CHAPTER 4

CUMULATIVE EFFECTS IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

4.0 CUMULATIVE EFFECTS, IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

4.1 CUMULATIVE EFFECTS

The CEQ regulations for implementing NEPA define cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). Assessing cumulative effects involves defining the scope of the other actions and their interrelationship with the proposed action, if they overlap in space and time.

Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time. The CEQ guidelines recognize that it is not practical to analyze the cumulative effects of an action on the universe but, instead, direct focus on those effects that are truly meaningful. This chapter analyzes the proposed POA expansion alternatives with other projects that together may affect physical, natural, and human resources of the Knik Arm region. Cumulative effects are most likely to arise when a proposed action is related to other actions that could occur in the same location or at a similar time. Actions geographically overlapping or close to the proposed action would likely have more potential for a relationship than those farther away. Similarly, actions coinciding in time with the proposed action would have a greater potential for cumulative effects. Therefore, to identify cumulative effects, the analysis needs to address three questions:

1. Could resources affected by the proposed action interact with resources affected by past, present, or reasonably foreseeable actions?
2. If one or more of the affected resources of the proposed action and another action could interact, would the proposed action affect or be affected by impacts of the other action?
3. If such a relationship exists, are there any potentially significant impacts not identified when the proposed action is considered alone?

4.2 APPROACH USED FOR CUMULATIVE EFFECTS ANALYSIS

4.2.1 Scope

The scope of the cumulative effects analysis involves both the geographic extent of the effects and the time in which the effects could occur. This cumulative effects analysis includes the boundaries of the POA, adjacent areas such as Elmendorf AFB and the Knik Arm from north of Cairn Point to south of Ship Creek (including activities at Port MacKenzie). Actions not occurring within or near these areas are not considered in the analysis since they would be unlikely to interact with the proposed action in a cumulative manner. The time frame for cumulative effects includes seven consecutive years for

construction, beginning no earlier than 2005. In considering cumulative effects from operations, the time frame for analysis extends from Project completion to 2025. Note that this analysis considers actions initiated before 2005, but the cumulative effects of such actions with the proposed action do not begin until the proposed action is initiated.

For the purpose of this analysis, public documents, especially permits issued by the USACE and information prepared or transmitted by federal, state, and local government agencies, were the sources of data on potentially related past, present, and future actions. As part of the review of projects for the cumulative analysis, USACE Section 404 permits for projects over the previous 45 years were examined for the area (Table 4-1). These projects provided both the historic context for development in the area and the identification of on-going and reasonably foreseeable future projects. However, some actions lack permits or other documentation, and remain undeveloped or marginally developed, and, as such, were considered to be speculative. CEQ regulations admonish agencies to avoid speculation in EAs and to evaluate the degree of development of an action to determine if it warrants cumulative analysis. Speculative projects have not been considered as part of the cumulative analysis.

Cumulative effects analysis also needs to consider the combined additive or interactive impacts of the accumulation of all of the elements associated with a single action alternative (e.g., construction plus operations). In the Environmental Consequences section of Chapter 3, each resource section is not only assessed for the specific environmental consequences of individual elements, but also for the combined effects of all elements. Since this aspect of cumulative effects was presented in Chapter 3, it will not be discussed further in this section.

4.2.2 Methodology

The methodology for cumulative effects analysis in this EA consists of the following steps:

1. *Identify past, present and reasonably foreseeable external factors (such as other similar projects or other types of human activities) that could have additive or synergistic effects.* Past actions must be evaluated to determine whether there are residual effects that may still result in synergistic or incremental impacts when combined with the proposed action alternatives. The CEQ guidelines also require that cumulative effects analysis assess reasonably foreseeable future actions. In these analyses, the most significant past action was the filling and dredging of terrestrial wetlands and tidal areas. The most significant current actions evaluated were a number of local developments occurring near the POA and at Port MacKenzie.
2. *Evaluate the significance of the potential cumulative effects using criteria established for direct and indirect impacts and the relative contribution of the action alternatives to cumulative effects.* Of particular concern are situations where less than significant direct and indirect impacts lead to significant cumulative effects, or where significant external effects accentuate significant direct and indirect impacts.

Table 4-1 USACE Permits Issued for the Cumulative Impact Area						
Date	***File Number***	***Duration of Permit***	***Issued To***	***Area***	***Restrictions***	***Action***
1946	1-46002	1946-1949	Alaska Fish and Farm Products, Inc.	North of Anchorage city limits		Construct a dock and approach in Knik Arm
1950	1-490018, Knik Arm 8	1950-1955	Permanente Cement Company	West of Ocean Dock railroad spur and 1150 feet south of southeast corner of the dock		Construct a dock and dredge a slip; the material placed on either side of the slip to act as a breakwater in Knik Arm
1956	1-560056	1956-1959	POA	POA		Construct a Port dredging to -35 feet MLLW; fill 700 feet x 250 feet of tidelands with sand, gravel to construct railroad tracks, road; install 30 inch diameter piling, transit shed, crane base; riprap coast for protection; fill a 4.02 acre area
1961	M-46002	1961-1964	Alaska Fish and Farm Products, Inc.			Construct a bulkhead and place fill in Knik Arm
1963	1-630012	Unknown	Foss Launch and Tug Company	Knik Arm		Maintain an existing buoy in Knik Arm; the buoy is a 13-inch diameter steel tank with wood guard rail
1963	1-630013	1963-1966	Foss Launch and Tug Company	Knik Arm		Place a mooring buoy in Knik Arm
1965	M-560056	1965-1968	POA	POA		North docking berth extension; pilings in tidelands to support a 11,250 square feet deck
1967	1-660028, Cook Inlet 108	1967-1970	Chugach Electric Association, Inc.	From a point near Point Woronzof and a point near Point MacKenzie		Construct a submarine cable crossing across Knik Arm

Table 4-1 USACE Permits Issued for the Cumulative Impact Area (con't)

Date	*File Number*	*Duration of Permit*	*Issued To*	*Area*	*Restrictions*	*Action*
1972	N-560056	1972-1975	POA	POA		Construct a dock extension, place fill, remove approximately 240,000 cubic yards of material; Phase 1-Fill between existing wharf and Tidewater Road and Tidewater Road to east, pile-supported deck 370 feet x 70 feet, 105 feet x 30 feet trestle, suction dredge 120,000 cubic yards; Phase 2- Fill 715 feet (triangular) from P-1/2 deck to Tidewater Road, pile-supported deck 344 feet x 70 feet with 225 feet x 30 feet trestle, suction dredge 120,000 cubic yards
1977	M-770008, Knik Arm 46	1977-1992	Oceaneering International, Inc.	1200 Ocean Dock Road	Utilize bulldozer at low tide to push the material seaward and into deeper water to be dispersed by tidal currents	Dredge to a depth of up to eight feet for a total up to 10,000 cubic yards in an approximately 250,000 feet area
1977	1-760045, Cook Inlet 25	Unknown	POA	POA		Remove approximately 100,000 cubic yards of material and construct additional facilities consisting of a dock extension and two trestles
1977	2-770144, Cook Inlet 25	Unknown	POA	POA		All permits combined for permit number 770144, Cook Inlet 25
1977	4-770144, Cook Inlet 25	Unknown	POA	POA		Construct additional facilities consisting of a mooring dolphin, 94 feet long walkway to the dolphin; dredge and fill approximately 930 feet x 330 feet and 800 feet x 400 feet; transport dredged material for ocean dumping
1981	4-81077, Knik Arm 59	Unknown	MOA			Upgrade an existing trail by placing approximately 790 cubic yards of fill material; construct a bituminous surfaced ramp from Station 0+00 to 5+80; place a six inch gravel overlay from 5+80 to 17+00

Table 4-1 USACE Permits Issued for the Cumulative Impact Area (con't)

Date	*File Number*	*Duration of Permit*	*Issued To*	*Area*	*Restrictions*	*Action*
1981	M-810213, Knik Arm 60	1981-1993	POA	Knik Arm in Cook Inlet, Tracts A and EE (POA)		Discharge approximately 200,000 cubic yards of gravel fill material in approximately 14.2 acres of wetlands for additional transit area
1981	2-810213, Knik Arm 60	Unknown	POA	POA		Expand the present facility by placing 427,878 cubic yards of fill material; Lots 12 and 12A will contain 218,920 cubic yards on 7.6 acres while Lot D will contain 208,958 cubic yards on 7.2 acres; Approximately 70,000 cubic yards would be dredged from the toe of the proposed fill area
1982	1-820099, Knik Arm 73	Unknown	POA	POA		Repair Terminal 1 by the construction of two lateral stability cluster piles, 24 feet x 70 feet each, in the area and addition of a 55.5 feet x 228 feet gantry crane turnout trestle
1983	2-830385, Ship Creek 6	Unknown	MOA	Ship Creek		Place approximately 23,000 cubic yards of fill material in the wetlands; the fill area will be approximately 320 feet wide, 6 feet deep, and will vary from 330 feet to 660 feet in length; project involves the construction of a concrete launch ramp and an extension to an existing ramp
1983	4-830014, Cook Inlet 286	1983-1986	MOA	Cook Inlet		Excavate and backfill 2,230 cubic yards of material into preservation zone wetlands along Fish Creek to reconstruct and weight an existing sanitary sewer gravity diversion line
1985	T-850014, Cook Inlet 326	1985-2000	North Star Terminal and Stevedore Company (NSTSC)	North of existing NSTSC facilities on the southeast shoreline of Knik Arm, 790 Ocean Dock Road		Increase volume of maintenance dredging from 2,000 cubic yards to 8,000 cubic yards, reauthorize the work authorized in a previous permit, reauthorize the discharge of 110,000 cubic yards of Type IV material into 2.5 acres of tidelands
1985	2-850360, Cook Inlet 335	Unknown	MOA	Cook Inlet west of the intersection of 5th and N streets		Place approximately 700 cubic yards of compacted gravel fill material and 520 cubic yards of riprap to replace a storm drain outfall pipe and construct erosion protection at the end of the outfall; the pipe will be approximately 24 inches in diameter and 125 feet long

Table 4-1 USACE Permits Issued for the Cumulative Impact Area (con't)						
Date	***File Number***	***Duration of Permit***	***Issued To***	***Area***	***Restrictions***	***Action***
1985	M-830014, Cook Inlet 286	1985-1988	MOA			Place fill material in wetlands to construct a diversion line for a sanitary sewer; construction will include approximately 94 cubic yards of backfill, 52 cubic yards of wire mesh/rack retaining wall and 48 linear feet of a 36 inch x 22 inch culvert with riprap protected inlets and outfalls
1985	M-830385, Ship Creek 6	Unknown	MOA	Ship Creek		Modification includes maintenance dredging on a periodic basis for 4 years; a maximum of 1,000 cubic yards of material will be dredged during any one operation; the material will be pushed to mean low water and then dispersed by tidal action
1987	M-820099, Knik Arm 73	1987-1999	POA	POA		Permit modified by giving it a completion date of October 1999
1988	M-860806, Knik Arm 107	1988-1989	POA	South of the mouth at Ship Creek		Place approximately 450,000 cubic yards of Type II fill material and riprap into 12.1 acres of wetlands and tideflats for construction and completion of a building pad, parking area, access road, boat ramps, shore protection and other special uses
1989	M-770144, Cook Inlet 25	1989-1992	MOA	POA		Rotate the POL terminal by 10 degrees; increase the dredged material from 27,000 cubic yards to 90,000 cubic yards and reduce acreage from five to four
1989	O-860806, Knik Arm 107	1989-1992	POA	South of the mouth at Ship Creek		Allow for the construction of a dock and gangways within the existing permitted area
1989	2-890012, Ship Creek 12	1989-1992	Whitney Foods	Mile 0.5 Ship Creek and Cook Inlet at 658 Ocean Dock Road	Maintenance dredging can occur until 1999; work will occur between September 1 and May 1 to prevent disturbances of fish migration in Ship Creek	Dredge approximately 2,800 cubic yards of silt material from below the mean high water mark of Ship Creek; the material will be disposed of below -4 feet MLLW of Cook Inlet; the dredged area will measure approximately 6 feet x 50 feet wide x 250 feet long; the disposal area will measure approximately 2 feet deep x 1,200 feet wide x 1,800 feet long

Table 4-1 USACE Permits Issued for the Cumulative Impact Area (con't)						
Date	***File Number***	***Duration of Permit***	***Issued To***	***Area***	***Restrictions***	***Action***
1990	N-770144, Cook Inlet 25	1990-1992	POA	POA		Reduce the quantity of dredged material to 30,000 cubic yards over a three acre area instead of four; the dock will shift 33 feet seaward of its original location
1990	M-810213, Knik Arm 60	Unknown	POA	POA	Adequate culverting to maintain natural drainage shall occur; fill material shall be maintained to prevent erosion	Discharge approximately 200,000 cubic yards of gravel fill material in approximately 14.2 acres of wetlands for additional transit area at the port
1992	2-920080, Knik Arm 119	1992-1995	Mapco Alaska Petroleum, Inc.	1076 Ocean Dock Road	No fill shall be directly placed in the waters of Knik Arm	Discharge approximately 25,000 cubic yards of grade-two, non-frost susceptible pit run gravel as primary fill into approximately 1.26 acres of the tidal flats of Knik Arm for a footprint of 55,000 square feet; additional 6,000 cubic yards material discharged into the tidal flats on top of the primary fill to form a containment berm around three petroleum storage tanks; 1,500 cubic yards of hard angular quarry stone 16 inches to 36 inches in diameter discharged as rip-rap to from a seaward bulkhead containing primary fill
1994	M-940054, Knik Arm 122	1994-2000	ABI	Within Section 7 in the POA	Prior to discharging the fill, permitee will conduct an examination of the fill source as detailed in 40 CFR Part 230.6	Discharge clean fill into waters below the high tide line to construct a level fill pad to consolidate a bulk concrete transfer and storage operation; a total of approximately 15,810 cubic yards of fill will be discharged into approximately 2.2 acres of water
1994	D-770144	1994-1998	POA	POA	Beluga advisory	Dock fender replacement; repair and rehabilitation of POL 2; repair Trestle Pier No. 2 and two existing split piles and one corroded pile
1994	O-770144, Cook Inlet 25	45 days	POA	POA	Watch for Beluga whales at all times	Temporary placement of four indicator piles for test purposes into navigable waters of Knik Arm for the Pile Capacity Testing Program Study for POL 2

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Date	*File Number*	*Duration of Permit*	*Issued To*	*Area*	*Restrictions*	*Action*
1994	N-810213, Knik Arm 60	1994-1997	POA	POA		The construction time limit for completing project is extended by three years
1994	O-810213, Knik Arm 60	Unknown	POA	POA	No land clearing, excavation or fill placed in the wetland area from May 10 to July 15	Excavation of approximately 46,000 cubic yards of wetland material and the discharge of approximately 52,000 cubic yards of fill material into approximately two acres of wetlands for additional transit area; all excavated wetland material will be placed at an upland disposal site
1996	1-960097, Cook Inlet 335	1996-1999	M. John Dupier	North of small boat ramp in the Ship Creek Waterfront Development area		Construct an 8 feet x 200 feet catwalk to access a barge which will serve as a floating dock
1997	O-810213, Knik Arm 60	1997-1999	POA	POA		The time limit for completing the work ends on August 31, 1999
1997	M-970423, Knik Arm 126	1997-2001	Anchorage Fueling and Service Company	Knik Arms Mud Flats		Expand the authorized construction corridor by 20 feet on each side from station 59+60 to station 135+80 and by an additional 20 feet on the waterward side from station 135+80 to station 233+20, and in an irregularly shaped area averaging approximately 300 feet by 65 feet area adjacent to Anchorage Water and Wastewater Utility pump 2; this would increase the construction corridor acreage by a total of 11.47 acres and 0.44 acres, respectively

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Date	*File Number*	*Duration of Permit*	*Issued To*	*Area*	*Restrictions*	*Action*
July 24, 1998	2-970423, Knik Arm 126	Unknown	Anchorage Fueling and Service Company	NE corner of Tidewater and Terminal Roads proceeding southwest onto the tidal mudflats of Knik Arm, and ending at the AFSC tank farm at the corner of Point Woronzof Drive and West End Road	Construction of the intertidal areas between the small boat harbor and the bluffs at Point Woronzof will occur between October 12 and March 15; freshwater wetland construction will occur between October 12 and April 15	Install a 12-3/4 inch outside diameter pipeline in approximately 195 feet of freshwater tidelands and approximately 15,564 ft, of tidal mudflats, wetlands, and the beach; the freshwater area affected would be 0.19 acres; the construction corridor of the tidal mudflats, wetlands, and beach would affect 25.54 acres with extra work space affecting 1.27 acres for a total of 26.81 acres; the estimated acreage in tidal mudflats is 22.52 acres, wetlands at 2.58 acres, and beach at 1.71 acres
1998	T-790412, Knik Arm 51	1998-2001	Matanuska-Susitna Borough		No in-water pile driving and phase 3 construction to occur from May 1 to October 3.	Construct 500 feet of steel bulkhead with an attached dock and place fill behind the bulkhead; a total of 16.0 acres below high tide low will be filled; discharge 200,000 cubic yards of material below high tide line with an additional 20,000 cubic yards of armor rock; concrete and steel deck would be attached to the bulkhead
1999	1-990227, Knik Arm 130	1999-2002	Allen Marine Goldbelt Tours, LLC	North of small boat ramp in the Ship Creek Waterfront Development	Wooden portions of the pier cannot be treated with pentachlorophenol	Seasonally install an 8 feet x 90 feet aluminum ramp, 6 feet x 140 feet orthotropic bridge, and a 120 feet x 30 feet x 7 feet barge; permanently install two reusable 20 inch pile sockets approximately -2 feet below ordinary high water mark of Knik Arm to support seasonal pilings for the bridge

Table 4-1 USACE Permits Issued for the Cumulative Impact Area (con't)

Date	*File Number*	*Duration of Permit*	*Issued To*	*Area*	*Restrictions*	*Action*
2000	Y-850014, Cook Inlet 326	Complete structures, fills, and buttresses dredging ends in 2003; complete maintenance dredging by 2010; complete the authorized fill by 2003	NSTSC	North of existing NSTSC facilities, 790 Ocean Dock Road	In-water construction, pile driving, or dredging activities will not occur from May 1 through October 15 to avoid unnecessary conflicts with beluga whales; if any of these activities need to occur during those months, the permitee will need to develop a Marine Mammal Monitoring Plan; the Plan will include the species to be monitored, on-site monitoring and observation techniques, recording system for observations, position, and movements, and an identification of a "zone of avoidance" where work will cease should the marine mammal appear; fill will not be placed directly into the water and not below MLLW	600,000 cubic yards of Type IV fill material will be placed onto ten acres of Knik Arm tidelands above the MLLW line to raise the elevation to +35 feet MLLW; a pile-supported multi-purpose dock constructed from the edge of the fill to the -40 feet MLLW line; buttress dredging will be approximately 20,000 cubic yards with the dredged material being placed on either side of the buttress trench; a 400 feet section along the seaward side will be sheetpiled to accommodate sea-going barges; hydraulic maintenance dredging will occur every ten years to maintain the deep water dock at -40 feet MLLW; discharge 110,000 cubic yards of Type IV material onto 2.5 acres of tidelands to an approximate elevation of +35 feet MLLW and install sheetpile to the northern and seaward sides of the fill; maintenance dredging would occur four times per year to dredge up to 8,000 cubic yards of marine silts and clays

Table 4-1 USACE Permits Issued for the Cumulative Impact Area (con't)

Date	*File Number*	*Duration of Permit*	*Issued To*	*Area*	*Restrictions*	*Action*
2000	N-1994-0554, Knik Arm 122	2000	ABI	Within Section 7 in the POA	Prior to the placement of fill material, ABI will conduct an examination of the fill according to CFR Part 230.60	Second modification for this permit; same actions as before
2001	M-920080, Knik Arm 119	Unknown	Williams Alaska Petroleum, Inc.	1076 Ocean Dock Road		Discharge 300,000 cubic yards of gravel, concrete rubble and riprap into 8.5 acres of intertidal mudflats for the construction of a double track rail loop; build temporary equipment storage inside the rail loop; compatible with the permit issued to NSTSC
2001	2-2001-0485, Knik Arm 133	2001-2005 (construction), 2001-2012 (maintenance dredging)	Summit Alaska, Inc.		Construction to occur between May 1 and August 31 when the area is dewatered	Construct a barge docking and gravel transfer facility by placing approximately 7,500 cubic yards of fill material into tidelands to create a 150 feet long, 30 feet wide dike; place approximately 11 piles into the tidelands out 150 feet from the end of the dike, ending in two dolphins; place a 300 feet long conveyor system, with a hopper at the end, on top of the dike and pilings; dredge approximately 2,000 cubic yards of material from a 100 feet x 300 feet area seaward of the dolphins to create a berth and dispose of the spoil directly seaward of the berth; annual dredging maintenance could occur up to four times a year to remove approximately 2,500 cubic yards of spoil annually for a period of ten years

Table 4-1 USACE Permits Issued for the Cumulative Impact Area (con't)

Date	*File Number*	*Duration of Permit*	*Issued To*	*Area*	*Restrictions*	*Action*
2001	O-1994-0554, Knik Arm 122	1994-2005	ABI	Within Section 7 in the POA	Fill placed during low tide; minimum disturbance to tidelands; operation of machinery and equipment must remain in the footprint; minimum entry of fines and suspendible material	Expand fill area at the materials off-loading and storage facility by installing a pre-cast concrete block retaining wall and discharging clean gravel fill; total of 566 cubic yards of fill material covering 0.134 acres, between the high tide line and mean high water elevations of Knik Arm
2001	P-770144, Cook Inlet 25	2001-2004	POA	POA		Construct third trestle at the north end of Terminal 3 with the driving of 22 30-inch steel piles; this trestle will link an intertidal fill area to the existing dock structure and increase capacity and efficiency in which cargo from container ships is transferred; the trestle will consist of a pre-cast concrete dock measuring 181 feet long x 30 feet wide

Table 4-1 USACE Permits Issued for the Cumulative Impact Area (con't)

Date	*File Number*	*Duration of Permit*	*Issued To*	*Area*	*Restrictions*	*Action*
2001	1-2001-0809, Knik Arm 134	2001-2005	Cook Inlet Excursions	South of the Ship Creek Public boat launch ramp and the boat dock operated by Cook Inlet Tug and Barge Company	Construction work cannot occur between May 1 and June 15; work performed between June 16 and August 31 will occur during low tide; pile driving, site preparation, and other basic construction for the access walkway will occur during lower tide stages during peak water bird staging periods of May 1-June 1 and July 1-August 15; in-water construction will cease when beluga whales are sited within 2,000 feet of area	Construct walkway and floating dock
2001	W-1979-0412, Knik Arm 51	2001-2004	Matanuska-Susitna Borough	Port MacKenzie in the Knik Arm	A beluga whale observer will be present; work will cease if a beluga is within 2,000 feet of the area	Construction of a ferry landing off the south wing of the existing fill dock; transfer bridge from the dock to the hoist tower consisting of four pipe pile dolphins; catwalk extending south from the hoist tower; seasonal float attached to the catwalk dolphins
2002	N-920080, Knik Arm 119	2002-2006	Williams Alaska Petroleum, Inc.	1076 Ocean Dock Road		Construct a 120,000 barrel fuel storage tank
2003	4-1994-0934, Knik Arm 135	2003-2006	POA	Cherry Hill Ditch between the Port and Elmendorf AFB		Place 1,200 feet of pipe in the ditch and place fill around it as part of an 18.5 acre project to expand the existing road and rail on that side of the port
2003	D-2003-0502	2003-2005	POA	POA		Perform geotechnical exploration at the POA

Table 4-1 USACE Permits Issued for the Cumulative Impact Area (con't)

Date	*File Number*	*Duration of Permit*	*Issued To*	*Area*	*Restrictions*	*Action*
2003	2-2003-358, Ship Creek 26	2003-2006-Original dredging and 2003-2013 for maintenance dredging	Busy Bee Marina	564 Ocean Dock Road	Dredging must take place between October 1 and April 30; dredged material will be pushed into Ship Creek as the high tide is falling to help move the material downstream	Dredge approximately 4,250 cubic yards from the 19,000 square feet marina and deposit it in Ship Creek to lower the bottom approximately six feet; additionally, annual maintenance is approved to maintain the new bottom elevation
2003	AA-1984-0184, Ship Creek 7	Construction ends in 2006; Maintenance dredging will end in 2012	Swan Bay Holdings, Inc.	North of Ship Creek near the POA	Fill placement in water between September 1 and April 30; fill placement between May 1 and August 31 when the area is dewatered by tides	Approximately 450,000 cubic yards of fill material will be placed into seven acres of Knik Arm tidelands above the MLLW to raise the elevation +35 feet MLLW; a pile-supported dock will be constructed from the edge of the fill to the -40 feet MLLW line; buttress dredging will amount to approximately 20,000 cubic yards with the material being placed on either side of the buttress trench; temporary erosion protection will be placed along the seaward edge of each fill phase; hydraulic maintenance dredging for ten years to maintain deep water at -40 feet MLLW with the material being deposited approximately 4,000 feet seaward of the MLLW line
2004		2005-2030	POA and MARAD	Adjacent to Terminal Road		Obtain a right-of-way access through federal property adjacent to Port-owned land and to extend the roadway and railroad tracks
2004	1994-934-D	2004-2006	U.S. Coast Guard	POA	Pile driving should occur at low tide and if Beluga whales are observed, work will cease during that time	Temporary U.S. Coast Guard floating dock

3. *Discuss the reasoning that led to the evaluation of significance, or lack of significance, citing evidence from quantitative information where available.* The advantages of this approach are that it: (1) closely follows CEQ guidance; (2) employs an orderly and explicit procedure; and (3) provides the reader with the information necessary to make an informed and independent judgment concerning the validity of the conclusions.

The criteria for significance and determinations of cumulative effects significance are the same as those used to analyze the direct and indirect impacts of the alternatives on the environment. The following ratings for significance are used; significant (beneficial or adverse) or not significant. Where sufficient information is available, the criteria used are quantitative in nature. In other instances, where less information on the direct and indirect impacts of the alternative is available, the criteria used are qualitative in nature.

This analysis considers the cumulative effects of Alternatives A, B, and C. As evidenced by the analysis of environmental consequences in Chapter 3, Alternatives A, B, and C share major elements, such as basic construction activities, dredging, filling (although the quantities of fill vary by alternative), equipment, utilities, and operations activities. For this reason, they are treated in a combined fashion in this cumulative analysis.

4.3 EVALUATION OF PAST ACTIONS POTENTIALLY GENERATING CUMULATIVE EFFECTS

For part of the initial analysis of cumulative impacts, MARAD and the POA examined the history of development in the area. Initial area development occurred primarily within the Ship Creek area one mile south of the POA expansion, and included:

- Establishment of the Alaska Engineering Commission headquarters camp in 1914;
- Establishment of Alaska Railroad Corporation headquarters and operations centers;
- Establishment of a short-lived tent city with more than 2,000 residents; and
- Construction of three dams.

By 1963, fewer than 20 years after construction of the first Ship Creek dam, the salmon populations were considered only remnant runs when compared to estimates regarding populations in 1900.

Expansion activities were also occurring at the current POA site during these years, although less quantitative information is available. From pictures, it is evident that filling of tidelands in the area near the Ocean Dock was occurring in the 1950s.

During the early 1970s, sediment accumulation in the bed of Ship Creek required bulldozers to push the fines back out of the streambed to the edges of the new golf course at Elmendorf AFB. Between 1950 and 1999, more than one mile of stream length and two miles of shoreline habitat in the lower twelve miles of Ship Creek were lost to straightening of the creek. As a result, there were fewer islands in the creek, and riparian habitats and wetlands were lost. By this time, the POA was permanently established at its current location. Most backlands at the existing POA are a result of tidelands filled since the 1920s. Altogether, 129 acres of the present POA area was filled. Information on tideland development activities at the POA over time can also be gleaned from USACE permits issued for the area. Table 4-1 shows over four acres of fill authorized in 1956, permits for two dock extensions in the 1970s, and permits for numerous expansion activities in the 1980s. These expansion activities included filling more than 30 acres of wetlands and tidelands and re-authorization of some projects in the 1990s that had been previously proposed but not completed.

In addition to tideland development, USACE has performed annual maintenance dredging under federal mandate in the area for nearly 45 years to maintain shipping access to the POA (Table 4-2). Dredging to maintain a deep water navigable channel in Cook Inlet has occurred since 1996, consisting of initial dredging of over one million cubic yards and annual maintenance dredging of 520,000 cubic yards. Table 4-2 depicts a chronology of dredging conducted by the USACE in the POA vicinity and Cook Inlet based on USACE documentation. More specific and recent information on filling and dredging around and at the POA (i.e., North Star, Summit Dock and Barge, Williams Logs) will be discussed in the cumulative analysis in the next section.

Table 4-2 USACE Dredging History - Anchorage Harbor Area and Cook Inlet					
Date	***Reference Document (Author)***	***Annual Amount of Dredging (cubic yards)***	***Area Dredged***	***Disposal Site Details***	***Additional Information***
1959-1961	Anchorage Harbor, Alaska: History and Project Conditions (USACE)	Unknown	Approach to new dry cargo berth at City Dock		Depth -35 feet MLLW
1965	N/A	Unknown	Approach to POA City Dock		Annual maintenance dredging surveys begin; depth -35 feet MLLW
1974	EIS - Anchorage Harbor Operation and Maintenance (USACE)	Up to 70,000	POA		
1977	Anchorage Harbor, Alaska: History and Project Conditions (USACE)	Unknown	Expanded from the original 2,000 feet project limit to 3,000 feet length		Per Congressional approval (Public Law 94-587, Oct. 22, 1976)
1978	EA and FONSI – Anchorage Harbor Operation & Maintenance (USACE)	Up to 100,000	POA area extended approximately 930 feet to the north, from existing 2,070 feet length, dredging extends further north and south	2,135-feet section of Knik Arm; parallels dock at minimum distance of 1,000 feet in water depths greater than -40 feet MLLW	Shallow open water disposal; 714 feet of new dock constructed since 1974 EIS; depth -35 feet MLLW
1980	EA – Proposed Dredged Material Disposal Site Relocation at Anchorage Harbor, Alaska (USACE)	Increased maximum amount from 180,000 to 250,000	POA same as previous	Disposal site approximately 2,000 feet by 3,000 feet; Relocated 0.5 mile north to minimize return of material from currents	Depth -35 feet MLLW

Table 4-2 USACE Dredging History - Anchorage Harbor Area and Cook Inlet

Date	*Reference Document (Author)*	*Annual Amount of Dredging (cubic yards)*	*Area Dredged*	*Disposal Site Details*	*Additional Information*
1981-1982	Anchorage Harbor, Alaska: History and Project Conditions (USACE)	894,076 (between spring 1981 and fall 1982)	POA		Performed by USACE and contractors to remove material from excessive shoaling during spring/ summer 1981; depth -35 feet MLLW
1983	EA & FONSI– Anchorage Harbor Operation and Maintenance, Inclusion of Agitation Dredging (USACE)	Total amount to remain the same, varying between 100,000 and 300,000	POA	In water depths of at least -40 feet MLLW; minimum distance of 1,000 feet, preferably 2,000 feet offshore from dock face	Proposal to include agitation dredging as an equal alternative to clamshell dredging; Depth -35 feet MLLW
1996	EA & FONSI – Cook Inlet Deep Draft Navigation Interim Feasibility Report and EA (USACE)	Initial estimate 1,109,918 in 3 months; maintenance amount estimate 520,037 every 5 years	Cook Inlet Deep Draft Navigation Channel; 151 acres total (1,001 feet by 6,562 feet)	In open deep water near Fire Island at depths of -50 to -80 feet MLLW; minimum distance of 3,000 feet offshore from dock face	Depth of initial dredging -42.6 feet to -44 feet MLLW
1999-2000	Anchorage Harbor, Alaska: History and Project Conditions (USACE)	893,236 from 10/1/99 to 9/30/00 annual maintenance contract; plus additional 565,000	POA		Additional amount removed during 15 days in November 1999; was hazardous shoaling

Table 4-2 USACE Dredging History - Anchorage Harbor Area and Cook Inlet

Date	*Reference Document (Author)*	*Annual Amount of Dredging (cubic yards)*	*Area Dredged*	*Disposal Site Details*	*Additional Information*
2001	EA & FONSI – Maintenance Dredging and Dredged Material Disposal, Anchorage Harbor, Alaska (USACE)	Increases volume and frequency from the average 250,000 allowed under previous authorizations to 0.6 to 1 million; quantity has ranged from 251,968 to 1,037,163 each year since 1994	POA approximately 3,000 feet long by an average of 600 feet wide	No change from previous 1983 POA area	Average two to four barge trips per day containing 1,500 cubic yards each, yet shoaling in the harbor area increasing; current two phase dredging schedule not keeping up, thus limiting access; depth -35 feet MLLW
2001	EA & FONSI - Maintenance Dredging and Dredged Material Disposal, Anchorage Harbor, Alaska (USACE); same as referenced above	Initial dredging completed, annual maintenance amount now anticipated at every two to three years	Cook Inlet Deep Draft Navigation Channel; 366 acres (1,214 feet by 13,142 feet)	No change from previous 1996 Cook Inlet Deep Draft Navigation Channel area	

4.4 ASSESSMENT OF CUMULATIVE EFFECTS

Review of plans, studies, and other documents from city, state, and federal agencies revealed both ongoing and future, reasonably foreseeable actions that warranted evaluation for their potential interactions with the Project at the POA (FTA 2003, FTA and ARRC 2003). Table 4-3 presents past (within the last ten years), ongoing, and reasonably foreseeable future actions addressed in this analysis. Figure 4-1 shows the locations of these actions.

Table 4-3 Past, Ongoing, and Reasonably Foreseeable Actions Used for Cumulative Effects Analysis

Project	*Proponent*	*Timing*	*Description*	*Interaction with Marine Terminal Redevelopment Project*
Past				
Cook Inlet Dock Expansions (1-2001-0809)[1]	Cook Inlet Excursions	Construction 2001-2005	Construct walkway and floating dock	Located south of the Ship Creek Public boat launch ramp
Repair POL 2 (D-770144)	POA	Construction between 1994-1998	Repair and rehabilitation of POL 2 including dock fender replacement, repair Trestle Pier No. 2 and three existing piles	Reduced the likelihood of leaks occurring at POL 2; no dredging or pile driving
Construct a third trestle at Terminal 3 (P-770144)	POA	Construction between 2001 and 2004	Construct third trestle at the north end of Terminal 3 with the driving of 22 30-inch steel piles	Increased capacity and efficiency in which cargo from container ships was transferred
Construction of a double-track rail loop (M-920080)	Williams Alaska, Petroleum, Inc.	Construction between 2001 and 2004	Discharge 300,000 cubic yard of gravel, concrete rubble and riprap into 8.5 acres of intertidal mudflats for the construction of a double track rail loop, and build temporary equipment storage inside the rail loop	Improved intermodal transportation on ARRC lease lands

[1] These numbers refer to the associated USACE permit number for these projects

Table 4-3 Past, Ongoing, and Reasonably Foreseeable Actions Used for Cumulative Effects Analysis (con't)

Project	*Proponent*	*Timing*	*Description*	*Interaction with Marine Terminal Redevelopment Project*
Past				
Construct Bulk Storage Tank loop (N-920080)	Williams Alaska Petroleum, Inc.	Construction between 2002-2006	Modification of an existing loading rack and bulk storage tank construction to allow for year round sales and storage of gasoline blendstock	Increased capacity at the Williams Alaska Petroleum, Inc. facility and improved transportation by reducing customer waiting times
Pedestrian Safety and Amenities Project	ARRC	Construction 2002-2003	Improve pedestrian access to the Ship Creek area by adding/ refurbishing sidewalks, providing pedestrian crossing panels over the track on North C Street, and lighting, landscaping, and interpretive signs	This project invited more pedestrian traffic and visitors to the ARRC intermodal transit area and improved recreational access to Ship Creek
Ongoing				
Port MacKenzie construction of a deep water dock	Matanuska-Susitna Borough	Ongoing	Extend the existing barge dock to deep water, where ocean vessels may dock	Increase in ocean vessels docking at Port MacKenzie; conflict with the traffic between the two ports
Ship Creek Culvert Removal Project	MOA	Construction scheduled to begin in 2005	Reconstructing or relocating the existing embankment, road, culverts, and utilities associated with the crossing of Ship Creek with a bridge	Provide safe and efficient vehicle and pedestrian access to Ship Creek and to Ship Creek Point for industrial, commercial, and recreational users
Ship Creek Pedestrian Trail Beginning at the CEA Dam	MOA	In 2002, the first 600 feet of the trail were constructed; in 2004, 12,000 feet to Reeve Blvd. will be added; the remainder will be done in phases over several years	Build a trail along Ship Creek	This action will improve recreation in the Ship Creek area

Table 4-3 Past, Ongoing, and Reasonably Foreseeable Actions Used for Cumulative Effects Analysis (con't)

Project	*Proponent*	*Timing*	*Description*	*Interaction with Marine Terminal Redevelopment Project*
Ongoing				
Ship Creek Watershed Improvements and Restoration	MOA/ ARRC	Ongoing	Various improvements such as salmon viewing and other water quality improvements; commercial, residential, and recreational amenities also planned	The various projects will make improvements in the Ship Creek area
Annual Maintenance Dredging at POA Harbor[2]	USACE	Ongoing	Continuation of 206 acres of annual maintenance dredging	Portions of the current dredge area will be filled by the proposed action
Intermodal Transit Center (ITC)	ARRC	Proposed for near-term future	Construct and operate an ITC south of Ship Creek and ARRC's freight intermodal yard	Vehicle operations involve same roads (FTA and ARRC 2003); provides multi-use passenger intermodal facility and will accommodate POA cruise traffic
Various Road Improvements	AMATS[3]	Construction through 2009	Improvements to Whitney Road, Ocean Dock Road (outside POA), and others in area	Improvements should reduce effects of long term growth regardless of expansion (AMATS 2001)
POA Road and Rail Extension	POA/ MARAD	Construction of double track in 2004 and 2005 with third track and final yard by 2011	Extension of Terminal Road and construction of an intermodal rail yard	Will reduce truck trips to the ARRC intermodal yard by 6,760; reduce CO emissions; increase noise slightly to 45 dBA from construction and 50 dBA from operations at 1,000 feet (Cherry Hill Housing)
Construction of the Anchorage Operation Center	ARRC	Ongoing, 2004-2005 construction	Construction of a new operations center in the existing rail yard	Improve efficiency at the ARRC yard by allowing all operations personnel to work in the same location
North Ship Creek Rail Yard Expansion Located North of Whitney and Post Roads and North of Ship Creek	ARRC	Ongoing	Upgrade and expand to build new facilities, align new and existing track, and configure operations for greater safety and efficiency	Improve efficiency and safety at the ARRC yard

[2] The location of this ongoing dredging is depicted in Figure 2-17

[3] AMATS = Anchorage Metropolitan Area Transportation Solutions

Table 4-3 Past, Ongoing, and Reasonably Foreseeable Actions Used for Cumulative Effects Analysis (con't)				
Action	***Proponent***	***Timing***	***Description***	***Interaction with Marine Terminal Redevelopment Project***
Ongoing				
U.S. Army Transformation	U.S. Army	Construction 2004-2006	Transformation of the 172nd Infantry Brigade into a Stryker Brigade Combat Team	Requires staging facility at the POA; deployment would involve 80 rail cars per day during training exercises or deployment (USARAK 2004b)
Alaska Basic Industries Expansion (O-1994-0554)	ABI	Construction between 2001 and 2005	Install a pre-cast concrete block retaining wall and clean gravel fill, with interlaid geotextile fabric to expand the material off-loading and material storage area	Increase capacity at the Alaska Basic Industries facility; filling of 0.134 acres of tidelands south of the POA
Construct a Barge Docking and Gravel Transfer Facility (2-2001-0485)	Summit Alaska, Inc.	Construction between 2001 and 2005 and dredging from 2001-2012	Construct a barge docking and gravel transfer facility; approximately 7,500 cubic yards of fill material into tidelands; approximately eleven piles out 150 feet from the end of the dike, two dolphins, and a 300-feet long conveyor system on top; includes construction and potential annual dredging maintenance up to four times a year	Increase capacity at the Summit Alaska, Inc. facility via filling of tidelands and creation of new waterfront structures south of the POA
Temporary Coast Guard Floating Dock (1994-934-D)	POA	Construction between 2004-2006	Construct a temporary Coast Guard floating dock at the POA	Temporary measure to increase berthing capacity at the existing POA for Coast Guard
Reasonably Foreseeable				
Knik Arm Ferry	FTA	Proposed for near-term future	Develop and operate a ferry linking Anchorage and Port MacKenzie	Vehicle operations involve same roads (FTA 2003)
Anchorage Yard Passenger Car Shop	ARRC	On hold	Construct a facility that would service passenger cars; up to five tracks entering the facility	Increased efficiency; allow for more cars to be serviced each night

Table 4-3 Past, Ongoing, and Reasonably Foreseeable Actions Used for Cumulative Effects Analysis (con't)				
Action	***Proponent***	***Timing***	***Description***	***Interaction with Marine Terminal Redevelopment Project***
Reasonably Foreseeable				
Anchorage Yard Locomotive Fueling System	ARRC	Near future	Upgrading the existing locomotive fueling facility, and reducing on-site storage	Improve the pumping systems, fuel containment systems; allow for increased efficiency
Capacity Improvements between Mile 110 and 114	ARRC	Near future	Improve the four-mile corridor by adding sidings, installing automated signals and switches, and extending the double track	Improve efficiency and safety at the ARRC yard as well as alleviate congestion, future passenger and freight train demands; potential to move goods from the yard to outside areas efficiently
Swan Bay Terminal Expansion (AA-1984-0184)	Swan Bay Holdings, Inc. (adjacent to and coinciding with North Star Terminal project)	Construction and authorized fill to be completed by 2006; maintenance dredging will end in 2012	Construction of expanded docking facilities into tidelands north of Ship Creek inlet and south of the POA expansion area	Distance out and dredge depths require coordination; may affect POA area hydrodynamics; provides additional waterfront storage and deep water berth
North Star Terminal Expansion (Y-850014)	NSTSC (adjacent to and coinciding with Swan Bay Holdings, Inc. project)	Construction and authorized fill to be completed in near future; maintenance dredging to be completed by 2010	Construction of expanded privately developed docking facilities into tidelands north of Ship Creek inlet and south of the POA expansion area	Distance out and dredge depths require coordination; may affect POA area hydrodynamics; provides additional waterfront storage and deep water berth

Table 4-3 Past, Ongoing, and Reasonably Foreseeable Actions Used for Cumulative Effects Analysis (con't)				
Action	***Proponent***	***Timing***	***Description***	***Interaction with Marine Terminal Redevelopment Project***
Reasonably Foreseeable				
Port MacKenzie construction of a ferry landing (W-1979-0412)	Matanuska-Susitna Borough	Construction near future	Construct a ferry landing off the south wing of the existing fill dock; transfer bridge from the dock to the hoist tower consisting of four pipe pile dolphins; catwalk extending south from the hoist tower; seasonal float attached to the catwalk dolphins	Increase in vessel movement between the two ports; potential for conflicts between ships arriving/departing the POA and the ferry; proposed action landing site at North Star not included in POA Project; may affect POA secured boundary of 3,000 feet
Coastal Trail-Ship Creek Trail Connection	MOA	Construction near future	Connect the Coastal Trail to the Ship Creek Trail	Improve pedestrian access to Ship Creek Point and further up Ship Creek
Knik Arm Power Plant Project	Private Developer	Proposed for near-term future	Repowering Kink Arm Power Plant as a new facility to generate and supply electric power and steam heat for uses in the vicinity of downtown Anchorage	Once operational the plant may use water from Ship Creek
Busy Bee Marina dredging (2-2003-358)	Busy Bee Marina	Occurring near future; and maintenance dredging until 2013	Dredge approximately 4,250 cubic yards of mud from the 19,000 square feet marina and deposit it in Ship Creek to lower the bottom approximately six feet	Will assist in maintaining adequate depth of Ship Creek for boats berthing at the Busy Bee Marina
Long-Term Future				
Knik Arm Bridge (Conceptual)	KABATA[4]	Future	Construct a vehicle bridge across Knik Arm with its eastern terminus just north of the POA and potential for a roadway along the tidelands	Location of roadway could be adjacent to the POA (existing and redeveloped); A Notice of Intent was published in January, 2005 to begin the NEPA analysis, but siting, alternative routes, and design have not been finalized or published.

Table 4-3 Past, Ongoing, and Reasonably Foreseeable Actions Used for Cumulative Effects Analysis (con't)				
Action	***Proponent***	***Timing***	***Description***	***Interaction with Marine Terminal Redevelopment Project***
Speculative				
Seasonal aluminum ramp, bridge, and barge (1-990227)	Allen Marine Goldbelt Tours, LLC	Construction between 1999-2002	Seasonally install an aluminum ramp, orthotropic bridge, and a barge north of the small boat ramp in the Ship Creek Waterfront Development; permanently install two reusable pile sockets to support seasonal pilings for the bridge; to be removed at the end of October of each year	Expanded facility will be used to operate a sightseeing and dinner cruise vessel during the tourist season; may conflict with US Coast Guard security buffer for ship traffic into and out of POA area

[4] KABATA = Knik Arm Bridge and Toll Authority

A project proposed for the future is the Knik Arm Bridge. The Knik Arm Bridge is currently proposed as a two-lane highway bridge and causeway that would cross Knik Arm and connect on both sides with existing roads and planned transportation infrastructure. Although partial funding for preliminary project studies has been issued, additional funding is required for preliminary and final design and construction (KABATA 2004). Actual alternative routes and designs have not been determined. The NEPA Notice of Intent for this project was published in January, 2005.

In addition, Table 4-3 lists one action that remains undeveloped or marginally developed, and, as such, speculative. Because CEQ regulations admonish agencies to avoid speculation in EAs, this speculative project will not be considered as part of the cumulative effects analysis. The project, seasonal aluminum ramp, bridge, and barge, was permitted for construction between 1999 and 2000, but never built. The permit has since expired and this structure for sightseeing and dinner cruises can only be considered speculative.

Figure 4-1
Locations of Past, Ongoing, and Reasonably Foreseeable Actions

4.4.1 Cumulative Effects to Physical Resources

Air Quality. Cumulative effects to air quality from the proposed Project, when combined with other regional development projects, would not be significant. Several construction projects (e.g., North Star Terminal Expansion, U.S. Army Transformation, POA Road and Rail Extension) would overlap in year 2005, but cumulative emissions would not be regionally significant. Emissions from these projects have been analyzed as part of the Anchorage, Alaska CO Maintenance Plan and found that they would not cause the area to exceed the NAAQS for CO. Many of the construction and operational phases of these projects would affect vehicle traffic along the road network south of the POA, and certain cumulative projects would result in an increase in overall traffic. However, other reasonably foreseeable planned projects could result in reduced traffic. These projects include implementation of the MOA Ship Creek Multimodal Transportation Plan, the ARRC ITC and railyard improvements, the Knik Arm Ferry, and various road improvements. Such projects would result in greater efficiencies (e.g., improved traffic network systems that would reduce idling times), thus reducing emissions associated with ground and marine traffic. The Road and Rail Extension Project could eliminate 6,760 truck trips on this road network per year, thereby reducing traffic and accompanying exhaust emissions. The net impacts of other planned projects to air quality impacts would be less than significant, since most emission sources would be mobile and intermittent in nature, and their resulting pollutant impacts would not be large enough in the localized area to cause an exceedence of any ambient air quality standard. Therefore, when compared with existing baseline conditions, no significant cumulative adverse impacts to air quality would occur.

Noise. The analysis for the Project demonstrated that construction noise, including underwater noise and vibration, would not have significant adverse impacts within the POA or at nearby residential and park areas such as Cherry Hill housing and Government Hill. Cumulative construction, dredging, and operations projects would result in additional short-term increases in noise levels. Thus, temporary increases in localized noise from construction equipment and related vehicles would be expected. However, the proposed action effects would only overlap with projects occurring at the same time and general area as the regional expansion and development projects. The only projects occurring geographically and temporally in the same area are the Marine Terminal Redevelopment Project and the Road and Rail Extension Project at the POA. The Port MacKenzie deepwater development project is occurring on the west shore across the inlet from the POA. Noise from road and rail operations and construction were included within the analysis for the proposed action. The analysis concluded that construction and operations noise levels would not have a significant adverse impact on local communities. The combined impacts of these actions would remain well below the threshold of significance and would not be anticipated to have a significant cumulative adverse impact on the surrounding communities or noise-sensitive land use areas (e.g., parks).

Hazardous Materials and Waste. Projected expansion and development in the POA likely would result in additional throughput of POL; 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. The POA plans no introduction of new types of hazardous materials or waste. Contaminated sites from past activities exist in areas of the various regional projects; however, avoidance of areas of historic spills in the Project area, as well as implementation of protection measures, would ensure no off-site migration of contaminants. In addition, POA users and lessees are closely monitored by the POA to confirm compliance with applicable permits and regulations. Other projects contain stipulations concerning the management and handling of hazardous wastes as well. Therefore, the cumulative adverse impacts of the proposed action and other reasonably foreseeable projects with respect to hazardous materials and waste would not be significant.

Safety. Over a ten year period, numerous public and private construction-related projects occurred in the POA and surrounding areas. Projects designed to improve roads, bridges, and pedestrian walking trails would have a beneficial cumulative impact to human safety as they would move pedestrians safely around congested industrial areas. Military aviation safety would remain unimpacted because neither the proposed action nor reasonably foreseeable projects would result in EMI or exceed height restrictions that would interfere with aviation or other military activities at Elmendorf AFB. When combined with other regional projects, the proposed action would have no significant cumulative adverse impact to safety. It would, however, eliminate cross-traffic, improve roadway circulation, eliminate use of structures beyond design-life, and re-align rail traffic to minimize at-grade vehicular crossings within the POA. These issues are discussed under Transportation below.

4.4.2 Cumulative Effects to Natural Resources

Geology and Soils. Disturbance of non-submerged soil during construction for various planned projects may increase the potential for short-term erosion and sedimentation. For projects requiring NPDES permits, a *Stormwater Pollution Prevention Plan* would be prepared and implemented as part of the permits. BMPs, such as catch basins, siltation mats and filtration controls would be employed during construction to minimize the potential for erosion and sedimentation, and to protect adjacent properties and waterways from effects related to erosion, sedimentation, and flooding. There would be operational impacts to geology and soils, as well, from annual maintenance dredging in the vicinity of the POA. However, the annual maintenance dredging footprint at the POA would decrease under the Project, and partially offset dredging increases in other areas. With the implementation of the above procedures, cumulative impacts on geology or soils would not be significant. The proposed action and reasonably foreseeable projects would not result in cumulative adverse contributions to health, safety, or environmental risks associated with seismic events. In fact, the Project would be designed to reduce effects from seismic events and to mitigate beach erosion between the north end of the POA and Cairn Point, in the area of LF04. Therefore, the Project would have beneficial effects related to soils and geology.

Hydrodynamics and Sedimentation. Impacts to hydrodynamics and sedimentation for the proposed Project are associated with the change in tidal circulation and its effects on sedimentation throughout Knik Arm. A numerical tidal circulation model study was performed to examine the tidal circulation in Cook Inlet and in the POA area. The objective of the study was to characterize tidal circulation patterns at and near the POA for existing conditions and the conditions under the Project. Based on these results, a sedimentation analysis was performed to assess the current and future sedimentation conditions. All of the past cumulative projects are small in scale in comparison to the proposed action. However, it was important to capture the cumulative effects of such projects. Thus, the hydrodynamic and sedimentation cumulative impacts of past projects in the Knik Arm area were accounted for as existing conditions when the modeling effort was performed for this Project. These impacts were discussed in section 3.3.2. The impacts of the Port MacKenzie Improvements Project was analyzed by superimposing the expansion over the existing conditions. No significant cumulative adverse impacts are expected in the Ship Creek or Port MacKenzie areas from the Project, in combination with other past projects. There are however preliminary indications of a connection between the construction of Port MacKenzie and rates of sedimentation in the POA area.

Reasonably foreseeable projects that could potentially interact with the proposed action are Knik Arm Ferry, North Star Terminal Expansion, Port MacKenzie Ferry Landing, Port MacKenzie Deepwater Dock, and the annual maintenance dredging at the POA. These projects, when considered with the proposed action, would result in less than significant adverse impacts to hydrodynamics and sedimentation because any change in sedimentation caused by these future projects within the area of influence would not be substantial. The dredged material discharged from the construction of the North Star Terminal Expansion would add to the deposition of material in the disposal area that would be used by the Project. However, the annual maintenance dredging for the POA is expected to be equal to or less than the dredging without the Project. Also, there is capacity at this disposal site to accept this volume and type of material, so there would be a less than significant adverse impact from this disposal. Furthermore, it is assumed that all material that is deposited at the disposal site located to the south of the POA has met all USACE and USEPA criteria for disposal. In addition, none of the projects, either individually or cumulatively, would create enough sediment deposition at the disposal site or the POA to interfere with current or proposed operations at the POA. Therefore, cumulative adverse impacts to hydrodynamics and sedimentation would not be significant.

Water Quality. Potential cumulative impacts to water quality resulting from the proposed action and the identified regional development projects were assessed using the same criteria used to evaluate Project-specific impacts as described in section 3.3.3. Cumulative changes to marine water quality from historical inputs combined with other past, present, and future projects may result in impaired water quality. Cumulative changes could be considered significant if they cause incremental increases in certain contaminants or in areas that are already affected by historically impaired water quality.

Direct impacts to marine water quality resulting from implementation of the proposed action in conjunction with the identified cumulative projects would be associated with: 1) the re-suspension of sediments during dredging and in-water construction activities, which would cause localized and temporary increases in turbidity; and 2) potential contaminant inputs from accidental spills. Short-term increases in turbidity associated with the various planned projects would be temporary and would not generate chronic adverse effects on water quality. Potential impacts from accidental spills would be minimized through compliance with established contingency plans (see section 3.3.3).

Identified land-based projects would result in land use changes that could cumulatively increase stormwater runoff in the region. Thus, increases in the concentrations and volumes of pollutants carried by the stormwater into the receiving waters could occur. However, these point and non-point sources of stormwater would be covered under applicable stormwater permits (i.e., NPDES permits). These permits would include water quality monitoring and would be further reduced via implementation of standard site-specific BMPs, with the goal to ensure that stormwater runoff quality would not exceed applicable water quality standards. For these reasons, the potential adverse water quality impacts associated with the identified cumulative projects are expected to be less than significant.

Biological Resources

Vegetation, Habitats and Wildlife. For vegetation, habitats, and wildlife, the geographical area of interest includes those areas that could be affected by past, ongoing, and reasonably foreseeable projects at the POA and adjacent coastal area. Many of the potentially affected species are associated with habitats that have been degraded and/or reduced in size due principally to historical impacts such as building, urbanization, and development of the POA and surrounding areas (see section 4.3). Due to this increasing urbanization and development, the POA and properties at Ship Creek have little terrestrial habitat and support a low diversity and abundance of wildlife. The proposed expansion of the POA would not have a significant impact on the biological resources that do occur at the POA. The other past, ongoing, and reasonably foreseeable projects considered in this analysis (see Table 4-3) would have similar less than significant impacts on terrestrial biological resources. Because all of the projects would occur in already developed areas, none would result in the loss or significant degradation of terrestrial habitat. The cumulative effect of the proposed action, together with other past, ongoing, and reasonably foreseeable projects on vegetation, habitats, and wildlife would also be less than significant.

Special-Status Species: Belugas. In the Final EIS on the Subsistence Harvest Management of Cook Inlet Beluga Whales, NOAA Fisheries evaluated in detail the cumulative impacts on Cook Inlet beluga whales (NOAA Fisheries 2003b). The agency found that cumulative impacts are diverse and include subsistence harvest, stranding, direct and indirect interactions with commercial and recreational fisheries including impacts to beluga prey, oil spills, municipal wastes and other pollutants, oil and gas development, municipal activities, underwater noise, airborne noise, tourism, vessel disturbances,

predation, and disease. However, overall habitat of the Cook Inlet stock of belugas has not been destroyed, modified, or curtailed to a degree to cause the stock to be in danger of extinction in the foreseeable future. Subsistence over-harvest of Cook Inlet belugas was considered the only activity that has caused serious declines in the past. The agency concluded that cumulative impacts of activities in Cook Inlet other than subsistence harvest have been minimal (NOAA Fisheries 2003b).

With implementation of the proposed POA expansion, specific management actions to minimize impacts to belugas would be followed (see Chapter 2). In addition, all past, ongoing, and reasonably foreseeable projects in the lower Knik Arm area have beluga-specific environmental restrictions placed on their USACE permits. In general, marine mammal observers must be present during all pile driving activities from May 1 to October 15 and operations may be required to cease if belugas are sited within a specified distance of construction activities. These environmental restrictions on all projects addressed in this cumulative analysis, combined with the management actions outlined in Chapter 2 for the proposed activities associated with the Project, would ensure that no significant cumulative adverse impacts to belugas would occur.

Essential Fish Habitat and Federally Managed Fish Species. The EFH analysis for fisheries, including federally managed species for which EFH is protected, and special-status species, includes the areas within the surrounding waters of the POA south to Ship Creek, north to Cairn Point, and west to Port MacKenzie. The proposed Project is within the geographical range of migratory fish and the foraging range of beluga whales and marine birds that travel through the area.

Potential impacts from construction and operations associated with the Project on federally managed fisheries would be short-term and less than significant (see section 3.3.5). Of all the past, ongoing, and reasonably foreseeable projects considered in this analysis (see Table 4-3), only 14 involve in-water work that may potentially impact marine resources near the POA or lower Knik Arm (Table 4-4; see Figure 4-1). The types of biological impacts resulting from construction and dredging activities associated with these projects would be similar to those described for the proposed POA expansion. For the Project, there would be short-term and localized disturbance to marine fisheries due to increased turbidity and other water quality effects, and due to noise and construction activity. All of the projects would employ, or have employed, USACE permit conditions and other environmental protection measures (e.g., management actions described in Chapter 2) to minimize impacts to water quality and marine biota. As discussed in section 3.3.5, the Project would have adverse but not significant impacts on EFH with the development (through filling) of approximately 135 acres within existing intertidal and subtidal areas and the annual maintenance dredging of 184 acres of subtidal area. In addition, up to 4,000 piles would be placed to support the proposed dock structure under Alternative B. These impacts to EFH, when combined with the impacts due to dredging, fill, and placement of piles from projects addressed in this cumulative analysis (Table 4-4), would result in adverse, but not significant, cumulative impacts to EFH in Knik Arm. The no-action alternative would result in similar impacts because of required replacement

and maintenance activities, although filling would not be required under the no-action alternative. Management actions or mitigation for these impacts would ensure that cumulative impacts to fisheries and EFH do not occur or are minimized.

Table 4-4 Potential Impacts to EFH from Past, Ongoing, and Reasonably Foreseeable Projects in the Vicinity of the POA

	Impacts to EFH		
Project	*Maintenance Dredging (acres)*	*Fill (acres)*	*No. Piles*
Past			
Cook Inlet Dock Expansions	0	0	5
Third Trestle at Terminal 3	0	0	22
Double-track Rail Loop	0	8.5	0
Ongoing			
Port MacKenzie Deep-water Dock	Unknown	0	16
Ship Creek Culvert Removal	0	0.22	0
Annual POA Maintenance Dredging	206	0	0
Pre-Cast Concrete Block Retaining Wall	0	0.134	0
Barge Docking & Gravel Transfer Facility	0.6	0.1	13
Temporary U.S. Coast Guard Floating Dock	0	0	10
Reasonably Foreseeable			
Knik Arm Ferry	Unknown	0	51
Swan Bay Terminal Expansion	0.9	7.5	0
North Star Terminal Expansion	3.1	12.5	0
Port MacKenzie Ferry Landing	Unknown	0	17
Busy Bee Marina Dredging	0.4	0	0
Totals	**211**	**28.9**	**134**

4.4.3 Cumulative Effects to Human Resources

Land Use and Coastal Zone Consistency. The geographical region of influence for land use impacts includes the surrounding land areas around the POA. With increasing distance from the POA, land use changes resulting from the other projects would have a decreasing contribution to cumulative impacts on land use. The general trend in area land use is toward passenger intermodal and pedestrian use south of Ship Creek, and industrial and freight use north of Ship Creek. However, no changes in planned land use at the POA or in the immediate vicinity are expected in the future. The proposed action along with other regional port expansion development projects (e.g., North Star Expansion, Ship Creek Intermodal Transit Center) in the heavily industrialized POA are consistent with current land uses and zoning for the area and would result in operation efficiencies in these areas. All projects within the coastal zone would continue to be governed by the Alaska Coastal Management Plan as well as the ACMP and the Matanuska-Susitna Borough Coastal Management Program. The POA is an industrial area and has no identified coastal resource values that would be affected. Therefore, the cumulative adverse impact on land use from these and future proposed expansion and development projects would not be significant.

Recreation and Visual Resources. The proposed action would not contribute to significant impacts to recreational activities in the immediate vicinity or in the region as a whole. The proposed action and various other actions would occur in industrial areas and would be consistent with the visual characteristics of those locations. In addition, the POA would institute various management actions to enhance the use and visual appeal of Ship Creek Point and to procure conservation easements and assess habitat restoration opportunities. These are locations outside the secured area of the POA and open to the general public. Future development projects at Ship Creek Point would include interpretive sites on historic cultures and usage of Upper Cook Inlet in the Ship Creek area, as well as development of a pavilion designed on a model of a Dena'ina culture "Nichil" or "Big House." Other regional enhancement projects would add pedestrian amenities such as sidewalks, a shopping plaza, walking trails, enhanced overlooks, and enclosed sky bridges which would improve public viewing of the mountains and the historic ARRC train depot. In addition, habitat restoration programs could incorporate engineered wetlands and associated boardwalks, a plaza, and wildlife viewing areas. The proposed enhancements and additions would have beneficial aesthetic and recreational effects. Therefore, cumulative impacts to regional recreation and visual resources would be beneficial.

Transportation/Traffic. Construction activities associated with proposed and future projects would result in traffic increases in the local area, particularly along the road network south of the POA. However, the impact would be short-term, and would not result in significant long-term impacts. Operational traffic associated with the proposed action in combination with other cumulative projects in the region would occur on regional roadways. However, some reasonably foreseeable planned projects could result in reduced traffic. These projects include implementation of the MOA Ship Creek Multimodal Transportation Plan, the ARRC ITC and railyard improvements, the Knik Arm Ferry, and various road improvements. Such projects would result in greater efficiencies (e.g., improved traffic network systems that would reduce idling times), thus reducing emissions associated with ground and marine traffic. In addition, the Road and Rail Extension Project would eliminate 6,760 truck trips on this road network per year, thereby reducing traffic and accompanying exhaust emissions. Many of the regional projects which address reconfiguration of signals, gates, crosswalks, and roads would enhance traffic safety and minimize potential effects to pedestrians. Thus, the proposed action combined with several of the proposed projects in the area are expected to have long-term efficiency improvements for transportation systems in the POA and Ship Creek areas that would off-set traffic increases associated with other planned projects. Therefore, cumulative adverse impacts to transportation and traffic in the region would not be significant.

4(f)/106 Resources. Adverse impacts to 4(f)/106 resources through implementation of the proposed action, and when combined with proposed future development projects, are not expected. Recent environmental analysis of several projects listed in Table 4-3 indicate no adverse effect on cultural resources and no adverse impacts to 4(f) properties would occur as a result of the Project. There would be beneficial effects to public parks and recreation lands with implementation of the Project. These

beneficial effects will result from procuring conservation easements, assessing habitat restoration, restoring that habitat (if practicable), and enhancing Ship Creek Point and the Sea Service Veterans Memorial Park. 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. The POA would erect a sign at the Ship Creek Point site, with information obtained from cultural resource studies, to raise public awareness and provide education on past native use of the waterfront and Ship Creek. This, combined with a Dena'ina cultural study, would have a beneficial effect on cultural resources. Therefore, cumulative impacts to 4(f)/106 resources in the region would be beneficial.

Public Services and Utilities. The Project, when viewed in conjunction with other regional development projects, could increase demand on local utilities. However, demand for electricity, gas, and water would increase whether or not these projects are implemented. Also, as part of the proposed action, 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 (e.g., cranes, reefers, lightpoles, and cathodic protection). Therefore, the cumulative adverse impact of the proposed action compared to existing conditions is not significant. Changes in the requirements for fire or hazardous materials response capabilities would not be anticipated. Cumulative demand for public services such as security (e.g., police, Coast Guard), fire protection, and other emergency responders would not increase substantially relative to current conditions and could be facilitated by existing resources. As such, cumulative adverse impacts to public services and utilities would not be significant.

Socioeconomics and Environmental Justice. The proposed action, when viewed in conjunction with other regional development projects, would have beneficial cumulative effects on socioeconomic resources in Alaska. Construction spending for such development would result in direct economic stimulus to the construction industry itself, as well as direct, indirect, and induced economic effects that would be beneficial to other economic sectors in the region. The engineering, architectural, and other services sector, and financial and insurance firms, would receive sizable portions of the direct spending. 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. In general, the net cumulative effects of these projects would be increased economic output and growth in the region, as well as increased employment, income, and consumer spending.

The cumulative effect of operations following development of these projects would exert additional direct beneficial effects in the immediate vicinity of each project, as well as direct increases in business for related industries throughout the region. Trucking and warehousing, petroleum producers, wholesale trade, and other economic sectors would benefit from transportation network improvements (e.g., Knik Arm Ferry, the Intermodal Transit Center and various road improvement projects, port and dock expansions, etc.). Passenger ferry operations in conjunction with cruise terminal traffic would lead

directly to cumulative increased sales in personal services, eating and drinking establishments, amusement and recreation, food production, and many other regional industries. These impacts would be beneficial.

With regards to environmental justice, areas potentially affected by the cumulative development projects are mainly industrial and well isolated from residential developments. As described in section 3.4.6 for the proposed action, potential environmental justice populations reside outside the POA. Expansion of the POA and other cumulative projects focused on transportation network improvements would result in improved travel conditions with more efficient transport of goods and added revenue and jobs in the local economy. Increased efficiency in the local transportation network would help reduce transportation costs that are paid by suppliers, wholesalers, and others in the supply chain which are passed on to consumers in the price of goods. The time to market may also be reduced, thereby potentially increasing sales volumes, levels of service, customer good will, and associated profitability for businesses throughout Alaska. These beneficial effects would be equally distributed throughout the local and regional economies and no disproportionate or adverse effects to minority or low-income populations would occur. No significant cumulative adverse impacts on environmental justice would occur.

Cultural Resources. Several cultural and historical sites and historic buildings exist in the Ship Creek/POA area. These sites include the National Register-listed Anchorage Railroad Depot and Alaska Railroad Freight Shed, Warehouse Three, Ketchikan Spruce Mills on Ocean Dock Road, and the general location of a former native historic fishing camp. The proposed action and proposed future development projects would not have significant impacts to cultural resources. Recent environmental analysis of several projects listed in Table 4-2 indicates no significant cumulative adverse effect on cultural resources. In addition, various proposed management actions, such as an interpretive center with public displays on Dena'ina history and culture as well as a Dena'ina cultural study, would have a beneficial effect on cultural resources. As such, cumulative adverse impacts to cultural resources would not be significant.

4.5 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires that environmental analysis include identification of "...any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented." Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects this use could have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable timeframe. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., extinction of a threatened or endangered species or the disturbance of a cultural resource).

For the proposed Project, most resource commitments are neither irreversible nor irretrievable. Most impacts are short-term and temporary, or longer lasting, but less than significant. Those limited resources that may involve a possible irreversible or irretrievable commitment are:

- Commitment of tidelands for the dock expansion;
- Use of various nonrenewable materials such as minerals, metals, and petroleum products during seven seasons of construction; and
- Use of nonrenewable petroleum products for trucks, vehicles, loading/unloading equipment, trains, and building equipment.

The required resources and materials are available from existing sources, and the increase in use would be minimal compared to their availability.