Cook Inlet. The closest identified harbor seal haulout site to the POA is approximately 25 miles to the south along Chickaloon Bay in the southern portion of Turnagain Arm (ADNR 1999, NOAA Fisheries 2003b). The presence of harbor seals in Upper Cook Inlet is seasonal. They are commonly observed along the Susitna River and other tributaries within Upper Cook Inlet during eulachon and salmon migrations (NOAA Fisheries 2003b). During aerial surveys of Upper Cook Inlet in 2001, 2002, and 2003, harbor seals were observed 15 to 60 miles south-southwest of Anchorage at the Chickaloon, Little Susitna, Susitna, Ivan, McArthur, and Beluga Rivers (Rugh *et al.* 2004a, b). Harbor seals are rarely observed in Knik Arm (Figure 3-27; NMML 2004; Rugh *et al.* 2004a, b).

Beluga Whale

Although not listed under the ESA as threatened or endangered or proposed as such, the Cook Inlet population of beluga whales was considered a candidate species and has recently been listed by NOAA Fisheries as a Species of Concern (NOAA Fisheries 2004b). In addition, the Cook Inlet stock is considered depleted under the MMPA (NOAA Fisheries 2000). Beluga whales occur seasonally throughout much of Alaska, except in the Southeast region and the Aleutian Islands. Five stocks are recognized in Alaska-Beaufort Sea, eastern Chukchi Sea, eastern Bering Sea, Bristol Bay, and Cook Inlet (NOAA Fisheries 2003a).

The following discussion of the distribution of belugas in Upper Cook Inlet is based upon three types of data provided by the National Marine Mammal Laboratory (NMML) (NMML 2004): NOAA Fisheries aerial surveys; NOAA Fisheries data from satellite-tagged belugas; and opportunistic sightings. The combination of these three data types has provided a relatively good picture of the distribution and occurrence of belugas in Upper Cook Inlet, particularly in the Lower Knik Arm and POA area.

NOAA Aerial Surveys

Since 1993, NOAA Fisheries has conducted annual aerial surveys in June or July to document the distribution and abundance of belugas in Cook Inlet. In addition, to help establish the distribution of belugas in Cook Inlet throughout the year, aerial surveys were conducted every one to two months between June 2001 and June 2002 (NOAA Fisheries 2004c). Although these data are limited due to the low number of animals tagged and associated satellite locations for each beluga, when combined with the formal aerial surveys and opportunistic sightings (see below), they do allow a relatively complete assessment of the distribution of belugas throughout the year, particularly during the winter months when aerial and opportunistic sightings are not available or are difficult to obtain.

NOAA Fisheries Satellite Tag Data

Since 1999, 18 belugas in the Upper Cook Inlet have been captured and fitted with satellite tags that provide information on their movements during late summer, fall, winter, and spring. In 1999, one beluga was tagged and its movements were recorded from June through September 1999. Two belugas were tagged in 2000 and their movements were recorded from September 2000 through January 2001. In 2001, seven belugas were tagged and their movements were recorded from August 2001 through March 2002. In 2002, eight belugas were tagged and their movements were recorded from August 2002 through May 2003 (NOAA Fisheries 2004c). Beluga satellite tag data from 2002 are presented in Appendix I.

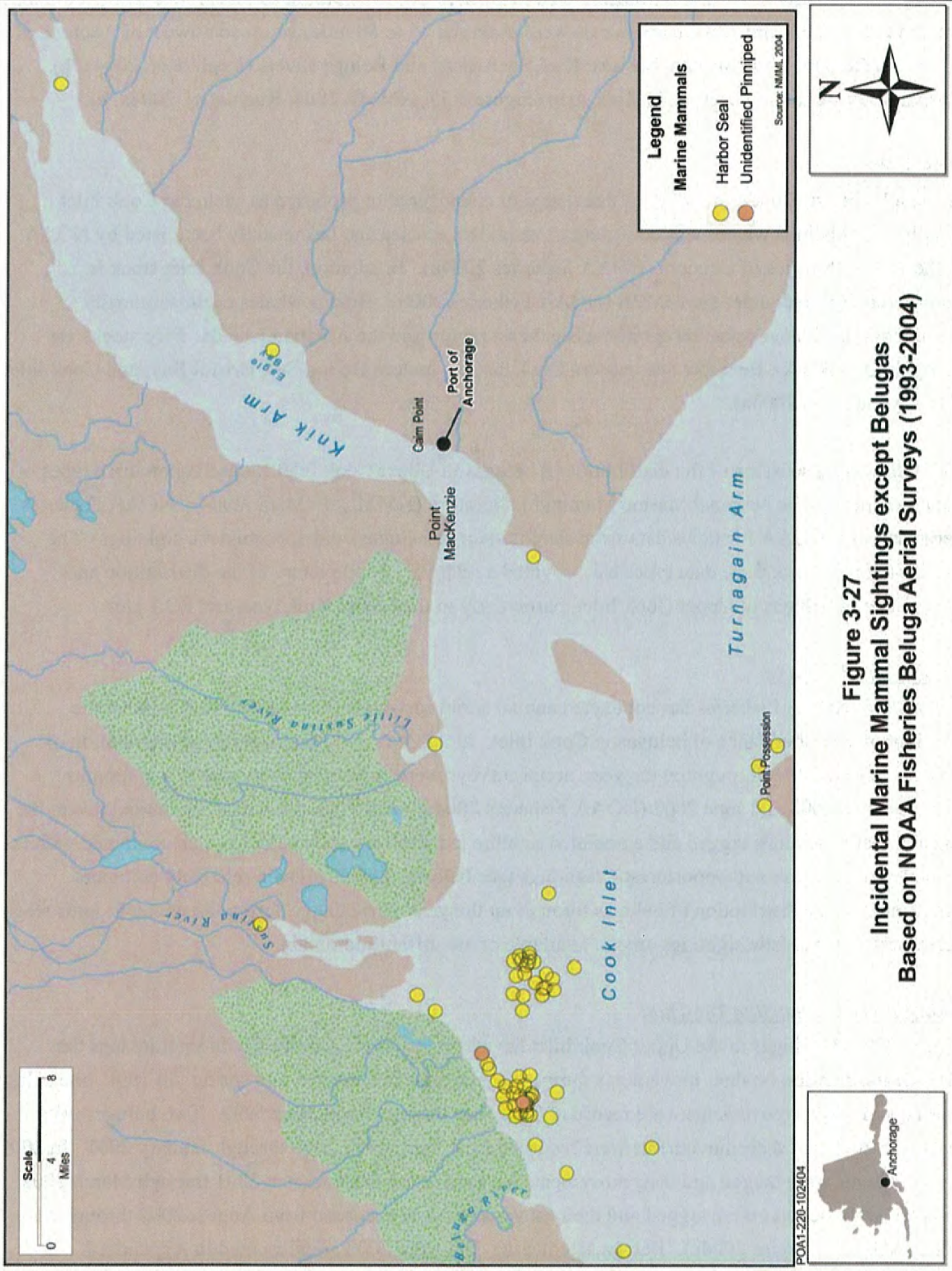

Figure 3-27
Incidental Marine Mammal Sightings except Belugas Based on NOAA Fisheries Beluga Aerial Surveys (1993-2004)

Opportunistic Sightings

Opportunistic sightings of belugas in Cook Inlet have been reported to the NMML since 1977. The NOAA Fisheries Alaska Regional Office set up a network to improve the public's awareness of belugas and encourage reports of sighting information. The beluga data were then entered into a dedicated database designed and maintained by the NMML. The high visibility and distinctive nature of belugas make them well suited for opportunistic sightings. Opportunistic sighting reports come from a variety of sources including observations by NOAA Fisheries personnel conducting research in Cook Inlet, observations by ADFG personnel during systematic aerial surveys for birds, commercial fishermen, pilots, POA personnel, casual observations by tourists on shore, or people fishing in small boats. Location data range from precise locations (e.g., Global Positioning System-determined latitude and longitude) to approximate distances from major landmarks. In addition to location data, most reports include date, time, approximate number of whales, and notable whale behavior (NOAA Fisheries 2004c). Since opportunistic data is collected at any time of the month, and often multiple times a week, these data often provide a relatively good approximation of beluga locations and movements in those areas frequented by natural resource agency personnel, fishermen, and other individuals.

Depending on the season, belugas can occur in both offshore and coastal waters. Most Alaska belugas overwinter in the Bering Sea except for those found in Cook Inlet. In general, belugas remain in Cook Inlet during the winter, but they are more dispersed throughout the Upper and Mid Inlet rather than concentrated near river mouths, as they are during the summer months when prey is present (Moore *et al.* 2000; NOAA Fisheries 2003a, b, 2004c). Data from NOAA Fisheries aerial surveys, opportunistic sightings, and the tracking of satellite-tagged belugas confirm that they are more widely dispersed throughout Upper Cook Inlet during winter (November-April) with animals tending to be found between Kalgin Island and Point Possession (Figures 3-28 and 3-29; Appendix I). Based on opportunistic sightings and satellite tagging data, there are fewer observations near Anchorage and Knik Arm in general during November through April (Figure 3-29) (NMML 2004, NOAA Fisheries 2004c).

During the spring and summer, Upper Cook Inlet belugas are generally concentrated near the warmer waters of river mouths where prey availability is high and predator occurrence is low (Moore *et al.* 2000). Most of the calving in Cook Inlet occurs from mid-May to mid-July in the vicinity of these warm-water river mouths, although Native hunters have described calving as early as April and as late as August. Concentrations of belugas in Upper Cook Inlet in April and May correspond with migrations of eulachon that are returning to rivers and streams in the northern portion of Upper Cook Inlet (NOAA Fisheries 2003a, b). Data from NOAA Fisheries aerial surveys, opportunistic sightings, and the tracking of satellite-tagged belugas confirm that they are concentrated along the rivers and nearshore areas of Upper Cook Inlet and Knik Arm during the summer (May-October) (Figures 3-30, 3-31, and 3-32; Appendix I) (NMML 2004, NOAA Fisheries 2004c). They are commonly seen at the mouth of Ship Creek from early

Figure 3-28
Beluga Sightings Based on NOAA Fisheries Aerial Surveys: November to April (2001-2002)

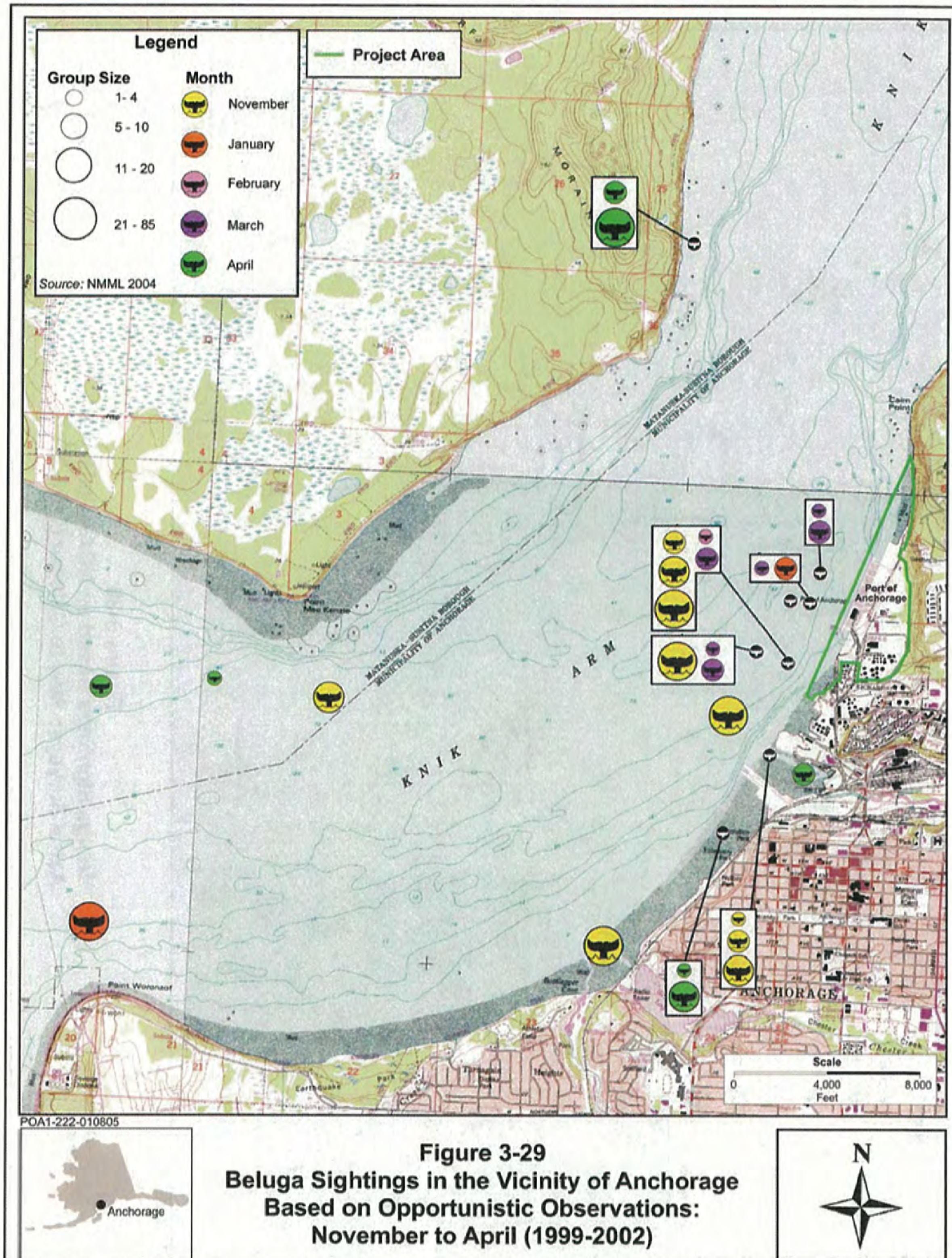

Figure 3-29
Beluga Sightings in the Vicinity of Anchorage Based on Opportunistic Observations: November to April (1999-2002)

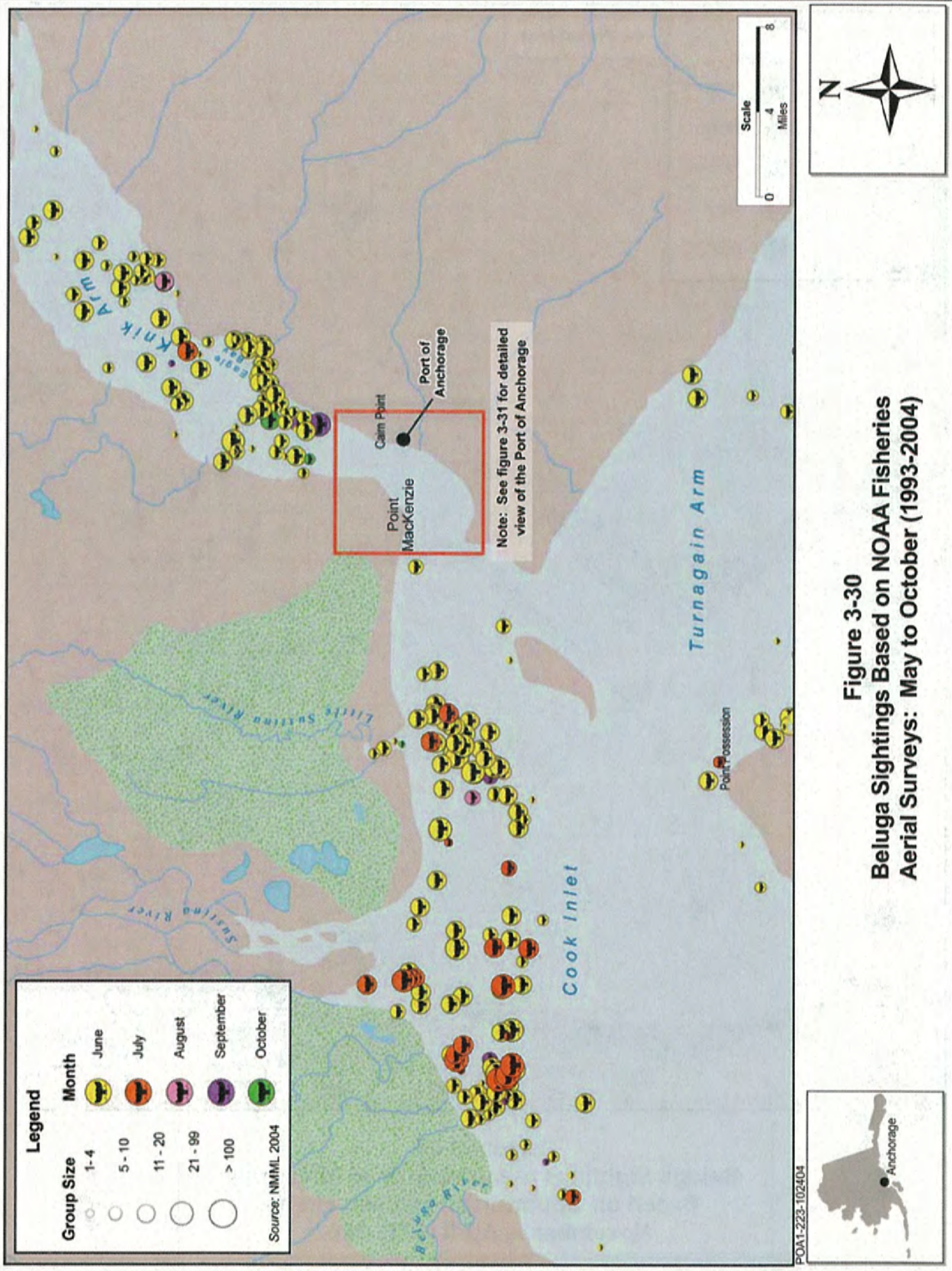

Figure 3-30
Beluga Sightings Based on NOAA Fisheries Aerial Surveys: May to October (1993-2004)

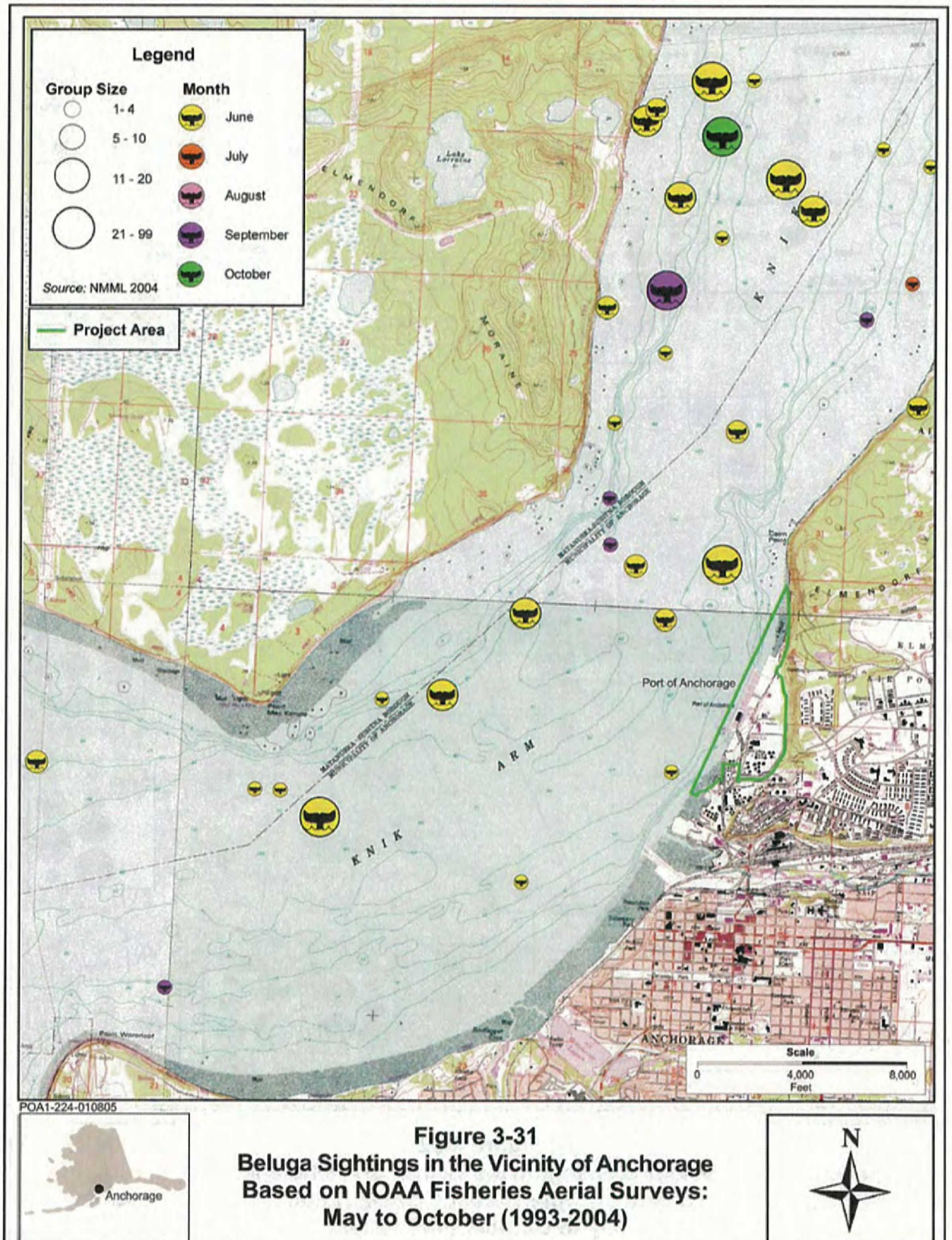

Figure 3-31
Beluga Sightings in the Vicinity of Anchorage Based on NOAA Fisheries Aerial Surveys: May to October (1993-2004)

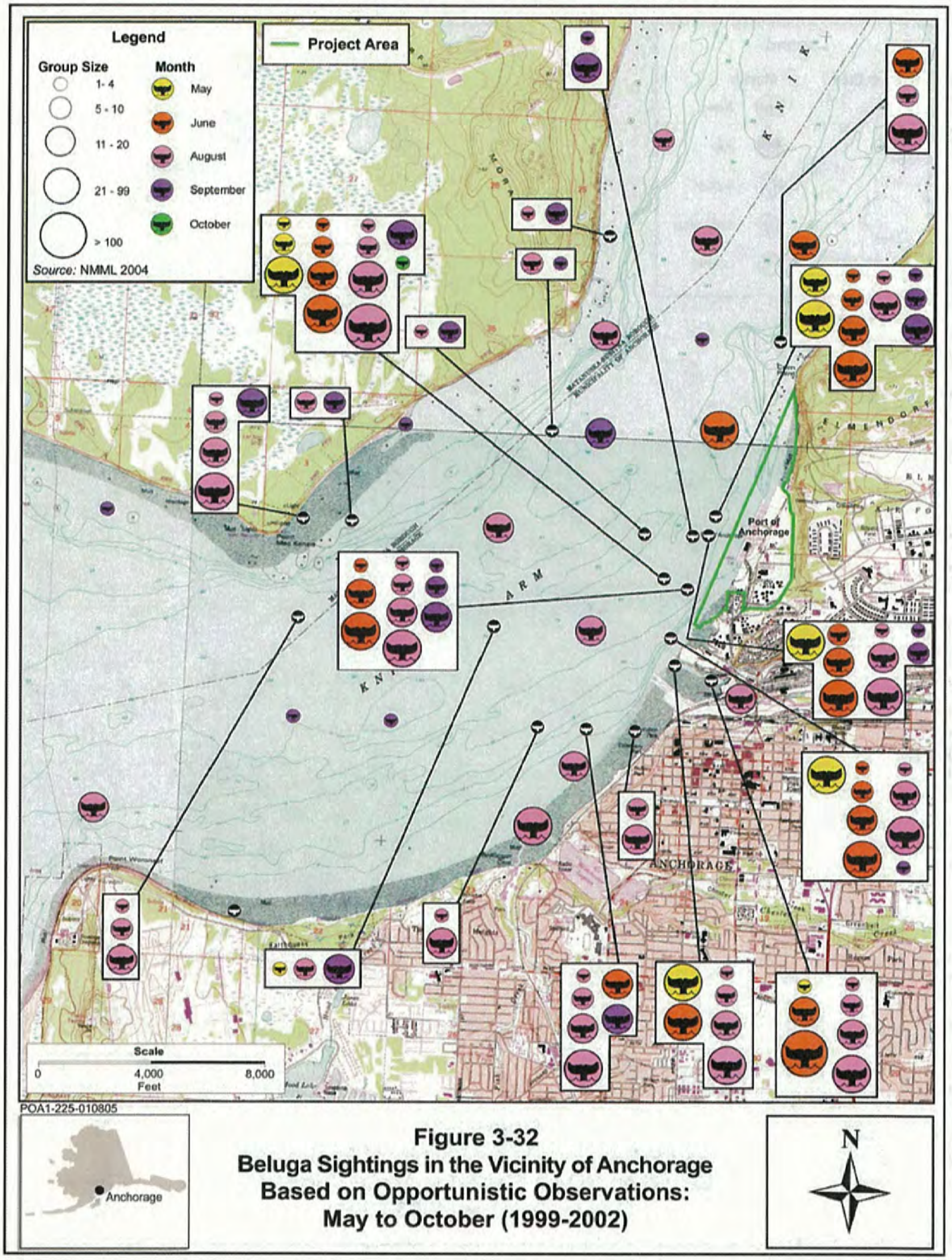

Figure 3-32
Beluga Sightings in the Vicinity of Anchorage Based on Opportunistic Observations: May to October (1999-2002)

July to early October, where they feed on salmon and other fish, and in the vicinity of the POA (e.g., alongside docked ships and within 300 feet of the POA docks) (GLT 2000, Blackwell and Greene 2002, NMML 2004). Belugas have also been observed feeding immediately offshore of the tidelands north of the POA in the vicinity of LF04 and south of Cairn Point (NOAA Fisheries 2004d).

Based on surveys of Cook Inlet in 2004, the index count of 187 belugas is lower than, but similar to, previous yearly index counts since 1998, generally around 200 whales. Index counts made prior to 1998 were generally higher, accounting for around 300 whales. All of the belugas observed during the 2004 surveys were seen in the Susitna Delta and Turnagain Arm/Chickaloon areas (Rugh *et al.* 2004a, c).

To provide additional information concerning beluga whales in the POA Project area, the POA is working with NOAA Fisheries to monitor beluga whales before, during, and after construction activities.

The monitoring program will include the following.

- Shore-based observations by at least two teams may monitor the beluga movements, timing, group size, locations, identifiable behaviors and patterns, and use of the area near the Project. NOAA Fisheries has recommended that the Project occur from March through November starting in 2005, continuing each construction year (excluding the winter ice months), and including one year after Project completion. Beluga observation will be performed six hours daily, twice a week. The observers would work to monitor all tide levels for each month. Such monitoring would assess if any long-term changes have occurred in beluga movements due to the POA expansion and increased shipping traffic.
- The results of this monitoring study would allow managers to better understand the use of Lower Knik Arm and the effects to the belugas due to construction activities. A Geographic Information System (GIS) database may be set up to manage and analyze the observation data. Beluga whale seasonal, tidal, and construction activity trends would be established.
- The POA may map the sound attenuation for the Knik Arm near the Project. The results of this sound attenuation map would allow managers to understand better the noise levels of in-water activities, such as pile driving and fill. This would help to determine a low-impact or a non-impact perimeter around the Project. A sound attenuation map would allow the POA and NOAA Fisheries to determine what distance between Project construction and belugas is needed to protect the belugas from harm.

Other data collection options were considered. Those options included aerial surveying, suction tagging and fish sampling in response to identified beluga feeding activity. However, the costs, manpower requirements, limited area of investigation, and other components render such options impracticable. POA will provide acoustic and observation data from the POA to parties interested in defining beluga activities through the area.

KABATA Study

KABATA is sponsoring an ongoing study to monitor beluga whales in Upper Cook Inlet. Initiated in late July 2004, this study has three primary objectives:

1) Assess the temporal patterns of beluga whale use of Knik Arm;
2) Record the underwater noise levels of pile driving in the vicinity of the proposed bridge site; and
3) Review mitigation measures used worldwide to minimize the impact of bridge construction activities on marine animals and develop a mitigation strategy for bridge pile driving (LGL Associates 2004).

Results from this study remain quite preliminary, although beluga whales were observed in the study area. At Cairn Point, the observation location nearest the POA, whale numbers were highly variable over the three months of study. Preliminary results suggest that such variability is due to a wide number of factors, including seasonality.

No results from the pile driving study are yet available. Both impact and vibratory pile drivers were used.

Environmental Consequences

This section presents the analysis for potential direct or indirect impacts to biological resources from implementation of Alternatives A, B, C, and No Action. Direct impacts could be associated with ground-disturbing activities resulting from construction of the proposed action (e.g., dredging or fill of subtidal and intertidal mudflats or direct mortality of wildlife species). Indirect impacts could be caused by or result from project-related activities, are later in time, and are reasonably certain to occur.

Determination of the significance of potential impacts to biological resources is based on: 1) the importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource; 2) the proportion of the resource that would be affected relative to its occurrence in the region; 3) the sensitivity of the resource to proposed activities; and 4) the duration of ecological ramifications. Impacts to biological resources are considered significant if species or habitats of concern are significantly affected over relatively large areas or disturbances result in reductions in the population size or distribution of a Special-Status Species.

Proposed Action

The Preferred Alternative/Alternative A

Vegetation and Habitats

Terrestrial
Implementation of Alternative A would result in the development of approximately two acres of previously disturbed, alder-dominated terrestrial vegetation within the eastern portions of Areas 5 and 6. The proposed construction activities would not occur near any delineated wetlands. Therefore, due to the lack of sensitive terrestrial vegetation within Areas 5 and 6, proposed construction would not have significant adverse impacts on terrestrial vegetation and habitats. Areas 1 through 4 are adjacent to existing operational areas that are fully developed and proposed activities in these areas would not significantly impact terrestrial vegetation and habitats. Under Alternative A, the commencement of POA operations upon completion of the construction activities would have no significant adverse impacts on terrestrial vegetation and habitats.

Marine
Implementation of Alternative A would result in the fill of approximately 135 acres (69 acres of subtidal and 66 acres of intertidal areas) west, northwest, and southwest of existing POA facilities. Approximately 36 acres of the subtidal acreage proposed for fill is currently dredged annually. Based upon best available data and previous and on-going fish and invertebrate sampling efforts (USDOT 1983; Pentec 2004a, b, c, d, e), these areas are considered to have a very low abundance and diversity of marine vegetation and invertebrates, primarily algal mats and polychaetes. In addition, through the Section 404 permitting process, MARAD and the POA will mitigate the loss of intertidal and subtidal habitat with restoration efforts on Ship Creek (see section 2.2.2). Therefore, there would be no significant adverse impacts to marine vegetation and habitats with implementation of Alternative A.

Upon completion of the proposed redevelopment activities, annual dredging would be required west of the new POA waterfront facilities to facilitate ship movement into and out of the POA. Proposed annual dredging operations would be similar in scope and action to those currently permitted by the USACE, although actual dredged quantities may be reduced (see section 3.3.2). Therefore, there would be no significant adverse impacts to marine vegetation with the commencement of POA operations under Alternative A.

Non-Federally Managed Fisheries
Construction activities would involve a decrease in marine habitat and changes in the noise environment in the vicinity of the POA. Based on sedimentation modeling, there would be no changes to existing current or sediment deposition patterns in and around the mouth of Ship Creek with implementation of Alternative A (refer to section 3.3.2). The use of a cathodic protection system to prevent corrosion of

pilings is a standard practice in marine docks and terminals, and is not expected to have any significant adverse impacts to fish species. Protection of water quality for finfish would be ensured by adherence to construction BMPs, NPDES permit requirements and a pollution prevention plan during construction and during POA operations (refer to sections 2.2.2 and 3.3.3).

Approximately 135 acres of marine subtidal and intertidal habitat would be lost with the addition of fill behind the sheet pile structure comprising the new dock. In addition, approximately 6.7 million cubic yards of material would be dredged from 286 acres along the front face and behind the new dock structure during the estimated six years of in-water construction. Due to the muddy and homogeneous habitat, and based on best-available data from past and on-going fish sampling efforts in the vicinity of the POA, fish diversity and abundance is low (Table 3-16; USDOT 1983; Pentec 2004a, b, c, d, e). Furthermore, approximately one million cubic yards of sediment are currently dredged annually, from May through November, along the entire front of the existing POA dock structure. Therefore, due to the lack of significant marine habitat and the low diversity and abundance of fish species in the vicinity of the POA, there would be no significant long-term adverse impacts to local or regional finfish populations with the fill of 135 acres of subtidal and intertidal marine habitat under Alternative A.

Proposed construction activities would also involve increases in the local underwater noise environment in the vicinity of the POA. Most fish species appear to react to low- or mid-frequency sounds, and the vast majority of sound produced by proposed construction activities is low-frequency sound. This analysis focuses on potential low-frequency noise effects. The estimated sound levels of in-water activities associated with proposed construction activities are summarized in Table 3-17. For the purposes of this analysis, all references to water-borne sound are made in dB re 1 μPa (refer to section 3.2.2). Overall, underwater noise levels are expected to average in the 160 dB to 165 dB range at about 300 feet from the source during construction with peak sound levels at 192 dB.

Table 3-17 Primary In-Water Noise Sources Associated with Proposed Construction Activities of the Project

Source	***Alternative***	***Frequency (Hz)***	***Noise Level peak/rms (dB re 1 μPa)***	***Signal Duration (Continuous or Pulse)***
Surface Vessels	A, B, C, No Action	1,000	149/138 dB	Continuous
Dredging Operations	A, B, C, No Action	250	149/143 dB	Continuous
Compaction of Fill	A, B, C	40-140	192/160 dB	Continuous
Vibratory Pile Driver	A, C	40-140	192/160 dB	Continuous
Impact Pile Hammer	B, C, No Action	250	209/195 dB	Pulse

Sources: USACE 2001, Blackwell and Greene 2002, Betke et al. 2004, NOAA Fisheries 2004f

In general, fish perceive underwater sounds in the frequency range of 50 to 2,000 Hz, with peak sensitivities below 800 Hz (Popper and Carlson 1998, Department of the Navy 2001). However, salmon are sensitive to underwater impulsive sounds due to swimbladder resonance. As the pressure wave passes through a fish, the swimbladder is rapidly squeezed as the high pressure wave, and then underpressure component of the wave, passes through the fish. The swimbladder may repeatedly expand and contract at the high sound pressure levels creating pressure on the internal organs surrounding the swimbladder (NOAA Fisheries 2004f).

Permanent injury to fish from acoustic emissions has been shown for high-intensity sounds of long duration, on the order of several hours. In a review on the effects of low-frequency noise to fish (NOAA Fisheries 2004f), a threshold of 180 dB peak sound level was used to define the potential injury to fish.

In behavioral studies, sound pressure levels are commonly expressed as rms or average levels. Sound pressure levels greater than an average of 150 dB (rms) are expected to cause temporary behavioral changes such as a startle response or behaviors associated with stress. Although these sound pressure levels are not expected to cause direct injury to a fish, they may decrease the ability of a fish to avoid predators (NOAA Fisheries 2004f). Therefore, the threshold for behavioral disruption is considered to be 150 dB (rms) (per NOAA Fisheries 2004f).

Impact pile driving can produce sound pressure waves that can injure and kill fish (Longmuir and Lively 2001, Stotz and Colby 2001 as cited in NOAA Fisheries 2004f). The sound pressure waves can cause barotraumas and include hemorrhage and rupture of internal organs and damage to the auditory system. Death can occur instantaneously, minutes after exposure, or several days later.

Atlantic salmon (*Salmo salar*) have been found to perceive underwater sound up to 380 Hz. However, other studies have shown that sensitivity to sound in Atlantic salmon drops off sharply above 150 Hz (Knudsen *et al.* 1992, 1994). Facey *et al.* (1977) tested the response of Atlantic salmon parr to pulsed ultrasonic transmitters transmitting at: 1) 75 kilohertz (kHz) (258 and 194 pulses per minute); 2) 75 kHz (180 pulses per minute); 3) 75 kHz (200 pulses per minute); and 4) 55 kHz (100 pulses per minute). They found that the salmon were unable to detect any of these transmissions.

Juvenile chinook salmon have been shown to exhibit avoidance responses to low-frequency sound up to 280 Hz, with no response to higher frequencies (Carlson 1994). The strongest response was found for sounds between 30 and 150 Hz. Rainbow trout (*O. mykiss*), a related species, have been found to be sensitive to sounds from 25 to 800 Hz (Abbott 1973). Salmon were found to respond to low-frequency sounds, but only at very short ranges, within distances of two feet or less from the sound source, even though the sounds were at levels up to 156 dB.

Carlson (1994), in a review of 40 years of studies concerning the use of underwater sound to deter salmonids from hazardous areas at hydroelectric dams and other facilities, concluded that salmonids were only able to respond to low-frequency sound and only able to react to sound sources within a few feet of the source. He speculated that the reason that underwater sound had no effect on salmonids at distances greater than a few feet is that they react to water particle motion/acceleration, not sound pressures as such. Detectable particle motion is only produced within very short distances of a sound source, although sound pressure waves travel farther.

Underwater noise levels from construction activities would occur at around 165 dB (rms). It would include both high frequency, continuous noise from ships in the channel, and low frequency, impulse noise from pile driving. Based on previous acoustic data for impact pile driving, it is expected to generate peak sound pressures up to 209 dB, and average (rms) levels will be 195 dB, when measured 30 feet from the pile (NOAA Fisheries 2004f). Both of these levels exceed the previously defined thresholds for physical injury and behavioral disruption of fish. Vibratory hammers, on the other hand, produce peak levels approximately 17 dB less than impact hammers, with an estimated peak level of 192 dB. Although this is above the peak threshold for physical injury (180 dB), no fish kills have been linked to the use of vibratory hammers (NOAA Fisheries 2004f). As discussed below, however, vibratory hammers may still impact fish behavior.

The sound from the two types of pile hammers differ not only in intensity but also in frequency and impulse energy. The majority of sound energy of impact hammers is around 100 to 800 Hz, the frequencies thought to be most harmful to fish. In contrast, the majority of sound energy of vibratory hammers is around 20 to 30 Hz, below the level thought to cause harm to fish. Fish have been shown to avoid infrasound, and habituation to the sound does not occur even after repeated exposure (Dolat 1997 as cited in NOAA Fisheries 2004f, Knudsen *et al.* 1994). Since vibratory hammer sound is near the frequency of infrasound and is of long duration, fish may avoid the area. Fish response to impact hammers is very different. During the first few strikes of an impact hammer, fish may elicit a startle response. After these initial strikes, the startle response subsides and fish may remain within the field of a potential injury. Therefore, impact hammers are potentially more harmful to fish than vibratory hammers because: 1) they produce sound pressure levels with greater potential to physically harm fish; and 2) the sounds do not elicit an avoidance response from fish, thereby exposing them to potentially injurious sound levels for longer periods.

The use of impact pile hammers would have an adverse, short-term impact on local fish populations in the vicinity of the POA. The use of a vibratory pile hammer would also have an impact on fish, but to a lesser extent than with the use of an impact hammer. Since a vibrating pile driver would be used under Alternative A, no short-term or long-term significant adverse impacts to local or regional fish populations would occur due to noise increases during construction.

With the implementation of standard shipboard pollution prevention measures (see section 2.2.2), adherence to State of Alaska and federal regulations, and NPDES permit requirements, there would be no significant adverse impacts to fish from POA operations. In addition, proposed POA operations upon completion of the Project are not expected to result in any noise impacts to fish species within the vicinity of the POA.

Wildlife

Construction activities associated with Alternative A would displace wildlife from suitable terrestrial and marine habitat in the immediate vicinity of the Project area. Smaller, less mobile species and those seeking refuge in burrows (e.g., voles) could inadvertently be killed during construction activities. In addition, approximately eight acres of intertidal mudflats to the north of the existing POA facilities (Areas 5 and 6) and adjacent to LF04 would be developed. Shorebirds may use this area infrequently through the spring and fall migration and the summer. However, long-term impacts to local or regional populations of such species would not result and there would be no significant adverse impacts to wildlife with implementation of the construction activities associated with Alternative A.

Special-Status Species

Threatened and Endangered Species

Since no species listed by either the USFWS or NOAA Fisheries are known to occur in the vicinity of the POA, there would be no impacts to threatened and endangered species with implementation of Alternative A.

Marine Mammals

The only marine mammal known to frequent the vicinity of the POA is the beluga whale. During the spring and summer, Upper Cook Inlet belugas are generally concentrated near the warmer waters of river mouths where prey availability is high and predator occurrence is low (Moore *et al.* 2000). Concentrations of belugas in Upper Cook Inlet in April and May correspond with migrations of eulachon that are returning to rivers and streams in the northern portion of Upper Cook Inlet (NOAA Fisheries 2003a, b). Belugas are commonly seen at the mouth of Ship Creek from early July to early October where they feed on salmon and other fish, and at the POA (GLT 2000, Blackwell and Greene 2002).

Although with the implementation of Alternative A there would be a loss of approximately 135 acres of marine habitat in the vicinity of the POA, the area in the immediate vicinity of the POA is not greatly used by belugas. Belugas that are observed in the vicinity of the POA are most likely using the area around the mouth of Ship Creek to feed on salmon, eulachon, and other fish. As stated above in the analysis of impacts to finfish, there would be no changes to existing current or sediment deposition patterns in and around the mouth of Ship Creek with implementation of Alternative A (refer to section 3.3.2). In addition, protection of water quality for beluga whales would be ensured by adherence to construction BMPs, NPDES permit requirements, and a pollution prevention plan during construction and during POA operations after construction (refer to sections 2.2.2 and 3.3.3).

Recently, NOAA Fisheries used a threshold value of 180 dB as criteria for marine mammal harassment associated with seismic monitoring in the State of Washington (NMFS 2002). Although the sound sources addressed in this case were related to seismic equipment, the threshold of 180 dB is generally accepted based on published threshold values for temporary threshold shift in marine mammals and criteria used by NOAA Fisheries when issuing small take authorizations (NMFS 1995, 2002; Ridgway *et al.* 1997; Finneran *et al.* 2000). Finneran *et al.* (2000) showed that a peak sound pressure level of 180 dB represents a conservative estimate of no temporary threshold shift, considered by NOAA Fisheries to be the upper limit of Level B harassment under the MMPA. The 180-dB received energy level is for transmissions in excess of 100 seconds. Therefore, this analysis will use the value of 180 dB as the reference point for acoustic analysis for marine mammals.

Beluga whales can hear over a wide range of frequencies, covering most man-made and natural sounds. Their peak sensitivity is between 10 and 100 kHz (Richardson *et al.* 1995), which is above the frequency range of most industrial noise. At low frequencies (less than 100 Hz) beluga whale hearing threshold levels may be comparable to or exceed 1-Hz band levels for a variety of industrial activities that typically occur during the summer in the POA (Blackwell and Greene 2002). This is supported by the observation by Blackwell and Greene (2002) of beluga whales traveling slowly within a few feet of the hull of a docked cargo ship at the POA.

In general, reactions by beluga whales to surface vessels range from great tolerance to extreme sensitivity, depending on whale activities and experience, habitat, boat type, and boat behavior. Belugas are tolerant of frequent passages by larger ships traveling in consistent directions in summering areas such as Cook Inlet, Beaufort Sea, and the St. Lawrence River. However, beluga whales have been known to flee from fast and erratically moving small boats. Some will also disperse upon the approach of small ships. Call types, rates, and frequencies may change during boat approaches, possibly to increase call detectability. In the St. Lawrence estuary, the frequency and intensity of disturbance varied with the number and speeds of the boats, the activity and ages of the whales, and location. Beluga whales were strongly disturbed when approached by boats at speeds greater than idle. Compared to beluga whales engaged in other activities, feeding or traveling whales were less likely to react to boats but, when they did react, responses were stronger (Richardson *et al.* 1995). It is not clear from existing research, however, the extent to which noise interferes with life-functions of whales or other marine mammals. There are no data available on the long-term effects of underwater noise. However, the POA would have a beluga observer during pile driving activities and cease operations if a beluga approaches closer than a designated distance from construction areas. Projected noise levels of 165 dB (rms) (Table 3-17) and a peak sound level of 192 dB would be associated with vibratory pile driving at 300 feet. With noise attenuation and distances of 1,500 feet or more, there would be no significant adverse impacts to belugas upon implementation of Alternative A.

The POA and NOAA Fisheries/NMML are developing a beluga monitoring plan for the pre-construction, construction, and post-construction phases of the proposed Project (refer to section 2.2.2). This plan will be used to study beluga behavior during and after construction and ensure that significant adverse impacts do not occur.

Alternative B

Under Alternative B, impacts to vegetation and habitats, wildlife, special-status species, and marine mammals would be similar as those discussed under Alternative A. Approximately 48 acres of subtidal area and 62 acres of intertidal area would be filled with implementation of Alternative B, or 25 acres less than under Alternative A. Although less area would be filled under Alternative B, thereby leaving more marine habitat, the construction activities associated with the installation of the pile-supported dock would involve the use of an impact pile hammer. Because it is impulsive and louder, the potential noise impacts to the marine environment with the use of a mechanical pile driving hammer would be greater than the noise impacts associated with the sheet pile method of Alternative A. Peak sound levels may occur to 209 dB, well above the 180 dB threshold. The use of impact pile hammers would have an adverse, but not significant adverse, impact on local fish populations in the vicinity of the POA. Noise attenuation with distance would reduce any adverse impacts to belugas to less than significant levels. A beluga monitoring plan would also be developed under Alternative B.

The construction of the proposed dock would increase the operation and maintenance activities at the POA and could, therefore, increase the potential for impacts to water quality. With implementation of Alternative B, current POA standard operating procedures would continue to be implemented to prevent and reduce the potential for fuel spills, waste discharges, and mechanical failures. The POA and vicinity currently experience a large volume of marine traffic and associated activities. It is expected that increased POA operations would not impact fish species abundance or distribution in the area.

Alternative C

Under Alternative C, impacts to vegetation and habitats, wildlife, special-status species, and marine mammals would be similar as those discussed under Alternative A. Approximately 131 acres of subtidal (66 acres) and intertidal (65 acres) areas would be filled. Under Alternative C, the construction activities associated with the installation of the segment of pile-supported dock would involve the use of a mechanical pile driving hammer. Because it is impulsive and louder, the potential noise impacts to the marine environment with the use of a pile hammer could be greater than the noise impacts associated with the sheet pile method of Alternative A. However, as compared to Alternative B, the length of pile-supported deck is significantly less, and the time required for the placement of piles by the mechanical pile driver is also less. A beluga monitoring plan would also be developed under Alternative C.

The construction of the proposed dock would increase the operation and maintenance activities at the POA and could, therefore, increase the potential for impacts to water quality. With implementation of Alternative C, current POA standard operating procedures would continue to be implemented to prevent and reduce the potential for fuel spills, waste discharges, and mechanical failures. The POA and vicinity currently experience a large volume of marine traffic and associated activities. It is expected that increased POA operations would not impact fish species abundance or distribution in the area.

No Action

Under the no-action alternative, no expansion-related construction activities would occur. However, 1,000 piles would either be replaced or strengthened over a period of approximately six to eight years for maintenance purposes. Potential noise impacts due to the placement of the pilings have been previously discussed under Alternative A. Noise impacts to fish and belugas are the same as under Alternative B. There would be no loss of intertidal or subtidal lands except for those areas currently dredged for maintenance purposes. These areas would continue to be dredged under the no-action alternative. There would be no significant adverse impacts to biological resources with implementation of this component action of the no-action alternative.

3.3.5 Essential Fish Habitat Assessment

Although part of biological resources, EFH comprises a specific and unique component covered by particular laws (Public Law 104-267) and regulations (50 CFR 600). Addressing impacts to EFH, while subsumed under NEPA, must also conform to the structure and terminology required by these laws and regulations. Therefore, these sections of the biological resources discussion follows a different format than the remainder.

Description of the Proposed Action

The POA proposes to implement the Project, which would add approximately 135 acres of land and approximately 8,880 feet of waterfront structures in an area located west, northwest and southwest of the existing POA facilities. The proposed action consists of two primary components:

- ***Construction*** of marine structures for berthing barges, cruise ships, container ships, and RO-RO vessels for the critical replacement of functionally obsolete facilities in conjunction with the placement of fill in the tidelands for creation of cargo transfer and storage areas, staging area for Stryker Brigade Combat Team and other USARAK deployments, industrial fabrication and staging areas and
- ***Operation*** of a modern, stable, and secure facility with improved equipment for loading, unloading, cargo transfer, and storage.

In addition, dredging would be conducted by the USACE to provide construction site preparation and suitable water depths for ships that would call on the terminal. Dredging would apply to the berthing area and maneuver area for ships, and extend to a design depth of -45 feet MLLW, or 10 feet lower than current dredge depths.

The proposed action would meet the defined needs presented in Chapter 1. These needs include replacing functionally obsolete and degraded infrastructure; meeting engineering requirements to withstand tides, ice, and significant earthquake events; expanding the POA; providing longer berths and additional barge and passenger berths; reorganizing storage and intermodal transportation; providing space and facilities to support military rapid deployment; providing industry standard cranes and other operational equipment; and dredging to -45 feet MLLW. Three alternative methods of design, a sheet pile method, a pile-supported dock, and a combination of the two design techniques were identified as alternatives. Detailed descriptions of each alternative are presented in sections 2.2.1 through 2.2.5.

Analysis of Potential Adverse Effects of Action on EFH and Federally Managed Species

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires federal agencies to consult with NOAA Fisheries on activities that may adversely affect EFH. The objective of an EFH assessment is to describe potential effects of a proposed action to designated EFH for federally managed fisheries. Congress defined EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 USC 1802(10)). The EFH guidelines under 50 CFR 600.10 further interpret the EFH definition as follows:

> "Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and 'spawning, breeding, feeding, or growth to maturity' covers a species' full life cycle."

All of Cook Inlet is designated EFH for both juvenile and adult lifestages of Pacific cod, walleye pollock, and sculpins (Table 3-18) (NOAA Fisheries 2004e). In addition, all streams, lakes, ponds, wetlands, and other water bodies that currently support or historically supported anadromous fish species (e.g., salmon) are considered freshwater EFH. Marine EFH for salmon fisheries in Alaska include all estuarine and marine areas used by Pacific salmon of Alaska origin, extending from the influence of tidewater and tidally submerged habitats to the limits of the U.S. Exclusive Economic Zone (EEZ) (NOAA Fisheries 2004e). The following discussion includes a brief description of the distribution of Pacific cod, walleye pollock, and sculpins within the Project area, and a discussion of the four species of salmon with designated EFH in the Project area (chinook, coho, pink, and chum).

Pacific Cod

Pacific cod is a demersal species that has a general distribution throughout the continental shelf and upper slope through the Gulf of Alaska and into Cook Inlet. However, in Alaska the species is concentrated in the Bering Sea and along the Aleutian Islands (NMFS 1998). Adults form aggregations during peak spawning season, which occurs January through May. Eggs are demersal and adhesive, hatching in approximately 15 to 20 days. Larvae are epipelagic in the upper 135 feet of the water column and moving down the water column as they grow. Juveniles are typically found at depths of 180 to 450 feet within the inner continental shelf. Adult Pacific cod are found inhabiting depths from shoreline to 1,500 feet, and more mature fish are concentrated on the outer continental shelf (NMFS 2004). In winter and spring, cod concentrate on the shelf edge and upper slope at 300 to 600 feet deep where they over-winter; they then move to shallower waters (less than 300 feet deep) in the summer. Preferred substrate is soft sediment, from mud to clayey sand. They are omnivorous and prey on polychaetes, amphipods, shrimp, euphasiids, and numerous fish species including pollock and sole (NMFS 2004).

Although the bottom habitat of Knik Arm could support Pacific cod, there is no evidence that the area in the vicinity of the POA currently supports Pacific cod. In addition, only saffron cod, not Pacific cod, were caught during seine and trawl surveys conducted in Lower Knik Arm in 1983 and 2004 (see Tables 3-15 and 3-16; USDOT 1983; Morsell 2003 as cited in FTA 2003; Pentec 2004a, b, c, d, e).

Table 3-18 Species with Designated EFH in the Project Area

Species	*Lifestage*	*Comments*
Chinook salmon Coho salmon Pink salmon Chum salmon	Juveniles (estuarine)	The salinity transition zone (ecotone) and contiguous intertidal and nearshore habitats below mean higher high tide in Alaska where salmon currently or historically occur.
	Juveniles (marine)	Marine waters from Dixon Entrance to the Bering Straits, extending from the intertidal area to the limits of the U.S. EEZ.
	Immature and maturing adults (marine)	Marine waters below mean higher high tide from Dixon Entrance to the Bering Straits, extending from the intertidal area to the limits of the EEZ. Immature salmon use this marine habitat year-round. All species commonly found in the Knik Arm.
Pacific cod	Late Juveniles (2 to 5 yrs)	Areas of mud, sandy mud, muddy sand, and sand along the inner and middle continental shelf and the lower portion of the water column. Feeding areas are those containing pollock, flatfish, and crab.
	Adults (5+ yrs)	Areas of mud, sandy mud, muddy sand, and sand along the inner, middle, and outer continental shelf up to 1,500 feet and the lower portion of the water column. Feeding areas are those containing pollock, flatfish, and crab. Spawning occurs from January through May. Rare to absent in Project area based on available habitat and past and current fish sampling (USDOT 1983; Pentec 2004a, b, c, d, e).
Walleye pollock	Juveniles (4-4.5 yrs)	Pelagic waters along the inner, mid, and outer continental shelf. Feeding areas are those that contain pelagic crustaceans, copepods, and euphausiids. Oceanographic features that juveniles may be associated with are fronts and the thermocline.
	Adults (4.5+ yrs)	Pelagic waters from 210 to 600 feet along the outer continental shelf and basin. Feeding areas are those that contain pelagic crustaceans and fish. Oceanographic features that adults are associated with are fronts and upwelling. Rare to absent in Project area based on available habitat and past and current fish sampling (USDOT 1983; Pentec 2004a, b, c, d, e).
Sculpins (Family Cottidae)	Juveniles and Adults	Broad range of demersal habitats from intertidal pools, all shelf substrates (mud, sand, gravel, etc.), and rocky areas. Rare in Project area based on available habitat and past and current fish sampling (USDOT 1983; Pentec 2004a, b, c, d, e).

Source: NMFS 2004

Walleye Pollock

Pollock is a semidemersal schooling fish that becomes increasingly demersal with age. It has a general distribution throughout the continental shelf and upper slope through the Gulf of Alaska and into Cook Inlet. However in Alaska, the species is concentrated in the Bering Sea (NMFS 1998). After over-wintering along the outer continental shelf, pollock make seasonal migrations to shallower waters (270 to 420 feet) to spawn in early spring. Spawning is pelagic as is most of the pollock's life. Larvae are pelagic throughout the continental shelf within the top 120 feet in the Gulf of Alaska and pelagic along the outer to mid-shelf region in the Bering Sea. Juveniles are pelagic and demersal with no known benthic habitat. Juvenile pollock feed primarily on copepods and euphausiids; as they mature they become more piscivorous. Pollock are an important prey item for Stellar sea lions, other marine mammals, and seabirds (NMFS 2004).

Pollock are not thought to occur within Knik Arm or the vicinity of the POA due to lack of suitable habitat. In addition, no pollock were caught during seine and trawl surveys conducted in Lower Knik Arm in 1983 and 2004 (see Tables 3-15 and 3-16; USDOT 1983; Morsell 2003 as cited in FTA 2003; Pentec 2004a, b, c, d, e).

Sculpins

Juvenile and adult sculpins are demersal fish that live in a broad range of habitats, from rocky intertidal pools to muddy bottoms of the continental shelf, and rocky, upper slope areas. They generally feed on small invertebrates such as crabs, mussels, and barnacles, but larger species also eat fish. Sculpins typically spawn in winter, laying demersal eggs in rocky shallow waters near shore. The duration of egg incubation is unknown. Larvae are pelagic, distributing mostly on the inner and middle shelf (NMFS 2004).

The marine habitat in the vicinity of the POA does not contain suitable sculpin habitat. Sculpins generally favor rocky intertidal zones and upper slopes. Of the approximately 5,500 fish caught during beach seine surveys within Knik Arm in 1983, only two were Pacific staghorn sculpin (*Leptocottus armatus*) and these were caught at Station 3, ten miles to the north of the POA (Figure 3-26; USDOT 1983). In addition, during 2004 sampling efforts, Pacific staghorn sculpin were collected only at Stations 7A and 14, six and three miles, respectively, north of the POA (see Figure 3-26 and Tables 3-15 and 3-16; Pentec 2004a, b, c, d, e).

Salmonids

Two rivers and 16 creeks support anadromous fish throughout Knik Arm (Table 3-19, Figure 3-33). Salmonids from these creeks and rivers may potentially move through the waters surrounding the POA on their migration to and from Lower Cook Inlet and the Gulf of Alaska. Of these, only Ship Creek is within one mile of the proposed Project area. The other rivers and creeks range from 2 to 28 miles from the POA.

Table 3-19 Occurrences of Salmonids within Knik Arm Streams

Creek/River	*Chinook*	*Coho*	*Sockeye*	*Chum*	*Pink*	*Dolly Varden*
West Side Knik Arm						
Mule Creek		r				
Goose Creek		p				
Fish Creek	p	p	p	p	s	
O'Brien Creek		r				
Crocker Creek		r				
Creek to Lucy Lake		p	p			
Cottonwood Creek		p	p			
Rabbit Slough	pr	sr	p	p		
East Side Knik Arm						
Fish Creek		r				
Chester Creek		r			p	p
Ship Creek	p	p		p	p	
Sixmile Creek		sr	sr		s	sr
Unnamed Creeks A		sr				
Eagle River	r	p	r	p	p	
Fire Creek	p	sr				
Peters Creek	p	r			p	
Eklutna River	pr	pr	r	p	s	
Unnamed Creeks B		r				
Matanuska River	p	p	p	p	p	

Notes: See Figure 3-27 for locations of creeks and rivers.
p = present, r = rearing, s = spawning.
Source: ADFG 2004a.

Two hatcheries managed by ADFG, Elmendorf AFB and Fort Richardson, annually stock lakes and creeks within the Anchorage area. Smolt are released at selected stocking locations in late May or early June each year. There could be as many as five or six release times within the May through June time period, and as many release times in a single day. Only two anadromous creeks are stocked by these hatcheries. Chester Creek is stocked with rainbow trout and Ship Creek is stocked with coho and chinook. From 1999 through 2004, the average annual number of chinook and coho stocked in Ship Creek was 276,303 and 230,790, respectively. The average smolt size at stocking is 4.1 inches for chinook and 4.7 inches for coho (ADFG 2004e).

Currently all five species of Pacific salmon occur and are subject to commercial harvest in Upper Cook Inlet. In terms of commercial value, sockeye salmon (*Oncorhynchus nerka*) are the most important salmon followed by coho (*O. kusutch*), chum (*O. keta*), pink (*O. gorbuscha*), and chinook salmon (*O. tshawytscha*) (ADFG 2003) (Table 3-20). Commercial fishing season begins around mid-May and lasts to mid-September, depending on the species (ADFG 2004b). The actual season varies based on previous years' harvest and forecasts of expected adult returns. Spawner, fry, and smolt data are reviewed for each river system within each commercial fisheries district and subdistrict, and models are used to project

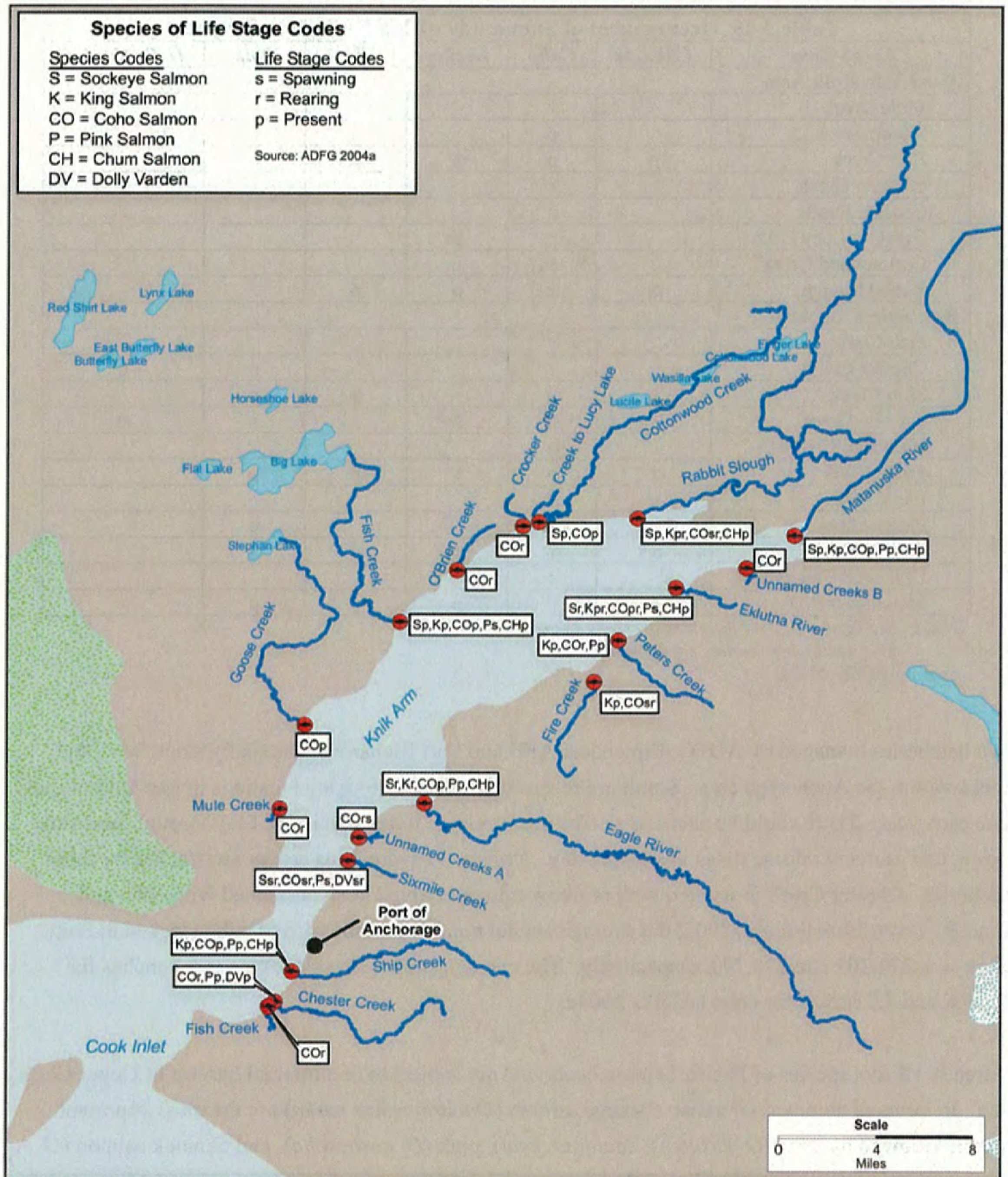

Figure 3-33
Occurrences of Anadromous Fish Streams and Associated Species in Knik Arm

expected return. These numbers are used in determining whether a fishery should be shortened or potentially closed for the season to enable the rebuilding of fish runs (ADFG 2003).

Table 3-20 Movement and Harvest of Salmon Species within Upper Cook Inlet

Lifestage	*Salmon Species*	*Period of Movement*	*Avg. Commercial Harvest (1993-2003)*
Adult	Chinook	May –Jul	2,432
	Coho	mid-Jul – Nov	64,786
	Sockeye	early Jul – late Aug	79,408
	Chum	Jun – Sep	18,874
	Pink	Jun – Oct	10,986
Juvenile	Chinook	early May – late Sep	
	Coho	mid-May – late Sep	
	Sockeye	mid-May – late Sep	
	Chum	early May – late Jul	
	Pink	early May – late-Jul	

Sources: ADFG 2004a, c, d; Pentec a, b, c, d, e.

Salmon use the Upper Cook Inlet, and Knik Arm in particular, as a migratory corridor to river and stream spawning areas and also to offshore, marine feeding areas in the Gulf of Alaska. Ship Creek, which is approximately one mile south of the southern limit of the proposed Project activities, supports runs of coho, pink, chum, and chinook salmon (ADFG 2004a). Although general residence timing of juvenile salmon in Knik Arm is unknown, based on limited fish sampling efforts in Upper Cook Inlet, all five salmon species conventionally were thought to leave Upper Cook Inlet by mid- to late-June. Current fish sampling efforts have found three species of juvenile salmonids within Lower Knik Arm to at least late September (Table 3-20; Pentec 2004a, b, c, d, e).

<u>Chinook</u>

Adult chinook movement in Knik Arm is generally from May to July with the peak in late May (Table 3-19). Chinook from the south-central area of Alaska exhibit a stream-type life history, spending one or more years as fry or parr in freshwater before migrating to sea for extensive offshore oceanic migrations (Groot and Margolis 1991). Although chinook salmon are not considered common in the Upper Cook Inlet, juveniles were an abundant salmon species caught along the shores of Susitna, Tyonek, and Trading Bay regions (outside Knik Arm and more than 25 miles west-southwest of the POA) during June and July 1993 sampling events. Juvenile chinook in Upper Cook Inlet feed on fish larvae and aquatic insects such as Dipterans and Hemipterans (Moulton 1997).

Chinook naturally occur within Ship Creek (ADFG 2004a) and the creek is also stocked with hatchery fish from the Elmendorf AFB and Fort Richardson hatcheries (ADFG 2004e). The hatchery fish probably comprise the majority of returning chinook salmon to Ship Creek. Both wild and hatchery fish are likely to be present in lower Ship Creek during outmigration while their osmoregulatory systems adjust to the estuarine waters of Knik Arm. Chinook may also use the upper intertidal mudflats adjacent to Ship Creek during high tide during their outmigration and return (FTA 2003). Although juvenile chinook were originally thought to occur in Knik Arm only from May to late June, recent sampling efforts have found juvenile chinook through September (see Tables 3-15, 3-16, and 3-20). More juveniles were seen during July than in August or September; no adult chinook were observed during these sampling events. Juvenile chinook were observed up to the end of September at those fish sampling stations adjacent to the POA (Table 3-20; Pentec 2004a, b, c, d, e).

Coho

Coho run timing is influenced by water temperature, with the arrival dates of spawners dependent upon the temperature of the spawning grounds. For example, warmer temperatures yield late spawners. In general, coho spawning occurs from July through November and typically at night. Fertilized eggs develop during winter, hatching in spring and fry emerge in May or June. Fry rear in streams or lakes for three to five years before migrating to sea as smolts (ADFG 2004f). In Upper Cook Inlet, juvenile coho feed on Calanoid copepods, insects, fish, and other zooplankton (Moulton 1997). Once they enter the marine environment, juveniles can spend anywhere from six months to two years before returning to freshwater as adults (ADFG 2004c). Coho occupy more diverse habitats than other salmon species, using freshwater, nearshore, and offshore habitats during their lifecycle.

Coho are likely to occur in lower Ship Creek during outmigration while their osmoregulatory systems adjust to the estuarine waters of Knik Arm. They may also use the upper intertidal mudflats adjacent to Ship Creek during their outmigration and return (FTA 2003). Coho are known to occur within Ship Creek, which is stocked with coho smolts from the Fort Richardson hatchery (ADFG 2004a, e). Although juvenile coho were originally thought to occur in Knik Arm only from May to late June, recent sampling efforts have found juvenile coho through September (see Tables 3-15, 3-16, and 3-20). Adults were most prevalent during the July and August sampling events. Juvenile and adult coho were observed up to the end of September at fish sampling stations adjacent to the POA (Table 3-16; Pentec 2004a, b, c, d, e).

Sockeye

The most prevalent salmon species in the Upper Cook Inlet is the sockeye (ADFG 2003, 2004d). The most productive spawning occurs in river systems that have an attached lake. The Fish Creek (Big Lake) system on the west side of Upper Cook Inlet is the largest sockeye drainage in the region of the POA (ADFG 2003). Sockeye spawning occurs during the summer months, and fry rear in freshwater for up to four years before migrating to sea (ADFG 2004c). Juvenile sockeye diets in Upper Cook Inlet consist of Calanoid copepods, insects, harpactacoides, and fish larvae (Moulton 1997). Although sockeye are not known to occur within Ship Creek (ADFG 2004a), juvenile sockeye have been observed in low numbers during sampling efforts near Cairn Point (USDOT 1983). Originally thought to occur in Knik Arm only from May to late June, recent sampling efforts have found juvenile sockeye during July and September (Tables 3-15 3-16, and 3-20). September sampling near the POA observed only small numbers of juvenile sockeye and no adults were captured (Table 3-16; Pentec 2004a, b, c, d, e).

Chum

Chum enter freshwater in June through September, spawning in early fall (Table 3-13). Eggs hatch in late December through early January, with a short residence in freshwater. Chum fry feed on small insects in the estuary prior to movement into sea in late spring or early fall (ADFG 2004f). Once they enter the sea, chum spend three to six years maturing in the areas around the Gulf of Alaska and on into the Bering Sea (ADFG 2004c).

Chum are known to occur in Ship Creek (ADFG 2004a) and near Cairn Point north of the POA (USDOT 1983). As with the other salmon species, chum salmon use the mouth of Ship Creek and the adjacent intertidal mudflats for osmoregulation during outmigration and during their return to Ship Creek as adults. Although originally thought to only occur in Knik Arm from May through late June, recent sampling events have found low numbers of both juvenile and adult chum in Knik Arm in late July (Tables 3-15, 3-16, and 3-20). No chum salmon were collected near the POA during August and September (Table 3-16; Pentec 2004a, b, c, d, e).

Pink

Pinks enter freshwater between June and October. Eggs hatch in early to mid-winter. Pinks have the shortest freshwater residence of all the Pacific salmon, generally migrating into saltwater in late winter and early spring, but most leave during April and May. Juvenile pinks feed largely on Calanoids, various zooplankton, and fish larvae in Upper Cook Inlet (Moulton 1997). They reach full maturity at two years of age, producing unrelated odd and even-year cycles (ADFG 2004c).

Pinks are known to occur in Ship Creek (ADFG 2004a) and as with the other salmon species, pinks use the mouth of Ship Creek and the adjacent intertidal mudflats for osmoregulation during outmigration and during their return to Ship Creek as adults. Although previously thought to only occur in Knik Arm from May through mid-June, recent sampling efforts have found juvenile pink salmon as late as the end of July (Tables 3-15 and 3-20), but in low numbers; no pink salmon were collected near the POA or in Knik Arm in August, September, or October (Table 3-16; Pentec 2004a, b, c, d, e).

Federal Agency's Conclusions Regarding the Effects of Action on EFH

This section presents the analysis for potential direct or indirect impacts to Fisheries and to EFH from implementation of Alternatives A, B, C, and No Action. Direct impacts could be associated with ground-disturbing activities resulting from construction of the proposed action (e.g., dredging or fill of subtidal and intertidal mudflats or direct mortality of fish species). Indirect impacts could be caused by or result from Project-related activities, are later in time, and are reasonably certain to occur.

Determination of the significance of potential impacts to EFH is based on: 1) the importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource; 2) the proportion of the resource that would be affected relative to its occurrence in the region; 3) the sensitivity of the resource to proposed activities; and 4) the duration of ecological ramifications. Impacts to biological resources are considered significant if species or habitats of concern are significantly affected over relatively large areas or disturbances result in reductions in the population size or distribution of a federally managed species.

Impacts to Federally Managed Fish Species

Under the proposed action, the dock structure would use a sheet pile or the pile-supported dock design. Construction activities associated with these methods would involve a decrease in marine habitat and changes in the noise environment in the vicinity of the POA. Based on sedimentation modeling, there would be no changes to existing current or sediment deposition patterns in and around the mouth of Ship Creek with implementation of the proposed action (refer to section 3.3.2). The use of a cathodic protection system to prevent corrosion of pilings is a standard practice in marine docks and terminals and is not expected to have any significant adverse impacts to federally managed fish species. Protection of water quality for federally managed species would be ensured by adherence to construction BMPs, NPDES permit requirements, and a pollution prevention plan during construction and during POA operations (refer to sections 2.2.2 and 3.3.3).

Between 110 and 135 acres of marine subtidal and intertidal habitat would be lost with the addition of fill behind the sheet pile structure comprising the new dock for the proposed action . In addition, approximately 6.7 million cubic yards of material would be dredged from 286 acres along the front face and behind the new dock structure during the estimated six years of in-water construction (for habitat effects see discussion below). Due to the muddy and homogeneous habitat, and based on best-available data from past and on-going fish sampling efforts in the vicinity of the POA, fish diversity and abundance is low (Table 3-16; USDOT 1983; Pentec 2004a, b, c, d, e). Furthermore, approximately one million cubic yards of sediment are currently dredged annually from May through November along the entire front of the existing POA dock structure. Therefore, due to the lack of significant marine habitat and the low diversity and abundance of fish species in the vicinity of the POA, there would be no significant long-term adverse impacts to local or regional federally managed fish populations with the fill of between 110 and 135 acres of subtidal and intertidal marine habitat under the proposed action.

Proposed construction activities would also involve increases in the local underwater noise environment in the vicinity of the POA. Impacts to federally managed fish species are the same as those discussed under impacts to non-federally managed fish (section 3.3.4). Based on previous acoustic data for impact pile driving, it is expected that the peak sound pressures will be up to 209 dB and average (rms) levels will be 195 dB, when measured 30 feet from the pile (NOAA Fisheries 2004f). Both these levels exceed the previously defined thresholds for physical injury and behavioral disruption of fish. Vibratory hammers produce peak levels approximately 17 dB less than those from impact hammers, with an estimated peak level of 192 dB. Although this is above the peak threshold for physical injury (180 dB), no fish kills have been linked to the use of vibratory hammers (NOAA Fisheries 2004f).

Impacts to EFH

Potential Impacts of Fill

Under the proposed action, construction of the POA dock structure would result in the placement of fill in 110 to 135 acres of marine EFH for seven species: chinook salmon; coho salmon; pink salmon; chum salmon; Pacific cod; walleye pollock; and sculpins. This represents 0.001 percent of the EFH present in Upper Cook Inlet. Although the area in the vicinity of the POA is designated as EFH for Pacific cod, walleye pollock, and sculpins, previous and on-going surveys and studies indicate that these species are rare to absent in the vicinity of the POA due to the lack of suitable habitat (Table 3-16; USDOT 1983; Morsell 2003 as cited in FTA 2003; Pentec 2004a, b, c, d, e). It is noted that, for the southern portion of the Project area, the mapped EFH is on, or adjacent to areas of industrial use, POA operations, and/or dredging. In the northern portion, the mapped EFH is adjacent to, or included in, the boundaries of a regulated landfill containing various hazardous materials. Although between 110 to 135 acres of EFH for four salmon species would be permanently lost due to the fill of intertidal and subtidal areas, approximately 36 acres of the subtidal area proposed for fill is currently dredged annually. In addition, upon completion of proposed expansion activities, approximately 184 acres of EFH would be dredged annually for maintenance/operations; currently the USACE dredges 206 acres within this area. Thus, the proposed action requires 22 fewer acres to be dredged than is currently identified within USACE project limits (Table 3-21).

Table 3-21 Summary of Potential Impacts to EFH under Each Alternative

Alternative	*Fill (acres)*			*Maintenance/Operations Dredging (acres)*			*Number of Piles*	*Years of Construction*	*Adverse Affects to EFH?*
	Intertidal	*Subtidal*	*Total*	*Intertidal*	*Subtidal*	*Total*			
A	66	69	135	11.0	173	184	260	6	Yes
B	62	48	110	11.0	173	184	4,005	6	Yes
C	66	65	131	11.0	173	184	960	6	Yes
No Action	0	0	0	0	206	206	1,000	8	No

Notes: Under the no-action alternative, all piles would be replaced.
Alternative A is the Preferred Alternative.

Potential Impacts of Pilings

Since, under the proposed action, the proposed dock would be a sheet-pile structure, a pile-supported dock, or a combination of both, between 260 to 4,005 steel pipe piles would be driven as part of the construction (Table 3-21). There would be no additional loss of EFH due to pile placement. Potential noise impacts due to the placement of the pilings have been previously discussed. Studies have shown that pilings do not have a detrimental effect on fish abundance or diversity in an area. Juvenile and adult salmonids are known to frequent dock pilings, and no aggregation of predators have been observed (Simenstad *et al.* 1999, Kahler *et al.* 2000, Haas *et al.* 2002). It is not expected that the installation of steel piles would adversely affect EFH, either directly or indirectly, and that there would be no long-term indirect impacts to EFH due to the placement of the pilings.

Potential Impacts of Dock Construction

The construction of the dock would cause shading of areas otherwise open to sunlight. Shading could inhibit or slow growth of marine plants and invertebrates, which could have direct impacts on EFH. However, due to the extreme tides, currents, and turbid conditions of Knik Arm, the area under the proposed dock is not expected to provide optimal conditions for the development of marine flora and invertebrates. In addition, the dock would be far enough above the water that shading would be minimized, particularly during low tide.

Potential Construction Impacts

Potential temporary impacts to EFH during construction activities include increased turbidity in EFH from the placement of fill and dredging operations. However, Knik Arm is known to be naturally turbid and its strong tidal currents would quickly dissipate any sediments associated with proposed construction or dredging activities.

Potential Impacts due to POA Operations

The construction of the proposed dock would increase the operation and maintenance activities at the POA and, therefore, would increase the potential for impacts to water quality. With implementation of the proposed action, current POA standard operating procedures would continue to be implemented to prevent and reduce the potential for fuel spills, waste discharges, and mechanical failures. The POA and vicinity currently experiences a large volume of marine traffic and associated activities. It is expected that increased POA operations would not impact fish species abundance or distribution in the area.

No Action

Under the no-action alternative, there would be no fill of EFH and the current permitted maintenance/dredging requirements would continue (Table 3-21). To repair the existing dock structure, approximately 1,000 piles would either need to be replaced or strengthened. These piles would be placed either within existing piles or existing piles would be replaced in kind. There would be no loss of EFH. As stated above under the proposed action, adverse, but not significant adverse, noise impacts to fish from pile driving are not expected. Therefore, there would be no significant adverse impacts to EFH with implementation of the no-action alternative (Table 3-21). However, it is noted that the no-action alternative would eliminate management practices along the 3,000-foot lengths of LF04 that would reduce the continued exposure of various wastes at LF04 and the potential migration of these wastes into the EFH.

Proposed Mitigation and Other Management Actions

The following conservation measures have been incorporated into the proposed action to avoid, minimize, and mitigate impacts to EFH. These are general measures that will be modified to specifically address details of the preferred alternative.

Mitigations

The proposed action includes a variety of BMPs designed to lessen the potential for adverse environmental effects. Prior to implementing the proposed action, MARAD and the POA would require the preparation of a plan detailing definition and implementation of BMPs to prevent erosion and sedimentation during construction and operation; control specific on-site erosion and sedimentation; protect adjacent properties and watercourses from effects related to erosion, sedimentation, and flooding; control spills; handle potentially hazardous materials and waste in accordance with federal, state, and local regulations; and otherwise lessen the potential for adverse environmental effects. BMPs developed in accordance with USEPA's *Stormwater Management for Construction Activities: Developing Pollution and Prevention Plans and BMPs* (USEPA 1992) will be employed to minimize the introduction of suspended sediment and siltation of Knik Arm during dredging and filling activities. Other BMPs as outlined in section 2.2.2 would be implemented.

The Project would fill up to 135 acres of mapped EFH. This same area would consist of a loss of 66 acres of intertidal area and 69 acres of subtidal area. Through the Section 404 process with the USACE, the POA and MARAD will mitigate the loss of these areas. Mitigation would occur in the Ship Creek area and may include:

- Habitat restoration (25 acres) in the mudflats south of Ship Creek;
- Channel restoration and streambank protection of lower Ship Creek;
- Lowering of the first dam on Ship Creek to allow salmon migration at high tide;
- Procurement of other conservation easements; or
- In lieu fees.

The specific mitigation proposal will be designed with input from appropriate resource agencies and after completion of the first phase of the USACE's Ship Creek watershed modeling project in 2005.

Monitoring and Ongoing Studies

To better understand the distribution and abundance of fish and marine invertebrates in the vicinity of the POA, the POA developed a marine biological resources study plan for the Project area. The POA is currently supporting fish and marine invertebrate sampling in the vicinity of the POA (refer to section 2.2.2). The focus of the activities will be in the POA vicinity. These studies were initiated on September

2004, after review and tentative concurrence with the plan by representatives of appropriate resource management agencies. These studies are to be performed in conjunction with, but separate from, planned KABATA studies. These studies will supplement the USDOT (1983) study, which has been the only Knik Arm-based study to date. In addition to using similar fish seining techniques as those in the 1983 study, the proposed fish and marine biological studies will also include invertebrate sampling. Sampling will be conducted at four stations in the vicinity of the POA: 1) south of Cairn Point and north of the POA (same station as the USDOT [1983] study); 2) South Tidelands south of Fuel Dock POL 2; 3) immediately landward of the POA offices and south of Trestle No.1; and 4) south of the boat launch. These studies are to be completed by 2005. The studies also include a survey of juvenile salmonid outmigration from Ship Creek in the spring of 2005, identification of fish from the Ship Creek hatcheries, and fish habitat use in the vicinity of POA facilities.

Summary

Based on the impact analysis, MARAD concludes that there would be adverse effects to EFH from the proposed action. Depending upon the alternative selected, fill within intertidal and subtidal zones would result in the loss of 110 to 135 acres of EFH. Noise impacts from pile driving under Alternative B would also be adverse. However, the use of mitigation measures included within the proposed action and described above, would ensure that the effects would be less than significant. The POA and MARAD also have initiated fish studies to be conducted before and during construction activities. If new information during the monitoring phase indicates that the Project would have a significant adverse impact on resources then appropriate environmental documentation and mitigation would be implemented.

3.4 HUMAN RESOURCES

3.4.1 Land Use and Coastal Zone Consistency

Land use generally refers to human modification of land, often for residential or economic purposes. The attributes of land use include general land use and ownership, special use land areas, and land management plans. Land uses are frequently regulated by management plans, policies, ordinances, and regulations that determine the types of uses that are allowable or that protect specially-designated or environmentally-sensitive uses. Special use land management areas that may be considered by agencies to be environmentally sensitive or worthy of specially-designated status are generally more rigorously managed. Coastal zones, although not special use land management areas, are managed intensively to ensure compliance with local and state requirements.

Affected Environment

Land Use

The POA is owned and operated by the MOA and lies on the eastside of Knik Arm in Upper Cook Inlet. The POA is a municipal agency, guided by a seven-person Anchorage Port Commission. That body has general oversight over operations, tariffs, and terminal rules and regulations. The Mayor of Anchorage maintains line authority and responsibility over the POA. In general, the POA is managed by a Port Director and a professional team composed of a manager of finance, operations/maintenance, engineering, governmental and environmental affairs, and business development. The POA's current role is to serve as Alaska's primary marine transportation link for the receipt of merchandise, building materials, and consumables. It also serves as an export facility for selected Alaskan commodities such as frozen seafood products, scrap metal, and refined petroleum (VZM 1999). Approximately 129 acres comprise the lands of the POA (refer to Figure 1-3).

The POA is bordered on the north and east by Elmendorf AFB, on the west by the Knik Arm portion of the Cook Inlet, and on the south by the ARRC and the former U.S. Army Defense Fuels property (refer to Figure 1-3). The ARRC holds title to the majority of the land immediately to the south of the POA under the terms of the Alaska Railroad Transfer Act of 1982 and the Exclusive License issued pursuant to that Act on January 5, 1985 (FTA and ARRC 2003). Several maritime/port-related facilities operate on the POA and ARRC properties under long-term leases. Table 3-22 presents property ownership and leased tenants that use the POA.

Table 3-22 Property Owners and Leased Tenants at the POA

Leased Tenants	***Land Owner***			
	POA	*ARRC*	*MOA*	*DoD*
Cargo / Bulk				
TOTE	X			
Horizon	X			
ASIG	X			
Alaska Basic Industries (cement)		X		
North Star (container and bulk)		X		
Douglas Management (container, bulk, gravel)		X		
Liquid-Bulk (POL)				
Williams Alaska		X		
Chevron		X		
ASIG Support		X		
Tesoro	X	X		
Passenger/Cruise Area	X			
Defense Fuels property				X
Ship Creek Point	X			
Lands Surrounding Ship Creek Point		X		
ARRC Intermodal Yard		X		
Tidelands				
North	X			
South		X	X	

The Anchorage Bowl Comprehensive Plan (MOA 2001a) lists the POA as zoned for a Marine Industrial District with heavy industrial use (Figure 3-34). The Marine Industrial District is intended for marine commercial and light industrial manufacturing, processing, storage, wholesale, and distribution operations that are water-dependent or water-related. The POA area between Tidewater and Terminal roads consists of an industrial area with the portion west of Tidewater Road used for transportation purposes (Figure 3-35).

Surrounding land uses include Elmendorf AFB and the former U.S. Army Defense Fuels property. Cherry Hill residential area is located on a bluff east of the POA property within Elmendorf AFB. Government Hill, a non-military residential community, is located approximately 0.25 miles southeast of the POA. Multiple fuel tank farms are located in the area. No special use land areas, such as national parks or monuments, occur directly adjacent to or near the proposed expansion area.

Ship Creek Point, at the western end of Ship Creek, is controlled and maintained by the POA. Boat and trailer parking and storage occur on ARRC property. Ship Creek Point is used primarily for a public boat launch, boat and trailer parking, and short- and long-term boat storage. The boat launch area is used year-round by Cook Inlet Tug and Barge Company and the parking area is used in the winter as inventory surplus for a local car dealership. Ship Creek Point also contains the Sea Service Veterans Memorial Park.

Coastal Zone Consistency

In 1972, Congress passed the Coastal Zone Management Act with the intent to promote orderly development and protection of the nation's coastal resources and to encourage voluntary partnership between the federal government and governments in coastal states, whereby coastal state governments develop their own coastal zone management programs. In 1977, the State of Alaska passed the Alaska Coastal Management Act; the ACMP implements Alaska's Coastal Management Act. The ACMP includes a number of coastal district "enforceable policies" that serve to maintain and preserve communities' coastal resources and habitats (ADGC 2003). These policies include preserving Class I waters by limiting pollutants and controlling erosion; limiting development of wetlands, marshes, tidelands, and beaches; maintaining existing natural vegetation; discouraging development in hazard areas; and protecting historical and archaeological areas. The policies also protect recreational areas and scenic corridors. Enforceable policies of the MOA Coastal District and associated Anchorage Coastal Management Plan are applicable to the Project. The Anchorage Plan has identified the POA as an Area Meriting Special Attention, primarily due to water-dependent and related uses, POA facilities, and support activities. No specific standards are prescribed for such areas, rather "the policies which will be applied to these areas must preserve, protect, or restore the value for which the area was designated" (ACMP 1981).

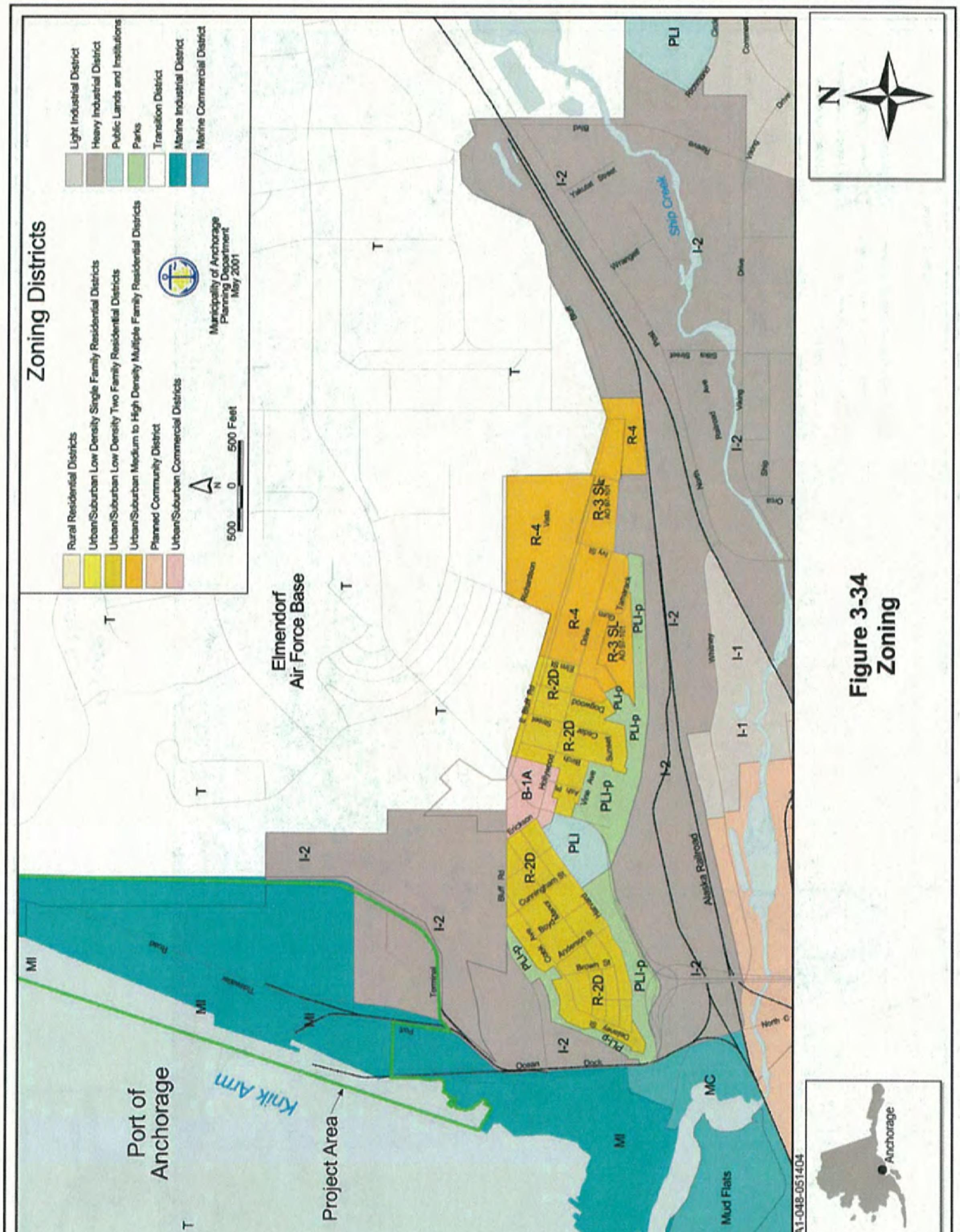

Figure 3-34
Zoning

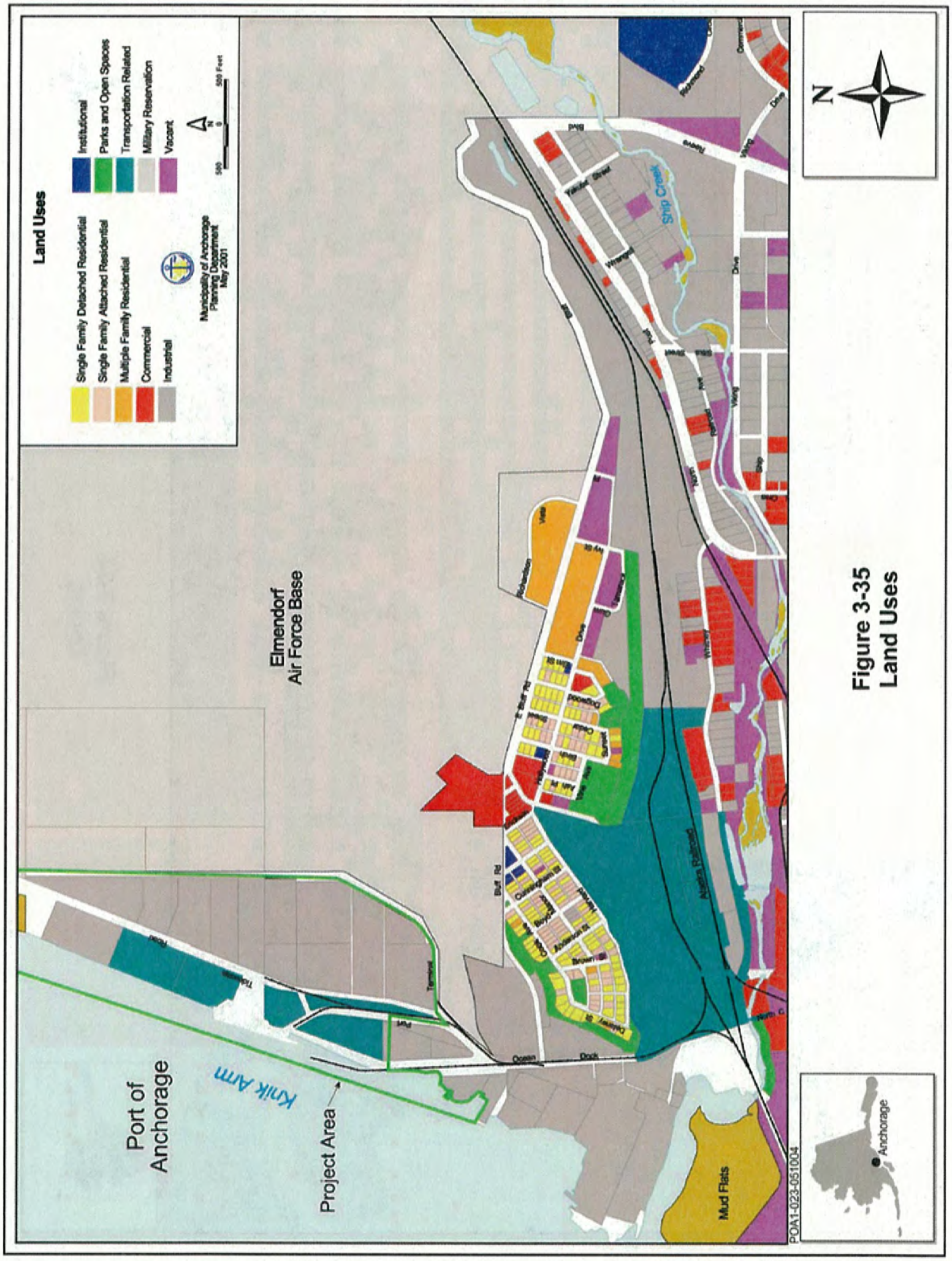

Figure 3-35
Land Uses

The ACMP ensures that any activity within or affecting the coastal zone would be performed in a manner consistent to the maximum extent practicable with the established coastal district enforceable policies and statewide standards. To achieve this goal, a consistency review and determination process is conducted prior to issuance of any state permits. The MOA's Coastal District Coordinator conducts a formal consistency review, and, if necessary, suggests stipulations to bring a project into consistency with the Anchorage Coastal Management Plan. These stipulations are then carried on the state and federal permits. State resource agencies included in the consistency review process are ADNR, ADFG, and ADEC, among others. For the proposed action, the MOA Coastal District, within the Department of Community Planning and Development, will review the proposal and ensure consistency with the enforceable policies of the Anchorage Coastal Management Plan. A consistency permit application will be submitted as part of the Project. The USACE will also coordinate federal review of the proposed action, since a Section 404 permit is required. Local, state, and federal agencies will determine if the proposed action is consistent with coastal management policies. The MOA Coastal District will conduct a final coastal zone consistency review for the USACE permit.

Section 810 of the Alaska National Interest Lands Conservation Act requires review of land use actions that may significantly restrict subsistence uses and needs. According to the Office of Subsistence Management, no significant subsistence activity occurs within the POA area (USFWS 2004b). Evaluation of potential restrictions to subsistence are discussed below.

Environmental Consequences

Proposed Action

<u>The Preferred Alternative/Alternative A</u>

Under Alternative A, approximately 135 acres of tidelands would be filled for the expansion and more than six million cubic yards of sediment would be dredged. Most of the area to be filled is currently under POA ownership, while the remainder to the south is under long-term lease from ARRC and will be returned to ARRC upon expiration of the lease. Construction and operations would be consistent and compatible with current land use plans and zoning for the area. Fill covers almost all areas at the POA; excavation of soil and placement of fill is common practice. Alternative A is also consistent with future plans for the area in the MOA's Anchorage 2020 Comprehensive Land Use Plan (MOA 2001a) and the 2001 Long Range Transportation Plan (MOA 2001b). Access to the POA would continue via existing routes or new arrangements during construction with minimal disruption of business. Post-construction access would be greatly improved. Alternative A and resulting operations would take place within the coastal zone, but are consistent with the Anchorage Coastal Management Plan regardless of the alternative chosen. The POA is an industrial area and has no identified coastal resource values that would be affected.

No significant adverse impacts to subsistence uses are expected as a result of the proposed action for any of the design alternatives. Subsistence use in the POA area is limited to nonexistent. Any temporary increases in silt flow as a result of the design alternative would not be detrimental to subsistence resources. Because of these factors, no increase in competition for subsistence resources and no significant change in regional subsistence use patterns are anticipated.

Alternative B

Under Alternative B, all actions relating to construction and operations would be similar to Alternative A. A total of 110 acres of tidal mudflats would be filled. Development would be consistent with all local plans, and no significant adverse impacts to land use would occur.

Alternative C

No significant adverse impacts to land use would occur under this alternative. Conditions as described under Alternative A are the same, except that 131 acres of tidal mudflats would be filled under Alternative C.

No Action

No change from current land use in the Project area would occur. The POA would remain at its current size and operations would continue as described in baseline conditions. Tidelands leased from ARRC would remain unfilled and be released to ARRC at the end of the lease term. Portions of existing terminals could be repaired or replaced in a single construction season, but the areas would be closed for construction and the existing tenants would have to shift away from construction areas or halt their operations altogether. Thus, operational inefficiencies would occur. However, the repair and replacement of steel piles would be consistent and compatible with current land use plans and zoning for the area, and with projected land use and zoning for the area in the MOA's Anchorage 2020 Comprehensive Land Use Plan (MOA 2001a) and the 2001 Long Range Transportation Plan (MOA 2001b). Operational constraints would not change the nature of activities at the POA. Therefore, there would be no significant adverse impacts to land use and coastal zone consistency.

3.4.2 Recreation and Visual Resources

Recreation resources include outdoor recreational activities that take place away from participants' homes. Because the proposed action will take place in an urban area, recreation analysis will focus on urban recreational activities associated with urban parks, trails, waterways, and sightseeing. Visitors in this type of area seek urban recreation opportunities with ease of access, developed areas and facilities, and an array of potential uses. For these reasons, the effects of existing use of areas surrounding the POA on a user's expectations were considered in assessing baseline conditions. Typically, recreational use in an area can be described by the number of users, available activities, uniqueness of the area as a recreational resource, and the perceived value or benefit of the area for the users.

Visual resources are defined as the natural and manufactured features that comprise the aesthetic qualities of an area. These features form the overall impression that an observer receives of an area or its landscape character. Landforms, water surfaces, vegetation, and manufactured features are considered characteristics of any area if they are inherent to the structure and function of the landscape. The significance of a change in visual character is influenced by social considerations, including public value placed on the resource, public awareness of the area, and general community concern for visual resources in the area. For this EA, these social considerations are addressed as visual sensitivity, and are defined as the degree of public interest in a visual resource and concern over adverse changes in the quality of that resource.

Affected Environment

Recreation

The POA is a secure facility with controlled access at both the main gate and several internal gates. Only individuals with official business at the POA and the proper credentials can enter the facility; it is not open to the general public nor does it contain any recreation sites. A berth used by passenger/cruise ships occurs within the POA and is used mainly for small ships using the POA as a starting point for 10-day to 14-day excursions to western Alaska. However, because of security reasons, access to and from the site for such uses is strictly controlled.

Ship Creek Point, located southwest of the proposed Project area and outside the secured area of the POA, is the only major public boat launch ramp in the Anchorage area. This area is owned by the MOA and managed by the POA. The main users of the boat launch are recreational boaters and fishermen, commercial fishermen, and duck hunters. On a seasonal basis, use of the boat launch by water and jet skiers during slack tides in Cook Inlet is a small but growing recreational activity. Many tourists travel to Ship Creek Point and Ship Creek to view salmon, fishermen, boaters, and the mountain and Inlet vistas. Bird and whale watching from Ship Creek Point is a popular mid summer and fall activity. In winter, local residents use the lower Ship Creek area for duck feeding and viewing. Ship Creek Point also contains the Sea Service Veterans Memorial Park.

Ship Creek enters Knik Arm northeast of Ship Creek Point and lies to the south and southeast of the Project area. It is heavily used during the summer by sport anglers due to its proximity to downtown Anchorage and hatchery-supported salmon runs. The world's only two metropolitan salmon derbies are held annually at Ship Creek: the King Salmon Derby in June and the Silver Salmon Derby in August. Estimates from 2002 indicate 47,000 angler days on Ship Creek with 2,300 King Salmon and 17,000 Silver Salmon caught (ADFG 2002).

No parks are located within the Project area. Figure 3-36 shows the parks and trails in the Project vicinity. Cunningham and Suzan Nightingale McKay Parks are the closest to POA. Cunningham Park is a small 0.05-acre undeveloped natural area and Susan Nightingale McKay Park consists of 1.36 acres of paved pathways and play equipment and is used mainly for picnics and day outings. The adjacent western portion of Government Hill Greenbelt Park is primarily undeveloped open space with no formal improved areas for visitors. This land is leased from the ARRC by the MOA and contains two historic railroad houses. Brown's Point Park, surrounded by the Greenbelt, is used mainly as a picnic area and viewpoint. Al Miller Memorial Park, also in this area, has play equipment and picnic areas (MOA 2004).

The closest existing formally-recognized recreational trails are located along Ship Creek, and a new trail has been proposed from Ship Creek to the Government Hill Greenbelt. The current terminus of the Coastal Trail is located south of the Project area in downtown Anchorage. An extension is proposed to connect the Coastal Trail from downtown northeast to the Ship Creek area (see section 2.2.2).

Visual Resources

The visual setting of the POA and the location of the proposed action is characterized as "industrial." The dominant view of the POA consists of multi-story cranes (approximately 175 feet in height), large warehouse-like buildings, stacked cargo containers, and petroleum tanks. The POA is not highly visible because it is lower than most of the surrounding area, including most of downtown Anchorage and Government Hill. The POA can be seen in the mid-ground from some of the nearby parks on the Government Hill bluff (Figure 3-37). These views are obscured by trees in summer, and decrease with distance from the bluff's edge due to topographical differences. In the winter, when the view is more exposed, recreational use of the park areas decrease. Much of the Government Hill Greenbelt is bordered on the POA side by a chain link fence with three strands of wire atop; views of the POA are through the fence. From downtown, the Project area is visible in the background from the hilltop in Quyana Park, the upper floors of some high-rises, and from 2nd and 3rd Avenues. The most visible features from the Project area are the railroad tracks, the POA itself, Ship Creek Point, and the petroleum tanks in and around the POA.

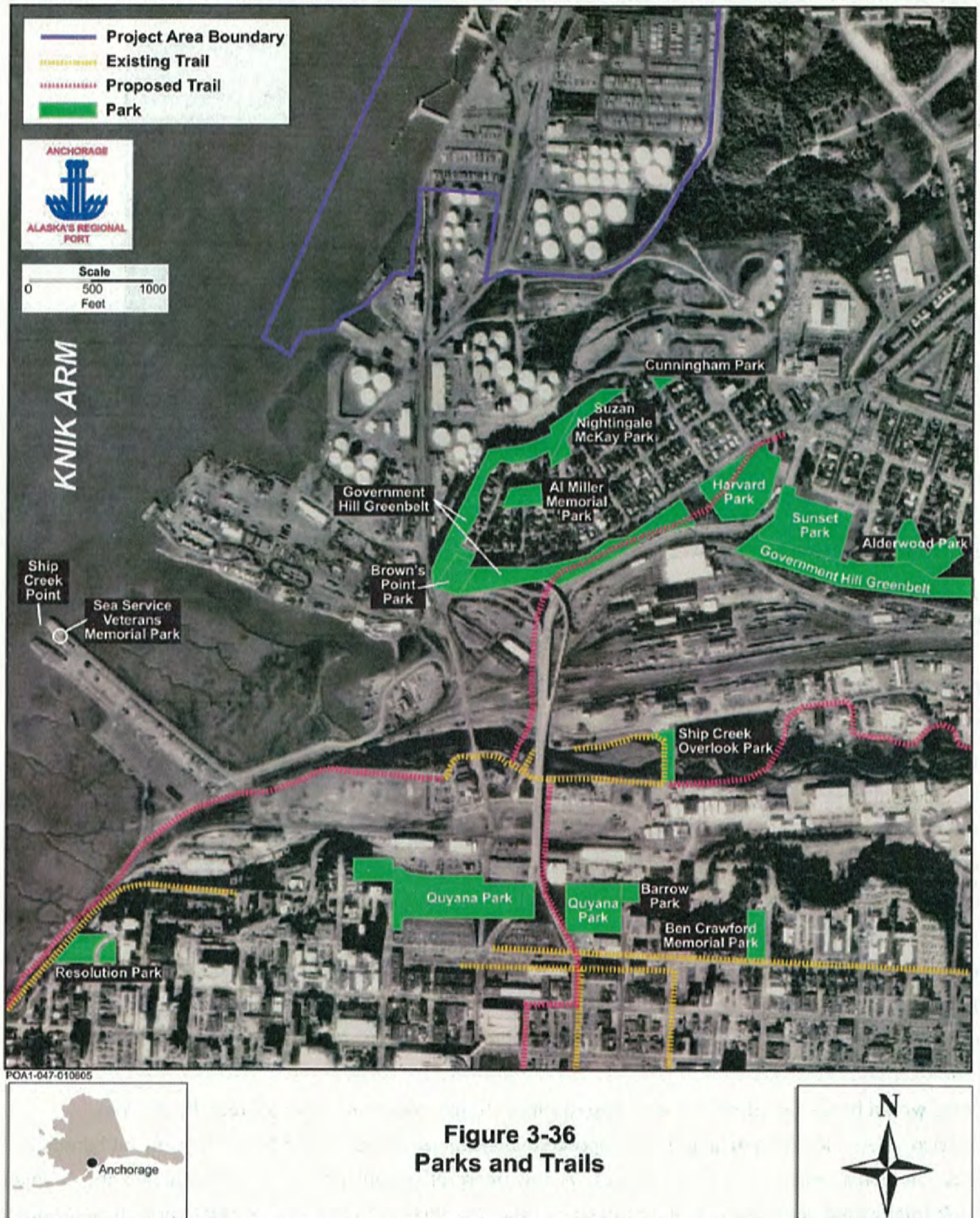

Figure 3-36
Parks and Trails

Figure 3-37 View from Suzan Nightingale McKay Park

Environmental Consequences

Proposed Action

The Preferred Alternative/Alternative A

Recreation

Adverse impacts to recreation would not be significant for Alternative A. The POA is a secure facility with controlled access at both the main gate and several internal gates. Only individuals with official business at the POA and the proper credentials can enter the facility; it is not open to the general public nor does it contain any recreation sites. Currently, the only recreational use of the POA is as a passenger/cruise ship port of call. If implemented, Alternative A would develop a secure cruise ship berth to service passengers and baggage, and be able to accommodate larger ships, thus improving this recreational opportunity. Expansion of the POA would also improve opportunities for a projected U.S.-flagged small cruise ship market and expedition-like seasonal Arctic cruise market using Anchorage as a homeport due to proximity to Ted Stevens Anchorage International Airport.

There would be no significant adverse impact on the Ship Creek area or Ship Creek Point from Alternative A, and implementation of proposed management actions would have a significant beneficial effect on recreational and visual resources. A new interpretive center for public information about Upper Cook Inlet would be added with the extension of the Sea Service Veterans Memorial Park. In addition, the coastal trail may be extended to avoid the railroad tracks as part of potential mitigation activities. This would provide an additional avenue for walkers and bikers in the area and is a critical part of connecting the area trail network (see Figure 2-30). Also with implementation of Alternative A, public access would not be restricted at current recreational areas; vehicle traffic in the vicinity would temporarily increase beyond baseline levels during the summer construction seasons (see section 3.4.3) but is not expected to adversely affect recreational activities.

Current recreational fishing opportunities at Ship Creek for sport anglers would continue during construction and expanded POA operations with no significant adverse effects. As discussed in section 3.3.4, there would be no significant adverse impacts to marine vegetation and habitats. No changes would occur to existing current or sediment deposition patterns (particularly for the area in and around the mouth of Ship Creek), no significant adverse impacts would occur to local or regional salmonid populations, and no impact would occur to fish species abundance or distribution in the area. Based on the biological analysis, there would be no significant adverse impacts to the Ship Creek fishery and salmon derbies.

U.S. Department of Housing and Urban Development guidelines for noise zones at playgrounds and neighborhood parks recommend anything below 65 Ldn as acceptable noise levels. Because noise increases from the proposed action would have transient and localized effects that would decrease with distance and terrain attenuation (refer to section 3.2.2), no significant audible adverse impacts on nearby parks would occur.

Visual Resources

Adverse impacts to the visual environment would not be significant under Alternative A. The visual setting of the POA is "industrial" with cranes, warehouses, and petroleum tanks dominating the view. Construction activity viewed from areas around the POA would look similar to the existing viewscape. As construction progresses, areas of the POA under active construction and visible at a given time would differ, although the overall visual setting of the POA would remain the same. Some changes in the visibility of the area would occur due to the increased height of the new cranes (approximately 220 feet tall, 45 feet taller than existing cranes). Also, expansion of the marine terminal westward would result in the POA being slightly more visible from certain vantage points, including downtown Anchorage and Government Hill. However, this expansion would be consistent with the existing visual setting of the POA and its immediate vicinity. Visual impacts on nearby parks and recreation areas would be minimal. In addition, implementation of proposed management actions (specifically the Sea Service Veterans Memorial Park and potential habitat restoration) would result in beneficial aesthetic effects in nearby areas. Since Alternative A would result in no significant change in visual assets, no adverse impacts to visual resources would result from Alternative A.

Alternative B

No significant adverse impacts to recreational resources would occur under Alternative B. All conditions would be the same as described for Alternative A. No significant adverse impacts to visual resources would result from Alternative B. Visual settings would be similar to existing conditions. Conditions as described under Alternative A are the same for this alternative.

Alternative C

No significant adverse impacts to recreational resources would occur under Alternative C. All conditions as described for Alternative A would be the same for this alternative. No significant adverse impacts to visual resources would result from Alternative C. Visual settings would be similar to existing conditions. Conditions as described under Alternative A are the same for this alternative.

No Action

POA operations would continue as described in baseline conditions, with changes in operations to accommodate repair, replacement, and maintenance activities. Extension of the Sea Service Veterans Memorial Park with a new interpretive center for public information about Upper Cook Inlet would not occur, nor would any habitat restoration, including any potential extension of the Coastal Trail. Thus, the associated aesthetic and recreational improvements (e.g., an additional avenue for walkers and bikers to avoid the railroad tracks) would not occur.

The cruise ship terminal would not be built, and the expected increase in cruise-related recreation opportunities would not occur. Current operations could be disrupted during extended periods of restricted access or discontinued due to closure of specific berths during periods of repairs and replacement. These impacts would be adverse but not significant, because the current use of the POA by cruise ship passengers is limited.

In terms of visual resources, although maintenance would occur to replace existing infrastructure, these actions would be in keeping with the current visual resources at the POA and there would be no change to this resource. Therefore, there would be no significant adverse impacts to visual resources.

3.4.3 Transportation/Traffic

Transportation resources refer to the infrastructure and equipment required for the movement of people, manufactured goods, and raw materials in geographic space. The POA, navigable waters of Cook Inlet, and adjacent areas in Anchorage during construction and operation of the Project will be the focus of this analysis. Roadway operating conditions and the adequacy of the roadway system to accommodate vehicles are typically described in terms of average daily traffic volumes and level of service (LOS) ratings. LOS ratings range from a rating of A for free-flowing traffic conditions to a rating of F for congested conditions.

The POA serves as the northern terminus of an intermodal transportation network within Anchorage. Additional rail access will be constructed in 2004 and 2005 along the eastern border of the POA. A single railroad-road corridor connects the POA area with the Anchorage central business district. From the central business district, road and rail systems provide an extension of POA access to the Ted Stevens

Anchorage International Airport. In addition, the road system connects with Alaska's National Highway System and the railroad system within Alaska.

Affected Environment

Marine Transportation

The POA serves a central role in Alaska's marine transportation system. The largest of the state's 95 ports and harbors, the POA serves 80 percent of Alaska's populated areas and is the gateway for 90 percent of all merchandise cargo consumed in Alaska. The POA links railroad, road, and air cargo throughout the state. The POA accommodates cruise vessels and a full range of maritime commodities, including container, trailer, break-bulk, dry-bulk, and liquid-bulk cargos. The POA stages 100 percent of the exports of refined petroleum products from the state's largest refinery in Fairbanks and facilitates petroleum deliveries from refiners on the Kenai Peninsula and in Valdez.

The affected area for the proposed action consists of marine vessel routes and docking terminals in the immediate vicinity of the proposed the Project. The POA currently is able to accommodate ships with a draft up to 35 feet. Five berths are available at the POA: POL 1 and POL 2 are used for dry-bulk and liquid-bulk vessels; Terminal 1 accommodates container and general cargo vessels; Terminal 2 is used for container vessels; and Terminal 3 is used for RO-RO vessels. All berth use is scheduled, and berths are available 24 hours per day. Four of the berth lengths are between 600 and 655 feet. The fifth and largest berth is 1,000 feet. The POA cannot currently accommodate the largest generation of Post Panamax ships as none of its berths provide sufficient draft, nor is their sufficient length if other berths are in use (VZM 1999).

Two container cargo ships arrive regularly at the POA two times weekly throughout the year (Sundays and Tuesdays), with an additional ship arriving on Saturdays during the summer months. In 2003 there were 491 ship visits to the POA, or approximately 9.8 ship visits per week (POA 2004a). In August, the most active month of 2003, there were 75 visits to the POA. During January, the least active month, the POA received 23 visits.

The POA is principally a receiving port, with tonnage of inbound cargo typically more than twice as large as outbound cargo (VZM 1999). Of the approximately 3.3 million tons of cargo shipped across the POA in 1997, 80 percent was destined for Anchorage; 12 percent for Fairbanks; and eight percent for other locations in Alaska (MOA 2001a). Containers are off-loaded by cranes and RO-RO transfer bridges. After off-loading, trucks transport containers to various transit areas for staging and subsequent travel on local roads.

Vehicle Transportation

The affected area for the proposed action consists of the primary roadways and intersections in the immediate vicinity of the proposed Project: Ocean Dock Road; Port Access Road (A Street/C Street) overpass; Whitney Road; Seward Highway; and other major access routes to the POA (Figure 3-38). As a result of events threatening national security, the POA restricted all inbound vehicular traffic to legitimate business-related entry only effective October 3, 2001. Public pedestrian and bicycle traffic is not permitted; therefore, truck traffic is the primary means of transport on the POA property (MOA 2003b). Limited pedestrian traffic occurs by workers on POA property.

The intersection of Ocean Dock Road, North C Street, and Port Access Road is crucial to POA access. All POA-related traffic flows via Ocean Dock Road to the nearby industrial areas and the greater Anchorage area, and most of this traffic must pass through this intersection (see Figure 3-38). Within the POA area, Ocean Dock Road splits to form the parallel roadways of Tidewater Road and Anchorage Port Road and Terminal Road along the eastern POA boundary. In order to reduce traffic conflict within the POA, access to the Horizon storage areas goes from Anchorage Port Road to Gull Avenue to Tidewater Road. Access to the TOTE yards is accomplished by traveling on Anchorage Port Road to Terminal Road. Whitney Road serves as the primary means to link the POA with the Ship Creek industrial area and the ARRC Intermodal Rail Yard. Port Access Road connects Ocean Dock Road with the Anchorage central business district to the south. Port Access Road splits near 1st Avenue to form the A Street/C Street couplet, which provides access to mid-town Anchorage. Additional roadway connections include the use of I and L Streets to Minnesota Drive and Gambell and Ingra Streets to the New Seward Highway.

In addition to these main public access roads, Elmendorf AFB has limited access to the POA. There are no public roads leading directly from Elmendorf AFB onto POA lands, leased or owned. There is a parking lot with chained gate outside of the most northeastern point of POA property line. This lot is owned by the Air Force, and access to and from the base onto POA property is currently prohibited. There is an unimproved dirt road north of the POA from Elmendorf AFB and a dirt road from Elmendorf AFB to the eastern boundary of the POA.

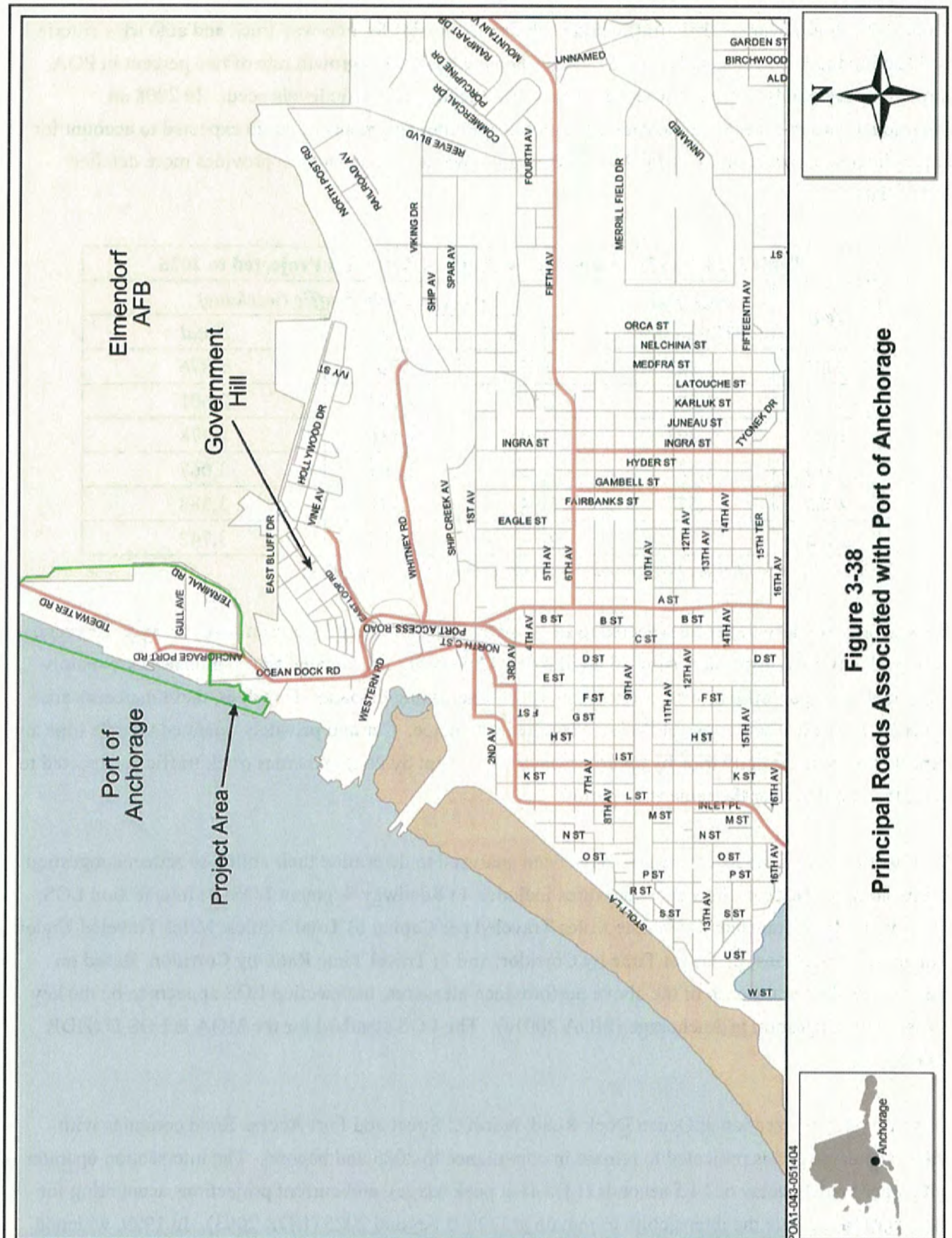

Figure 3-38
Principal Roads Associated with Port of Anchorage

Table 3-23 shows average daily traffic and peak day truck trips for one-way truck and auto trips entering and leaving the POA projected to 2025. These data are based on a growth rate of two percent in POA throughputs and only represent weekday data, when the highest traffic levels occur. In 2008 an intermodal yard is expected to become operational, with rail shipments of cargo expected to account for approximately ten percent of all POA-related cargo movement. Appendix F provides more detailed traffic data.

Table 3-23 Traffic Associated with POA Activities Projected to 2025

Year	*Peak Day Truck Trips*	*Average Daily Traffic (weekday)*		
		Truck	*Auto*	*Total*
2003	1,229	903	973	1,876
2008	1,240	1,527	1,074	2,601
2010	1,292	1,592	1,186	2,778
2015	1,427	1,758	1,309	3,067
2020	1,577	1,943	1,445	3,388
2025	1,742	2,147	1,595	3,742

Note: For more detailed POA-related traffic information refer to Appendix F.

POA-generated daily traffic is expected to increase by approximately 99 percent over the next 20 years, with peak day truck trips increasing an anticipated 42 percent. Anticipated traffic increases are mainly attributed to cargo traffic movement associated with increasing demand. However, these increases are expected to occur whether or not Project activities take place. Car and privately operated vehicle trips are expected to increase daily trips by approximately 64 percent by 2025, whereas truck traffic is expected to more than double over the same time period.

Various traffic performance measures have been analyzed to determine their ability to reflect congestion in Anchorage. These performance measures include: 1) Roadway Segment LOS; 2) Intersection LOS; 3) Vehicle Miles Traveled; 4) Vehicle Miles Traveled per Capita; 5) Total Vehicle Miles Traveled Under Congested Conditions; 6) Travel Time by Corridor; and 7) Travel Time Ratio by Corridor. Based on analysis conducted for each of the above performance measures, intersection LOS appears to be the key measure of congestion in Anchorage (MOA 2001a). The LOS standard for the MOA is LOS D (HDR 2003).

Currently, the intersection at Ocean Dock Road, North C Street and Port Access Road complies with MOA standards and is projected to remain in compliance to 2025 and beyond. The intersection operates with a per vehicle delay of 14.5 seconds (LOS B at peak usage), and current projections accounting for the Project anticipate the intersection to remain at LOS B beyond 2025 (HDR 2003). In 1999, widened paved shoulders were added to Ocean Dock Road, and four at-grade railroad crossings were eliminated by removal of several spurs, improving traffic circulation. Additional transportation projects over the next six years are expected to continue to improve flows at Ocean Dock Road (VZM 1999). Freight routes in the vicinity of the POA considered "constrained" in a survey of motor carriers included Ocean Dock Road, Whitney Road, Ship Creek Avenue, 1st Avenue, C Street/A Street, Tudor Road, Lake Otis Parkway, 15th Avenue, and Commercial Drive (MOA 2001a).

Rail

A single rail line enters the southern portion of the POA from the ARRC main access track to the south. The primary function of the rail line is movement of bulk liquids for companies such as Tesoro and Chevron. The main ARRC freight yard is located adjacent to Whitney Road on Ship Creek south of the POA and serves all passenger trains and main freight trains. The current rail yard is located approximately three miles southeast of the POA and is accessed by container trucks by way of Whitney Road. Whitney Road is crossed a number of times with rail tracks and is frequently blocked by parking associated with recreation along Ship Creek.

As a separate, independent action, a Road and Rail Extension Project is underway to provide intermodal access to the POA. That project, discussed below, will reduce truck traffic along Whitney Road.

Transportation Planning

A number of transportation studies have been conducted over the last ten years assessing transportation efficiencies in Anchorage. (Reid Middleton 1993; VZM 1996; AMATS 2001; MOA 2000; MOA 2003b). These studies have suggested numerous modifications that have improved traffic flow within the POA and in the surrounding municipality. These studies have also identified deficiencies in existing transportation systems in the Anchorage area and made recommendations for improvements or modifications to resolve freight mobility constraints. Constraints identified by the studies included traffic congestion, loading facilities, conflicts with other freight and private passenger vehicles, a lack of traffic signals, and awkward intersection configurations. Specific concerns within the POA included congestion of primary roadways conveying traffic, in particular the Whitney/Ocean Dock Road intersection, the Central Business District and the A Street/C Street ramps to Port Access Road. Recommendations for improving traffic specifically within the POA include improving access connections between the POA and Ship Creek warehouse district and Anchorage, as well as improving roads within the Ship Creek basin (AMATS 2001).

Two other independent transportation projects that will have direct impacts on POA operations include the construction of inbound and outbound access ramps to Port Access Road from Ocean Dock Road and a Road and Rail Extension Project providing enhanced rail access to the POA. Additional access ramps and the addition of a stoplight at the intersection of Ocean Dock Road and North C Street will improve access to Port Access Road, but is otherwise not expected to significantly alter LOS levels at the intersection of Ocean Dock Road and North C Street. The intersection is expected to remain at LOS B with or without the additional access roads through 2020 (HDR 2003). The Road and Rail Extension Project will add dual working tracks and a single run-around track within a 160-foot wide corridor, and will also support a roadway and an intermodal freight yard for loading and unloading at the POA. Railroad construction will run parallel to the current Terminal Road and its extension concluding at the northeast boundary of the POA and the southwest boundary of Elmendorf AFB. With a length of 6,800 feet, the corridor will support about 13,000 feet of railroad track and a three-lane paved road. The rail extension is expected to reduce traffic between the POA and ARRC intermodal yard by 6,760 annual truck trips (POA 2004a). The Road and Rail Extension Project is expected to be complete by 2010. Other transportation projects to be implemented over the next few years are presented in Figure 3-39.

Environmental Consequences

Proposed Action

The Preferred Alternative/Alternative A

Construction of Alternative A requires more than 12.3 million tons of fill material. Depending on the location of the fill source chosen, the bulk of this material would arrive either by railcar, barge, or both. However, one scenario would include bringing fill material by truck (ten trucks per hour) for initial site preparation work in the first nine days of each construction season and then by rail (one train per day) and barge (one to two barges per day). Other sources for fill could include conveyor belts and use of dredged materials. Use of truck, rail, and barge combinations would represent the maximum potential effect to the street transportation system.

Once fill material has been transported to the site, a combination of trucks and portable conveyors and other construction equipment would then be used to move the material to its final location. If material is derived from properties adjacent to the POA, it could be delivered by a combination of off-road trucks and conveyors. Dredged material could be used as fill, reducing the transport of fill material. Using the maximum scenario of transport with trucks, trains, and barges, the transportation routes used for adjacent material sources would not affect existing primary roadways and access routes to the POA. Thus transport of fill would not significantly impact existing transportation and circulation within the POA.

At the POA, miscellaneous equipment would be required to receive material from the railcars and stockpile the material on site. This equipment would consist of one diesel-powered locomotive, electric powered conveyors, and three diesel powered dozers. Barge deliveries would be assisted by diesel powered tugboats designed to tow and push the barges to the desired staging location. The material would then be loaded off-loaded by a barge-mounted bucket excavator feeding a hopper-conveyor system. In the likely maximum construction season, it is estimated that delivery of fill would require 137 train trips, 274 barge trips, and 1,440 truck trips. Barge trips would increase by 50 percent (an increase

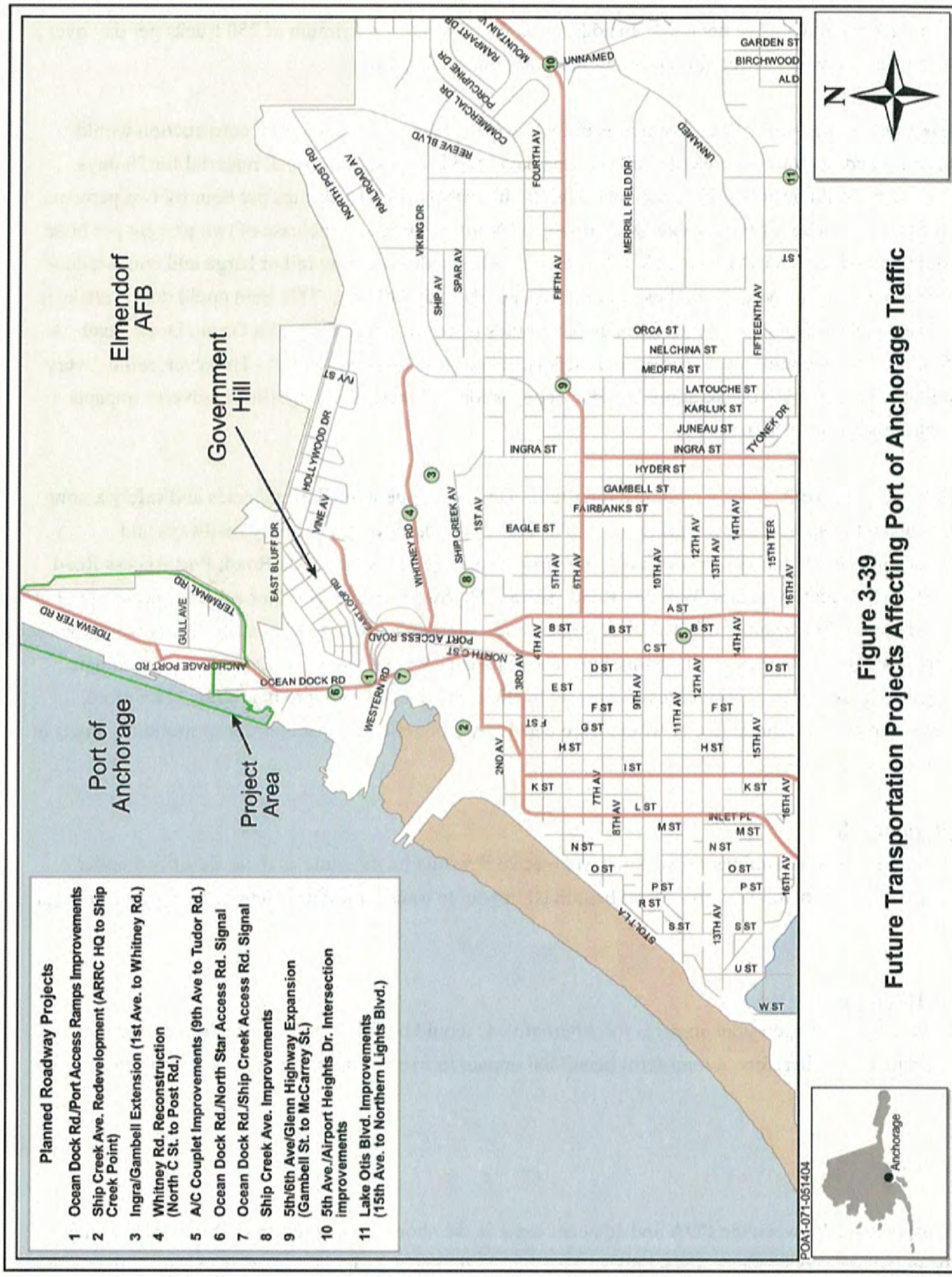

Figure 3-39
Future Transportation Projects Affecting Port of Anchorage Traffic

from three per day to five per day). In addition to fill material, a maximum of 250 trucks per day over a 28-day period would be required to bring in asphalt for paving areas.

Peak trucks per hour for POA operations in 2003 were 1,229. Truck trips from construction would include an additional ten trucks for fill for nine days, and 25 trucks for asphalt material for 28 days. These trips could be arranged to run concurrently, increasing peak truck trips per hour by two percent. Given an LOS level of B at Ocean Dock Road and North C Street, an increase of two percent per hour would not reduce the LOS level below B. Fill may also be delivered by rail or barge and could reduce these impacts. This would entail use of one train per day with 80 cars. This train could delay traffic at intersections near the POA by as much as 25 minutes if it used tracks that cross Ocean Dock Road. A 25-minute delay could impact traffic and increase congestion next to the POA. However, rail delivery could be timed to avoid peak hours to reduce congestion. Therefore, no significant adverse impacts would result from Alternative A.

Under Alternative A, there would be a long-term increase in operational efficiencies and safety among intermodal transportation systems at the POA. Traffic increases on the primary roadways and intersections in the immediate vicinity of the proposed Project: Ocean Dock Road; Port Access Road (A Street/C Street) overpass; Whitney Road; Seward Highway; and other major access routes to the POA would not be significantly affected by Alternative A. A combination of railcars and trucks would be used to transport goods to their final destination. The expansion design would sufficiently accommodate projected increases in commodities and vessel traffic through 2025 and into the future. Therefore, implementation of Alternative A would have a long-term beneficial impact on transportation systems in the area.

Alternative B

Construction and operations impacts for Alternative B would be the same as those described under Alternative A. Therefore, a long-term beneficial impact to transportation systems would occur through 2025.

Alternative C

Construction and operations impacts for Alternative C would be the same as those described under Alternative A. Therefore, a long-term beneficial impact to transportation systems would occur through 2025.

No Action

Transportation between the POA and adjacent areas in the short-term would not substantially change. The repair and replacement of steel piles is not expected to pose a significant adverse impact to traffic, as the majority of construction materials would be imported through the POA's own facilities via marine transport. The movement of equipment and discarded materials would likely occur by ground transport via truck or rail, resulting in an adverse but, not significant, impact. Additional operational inefficiencies at the POA could occur due to construction activities on the dock. Although portions of existing terminals could be completed in a single construction season, some areas would have to be closed during construction and the existing tenants would have to shift away from construction areas or halt their operations altogether. These obstacles would occur necessarily during the peak season when cargo throughputs are at their highest. Thus, operational inefficiencies would likely be more substantial with activities on the dock compared to below-dock no-action alternative approaches discussed. Therefore, short-term adverse, but not significant, impacts to both marine and ground transportation could occur as a result of maintenance and repair activities under the no-action alternative.

Transportation conditions are expected to gradually deteriorate as cargo throughputs increasingly exceed the POA's capacity. By 2025, an anticipated four out of five types of cargo throughputs will exceed the POA's maximum capacity as growing population and demand increase, potentially resulting in a bottleneck to the supply of goods to Alaska. Cargo volumes that exceed the sustainable capacity of POA operations are considered to be difficult to maintain without rendering such operations unprofitable, impractical, or unsafe. Unanticipated traffic delays and deteriorating ground traffic conditions could ensue as throughputs become less manageable and more sporadic due to marine traffic bottlenecks and operational inefficiencies at the POA. Therefore, significant adverse impacts to both marine and ground transportation could occur as a result of increasing cargo throughputs under the no-action alternative.

The limited number of standard military supply shipments currently conducted by commercial carriers would continue to be accommodated, but projected requirements for large force deployments in support of the global war on terrorism or for other national security objectives would be restricted by capacity constraints, a lack of sufficient staging area, and an inability to use larger ships due to water depth limitations and berth size. As recently as December of 2004, DoD representatives communicated concerns to the POA about the lack of available staging areas during specific deployments. These deployments involved a relatively small number of vehicles (approximately 300), as compared to projected deployments of the Stryker Brigade Combat Team. The DoD representatives specifically expressed a vital need for substantial additional acreage as soon as feasible.

In case of national emergency, the military could take over all POA berths. This would not allow for commercial shipping operators to bring in cargo for up to two weeks. Given the "just-in-time" nature of goods and supplies to Anchorage, such restrictions on commercial dock use could result in shortages of critical goods. Therefore, significant adverse impacts to transportation could result from constraints on military deployment and strategic requirements under the no-action alternative.

3.4.4 4(f)/106 Programmatic Evaluation

Section 4(f) of the Department of Transportation Act of 1966 as amended by 49 USC 303 was adopted to protect the natural beauty of the countryside, public parks and recreation lands, wildlife and waterfowl refuges, and cultural resources. Federally-funded transportation projects requiring use of any of these lands or causing effects to significant cultural resources must demonstrate that no other prudent or reasonable alternatives exist. In addition, the Project must adopt all possible planning measures to minimize harm to such locations. In order for a cultural resource to be granted protection under Section 4(f), it must be considered significant. Significance is determined via the process described in Section 106 of the NHPA of 1966; archaeological site significance is also determined by the value of the site for preservation in place. If the action would not affect such locations, then no 4(f) regulations apply.

Affected Environment

As previously discussed in section 3.4.2, the proposed action would have a beneficial effect on existing parks and recreation lands near the POA. With the extension of the Sea Service Veterans Memorial Park a new interpretive center for public information about Upper Cook Inlet would be added at Ship Creek Point. Also, as part of the potential habitat restoration, the Coastal Trail could be extended and other recreational enhancements would be provided such as boardwalks, viewing areas and observation points.

Section 3.4.7, discusses resources in the affected area and its immediate vicinity. Three archaeological sites have been recorded within the Project area. Two of the sites are no longer evident, or have been removed from the area, and therefore, are not considered to be significant. The third site is a historic native fishing camp thought to be in the vicinity of an old military dump (LF04). MARAD has determined that the site integrity has been altered because of disturbance from the military landfill, subsidence from the 1964 earthquake, and erosion and deposition over time. The Alaska SHPO has concurred with the determination and finding that the Project would not have a significant adverse impact on National Register-eligible resources. With the proposed action, an interpretive center with public displays on Dena'ina history and culture would be built and a Dena'ina cultural study would be conducted.

Environmental Consequences

Proposed Action

<u>The Preferred Alternative/Alternative A</u>

There would be beneficial effects to public parks and recreation lands with implementation of the proposed action, and habitat restoration and enhancement to Ship Creek Point and the Sea Service Veterans Memorial Park. No adverse impacts to 4(f) properties would occur. MARAD has determined that three archaeological sites in the Project area are not significant. Another part of the Ship Creek Point enhancement would include an interpretive center pavilion modeled after a Dena'ina "Nichil" or "big house" with public displays on Dena'ina history and culture. This, combined with a Dena'ina cultural study, would have a beneficial effect on cultural resources.

Alternative B

Impacts are the same as those described for Alternative A.

Alternative C

Impacts are the same as those described for Alternative A.

No Action

POA operations would continue as described in baseline conditions, with changes in operations to accommodate repair, replacement and maintenance activities. No significant adverse impacts would occur to 4(f) resources from this activity.

Extension of the Sea Service Veterans Memorial Park with a new interpretive center for public information about Upper Cook Inlet would not occur, nor would potential habitat restoration and associated recreational enhancements. Thus, the associated recreational and cultural improvements (e.g., a pavilion with interpretive cultural information) would not occur.

3.4.5 Public Services and Utilities

Utilities at the POA include POL pipelines, electrical power, natural gas, potable water supply systems, wastewater and stormwater systems, solid waste collection and disposal, fire protection, police protection, and health services. The stormwater system has been discussed previously under section 3.3.3. Utilities and infrastructure outside the POA would not be affected as a result of implementation of the proposed action or alternatives.

Affected Environment

POL Pipelines

An extensive network of primarily underground pipelines serves the tank farms located at the POA. This network was initiated with the storage of fuel during World War II. The current pipeline network includes lines running from storage facilities to petroleum terminals at the POA. A new jet fuel supply pipeline was constructed in 1998 to provide fuels from ASIG storage tanks near the POA to the Ted Stevens Anchorage International Airport. This line runs underground through the POA mostly within the

Ocean Dock Road and ARRC rights of way (VZM 1999). A new fuel line from POA to Elmendorf AFB was also constructed in 2003.

The POA Valve Yard was rebuilt in 1996, increasing the available capacity and efficiency of the system. The POA Valve Yard is a semi-automated 96 valve manifold system that allows for fuel transfer between POL 1, POL 2, and local liquid-bulk storage facilities. The system includes eight pipe headers, four to each POL dock, capable of supplying 6,000 barrels per hour. Hose derricks with hydraulic tidal compensation winches augment the ship to shore connections (VZM 1999).

Electricity

Electricity to the POA is provided by Municipal Light & Power (ML&P) via overhead power lines along Ocean Dock Road. POA-maintained facilities are supplied by about 19 meter drops throughout the area, an additional 17 meters were billed to POA users, and nine electric meters at the property were not in service at the time of the most recent inventory (R&M 1999). POA billed electricity usage for 2003 was 1,995,995 KWH and ranged monthly from 37,501 KWH in August to 264,819 KWH in January (POA 2004c). Cathodic protection usage ranges from 36,000 to 45,000 KWH per month (Coffman Engineers 2005). Thus, cathodic protection uses the second highest power consumption, over 24 percent, of the total POA usage. The highest usage area was the Port Administration Building at just over 30 percent.

ML&P purchases power from the federally-owned Eklutna Hydro Electric Facility and the state-owned Bradley Lake Hydro Electric Facility. ML&P also owns eight electrical generating facilities, fueled by diesel and oil (AVO 2004).

Natural Gas

Natural gas is provided by Aurora Gas, a private company, via pipelines (POA 2004c). Twelve gas meters exist at the POA: two are billed to the POA; nine are billed to POA tenants; and one is not in service (R&M 1998). Gas usage for the two POA meters during 2003 was 81,395.58 hundred cubic feet, with the majority of use during the winter months.

Potable Water Supply and Wastewater

Potable water and other water are supplied by the MOA to four service locations (POA 2004a). Total water usage for 2003 was 3,822,000 gallons, averaging 318,500 gallons per month. Monthly usage ranged from a February low of 22,000 gallons to an April high of 852,000 gallons. One main sewage treatment line runs through the POA along Tidewater Road and branches to the south and southeast (R&M 2000). Total sewer usage was 326,390 gallons in 2003. Usage ranged from 10,000 to 37,000 gallons per month.

Solid Waste Collection and Disposal

MOA's Solid Waste Services Department serves the POA. Dumpsters are provided and collection service is available five days a week. In the winter, three to four dumpsters are emptied three times a week, and in the summer four to five dumpsters are emptied three or more times per week. Solid Waste Services transports collected waste to the landfill located in Eagle River. Fees are charged per dumpster and POA users are responsible for their facilities. Waste oil and hazardous materials are handled by private contractors in a manner that complies with all existing local, state, and federal regulations and policies. Agents for vessels making POA calls are responsible for arranging solid waste pick up as required (POA 2004a).

Community Services

Fire protection and emergency services are provided by the MOA Fire Department (POA 2004a). In 1999, the POA upgraded their dock-side fire water system and their building sprinkler systems (VZM 1999). The POA currently contracts its security staff under jurisdiction of the U.S. Coast Guard and Homeland Security. The nearest public hospital to the POA that provides emergency medical and ambulance services is the Alaska Regional Hospital, which is approximately four miles from the POA.

Environmental Consequences

The assessment of impacts to utilities is based on comparing existing use and condition to proposed changes in these resources. The analysis compares current utility usage for applicable functions with anticipated future demands to determine potential impacts. Potential impacts to utilities may occur if a change in demand resulting from the proposed action significantly affects the ability of a utility provider to service existing customers. Facilities, such as landfills, may be impacted if they are unable to effectively accommodate additional demands resulting from a proposed activity.

Proposed Action

The Preferred Alternative/Alternative A

Impacts to utilities during construction of the Project are considered to be short-term in nature and would not significantly affect existing utility infrastructure. Implementation of BMPs, such as recycling suitable construction debris, would further reduce existing utility impacts associated with construction operations. Therefore, no significant adverse impacts to utilities would occur during construction of Alternative A.

There are currently no daily limits imposed on the POA for electrical, gas, or water consumption. Implementation of Alternative A would install approximately 8,880 feet of waterfront structures to the existing POA facilities. Operations under Alternative A would accommodate seven ship terminals and two barge berths. Electrical, gas, and water consumption is expected to increase with the larger facility. Electrical needs for Alternative A's cathodic protection system would vary depending on the use of protective coating on either one or both sides of the sheet pile (see Table 2-5). Monthly use would range from approximately 173, 871 KWH with additional protective coating to 497,465 KWH with protective coating on only the seaward side of the sheet pile. Electricity demand under Alternative A would have no significant adverse impact on the ability of the ML&P to effectively serve customers. Electrical use would increase primarily due to larger cranes, refrigerated warehouses, and increased lighting. However, ML&P does not foresee problems with meeting demands. ML&P would install new transformers and the POA would construct a secondary distribution system (substation) to transfer power from the new transformers to the individual recipients (cranes, reefers, lightpoles, cathodic protection system, etc.) (ML&P 2004).

Solid waste generation at the POA is expected to increase with implementation of Alternative A. However, the minor increase in solid waste generation would have no significant adverse impact on the ability of the Solid Waste Service Department to effectively serve customers, nor would the proposed action significantly impact the capacity of the municipal landfill in Eagle River. In addition, given that that throughputs are projected to increase whether the Project occurs or not, this escalation in demand would occur in any case. Therefore, no significant adverse impacts to solid waste management would occur under Alternative A.

Although demand on community services is expected to increase with implementation of Alternative A, the minor increase in demand is not expected to significantly impact existing community resources. As part of the proposed action, the POA would construct a new fire station that would serve Government Hill and the POA.

Alternative B

No significant adverse impacts would occur to public services and utilities under Alternative B. Demand would increase with expanded operations, but it could be accommodated by current service providers. Electrical needs for a cathodic protection system would consist of approximately 458,827 KWH per month with protective coating on the piles. A substation would be constructed at the POA to transfer power from new ML&P transformers to the individual recipients (lights, cranes, reefers, cathodic protections, etc.). As part of the proposed action, the POA would construct a new fire station that would serve Government Hill and the POA.

Alternative C

No significant adverse impacts would occur to public services and utilities for Alternative C. Demand would increase with expanded operations, but it could be accommodated by current service providers. Electrical needs for a cathodic protection system would be the same as for Alternative A. A substation would be constructed at the POA to transfer power from new ML&P transformers to the individual recipients (lights, cranes, reefers, cathodic protection, etc.). As part of the proposed action, the POA would construct a new fire station that would serve Government Hill and the POA.

No Action

The POA would continue to use and generate the same types of public services and utilities as are currently being managed at the POA. Baseline utility conditions would remain unchanged but would not be improved. Normal maintenance operations would continue and no substantial upgrades to utilities systems would be performed. No significant adverse impacts to utilities would occur under the no-action alternative, although neither would efficiencies in consolidating electrical sources.

Impacts to utilities during repair or replacement of steel piles or replacement of the cathodic protection system are considered to be short-term in nature and would not significantly affect existing utility infrastructure. Implementation of BMPs, such as recycling suitable construction debris, would further reduce existing utility impacts associated with repair and maintenance operations. Therefore, no significant adverse impacts to utilities would occur due to repair or replacement of steel piles.

Electrical, gas, and water consumption is expected to gradually increase with projected increasing POA activity, due to increased usage of existing cranes and refrigerated warehouses. However, ML&P would not have a problem meeting demands, and existing transformers at the POA should suffice to handle the increased electrical usage. Therefore, no significant adverse impact to existing utilities systems is expected to occur due to continued POA operations.

Solid waste generation at the POA is expected to increase. However, the minor increase in solid waste generation would have no significant adverse impact on the ability of the Solid Waste Service Department to effectively serve customers nor would the no-action alternative significantly impact the capacity of the municipal landfill in Eagle River. Therefore, no significant adverse impacts to solid waste management would occur. Although demand on community services is expected to increase, the minor increase in demand is not expected to significantly impact existing resources. Therefore, no significant adverse impacts to community resources would occur under the no-action alternative.

3.4.6 Socioeconomics and Environmental Justice

Socioeconomics

The socioeconomics evaluation for this EA focuses on the general features of the local economy that could be affected by the proposed action or alternative. The affected environment for this analysis focuses on the MOA and also includes the Matanuska-Susitna Borough and the State of Alaska. Socioeconomics comprise the basic attributes of population and economic activity within an affected environment and typically encompasses population, employment and income, and industrial/commercial growth.

Affected Environment

Anchorage serves as a gateway to most of Alaska, both for the people who visit or relocate to the state, and for the cargo that supports Alaska's residents and economic activities. More than 40 percent of the Alaskan people reside in the MOA itself. The POA is the major source and destination for all large and heavy cargo into or out of all regions of the state, except for Southeast Alaska. The POA is a critical part of Alaska's economy because it handles 90 percent of the general cargo and serves 80 percent of Alaska's populated areas. It also:

- Stages 100 percent of the exports of refined petroleum products from the state's largest refinery in Fairbanks and facilitates petroleum deliveries from refiners on the Kenai Peninsula and in Valdez, and
- Generates direct and indirect employment opportunities for stevedores, truckers, railroaders, warehousemen, the oil and construction industries, the Finance-Real Estate sector and a growing number of export-related jobs in petroleum products, frozen seafood products, scrap metal, mining, and manufacturing.

The MOA's Comprehensive Economic Development Strategy considered the POA's expansion to be the city's top priority (MOA 2003a). An analysis of POA's economic impact in 1998 (VZM 1999) determined that the POA contributed $15.6 million in personal income annually through employment and an estimated total of $725 million to Alaska's Gross State Product (GSP). Using similar methods and multipliers as used in the Master Plan, an updated analysis in 2004 estimates that the POA contributed $805 million to the GSP in 2003; this is based on capital expenditures of $8.57 million, $66 million in direct and indirect jobs and income, and $730 million from businesses that used POA goods.
Estimates prepared by the Alaska Department of Labor and Workforce Development show that in July 2003 the Alaska population totaled 648,818, 42.5 percent of which resided within the MOA (274,003 people). Additionally, another 10.5 percent of Alaska's population resided in the adjacent Matanuska-Susitna Borough (67,473 people). These two areas combine to form the state's most prominent local economy, known as the Anchorage/Matanuska-Susitna Economic Region, and together they house an estimated 53 percent of the state population.

Moreover, this concentration of people in and around Anchorage has increased in recent years. The state population grew at an average annual rate of 1.3 percent from 1990-2000, slowing to an average of 1.1 percent per year from 2000-2003. Meanwhile, the population of the Anchorage/Matanuska-Susitna Economic Region grew an average of 1.8 percent per year from 1990-2000, and this rate has increased to an average of two percent annually from 2000-2003. The Matanuska-Susitna Borough grew an average of four percent per year during both of those periods.

The state's labor force is concentrated in the MOA area, but unemployment is relatively low in the MOA compared to the rest of the state. During 2003, the average monthly labor force in Alaska totaled 331,675 people, 26,561 of which were unemployed in the average month, resulting in an overall unemployment rate of eight percent (Table 3-24). To the contrary, just 8,470 were unemployed in the MOA out of a total labor force of 147,868 people in 2003, a rate of 5.7 percent. Both of these unemployment rates have generally risen since 1998, when the state unemployment stood at 5.8 percent, and unemployment within the MOA was only 4.1 percent.

Table 3-24 Labor Force and Unemployment, Anchorage and Alaska 1990-2003

	MOA				*State of Alaska*		
Year	*Labor Force*	*Unemployed*	*Rate (%)*		*Labor Force*	*Unemployed*	*Rate (%)*
1990	122,966	6,248	5.1		270,241	19,026	7.0
1991	122,864	8,408	6.8		275,658	23,990	8.7
1992	127,751	9,391	7.4		287,475	26,551	9.2
1993	132,922	7,889	5.9		296,589	22,899	7.7
1994	134,616	7,574	5.6		303,690	23,551	7.8
1995	132,767	6,964	5.2		301,969	22,095	7.3
1996	136,172	7,451	5.5		311,975	24,366	7.8
1997	137,725	7,959	5.8		314,285	24,804	7.9
1998	141,343	5,775	4.1		316,673	18,339	5.8
1999	142,166	6,425	4.5		317,921	20,235	6.4
2000	142,874	6,798	4.8		318,828	21,373	6.7
2001	144,966	6,308	4.4		321,294	20,627	6.4
2002	145,082	7,918	5.5		323,703	25,032	7.7
2003	147,868	8,470	5.7		331,675	26,561	8.0

Source: Alaska Department of Labor, online 3/17/04, http://almis.labor.state.ak.us/

In 2003, there were an estimated 299,517 total non-farm wage and salary jobs in Alaska (Table 3-25), and 159,983 (53.4 percent) were in the Anchorage/Matanuska-Susitna Economic Region. In fact, 144,642 of these jobs (48.3 percent) were in the MOA (Table 3-26). Whereas the state's employment is becoming more concentrated in the economic region, having risen to 53.4 percent in 2003 from 49.5 percent in 1992, the jobs are decentralizing within this region. In particular, Matanuska-Susitna Borough's percentage of regional jobs grew from 6.1 percent in 1990 to 9.6 percent in 2003, as this borough's non-farm wage and salary employment more than doubled from 7,200 jobs in 1990 to 15,341 jobs in 2003.

Table 3-25 Total Nonfarm Wage and Salary Employment (jobs), Anchorage, Matanuska-Susitna Borough and Alaska 1990-2003

	Anchorage/Matanuska-Susitna Economic Region			***State of Alaska***
Year	*MOA*	*Matanuska-Susitna Borough*	*Region Total*	
1990	111,400	7,200	118,600	237,800
1991	112,500	8,050	120,550	242,800
1992	113,800	8,500	122,300	247,200
1993	117,500	8,900	126,400	252,900
1994	120,100	9,950	130,050	259,300
1995	120,500	10,200	130,700	262,000
1996	121,100	10,550	131,650	263,600
1997	123,900	11,450	135,350	268,700
1998	128,700	12,050	140,750	275,000
1999	131,100	12,350	143,450	277,800
2000	134,400	12,900	147,300	283,900
2001	137,900	13,400	151,300	290,000
2002	142,000	14,250	156,250	295,750
2003	144,642	15,341	159,983	299,517

Source: Alaska Department of Labor, online 3/17/04, http://almis.labor.state.ak.us/

Most of these jobs are in industries that provide services – including trade, transportation and utilities, financial activities, business and personal services, and government. In the state overall, 87.5 percent of all wage and salary employment was in these service-providing industries. Within the MOA, this percentage was 91.2, with an estimated 131,967 service-providing wage and salary jobs in 2003. Jobs in some industries are especially clustered in the MOA, notably 74.7 percent of the state's wholesale trade employment, 72.6 of Alaska's professional and business service jobs, and 64.4 percent of all telecommunications jobs. MOA area jobs generally pay more than jobs elsewhere in Alaska. In 2002, an estimated $4.1 billion were earned from wages by private enterprises in the Anchorage/Matanuska-Susitna Economic Region. This amount was 56.7 percent of the total wages earned from private enterprises in the state that year ($7.25 billion) (Table 3-27).

Table 3-26 Nonfarm Wage and Salary Employment (jobs) by Sector, Anchorage and Alaska 2003		
Industrial Sector	*State of Alaska*	*MOA*
Total Nonfarm Wage & Salary	**299,517**	**144,642**
Goods-Producing	**37,417**	**12,692**
Natural Resources & Mining	10,058	2,500
Logging	533	no data
Mining	9,717	2,408
Oil & Gas Extraction	8,042	2,250
Construction	16,242	8,283
Manufacturing	11,142	1,900
Wood Products Manufacturing	300	no data
Seafood Processing	7,292	no data
Service-Providing	**262,100**	**131,967**
Trade, Transportation, Utilities	61,050	32,708
Wholesale Trade	6,167	4,608
Retail Trade	34,200	17,525
Food & Beverage Stores	5,750	2,392
General Merchandise Stores	9,025	4,250
Trans/Warehouse/Utilities	20,700	10,558
Air Transportation	6,158	3,333
Truck Transportation	2,750	no data
Information	7,050	4,658
Telecommunications	4,117	2,650
Financial Activities	13,875	8,450
Professional & Business Svcs	23,758	17,242
Educational & Health Services	31,975	17,242
Health Care/Social Assistance	29,825	15,783
Ambulatory Health Care	12,842	6,800
Hospitals	7,842	4,783
Leisure & Hospitality	29,650	15,017
Accommodation	7,558	3,133
Food Svcs & Drinking Places	18,025	10,133
Other Services	12,575	6,142
Government	82,150	30,525
Federal Government	17,042	9,700
State Government	24,275	9,650
Local Government	40,858	11,183
Tribal Government	3,525	300

Source: Alaska Department of Labor 2004

Table 3-27 Total Wages Earned from Private Enterprises (in Millions of Dollars) Anchorage Municipality, Matanuska-Susitna Borough and Alaska 2000-2002

	2000	*2001*	*2002*
MOA	$3,553	$3,836	$3,853
Matanuska-Susitna Borough	$232	$251	$255
Anchorage/Matanuska-Susitna Economic Region	$3,785	$4,087	$4,108
State of Alaska	$6,945	$7,351	$7,247

Source: Alaska Department of Labor, online 3/17/04, http://almis.labor.state.ak.us/
Note: 2002 values are estimated based on data for first two quarters.

Planners for the MOA, in conjunction with the Institute for Social and Economic Research at the University of Alaska-Anchorage, have adopted projections of population and employment up to the year 2020. In 2020, these planners expect totals of 365,700 people and 172,900 jobs in Anchorage, and another 89,800 people and 18,300 jobs in the Matanuska-Susitna Borough.

Environmental Consequences

Most of the following economic effects were determined by applying MARAD's Port Economic Kit, an input-output analysis framework that is especially suitable for assessing the economic effects of port activities (A. Strauss Weder and CUPR 2000). The kit contains multipliers that apply specifically to the economic structure of the State of Alaska, so the effects that are presented below apply to Alaska businesses – any economic effects accruing to businesses outside Alaska are counted as leakages by this model.

Although the entire State of Alaska is influenced, almost all of the effects would be concentrated in the MOA and, to a lesser extent, the Matanuska-Susitna Borough. This concentration is due to both POA proximity and to the Anchorage/Matanuska-Susitna Economic Region's dominant role in Alaska's economy.

Construction spending was segmented into specific industrial sectors for input to the model. The spending on steel material and cranes was counted as an immediate leakage from the regional economy, assuming these materials and equipment would be produced outside Alaska. All other construction spending was allocated to regional industries. The model adjusts this regional spending as necessary to correspond with the region's industrial structure.

For operations, the projected cargo and passenger levels were input directly to the model, which translated these POA activities to local expenditures by key industrial sectors. To assess the effects of the no-action alternative, sustainable capacities without the Project were used to cap the projections of cargo and cruise passengers.

Direct effects owing to construction spending (annually during the approximately seven-year construction phase) and POA operations (annually through 2025) would result in indirect and induced effects that are the principal results of the model. Indirect effects are caused by the second and later rounds of spending by regional firms to support the increased production. Induced effects result from the regional spending of earnings by employees and proprietors of these regional firms. The total economic effects reported below, are the sum of estimated direct, indirect, and induced effects.

Total effects are presented in terms of four key economic indicators: 1) Output – represents changes in sales by Alaskan firms, less the cost of goods sold; 2) Employment – measures the number of jobs produced, and includes a mixture of full- and part-time jobs corresponding to regional norms; 3) Income – includes wages, salaries, and proprietors' income; and 4) GSP – analogous to a nation's Gross Domestic Product, and also known as value added, essentially measures the difference between the total value of regional production and the value of goods and services purchased by the producing firms.

More analytical details and results from the socioeconomic analysis are presented in Appendix G. The appendix also breaks down the total effects by sector and year for construction and operations. For the purposes of this analysis, reasonable assumptions had to be made regarding the potential phasing of annual construction expenditures throughout the construction period. This was necessary because actual construction phasing is a product of the final project design process, permitting actions, and other outside influences. Using the general phasing strategy (Figure 2-15) and the construction sequencing guidelines described in section 2.2.1, a team of experienced port engineers developed two likely scenarios for construction phasing and associated annual expenditures. The two scenarios, Phasing Options 1 and 2, differ primarily in the order in which construction would occur within the six defined construction areas. Phasing Option 1 assumes that construction efforts would focus on Areas 5 and 6 first followed by Areas 1, 4, 2, and 3, respectively. Phasing Option 2 assumes that the focus of construction after developing Areas 5 and 6 would be on Areas 1, 2, 3, and 4 in that order. As the results below indicate, this difference in phasing affects the annual distribution of economic impacts, but does not appreciably influence the total project effects. Although it is generally anticipated that construction will begin in 2005, the model analysis is not calendar-dependent, so the results below are presented in terms of Year 1, Year 2, etc., of the total seven-year construction period.

Proposed Action

Construction spending would result in direct beneficial economic effects to the construction industry itself, as well as other industrial sectors in the region. Engineering, architectural, and other services, and financial and insurance firms receive sizable portions of the direct spending. As further examples, mining firms would provide fill and paving materials, petroleum producers would provide fuel, stone/clay/glass and fabricated metal producers would provide building materials, wholesale outlets would help acquire these materials, and trucking firms would help deliver them.

POA operations exert direct effects, but they also directly increase business for related industries. Trucking and warehousing, petroleum producers, wholesale trade, and others gear up for increased cargo operations. Cruise operations lead directly to increased sales in personal services, eating and drinking, amusement and recreation, food production, and many other regional industries.

The Preferred Alternative/Alternative A

Regional expenditures for the sheet pile design would lead to total output effects in excess of $530 million over the seven-year construction period beginning in 2005. With Phasing Option 1, the peak impact year would be Year 4, which would account for more than $106 million of the total Project output, and nearly 1,400 jobs (Table 3-28). Income and GSP would also peak in Year 4 under this phasing option.

Table 3-28 Total (Direct and Indirect/Induced) Economic Effects of Expenditures Alternative A: Construction by Sheet Pile Design - Phasing Option 1

Year	*Output ($000)*	*Employment (jobs)*	*Income ($000)*	*GSP ($000)*
1	$83,682	1,029	$35,852	$54,760
2	$75,807	953	$32,737	$49,633
3	$94,291	1,119	$38,563	$60,100
4	$106,818	1,387	$48,589	$71,633
5	$87,268	1,107	$39,235	$58,460
6	$78,138	976	$35,433	$52,600
7	$8,609	99	$3,562	$5,580
Total	**$534,613**	**6,670**	**$233,971**	**$352,766**

Source: results of MARAD Port Economic Kit, based on detailed construction spending assumed in Alaska.

Under Phasing Option 2, the peak impact year would be Year 3 (Table 3-29). The output impact of this phasing option is projected at more than $106 million and the employment impact at nearly 1,400 jobs that year.

Table 3-29 Total (Direct and Indirect/Induced) Economic Effects of Expenditures Alternative A: Construction by Sheet Pile Design - Phasing Option 2

Year	*Output ($000)*	*Employment (jobs)*	*Income ($000)*	*GSP ($000)*
1	$83,682	1,029	$35,852	$54,760
2	$75,807	953	$32,737	$49,633
3	$106,818	1,387	$48,589	$71,633
4	$78,138	976	$35,433	$52,600
5	$87,268	1,107	$39,235	$58,460
6	$94,291	1,119	$38,563	$60,100
7	$8,609	99	$3,562	$5,580
Total	**$534,613**	**6,670**	**$233,971**	**$352,766**

Source: results of MARAD Port Economic Kit, based on detailed construction spending assumed in Alaska.

With the Project completed, POA operations are projected to increase annually in response to expected growth in regional population and general economic activity unconstrained by the capacity and functional obsolescence issues associated with the existing operation. By 2025, the total output generated by cargo and cruise passenger operations at the POA would exceed $919 million a year, and would account for more than 8,400 jobs (Table 3-30). This economic activity would produce more than $515 million of GSP and $272 million of income that year alone. Transportation and Public Utilities would earn the bulk of these total effects.

Table 3-30 Total (Direct and Indirect/Induced) Economic Effects of POA Operations With the Project in the Year 2025

Industrial Sector	*Output ($000)*	*Employment (jobs)*	*Income ($000)*	*GSP ($000)*
Agriculture	$203	1	$29	$131
Agricultural Services, Forestry, and Fishing	$969	37	$589	$921
Mining	$47,650	131	$8,554	$32,613
Construction	$46,686	166	$22,991	$30,998
Manufacturing	$133,840	407	$14,985	$76,350
Transportation and Public Utilities	$437,189	3,856	$130,308	$201,596
Wholesale	$30,682	333	$11,891	$22,410
Retail Trade	$47,162	906	$16,325	$27,069
Finance, Insurance, and Real Estate	$83,337	1,045	$27,527	$62,671
Services	$84,295	1,501	$35,985	$56,945
Government	$7,051	41	$3,471	$3,432
TOTAL	**$919,062**	**8,424**	**$272,655**	**$515,136**

Source: results of MARAD Port Economic Kit (Alaska region), based on cargo and cruise passenger projections (Table 1-2).

Alternative B

Construction costs, and thus regional expenditures, would be greater for the pile-supported dock design alternative. Over the seven-year construction period, these expenditures would lead to nearly $675 million in total output effects. With Phasing Option 1, the peak impact year would be Year 4, with nearly $128 million of the total output, and more than 1,600 jobs (Table 3-31). Income and GSP would also peak in Year 4 under this phasing option. It should be noted that construction activities would support more than 1,200 jobs each year from Year 1 through Year 6 under this alternative. The peak year under Phasing Option 2 would be Year 6, with the same amount of total output and jobs as phasing Option 1, year 4 (Table 3-32).

Table 3-31 Total (Direct and Indirect/Induced) Economic Effects of Expenditures Alternative B: Construction by Pile-supported Dock Design - Phasing Option 1				
Year	*Output ($000)*	*Employment (jobs)*	*Income ($000)*	*GSP ($000)*
1	$108,450	1,299	$46,433	$71,266
2	$106,795	1,297	$46,091	$70,347
3	$114,122	1,336	$47,028	$73,306
4	$127,864	1,614	$57,524	$85,616
5	$108,268	1,334	$48,149	$72,411
6	$99,623	1,211	$44,608	$66,913
7	$8,609	99	$3,562	$5,580
Total	**$673,731**	**8,190**	**$293,395**	**$445,439**

Source: results of MARAD Port Economic Kit, based on detailed construction spending assumed in Alaska.

Table 3-32 Total (Direct and Indirect/Induced) Economic Effects of Expenditures Alternative B: Construction by Pile-supported Dock Design - Phasing Option 2				
Year	*Output ($000)*	*Employment (jobs)*	*Income ($000)*	*GSP ($000)*
1	$108,450	1,299	$46,433	$71,266
2	$106,795	1,297	$46,091	$70,347
3	$99,623	1,211	$44,608	$66,913
4	$114,122	1,336	$47,028	$73,306
5	$108,268	1,334	$48,149	$72,411
6	$127,864	1,614	$57,524	$85,616
7	$8,609	99	$3,562	$5,580
Total	**$673,731**	**8,190**	**$293,395**	**$445,439**

Source: results of MARAD Port Economic Kit, based on detailed construction spending assumed in Alaska.

Alternative C

Under Phasing Option 1, the combined design alternative would result in more than $560 million in total output effects. The peak year impacts of combined construction would be greater, however, than any annual impact associated with the other two alternatives. In Year 4, total output effects would be nearly $140 million, and the Project would account for more than 1,750 jobs (Table 3-33). The peak year for Phasing Option 2 is Year 6, also with nearly $140 million in total output and more than 1,750 jobs (Table 3-34).

Table 3-33 Total (Direct and Indirect/Induced) Economic Effects of Expenditures Alternative C: Construction by Combined Design - Phasing Option 1				
Year	*Output ($000)*	*Employment (jobs)*	*Income ($000)*	*GSP ($000)*
1	$83,682	1,029	$35,852	$54,760
2	$75,807	953	$32,737	$49,633
3	$94,291	1,119	$38,563	$60,100
4	$138,251	1,757	$62,604	$92,950
5	$87,268	1,107	$39,235	$58,460
6	$78,016	975	$35,384	$52,524
7	$8,609	99	$3,562	$5,580
Total	**$565,924**	**7,039**	**$247,937**	**$374,007**

Source: results of MARAD Port Economic Kit, based on detailed construction spending assumed in Alaska.

Table 3-34 Total (Direct and Indirect/Induced) Economic Effects of Expenditures Alternative C: Construction by Combined Design - Phasing Option 2				
Year	*Output ($000)*	*Employment (jobs)*	*Income ($000)*	*GSP ($000)*
1	$83,682	1,029	$35,852	$54,760
2	$75,807	953	$32,737	$49,633
3	$78,016	975	$35,384	$52,524
4	$94,291	1,119	$38,563	$60,100
5	$87,268	1,107	$39,235	$58,460
6	$138,251	1,757	$62,604	$92,950
7	$8,609	99	$3,562	$5,580
Total	**$565,924**	**7,039**	**$247,937**	**$374,007**

Source: results of MARAD Port Economic Kit, based on detailed construction spending assumed in Alaska.

No Action

If the Project did not occur, POA operations would be stifled; sustainable capacities for containerized cargo, autos, dry-bulk cargo, and cruise passengers all have been assessed at less than the future projections of demand. The Project is designed to remedy these shortfalls. Therefore, without redevelopment, the positive impacts reported for POA operations in the year 2025 above could not occur—the potential for economic development would recede into a deferred future. By considering the sustainable capacities for the constrained cargo categories and cruise passengers, the total economic output associated with POA operations would be less than $400 million in 2025, and related employment would total less than 3,700 jobs (Table 3-35). These amounts represent a potentially $522 million less in output, 4,700 fewer jobs, $154 million less in income, and $294 million less of GSP that year. Moreover, these losses would be expected to continue to increase in subsequent years.

Table 3-35 Total (Direct and Indirect/Induced) Economic Effects of POA Operations With and without the Project and Impact of No Action, in 2025				
	Output ($000)	***Employment (jobs)***	***Income ($000)***	***GSP ($000)***
With Project	$919,062	8,424	$272,655	$515,136
Without Project	$396,351	3,698	$117,993	$220,553
Loss from Operations: No Action	**$522,712**	**4,726**	**$154,662**	**$294,583**

Source: results of MARAD Port Economic Kit (Alaska region), based on cargo and cruise passenger projections and sustainable capacities (Table 1-2).

Further impacts of the no-action alternative might be felt throughout the regional economy in addition to these direct, indirect, and induced effects of POA operations. The reason is that virtually all of the businesses, and approximately 90 percent of Alaska's population, depend upon the POA to deliver goods to and from the region. To the extent that POA operations are stifled by capacity constraints, these firms and people could suffer delivery delays, loss of jobs, and loss of revenue.

In the near-term, construction expenditures associated with the retrofitting of the existing POA structure under the no-action alternative would have a positive impact on the local economy. Project engineers have estimated that all such construction would take approximately eight years to complete. Based on the number of new piles required and the nature of the constrained pile-replacement strategies from above the existing dock, total construction expenditures would equal approximately 30 percent of the costs to implement Alternative A of the proposed action. Construction expenditures would potentially generate $160 million in total output and about 2,000 jobs. Increases in income and GSP associated with these expenditures would be approximately $70 million and $106 million, respectively, over the course of the eight-year construction period. These beneficial economic impacts from construction would partially offset the expected long-term economic losses from reduced operational capacity at the POA through 2025. As shown in Table 3-36, the net losses in economic activity associated with the no-action alternative would still be considerable.

Table 3-36 Total Estimated (Direct and Indirect/Induced) Economic Impact of the No-Action Alternative (Through 2025)				
	Output ($000)	***Employment (jobs)***	***Income ($000)***	***GSP ($000)***
Impact on Operations	$-522,712	-4,726	$-154,663	$-294,584
Offset from Construction	$160,383	2,001	$70,191	$105,829
Net Impact from No Action	**$-362,329**	**-2,725**	**$-84,472**	**$-188,755**

Source: Operations Impact results from MARAD Port Economic Kit (Alaska region), based on cargo and cruise passenger projections and sustainable capacities (Table 1-2). Construction impacts generated by analysis of proportional share of construction expenditures under the no-action alternative relative to expenditures and resulting impacts from proposed action Alternative A (see Table 3-28).

Environmental Justice

EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, issued in 1994, directs federal agencies to take the appropriate and necessary steps to identify and address disproportionately high and adverse effects of federal projects on the health or environment of minority and low-income populations to the greatest extent practicable and permitted by law.

In 2000, the MOA population was predominantly Caucasian (72 percent) with Native American (7 percent), African-American (6 percent), Asian/Pacific Islander (7 percent), Hispanic/Latino (6 percent) and other races (3 percent) comprising the remainder of the population reporting only one race. The ethnic composition found in the MOA closely resembles that found across the U.S.

The POA is an industrial area bordered by Elmendorf AFB, Knik Arm, and the ARRC industrial areas. The nearest residential areas are Government Hill approximately 0.25 miles to the southeast and the Cherry Hill housing area (Elmendorf AFB) 0.20 miles to the east. To characterize the demographics of the potentially affected area surrounding the POA, certain U.S. Census block data were used to estimate nearby populations (Figure 3-40). Population, race, and income data are provided in Table 3-37, which include comparable race only, income data for the MOA and Alaska. These data are for individuals who reported one race alone combined with those who reported more than one race per person. The ethnicity and poverty status in the census block groups and tracts around the Project area were compared to data for the MOA population to determine if any minority or low-income communities exist in the area that could be disproportionately affected by the proposed action.

Table 3-37 Key Demographic and Economic Data

	State of Alaska[2]	*MOA*[2]	*Block Group 04001*	*Block Group 05001*	*Block Group 05002*	*Block Group 06001*	*Block Group 11001*	*Block Group 11002*
Race								
Caucasian	74%	77.2%	77.2%	72.7%	46.5%	36.6%	65.5%	52.5%
African American	4.3%	7.2%	12.3%	6.2%	8.0%	8.8%	3.8%	11.8%
Alaskan Native and American Indian	19%	10.4%	0.7%	9.3%	9.0%	40.1%	11.1%	23.6%
Asian	5.2%	7.1%	2.8%	2.4%	19.6%	1.4%	6.1%	1.7%
Other Races	3.3%	4.7%	7.0%	9.3%	17.0%	13.0%	13.4%	10.4%
Total	**626,932**	**260,283**	**6,626**	**792**	**1,156**	**284**	**261**	**1,197**
Economic Data								
Average per capita income (1999)	$22,660	$25,287	$13,194	$24,800	$16,161	$12,595	$41,186	$16,292
Civilian labor force unemployed in census tract[1]	9.0%	6.8%	4.3%	4.6%	4.6%	16.6%	35.3%	35.3%
Individuals below poverty level	9.4%	7.3%	3.5%	4.8%	12.2%	48.5%	11.5%	38.1%

[1] *Census tracts are the smallest census unit for which unemployment information is available in the MOA.*
Source: U.S. Bureau of Census, 2000 American Fact Finder
[2] *Numbers reflect individuals reporting two or more races*

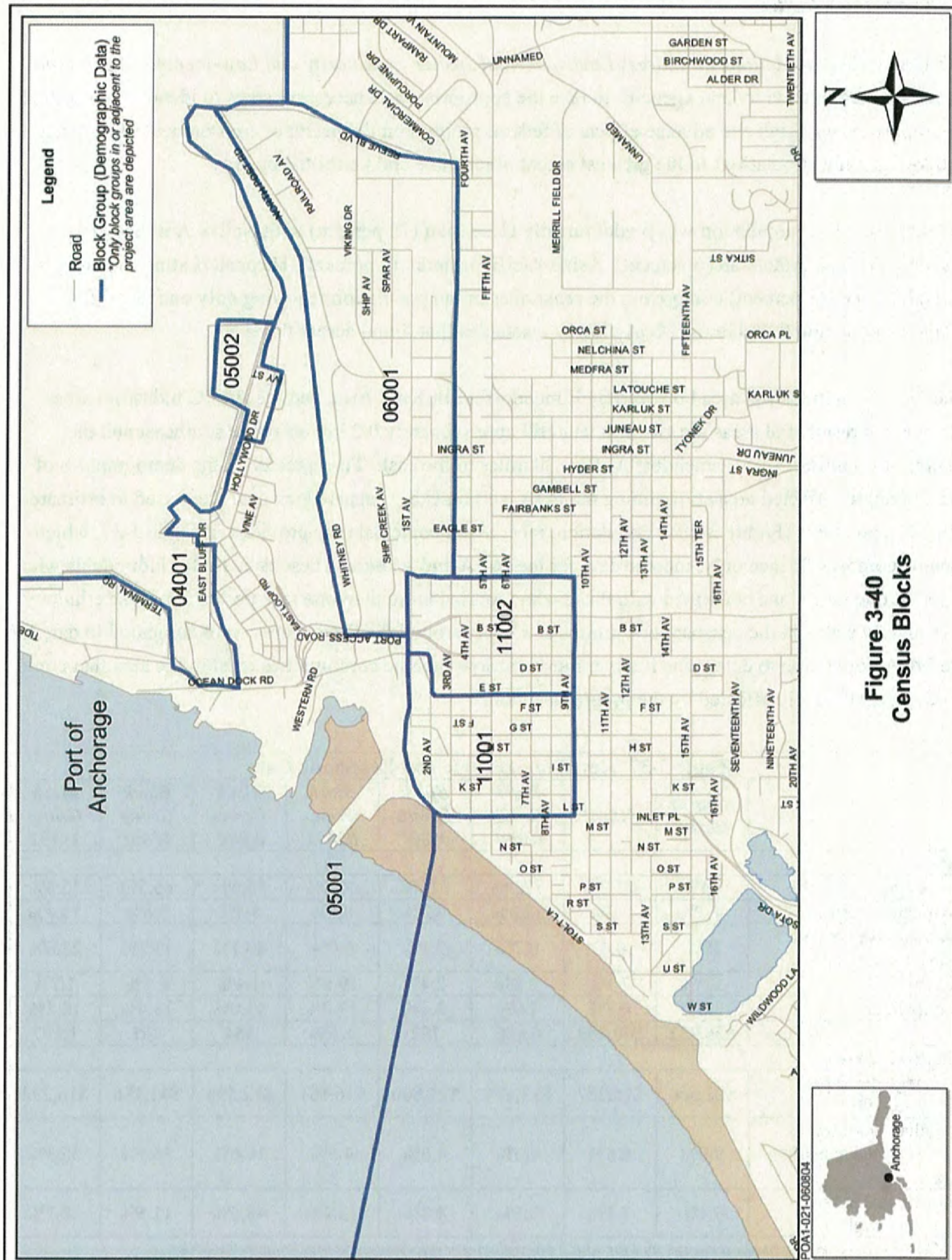

Figure 3-40
Census Blocks

Based on these data, all but one block group (04001) have low-income or minority populations, or both disproportionately greater than those of the State of Alaska or the NDA in total. The block group on Elmendorf AFB nearest to the POA, 04001, has a lower percentage of minority populations than the State of Alaska and a comparable number to the MOA. The percentage of individuals below the poverty level are well below both the state and MOA average in this block group as well as in block group 05001, which covers the POA and extends north, south and southeast and is approximately two miles long by five miles wide. Block group 05001 has a slightly lower percentage of Caucasians, but minority populations are consistent with the state and MOA levels. Of the remaining block groups, one (06001) has 48.5 percent of individuals living below the poverty level and a 63.4 percent minority population. The POA is geographically separated below the bluffs on which residential areas lie. Residences are not adjacent to the Project area, but are segregated industrial land uses, and are at least 0.25 to 2 miles distant.

Environmental Consequences

Proposed Action

<u>The Preferred Alternative/Alternative A</u>

Because of several factors, the potential environmental justice populations were determined to reside outside the Project area. There are no residential structures within the Project limits, the Project and surrounding areas are mainly industrial, and the block groups extend as far as five miles outside the Project. Expansion of the POA would result in improved conditions with faster, more efficient transport of goods, and added revenue for the local economy. There would be no disproportionately high or adverse effects to minority or low-income populations under Alternative A.

<u>Alternative B</u>

No disproportionately high or adverse effects to minority or low-income populations would occur under Alternative B.

<u>Alternative C</u>

No disproportionately high or adverse effects to minority or low-income populations would occur under Alternative C.

No Action

Under the no-action alternative, the proposed Project would not occur but some construction would need to occur to repair and maintain the existing POA infrastructure. There would be a net loss of revenues and employment that could affect all segments of the society, but no disproportionately high or adverse effects to minority or low-income populations would occur.

3.4.7 Cultural Resources

Cultural resources consist of prehistoric and historic districts, sites, structures, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources can be divided into three major categories: archaeological resources (prehistoric and historic), architectural resources, and traditional cultural properties.

Archaeological resources are locations where human activity measurably altered the earth or left deposits of physical remains (e.g. stone flakes, arrowheads, or bottles). Archaeological resources may be either prehistoric or historic, and can include campsites, roads, fences, trails, dumps, battlegrounds, mines, and a variety of other features.

Architectural resources include standing buildings, dams, canals, bridges, and other structures of historic or aesthetic significance.

Traditional cultural properties can include archaeological resources, buildings, neighborhoods, prominent topographic features, habitats, plants, animals, or traditional hunting and gathering areas that Native Americans and other groups consider essential for the continuance of traditional cultures.
Under the NHPA, as amended, only significant historic cultural resources, known or unknown, warrant consideration with regard to adverse impacts from a proposed action. Archaeological and architectural resources generally must be more than 50 years old to be considered for protection under the NHPA. However, more recent structures associated with significant national events may warrant protection if they are "exceptionally significant." To be considered significant, archaeological or architectural resources must meet one or more criteria as defined in 36 CFR 60.4 for inclusion in the National Register. These criteria include association with an important event, association with a famous person, embodiment of the characteristics of an important period in history, or the ability to contribute to scientific research. Resources must also possess integrity (i.e., its important historic features must be present and recognizable).

Traditional cultural properties can be evaluated for National Register eligibility as well. However, even if a traditional resource is determined to be not eligible for the National Register, it may still be significant to a particular community or Native organization and protected under other laws and regulations discussed below. The significance of a traditional cultural property is usually determined by consulting with the appropriate group.

Several other federal laws and regulations have been established to manage cultural resources, including the Archaeological and Historic Resources Preservation Act (1974), the Archaeological Resources Protection Act (1979), and the Native American Graves and Repatriation Act (1990). In addition, coordination with federally recognized Native American organizations must occur in accordance with the American Indian Religious Freedom Act (1978); EO 13007, *Sacred Sites*; and EO 13175, *Consultation and Coordination with Indian Tribal Governments,* which emphasizes the importance of respecting and consulting with tribal governments on a government-to-government basis.

The APE for cultural resources considers both the current area of the POA, the tidal areas to be filled, and areas adjacent to the POA that could be affected by changes in setting relating to increases in noise or visual intrusions (Figure 3-41).

Existing Conditions

Several archaeological and architectural surveys have been conducted in the vicinity of the Project area. These include an archaeological survey of Elmendorf AFB, a survey of architectural resources on Ship Creek, a historic homestead study on Elmendorf AFB, and an overview of Dena'ina land uses on and near Elmendorf AFB. Ethnographic studies in the general vicinity include *The Once and Future Village of Ikluat/Eklutna* (Chandonnet 1979), *Tanaina Plantlore Dena'ina K'et'una* (Kari 1987), *Shem Pete's Alaska: The Territory of the Upper Cook Inlet* (Kari and Fall 1987), and *And the Land Provides* (Morgan 1974).

Records at the Alaska Heritage Resources Survey, Alaska Office of History and Archaeology (AOHA) were also examined in order to determine if any cultural resources had been previously documented within the Project area boundary or the vicinity (within 0.5 miles). The records search documented three archaeological sites within or immediately adjacent to the POA and six architectural resources within 0.5 miles of the POA.

Archaeological Resources

Three sites have been recorded within the POA or adjacent to the Project area. Tak'at, a native fishing camp used in the early part of the twentieth century, has tentatively been recorded on the beach next to the northern end of the proposed Project area on Elmendorf AFB. The AOHA assigned Tak'at site number ANC-01337. The general location of the site was examined for possible artifacts and local inhabitants were interviewed, showing the researchers where the camp was located (AOHA 2003a). The projected location has been subsumed into a landfill (LF04) by the military for many years, making the exact location of the camp difficult to determine through archaeological excavations. Archaeological testing at the identified site in 1996 indicated that domestic materials from the 1940s were mixed with military debris and debris from the 1964 earthquake. AOHA determined at that time that the site did not contain enough archaeological information to justify National Register-eligibility (McMahan and Holmes 1996). The SHPO formalized this conclusion on November 1, 2004, and determined that the site is not National Register-eligible.

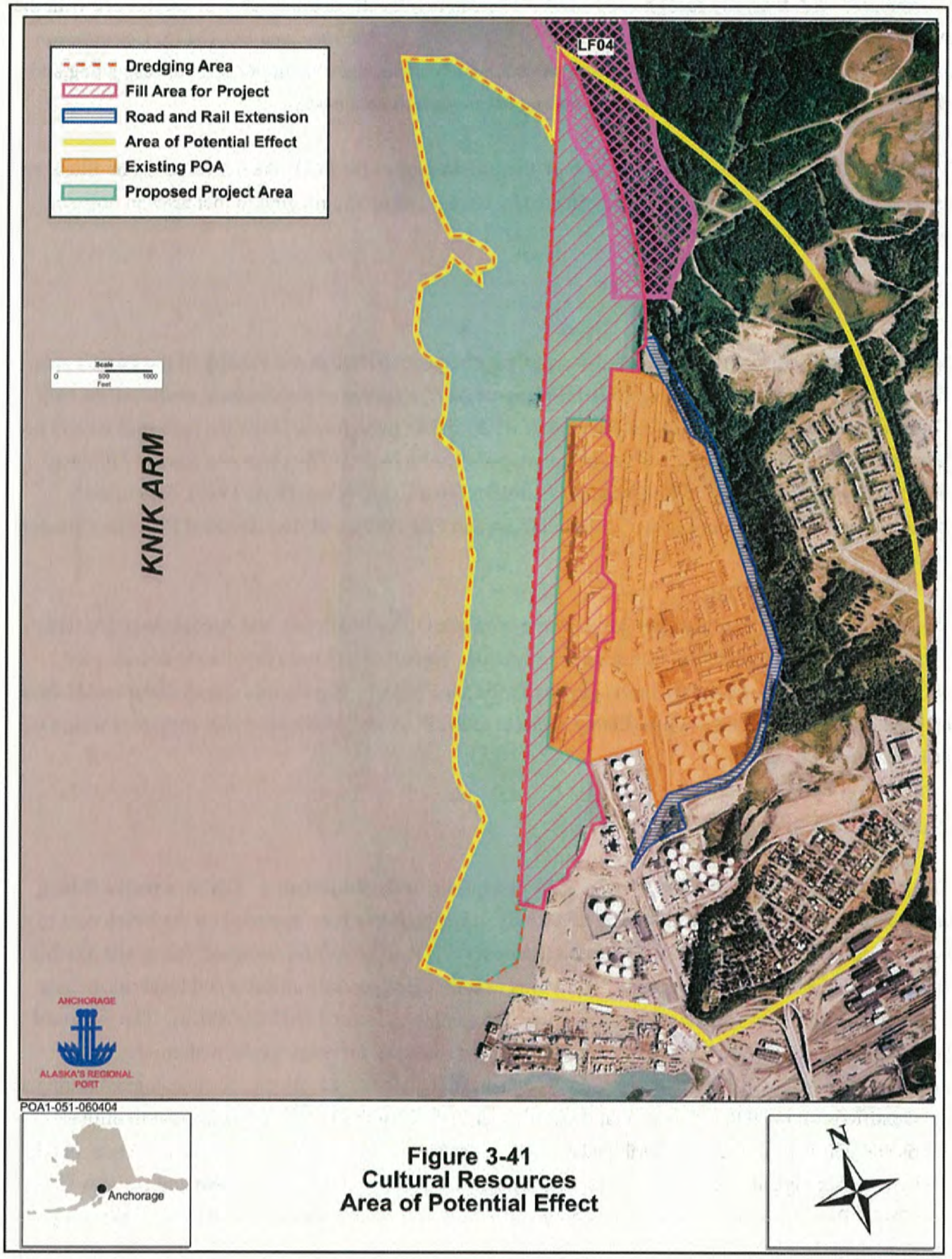

Figure 3-41
Cultural Resources
Area of Potential Effect

The second site, designated as ANC-00760, contains the foundation of a warehouse that was owned by G.W. Palmer, a trading post operator at the settlement of Knik near the turn of the twentieth century. It is also located on Elmendorf AFB, along the shoreline approximately 1.5 miles north of the mouth of Ship Creek and just east of the Project area boundary. Archaeologists attempted to relocate this site in the late 1980s, but could not find it, suggesting that the site had most likely been lost due to erosion or the Good Friday Earthquake of 1964 (AOHA 1992). Based on this fact and other data, the SHPO determined the site is not National Register-eligible.

The site designated as ANC-01302 was the terminal end to the Whittier-to-Anchorage military pipeline, which was used to move fuel from tankers at the Whittier terminal to Elmendorf AFB, a distance of approximately 50 miles (AOHA 2003b). The terminal end was originally located on POA property, but was removed in 1996. The U.S. Army is currently performing a search for the closeout documents that verify the removal of the terminus (USARAK 2004a). Nevertheless, the SHPO determined the site is not National Register-eligible on November 1, 2004.

Architectural Resources

Six architectural resources in the Government Hill neighborhood are located within 0.25 miles of the Project area. Government Hill was originally constructed to house government employees beginning around 1915 (CRC and HDR 2003).

The first of the six sites is ANC-00046, or Alaska Engineering Commission (AEC) Cottage #7, and is located at 349 West Harvard Avenue. This cottage was built in 1915 as one of 13 residences to house government employees. It was originally the residence of John H. (Jack) and Nellie Brown. The cottage has undergone extensive remodeling, but is still similar to the original style, which was a 23-foot by 24-foot, one-and-a-half story, wood frame structure with three main rooms, a kitchen, bathroom, and veranda (AOHA 1974a). Although this cottage has not been listed on the National Register, two of the other 13 AEC cottages (AEC Cottage #23 and #25) were placed on the National Register in the 1990s (NRIS 2004). Both of the listed cottages are located south of the APE, near Ship Creek.

Site ANC-00047, located at 300.5 East Cook Avenue, is the site of a Quonset hut constructed by the federal government in the World War II era (circa 1943) along with several others to alleviate housing shortages during the construction of the original Fort Richardson military installation. This site is not eligible to the National Register, as the hut was demolished sometime between 1974 and 1987. In 1987 an examination of this site revealed that a large new residence had been constructed where the hut once stood (AOHA 1974b).

Site ANC-00048, located at 786 Delaney Street on the southwest tip of Government Hill at Brown's Point, consists of a Civil Works residential dwelling. Built in 1941 by the USACE, this Cape Cod style cottage was one of two nearly identical wood frame structures built during the construction of the original Fort Richardson as residences for the Area Engineer, B.B. Talley (later a Brigadier General), and the Resident Engineer, Captain Craig Smyser. The second cottage (site number ANC-01205), is located at 800 Delaney Street. The design of these cottages was similar to military houses at Mud Mountain Dam near Fort Lewis, Washington and they were alternately called USACE Houses or Brown's Point Cottages (AOHA 1974c, d). Both of these structures and Brown's Point Park, located just west of the dwellings, have been nominated to the National Register under the Brown's Point Historic District nomination. According to AOHA personnel, this nomination is currently with the Keeper of the National Register who will make the final decision regarding the eligibility of the proposed Brown's Point Historic District (OAHA 2004).

Site ANC-00049 consists of more than ten two-story "neo-colonial" wood frame duplexes built in the mid-1940s to serve as two family units for ARRC personnel. By 1987, some of these structures had undergone renovation, but they were largely unchanged in outward appearance. They are located on Manor Avenue (house numbers 209 through 233 and 319 through 347) and on Delaney Street (house numbers 901 through 903) (AOHA 1974e).

The final site ANC-00306 is a historic structure located at 132 Manor Avenue, on the southeast corner of the intersection of Manor Avenue and Boyd Street on Government Hill. This structure is a 28-foot by 28-foot, wood frame building with board and batten siding and a hip roof crowned by a central cupola supporting a mast. It was built by the AEC in 1917 as a wireless station, and contained two operation rooms, a generating room, and living quarters for two men. Two additions have been added to this structure, one in 1948 and one in 1964. The station was phased out of service between 1940 and 1970. This structure is considered to be historically significant by the Alaska SHPO, as it housed a vital early communication system for Anchorage and the State of Alaska (AOHA 1983).

Traditional Cultural Properties

A number of studies have been conducted in the Elmendorf AFB area that demonstrate the importance of the use of the Project area to Native Alaskans. Based on oral histories, the area was used up to World War II, when Dena'ina people were removed from the land with the development of the U.S. Army base at Fort Richardson. Traditional uses of the area include the seasonal fish camp, Tak'at, discussed previously. Other sites outside of the APE, but occurring on Elmendorf AFB, include other fish camp sites, storage pits, culturally modified trees (carved trees, blazed trees, and "looped" trees), cabins, and trails (Davis 1994; Fall *et al.* 2003).

The POA has consulted with Alaska Native groups on the location of specific traditional cultural resources. Letters have been sent to the Native Village of Eklutna, Native Village of Tyonek, Knik Tribal Council, Seldovia Village Tribe, Ninilchik Village Traditional Council, Kenaitze Indian Tribe, and the

Native Village of the Chickaloon initiating government-to-government consultation. These letters requested information on concerns about the Project and identification of sites that could have religious or cultural significance. The POA and Native Alaska elders have participated in five site walks examining the Project area and adjacent locations for traditional cultural resources. These walks have possibly identified the previous location of Tak'at and older birch trees that could have been used to store food in the past by Alaskan Native inhabitants. The older birch trees are not within the current Project area.

Environmental Consequences

Analysis of potential impacts to cultural resources considers both direct and indirect impacts. Direct impacts may be the result of physically altering, damaging, or destroying all or part of a resource; altering characteristics of the surrounding environment that contribute to the importance of the resource; introducing visual or audible elements that are out of character for the period the resource represents (thereby altering the setting); or neglecting the resource to the extent that it deteriorates or is destroyed. Direct impacts can be assessed by identifying the type and location of the proposed action and by determining the exact locations of cultural resources that could be affected. Indirect impacts are those that may occur as a result of the completed Project, such as increased vehicular or pedestrian traffic in the vicinity of the resource.

Proposed Action

The Preferred Alternative/Alternative A

Under Alternative A, the POA would expand its surface area by 135 acres, demolish obsolete structures, upgrade equipment, and provide additional storage and berthing areas for larger commercial ships and military deployments. The Project would involve filling 135 acres of tidelands; dredging; and construction of berths for barges, tankers, cargo ships, and cruise ships. Construction is proposed over a seven-year period. The proposed action also includes providing POA operations through 2025. Construction and operation would not adversely impact any of the architectural resources discussed in this section. None of these resources would be directly affected by construction activities (demolition, dredging, filling) and the audible and visual settings would not change from current conditions. Construction noise at the historic structures should not exceed 66 dBA, below the level usually considered to be a significant adverse impact (see section 3.2.2).

The three identified archaeological sites would not be adversely affected by Alternative A. Site ANC-00706, the Palmer Warehouse is no longer extant and, despite several attempts, has not been relocated. In 1996, the USACE removed and disposed of the terminal end of the Whittier-Anchorage pipeline (site ANC-01302). Because these resources are no longer present and, therefore, are not eligible to the National Register, they would not be adversely affected by Alternative A.

A Native Alaskan seasonal fishing camp site has been recorded (site ANC-01337) on the beach and mudflats below the Knik Bluff in an area proposed for fill as part of Alternative A and possibly within the boundaries of LF04. Tak'at has been documented as an archaeological site on an Alaska Historic Resources Survey form. It was tentatively located based on the presence of a pile of large rocks (possibly the remains of a dip net platform), a Blue Willow pattern plate, and by recollections of Dena'ina Elders who had visited and worked at the summer fish camp. In 1995, limited test excavations and a surface collection were conducted, yielding primarily ceramic sherds dating from the 1940s to the 1950s. During a site walk in May 2004, some blue willow whiteware fragments were found along the beach. Because of disturbance from the military landfill, subsidence from the 1964 earthquake of more than seven feet in this area, and erosion and deposition that has occurred since the 1940s, MARAD has determined that the site integrity has been altered and therefore it is not eligible to the National Register. MARAD completed the Section 106 process with the Alaska SHPO and with Native Alaskan villages. This process yielded a final determination from the SHPO that the site did not meet the criteria for eligibility to the National Register. As such, the SHPO concluded that no historic properties would be affected by the Project.

To identify resources of cultural and religious significance, government-to-government consultation between MARAD and Native Alaskan villages is on-going. As part of the proposed action, the POA would enhance Ship Creek Point and expand the Sea Service Veterans Memorial Park with an interpretive center. The interpretive center would consist of a pavilion modeled after a Dena'ina "Nichil" or "big house" that would contain public displays on Dena'ina history and culture. The information on Dena'ina culture would be obtained through a study authored by Dena'ina Elders from local villages. The interpretive center and study would have a beneficial effect on cultural resources.

Alternative B

Impacts to cultural resources would be the same as under Alternative A.

Alternative C

Impacts to cultural resources would be the same as under Alternative A.

No Action

Repairing and relocating steel piles and other appurtenances or constraints on POA operations would not adversely impact any significant archaeological, architectural, or traditional resources. No known resources are within the current dock area and the structures themselves are not greater than 50 years old or of exceptional significance. Noise from construction at the historic structures in the APE would not exceed 65 dBA, below the level usually considered to be significant (see section 3.2.2). However, the no-action alternative would not provide environmental enhancements as included in the proposed action. Extension of the Sea Service Veterans Memorial Park with a new interpretive center for public information about Native Alaskan use of Upper Cook Inlet would not occur.

3.5 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

This EA presents the existing environmental conditions and potential consequences that could result from the proposed action. An examination of the possible impacts focused the analysis on 16 resource categories: air quality; noise and vibration; hazardous materials and waste; safety; geology and soils; hydrodynamics and sedimentation; water quality; biological resources; EFH; land use and coastal zone consistency; recreation and visual resources; transportation, 4(f)/106 resources; public services and utilities; socioeconomics and environmental justice; and cultural resources.

According to the analysis in this EA and based upon best available data, implementation of the proposed action's three design alternatives (including management actions) would not result in significant adverse impacts in any resource category. Although emissions and noise levels would increase, CO emissions levels would not exceed *de minimis* levels and, therefore, would not have a significant adverse impact. Noise levels in nearby residential areas would not exceed MOA levels or levels established as significant by MARAD and other transportation agencies.

Construction of the Project would not have a significant adverse impact on biological resources. Filling of EFH could have an adverse impact. Although, based upon best available data, the impact would not be significant, the POA would implement management measures (e.g., fish studies and mitigation identified through the Section 404 permitting process) to monitor for impacts and address unanticipated impacts to less than significant levels. Potential adverse impacts to beluga whales from construction may also occur. Best available data indicate that those impacts would not be significant. The POA would also implement measures, such as a beluga monitoring plan and appropriate management practices for whenever belugas approach construction activities, to address unanticipated impacts.

No significant adverse impacts would occur to hazardous materials and waste, safety, geology and soils, hydrodynamics and sedimentation, water quality, land use, transportation, public services and utilities, and cultural resources.

Beneficial economic impacts from construction would range from an additional 6,600 to 8,000 jobs and additional GSP of between $352 million to $445 million. Beneficial economic impacts to the region in 2025 from expanded operations would include more than $515 million in GSP, accounting for more than 8,400 jobs, and more than $272 million in income. Other beneficial impacts under the proposed action include enhancement to parks and 4(f) resources, enhancement and improvements to LF04, and creation of an Alaska Native interpretive area.

Implementation of the no-action alternative would result in adverse impacts, including increasing noise levels at nearby residential areas, lack of critical commercial goods in the future because of congestion, delay during major military deployments, and significant potential loss of jobs and income without POA expansion. It is projected that in 2025, a lack of implementing the Project at the POA would result in almost 4,700 fewer jobs, $522 million less in output, $154 million less in income, and $294 million less in GSP. Enhancements and improvements to Ship Creek, additions to parks, inclusion of a Native Alaskan interpretive center, and improvements to LF04 would not occur. No significant adverse impacts due to the no-action alternative would occur to air quality, hazardous materials and waste (although the potential for spills could increase with congestion), safety, geology and soils (although the POA would be more susceptible to damage from an earthquake), hydrodynamics and sedimentation, water quality, biological resources, land use, recreation and visual, 4(f) resources, public services and utilities, and cultural resources.

A summary of the potential impacts by resource category for the proposed action's three design alternatives and the no-action alternative is presented in Table 3-38.

Table 3-38 Comparison of Alternatives by Resource

	Preferred Alternative/Alternative A	*Alternative B*	*Alternative C*	*No Action*
Physical Resources				
Air Quality	• No significant adverse impacts to air quality • Additional CO emissions from construction and operations would increase 96 tons during the heaviest emission year, but would not exceed federal *de minimis* levels • Operations would add 85 tons CO by 2025, but would not exceed federal *de minimis* levels	• Same as Alternative A	• Same as Alternative A	• No significant adverse impacts to air quality • Additional CO emissions from repair/replacement construction and operations would increase 37 tons during the heaviest emission year, but would not exceed federal *de minimis* levels due to increase in idling ship days, trucks, cars, and trains despite the lack of increase in capacity • Operations would add 85 tons CO by 2025, but would not exceed federal *de minimis* levels
Noise and Vibration	• No significant adverse noise and vibration impacts would occur • Construction (including pile driving) would result in noise level increases of 0.5 and 1.0 dBA on nearby residential lands and parks, respectively • Operations would result in noise levels of 65.1 dBA or less at nearby areas, an increase of 0.4 dBA or less	• Same as Alternative A, except construction would result in noise level increases of 1.5 and 2.2 dBA on nearby residential lands and parks, respectively	• Same as Alternative A, except during construction of Area 4, which would result in noise levels the same as Alternative B	• Adverse noise and vibration impacts would occur at Suzan Nightingale McKay Park, Brown's Point Park, and Cherry Hill housing's south end due to noise level increases from 2.6 to 4.1 dBA from pile replacement and repair • Noise levels associated with operations are the same as for Alternative A
Hazardous Materials and Waste	• No significant adverse hazardous materials and waste impacts would occur • No significant adverse impact to hazardous waste generation or management, no introduction of new types of hazardous waste • Projected operations would increase POL throughput and use, but management measures would result in no adverse impacts • Placement of fill would have a positive impact at LF04 site by eliminating tidal erosion, limiting accessibility, and mitigating potential waste release	• Same as Alternative A	• Same as Alternative A	• No significant adverse hazardous materials and waste impacts would occur • Existing procedures for the management of hazardous materials would remain unchanged • Increase in congestion without expansion could increase environmental risk; adverse, but not significant adverse impact • Tidal erosion and limited access restrictions at LF04 site would continue

	Preferred Alternative/Alternative A	*Alternative B*	*Alternative C*	*No Action*
Safety	• No significant adverse safety impacts • Elmendorf AFB aircraft safety and electromagnetic visibility unimpaired	• Same as Alternative A	• Same as Alternative A	• No significant adverse safety impacts in relation to aircraft activities or electromagnetic interference at Elmendorf AFB
Natural Resources				
Geology and Soils	• No significant adverse impacts to geology and soils • BMPs employed to reduce potential effects from short-term erosion and sedimentation • Pile driving during construction activities may result in non-significant, adverse, short-term vibratory and sedimentation impacts • Potential for lateral movement during an earthquake reduced by maintaining or improving current stability conditions • Net increase of 81 acres dredging for construction • Net decrease of 22 acres annual maintenance dredging	• Same as Alternative A	• Same as Alternative A	• No significant adverse impacts to geology and soils • Despite repairs, POA would continue to be susceptible to earthquake damage due to design inadequacies • Not feasible to retrofit the current infrastructure to completely meet modern seismic design standards • Continued annual USACE maintenance dredging of 206 acres
Hydrodynamics and Sedimentation	• No significant adverse impacts to hydrodynamics and sedimentation • Potential for less sedimentation than existing conditions around POA, thus less maintenance dredging required • Changes in tidal currents generally less than four inches per second, except at Berth 1 and 2 and former Summit Barge and Transfer Facility stations, where changes up to eight inches per second are predicted	• Same as Alternative A	• Same as Alternative A	• No significant adverse impacts to hydrodynamics and sedimentation • No decrease in maintenance dredging

	Preferred Alternative/Alternative A	*Alternative B*	*Alternative C*	*No Action*
Water Quality	• No significant adverse impacts to water quality • Construction could lead to short-term increases in sediment discharges to surface waters; BMPs would be implemented to reduce erosion and sediment transport • No significant adverse impacts to groundwater • Operations increases result in potential for increased pollutant discharge to stormwater runoff, NPDES permit requirements and system designed to reduce potential impacts	• Same as Alternative A	• Same as Alternative A	• Adverse, but not significantly adverse, impacts to water quality • Short-term adverse impacts from sedimentation due to pile repair/replacement, BMPs would be implemented to reduce sedimentation • Increase in throughput using existing facilities could result in increased potential for accidental pollutant discharges without improved stormwater conveyance and treatment infrastructure
Biological Resources	• Adverse, but not significant adverse, impacts to marine vegetation and habitats from filling 135 acres of subtidal and intertidal areas • No significant adverse impacts to wildlife or listed species • Adverse, but not significant adverse, impacts due to construction-related noise (195 dB peak and 165 dB average) • No significant adverse impacts due to subsequent POA operations to fisheries and belugas • Beluga whale monitoring plan would be implemented during pre-construction, construction, and post-construction phases • Adverse, but not significant adverse, impacts to biological resources • Ongoing and future fish sampling studies would occur at the POA • Mitigation of loss of intertidal and subtidal areas to include restoration efforts on Ship Creek	• Same as Alternative A, except filling 110 acres of subtidal and intertidal areas • Peak underwater noise levels of 209 dB from impact pile driving; average of 195 dB, could have adverse impacts to fisheries and belugas	• Same as Alternative A, except filling 131 acres of subtidal and intertidal areas	• Adverse, but not significant adverse, impacts due to noise associated with repair of the existing dock structure • Peak and average noise levels from impact pile driving same as Alternative B • No significant adverse impacts due to on-going and subsequent POA operations • No significant adverse impacts to biological resources

	Preferred Alternative/Alternative A	*Alternative B*	*Alternative C*	*No Action*
Essential Fish Habitat	• Adverse impacts to 135 acres of EFH, but no long-term significant adverse impacts to federally managed fish species • No significant adverse impacts to federally managed species from construction related noise • Ongoing and future fish sampling studies would occur at the POA • Mitigation of loss of 135 acres of EFH to include potential restoration efforts on Ship Creek	• Same as Alternative A, except filling 110 acres of subtidal and intertidal areas and adverse impacts to 110 acres of EFH • Noise increase from impact pile driving could have adverse impact to federally managed species	• Same as Alternative A, except filling 131 acres of subtidal and intertidal areas and adverse impacts to 110 acres of EFH	• Noise increase from impact pile driving could have adverse impact to federally managed species
Human Resources				
Land Use and Coastal Zone Consistency	• No significant adverse impacts to land use and coastal zone consistency • Project consistent with current land use plans and zoning • 135 acres of tidelands filled	• Same as Alternative A except 110 acres of tidelands filled	• Same as Alternative A except 131 acres of tidelands filled	• No significant adverse impacts to land use and coastal zone consistency • No change from current land uses at the site
Recreation and Visual Resources	• No significant adverse impacts to recreation and visual resources • Improved recreation opportunity for cruise ships • Beneficial aesthetic and recreation effects from new interpretive center, potential habitat restoration, and potential coastal trail extension • No significant adverse impact to recreation or visual resources due to construction noise or resulting operations	• Same as Alternative A	• Same as Alternative A	• No significant adverse impacts to recreation and visual resources • No improvements to parks and trails • The cruise ship terminal would not be built; no increase in this recreation opportunity would occur • Potential for adverse impacts to existing cruise operations due to constraints on POA operations

	Preferred Alternative/Alternative A	*Alternative B*	*Alternative C*	*No Action*
Transportation/ Traffic	• No significant adverse impacts to transportation/traffic • Short-term increase in truck, barge, and/or rail traffic and traffic during construction seasons • Adverse short-term impacts during construction reduced as construction progresses and via logistics planning • Beneficial operations impact with increased operational efficiencies and safety among intermodal transportation systems and minimal traffic increases • Long-term beneficial impact on area transportation systems	• Same as Alternative A	• Same as Alternative A	• Significant adverse impacts to transportation/traffic • Increased operational inefficiencies would occur during replacement of piles, resulting in adverse, but not significant adverse, impacts • Significant adverse marine and ground transportation impacts may occur due to increasing inefficiencies and deteriorating transportation conditions at the POA • Significant adverse impacts to commercial goods transported during a major military deployment requiring all POA berths
4(f)/106 Programmatic Evaluation	• No adverse impact to 4(f)/106 programmatic evaluation • No significant adverse impacts to public parks, recreation lands, wildlife and waterfowl refuges, and cultural resources • Beneficial effects to parks, recreation lands and cultural resources with Ship Creek Point enhancements and potential habitat restoration	• Same as Alternative A	• Same as Alternative A	• No adverse impact to 4(f)/106 programmatic evaluation • Parks, recreation and cultural enhancements would not occur
Public Services and Utilities	• No significant adverse impacts to public services and utilities • New transformers and substation would help meet additional electricity demand • Increases in electricity and community services demands and solid waste generation would not result in adverse affects	• Same as Alternative A	• Same as Alternative A	• No significant adverse impacts to public services and utilities • No change from existing utility service infrastructure and needs • No improvements to existing infrastructure or consolidation efficiencies would occur

	Preferred Alternative/Alternative A	*Alternative B*	*Alternative C*	*No Action*
Socioeconomics (Economics and Environmental Justice)	• Beneficial impacts to regional and state economies • Anticipated construction expenditures over seven years would generate in excess of $530 million in total economic output, 6,700 jobs, $230 million in income, and $350 million in GSP • By 2025, estimated economic benefits of POA operations would approach $920 million in output, 8,400 jobs, $270 million in income, and $515 million in GSP • Would not result in disproportionate effects to minority or low-income populations • No significant adverse environmental justice impacts would occur	• Beneficial impacts to regional and state economies • Anticipated construction expenditures would generate in excess of $673 million in total economic output, 8,190 jobs, $293 million in income, and $445 million in GSP • By 2025, estimated economic benefits of POA operations would approach $920 million in output, 8,400 jobs, $270 million in income, and $515 million in GSP • Would not result in disproportionate effects to minority or low-income populations • No significant adverse environmental justice impacts would occur	• Beneficial impacts to regional and state economies • Anticipated construction expenditures would generate in excess of $565 million in total economic output, 7,000 jobs, $247 million in income, and $374 million in GSP • By 2025, estimated economic benefits of POA operations would approach $920 million in output, 8,400 jobs, $270 million in income, and $515 million in GSP • Would not result in disproportionate effects to minority or low-income populations • No significant adverse environmental justice impacts would occur	• Would result in adverse impacts to regional and state economies • Potential 4,726 fewer jobs, $154 million less in income, $522 million less in output, $294 million less of GSP for the year 2025 due to lack of expanded POA • Anticipated construction expenditures over 8 years to replace and retrofit the existing docks would generate approximately $160 million in total economic output, 2,000 jobs, $70 million in income, and $105 million in GSP • Increased cost of goods as operational inefficiencies increase or as inadequately maintained facilities are restricted in use • No disproportionate effects to minority or low-income populations would occur and no significant adverse environmental justice impacts would occur
Cultural Resources	• No significant adverse impacts to cultural resources • No significant adverse noise and visual impacts to architectural resources • Beneficial effect to cultural resources from interpretive center highlighting Dena'ina history and culture at Ship Creek Point and Dena'ina culture study	• Same as Alternative A	• Same as Alternative A	• No significant adverse impacts to cultural resources • Interpretive center with public information about Native Alaskan use of Upper Cook Inlet would not be built • Repair/replacement of existing structures would not adversely affect any National Register-eligible cultural resources